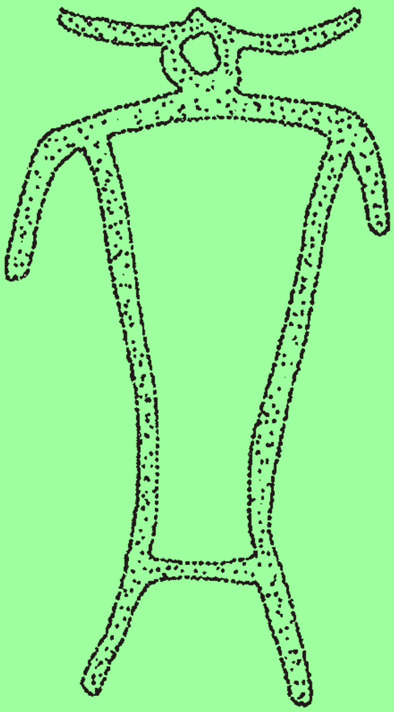
COLORADO PREHISTORY:

A CONTEXT FOR THE NORTHERN COLORADO RIVER BASIN



Alan D. Reed

and

Michael D. Metcalf

COLORADO PREHISTORY:

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by

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Colorado Council of Professional Archaeologists
1999

Third Printing
March 2009

ISBN 0-87480-708-5

The third printing is a joint effort of the Colorado Council of Professional Archaeologists and the Colorado Archaeological Society

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Prehistory of Colorado: A Publication Series
Funding provided by the
STATE HISTORICAL FUND, COLORADO HISTORICAL SOCIETY
Project #97-PI-015

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ACKNOWLEDGMENTS

This document is the product of the many archaeologists who have conducted archaeological work in western Colorado. It would have not been written, however, were it not for the instigation of the Colorado Council of Professional Archaeologists and funding by the State Historical Fund. We are especially indebted to the members of the Grant Advisory Board, consisting of Sandy Karhu, Gordon C. Tucker, William G. Killam, Douglas Scott, Margaret Van Ness, and Steve Lekson, who provided valuable direction for the project. Kim Redman of Alpine worked for weeks on the project; she was responsible for creating the excavation database and for extracting the necessary data from regional reports. Kevin Black, Todd McMahon, and Joanne Sanfilippo reviewed a draft version of this manuscript. These reviewers provided many valuable comments, and the document has been much improved as a result of their efforts. Amy Holmes and Michael McFaul provided comments on a draft of the paleoenvironmental section. Philip Duke pointed out the importance of presenting diverse models of prehistoric adaptations. We hope that we have effectively implemented his suggestion. Many people provided important information or reports on request; these include Kristie Arrington, Bill Buckles, Hal Keesling, Laura Kochanski, David B. Madsen, Kae McDonald, Todd McMahon, and Joanne Sanfilippo. Jim Green, Todd McMahon, and Margaret Van Ness of the Office of Archaeology and Historic Preservation shared their thoughts about management of cultural resources. Mary Sullivan of that office assisted in site file searches and provided us a database comprised of inventory-level data. Kevin Black, Elizabeth Morris, and Mark Stiger graciously shared many of their ideas on the region's prehistory. Graphics were prepared by Leslie Morlock and Shanna Diederichs of Alpine and Anne McKibbin of Metcalf Archaeological Consultants. Susan Chandler of Alpine edited the initial draft and kept the effort on track. Carole Graham, Joetta Gray, and Debby Chamberlain assisted with data assembly and clerical tasks. Manuscript editing was conducted by Andrea M. Greenaker. To all these people we extend our heartfelt thanks.

Alan D. Reed
Michael D. Metcalf

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!

Susan Collins
State Archaeologist
Deputy State Historic Preservation Officer

Georgianna Contiguglia
President, Colorado Historical Society
State Historic Preservation Officer

CONTRIBUTORS

Alan D. Reed earned an MA degree in Anthropology from the University of Colorado in 1978. He has conducted archaeological work in western Colorado for over 25 years, and was the author of the 1984 regional research design for west-central Colorado. Mr. Reed is one of three principals at Alpine Archaeological Consultants, Inc. in Montrose, Colorado.

Michael D. Metcalf earned an MA degree in Anthropology in 1974 and has been active in Colorado archaeology for three decades. he is a principal in Metcalf Archaeological Consultants, based in Eagle, Colorado, and maintains an active research interest in the Northern Colorado River Basin study unit.

Chapter 1
INTRODUCTION

OBJECTIVES

In 1983, the Colorado Historical Society sponsored the production of five Resource Protection Planning Process documents (RP-3) to establish the context of prehistoric sites recorded within the state's boundaries. These documents were prepared in response to the Department of the Interior's Archeology and Historic Preservation guidelines, which pointed out the need to consider archaeological sites in the context of other regional sites and with regards to general trends and patterns of history or prehistory (*Federal Register*). The RP-3 documents, published in 1984, outlined general regional prehistory, identified significant gaps in the database, and presented important research topics. Because the significance of most prehistoric sites in Colorado is evaluated in terms of the potential for yielding information important to prehistory, the RP-3 documents have been important contexts for evaluations.

In the 15 years since the RP-3 documents were written, the archaeological database has grown dramatically. More than 65 percent of the archaeological documents on file at the Office of Archaeology and Historic Preservation (OAHP) have been produced since the publication of the RP-3 contexts. With the completion of so many additional archaeological studies has come refinement of our heuristic models. As models have changed, archaeologists have recognized that revision of the regional prehistoric contexts has become necessary.

In 1997, the Colorado Council of Professional Archaeologists (CCPA) undertook the responsibility to revise the RP-3 contexts and contracted with teams of professional archaeologists to prepare new context documents for five regions. Funding for the project was provided through a grant from the State Historical Fund. The five regions are substantially different from those employed in the 1984 effort and have primarily been delineated along major river systems. The five regions incorporate the Platte, Arkansas, Rio Grande, and the Colorado River systems. The Colorado drainage has been divided into northern and southern units to isolate the homeland of the Ancestral Pueblo (Anasazi) in southwestern Colorado. This document concerns the prehistory of the Northern Colorado Basin. Its purpose is to provide a brief culture history framework, present and evaluate models of prehistoric behaviors, and provide direction for future archaeological investigations.

DEFINITION OF THE STUDY AREA

The Northern Colorado Basin is bounded on the east by the Continental Divide, on the north by the Wyoming border, and on the west by the Utah border (Figure 1-1). The southern boundary was intended to segregate the homeland of the Ancestral Pueblo and was derived by delineating the northernmost extent of concentrated Ancestral Pueblo long-term residential sites. The southern boundary has been drawn to include eastern Dolores County, northeastern Montezuma County, and northern La Plata County in the Northern Colorado Basin study area (Figure 1-2). The study area subsumes all or portions of three regions defined in the 1984 RP-3 context project; these include the Northwest Colorado region (Grady 1984), the west-central Colorado region (Reed 1984b), and the western portion of the mountain region (Guthrie et al. 1984).

Because the study area covers such a large area, it has been divided into six smaller units to facilitate discussion. These six units also represent major river drainages; they include 1) the Yampa and Green, 2) the White, 3) the Colorado, 4) the Gunnison, 5) the Dolores, and 6) the San Juan drainage units (Figure 1-3). Boundaries between the units have been drawn along the divides separating the drainage systems.

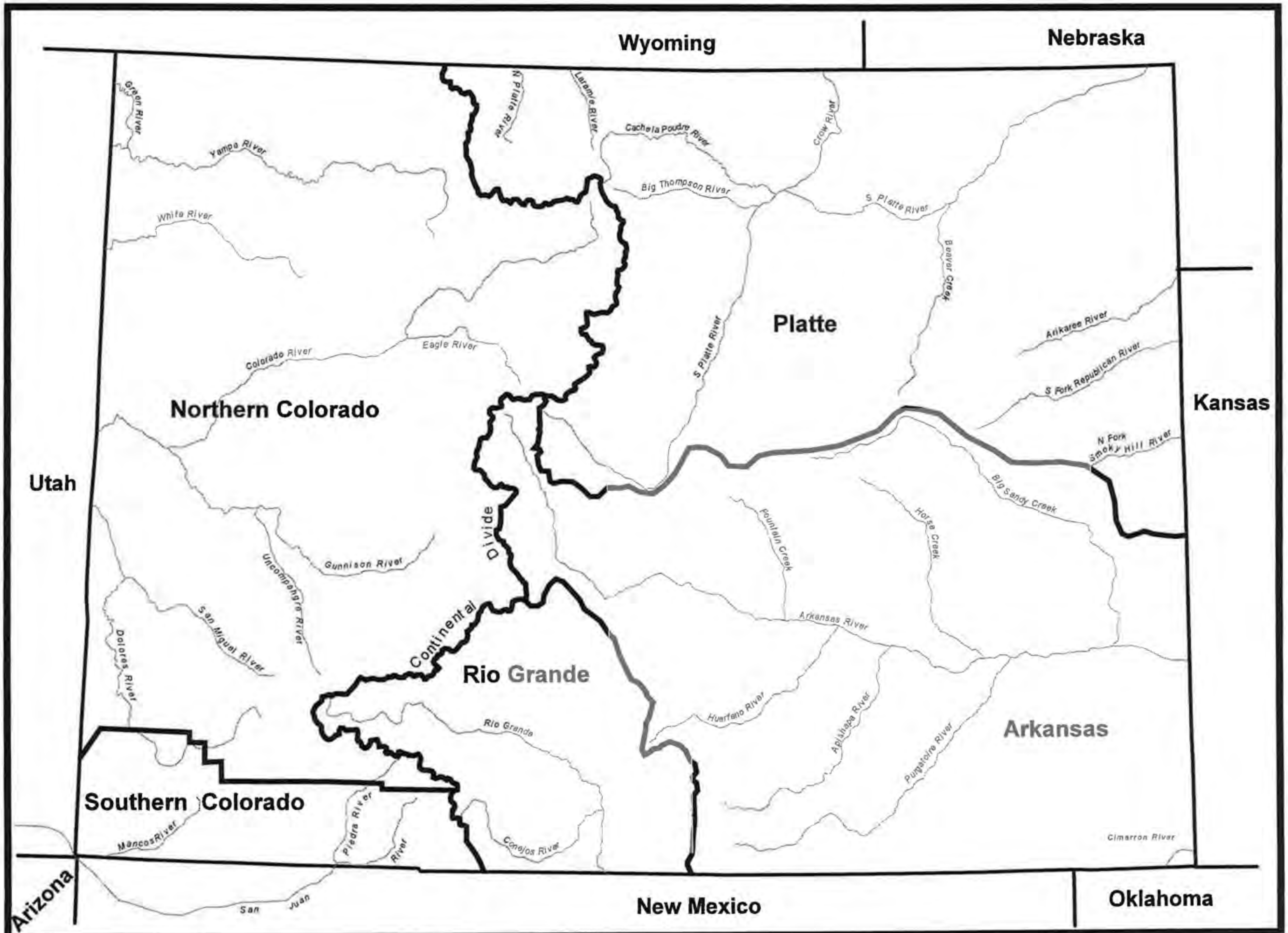

Figure 1-1. Location of the Northern Colorado Basin in Colorado.

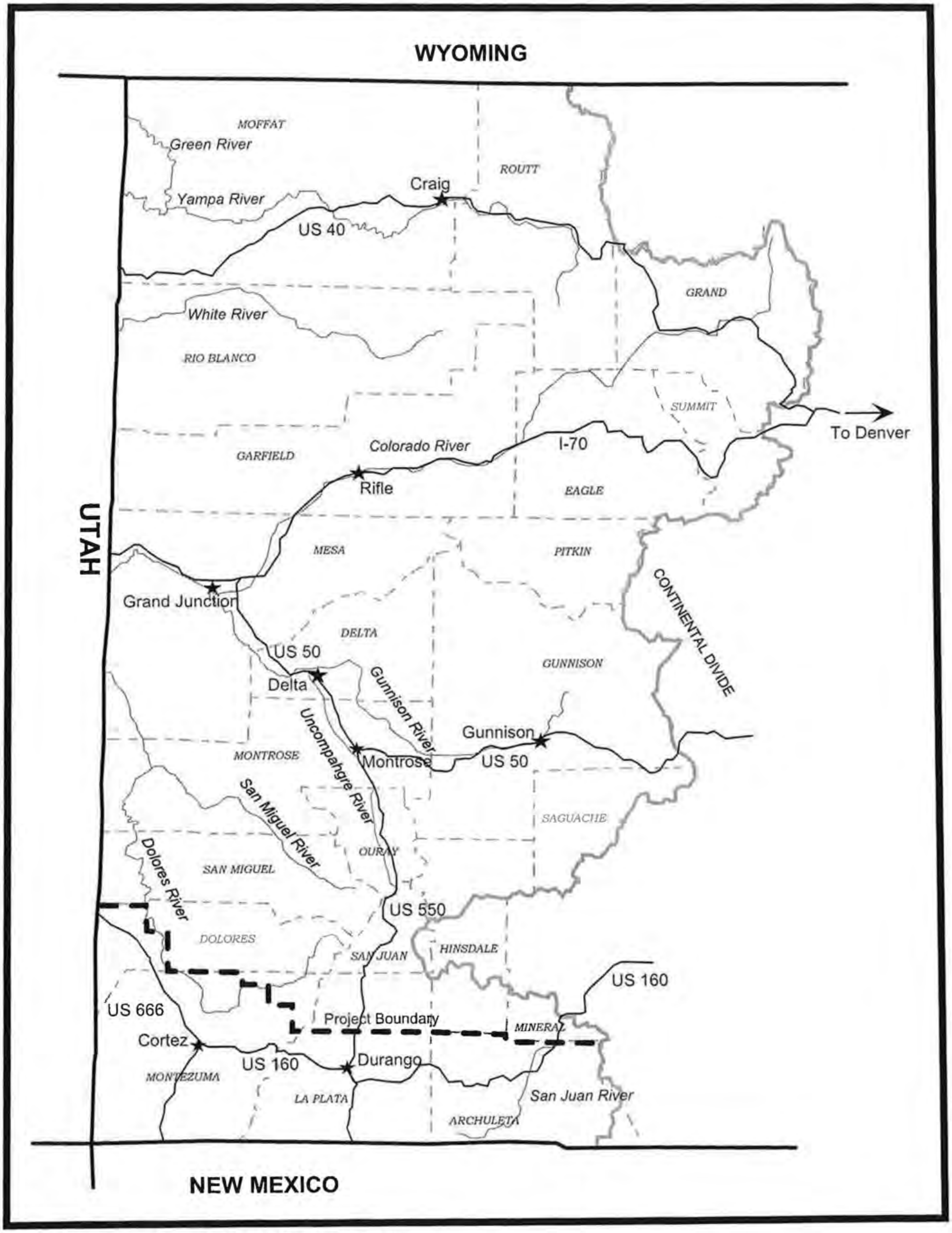

Figure 1-2. Map of the Northern Colorado Basin.

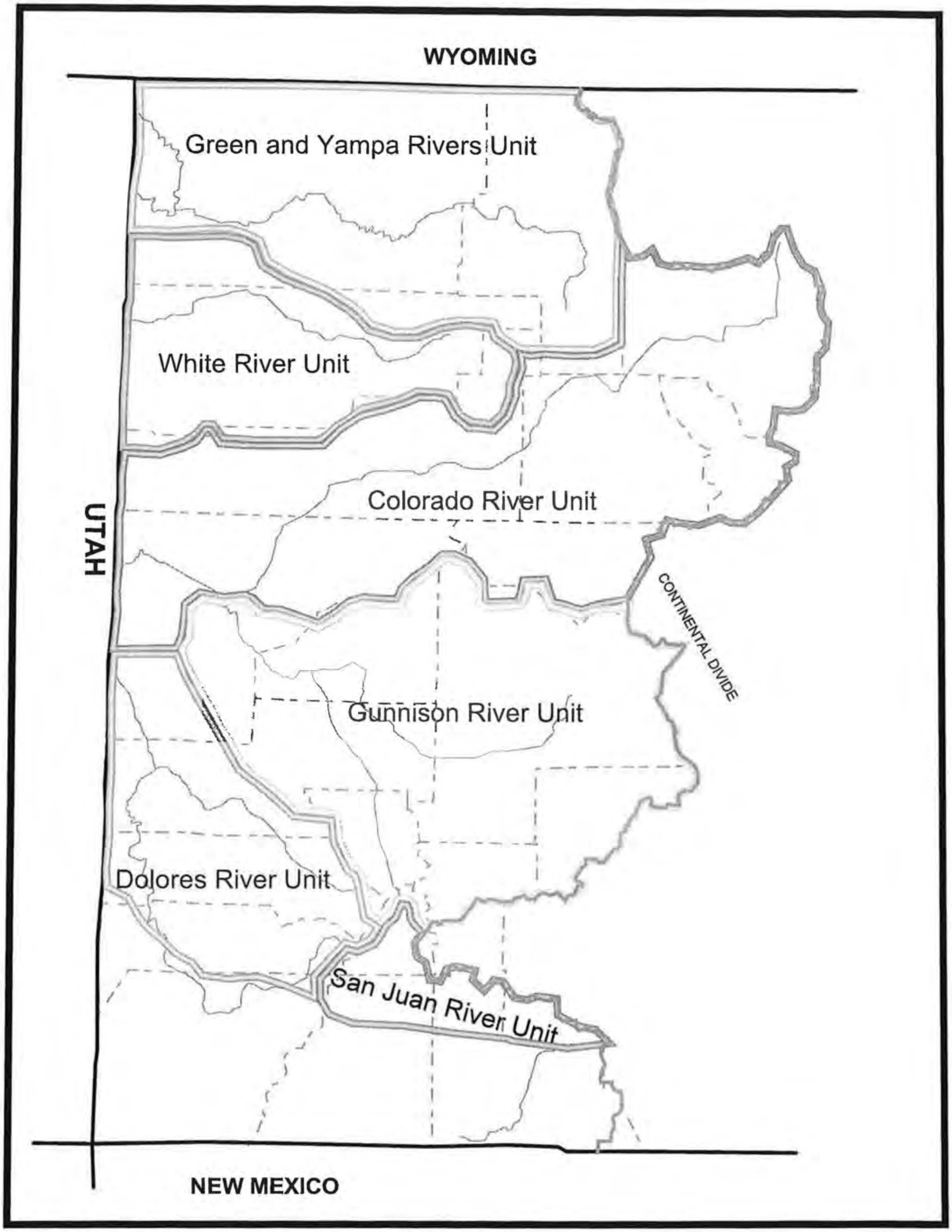

Figure 1-3. Drainage units within the Northern Colorado Basin.

ARCHAEOLOGICAL UNITS

Discussion of the prehistory of the Northern Colorado Basin in the sections that follow is organized by archaeological units. Archaeological units are heuristic devices that can, when properly defined, convey information about variability in the archaeological record, and so are useful for communication. Archaeological units are the creation of archaeologists to describe sets of artifacts, features, subsistence practices, and other aspects of culture, and probably would have little meaning to the peoples whose remains are described. As the understanding of the archaeological record grows and changes, these artificial units usually become less useful for describing variability, and new archaeological units are defined. Archaeological units are simply tools that should be created or discarded as needed.

Several types of archaeological units are used or referenced in this document; these include eras, stages, traditions, periods, and phases. These units are defined below:

Stage: A stage is a synthetic unit implying similarity of cultural content over a broad area, incorporating many local and regional sequences (Willey and Phillips 1958). It implies general similarities in lifeways and the material culture utilized in the execution of those lifeways; it does not necessarily imply temporal contemporaneity.

Era: An era is an extended period of time. Like periods, eras are only units of time and do not necessarily convey any information about cultural content. The utility of a unit referencing an extended period of time is apparent for several reasons. First, archaeologists have found it useful to divide the nearly 11,500 years of culture history into several major units, and have generally done so using stages. The 1984 prehistoric contexts, for example, divided prehistory into Paleoindian, Archaic, Formative, and Protohistoric/Historic stages, which were further subdivided into smaller units, such as phases, periods, and traditions. Use of several of these stages has been criticized in recent years. As O'Neil (1993) has pointed out, stages, as defined by Willey and Phillips (1958), are linear and sequential, and imply evolutionary progression or retrogression. Connotations about evolutionary progress are unnecessary when describing successful adaptive strategies. Some archaeologists have also expressed doubts that the Formative stage was ever really present in many parts of western Colorado. According to Willey and Phillips (1958:146) the Formative stage is characterized by the successful integration of agriculture or other subsistence system of similar effectiveness into a well-established, sedentary village life. In western Colorado, this definition seems to best describe the Anasazi tradition — the Fremont and Gateway tradition sites show only limited evidence of sedentary lifestyles. The term "Formative era" should only be interpreted as a time when the horticultural adaptations were florescing in many parts of the western United States; no inference about the actual subsistence practices of the peoples subsumed by the Formative era should be made. The era concept avoids the problems associated with the use of stages, while still permitting the definition of smaller internal units, such as periods.

Tradition: Willey and Phillips (1958:37) define tradition as "a (primarily) temporal continuity represented by persistent configurations in single technologies or other systems of related forms.". This definition emphasizes persistence or evolution of certain archaeological traits through time, in a geographically limited area.

Phase: A phase is a synthetic unit that denotes a considerable similarity of cultural content, occurring in a limited geographical area and in a brief period of time. Definition of phases requires a strong regional database.

Period: Periods are units of time. No similarity in cultural content or geographical space is implied in the use of the term. As employed herein, periods refer to shorter units of time than eras.

The prehistory of the Northern Colorado Basin has been herein divided into various eras, traditions, phases, and periods, as shown below. The archaeological units employed herein are defined in the "Space/Time Systematics" sections of the ensuing chapters.

Paleoindian Era		11,500 – 6400 B.C.
	Clovis tradition	11,500 – 10,500 B.C.
	Goshen tradition	11,000 – 10,700 B.C.
	Folsom tradition	10,800 – 9500 B.C.
	Foothill-Mountain tradition	9500 – 6400 B.C.
Archaic Era		6400 – 400 B.C.
	Pioneer period	6400 – 4500 B.C.
	Settlement period	4500 – 2500 B.C.
	Transitional period	2500 – 1000 B.C.
	Terminal period	1000 – 400 B.C.
Formative Era		400 B.C. – A.D. 1300
	Anasazi tradition	A.D. 900 – 1100
	Fremont tradition	A.D. 200 – 1500
	Gateway tradition	400 B.C. – A.D. 1300
	Aspen tradition	A.D. 1 – 1300
Protohistoric Era		A.D. 1300 – 1881
	Canalla phase	A.D. 1100 – 1650
	Antero phase	A.D. 1650 – 1881

Chapter 2
ENVIRONMENTAL CONTEXT

THE MODERN ENVIRONMENT

Topography and Physiography

The Northern Colorado Basin study area is composed of portions of four major physiographic units: the Southern Rocky Mountains, the Colorado Plateau, the Middle Rocky Mountains, and the Wyoming Basin. The Southern Rocky Mountains unit comprises roughly the eastern half of the study area (Figure 2-1). This unit consists of a granite core that has been repeatedly uplifted to the point that mountaintop exposures are three to four miles above similar granite beneath the plains (Fenneman 1931). Sedimentary formations once overlaid the granite mountain core, most of which have now been eroded. In a few places, however, resistant sedimentary rocks form mountaintops. The uplifts have deformed the sedimentary formations along the flanks of the mountains to form monoclines, often manifest as hogbacks. Not all mountains are composed of granite; some, like the San Juan Mountains in the southern portion of the study area, are composed primarily of volcanic extrusives.

The crest of the Southern Rocky Mountains forms the Continental Divide, which separates the watersheds of Pacific and Atlantic Ocean tributaries. From north to south, the Continental Divide follows the crests of the Park, Rabbit Ears, Front, and Sawatch ranges, and the San Juan Mountains. These ranges are high and rugged; elevations exceed 4267 m (14,000 ft) atop a number of peaks. Other important topographic features situated west of the Continental Divide include the West Elk Range northwest of Gunnison, the Elk Mountains near Aspen, the Elkhead Mountains northeast of Craig, the San Miguel Mountains near Telluride, the La Plata Mountains west of Durango, and the White River Plateau northwest of Glenwood Springs. Middle Park, one of three major mountain parks in Colorado, is within the study area. Mountain parks are broad, mostly treeless depressions. Middle Park comprises a synclinal basin covered with Cretaceous and Tertiary strata (Fenneman 1931). Middle Park lies at the headwaters of the Colorado River in a prominent eastward bend in the Continental Divide.

The Wyoming Basin encroaches into the northwestern part of the study area, along the Wyoming border west of the Elkhead Mountains and north of the Axial Basin. The Wyoming Basin has the general characteristics of a moderately high plateau. In most areas, it is surrounded by mountain ranges. Mountains do not form the southern boundary of the Wyoming Basin in Colorado, however, so the topography seems continuous with that of the Colorado Plateau. That portion of the Wyoming Basin in Colorado is known as the Yampa Drainage Basin (Fenneman 1931). It is slightly folded and is characterized by relatively little local relief.

Just southwest of the Wyoming Basin, in the vicinity of Dinosaur National Monument, are the Uinta Mountains, a range of the Middle Rocky Mountain physiographic province. The Uinta Mountains comprise the largest mountain range in the United States that is oriented east to west, measuring approximately 240 km (150 mi) long by 56 km (35 mi) wide. Only the eastern end of the Uinta Mountains extends into Colorado. The Uinta Mountains are essentially a flat-topped anticline bounded by monoclines (Fenneman 1931). Uplift was greatest along the northern edge, resulting in a gradual southward dip. The core of the range consists of Precambrian quartzite. Peaks along the crest may exceed 3658 m (12,000 ft). Streams generally flow north or south away from the crest, though the Green River has cut through the range in the Canyon of Ladore, a 914-meter-deep (3000-ft) trench.

Most of the western half of the study area is on the Colorado Plateau. The Colorado Plateau encompasses broad portions of the Four Corners states. It is characterized by extensive, horizontal, sedimentary formations, relatively high elevation, and an arid or semiarid climate. The xeric environment has slowed the dissection of the Plateau country. Surface water runoff, especially from higher elevations within the Colorado Plateau and from the well-watered mountains that surround much of the unit, has, nonetheless, eroded hundreds of steep-sided canyons. Mesas comprise the less-eroded areas between canyons.

Fenneman (1931) recognizes two subdivisions of the Colorado Plateau in Colorado: the Uinta Basin and the Canyon Lands. The Uinta Basin subdivision is adjacent to and south of the Uinta Mountains and extends southward nearly to the Colorado River. The Uinta Basin is a large structural depression or syncline that has been uplifted. The unit was uplifted most at its southern edge, causing formations to gradually dip northward. The resulting escarpment just north of the Colorado River rises more than 900 m (3000 ft) above the valley floor. In some areas, especially in eastern Utah, two distinct cliff bands are evident in the area of maximum uplift. The upper cliff is referred to as the Roan Cliffs, and the lower is called the Book Cliffs. Together, these cliffs and intervening uplifted area comprise the Tavaputs Plateau, sometimes called the Roan Plateau in western Colorado.

The Canyon Lands subdivision is south of the Tavaputs Plateau. The topography of this unit has been shaped, to a considerable extent, by large rivers emanating from the Southern Rocky Mountains physiographic unit. These rivers have eroded the relatively soft Mancos Shale to form deep, wide valleys. Such valleys, along the lower Gunnison, Uncompahgre, and Colorado rivers, are presently the primary locus of agriculture and settlement in western Colorado. Two major uplifted areas dominate the landscape of the Canyon Lands subdivision of the study area. Both rise to elevations of 3048 m (10,000 ft) or more. The Uncompahgre Plateau extends from the Colorado River near of Grand Junction southeasterly to the San Miguel River. The crest of the Uncompahgre Plateau is relatively undissected, but large canyons have been eroded along the plateau's flanks in a trellis pattern. The Grand Mesa is just east of Grand Junction. Grand Mesa, and the spur to the north known as Battlement Mesa, are capped with basalt. The top of Grand Mesa is also relatively uneroded and is characterized by abundant natural lakes. Streams flow in a radial pattern from Grand Mesa.

Elevations in the study area range from 1311 m (4300 ft) where the Colorado River enters Utah to more than 4267 m (14,000 ft) atop the highest peaks in the Southern Rocky Mountains. To assess the proportions that various elevation zones comprise of the study area, a random sample of 250 points was selected, and elevations were tabulated. As shown in Table 2-1, very little area is below 1524 m (5000 ft) or above 3353 m (11,000 ft). The middle elevation zones, between 1829 m (6000 ft) and 2438 m (8000 ft) together comprise 50 percent of the study area. The mean elevation of the sampled points for the study area is 2395 m (7859 ft).

Geology

Because of the upheavals creating the various mountain ranges and plateaus in western Colorado, the region's geology is complex. The reader may wish to consult Tweto's (1979) excellent geologic map of Colorado for specific information about the types and distributions of surficial geological formations.

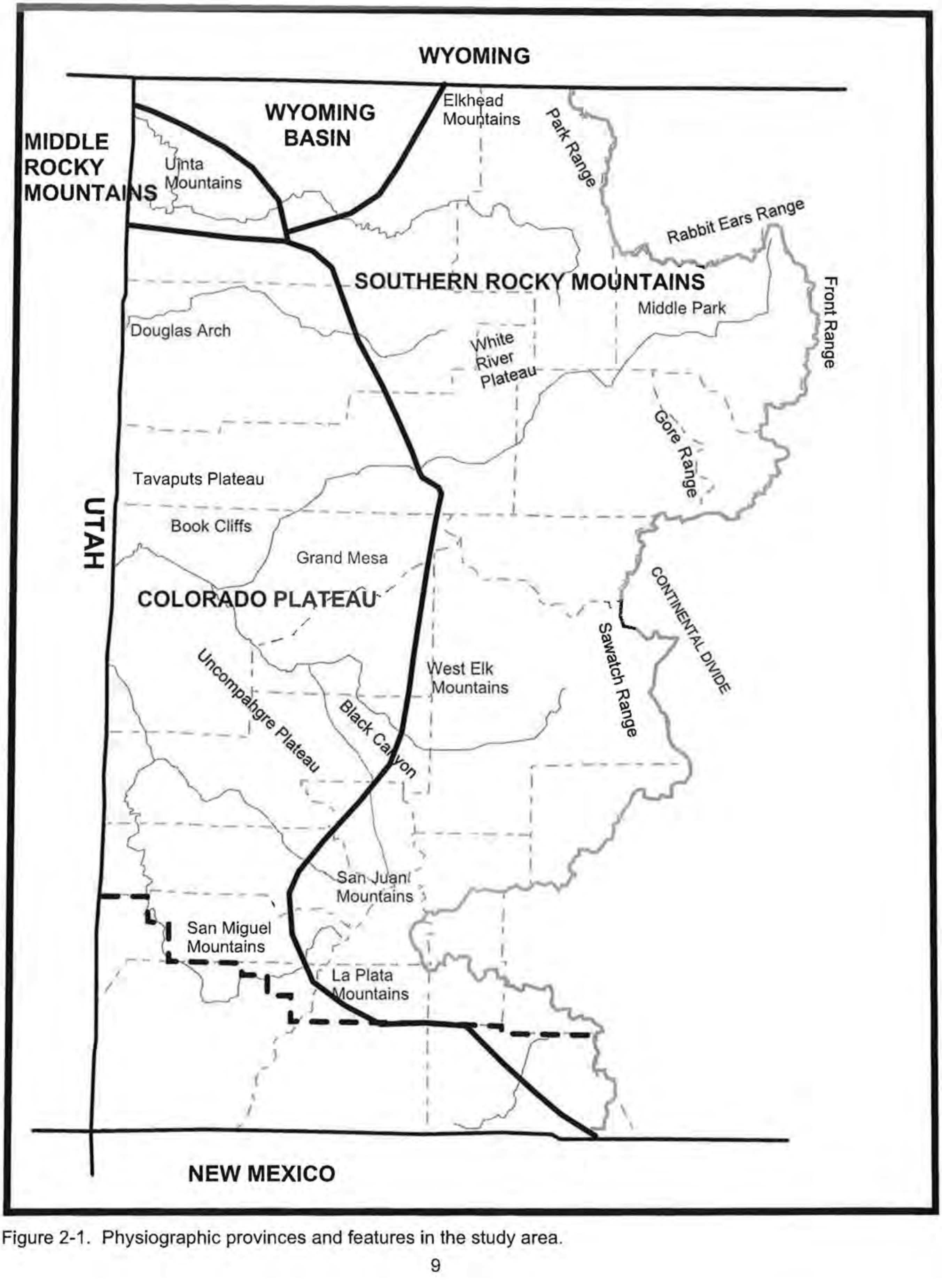

Figure 2-1. Physiographic provinces and features in the study area.

Table 2-1. Elevation Zones in the Study Area.

Elevation Range (ft)	Elevation Range (m)	Points in Sample	Percent of Area
Less than 5000 ft	Less than 1524 m	3	1
5000 – 5999 ft	1524 – 1828 m	21	8
6000 – 6999 ft	1829 – 2133 m	69	28
7000 – 7999 ft	2134 – 2438 m	56	22
8000 – 8999 ft	2438 – 2742 m	39	16
9000 – 9999 ft	2743 – 3048 m	28	11
10,000 – 10,999 ft	3048 – 3352 m	20	8
11,000 – 11,999 ft	3353 – 3657 m	8	3
Above 12,000 ft	Above 3658 m	6	2

Precambrian formations are exposed in several mountainous areas (Figure 2-2). Precambrian Uinta Mountain Group quartzite crops out at the eastern terminus of the Uinta Mountains in western Moffat County. Uncompahgre Formation quartzite and shale are exposed northeast of Durango; nearby, exposures of metamorphic rocks derived from volcanic rocks are present. Various types of metamorphic and granitic rocks occur along the spine of the Rocky Mountains, especially in the Park and Elk Mountain ranges. Similar formations are also exposed at the Black Canyon of the Gunnison near Montrose and atop the crest of the Uncompahgre Plateau southwest of Grand Junction.

Paleozoic era formations are also primarily exposed in mountain settings. The most expansive exposure of Paleozoic era formations extends from the White River Plateau northwest of Glenwood Springs southeast to the Aspen area, and also along the lower portion of the Park Range north of Leadville. The oldest of these date to or just before the Pennsylvanian period and include the Leadville Limestone, the Manitou Limestone, the Sawatch Limestone, the Maroon Formation, the Minturn Formation, and the Weber Sandstone. These formations comprise limestone, arkosic sandstone, sandstone, conglomerate, and some shale. Other Paleozoic era formations crop out north of Durango. These include the Rico and Hermosa formations, which are comprised of arkosic sandstone, conglomerate, shale, and limestone. Permian and Pennsylvanian formations also occur along the lower Yampa River in the general vicinity of Dinosaur National Monument. These include the Weber Sandstone, the Morgan Formation, and the Park City Formation. They, too, consist of limestone, sandstone, and shale.

Mesozoic era formations cover broad expanses of western Colorado. These formations mostly date to the Cretaceous period, though some Jurassic period formations, such as the Morrison, also occur. Mesozoic formations are present in the general vicinity of Rangely, at the western base of the Park Range, in the Gunnison area, and in the vicinity of the Uncompahgre Plateau. Most consist of sandstone or shale; coal occurs in some formations. Common Cretaceous formations include the Mesa Verde Formation, Mancos Shale, the Williams Fork Formation, the Iles Formation, Lewis Shale, the Hunter Canyon Formation, the Dakota Sandstone, and the Burro Canyon Formation.

Cenozoic era sedimentary formations extend from the northwestern corner of the state southeast to the vicinity of Grand Mesa, and include much of the Wyoming Basin and the Tavaputs Plateau. Most of these formations are of Tertiary age and are composed of shale, siltstone,

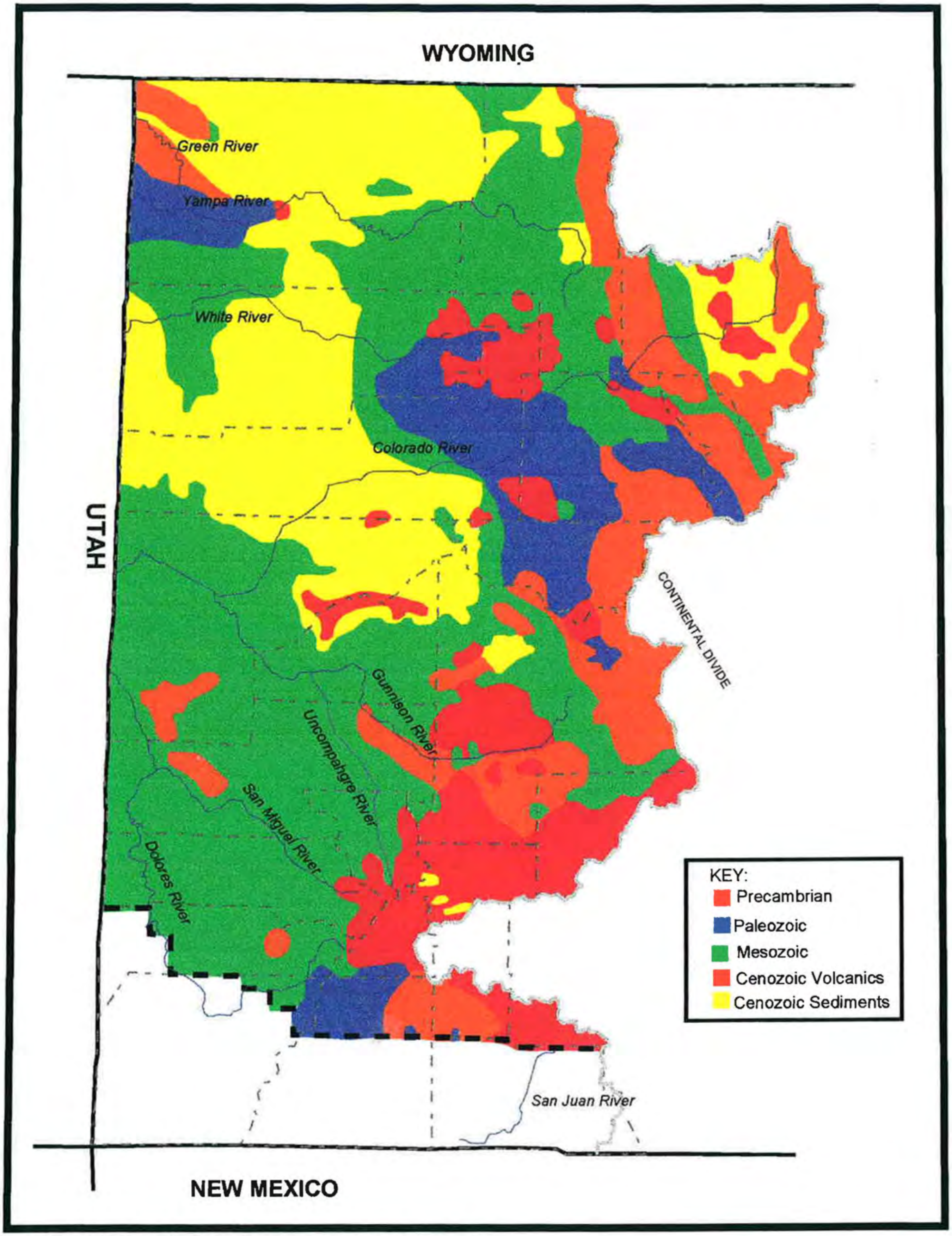

Figure 2-2. Generalized geologic map of the study area.

marlstone, claystone, mudstone, sandstone, and conglomerate. Primary Cenozoic era formations include the Uinta Formation, the Wasatch Formation, the Browns Park Formation, the Cathedral Bluffs Tongue, the Wasatch Formation, and the Parachute Creek Member of the Green River Formation.

Tertiary-aged volcanic rocks are also common in the study area, especially in the San Juan Mountains. Occurring on the surface there are basalt flows; pre-ash flow andisitic lavas, tuffs, and breccias; and ash-flow tuff. Basalt flows cap the top of Grand Mesa and occur on the White River Plateau, as well as the area southeast of Glenwood Springs. Intrusive rocks of felsic composition crop out southwest of Aspen (Tweto 1979).

The types of rock available on or near the surface affect human settlement patterns and technology. Sandstone that naturally spalls into tabular pieces is suitable for use in masonry without much modification, so areas where such rock is available may have been preferred for occupation by some prehistoric groups. The distribution of cryptocrystalline and noncrystalline rocks and rocks that cleave through crystalline structure was especially important, however, as these materials formed the basis of chipped stone tool technology. In a review of lithic sources listed in the OAHP database, Black (2000) identified 180 lithic procurement sites in 29 mountain counties. Because less than 5 percent of any of these counties have been subjected to archaeological inventory, the actual number of lithic sources is much higher. Sources for cryptocrystalline silicates (chert, chalcedony, jasper, and petrified wood), quartzite, and rhyolite are documented. Obsidian occurs in the Cochetopa Dome area south of Gunnison, Colorado. The Cochetopa Dome obsidian occurs primarily on the surface as small nodules, generally too small for reduction (Stiger 1998b). A few instances of prehistoric utilization of Cochetopa Dome obsidian have been documented, however (e.g., Black 1986). The OAHP database suggests clusters of lithic sources in Middle Park, in the middle portions of the Gunnison Basin, and along the Yampa River.

As Black's (2000) data indicate, sources for knappable tool stone are relatively widespread across the study area. Distributions were certainly not uniform, however, so tool stone had to be procured where available and transported to areas where it was unavailable. Sources include primary deposits, where tool stone outcrops, and secondary deposits, where materials have been transported by streams or glaciers. Primary sources may be extensive, such as in the Dakota Sandstone and Burro Canyon Formation of the Uncompahgre Plateau area, the Troublesome Formation of Middle Park, and the Bridger and Madison Formations north and west of Craig. There, clusters of quartzite or chert are interspersed throughout the horizontally oriented formation. During the Pleistocene, abundant rock was eroded from the mountains and transported great distances downstream, where it was deposited as terraces and benches. Some of this alluvial material is suitable for reduction. Lithic sources, then, includes most valleys. At some primary deposits, prehistoric peoples mined tool stone with bone, antler, or wooden implements (e.g., Metcalf et al. 1991). At other primary sources and probably all secondary sources, lithic materials were simply gleaned from the ground surface.

Soils

Soil data presented below summarize the work of the Upper Colorado Region State-Federal Inter-Agency Group (1971). Five general soil classes have been identified in the Northern Colorado Basin (Figure 2-3). Soils of the first class occur above 2438 m (8000 ft) elevation, generally on steep mountain slopes and in grassland parks and narrow mountain valleys. These soils tend to be cool and moist. Surface layers tend to be light-colored and loamy; subsurface layers are often sandy to clayey in texture. Cryoboralfs with Cryothods or Cryochrepts are common soil types within this zone.

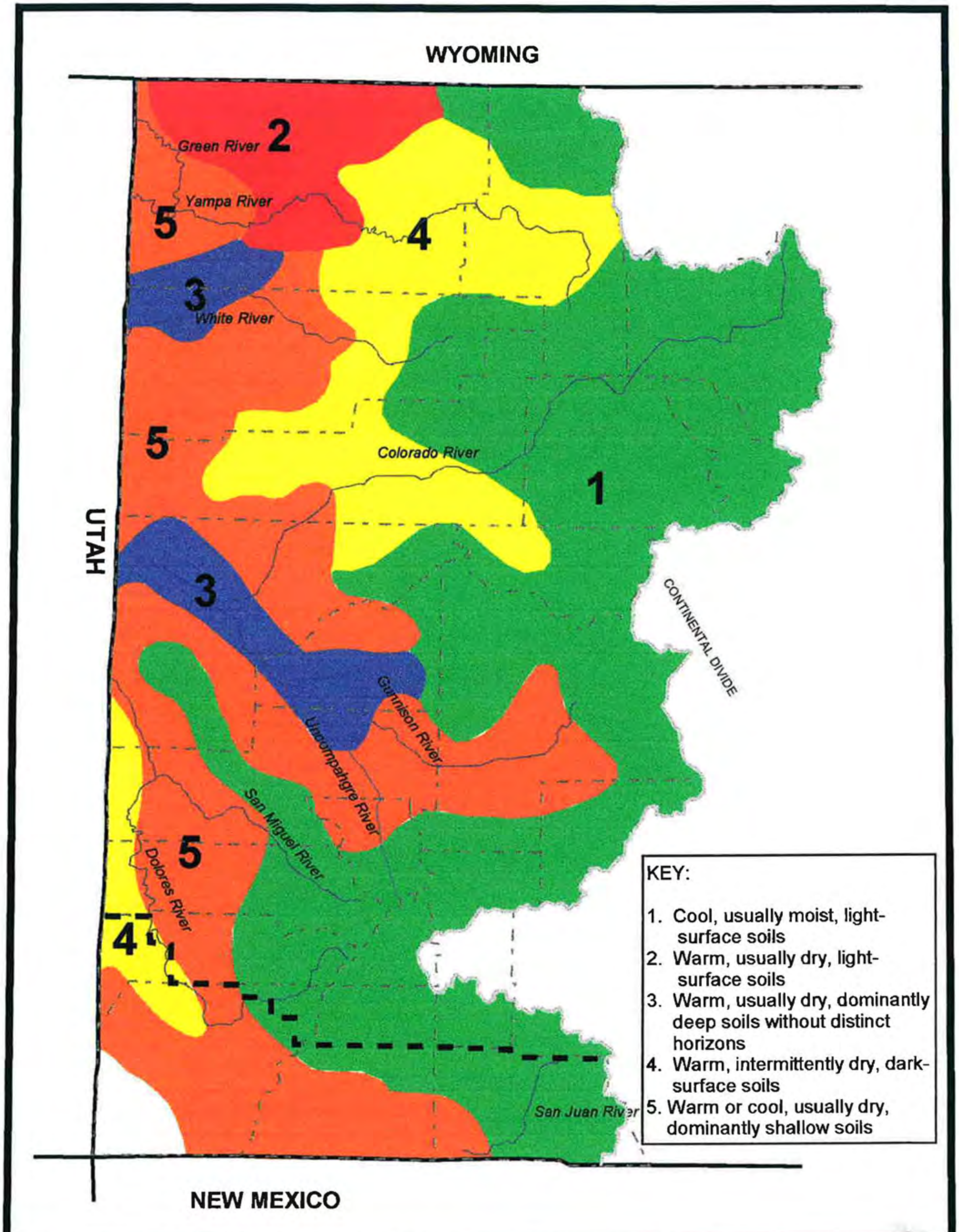

Figure 2-3. General soils map of the study area, after Upper Colorado Region State-Federal Inter-Agency Group (1971).

The second general soil class is primarily found on moderately sloping sagebrush- and grass-covered plateaus, foothills, and benches in Colorado. This soil class is primarily found in Moffat County. Upper soil layers are loamy, and subsoils contain clay. These soils are dominantly Haplargids.

The third general soil class occurs mostly in the lower elevations, roughly between 1372 m (4500 ft) and 1829 m (6000 ft). In western Colorado, these warm and usually dry soils occur primarily in the lower reaches of the Gunnison, Uncompahgre, and White River valleys, in areas dominated by shadscale and greasewood. Textures range from loamy to clayey. Common soil types include Torriorthents and Torrifluvents.

The fourth soil class is composed of warm, intermittently dry soils of the middle elevations. These soils cover mesas, plateaus, and lower mountain slopes, atop sandstone, shale, and alluvium. Soils tend to be dark-colored and friable. Soils textures are mostly loamy, but sandy and clayey soils are also found within this class. Argiustolls and Haplustolls are dominant soil types.

The fifth general soil class, widespread in lower and middle elevation zones in western Colorado, is found in canyon lands and on lower mountain slopes and valleys. Pinyon, juniper, grasses, and sagebrush usually grow atop these soils. The soils are warm or cool and are usually dry. They are predominantly dry and lack distinct horizons. A high percentage of the soils in this class are shallow. Dominant soil types in this unit include Torriorthents or Ustorthents.

Hydrology

The study area is drained by the Colorado River, which has its headwaters in the central portion of the study area, in the mountains above Middle Park. It flows southwesterly from Middle Park, where it is joined by the Eagle and Roaring Fork rivers. This system drains considerable portions of the Southern Rocky Mountain province in western Colorado. Westward, near Grand Junction, Plateau Creek flows into the Colorado. Plateau Creek drains the northern portion of Grand Mesa. The confluence of the Colorado and the Gunnison rivers is at Grand Junction, Colorado. Most of the other major river systems in western Colorado, including the Green and Yampa, White, Dolores and San Juan Rivers, join the Colorado River in Utah.

Several of the major river systems in the study area are fed by important, but secondary, rivers that merit mention. The Little Snake River is an important tributary to the Yampa River, draining portions of southwestern Wyoming and northwestern Colorado. Other important tributaries to the Yampa River include Fortification Creek and the Elk River. Fortification Creek drains portions of the Elkhead Mountains northwest of Craig, and the Elk River north of Steamboat Springs, drains much of the Gore Range. The White River drains the northern portion of the White River Plateau and the plateau country to the west. In terms of archaeological research, Douglas Creek, draining the Douglas Arch area south of Rangely, and Piceance Creek, draining the Piceance Basin southwest of Meeker, are important. The Gunnison River has several large tributaries, including the North Fork of the Gunnison west of Delta and the Taylor River northeast of Gunnison. The Uncompahgre River, which joins the Gunnison River at Delta, drains the northern slope of the San Juan Mountains and the eastern flank of the Uncompahgre Plateau. The Dolores River, in the southwestern portion of the study area, drains the San Miguel Range and the salt anticlines near Paradox. Its major tributary is the San Miguel River, which extends northeasterly from Telluride to skirt the western side of the Uncompahgre Plateau. The Little Dolores River southwest of Grand Junction is also an important tributary of the Dolores River. The southern slopes of the San Juan Mountains are drained by the San Juan River and its major tributaries, which include the Piedra, Los Piños, and Animas rivers.

Climate

The climatic data presented below are summarized from the work of Berry (1968). Climatic data should be regarded cautiously, because highly localized factors can significantly affect climatic conditions. In general, precipitation and temperature tend to increase with elevation, though local exposure to prevailing winds and the influence of nearby topographic features on air movements affects site-specific climates. Within the distance of a few kilometers, widely divergent climates may be present.

Western Colorado has low humidity, making for relative comfort, even on hot days. Evaporation rates are high. At relatively high elevation, the atmosphere in the study area is thin, resulting in relatively warm days and cool nights. Air usually flows into western Colorado from the west. Moisture moved by these air currents is derived from the Pacific Ocean. The lower elevations receive relatively little precipitation, because much of the moisture has already precipitated atop mountain ranges to the west. The moisture that makes it as far as western Colorado often falls on the western slopes of the major mountain ranges. Precipitation levels are highest in the winter months and lowest in June.

The climate of the Colorado Plateau tends to be more uniform than similar elevation zones on the Plains. The western valleys are protected, to some degree, by the surrounding high terrain. Summer temperatures are similar to those of the plains, but average winter temperatures are slightly lower because of the absence of chinook winds.

The mountains are usually cool, even in the summer. Mountain summits have an average annual temperature of only 32°F. According to Berry (1968), weather stations in mountain settings typically report summer daytime highs around 61°F, though temperatures may reach roughly 81°F. Nighttime temperatures are substantially lower than daytime temperatures. Winter temperatures in the mountains may exceed –51°F on clear, still nights. The coldest temperature on record for Colorado occurred at Maybell, west of Craig, when the nighttime temperature plunged to –62°F.

Western Colorado is occasionally subject to flooding. Flash floods may be produced by intense thunderstorms, though such flooding is usually highly localized. Spring floods are uncommon, but may occur when mountain snow levels are substantially higher than normal or when there is unusual warming in the spring.

The climate was important to the prehistoric inhabitants of western Colorado because it directly impacted the distribution and productivity of plant and animal resources. Generally, increased moisture leads to increased biomass. Temperature, especially as it relates to the length of the growing season, also affects plant and animal distributions and productivity. In areas with short growing seasons, such as in mountain settings, plants have a very limited time to grow and seed. These areas also tend to be well-watered, resulting in dense vegetation. Therefore, numerous species are available as food at roughly the same time — an attractive situation for both humans and animals.

Prehistoric horticulturists were, perhaps, even more concerned with precipitation and length of growing season than were hunters and gatherers. To grow corn, sufficient water was necessary, which left many of the lower elevation settings unsuitable for settlement. The horticultural potential of higher elevations, however, was restricted by length of the growing season. Corn requires a growing season of roughly 110 days (Petersen 1988). As indicated in Figure 2-4, most of the counties in the Southern Rocky Mountain province within the study area have too-short growing seasons for corn horticulture. The proper balance of precipitation (Figure 2-5) and length of growing season was found in a "farming belt" comprising the middle elevations of the Colorado Plateau (see Petersen 1988).

Flora

Because western Colorado is characterized by so much topographic and climatic diversity, a wide variety of plant species can be found in the study area. General plant communities can be identified that reflect the distribution of other environmental variables; these include the riparian, saltdesert shrub, sagebrush, pinyon/juniper, montane, subalpine, and alpine communities. The general distribution of these communities, except for the riparian habitat, is shown in Figure 2-6. The riparian habitat follows streams and rivers and may cross-cut other communities. It should be noted that the mapped distribution of the floral communities is of a general nature. As Weber (1987:1) points out, plant types within the floral communities may vary considerably because of "environmental compensation." This means that microenvironmental settings, such as slope exposure, soil warmth, and available water, may vary considerably within floral communities, resulting in the growth of plant types uncharacteristic of the general plant community. For example, a protected, north-facing slope in the middle-elevation pinyon/juniper floral community may actually support species commonly found in much higher elevation settings. Because of the effects of environmental compensation, plant resources, and, to a lesser extent, animal resources, can be construed as being distributed in a "patchy" fashion. This distinction is largely a matter of scale, but prehistoric settlement patterns probably reflect the distributions of favored resource patches.

The distribution of floral communities is generally associated with elevation. The saltdesert shrub community is largely restricted to the lower elevations in the study area. Much of the area covered by this community occurs along major river valleys, where relatively soft shales have eroded to form poorly drained, rather clayey soils. Common species include saltbush, rabbitbrush, galleta grass, Indian ricegrass, and greasewood (Soil Conservation Service 1972). As elevation increases, the saltdesert shrub community is replaced by the pinyon/juniper community. Pinyon and juniper woodlands are widely distributed throughout western Colorado. In addition to pinyon and juniper, this floral community often includes big sagebrush, rabbitbrush, wheatgrass, bluegrass, needlegrass, Indian ricegrass, and forbs. The montane community dominates the lower mountains. Common tree species include ponderosa pine, Gambel oak, Douglas-fir , blue spruce, white fir, and occasional aspen. Understory species may include fescue, muhly, bluegrass, shrubs, and forbs (Soil Conservation Service 1972). The subalpine zone is found in the higher mountains, below timberline. Stands of spruce, fir, lodgepole pine, and aspen are found in the montane zone, often interspersed with Thurber's fescue parks. The alpine floral community is found above timberline atop the highest peaks and ridges. Sedges, grass, willow, birch, and many species of forbs grow in the alpine zone. The floral composition of the riparian community varies by elevation. In the lower elevations, common species include cottonwood, willow, and grasses. Tamarisk is also common, but is an introduced species. In the higher elevations, willow and grasses dominate streamside communities.

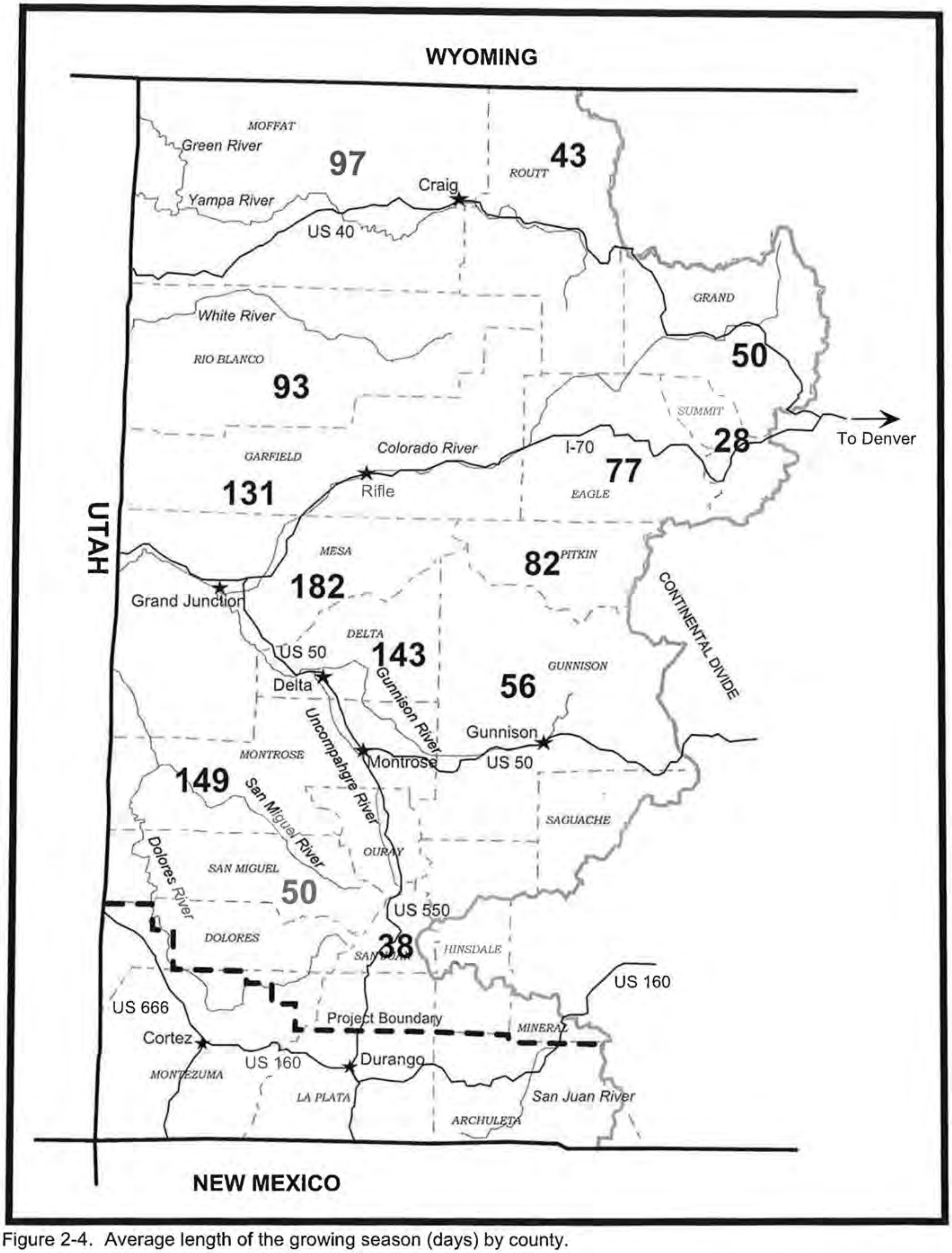

Figure 2-4. Average length of the growing season (days) by county.

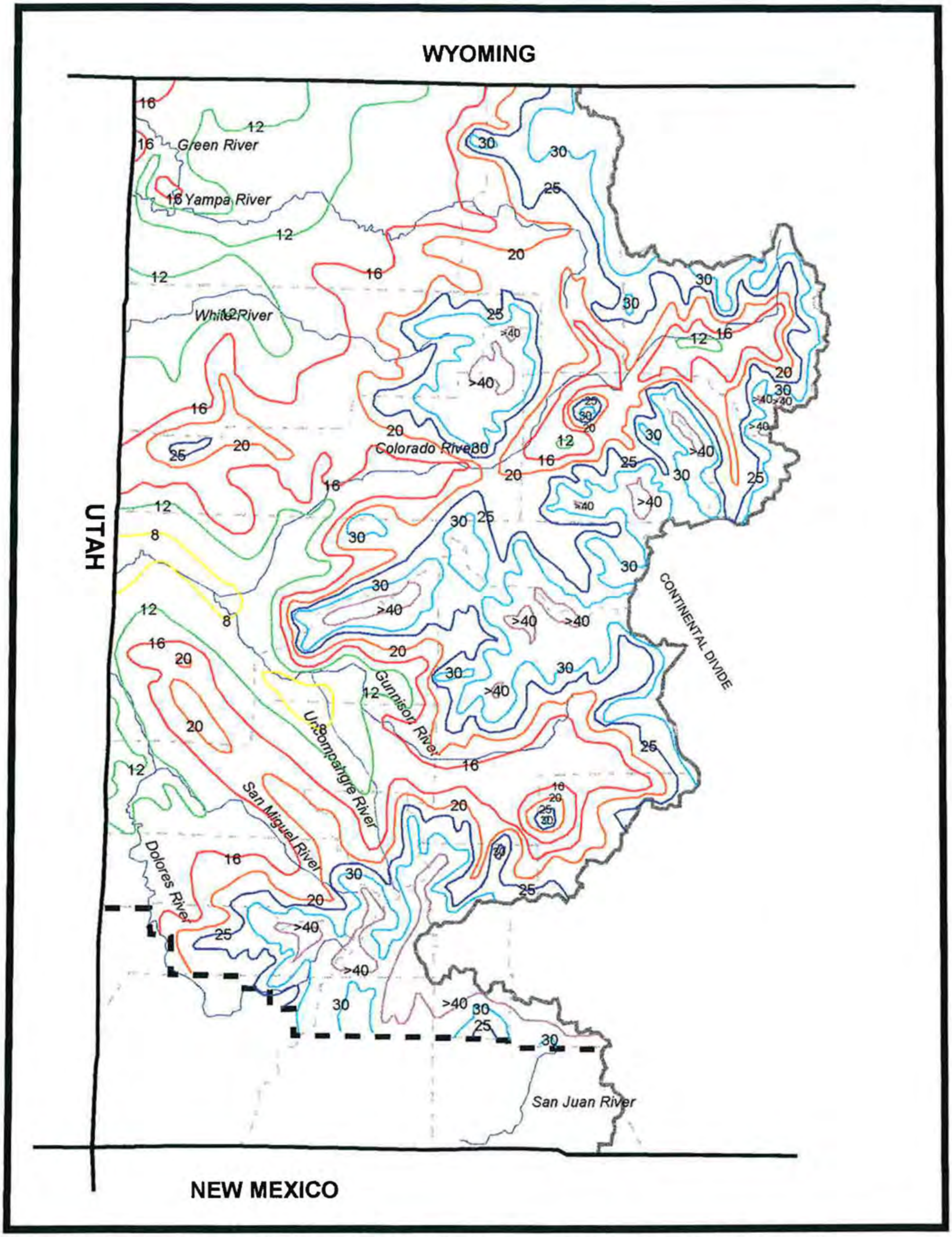

Figure 2-5. Approximate precipitation (in inches) within the study area (after Doesken et al., 1984).

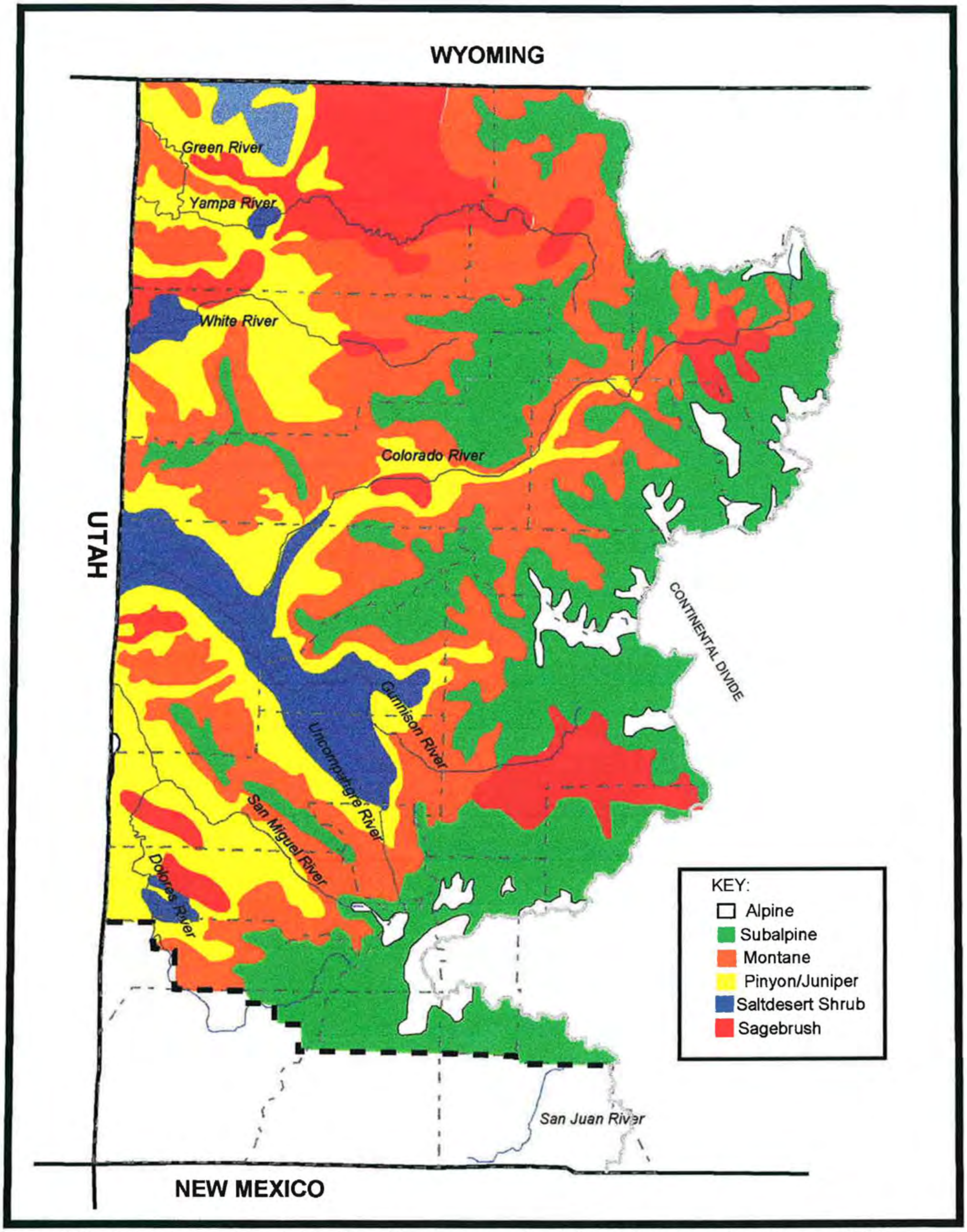

Figure 2-6. General map of the distribution of floral communities (after Soil Conservation Service 1972).

Fauna

Western Colorado is rich in wildlife. Important large artiodactyls include mule deer, elk, bighorn sheep, and pronghorn. The range of whitetail deer extends into northwestern Colorado, but mule deer are predominant (Burt and Grossenheider 1976). Bison ranged into western Colorado during historic times, though were never common (Meaney and Van Vuren 1993). Localized populations of moose occur in Middle Park, and mountain goat occur in some high mountain ranges in Colorado, but these two species were rather recently introduced and so were unavailable to prehistoric peoples during the Holocene. Mule deer, elk, and possibly other artiodactyls migrate between elevation zones on a seasonal basis. These animals spend winters in the lower to middle elevation zones, generally in areas forested by pinyon and juniper, where snows are not excessively deep and browse is available. With the arrival of spring, most individuals migrate to the higher elevations to take advantage of the abundant vegetation that flourishes in the short growing season. As shown in subsequent chapters, human settlement patterns were closely linked to large mammal migrations during many periods, and areas mapped as critical winter deer and elk habitat by the Division of Wildlife are characterized by high archaeological site densities (Horn et al. 1993).

Large carnivores and omnivores also follow the seasonal movements of the artiodactyls. Black bear, grizzly bear, mountain lion, and gray wolf ranged across western Colorado in the nineteenth century; black bear and mountain lion are still present. Smaller carnivores, such as coyote, lynx, bobcat, wolverine, badger, long- and short-tail weasel, mink, marten, ringtail, raccoon, swift fox, gray fox, red fox, and kit fox prey more upon smaller species that do not migrate, and are common over much of the study area. These mammals primarily prey upon rodents and insects, the former of which include marmot, various rats, mice, voles, gophers, squirrels, and prairie dogs. Lagomorphs, also a common food source for carnivores and people, are common in western Colorado, and include snowshoe hare, cottontail, black-tailed jackrabbit, and pika. River otter, beaver, and muskrat were once common along streams and rivers in the study area. Bats are common, if rarely observed.

Western Colorado is also home to several hundreds of species of birds. Common species historically used by humans for food included Canada goose, various species of ducks, sandhill crane, snipe, blue grouse, sage grouse, sharp-tailed grouse, wild turkey, ptarmigan, and Gambel's quail. Chuckar and ring-necked pheasant, popular game birds, have been introduced.

Various species of reptiles live in western Colorado; most are snakes or lizards. Amphibians such as frogs, toads, and salamanders are common. Insects probably comprise more of the faunal biomass than all of the other species. Certain insects were likely consumed by prehistoric peoples.

RECONSTRUCTION OF PAST ENVIRONMENTS

Introduction

Paleoenvironmental models for the study area tend to be incomplete and contradictory for a variety of reasons. There are a number of data sources about past environments within and adjacent to the study area, but this information has not been synthesized or critiqued except in limited fashion. The area is large enough to encompass variability, both in the kind of data that has been collected, and in terms of the rates and timing of paleoclimatic events. For example, the study area straddles a range of latitude where the effects of summer monsoon moisture vary with the strength of monsoonal flow. When the monsoon is weak, its effect diminishes northward and effectively dies in or south of the study area. During strong monsoon influences, its effect extends to the north of the study area. The topographic variability has a large effect on localized climates, so factors such as prevailing winds and orographic lifting have variable effects. Thus, results from one study site, or one type of study, may not agree with a study done in another location or with another data type.

Another problem lies in misuse of the models that do exist. It seems to be fairly common practice to selectively cite a single paleoclimatic record, most often the glacial sequence of Benedict (1981, 1985), and to assume that one's study area conforms to this record. Or, since models from different places and different data types often seem to conflict, there is a tendency to simply ignore the problem altogether. Thus, there is an underlying mind-set that carries the contradictory assumptions that one carefully constructed general model is good enough, and simultaneously assumes that a local sequence is unattainable within the context of archaeological sites. Yet there are numerous potential avenues to the reconstruction of paleoenvironments. The problem is that none of them is perfect, and often the results gleaned from one project seem to be unimpressively meager.

Paleoenvironmental reconstruction can be approached on several scales, from broad to specific. For example, global models based on earth-orbit parameters, insolation levels, and global circulation provide a general backdrop for large areas and spans of time. Conversely, a detailed bog stratigraphy with pollen and dates provides a very good record for a particular place. The most sensitive environmental record available in the area at this time would appear to be within fairly fine-grained pollen sequences from the Gunnison Basin (Fall 1997a, 1997b). When attempting a paleoenvironmental reconstruction, one must look to a variety of sources. The best example at an archaeological site within the study area is the work of Madole (1991) at the Yarmony site (Metcalf and Black 1991). In this reconstruction, he draws on global models for general constraints, utilizes the most applicable regional pollen sequences, and makes a careful interpretation of information inherent in the sediment sequence in the on-site stratigraphy. The result is a concise interpretation of what is known and what can be guessed about the past environments at the site.

Data Sources for the Northern Colorado Basin Study Unit

The data presented in the following section derive from a variety of sources as summarized in Figure 2-7. This chart shows the type of data and the paleoclimatic inferences that derive from them. In considering what data to include, a wide variety of sources was consulted from a number of disciplines, including studies from the Rocky Mountains and the Great Basin. The data types utilized include general circulation models (e.g., Kutzbach and Webb 1993; Thompson et al. 1993; Bryson et al. 1970); glacial sequences from the Front Range (Benedict 1981, 1985), Wind River Range (Richmond 1965; Burke and Birkeland 1983), San Juan Mountains (Carrara and Andrews 1976), and the Wasatch Mountains (Madsen and Currey 1979); pollen and macrobotanical columns from the Gunnison Basin (Markgraf and Scott 1981; Fall 1985, 1988, 1997a, 1997b), San Juan Mountains (Petersen 1988), and Wasatch Mountains (Madsen and Currey 1979); reconstructions based on sediment sequences at Yarmony (Madole 1991), in the Wyoming and Green River basins (Miller 1996a, 1996b; Eckerle 1996), and in pluvial lake levels in the Great Basin (Currey and James 1982; Benson et al. 1990); fossil insect studies in the Southern Rockies (Elias 1995); and packrat midden and faunal studies in the Great Basin (Thompson 1990; Grayson 1993). Although the applicability of some of these studies is greater than others and there is disagreement in the implications of some individual studies, the overall convergence of evidence for broad trends in paleoclimate is worth highlighting.

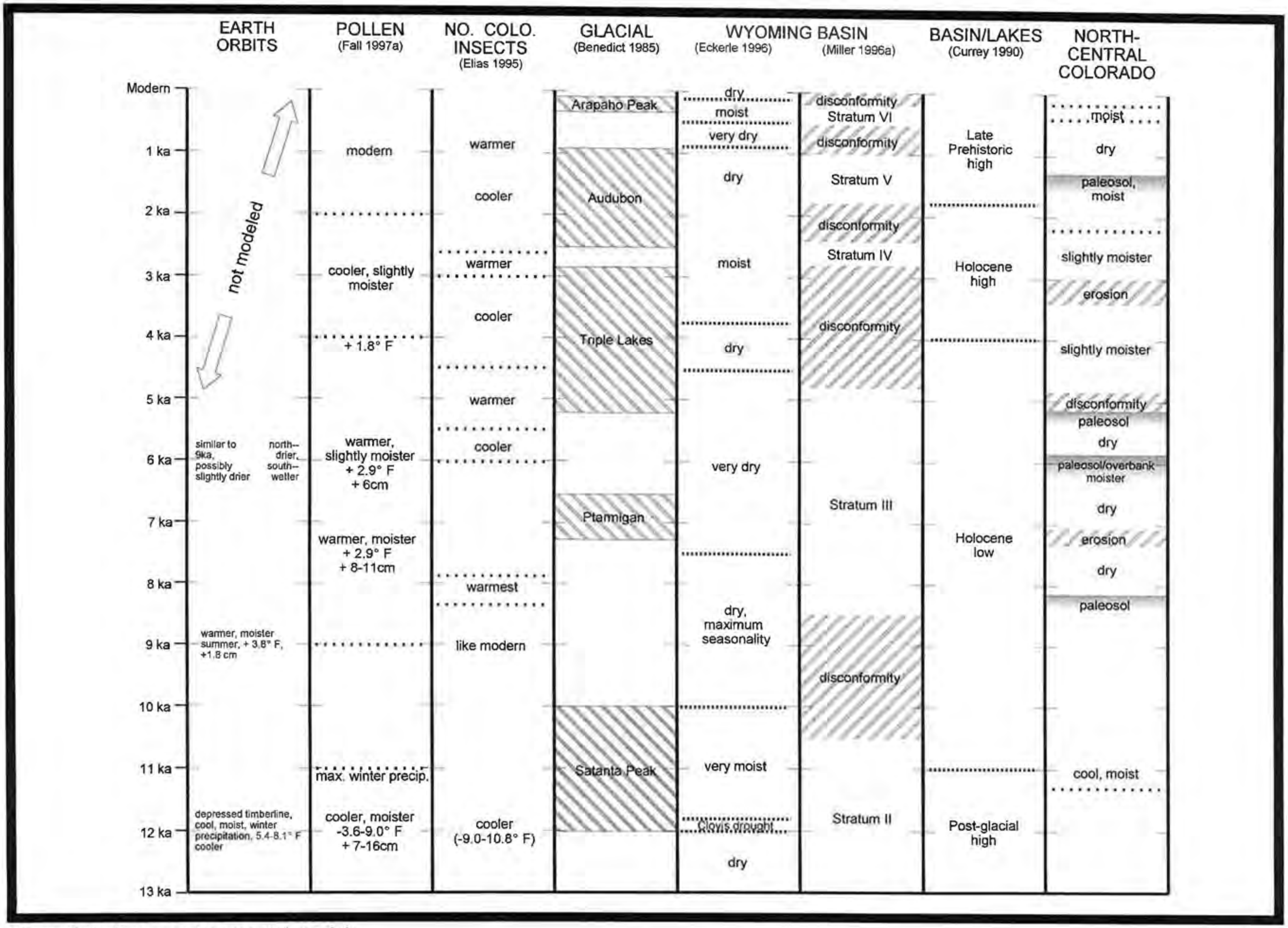

Figure 2-7. Paleoenvironmental models.

Broad-Scale Models of Climate

Among the more useful general models is the experimental model of Kutzbach and Webb, used by Madole at Yarmony, that deals with the effect that changes in earth-orbit parameters have on solar radiation reaching the earth (COHMAP Members 1988; Kutzbach and Webb 1993; Wright et al. 1993). This experimental model is complex in that it takes into account cyclical changes in the earth's tilt, rotation, and distance from the sun, as well as the effects of a melting continental ice sheet on atmospheric circulation. The various permutations of orbit geometry affect the intensity and seasonality of solar radiation reaching the earth and provide an "external forcing" of climates. A series of computer simulations, run for 18 ka, (18,000 years ago) 12 ka, 9 ka, and 6 ka, are used to predict global atmospheric circulation patterns, and resultant deviations in climate are measured as differences from modern. A number of specialists have used this model, along with other lines of evidence (e.g., pollen stratigraphies, glacial sequences, pack rat midden studies, and insect profiles) to examine inferred paleoclimatic patterns at these time intervals for a number of locations throughout the world (see Wright et al. 1993). A general model for the western United States is presented by Thompson et al. (1993). Information from this modeling and projections from pluvial lake levels and pollen columns indicate a series of broad changes in late Pleistocene-Holocene climates. About 18 ka, most data indicate full glacial conditions with cold, dry climate. Estimates of deglaciation in the Rocky Mountains vary from about 15 ka to 13.5 ka, depending on the mountain range.

By 12 ka, conditions were both warmer and wetter than during the full glacial of 18 ka in the region, though an estimated 5-9°F cooler and a good deal wetter than today. Projections for 9 ka show maximum summer radiation in the northern hemisphere about 8 percent greater than today, with maximum seasonality and winters with about 8 percent less solar radiation than today (Kutzbach and Webb 1993:6). A shift toward drier conditions is evident at or shortly after 9 ka in most records, with slightly warmer summers than today. The timing and amplitude of maximum drought varies between geographic areas and records, but the interval between 9 ka and 6 ka generally shows the warmest and driest period in the record. It is after 9 ka that the Southern Rocky Mountains, including most of the Colorado Basin study area, begins to differ from the record of the Middle Rockies and the Great Basin. Whereas most records show a period of maximum drought sometime between 9 ka and 6 ka, the record from the Colorado mountains and the record in most of the Southern Rockies do not show clear evidence of actual drought. Pollen records summarized by Fall (1997a) suggest that temperatures were about 2.8°F warmer than present between about 8 ka and 6 ka, with some drying evident, but even at 6 ka, she estimates precipitation to be about 6 cm greater than today. Thomson et al. (1993:493) estimate the Northern Colorado Basin had greater effective moisture than today at 12 ka, 9 ka, and 6 ka, except that around 6 ka, the northern half the study area is estimated to have been about as moist as today. The period of maximum effective moisture is about 9 ka, with the minimum estimated to be about 6 ka. The last 6,000 years are not modeled on this grander scale, but in general, the record shows substantial variability around the modern norm.

The main conclusion that can be drawn from the general circulation models is that, during the early Holocene, conditions were both cooler and moister throughout the study area. By about 9 ka, the effect of greater summer insolation and a lack of continental ice sheets allowed the development of a strong monsoonal influence, bringing a good supply of summer moisture into the region. Increased precipitation offset the effects warmer summer temperatures to keep effective moisture higher than today. By 6 ka, there was less seasonality in temperatures, with a weaker overall monsoon, and the northern part of the study area apparently was as dry as today. The key factor, however, particularly to adherents of a well-defined Altithermal (e.g., Antevs 1948, 1955), is that there probably was not an Altithermal over most of the Colorado Basin study area. The period of maximum dryness in the west appears to vary in timing between the Great Basin, Northwestern Plateau, Middle Rocky Mountains, and the Great Plains, but the Southern Rocky Mountains appear to have been buffered by the effects of the summer monsoon (e.g., Madole 1991).

Millennial Scale Cyclical Variations

The most recent efforts at interpretation of past climates in the Great Basin have recognized some significant developments in the understanding of worldwide climatic change in the Quaternary (Madsen 1999a; Madsen et al. 2000). In the last decade, analysis of proxy records from ice cores and cores from the ocean and larger continental lakes has indicated cycles of climate change that operate on a 1,000- to 2,000-year cycle (Bond et al. 1997; Brooks et al. 1996; Mayewski et al. 1997; Oppo 1997). Termed Dansgaard-Oeschger cyclical variations, these events of shorter cycle appear to be a basic feature of the climatic record (Oppo et al. 1998). Though it is not yet clear how these variations relate to longer term orbital and rotational cycles, it is becoming increasingly clear that the transitions between cycles is abrupt, on the order of a decade or two. Each cycle is initiated by a rapid rise in temperature followed by a gradual return to moderate conditions over the course of about 1000 years, and the cycle ends with a rapid return to very cold temperatures just prior to the start of the abrupt warming that starts the next cycle. The amplitude of these temperature shifts is on the order of 9-14°F during the Pleistocene, and moderates to about 2-5°F in the Holocene (Madsen et al. 2000).

As Madsen (1999a) points out, these abrupt millennial shifts would occur on a temporal scale within the life of an individual, with fundamental climate changes occurring in a stepwise fashion rather than gradually. He observes that the sharply bounded nature of cultural-historical categories may not be completely arbitrary, but rather a reflection of the effect that rapid climate changes had on prehistoric peoples. Nine of these cycles have been recognized in the last 12,000 years, and researchers in the Bonneville Basin are currently working with an array of data, including shoreline, vegetation, and faunal records, to determine if the cycles observed in Greenland ice and North Atlantic sea cores can be verified in their local record (Madsen et al. 2000). They have created a model by overlaying a series of short cycles, each assumed to be 1,500 years long, on the 20,000-year cycle used in the general COHMAP model. They then correlate the model by linking it to the well-dated Gilbert shoreline, and examine evidence for other correlations in shoreline and other proxy records (Madsen et al. 2000). Though many unresolved problems occur in the data, general correspondence is strong enough to support the existence and nature of stepwise climatic change in the Bonneville Basin record.

Two conclusions from this work can be extrapolated to the Colorado Basin study unit. First, the abrupt nature of climatic changes needs to be accounted for in examining the local proxy records. Second, since these millennial cycles are superimposed on longer-scale cycles of orbital geometry and solar radiation, each will occur against a different climatic backdrop and will have different consequences. The resulting variability and abruptness of climatic change paints a different picture of the adaptive stress facing prehistoric peoples than do the more gradual models of change that have more commonly been assumed in our reconstructions.

Finer-Grained Climatic Estimates in the Study Area

Detailed climatic proxy records from within and directly adjacent to the study area include pollen, plant macrofossil, fossil insect, glacial, and sediment data. The most complete record is that summarized by Fall (1997a) for the western mountains of Colorado. This study is based on dated stratigraphic pollen sequences from eight sites at varying elevations, chosen to be sensitive expansion and contraction of upper and lower treelines. Three assumptions are used to reconstruct the paleoclimate (Fall 1997a:1315): 1) the position of upper timberline is controlled by temperature, particularly mean July temperatures; 2) the lower forest boundary is limited by moisture, which is related to mean annual or seasonal precipitation; and 3) past climate conditions can be estimated using modern lapse rates (i.e., decrease in temperature of about 11°F and increase of about 22.5 cm per 1000 m gain in elevation).

Based on the presence of subalpine conifers in the Alkali Basin core at an elevation of 2750 m (9025 ft) below their modern distribution and their absence in cores from above 3150 m (10,335 ft) in sections dating between 15,000 and 11,000 before present (B.P.) Fall (1997a) calculates that climatic conditions at the Alkali Basin site were similar to those found today at an elevation of 3050 m. (10,000 ft) This implies a mean annual temperature of 2.9°F lower and mean annual precipitation of +7 cm of precipitation as compared to today. Using the maximum estimated treeline depression of 700 m (2300 ft) for the period from 15,000 to 11,000 B.P., estimates are for conditions as much as 9°F lower in summer and 7°F lower in mean annual temperature, with as much as 16 cm greater precipitation.

Estimates from several sites are that the subalpine forest in central Colorado grew 270 m (885 ft) above modern limits between 9000 and 4000 B.P. This implies July temperatures 3.4°F higher and mean annual temperatures 2.9°F higher than now. Without an increase in precipitation, the lower limit of forest would also be expected to rise, but instead, the record at Keystone Ironbog (Fall 1997b) and Alkali Basin (Markgraf and Scott 1981) shows that the lower forest boundary was as much as 200 m (656 ft) lower than today. This is interpreted to mean an increase in effective moisture on the order of 8 to 11 cm. After 6400 B.P., the forest boundaries remained similar, but estimates are that the forest was more open and its species composition had changed, a condition that is interpreted as continued warm temperatures but with somewhat less precipitation, though still with greater effective moisture than today.

After 4000 years B.P., upper timberline dropped 100-200 m (328 - 656 ft) and subalpine fir dominated the upper elevations, rather than Engelmann spruce, as was the case earlier. This is an indication of slightly drier conditions and a shift to winter-dominated precipitation. July temperatures are estimated at +1.3°F to +2.5°F over today and mean annual temperatures at +1.1°F to +2.2°F. This is a decline from earlier temperatures, and even though precipitation had dropped somewhat, effective moisture was probably higher due to the cooler temperatures. Upper timberline has been near its present position for the last 2,000 years, with essentially modern conditions present. There are indications of conditions slightly warmer than today until about 1000 B.P. and evidence for slight warming in the last 100 years.

Other observations made by Fall (1997a:1318) have implications for modeling in the study area. For example, subalpine fir *(Abies)* maximum pollen at Alkali Basin occurs about 11,000 B.P., indicating that maximum winter precipitation in the study area occurred at times when the winter jet stream was strong and positioned across the northern part of the area. This timing corresponds well with other regional data, including glacial- and sediment-based data. General warming through the late Pleistocene-early Holocene shows in most of the regional records, with maximum warming indicated sometime between 9000 and 6000 B.P. Summer solar radiation has been decreasing through the Holocene, evident in the central Colorado records as a lowering of upper timberline after 4000 B.P. and a raising of the lower boundary starting about 6000 B.P. Because of the effects of a strong monsoonal flow, effective moisture remained greater than today until at least 6000 B.P. in the higher and more southern parts of the study area.

Monsoonal Influences on the Study Area

Both the global circulation and pollen data summarized above clearly show that the strength and northern limits of the summer monsoon is a critical influence in the paleoclimates in our study area (see also Madole 1991). Not only does the amount of moisture contained in the monsoon have a critical role to play, but also the northern limits of summer monsoonal moisture are critical, because the Colorado Basin study area straddles this northern boundary . Areas west, north and to some extent, northeast of the Northern Colorado Basin are largely outside the influence area of this summer-wet moisture pattern. The post-9,000 B.P. warming outside the monsoon area of western North America saw greater drying, a phenomenon that led Antevs (1948, 1955) to define the Altithermal in the first place. The timing of maximum drying in the west is variable, however, and was probably time transgressive from north to south over the broader region (e.g., Miller 1992; Thompson et al. 1993). Beiswanger (1991), for example, suggests that early in the Holocene, the summer monsoon may have carried moisture into the Wyoming Basin, but this effect is gone by 7500-5000 B.P.

Interpretation of weakening monsoonal effects in the more northerly parts of the study area is complicated by the paucity of data when compared with the central and southern mountains. Pollen from Snowbird Bog in the Wasatch Range in northern Utah are in overall agreement with a warmer-wetter early Holocene (Madsen and Currey 1979), but the Mount Leidy pollen core from the Uinta Mountains is limited in that it is located about 90 m (295 ft) below modern timberline (nonsensitive setting) and contains sediments from only the last 6500 years. Fluctuations in pollen percentages occur, but are minor in scale (Carrara et al. 1985), but indicate possibly cooler condition between 6500 and 4600 B.P., followed by warmer conditions from 4600 B.P. to 2100 B.P., with cooling conditions continuing through the rest of the core.

Other studies with implications for the northern part of the study area include stratigraphic studies from Yarmony, Middle Park and the Wyoming Basin; glacial studies; and data from more distant sources, such as lake levels of the Great Salt Lake.

Sediment characteristics from Yarmony, together with the presence of subalpine species of construction wood in the pit structures, are suggestive that the Yarmony setting was within the area of monsoonal influence as late as about 6000 B.P. Other data that can be brought to bear on this question occur in studies of sediments in archaeological contexts in Middle Park (Miller 1996b), the Yampa River valley (McFaul and Metcalf n.d.) and in the Wyoming Basin (Miller 1996a; Eckerle 1996). Jim Miller (1992) has developed a dated stratigraphic sequence for the Blue River and Muddy Creek basins in the vicinity of Kremmling in Middle Park. This stratigraphy is based on eolian deposits and is divided into seven units with dates ranging from late Pleistocene to modern. Each unit includes a "cycle" that consists of deposition, stabilization, pedogenic reactions, and partial deflation to a resistant horizon that formed during the period of stability (Miller 1996b:10).

Such an eolian unit includes a sediment package that generally accumulated fairly rapidly, in Miller's view during the transition to a cool period when, presumably, vegetative cover would be thin as a result of the previous dry period, and effective moisture higher. Because of the higher effective moisture, however, stability would occur fairly quickly, stabilizing the deposit. During the stable period, chemical and biological activity would take place in the sediment, creating a profile with a resistant horizon within it, and at the same time, coarse materials would be reworked through the profile. At the onset of warmer/drier conditions, the deposit would deflate until the resistant horizon was reached or until an armor of coarse sediments had accumulated that would serve to stop further deflation. The deflated horizon then forms the disconformity between one sediment unit and the next. This view of sediment formation is generally pessimistic to the preservation of archaeological deposits because it implies that most prehistoric time is encapsulated at the disconformities between units, because most occupations occurred on stable surfaces that were subsequently deflated.

In any event, it is clear that the seven sedimentary units occur, though seldom all stacked in a single column. In many places older units have been stripped away by later erosion. Stratum I is reserved for pre-13,500 years deposits. Stratum II contains Goshen, Folsom and Cody points, with a radiocarbon age of 10,190 ± 90 B.P. from low in the deposit and 7510 ± 80 B.P. in the upper part (Miller 1996b:10). Early dates in lower Stratum III are about 6000 B.P., but the upper boundary is more problematic since it is a major disconformity. In Miller's view, this is thought to represent a severe drought between 3500 and 2800 B.P. An unknown interval of time is represented by this disconformity. The most recent age thus far in the unit is 5180 ± 80 B.P. Stratum IV is bracketed between about 2600 B.P. and 2300-1700 B.P.; Stratum V ends at about 500-800 B.P.; Stratum VI at 50 to 150 B.P.; and Stratum VII is modern. Stratum II has clear evidence of frost heaving within its structure.

Paleoclimatic implications from Miller's interpretation of depositional and deflationary cycles suggest onset of cool conditions sometime between 13,500 and about 10,800 B.P. Deflation occurred sometime after 7500 B.P. and prior to 6000 B.P. Deposition and implied cooler conditions occurred from before 6000 B.P. to after 5180 B.P. Major deflation occurred after 5000 B.P. and prior to 2600 B.P. Deposition/stability is again implied after 2600 B.P. to sometime between 2300 and 1700 B.P. Deposition/stability in Stratum V is between 1680 and 820 B.P., but the exact dating is not clear. Stratum VI is thought to correlate with the Little Ice Age between 500 and 200 years ago. Thus, cool periods appear to have had onsets before 11,000 B.P., after 7500 B.P. , after 5000 B.P., at about 2600 B.P., at about 500 B.P., and sometime in the last 150 years.

The record at Yarmony shares a few of these characteristics, though not necessarily the assumptions about paleoclimates. Unit I at Yarmony is Pleistocene in age. Units 2 and 3, which are equivalent in age, began to accumulate sometime slightly prior to 7000 B.P. and are bounded by a disconformity after 6000 B.P. Unit 4 began to accumulate prior to 4800 B.P. and is bounded by another disconformity prior to 1200 B.P. Unit 5, which differs from underlying deposits by being mainly eolian, postdates 1200 B.P. and is likely even younger (Madole 1991:42-43). Yarmony is predominantly a sheet alluvium deposit, and the conditions of deposition may well differ from that in the Middle Park eolian sequence. Still, the sequences share some commonalities. Stratum II has been stripped away in many locales in Middle Park, and an equivalent is absent at Yarmony. Unit 2/3 at Yarmony began to accumulate prior to 7000 B.P., while in Middle Park, Stratum III began to accumulate after 7500 B.P. and prior to 6000 B.P. A deflationary episode is present in Middle Park after the 7500 B.P. age, suggesting the possibility that this erosional period can be bounded between the 7510 ± 80 B.P. age from 5GA1609 in Middle Park, and the 7050 ± 200 B.P. age for lower Unit 3 at Yarmony. If so, this may imply the mid-Holocene maxima in the area.

Unit 3 at Yarmony accumulated mainly as alluvial fill in old rills and channels, and, Unit 4 is primarily a sheet wash deposit. Sediment yields apparently had halted by the end of the time represented by Unit 3, because the disconformity between Units 3 and 4 at Yarmony is marked by a weak A/C paleosol at the top of Unit 3, with a weak erosional surface at most separating the units. The disconformity between Units 3 and 4 is likely more a reflection of a period of stability than anything else, as the overlying Unit 4 is similar in character. Unit 4, which apparently mainly accumulated after 4700 B.P. , may be showing hill slope instability that corresponds to Miller's (1996b) hypothesized drought between 3500 B.P. and 2600 B.P. The paleosol at the top of Unit 4 at Yarmony may have formed during a period of stability after 2600 B.P. There is a marked change in the character of deposition, however, between Units 4 and 5. If Miller is correct in his assumption that eolian sediments accumulate during the transition to cooler conditions in the area, it is tempting to assign a Little Ice Age equivalency to Unit 5.

Stratigraphic Data from the Uinta Basin Lateral

The Colorado Interstate Gas Company (CIG) Uinta Basin Lateral (UBL) forms a north/south transect from the Wyoming Basin south into the White River Drainage, crossing the Yampa near the community of Maybell. Dated stratigraphic sections from 18 excavated archaeological sites form the basis for some paleoenvironmental inferences (McFaul 1997; McFaul and Metcalf n.d.). The record from these sites shows broad correspondence to large-scale records, as well as some smaller scale episodes that are more difficult to interpret. Though the stratigraphy has more than 100 radiocarbon dates, relatively few of these were taken directly from charcoal, whereas charcoal-enriched bulk soil samples provided the majority of dates. The following summary is based primarily on dates derived from wood charcoal, though some interpolation has been done from sediment dates and stratigraphic associations. Broad events visible in the record include 1) active eolian deposition at 9400 B.P. in the Wyoming Basin just north of the study area; 2) formation of a strong paleosol in these sediments at around 8400 B.P.; 3) an erosional disconformity prior to about 8200 B.P.; 4) resumption of both alluvial and eolian deposition by 8200 B.P. capped by a paleosol about 7400 B.P.; 5) onset of a major erosional period marked by disconformities in a number of sites and by abandonment of the T2 terrace on the Yampa River and equivalent terraces in some tributaries; 6) resumption of deposition by about 6970 ± 190 B.P. with some evidence of stability/paleosol formation just prior to 6000 B.P.; 7) resumption of relatively continuous deposition lasting until about 3500 B.P., with slowing or stability about 5100 B.P. and during the period from about 4600 to 3500 B.P. when thick cumulic paleosols show up in the Yampa valley; 8) a major episode of erosion apparent in several sites between 3500 and 3200 B.P.; 9) a period of deposition lasting from about 3000 B.P. to around 1000 B.P., with a widespread paleosol about 1700-1500 B.P., variable evidence of a discrete paleosol about 2200 B.P. and cumulic paleosols more generally between about 3000 and 2700 B.P.; and 10) eolian deposition after about 1000 B.P., with some evidence of a paleosol after about 580 B.P.

This sequence implies periods of higher effective moisture around 8400 B.P., 7400 B.P., just prior to 6000 B.P., generally between 4600 and 3500 B.P., from about 3000 to 2700 B.P. and around 2200 B.P., about 1700 B.P. to after 1500 B.P., and after 580 B.P. perhaps conforming to the Little Ice Age. Erosion is indicated at about 8300 B.P., 7300 to 7000 B.P., around 3500 B.P., and possibly after 1000 B.P., with the strongest episodes at 7300 and 3500 B.P. Alluvial deposition in flood plain settings is important in the record prior to 7000 B.P. in the Yampa Basin where the T2 terrace was abandoned by downcutting around this date. Prior to this time, paleosols are well developed, and generally higher effective moisture is indicated. Later paleosols tend to be weaker and to have strong carbonate components in them. It appears that maximum drying occurred around 7300 B.P., and although there are indications that erosion had stopped and deposition begun by 6900 B.P. in some environments, there is little evidence of better conditions until just prior to 6000 B.P. Landscape stability with paleosol development can be accurately estimated at 5MF3572 about 6000 B.P. from a radiocarbon age, and there are poorly dated correlates at two other sites. Further, a suite of six charcoal-based radiocarbon ages from cultural features between 5800 and 6100 B.P. in the UBL area suggests stability and some improvement in conditions. These ages mesh with data from Yarmony and Middle Park, as well as with insect data presented by Elias (1994:208) that show a minor period of cooling between about 6000 and 5500 B.P.

The next period of more favorable conditions in the Yampa Valley occurs about 4600 B.P. and appears to have lasted until about 3500 B.P. Several charcoal ages and numerous dates derived from charcoal-enriched feature fill sediments bracket a period of gradual slope wash and eolian deposition during which a cumulic A horizon developed. The record is truncated in many locations between about 3500 and 3200 to 3000 B.P. This cumulic horizon has been termed the Spring Creek soil in the area and is a widespread horizon marker (McFaul and Metcalf n.d.). It has regional correlates that closely correspond or overlap its period of occurrence. Elias (1994:209) notes a cooling between about 4500 and 3600 B.P. (or later in some sites), and Benedict (1985:164 brackets the Triple Lakes advances between roughly 5100 and 3000 B.P. Fall (1997a) shows a cool period from about 4000 to 2000 B.P. , a period that corresponds almost exactly to the Holocene highstand of the Great Salt Lake (Currey 1990). Grayson, based on a wide array of Great Basin data, uses the date of 4700 B.P. to mark the end of dry, middle Holocene conditions (Grayson 1993:221).

Most of the sites in the UBL record show either outright erosion or at least a hiatus in the records shortly after 3500 B.P. Deposition, and in some sites continuation of the building of a cumulic soil, had resumed by 3200-3000 B.P. A short, possibly intense drought is perhaps indicated, providing support for an argument for such an event by Miller for the Wyoming Basin and Middle Park (Miller 1996a, 1996b). Elias' 1994 data show the cool period ending between 3600 and 2700 B.P., depending on the site. Benedict (1985) notes two episodes of Triple Lake recession about 3450 and 3350 B.P. Not all observers support the existence of a dry episode, however. Eckerle (1996), relying heavily on the record of the Great Salt Lake, marks 3500 B.P. as the return of mesic conditions, implying drier conditions earlier.

In the UBL record, deposition had begun again by 3000 B.P. at most sites, with the record from two Spring Creek sites showing resumption of weak cumulic A horizon development during the approximate interval between 3200 and 2700 B.P. The record through the remainder of time is primarily depositional, but a paleosol occurs in a few locations around 2200 B.P., and a more definite paleosol occurs in widespread locales between about 1500 and 1800 B.P. Deposition continues to about 1000 B.P., after which there is a hiatus of several hundred years, with another paleosol showing up late in prehistory, perhaps about 500 years ago. Elias 1985, 1994:209) notes a cool interval in the record from Lefthand Reservoir between 2000 and1400 B.P. and a slight warming about 800 B.P. This sequence is in general agreement where there are records elsewhere.

Thus, the record from the northern part of the Colorado Basin study area suggests periods of lesser influence from the summer-wet monsoon pattern that dominates south of the Colorado River itself. It would appear that the records diverge about 7300 B.P., when widespread erosion and abandonment of the Yampa T2 terrace occurred. Whereas warm, moist conditions persist in pollen and other records in the southern area until about 6000 B.P., there is a period of deterioration in the northern record. Several lines of evidence point to a moister period, however, between about 6400 and 5800 B.P., perhaps indicating a return of monsoonal moisture.

Summary

Paleoclimatic models for the study area suggest several broad-scale trends where there is considerable convergence of evidence, and also indicate areas where records diverge. There will always be arguments, hopefully heated, about what the various proxy records mean in terms of past climates. The reconstructions discussed above are summarized in Figure 2-8. The trend is for a cool-moist early Holocene followed by general warming by at least 9500 B.P. Conditions were moister than today in all parts of the study area until around 7300 B.P., when the records diverge between north and south, roughly along the Colorado River. In the southern records, warm-moist conditions continue until after 6000 B.P., while in the northern area, there is a definite deterioration indicated by plentiful evidence of major erosion and incision of the Yampa River and tributaries around 7300 B.P. Somewhat moister conditions returned to the northern area ca. 6400 B.P. to perhaps as late as 5800 B.P., followed again by a period of less effective moisture. Until about 4600 B.P. in the northern area, there appears to have been both hill slope and eolian sediments available and deposition was ongoing. With few exceptions, there are no periods of stabilization or paleosols during this interval. In the south, records suggest continued warm and less moist conditions but do not indicate drought. The return of cooler conditions after 4600 B.P. is indicated by insect, glacial, and sediment records in the northern area, and also after 4000 B.P. in the southern pollen records.

Indications for the later Holocene vary according to the area and the resolution of the record. In the pollen records of Fall (1997a), a slightly cooler and less moist period dominates between 4000 and 2000 B.P., after which essentially modern conditions persist, which is to say that there is variability around what is perceived as the modern range of variation. Other records show variable, and sometimes conflicting, data after 4600 B.P. The sediment record from the northern area indicate a period of at least modestly greater effective moisture than today from around 4600 B.P. to as late as around 1500 B.P., but this era is interrupted by apparent drought for a short time after about 3500 B.P., and there is some indication of deterioration again just after 2700 B.P. . Brief paleosol-forming periods of stability are noted about 2200 B.P. and 1800 to 1500 B.P. Finally, some records show deterioration again after 1000 B.P. and a period of higher effective moisture after 600 B.P.

Overlain on the trend summarized above are a few shorter-scale trends that may have correspondence with broad-area climatic events that, in turn, might correlate with millennial scale events. One such event, which has been identified over much of the region, is the Younger Dryas, a short return of near-glacial conditions dated to about 12,700 to 11,600 calendar years, or about 11,200 to 10,100 B.P. (see Madsen 2000 for a summary). Though the Younger Dryas is not singled out in the early pollen record, the depressed treelines between 15,000 and 11,000 B.P. may reflect his event, and Miller (personal communication to Michael Metcalf , 1997) suggests that his Stratum II in Middle Park contains a paleosol related to the Younger Dryas. The Medieval warm period around 900 A.D. and the Little Ice Age are additional examples of widespread events that also show up in the Colorado Basin record.

The record in the Northern Colorado Basin study area contrasts with that of the wider region beginning as early as 8500 years ago, when warming and drying began in parts of the Great Basin and the Northern Rockies, and the southern part of the study area contrasts especially after 7300 B.P., when the area was essentially surrounded by Altithermal conditions. This contrast may have lasted, in some areas, until at least 5200 B.P., after which conditions had improved in all of the surrounding areas.

On Altitude, Monsoons, and Refuge

The two factors that seem to have the strongest positive influence on effective moisture and habitability in the study area are the effects of altitude-based lapse rates in temperature and precipitation and the buffering effects of summer monsoonal moisture. At all times, the cooler temperatures of higher elevations, combined with generally greater precipitation resulting from orographic lifting, mean that a generally higher amount of effective moisture occurs in the higher

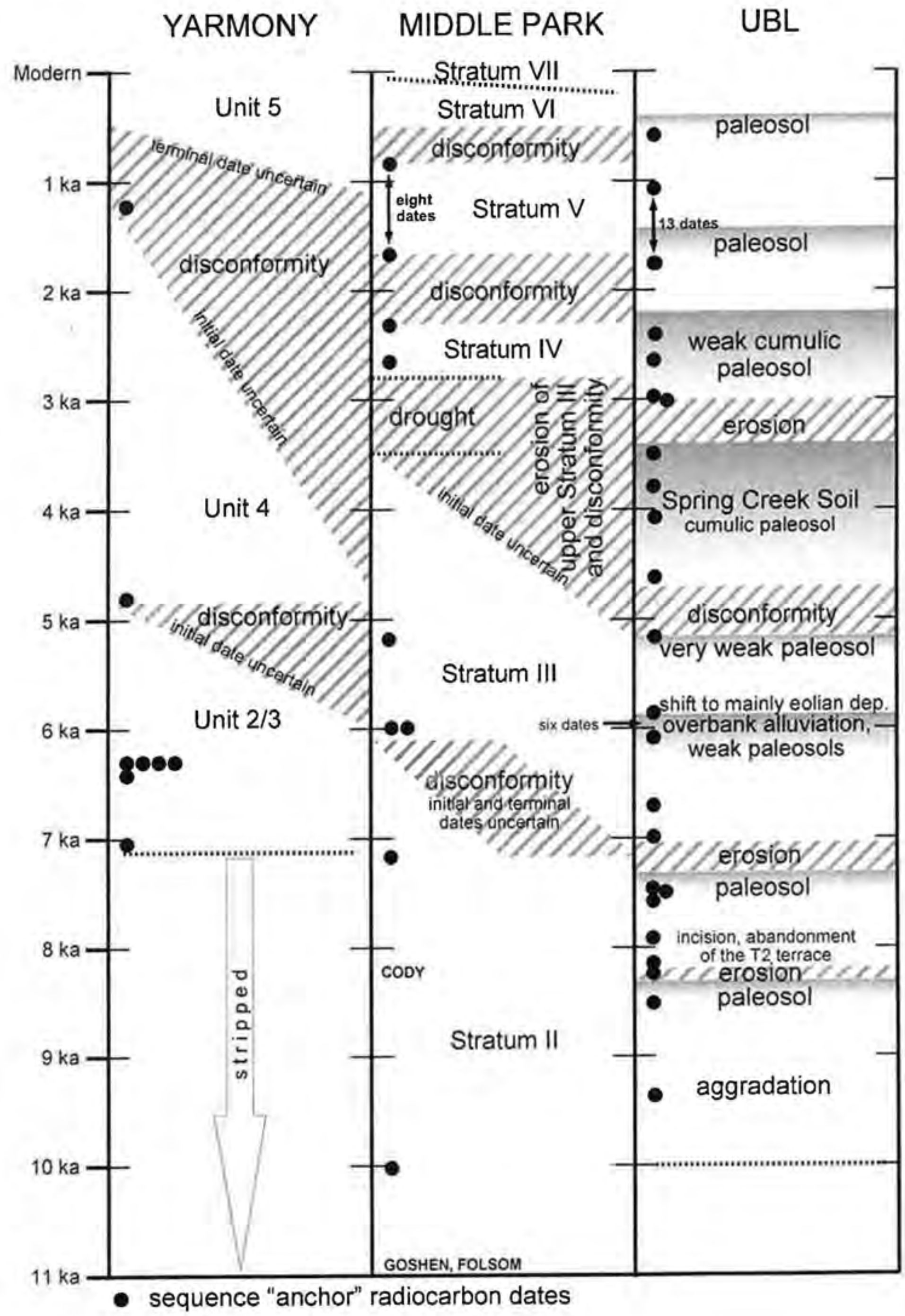

Figure 2-8. Sequence of paleoenvironmental events.

elevation areas common in the study area. During times when monsoon moisture is prevalent, the area is generally well-watered. At various time during prehistory, it can be expected that portions of the Colorado Basin study area were more productive than the lower plateaus and basins to the west and north. The Northern Colorado Basin study area generally has greater carrying capacity than neighboring areas, and this contrast would be especially marked during times of drought. Some consideration of paleoclimates, and especially on the productive potential of the habitat, should underlie all future models of settlement or population dynamics. The Altithermal refuge model first proposed by Benedict in connection with the Mount Albion complex has a great deal of validity as a concept regardless of its merits as a definition of an archaeological culture. An alternate hypothesis would be that the higher elevations would provide a degree of relief from dry conditions whether the drought is of short or long duration. Because the higher elevations are always a little wetter than the lowlands, however, there are always people in residence who know this and control or otherwise dominate access to the higher elevation resources. Too, there is simply less terrain, and resources are restricted by elevation and aspect. Thus, during times of climatic stress there will be tension over access to these relatively rich, but limited, resources.

The other dimension to this problem is the strong seasonality inherent to high, interior continental settings. The higher effective moisture of high elevations is offset by winter cold and snow. Thus, during times of serious drought, high elevations might provide summer relief but leave people without resources come winter. It is with this dilemma that projections of seasonality from global models attain importance. Although summer temperatures are thought to have peaked about 9000 to 10,000 B.P., this was also the time of peak seasonality with 8 percent less insolation during the winter. This strong seasonality likely placed severe limits on winter use of high elevations. According to earth orbit-models, seasonality of insolation has been decreasing since 9000 B.P., though there are other variables to take into account when modeling winter precipitation and temperatures. The distinction between winter and summer precipitation patterns and temperature patterns is of importance, as is the interplay between temperature and precipitation during different climatic episodes.

Thus far, models of climatic change have not been extrapolated into serious consideration of what the effective environment for human habitation would have been except in very general terms. Implications from pollen records measure gross characteristics like relative dominance of spruce-pine-fir pollen relative to nonarboreal types, and are effective in showing things like shifts in treeline, and position of sagebrush steppe relative to some of the lower pollen sites. The question becomes, what effect do these gross changes in vegetative patterns have on prehistoric adaptations? It is tempting to suggest that periods of higher effective moisture, in general, are better for human occupation, though there is plenty of evidence that occupations did not begin in the mountainous area until considerable warming had occurred in the late Pleistocene. But with warming temperatures and higher effective moisture came a spread of montane and subalpine forests with both raising and lowering of timberlines. This shift may not be good for humans, in that it reduces or eliminates the important and highly productive krumholz and alpine habitats. It also depresses the vegetative transitions on the lower end so that mountain shrubs and grassland-sagebrush steppe occur lower and in more restricted areas. Because conifer forest is an unproductive habitat for humans, this would tend to reduce the total area where productive resources occur. The question becomes, is the shrinking of the total area of good resource capability offset by a higher carrying capacity because of increased forage? How do fire histories, either deliberate or natural, relate to these questions? There are few answers to questions like these as the data are currently interpreted, but it is just these kinds of questions that need to be structured into future paleoenvironmental and geoarchaeological research.

Paleoenvironments and Site Preservation

The nature of the sediment histories in the various parts of any study area is critical to understanding the ages and distribution of well-preserved archaeological contexts. Geoarchaeologists and other soils and geological specialists should be, and for the most part are, involved in all major archaeological projects. The nature of the record that has thus far been studied suggests that there are both settings and temporal periods that will either be sensitive or insensitive to preservation of archaeological components. Stability is good for preservation of artifacts and features but creates problems in terms of providing good resolution of cultural events because the potential for reoccupation and horizontal mixing is very high. Nevertheless, there are methods for working with heavily reoccupied sites (e.g., Stiger 1998b). Erosion and deflation are bad because of the high potential for transporting cultural materials from one context, and either removing them from the record or concentrating them in one place in a stratigraphy. Low-energy aggradational contexts are the best places to find well-preserved archaeological materials, but are also rare and tend not to be readily visible. Future reconstructions of past environments, ultimately, need to be as sensitive to this aspect of inquiry as to the details of climate.

Chapter 3
KNOWN CULTURAL RESOURCES OF THE NORTHERN COLORADO BASIN

PREVIOUS ARCHAEOLOGICAL WORK

This section summarizes some of the more important archaeological investigations conducted in the Northern Colorado Basin over the past 75 years. The previous work is divided into two major categories: Early Investigations and Cultural Resource Management Era Investigations. The dividing point is the late 1970s, when national historic preservation legislation began to be routinely applied. As is evident, enactment of such legislation as the National Historic Preservation Act resulted in a dramatic increase in the quantity of archaeological investigations. The effects of this transition were especially profound in areas like the Northern Colorado Basin where cultural resources tend to be nonstructural and somewhat less "glamorous" than the Anasazi pueblos and Fremont pithouse villages in adjacent regions.

Early Investigations

Overview

The archaeology of the Northern Colorado Basin has been recorded in historical accounts since Fray Francisco Silvestre Velez de Escalante described the ruins of a small and ancient pueblo atop a ridge near the Dolores River in the Paradox Valley on August 23, 1776 (Warner 1995:26). It was not until the 1920s, however, that professional archaeologists began publishing accounts of cultural resources; these accounts were usually brief, but did provide baseline data regarding the general nature of the region's archaeological sites (e.g., Jeancon 1926, 1927; see also McMahon 1997). Best known of the 1920s investigations is W. C. McKern's rock art study. McKern (1978) examined sites at Mesa Verde, near Montrose, and near Craig, producing nearly 600 illustrations and photographs. The results were prepared for the Smithsonian Institution but were lost for decades; publication in 1978 by the Bureau of Land Management (BLM) brought the information to light. During the 1930s, more intensive archaeological surveys and the first controlled archaeological excavations were conducted. In 1931, George and Edna Woodbury conducted an archaeological survey of western Montrose County under the auspices of the Colorado State Historical Society and the Smithsonian Institution. Their primary research interest was in sites with masonry structures, which they attributed to Pueblo I-II period Anasazi (Woodbury and Woodbury 1932). Several rooms within rubble mounds in the Paradox Valley were excavated, resulting in the recovery of a tree-ring specimen dated to 1025 vv (Gleichman et al. 1982). Harold Huscher of the Colorado Museum of Natural History also conducted important documentation of the archaeological resources of western Colorado. The results of several years of "archaeological scouting" on the Uncompahgre Plateau in the 1930s were reported in a *Southwestern Lore* article entitled "Influence of the Drainage Pattern of the Uncompahgre Plateau on the Movements of Primitive Peoples." The paper describes in detail the plateau's environmental context and describes the relationship of site types, such as surface camps and rockshelters, to the local environment (Huscher 1939). Huscher's interest in regional archaeology extended far beyond Uncompahgre Plateau site distributions, however. In the late 1930s and early 1940s, Harold Huscher and his wife, Betty, conducted an extensive investigation of prehistoric masonry structures in western Colorado, north of the Anasazi homeland. Structural sites were mapped and, in some cases, excavated. Typical sites consisted of oval masonry structures with Pueblo II period pottery and small, corner-notched projectile points; some sites also yielded evidence of corn. The Huschers attributed many of such sites to Athapaskan groups migrating from former homelands in Canada to their present homelands in the Southwest (Huscher and Huscher 1939, 1943). Also in the late 1930s and early 1940s, C. T. Hurst of Western State College in Gunnison conducted extensive archaeological excavations at several important sites in western Montrose County. These sites included Tabeguache Cave, Tabeguache Cave II, Dolores Cave, Cottonwood Cave, Tabeguache Pueblo, and Cottonwood Pueblo (Hurst 1940, 1941, 1943a, 1944, 1946, 1947, 1948). The cave sites were generally believed to have been inhabited by aceramic, peripheral Basketmaker II peoples, as evidenced by discoveries of corn and, at Tabeguache Cave II, squash. Ute and pre-Basketmaker components were also detected at some sites. The rockshelter sites yielded a great variety of perishable artifacts, such as basketry, dart and arrow foreshafts, yucca sandals, matting, hide, and a medicine bundle. At Tabeguache and Cottonwood Pueblos, rectangular masonry habitation structures, some with contiguous rooms, were revealed. These open sites yielded small, corner-notched projectile points and ceramic types of the Anasazi Pueblo II period, such as Mancos Black-on-white.

As Hurst and the Huschers were conducting their research in west-central Colorado, Charles Scoggin and Edison Lohr of the University of Colorado Museum were investigating the cultural resources of Castle Park in Dinosaur National Monument. Inventory and excavation were conducted along the Yampa River. Excavations focused on Mantle's Cave, where approximately 530 m^2 were excavated. More than 50 storage features were discovered at Mantle's Cave, along with large quantities of perishable artifacts such as baskets, moccasins, fishhooks, snares, netting, and a flicker-feather and ermine-skin headdress. Corn and squash remains were also found. Before Scoggin could report his findings, he was killed in action in World War II. Reporting duties fell to Robert Burgh, who revisited the area and conducted limited excavations at Hells Midden, a stratified rockshelter in the Yampa Canyon in Dinosaur National Monument (Burgh and Scoggin 1948). Project data were compared to those of other regions, leading to the conclusion that the sites were primarily Fremont.

In 1950, Gilbert Wenger conducted a cultural resource inventory south of Dinosaur National Monument in the Douglas Creek area south of Rangely and on Blue Mountain, northwest of Rangely. Wenger's data, incorporated into his Master's thesis, suggested that many of the region's structural sites were associated with the Fremont culture as represented at sites in Utah (Wenger 1956). In the vicinity of Wenger's project area, Elmer Smith and University of Utah personnel conducted archaeological inventory and excavation in 1941. Excavations were conducted at the Dripping Rocks Cave site, south of K Ranch. Stratified cultural deposits were encountered. Unfortunately, Smith never reported his findings. The results of the excavations at Dripping Rocks Cave were reported by some years later Kathryn Anderson, (1964). The University of Colorado Museum conducted important investigations at Hells Midden in the late 1940s. The site contained deeply stratified cultural deposits with Fremont and Archaic components (Lister 1951).

Perhaps the most important archaeological investigation in northwestern Colorado in the 1960s was the University of Colorado's work at Dinosaur National Monument, conducted for the National Park Service. Cultural resource inventory was completed and 20 archaeological sites were excavated. Seven of the excavated sites were in Colorado; these included Lowell Spring (5MF224), Deerlodge Midden (5MF202), Disappointment Circle (5MF196), Baker Cabin Spring (5MF190), The Seeps Campsite (5MF138), and Serviceberry Shelter (5MF81). None of the Colorado sites had habitation architecture, and none were dated by radiocarbon methods. Several of the sites in Utah had Fremont pit and surface structures; interpretation of these sites led to Breternitz's (1970) definition of the Cub Creek phase of the local Fremont occupation.

The body of substantive knowledge concerning the prehistory of west-central Colorado increased dramatically in the late 1930s when the Denver Museum of Natural History commenced excavations at several rockshelters on the eastern slope of the Uncompahgre Plateau reported by amateur archaeologists Ruth and Carlyle (Squint) Moore. Huscher, H. M. Wormington, and others tested the Moore and Casebier sites in Roubideau Canyon in 1937, and more extensive excavations were completed in 1938 and 1939. In 1950, amateur archaeologist Al Look tested a rockshelter southwest of Whitewater and reported positive findings to the Denver Museum of Natural History. The museum renewed field investigations in the region in 1951, in a joint effort with the University of Colorado's archaeological field school. The excavations, conducted in 1951 and 1952, were directed by H. M. Wormington of the Museum and by Robert Lister of the University of Colorado. Sites investigated included the Taylor and Alva sites (rockshelters), Luster and Roth caves, and three open sites in Glade Park. Additionally, data from Little Park Caves tested by Al Look were examined. Excavation data from the Moore, Casebier, and Taylor sites were the basis of Wormington's dissertation entitled "The Archaeology of the Upper Colorado Plateau Area in the Northern Periphery of the Southwestern United States." Project data were also used to define the Uncompahgre complex, a local manifestation of the Desert culture (Wormington and Lister 1956). Artifacts diagnostic of the Uncompahgre complex included the "Uncompahgre Scraper," an adze-like scraper, and a large and partially polished stone object of unknown function.

Lister's involvement in the archaeology of west-central Colorado was renewed on a large scale in the early 1960s with the conception and execution of the Ute Prehistory project. The primary objective of the Ute Prehistory project was to construct a cultural chronology and to determine whether Ute traits could be traced into prehistory. William G. Buckles was selected as the project's field director, and archaeological fieldwork was conducted between 1961 and 1963. Thirty-nine sites on the eastern flanks of the Uncompahgre Plateau west of Delta and Montrose were excavated to some degree, and 17 rock art sites were recorded. The results were compiled into Buckles' (1971) dissertation, which would prove to be one of the most influential works regarding regional prehistory. Detailed analyses were conducted on artifacts and rock art elements, resulting in the definition of Uncompahgre Brown Ware pottery and rock art styles. Buckles found that the artifact types purported by Wormington and Lister as diagnostic of the Uncompahgre complex were not, in fact, restricted to west-central Colorado. Artifact assemblages were assigned to new phases when possible, though few were dated by chronometric methods. Buckles' phases provided the basis for redefinition of the Uncompahgre Complex. He regarded attempts to trace Ute archaeology into prehistory as unsuccessful, however, largely because of the absence of unequivocal diagnostic traits. Buckles noted continuity in basic cultural behaviors through time, but actual cultural continuity could not be demonstrated. Affiliation of Uncompahgre complex components with Athapascan groups, the Fremont, and the Anasazi, were rejected, though some influence by Fremont and Anasazi culture was noted.

In 1970, 41 years after the Woodburys had excavated structural sites in the Paradox Valley, San Diego State University (SDSU) and Colorado College (CC) jointly conducted a field school at site 5MN191 (Larry Leach, personal communication, 1999). The site, designated Mound 1 by the Woodburys, was referred to as and Paradox 1 by during the field school excavations. Except for Kasper's (1977) report of the faunal remains recovered at the site, the excavations were unreported until Todd McMahon of the Colorado Historical Society compiled extant site data. According to McMahon (1997), all of the artifacts and notes from SDSU and CC excavations were destroyed in a fire. McMahon was successful, however, in obtaining several photographs of the excavations from Larry Leach, which permit at least some discussion about Kasper's contention that the site had both Anasazi Basketmaker III and later Fremont components.

Summary of Theoretical Orientations

The theoretical orientations underlying the early archaeological projects described above were probably as diverse as the archaeologists conducting them, especially since many decades are represented. Various general theories abounded in the early part of this century (Trigger 1989; Harris 1968). Regardless of individual theoretical perspectives, however, the reports that were produced were decidedly culture-historical in content, with emphases upon constructing archaeological sequences through the study of stratigraphic correlations, seriation, and diffusion. A focus upon cultural chronologies was entirely tenable, considering the scant nature of the region's archaeological database.

The best of the early investigators carefully compared and contrasted their archaeological findings to archaeological assemblages reported elsewhere. Because well-excavated and reported assemblages were generally rare in other areas once inhabited by highly mobile peoples, researchers often had to utilize assemblages excavated at great distance from western Colorado. Assemblages from western Colorado, therefore, might be compared and contrasted to assemblages from the High Plains or the Great Basin. When comparisons were favorable, influence from these other regions was often postulated, leading researchers to hypothesize about past migrations from the outlying regions. The direction of migrations and the sources of "influences" may now be seen as historical accidents, reflecting the location and quality of the earliest archaeological investigations and the prestige of the archaeologist conducting them. For example, the Great Basin might have been considered to have been "influenced" by the peoples of the Northern Colorado Basin if Jesse Jennings had concentrated his early field efforts in this area, rather than in the Great Basin.

Cultural Resource Management-Era Investigations

With relatively high percentages of lands administrated by federal agencies, the Northern Colorado Basin was profoundly affected by the implementation of the historic preservation legislation passed in the late 1960s and the 1970s. Whereas early investigations were usually conducted for academic interest, archaeological investigations conducted after 1975 were usually conducted to meet legal requirements on projects involving federal lands, monies, or authorization. Agencies such as the BLM and the Forest Service hired staff archaeologists to assist in resource management and to oversee legal compliance. The quantity of investigations increased dramatically, beyond the ability of academic, museum, and federal archaeologists to conduct them. This led to the formation of the consulting archaeology industry.

Cultural Resource Overviews

Faced with managing hundreds of archaeological sites on thousands of acres of public land, the BLM elected to prepare cultural resource overviews of many resource areas as baseline documentation. The first of these in western Colorado was Tom McGarry's overview of the Craig District. Many sites were inspected, and an overview document was written; the results were never published, however (McGarry n.d.). In 1982, the Montrose District BLM published overviews of the San Miguel and Uncompahgre Resource Areas (Gleichman et al. 1982; Reed and Scott 1982). A similar document was published in 1987 describing the prehistoric cultural resources of the Little Snake Resource Area in northwestern Colorado (La Point 1987). A draft cultural resource overview of the Grand Junction Resource Area was prepared by Brian O'Neil (1993), but was never finalized. Recently, Philip Duke and his associates at the Center of Southwest Studies at Fort Lewis College have completed an archaeological overview of the Mancos-Dolores, Columbine, and Pagosa Districts of the San Juan National Forest (Duke 1998).

In response to the Secretary of the Interior's archaeology and historic preservation guidelines that call for preparation of historic contexts to aid in the evaluation of site significance (*Federal Register* 1983), the Colorado Historical Society published three regional contexts that pertain to the prehistoric cultural resources of the Northern Colorado Basin. Prehistoric context documents were prepared for the mountains (Guthrie et al. 1984), northwestern Colorado (Grady 1984), and west-central Colorado (Reed 1984b). These works, known as the RP-3 reports, provide brief overviews of culture history, evaluate the quality of the archaeological database, and identify important regional research questions.

Cultural Resource Inventories

To better manage the cultural resources on public lands, the BLM funded research to develop predictive models of site location in the western United States. The earliest efforts essentially considered whether site densities were related to topographic landform (e.g., Martin 1977) or attempted to determine which environmental variables might be useful for site prediction (Hurlbett 1977). Later models, however, were much more sophisticated, using discriminant analysis or stepwise regression models to differentiate site versus nonsite locations. Environmental variables found to aid in site prediction include site slope, aspect, horizontal and vertical distance to water, view angle, distance to vantage points, and shelter quality (Burgess et al. 1980; O'Neil 1993). The most recent predictive modeling efforts utilize Geographic Information Systems (GIS) technology to measure environmental variables (O'Neil 1993). The more sophisticated predictive modeling projects include Nickens and Associates' Class II inventory in the Glenwood Springs Resource Area (Burgess et al. 1980), Colorado State University's (CSU) sample-oriented inventory adjacent to Canyon Pintado Historic District (La Point et al. 1981), Newkirk and Roper's (1983) Class II of the Piceance Basin, and the BLM's Class II inventory of the Grand Junction Resource Area (see O'Neil 1993). A common element in most of these predictive modeling efforts is the work of Kenneth Kvamme, who gained an interest in the subject as a student at CSU and who later directed several of the aforementioned projects.

Since the late 1970s, many hundreds of cultural resource inventories have been conducted in the Northern Colorado Basin. It is beyond the scope of this project to review the survey reports in any sort of a comprehensive fashion. Inventory reports that have substantially influenced our understanding of regional archaeology include Toll's (1977) report on the cultural resources along the lower Dolores River; CSU's inventories of a planned railroad spur in southeastern Moffat County (Arthur et al. 1981), at nine oil shale tracts in the Piceance Basin (Weber et al. 1977), and near Canyon Pintado Historic District south of Rangely (La Point et al. 1981; Creasman 1981); and Gordon and Kranzush's report on the archaeology of the Texas-Missouri-Evacuation Creek area (Gordon et al. 1983). Additionally, Grady's (1980) dissertation about site distributions in the Piceance Basin was influential in modeling settlement patterns.

Archaeological Excavations

Although only a small percentage of recorded sites are subject to controlled excavation, the sample of excavated sites has increased substantially over the past two decades through the application of historic preservation legislation. Numerous sites have now been excavated in advance of various development projects. However, not all excavations are conducted to meet legal requirements; colleges and universities continue to sponsor archaeological field research. Academically oriented excavations include Western Wyoming College's field school investigation of the Sand Wash Wickiup site (Murcray et al. 1993), James Benedict's excavations at the Caribou Lake site (Benedict 1985), Western State College's long-term excavations at the Tenderfoot site (Stiger 1993), and Metropolitan State College's excavations at Weimer Ranch (Crane 1977).

Additionally, archaeological field investigations have been conducted expressly to provide data for theses or dissertations (e.g., Burney 1991; Cassells 1995; Gooding 1976; Naze 1994).

Major excavation projects conducted in the study area since the late 1970s are listed below (Table 3-1). Additional information on these projects can be found in the annotated bibliography comprising Appendix A. Several projects are sufficiently large or important to warrant special mention. In the Green and Yampa River Unit, Centennial Archaeology's excavation at site 5MF2544 on the Craig-Bonanza transmission line project contributed important information regarding regional Late Archaic, Late Prehistoric, and Protohistoric occupations (Kalasz et al. 1990). Excavations at the Red Army Rockshelter (5RT345) by Metcalf Archaeological Consultants revealed seven stratified components, dating between the Early Archaic and the Protohistoric periods. Two pit structures were discovered within the rockshelter, dating to the Early and Middle Archaic periods (Pool 1997). An Early Archaic period human burial was also found. The Red Army Rockshelter is at the Cyprus Twentymile Coal Mine southeast of Craig.

In the White River Unit, much of the recent excavation has been conducted by Centuries Research and by Archeological-Environmental Research Corporation Inc. (AERC). The work by Centuries Research has occurred in the Douglas Creek area in a natural gas field being developed by Chandler and Associates. Excavated components have been attributed primarily to the Fremont and the Ute. Excavated sites include Pedestal House (5RB733), Burned Cedar site (5RB2926), Corrugated Pot site (5RB2982), Sandshadow site (5RB2959), New site (5RB3060), Broken Blade Wickiup Village (5RB3182), Sky Aerie Promontory Charnel site (5RB104), and Rim Rock Hamlet Promontory site (5RB2792) (Baker 1992a, 1993, 1995, 1996, 1997, 1998a, 1998b). In the same area, AERC has been conducting archaeological investigations for Conoco Inc. Between 1988 and 1996, AERC has investigated 30 sites to one degree or another; these investigations have produced 32 radiocarbon dates (Hauck 1993, 1997).

Table 3-1. Major Testing and Excavation Projects.

Green and Yampa Rivers Unit
Gleichman and Spears 1985: Fortification Creek Valley
Hand 1993: Wolf Creek Pictograph site
Kalasz et al. 1990: Craig-Bonanza Project
Murcray et al. 1993: Sand Wash Wickiup site
Murray and Johnson 1997: Irish Canyon Rockshelter
Pool 1997: Red Army Rockshelter
Tanner and Creasman 1986: Sand Wash site
Truesdale 1993a: Pool Creek Burial site
Tucker 1981: Site 5RT139 Test
White River Unit
Arthur et al. 1981: Colowyo Railroad Spur Project
Baker 1992a: Pedestal House
Baker 1993: Burned Cedar and Corrugated Pot sites
Baker 1995: Sandshadow and New sites
Baker 1996: Broken Blade Wickiup Village
Baker 1998a: Rim Rock Hamlet
Baker 1998b: Sky Aerie Promontory Charnel site
Creasman 1981: Canyon Pintado Historic District
Fetterman and Honeycutt 1995: Site 5RB3042 along Douglas Creek

Table 3-1. Major Testing and Excavation Projects.

Hauck 1993, 1997: Douglas Creek–Texas Mountain Locality
LaPoint et al. 1981: Canyon Pintado Historic District
McAndrews et al. 1997: Little Spring Creek site
O'Neil 1980a: Walton Creek (5RT11)
Painter 1994: Data Recovery at 5RB234
Pool 1994: Cyprus Twentymile Coal Project
Pool 1997: Red Army Rockshelter
Zier and Jepson 1991: Piceance Creek rockshelters and Burke site
Colorado River Unit
Benedict 1985: Caribou Lake site
Black 1982a: Breckenridge Ski Area
Burney 1991: Three Sites in Middle Park
Cassells 1995: Sawtooth Game Drive site
Conner and Langdon 1987: Battlement Mesa Project
Daniels and Spencer 1982: Basalt-Malta Transmission Line
Frison and Kornfeld 1995: Middle Park Paleoindian Investigations
Gooding 1981: Vail Pass Camp
Gooding and Shields 1985: Sisyphus Shelter
Hand and Gooding 1980: Dotsero site
Hartley 1984: Jerry Creek Land Exchange
Liestman 1984: Pontiac Pit site
Metcalf et al. 1991: Kremmling Chert Procurement in Middle Park
Naze 1994: Crying Woman site
Reed and Nickens 1980: DeBeque Rockshelter
Wheeler and Martin 1984: Windy Gap
Gunnison River Unit
Baker 1980: Mount Emmons Project
Baker 1991: Ridge Site and Roatcap Game Trail sites
Black 1986: Park Cone Scraper site
Dial 1989: Pioneer Point site
Euler and Stiger 1981: Curecanti National Recreation Area
Horn et al. 1987: Indian Creek site
Jones 1982, 1986a, 1986b: Curecanti National Recreation Area
Liestman and Gilmore 1988: Soderquist Ranch site
Lutz 1978: Testing at 5ME217
Muceus and Lawrence 1986: Old Dallas Historical Program
Rood 1998: Elk Creek Village, Curecanti National Recreation Area
Rossillon 1984: Marion Site, Curecanti National Recreation Area
Stiger 1993; 1998b: Tenderfoot site
Stiger and Rood 1994: Assessment of 5HN65
Stiger 1981: Curecanti National Recreation Area
Tucker and Colorado Archaeological Society (CAS) 1989: Harris site
Dolores River Unit
Crane 1977, 1978: Weimer Ranch site
San Juan River Unit
Reed 1984a: Piedra Pass Campsites

Several particularly important excavation projects have been completed in the Colorado River Unit. These include the Colorado Department of Highways' investigations at Vail Pass Camp (5ST85), a multicomponent high-altitude site where 453 m^2 were excavated (Gooding 1981), and Sisyphus Shelter (5GF110), a multicomponent rockshelter along Interstate Highway 70 east of DeBeque (Gooding and Shields 1985). A possible slab-lined habitation structure at the latter site was found and attributed to the Late Archaic period. Benedict's (1985) excavations at the Caribou Lake site (5GA22) are noteworthy especially because a Cody complex projectile point and a small sample of other artifacts were found in association with a hearth producing a radiocarbon date congruous with the Paleoindian artifact sample. Cord-marked ceramic sherds were also found at the site, a variety rarely documented on the western slope. The Caribou Lake site is located west of Boulder at an elevation of 3400 m (11,155 ft). The University of Wyoming's investigations in Middle Park have also provided evidence of intact Paleoindian components, including those of the Folsom, Goshen, and Cody complexes or traditions (Frison and Kornfeld 1995). E. Steve Cassells'(1995) investigations at the Sawtooth Game Drive site (5GA55/5BL523) in the Indian Peaks Wilderness Area west of Boulder provided insight into prehistoric game drive systems and permitted interpretation of high-altitude settlement patterns. Various excavations in the higher elevations of the unit have yielded evidence of substantial habitation structures, leading to the position that the mountains may have been the locus of year-round occupation by prehistoric peoples (Black 1991a). In 1981, Western Cultural Resource Management found wattle-and-daub clusters at the Granby (5GA151) and Hill Horn (5GA680) sites at Windy Gap, indicative of habitation structures (Wheeler and Martin 1982). These sites were situated at 2499 m (8200 ft) and 2438 m (8000 ft), respectively. Shortly thereafter, Grand River Institute discovered a substantial pit structure near Battlement Mesa along the Colorado River; like the Windy Gap sites, the Kewclaw site was attributed to the Archaic stage. In 1987, Metcalf Archaeological Consultants discovered substantial Archaic pithouses near State Bridge along the Colorado River. This site, known as Yarmony House (5EA799), yielded evidence of winter occupation and provided the basis for refinement of Archaic settlement patterns (Metcalf and Black 1991a). Metcalf Archaeological Consultants also conducted important research at two quarry sites near Kremmling (5GA1144 and 5GA1172), where quarry pits containing wooden, antler, and bone quarry tools were found (Metcalf et al. 1991).

Recent archaeological work in the Gunnison River Unit is dominated by National Park Service and Western State College projects near Gunnison. The Park Service's Midwest Archaeological Center has conducted excavations at Curecanti National Recreation Area since 1978 that have provided important information regarding Ute archaeology (Dial 1989), Archaic habitation structures (Euler and Stiger 1981; Jones 1986a), and general prehistoric chronology (e.g., Jones 1982; Rossillon 1984). Western State College field school students recently completed important excavations at the Elk Creek Village site (5GN2478) in the Curecanti National Recreation Area to mitigate cultural deposits damaged by wave action. At least one substantial habitation structure was identified (Rood 1998). Western State College has excavated at the Tenderfoot site (5GN1835), just south of Gunnison, since 1991. Excavations include a block of 313 m^2, which has revealed approximately 50 features. Multiple occupations are evident. Portions of the site have been subjected to controlled surface collection over multiple years, providing interesting data on vertical movement of artifacts in mountain soils. The site serves as an object lesson that sites with shallow soils can yield important scientific information. Important work has also been conducted in the lower Gunnison Basin, near Whitewater. In 1984, Nickens and Associates excavated the Indian Creek site (5ME1373), an extensive site with at least 94 cultural features, including many roasting pits. A 10 m x 10 m block excavated to mitigate the effects of construction of a power transmission tower revealed three probable habitation structures associated with an Archaic component (Horn et al. 1987).

Synthetic Efforts

In addition to the recent projects discussed above, which focus upon a particular site or a cluster of sites in a particular development area, several important works have been conducted of a broader, synthetic nature. The archaeology of the Northern Colorado Basin has been summarized by three popular books focusing on the state's prehistory; these include Bruce Rippeteau's (1978) *A Colorado Book of the Dead: The Prehistoric Era,* Tammy Stone's (1999) *Prehistory of Colorado and Adjacent Areas,* and E. Steve Cassells'(1997) more ambitious *The Archaeology of Colorado*. Bonnie Pitblado's Master's thesis on the Paleoindian occupation of the southwestern quarter of Colorado is an important synthetic work; it makes a strong case for the application of George Frison's Foothill-Mountain tradition model to the region's Plano components, which hypothesizes a more generalized hunting and gathering strategy, rather than the big-game focus characteristic of Plano peoples inhabiting the Great Plains (Pitblado 1993, 1994).

Mountain archaeology has been a prominent research concern in recent years, fostered by Kevin Black's definition of the Mountain tradition (Black 1991a). According to Black (1991a:4), the Mountain tradition represents a settlement pattern characterized by year-round exploitation of mountain environments. This contrasts to earlier models, in which the mountains were supposedly used primarily in the summer by peoples with residential bases on the Plains or on the Colorado Plateau. Black's model made use of the emerging evidence of substantial Archaic pit structures being discovered in western Colorado's mountain environments, such as those at Windy Gap, Curecanti National Recreation Area, and Yarmony House. The implications for the logistical organization of mountain-based groups were later explored in an article published by Metcalf and Black (1997). Another synthetic effort worthy of note pertaining to mountain archaeology is Carey Southwell's (1995) Master's thesis on Colorado game drive systems.

Determination of the cultural placement of Formative-era masonry sites in west-central Colorado has also been of considerable research interest and has stimulated some synthetic works. This debate commenced with Schroeder's (1964) article entitled "The Cultural Position of Hurst's Tabeguache Caves and Pueblo Sites" and has persisted to the present, largely because of the lack of recent excavations at masonry habitation sites in the region and the uniformly poor quality of reporting of past excavations that have focused on these sites. Herbert Solomon (1992) provided new insight into the issue by reevaluating the artifact samples collected by Betty and Harold Huscher in western Colorado in the 1930s for his Master's thesis. Solomon rejected Athapascan affiliation and noted influences by Anasazi and Fremont culture. Reed (1997) supported Schroeder's (1964) position that indigenous groups not directly affiliated with either the Anasazi or the Fremont were represented, and suggested that the archaeological unit be referred to as the "Gateway tradition". Todd McMahon of the OAHP contributed greatly to the debate with his recording of the Woodbury's Paradox Valley sites. Data were retrieved from various historic archives, and photographs of SDSU and CC excavations were procured from Larry Leach (McMahon 1997). The compiled data — especially the photographs from Larry Leach — will prove invaluable to researchers. McMahon suggests that the sites can best be considered to be representative of the San Rafael Fremont. Kae McDonald (1989) also contributed to Formative-era studies when she reanalyzed previously excavated materials at Luster and Roth caves west of Grand Junction for her Ph.D. dissertation.

Regional rock art data have been synthesized by Sally Cole in two major works. Her 1987 analysis of the rock art in west-central Colorado discusses the various rock art styles evident in the region, including the Archaic stage Abstract Petroglyph style, the Glen Canyon Style 5, the Barrier Canyon style, and the Uncompahgre Rock Art style; the Formative stage Basketmaker II style, Abajo-LaSal Anasazi style, and the Fremont Rock Art style; and various Protohistoric/Historic period styles of probable Ute origin (Cole 1987). Much of this work was refined in her book *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region* published a few years later (Cole 1990).

Synthetic works have also been completed regarding Ute archaeology. In 1988, Paul Nickens organized a symposium on Ute archaeology at the annual meeting of the CCPA. The resulting papers, along with several others not presented at the meeting, were published by CCPA (Nickens 1988a). Topics included culturally peeled trees, Ute mortuary practices, wickiups, Euroamerican trade goods, pottery, cultural chronology, rock art, site distributions, and recent excavations. Additionally, historic Ute photographs on file at the Denver Museum of Natural History were published, along with a discussion of the contributions by William G. Buckles. More recently, Reed (1994) has published regional data concerning Ute archaeology in a study of the timing of Ute immigration to the area. Attributes of Ute wickiups have been examined in Sanfilippo's (1998) Master's thesis on differentiating Ute and Navajo brush structures.

In addition to the works mentioned above, two incomplete, large-scale archaeological investigations merit mention, because they will soon contribute a large amount of information on the prehistory of the Northern Colorado Basin. Fieldwork for both projects is complete. Metcalf Archaeological Consultants has recently completed mitigative excavations at sites along Colorado Interstate Gas Company's Uinta Basin Lateral (UBL) pipeline near Maybell, Colorado. Since 1991, Alpine Archaeological Consultants has been working on the TransColorado Natural Gas Pipeline project, a nearly 300-mile-long pipeline that extends from Piceance Creek southwest of Meeker, Colorado, to Bloomfield, New Mexico. Inventory was conducted in 1991 and 1992 (Chandler et al. 1991; Reed and Horn 1992a, 1992b), and the resulting survey data were synthesized (Horn et al. 1993). Alpine and Centennial Archaeology implemented an archaeological mitigation program in 1997 and 1998; 14 aboriginal sites in the Northern Colorado Basin were subject to full archaeological data recovery, and limited trenching and feature recovery were conducted at an additional 42 sites. Excavations at sites selected for full data recovery tended to be extensive; at site 5SM2425 near Redvale, 510 m^2 were excavated. Project excavations in the Northern Colorado Basin revealed Paleoindian, Archaic, Late Prehistoric, and Ute components.

Summary of Theoretical Orientations

If the theoretical orientations during the early period of archaeological inquiry were diverse, they have truly propagated into Michael Schiffer's (1996) "thousand archaeologies" in the cultural resource management era. This theoretical diversity is scarcely evident in the archaeological literature of the Northern Colorado Basin, however, partly because most of the practicing principal investigators received their college education from institutions in the western United States in the late 1970s or early 1980s, where New Archaeology was taught and the influences of Lewis Binford and Michael Schiffer were profound.

Although archaeologists have a host of theoretical models from which to choose, among them New Archaeology, Behavioral Archaeology, Marxism, Postprocessual Archaeology, and Evolutionary Archaeology, discussion of general theory is uncommon in the regional literature. Reports from the study area that do discuss general theory tend to ascribe to New Archaeology, with its emphasis on understanding culture change through the understanding of cultural processes, or an offshoot of New Archaeology, Cultural Ecology, which attempts to understand how human behaviors are energetically economical, especially within the context of the natural environment. Even when general theory is presented, reports seldom effectively link the recovered archaeological data back to the underlying theory.

If general theory is seldom manifested in regional works, the methods inspired by the theories are well represented. Basic methods of investigation, evaluation of data, and interpretation of results are decidedly scientific. Some reports are explicitly scientific in that they present hypotheses, state test implications, discuss methods necessary to test the hypotheses, then use project data to determine whether the stated hypotheses are supported. Some of the hypotheses presented in many of these reports can be criticized because they are more in the nature of simple expectations of the data, rather than being theory related, but the overall approach is laudable. Reflecting the requirements of Cultural Ecology and Schiffer's (1976) belief that past human behaviors can be understood if site taphonomy is interpreted, recent investigations have tended to be more multidisciplinary. Large-scale projects commonly employ geologists to interpret site geomorphology, and, increasingly, reports evidence greater concern for interpreting the effects of soil disturbances on cultural deposits. Palynologists, archaeofaunal analysts, malachologists, macrobotanical specialists, protein residue analysts, trace-element analysts, and specialists in various dating techniques are also commonly consulted on excavation projects. The contributions of Lewis Binford to American archaeology have also had an important impact on local archaeological methods. Settlement pattern research commonly employs Binford's models of collector versus forager logistical organization, and site structure has become an important research domain. The emphasis on site structure has resulted in the excavation of larger blocks within sites to better understand the relationship of activity areas, patterns of artifact disposal, and patterns of site cleaning.

SITE TYPES AND FREQUENCIES

As of October 1998, 12,981 aboriginal sites and 10,807 aboriginal isolated finds have been recorded in the Northern Colorado Basin and entered into the computer files of OAHP. Although some of the sites in the state's database have been excavated, most have not. The sites have been assigned to the descriptive site types presented in Table 3-2. These types generally follow those used by OAHP, though here cists are disregarded as architecture and are considered small, simple features similar to hearths for group assignment. Functional site types, though more informative, are not considered because different archaeologists use different criteria for classification.

Table 3-2. Frequency of Site Types in the Northern Colorado Basin.

Site Type	Frequency	Percentage of Sites
Open artifact scatters	10,849	84
Sheltered artifact scatters	765	6
Open architectural	432	3
Sheltered architectural	105	1
Rock art	303	2
Lithic procurement	285	2
Game drives	6	Nil
Trails	6	Nil
Culturally peeled trees	56	Nil
Isolated features	160	1
Isolated Burials	11	Nil
Ceremonial	3	Nil
TOTAL	12,981	99

Open Artifact Scatters

Open artifact scatters are, by far, the most common site type in the study area, comprising 10,849 (84 percent) of the sites. They occur in both mountainous and plateau settings. Most open artifact scatters yield only lithic artifacts, but 2 percent of those sites also yield ceramics. Sites in this category lack evidence of architecture, but many have small features such as hearths, cists, or cairns. The function of open artifact scatters is highly variable, but probably includes short-term and possibly seasonal habitation and/or resource procurement and processing.

Sheltered Artifact Scatters

Sheltered artifact scatters include rockshelters and caves that contain lithic and/or ceramic artifacts. These sites are relatively common in the study area, comprising 765 (6 percent) of the recorded sites. They tend to occur on the Colorado Plateau rather than in mountainous settings because the sandstone formations of the Colorado Plateau are more conducive for rockshelter formation. Prehistorically occupied limestone caves and volcanic vent caves are known to occur in mountain settings, however. Sites in this category lack evidence of architecture, but may have small, simple cultural features. That these sites were selected because of their shelter quality suggests that most were used for habitation. The duration of habitation was highly variable.

Open Architectural Sites

Open architectural sites are relatively uncommon, comprising only 432 (3 percent) of the recorded sites. A wide range of architectural types is included in this category, including pit structures, masonry surface rooms, and tipi rings. The frequency of these constituent architectural types, as compiled in the OAHP database, are shown in Table 3-3. Open architectural sites occur in both mountainous and plateau settings. Particular types of architecture, however, are more spatially restricted. Not all structure types within the group are habitations, as is shown below.

Wickiups

Wickiups are brush habitation structures. They may be either free-standing and conical, or may incorporate a standing tree in somewhat of a lean-to fashion. Free-standing wickiups are variable in size, from only 1 to 2 m in diameter to more than 6 m in diameter (Scott 1988). The poles that constitute the main structural support rest on the ground surface or are slightly pressed into the ground; postholes are not detected during excavation of wickiups. Some have interior hearths. According to Sanfilippo (1998), Ute wickiups were rarely encircled by stones intended to anchored closing materials or buttress poles.

Wickiups occur primarily in the pinyon/juniper zone between 1645 m (5400 ft) and 2438 m (8000 ft) elevation. Of the 95 wickiup sites in the OAHP database, elevations are available for 45 sites. The wickiup sites with recorded elevation range between 1646 m (5400 ft) and 2810 m (9220 ft). Only two sites occur above 2316 m (7600 ft), however; the mean elevation of wickiup sites is 1984 m (6510 ft). Due to the distribution of the pinyon and juniper vegetation zone, most of the recorded wickiup sites occur in the western portion of the study area, especially on the lower portions of the Uncompahgre and Roan plateaus (Figure 3-1).

Tree Platforms

Tree platforms consist of horizontal poles lodged in standing trees to support a hunter waiting in ambush above a game trail or to serve for storage. The actual function is inferred from the platform's context; hunting platforms occur as isolated features and storage platforms occur within wickiup villages. The sample of tree platform sites (n=4) is too small provide much insight into distributions, but they probably occur in the general vicinity as wickiup sites (see Huscher and Huscher 1939).

Other Brush Structures

Four sites are classified as other brush structures. Included in this group are a brush corral attributed to the Ute (5ME471), a tenuous brush structure recently excavated at the New Site (5RB3060) south of Rangely (Baker 1995), and a lean-to.

Table 3-3. Frequency of Architectural Types.

Architectural Type	Frequency	Percentage of Architectural Sites
Wickiups	95	22
Tree platforms	4	1
Other brush structures	4	1
Sweatlodges	4	1
Tipi rings	100	23
Stone alignments/walls	50	12
Stone enclosures	46	11
Circular stone structures	5	1
Rubble mounds/rooms	20	5
Pit structures	25	6
Granaries	4	1
Eagle traps	3	1
Hunting blinds	35	8
Other architectural sites	36	8
TOTAL	431	101

Sweatlodges

Four sweatlodges are identified in the OAHP database. Sweatlodges consist of a conical brush superstructure that was covered with earth or possibly less substantial materials. These structures are associated with large quantities of fire-cracked rock, which was usually heated in exterior hearths and transported to an interior basin. The four sweatlodges occur in San Miguel, Dolores, Rio Blanco, and Garfield counties. Sweatlodges were built by the Ute (Smith 1974) and the Navajo and do not appear to be evident prehistorically in the study area.

Tipi Rings

One hundred sites are classified as tipi rings in the OAHP database. Consisting of circular alignments of noncontiguous rocks, tipi rings are thought to have anchored the bases of temporary pole habitation structures. They may lack floor features and are often associated with low frequencies of artifacts, in spite of probable association with habitation activities. Site data suggest that tipi rings are more widely scattered than wickiups across the study area, occurring in both mountainous and plateau settings, from the low valleys to the Continental Divide. As shown in Figure 3-2, there appear to be two clusters of tipi rings: one in Middle Park in Grand County, and one in the upper Gunnison Basin in Gunnison County. It is probably no coincidence that the environment of Middle Park and the upper Gunnison Basin are similar. Both areas are characterized by relatively high elevation; by relatively less local relief than surrounding areas, causing them to be referred to as parks or mountain basins; and by expanses of big sagebrush Although tipi rings appear most abundant in the 2438 m to 3048 m (8000 to 10,000 ft) elevation range, they also occur in both higher and lower elevations, as well. Mean elevation for tipi ring sites is 2548 m (8360 ft).

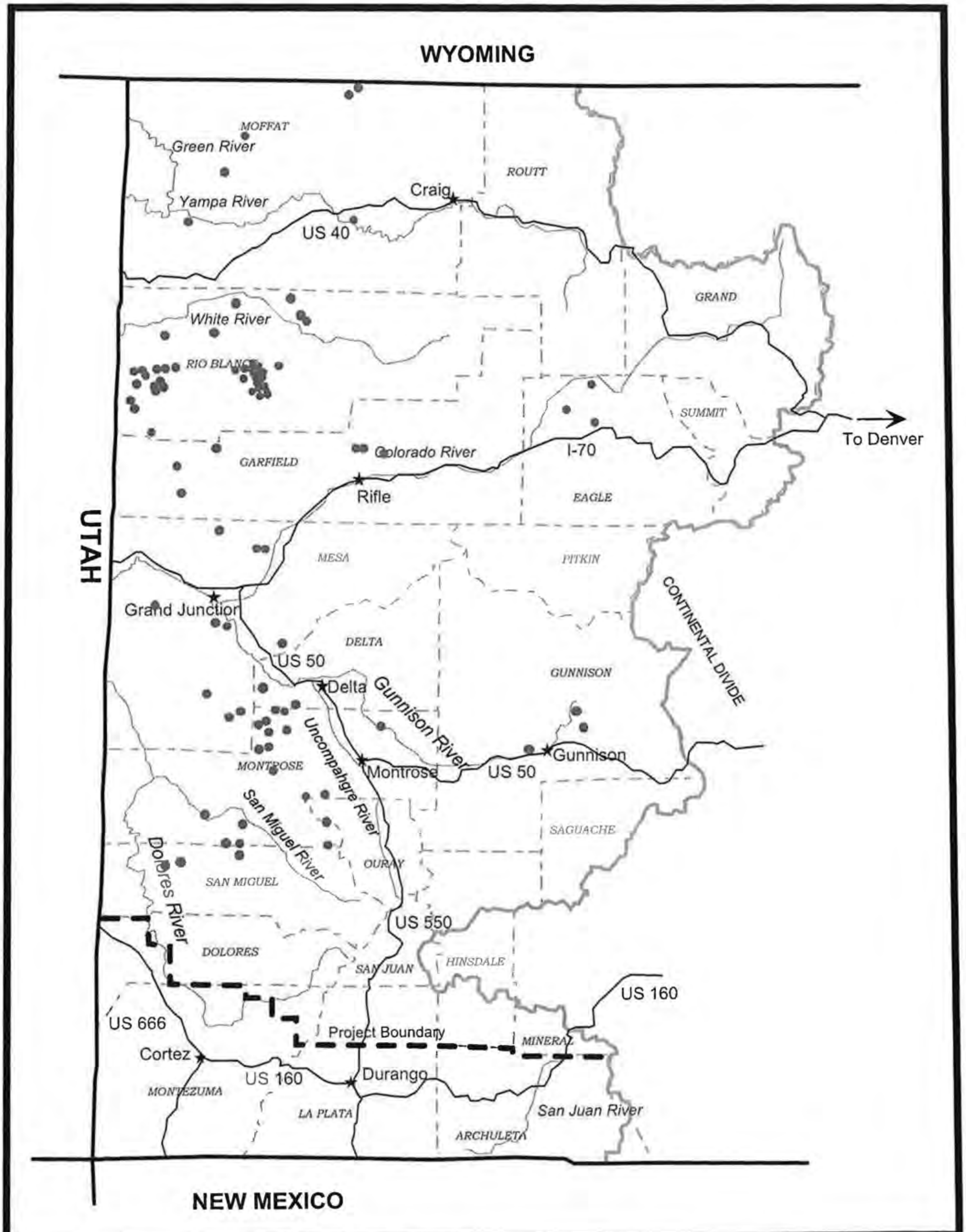

Figure 3-1. Distribution of recorded wickiups in the study area.

Stone Alignments and Walls

Fifty of the architectural sites have features described as stone alignments or walls. In most cases, they appear to represent alignments whose functions cannot be determined from surface inspection. These features may represent retaining walls or portions of habitations, windbreaks, game drive systems, or hunting blinds. Although most of these structures are masonry, a wall at site 5RB700 is comprised of adobe in the form of "turtle-back" bricks.

Stone Enclosures

Forty-six sites are described as stone enclosures, a site type seemingly restricted to survey reports. These sites are predominantly masonry, have relatively low standing walls, and are generally oval, circular, or U-shaped. A wide range of possible functions is suggested by site recorders, including use as hunting blinds, eagle traps, or fortifications. Stone enclosures occur primarily in the western portion of the study area, on the Colorado Plateau.

Circular Stone Structures

Five sites in the OAHP database are classified as circular stone structures. These structures are built of unmodified sandstone blocks and usually measure 3 to 6 m in diameters. Standing wall height seldom exceeds 1 m. Interior features are infrequent, consisting primarily of hearths. Excavated circular stone structures at the Weimer Ranch site in western Montrose County were clearly for habitation (Crane 1977). Circular stone structures occur over a broad area in western Colorado (Huscher and Huscher 1943:27).

Rubble Mounds and Rooms

Twenty of the open architectural sites in the OAHP database are classified as either rubble mounds or rooms. Although some recorders are uncertain of the function of the features they identified as rooms, most probably represent habitations. One of the sites in this category (5LP1442) is in northern La Plata County near the boundary between the Northern and the Southern Colorado River Basin study areas and evidently represents a Basketmaker III Anasazi component. The other sites in this unit occur in San Miguel, Montrose, Delta, Mesa, Rio Blanco, Eagle, and Grand counties. The Eagle County example is the Dotsero burial site, where the rooms are thought to represent hunting blinds (Hand and Gooding 1980). The habitation rooms, therefore, appear clustered in the western portion of the study area, on the Colorado Plateau, and especially in western Montrose County. Rooms within this category can be either contiguous or noncontiguous and can be either rectangular or oval in plan view. Contiguous rooms are often rectangular, such as at Tabeguache Pueblo (Hurst 1946), Cottonwood Pueblo (Hurst 1948), or at Paradox Valley Site No. 2 (Woodbury and Woodbury 1932), but contiguous oval rooms have also been documented (e.g., 5MN367).

Pit Structures

Twenty-five sites with pit structures are identified in the OAHP database. In some instances, possible pit structure depressions were noted by site recorders; these, too, are included in the database. Some pit structures are evinced by clusters of burned clay or burned adobe. Excavated pit structures in the project area are generally oval or circular and have floor excavated below the level of the prehistoric ground surface. Architectural details vary greatly in terms of floor depth, floor features, and superstructure. The pit structures in the OAHP database cluster in the mountain valleys such as along the Colorado River and along the upper Gunnison, in La Plata County, and in Moffat County. The three pit structures in La Plata County occur close to the Anasazi homeland and may indicate that the attempt to draw study area boundaries in a manner to

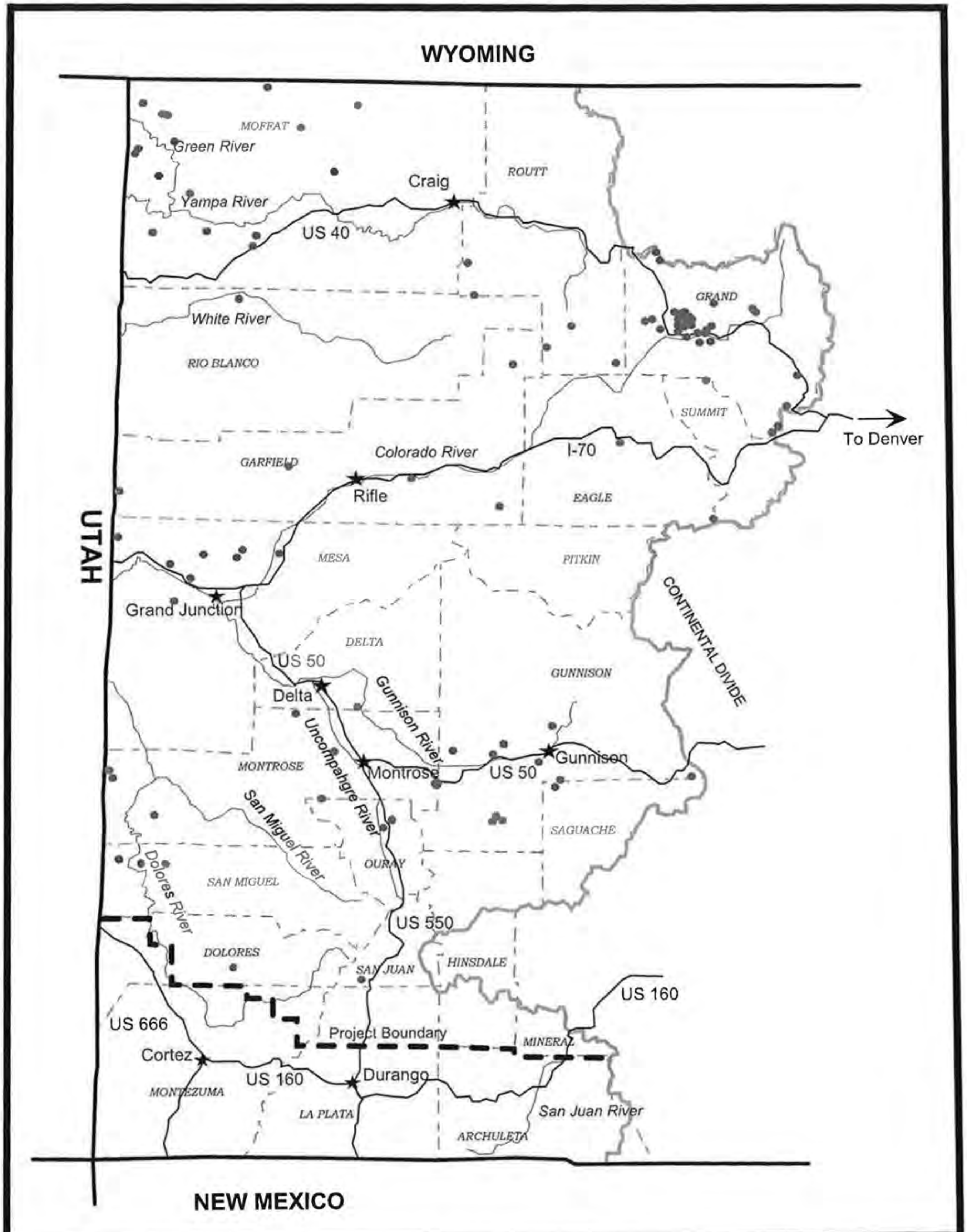

Figure 3-2. Distribution of recorded tipi rings in the study area.

exclude Anasazi long-term habitation sites was not entirely successful. The site recorders attribute the Moffat County pit structures to both Archaic and Fremont components.

Eagle Traps

Three sites recorded in the study area are classified as eagle traps. These sites occur in Eagle, Grand, and Mesa counties. Eagle traps consist of pits or circular stone walls that concealed a person waiting to reach out to catch an eagle drawn to bait. None have been excavated in the region.

Hunting Blinds

Thirty-five architectural sites composed of hunting blinds occur in the study area. According to Southwell (1995:37), game blinds are circular or semicircular walls of stacked rock that may incorporate existing boulders or trees. Some are excavated below the ground surface. Game blinds are usually situated along game trails, on game drive sites, along drive walls, or along topographic features where game movement was restricted. Game blinds at the Escalante Game Drive site near Delta generally ranged between 1 m and 3 m in diameter (Reed et al. 1997). Surface artifact densities are often low in the immediate vicinities of hunting blinds.

Sheltered Architectural Sites

A small percentage of the sites recorded in the Northern Colorado Basin consist of architectural remains within a rockshelter. Several are classified as granaries, though some masonry retaining walls or walls of unknown function have also been identified.

Granaries

Four sites in the OAHP database are classified as granaries; all are in Moffat and Rio Blanco counties. Many other granaries have been documented in northwestern Colorado (see Wenger 1956; Baker 1997). The granaries in northwestern Colorado are usually wet-laid masonry and decrease in diameter with height. Openings in the top were evidently covered with sandstone slabs. Wattle-and-daub granaries have also been found (Wenger 1956). A few granaries not in the OAHP database are also known from west-central Colorado. BLM archaeologist Richard Fike (personal communication to A.D. Reed, 1998) reports that a masonry granary has been discovered at the mouth of Escalante Canyon in Delta County, and Greubel et al. (1998) discovered a masonry granary above the Little Dolores River near Glade Park.

Other Architectural Sites

Various other types of open architectural sites in the OAHP database that cannot be classified into the above categories and that are represented in low frequencies are herein classified as other architectural sites. Thirty-six sites are included in this category. Most of the structures at these sites were too problematic or tenuous for the recorder to confidently classify into classes more specific than "structures." Two fortified sites (5GF1449 and 5SH49) and two hand-and-toehold steps are also included. In their review of fortified sites in western Colorado, Lyons and Johnson (1993) also include a semicircular stone enclosure near Kremmling (5GA279) and a Fremont site in Rio Blanco County (5RB344). Stacked rock walls in topographic settings that restrict access characterize these sites.

Rock Art

Rock art sites consist of petroglyphs and pictographs. Pictographs, though present, are far outnumbered by petroglyphs in western Colorado, though this may partly reflect accelerated erosion of pictographs. A total of 303 sites (2 percent of total sites) in the OAHP database consists exclusively of rock art; an additional 132 sites have rock art in addition to other cultural remains. Rock art is concentrated in the western portion of the study area where sandstone with smooth surfaces and, in many cases, desert varnish, are plentiful.

Lithic Procurement

Lithic procurement sites may be quarries, where prehistoric peoples actually mined knappable stone materials, or areas with abundant quantities of surface rock of suitable quality for reduction. Two hundred eighty-five (2 percent) sites in the database are classified as lithic procurement sites, where lithic procurement was the primary site activity. Lithic procurement is identified as a secondary activity at 42 additional sites. The distribution of lithic procurement sites, of course, reflects natural distributions of stone suitable for knapping at or near the ground surface. Sources are scattered throughout the study area, in both mountainous and plateau settings. Almost all sources are for either quartzite or cryptocrystalline quartz; a few rhyolite sources have also been identified.

Game Drives

Game drive sites are generally composed of rock and brush walls and circular stone blinds. The walls, situated to take advantage of natural topographic features, were intended to move big game animals toward an objective, such as a cluster of hunting blinds. The complexity of game drive sites varies considerably; some are composed of only a single wall, and others may consist of multiple walls and scores of blinds. Six game drive sites (less than 1 percent of total sites) are identified in the OAHP database. Cary Southwell's (1995) synthesis of game drive sites, however, includes at least 50 such sites in the study area.

Trails

Six sites (less than 1 percent) in the OAHP database are trails, most of which are attributed to the Ute because of historic accounts. In some cases, substantial cairns are situated along a trail.

Culturally Peeled Trees

Fifty-six sites (less than 1 percent) comprised of culturally peeled trees have been identified in the study area. Peeled trees have been found at seven other sites classified into other site types. Culturally peeled trees are characterized by one or more rectangular or oval scars, with the base of the scar between 30 and 90 cm from the ground and the top as much as 3 m above the ground (Martorano 1988:10). Martorano cites historical accounts of Utes peeling the cambium layer of ponderosa bark for use as food when other foods were difficult to procure. The bark probably had other uses as well. In western Colorado, trees peeled to extract cambium are invariably ponderosa pine.

Isolated Features

Sites classified as isolated features generally consist of single simple cultural features, such as hearths or roasting pits, with few or no artifacts found in association. One hundred sixty (1 percent) sites are identified in this group.

Isolated Burials

Eleven (less than 1 percent) sites in the OAHP database are classified as isolated burials. Most are Ute crevice burials.

Ceremonial Sites

Three (less than 1 percent) sites are classified as ceremonial sites. The sites are interpreted as vision quest locations, which may be manifested by isolated stone circles with few or no associated artifacts, generally situated in settings with panoramic views.

CULTURAL AFFILIATION OF COMPONENTS AND ISOLATED FINDS

Table 3-4 presents the cultural affiliation of components and isolated finds in the OAHP database. Many of the sites in the database have not been excavated, so affiliations must be regarded cautiously. It should be noted that the unit of study is site component, not site; because many sites are multicomponent, the total of components will exceed the total of sites recorded. The majority (74 percent) of components are of unknown cultural affiliation. Of the components assigned to cultural units, Archaic affiliation is most common, comprising 10 percent of the component total. Protohistoric components are the next most abundant, comprising 5 percent of the total. Some of the components classified as Late Prehistoric are also probably Protohistoric, as the Late Prehistoric spans the Formative and Protohistoric eras. Some of the Late Prehistoric components are also probably coeval with the components classified as Formative, Anasazi, and Fremont, so components from the Formative era are also well represented in the study area, most certainly exceeding 5 percent of the components. Paleoindian components are, indeed, rare in the study area; only 1 percent is attributed to that group.

Table 3-4. Cultural Affiliation of Components and Isolated Finds.

	Components		Isolated Finds	
Affiliation	**No.**	**%**	**No.**	**%**
Paleoindian	171	1	50	nil
Archaic	1,316	10	494	5
Formative	144	1	36	nil
Anasazi	155	1	187	2
Fremont	444	3	59	1
Late Prehistoric	575	4	192	2
Protohistoric	748	5	132	1
Unknown	10,238	74	9,812	90
TOTAL	13,791	99	10,963	101

Chapter 4
NATIVE AMERICAN PARTICIPATION IN COLORADO BASIN RESEARCH

Active involvement on the part of Native Americans within the Colorado Basin study unit has been rare until the last decade. Of course, ethnographic records have been utilized over the years, and informants with living memories of prereservation days were interviewed by anthropologists in the 1920s and 1930s. Though numerous historic accounts exist of interaction between early Euroamerican travelers and settlers in the mid- to late-1800s, the removal of permanent populations of Utes from the Colorado Basin study area had occurred by the 1880s, when resident bands were removed to reservations in southern Colorado and northeastern Utah. There is a record of Ute hunting parties returning to western Colorado for deer hunts into the early 1900s. Today, individual Ute people are tied to the study area only spiritually and through lore. This has begun to change in small ways through an emerging process of Native American consultation on federally mandated cultural resource projects.

It is not the intent of this document to detail and explain the various legal and policy mandates that have brought about this process. Federal agencies and tribal governments are still in the process of developing policy to comply with revisions to the National Historic Preservation Act, the Archaeological Resources Protection Act, Native American Religious Freedom Act, and Native American Graves Protection and Repatriation Act, and the exact nature of the process can be expected to change. Rather, this section deals with the brief history of interaction between archaeologists and Native American representatives in the study area and looks at the ways this interaction is shaping the nature of research.

The primary group recognized in the Colorado Basin study unit is the Ute, who collectively have three reservations, Southern Ute and Ute Mountain Ute in southern Colorado and the Uintah and Ouray (Northern Ute) in northeastern Utah. To a lesser extent, representatives from the Wind River reservation in Wyoming have been involved, primarily the Eastern Shoshone, but also — to a limited degree —the Northern Arapaho. This limited role in consultation is due, in large part, to the sketchy record of these tribes' use of the study area and because the documented use was transitory. Likewise, there is a possibility of transitory Comanche use of the area during the period after about A.D. 1500 during the Comanche-Shoshone penetration of the High Plains for bison hunting (Shimkin 1986:309). Though the Comanche have been consulted on projects on the Colorado Plains, it has been typical to involve only the Eastern Shoshone in northwestern Colorado. Pueblo peoples, primarily the Hopi, are also consulted; some Hopi clans are believed to have migrated through the Northern Colorado Basin. OAHP maintains a tribal contact list, and unless the responsibility is delegated to private firms, consultation is done between government agencies and tribal representatives.

Only a few reported projects include a discussion of Native American consultation, and all postdate 1990. In many cases, the consultation process is documented by separate letters and memorandums of agreement. Consultation has occurred on a projectwide basis for large-scale surveys, including the CIG UBL, TransColorado project, Mid-America Pipeline Rocky Mountain Loop, Vail Associates Category III expansion, expansion of the Cyprus-Twentymile coal mine, expansion of the Telluride Ski Area, and a number of other projects. General consultation to solicit comment on the effects of proposed actions on important spiritual and cultural sites and landscapes is the main purpose of such consultations. In the early 1990s, this process occurred during or immediately after surface survey, and preceded development approval. Consultation prior to the initiation of a project is becoming the norm.

Site types that have been identified as of interest to Native American representatives include rock art, human burials and remains, vision quest sites, hematite/red ochre sources, eagle traps, rock piles or cairns, fasting beds, traditional landscapes, and trails (Clifford Duncan, personal communication to M. D. Metcalf, 1993). In some cases, there is physical evidence for sites of traditional or spiritual interest. Other times visible or invisible features of the landscape have been identified as important. Management of sites important as traditional cultural properties is guided by Parker and King 1993. Protection of traditional or spiritual sites has been a factor in management agreements for several proposed actions in the Colorado Basin study unit, including protective easements for Whitely Peak in Middle Park during the Grand River Ranch Land Exchange and for the Ute Trail project on the White River National Forest (WRNF).

Other than general consultation for compliance projects, Native American involvement following the discovery of human remains is the most common form of consultation. Magennis et al. (2000) describe Native American involvement with the excavations of human burials at Yarmony and Red Army Rockshelter, and a similar process occurred during excavation of the McCoy Burial (Magennis 1996). These projects were facilitated by BLM archaeologists Frank Rupp, Brian Naze, Hal Keesling, and Patty Walker-Buchanan. Retrieval of the Hour Glass Cave individual also involved Native American consultation (Mosch and Watson 1993), which was facilitated by Bill Kight, archaeologist for the WRNF. In two cases, consultation resulted in destructive analysis including mitochondrial deoxyribonucleic acid (mtDNA) extraction and AMS dating (Hour Glass Cave and Yarmony). Dating of related charcoal was possible in the case of Red Army Rockshelter and McCoy. The Red Army Rockshelter individual was in a poor state of preservation and was analyzed in place. Consultation did not result in permission to conduct mtDNA or other destructive analysis in the latter two cases. All of the excavated individuals have been reburied with ceremonies. Prior to excavation of burials, archaeologist typically participate in a blessing ceremony. This may occur on the date of the excavation or at a consultation meeting a few days earlier.

Excavation of unmarked graves is governed by State of Colorado law on nonfederal surface. Procedures in these cases are similar, but consultation is coordinated through the OAHP with the Colorado Commission on Indian Affairs. Burials in the study area excavated under these procedures include 5OR1006, 5MN4494 (Black 1997b), and 5GF2432.

The Ute Trail project, funded by the WRNF in 1993 was a sort of hybrid of long-term management goals and cooperative research with the Southern Ute and with the Northern Ute from the Uintah and Ouray Reservation. It combined the work of archaeologists, historians, and Native American representatives in attempting to identify physical remains of the prehistoric/historic Indian trail connecting the Colorado River-Eagle River drainages with the upper White River, crossing the White River Plateau or Flat Tops. This trail probably existed in prehistory, but it appears to have attained importance following the establishment of the White River Agency in the 1860s. It was mapped by the Hayden survey parties in 1873, who incidentally used the trail for access. A remarkable length of trail remains preserved along with cairns, other stone features, and a previously recorded vision quest site. This project is reported and a Multiple Properties National Register form exists, but the documentation has not been released pending further confidentiality agreements between the Forest Service and the Ute tribes.

Numerous rock art sites that are of importance to tribal groups are recorded in the study unit. Increasingly, other site types are being recorded as archaeologists become more sensitive to looking for the evidence. Eagle traps occur relatively commonly on ridge lines along the major rivers. Low stone cairns occur on numerous high points, saddles, and promontories. Vision quest sites are still rare but tend to occur on high secondary summits and ridges. Except in a few very obvious cases, interpretation of age and distinguishing between Euroamerican and Native American features is difficult. Degree of sod and vegetative growth around and between stones, lichen growth, and the integrity of patination on upper surfaces is sometimes useful, but an adequate baseline for vegetation and lichen growth is lacking. Distinguishing cultural from natural features is an additional problem. Sometimes integrity of patination and lichen growth patterns are helpful. In addition, the presence of carbonate rinds on stones no longer in contact with the ground can provide useful clues.

Relationships between anthropologists and Native American representatives are currently in a formative, though largely positive, stage. There is no doubt that much can be gained from the perspective and knowledge retained by these people. Modern tribal representatives retain a good deal of traditional knowledge that is useful in interpreting the physical remains encountered in the field. Much has been lost as well. In the best circumstances, the methods of archaeology can compliment the knowledge passed on by oral histories. Specific locational information about eagle traps or vision quest sites is largely gone from these histories. Too, the deteriorated physical remains do not necessarily match what is retained in oral histories about how such sites looked. Importantly, however, a significant body of knowledge is preserved in oral histories concerning the context in which spiritual sites were utilized and of the rituals that were involved in their use. At the same time, archaeologists are covering a lot of ground and discovering or rediscovering an increasing number of these sites. In good circumstances, cooperation can restore lost connections for Native Americans and increase anthropology's scope as well.

Chapter 5
PALEOINDIAN ERA

INTRODUCTION

Human occupation of the Northern Colorado Basin appears to have commenced with the Paleoindian era. No evidence of a Pre-Clovis occupation has been found. The Paleoindian era subsumes what Willey and Phillips (1958) have defined as the Lithic or Paleoindian stage. According to Willey and Phillips (1958:80-81), the Lithic stage represents the adaptations of early immigrants to the New World during the time of environmental transition at the end of the Pleistocene. In most areas, Lithic stage subsistence focused on hunting, though gathering may have been the dominant subsistence activity in certain environments.

Recent analyses of radiocarbon determinations and other, independent dating methods have led Fiedel (1999) to conclude that the radiocarbon method underestimates the age of Paleoindian components by approximately 2,000 years. According to Fiedel (1999:99), several periods occurred during the late Pleistocene and early Holocene when "abnormally large ratios of ^{14}C effectively counterbalanced the radioactive decay rate, such that radiocarbon ages appear to remain constant over centuries of elapsed calendrical time." The dates presented below reflect Fiedel's work. Calendrical dates, presented as B.P. [cal], reflect the temporal adjustment required by Fiedel's model. Unadjusted radiocarbon determinations are presented as B.P. [^{14}C].

Within the study area, the Paleoindian era is represented by four traditions that can be distinguished on the basis of projectile point styles and, to a lesser extent, by subsistence strategies. The earliest of these, dating roughly between 13,400 and 12,500 B.P. [cal], is the Clovis tradition. The Clovis tradition was characterized by very large, fluted, lanceolate projectile points, sometimes found in association with mammoth or other Pleistocene megafaunal remains. A number of discoveries of now-extinct forms of Pleistocene megafauna have been made in the region, including mammoth, mylodont sloth, Shasta ground sloth, horse, bison, American cheetah, Catclaw's mountain sheep, and musk ox (Schroedl 1991:9; Stiger 1993:3). Many of these discoveries have occurred near major rivers and streams, suggesting that riverine environments were particularly well suited for megafauna at the end of the Pleistocene (Schroedl 1991). To date, no Clovis tradition artifacts have been discovered in association with Pleistocene megafauna in the study area. The distribution of Clovis points is similar to the distribution of Pleistocene megafaunal discoveries, however, suggesting that major canyons were the focus of Clovis hunters (see Schroedl 1991).

The Goshen tradition is a second recognized archaeological unit for the Paleoindian era. First defined in the northern Plains, Goshen tradition components underlie Folsom components and appear to be contemporaneous with Clovis tradition components. Although the sample of excavated Goshen components in the western United States is small, radiometric data suggest that the tradition dates between 13,000 and 12,700 B.P. [cal] (Fiedel 1999). Large, unfluted, lanceolate projectile points that evince basal thinning characterize Goshen components. Although similar in outline to Clovis points, Goshen points are especially similar to Plainview points, a later Plano complex type. The Goshen tradition appears to have emphasized big-game hunting to a degree similar to other early Paleoindian-era traditions.

The sequent Folsom tradition is characterized by finely crafted, fluted, lanceolate projectile points and an emphasis on the hunting of now-extinct varieties of bison. The tradition is dated from approximately 12,800 to 11,500 B.P. [cal] (Fiedel 1999). Like Clovis and Goshen points, Folsom projectile points are generally uncommon in the Northern Colorado Basin, though there may be localized areas, such as Middle Park, where Folsom sites occur in considerable quantity (Naze 1986). Although the general dearth of these points may be the result of erosional processes, it is also possible that the region was utilized less intensively than in subsequent periods (see Pitblado 1994).

On the Great Plains, the Plano tradition followed the Folsom tradition, representing a continued focus on bison hunting. Contemporaneous components in mountainous environments, however, appear to represent a somewhat different subsistence focus. In Wyoming, Frison (1992) has recognized two distinct adaptations during the late Paleoindian era, coterminous but occupying differing environmental situations. One cultural unit occupied the open plains and large intermontane basins; this group, representing the classic Plano tradition, focused on bison, which were often procured on communal hunts. The Foothill-Mountain complex occupied more rugged, higher elevations at the margins of the plains. These people procured deer, bighorn sheep, and pronghorn and perhaps more intensively exploited floral foodstuffs. The projectile points of the Foothill-Mountain unit reflect the difference in subsistence focus; the unfluted, lanceolate points tend to have restricted stems and indented bases and are more likely to have been manufactured from local quartzite than those from typical Plano components (Pitblado 1994). Frison (1992:338) suggests that the artifact assemblages from the Foothill-Mountain groups display greater regional variability than those from open plains groups, indicating more localized specialization.

In a review of a fairly large sample of Paleoindian projectile points from the southern quarter of Colorado, Pitblado (1994) found that Foothill-Mountain projectile point types, subsuming conventional types such as Pryor Stemmed, Lovell Constricted, Lusk, and Pine Springs points, are much more common in the region than point types associated with Plains-adapted groups or Great Basin groups. Based on projectile point frequencies, Pitblado (1994) convincingly argues that southwestern Colorado was occupied by Foothill-Mountain complex peoples following the Folsom tradition, possibly between 11,500 and 7500 B.P. [cal]. Because the environment of northwestern Colorado is generally similar to that within Pitblado's study area, it is likely that the Foothill-Mountain tradition extends throughout northwestern Colorado as well, and encompasses the entire Northern Colorado Basin. In her study area, Pitblado notes higher frequencies of Great Basin Western Stemmed complex projectile point types than Plains projectile point types, which she suggests may indicate closer cultural affinity with the Paleoindian groups to the west (see Schroedl 1991 for an opposing viewpoint).

QUALITY OF THE DATABASE

The archaeological database for the Paleoindian era is meager but growing. Whereas a few years ago, archaeologists were debating whether the Paleoindian finds in the region represented actual occupation by Paleoindian peoples or curation of Paleoindian artifacts from other regions by peoples of later cultures (see York 1991), it is now clear that Paleoindian components are present. The OAHP site database has 104 records of Paleoindian sites or isolated finds, including four Clovis and nine Folsom finds (Figure 5-1). Other documented finds of artifacts in the study area are not in the OAHP database. That Paleoindian components are present is indicated not only by the quantity of diagnostic Paleoindian artifacts, but also by the identification of Paleoindian components during archaeological excavations. Four Paleoindian components have been excavated and chronometrically dated in the Northern Colorado Basin (Table 5-1). These four sites yielded both Paleoindian-era diagnostic artifacts and radiocarbon dates that indicate occupations before 7500 B.P. [cal]. The most ancient of these is the Upper Twin Mountain site (5GA1513) in Middle Park, where University of Wyoming archaeologists tested the site and discovered a bison bone bed with an associated Goshen projectile point. Tooth eruption data indicate a late fall or early winter kill event (Frison and Kornfeld 1995). A radiocarbon sample collected from a bison bone indicated site occupation at 10,240 B.P. [^{14}C], which, at approximately 11,600 B.P. [cal], is later than expected by Fiedel's (1999) cultural sequence. No chronometrically dated Clovis or Folsom tradition components have yet been excavated in the study area. The Foothill-Mountain or Plano tradition is represented at three excavated sites. The Caribou Lake site (5GA22) excavations revealed multiple components, including a Paleoindian component. Hearth A-1 yielded a radiocarbon determination of 8460 B.P. [^{14}C] that was associated with a Cody complex projectile point base and a scatter of nondiagnostic artifacts (Benedict 1985). The feature area was interpreted as a lithic workshop. The site is near Arapaho Pass in Grand County, just above timberline. Site 5GN246 is between Montrose and Gunnison at the Soderquist Ranch. The most stratigraphically inferior component at this site yielded two Plano tradition projectile points. No cultural features were found in association with these points, but charcoal recovered in the same level yielded a radiocarbon determination of 7670 B.P. [^{14}C] (Liestman and Gilmore 1988). The most recent Paleoindian component was found on the Ute Prehistory project at Christmas Rock Shelter (5DT2), a site near Roubideau Creek on the western flank of the Uncompahgre Plateau. Cultural deposits at the rockshelter were stratified. In Level 9b, a Midland projectile point was recovered, along with other chipped and ground stone artifacts (Buckles 1971). In 1985, William Buckles and Robert Biggs submitted a charcoal sample from Level 10, immediately below Level 9b, to determine the age of the lowest assemblage in the rockshelter, designated by Buckles (1971) as the Buttermilk assemblage. The Midland point was attributed to the Buttermilk assemblage. The radiocarbon data suggest occupation of the Christmas Rock Shelter at approximately 6650 B.P. [^{14}C] (Buckles 1985).

Table 5-1. Dated Sites with Diagnostic Paleoindian Artifacts.

Site No.	Unadjusted Radiocarbon Determination	Diagnostic Artifacts	Reference
5GA1513	10,240 ± 70 B.P. [^{14}C]	Goshen points	Frison and Kornfeld 1995
5GA22	8460 ± 140 B.P. [^{14}C]	Cody point	Benedict 1985
5GN246	7670 ± 70 B.P. [^{14}C]	Hell Gap and James Allen points	Liestman and Gilmore 1988
5DT2	6650 ± 200 B.P. [^{14}C]	Midland point	Buckles 1971

As indicated in Appendix B, 26 other excavated sites have yielded radiocarbon determinations with calibrated ranges predating 7500 B.P. Some of these may be affiliated with Paleoindian occupations, and others are probably better classified as Archaic. A few may be noncultural. Site 5EA1009 in Eagle County is a human burial, which was subjected to AMS radiocarbon dating; these studies suggest that the skeleton dates to approximately 8170 B.P. [^{14}C] (Mosch and Watson 1993). No diagnostic artifacts were found with the burial, but it is likely that a Paleoindian is represented. Three of the 26 sites with Paleoindian-era dates yielded projectile points diagnostic of the Archaic era. An upper component of the Christmas Rock Shelter (Level 8, 5DT2) yielded radiocarbon determinations of 6600 and 7140 B.P. [^{14}C], but yielded various large side-notched, corner-notched, and contracting stemmed projectile points (Buckles 1971, 1985). Component C at site 5ML45 atop Piedra Pass was chronometrically dated to 7860 B.P. [^{14}C], but yielded large corner-notched, side-notched, and stemmed projectile points (Reed 1981). The association between the radiocarbon date and the projectile points found at site 5ML45 is not strong. Similarly, large corner- and side-notched points were recovered at site 5MF3003 in the CIG Pipeline project area in a component dated prior to 7500 B.P. The discovery of Archaic-style projectile points at sites with Paleoindian-era radiocarbon dates may have several possible

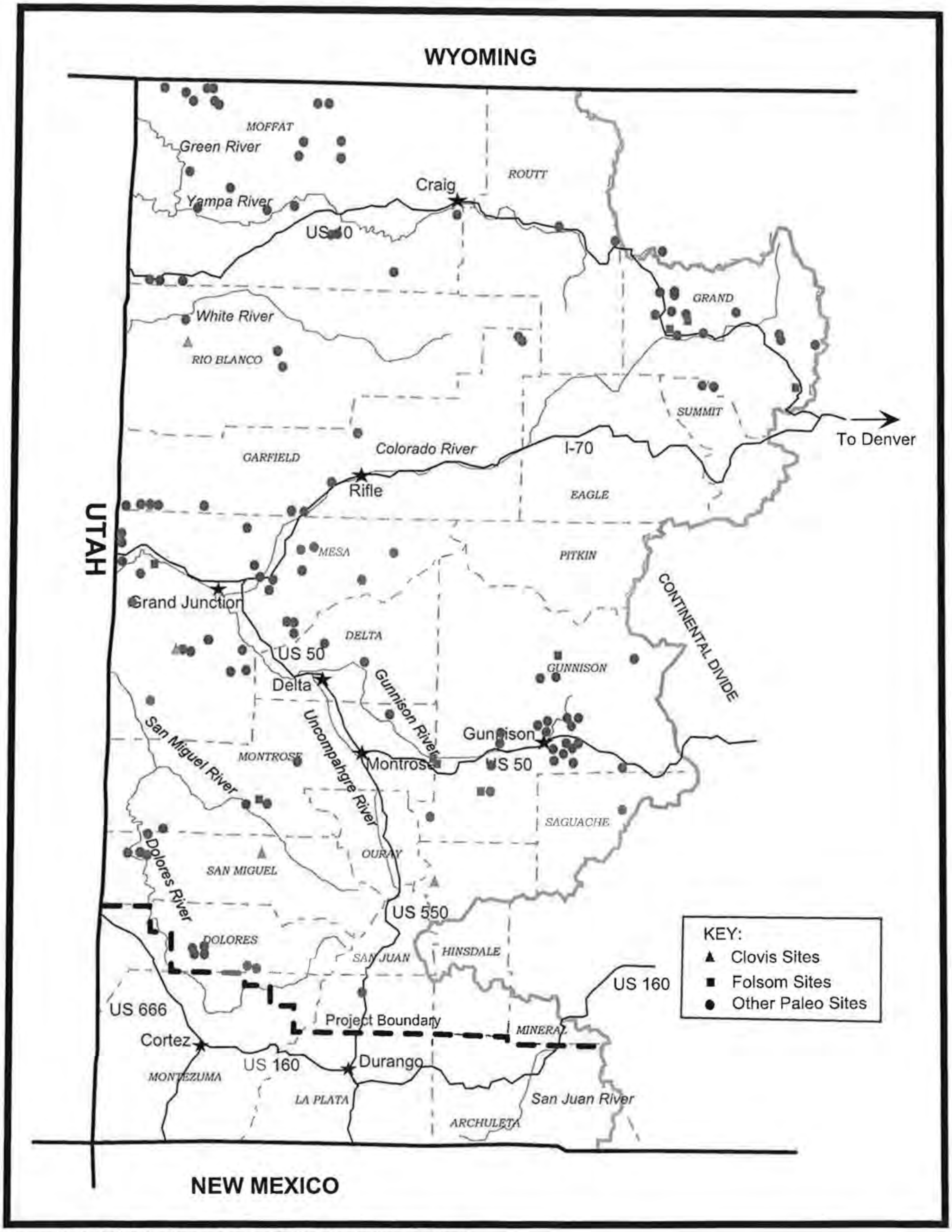

Figure 5-1. Distribution of recorded Paleoindian artifacts.

explanations. First, it is possible that both Archaic and earlier Paleoindian occupations occurred at the sites, but that cultural deposits were mixed and simply lacked deposition of diagnostic Paleoindian artifacts. Second, it is plausible that Archaic-stage lifeways and material culture developed prior to the complete demise of the Paleoindian stage, at least in certain environments. Schroedl (1991) and Black (1986) have suggested that the Archaic stage in the region may have developed as early as 9800 B.P.; data from Christmas Rock Shelter, 5ML45, and 5MF3003 provide limited evidence in support of this view.

Most of the sites dating prior to 7500 B.P. lack either diagnostic Paleoindian or Archaic artifacts. The cultural affiliation of these sites can only be determined from further excavation. Three of the early dates from sites 5RB2727, 5RB2728, and 5MF2642 are not clearly associated with cultural materials and may not represent cultural activities. The radiocarbon samples producing early dates at the Zephyr site (5MN1068) were contaminated with coal and may not be reliable (Indeck and Kihm 1982).

PARTICULARLY IMPORTANT SITES

Because of the dearth of excavation data relating to the Paleoindian era, any site with clear evidence of a Paleoindian component with contextual integrity should be regarded as a particularly important cultural resource. Four sites in the Northern Colorado Basin meet this criterion; Christmas Rock Shelter (5DT2), Soderquist Ranch (5GN246), Caribou Lake site (5GA22), and Upper Twin Mountain (5GA1513) have undoubtedly Paleoindian components. The Upper Twin Mountain site is especially noteworthy because it is the only representative of the early portion of the Paleoindian era.

Several other sites in the study area appear to have very high research potential. Wiesend and Frison (1998) report that 28 James Allen points and 2 Goshen points have been collected from the surface of the Phillips-Williams Fork Reservoir site (5GA1955) in Middle Park. With such an abundance of Paleoindian projectile points, the likelihood of buried Paleoindian components is great. Surface inspection and testing of the Lower Twin Mountain site (5GA186) in Middle Park have provided evidence of Goshen and Folsom components that are horizontally stratified (Frison and Kornfeld 1995). Frison and Kornfeld (1995) also report that the Hey Springs site on the lower slopes of Little Wolford Mountain in Middle Park yielded evidence of Folsom, Goshen, and Cody components, as well as bison bone. The Crying Woman site (5GA1208) in Middle Park was recorded and minimally tested by Brian Naze for his Master's thesis. Naze (1994) found spurred end scrapers, two Folsom points, one James Allen point, and several Archaic points at the site; the site's potential for buried Paleoindian components seems high.

MODELING THE EARLY PALEOINDIAN-ERA OCCUPATION

Because so few Clovis, Goshen, and Folsom components have been investigated in the Northern Colorado Basin, modeling of lifeways must rely almost exclusively upon interpretations derived from sites in other regions. This is undesirable, as the effects of the study area's mountainous and plateau environments on Paleoindian adaptations were probably significant. The dearth of regional Clovis, Goshen, and Folsom data also compels combination of the traditions into a single unit for the early Paleoindian era for the purpose of modeling.

Space/Time Systematics

Possibly because variability in early Paleoindian-era culture is so poorly understood, there is currently little debate about the period's archaeological units. The Clovis, Goshen, and Folsom traditions are widely recognized and accepted. These units are often referred to as complexes or periods, instead of traditions, but the underlying assumptions about time and cultural content are generally the same. The three units can be distinguished on the basis of projectile point typologies and, to a lesser extent, by subsistence practices.

Settlement Patterns

Kelly and Todd's Settlement Model

Kelly and Todd (1988) have produced a model of early Paleoindian settlement patterns that is meant to be applicable over most of the United States. In their model, the early immigrants to the New World encountered an environment rather unlike that of the present, both in terms of distribution of vegetative zones and animals. The faunal biomass was substantially greater and species tended to have broader and more overlapping geographic distributions. Human population densities were initially very low, and people's familiarity with local environments was not comparable to that characterizing later hunting and gathering groups. To exploit the expanses of "unmapped" lands, the early Paleoindians adopted a lifeway focusing on the exploitation of animal resources because this strategy required less familiarity with local environments. Unlike plant resources, fauna was available year-round, were widely dispersed across various environmental settings, and were uniformly edible without intensive processing. Early Paleoindians could more easily transfer their knowledge of animal behavior to new territories than they could their knowledge of plants. Faunal populations, however, were subject to fluctuations. Many species of large mammals were stressed by human predation and by the changing environment at the end of the Pleistocene. When desired game populations fell, early Paleoindians simply moved to new territories. An alternative strategy — shifting the economic focus to floral resources — may not have been viable in the northern forests and tundra environments because of the dearth of plant food resources or unfamiliarity with potential plant resources. In short, Kelly and Todd suggest that early Paleoindians employed a settlement pattern characterized by high residential and logistical mobility, which reflected short-term distributions of large game mammals.

Kelly and Todd (1988) discuss four test implications of their settlement model. These are listed below.

- Early Paleoindian behavior should be relatively consistent across broad areas regardless of local environments.
- Early Paleoindian land use was short-term and behaviorally redundant.
- Technology should be suitable for high mobility.
- Long-term food storage should not be evident at early Paleoindian sites.

Kelly and Todd argue that data support the above test implications. That behaviors were generally consistent over broad areas is indicated by the relative homogeneity in lithic technology. They state that early Paleoindian assemblages from distinct areas of the continent are more similar to each other than are assemblages from later contexts. Many early Paleoindian components share similar types of projectile points, steep-edged end scrapers, spurred scrapers, beaked gravers, burins, and bifaces (Kelly and Todd 1988:235). Similar tool kits imply similar behaviors. High mobility is supported by the lack of regional specialization in projectile point types and by redundancy in site composition. Although Kelly and Todd suggest that early Paleoindian sites are often composites of multiple, short-term activities that are similar in function, it is difficult to determine whether most later sites represent anything different. They add that artifacts diagnostic of the early Paleoindian era often occur as isolated finds, which might reflect ephemeral land-use patterns. A stronger case for high group mobility is made with technological data. Early Paleoindian assemblages, possibly excepting Western Stemmed assemblages, are characterized by bifaces made of high-quality lithic materials that were often transported long distances. Such bifaces are highly efficient for transport because they produce more cutting edge per unit of weight than a less-formal core and are suitable for a variety of other functions (Kelly and Todd 1988:237). The authors cite little evidence that early Paleoindian groups seldom practiced long-term storage of food, but do note that animal carcasses were less intensively processed than carcasses from later contexts. Intensive processing of bone to procure grease may have occurred on either freshly killed animals or on bones stored for some time.

Archaeological data from early Paleoindian sites in the Northern Colorado Basin, though limited to one excavated site, tend to support Kelly and Todd's settlement pattern model. The Upper Twin Mountain site (5GA1513) has yielded a bison bone bed, indicating that big-game hunting was an important site activity (Frison and Kornfeld 1995). The projectile points are apparently compatible with Goshen projectile points found on the northern Plains, further supporting the broad geographic distribution of conventional projectile point types.

Regional Models of Early Paleoindian Settlement Patterns

The dearth of early Paleoindian sites in the Northern Colorado Basin has limited attempts to characterize regional settlement patterns. Several preliminary observations have been made by regional archaeologists, however, which can be used to construct a tentative regional settlement model. Pitblado (1993) suggests that the low frequencies of Clovis and Folsom diagnostic artifacts reflect limited occupation of the southwestern quarter of Colorado. She cites the relatively large quantity of late Paleoindian artifacts in the region as evidence that demography, and not erosional processes, is responsible for the observed trends. Pitblado (1993) was aware of only five Clovis points and two Folsom points in her study area and suggests that these peoples made only sporadic forays into the region. In a study of Paleoindian projectile point distributions on the Dolores Plateau of the San Juan National Forest, York (1991) noted no early Paleoindian artifacts and several late Paleoindian artifacts, leading to his speculation that such highlands as the Dolores Plateau were unsuited for human habitation during the early Paleoindian era because of glaciation. Schroedl (1991) supported York's assertion that early Paleoindian occupations may have been concentrated in the lower elevations. In his study of Paleoindian projectile point distributions in Utah, Schroedl found that Folsom and Clovis points tended to occur below 1798 m (5900 ft) and suggested only occasional forays into the higher elevations. Schroedl observed that early Paleoindian finds tend to cluster along major rivers, where habitats may have been best suited for megafauna, and suggested most intensive occupation of riverine environments. This pattern may have changed in the later portion of the Paleoindian era, when humans followed large game seeking wetter environments more akin to those characterizing the Pleistocene into higher elevations (Schroedl 1991).

Evidence has been mounting, however, that some highland settings were fairly intensively occupied during the early Paleoindian era. Frison and Kornfeld (1995) report a comparatively high density of Folsom and Goshen tradition sites in the Little Wolford Mountain area of Middle Park; Naze (1986) and Walker-Buchanan (1997) also indicate substantial early Paleoindian occupation of Middle Park. The Upper Twin Mountain site, which has been demonstrated to contain a Goshen component, occurs in Middle Park. The Upper Twin Mountain site has an elevation of 2560 m (8400 ft). Just outside the Northern Colorado Basin area, excavations at the Black Mountain site have revealed a Folsom component at an elevation of 3097 m (10,160 ft). This site is in the headwaters of the Rio Grande west of Creede, (Jodry et al. 1996).

It is unlikely that Paleoindian groups in eastern Utah and western Colorado had substantially different settlement patterns, given the level of redundancy in environmental settings. The apparent concentration of early Paleoindian finds in the lowlands of eastern Utah and the highlands in western Colorado may be due to sampling error resultant from small sample size. If so, then it is likely that both uplands and lowlands were occupied and that it is premature to assess regional settlement patterns. It is also possible that both observed trends are real, in that early Paleoindian sites do cluster in both highland and lowland settings and that the middle elevations were the least intensively occupied. Such a pattern might have been manifested if early Paleoindians migrated on a seasonal basis. Although it has been shown in Chapter 2 that terminal Pleistocene climate was characterized by less radical swings in temperature than Holocene climates, it is still likely that game animals migrated from highlands to lower elevations for the winter. In fact, the depression of vegetative zones during the late Pleistocene probably meant that a much larger percentage of the mountainous region was snowbound in the winter, and that animals had to migrate to elevations lower than those of today. It is plausible, though certainly not demonstrated, that the concentration of low-elevation sites noted by Schroedl (1991) in Utah represents winter occupations, whereas the concentration of sites noted by Black (1997a) in Colorado's highlands represents warm-season occupation.

Frison and Kornfeld (1995:13), however, have found evidence at the Upper Twin Mountain site in Middle Park that supports low annual mobility and year-round occupation by Goshen tradition peoples. Tooth eruption data from bison comprising the site's bone bed suggests a late fall or winter kill event, and the site's chipped stone assemblages is described as nearly 100 percent local, Middle Park sources (Frison and Kornfeld 1995). Frison and Kornfeld suggest a pattern of year-round occupation of Middle Park.

In summary, regional data suggest that a rather complex settlement pattern was evident in the study area. In most of the study area, early Paleoindian populations were comparatively low and use of the region was sporadic. Sites may have clustered in the lower elevations of Utah, perhaps along major rivers. It is possible that many highland settings were uninhabitable because of glaciation or were suitable for occupation only during the warmer months. Groups utilizing such areas may have migrated to the lowlands in the cooler months, following game. Certain upland areas, however, such as Middle Park, were utilized fairly heavily and perhaps on a year-round basis. It is possible that year-round habitation of Middle Park was restricted to the period encompassed by the Goshen tradition. Test implications for this settlement model follow.

- Archaeofaunal data indicative of site seasonality will point to warm-season occupation of uplands and cold season occupation of lowlands, except for Middle Park and perhaps for other, similar mountainous settings.
- Substantial habitation structures dating to the Goshen period will be found in Middle Park.
- Storage facilities should be found at Middle Park Goshen sites, but not in lower elevations.
- Lithic technology at Goshen sites in Middle Park will reflect less mobility. There should be less use of imported, high-quality lithic material, less reliance on biface technology, and more expedient tools in Middle Park Goshen sites.

The limited data available from the Upper Twin Mountain site tend to contradict Kelly and Todd's model of high residential mobility during the early Paleoindian era. Evidence for year-round occupation of Middle Park is not unequivocal, however. Data currently consist of seasonality data that indicate *either* a late fall or winter bison kill event, so it is possible that the site occupants followed bison herds to lower elevations after a late fall hunt. Whether mountainous environments such as Middle Park could have supported large game herds during the Pleistocene/Holocene transition has not been unequivocally established. Naze (1986:5) cites historic accounts that suggest that bison may have once wintered in North and South parks, and infers that they may have also wintered in Middle Park. It is doubtful, however, that the modern environment mirrors that of the early Paleoindian era. Lithic data from the Upper Twin Mountain site support Frison and Kornfeld's (1995) contention that the site was occupied the year-round. They found that nearly all of the lithic material was of local origin, quite unlike the findings of Kelly and Todd. To date, no Paleoindian habitation or storage structures have been found in the study area.

Subsistence

Subsistence practices of the early Paleoindian era have long been thought to have emphasized exploitation of large mammals, a position reiterated by Kelly and Todd (1988). Kelly and Todd (1988:233) assert that, although early Paleoindian groups focused on large terrestrial mammals, they collected easily acquired berries, seeds, roots, nuts, and small game as opportunities arose. Intensive processing of floral resources was evidently seldom practiced because early Paleoindian lifeways were highly mobile — a lifestyle not conducive for developing either the knowledge or the means for intensive plant use. Although animal resources were most important in early Paleoindian subsistence systems, even these were not intensively processed, as indicated by the common occurrence of relatively intact bones and relatively complete animal skeletons (Kelly and Todd 1988). In later components, animal bones are often highly fragmented, suggesting the processing of bone grease and the extraction of every possible calorie.

Test implications for this conventional early Paleoindian subsistence model include the following.

- Clovis, Goshen, and Folsom components should be characterized by lower relative frequencies of manos and metates than later components.
- Early Paleoindian macrobotanical samples should be dominated by fruit seeds, large seeds, and nuts, rather than by small seeds requiring considerable labor to collect or process. Cheno-am seeds, so prevalent in later contexts, may be absent in early Paleoindian macrobotanical samples.
- Large mammals should dominate archaeofaunal assemblages.

The database for early Paleoindian sites in the study area is insufficient to evaluate the subsistence model presented above.

Technology

The hallmark of early Paleoindian era technology is the similarity of artifact types and of assemblage constituents over broad areas. As discussed above, the relative homogeneity of technology has been attributed to a highly mobile, generalized big-game hunting lifeway that was continental in scope (Kelly and Todd 1988). Regional specialization, with its associated proliferation of technological strategies, would occur in sequent periods.

Early Paleoindian components often yield lanceolate projectile points, steep-edged end scrapers, spurred scrapers, beaked gravers, burins, and bifaces (Kelly and Todd 1988). Projectile points found in the Northern Colorado Basin from this period include Clovis, Goshen, and Folsom types. With only one well-dated early Paleoindian component in the study area, little can be said about the chronology of projectile point types. No habitation structures have yet been found in the study area, though they were almost certainly constructed.

In a review of early Paleoindian technology, Kelly and Todd (1988) discern an emphasis on biface production and long-term use of formal tools and argue that such a technology was well suited for a highly mobile lifeway. As Kelly (1988) argues elsewhere, reliance on bifaces may be diagnostic of a highly mobile settlement system, as the tools are lightweight, multifunctional, and suitable for use as cores to produce flakes with a high ratio of cutting edge to flake weight. This model has the following test implications.

- Regional early Paleoindian sites should be characterized by higher relative frequencies of bifaces than sites attributed to later units.
- Lithic assemblages should be characterized by higher relative frequencies of high-quality, nonlocal materials.
- Formal tools from early Paleoindian assemblages should evidence higher incidences of recycling and rejuvenation than tools from later units.

Kelly and Todd (1988) assert that early Paleoindian lithic data support these test implications and provide a firm basis for their model of high residential and logistical mobility. Their conclusions, however, are not definitive; for example, they state that bifaces are common in early Paleoindian assemblages, but do not show that bifaces are present in higher frequencies than in assemblages associated with later, less mobile groups. Kelly and Todd (1988) indicate that early Paleoindian artifacts are often made of high-quality materials that were transported great distances from geologic sources, which suggests that such artifacts were intended for long-term use. Long-term anticipated artifact use is also indicated by rejuvenation, which they say may reflect anticipated migration to areas where lithic sources are known not to occur, or where the distribution of lithic sources is unknown. Again, direct comparisons to later assemblages would have bolstered their argument.

Data from the Northern Colorado Basin currently addresses only whether early Paleoindian tools were more likely to have been manufactured from high-quality, nonlocal materials. The local data appear to be contradictory. In her analysis of Paleoindian projectile points from southwestern Colorado, Pitblado (1993:54) found that Clovis and Folsom points were much less likely to have been manufactured from quartzite than any of the late Paleoindian points. Quartzite, though more abundant on the regional landscape, is often less desirable for knapping than chert or obsidian. Pitblado's data support Kelly and Todd's contention. At the Upper Twin Mountain site, however, Frison and Kornfeld (1995:13) found that nearly all of the component's chipped stone consisted of local Middle Park sources, and suggest that low group mobility is represented. The data presently suggest that the Goshen tradition occupants of Middle Park employed a different lithic technology than other early Paleoindian groups in the area.

Social Organization

Kelly and Todd (1988) characterize the social organization of the early Paleoindian era as a "high technology forager" system that was unparalleled in the rest of the prehistoric or historic record. They envision group organization as incorporating elements of both forager and collector strategies (see Binford 1980). Like later forager systems, the early Paleoindian system had high residential mobility that reflected resource availability, little emphasis on "place," emphasis on search and encounter hunting, and little long-term storage of food. Like collector systems, the "high technology forager" system was characterized by complex, curated technology, high logistical mobility, large territories, and repetitive use of sites (Kelly and Todd 1988:239). This model has the following test implications.

- The types of artifacts found at sites in various settings should be similar, varying in frequency rather than by functional class.
- Sites, though possibly showing signs of repeated use, should evidence relatively short-term occupation.
- Few storage structures will be found in early Paleoindian components.
- Higher percentages of early Paleoindian sites should have evidence of habitation than sites attributed to the late Paleoindian period.

Kelly and Todd (1988) cite several lines of evidence in support of the above test implications. They note that early Paleoindian sites in the eastern United States are differentiated in terms of the frequencies of various tool types, and not by the presence or absence of the tool types; this suggests less use of sites for specialized purposes. Places where resources were processed tend to also be places where habitation occurred. At Folsom sites in the west, occupation areas are often found near kill sites. It is unknown whether the trends noted by Kelly and Todd are significantly different from those of later cultures.

Site data from the Northern Colorado Basin are insufficient to permit examination of the test implications listed above. Data from the Upper Twin Mountain site, however, suggest that Kelly and Todd's model needs careful scrutiny. If the Upper Twin Mountain site was, indeed, occupied on a year-round basis, then a different type of social organization may have been present in Middle Park. More sedentary groups would be expected to have employed a collector strategy, with greater emphasis upon food storage and more logistical mobility.

MODELING THE FOOTHILL-MOUNTAIN TRADITION

Space/Time Systematics

Excavation data from late Paleoindian sites in Wyoming suggested to Frison (1992) that the Paleoindians of the foothills and mountain ecological zones employed a different subsistence strategy than contemporaneous Paleoindian groups of the Plains. The Foothill-Mountain components tended to yield somewhat fewer, but different, projectile point styles that were less likely to have been manufactured from distant sources. Moreover, the projectile points from the Foothill-Mountain sites tended to display more regional variation than points from sites on the Plains. Bison bone was observed to be relatively rare from the Foothill-Mountain contexts, and did not evidence large-scale, communal hunting. Frison perceived the Foothill-Mountain complex to represent a lifestyle less reliant on bison hunting. Plant resources were considered to be an important component of the foothill-mountain subsistence strategy, and hunting focused on mountain sheep and mule deer, with only a minor emphasis on bison hunting.

In her analysis of Paleoindian projectile points in the southwestern portion of Colorado, Pitblado (1993, 1998) asserts that the Foothill-Mountain tradition is the best descriptor for the dominant culture during the latter portion of the Paleoindian era. Pitblado recognized Plainview, Western Stemmed, Agate Basin, Hell Gap, Cody, and Foothill-Mountain projectile point series in her study area, and found that the Foothill-Mountain series were, by far, the most common. According to Pitblado (1994:11), Foothill-Mountain series projectile points are thick, roughly made lanceolate points with slightly concave and ground bases and parallel-oblique flaking. The majority are made of quartzite. She speculates that subsistence practices were considerably different from those of contemporaneous Plano cultures on the Plains; Foothill-Mountain tradition peoples are thought to have employed a more Archaic-like pattern, with less emphasis on big-game hunting. Importantly, Pitblado views the Foothill-Mountain tradition peoples as the indigenous inhabitants of the region. She explains the presence of other late Paleoindian projectile point series as representing either sporadic incursion by groups generally inhabiting adjacent areas or immigration of "foreign" groups (Pitblado 1993:46).

Definition of the Foothill-Mountain tradition in western Colorado should be regarded as tentative, considering the paucity of excavation data. As a tradition, it is more than a newly defined projectile point series; its definition hinges upon actual differences in subsistence, settlement, and other cultural systems from those of contemporaneous groups in other areas. The archaeological unit is attractive because such differences seem plausible. Whereas large-scale bison kill sites have been documented in the Plains, none have been identified in the Northern Colorado Basin. Western slope Paleoindian hunters appear to have taken game individually or on a small-scale basis (Pitblado 1993). The environment of the mountains and plateaus is certainly different from that of the Plains or Great Basin; such differences affected the density of historic bison herds and probably had similar affects on prehistoric herds (see Meaney and Van Vuren 1993). With lower densities of herd animals, west slope Paleoindians may have responded either by less utilization of the region or by a subsistence emphasis on different resources. In short, the ecological setting of the Plains contrasts sharply with that of western Colorado — to degrees similar to those that Frison (1992) observed in Wyoming — and different cultural adaptations seem likely.

If the Foothill-Mountain tradition represented an indigenous group and the makers of other Plano projectile point types utilized the region on a seasonal or sporadic basis, as purported by Pitblado, then several test implications can be offered. Unfortunately, the sample of excavated late Paleoindian sites is too small to permit their examination. The test implications include the following.

- Foothill-Mountain components should evidence greater utilization of local lithic materials and less reliance upon high-quality lithic materials from distant sources.
- Assuming that Foothill-Mountain groups were less mobile than other Plano groups, lithic reduction may have been oriented more toward core reduction rather than biface production.
- Foothill-Mountain sites should yield floral and faunal remains indicative of a broader hunting and gathering spectrum than sites attributed to other Plano groups.
- Foothill-Mountain tradition sites should be more likely to have substantial habitation structures than sites attributable to other Plano groups, because year-round habitation is implied.

Settlement Patterns

Very few settlement models have been offered by regional archaeologists for the late Paleoindian period. Alan Schroedl's (1991) model for Utah is examined, but most other efforts have focused on site distributions within relatively small study areas. York (1991), for example, examined Paleoindian projectile point distributions on the Dolores Plateau in the San Juan National Forest and concluded that the area was not utilized until the late Paleoindian period because of the extent of Pleistocene glaciation. When the glaciers were gone, the area might have served as a refuge for relict populations of Pleistocene fauna and would have attracted late Paleoindian hunters (York 1991:18). Cultural resource inventories have identified areas where late Paleoindian artifacts seem to be concentrated; these include the Sand Wash Basin in northwestern Colorado (Stucky 1977), the upper Gunnison Basin (Pitblado 1993), and possibly Middle Park. These concentrations seem to be supported by the distribution of late Paleoindian finds in the OAHP archaeological database (see Figure 5-1).

In his analysis of Paleoindian artifact distributions in Utah, Schroedl (1991) observes that high densities occurred along major rivers. He attributes this trend to relatively high densities of game animals attracted to the well-watered riparian habitats. Schroedl also notes that late Paleoindian artifacts were often found in high elevations, contrary to the distribution pattern of Clovis and Folsom artifacts. Schroedl (1991:9) suggests that the game animals desired by late Paleoindian hunters were increasingly drawn to the higher elevations as Pleistocene environments were replaced by Holocene environments. As the regional climate became warmer and drier and vegetative zones moved upslope, fauna sought the higher elevations because they were more similar to Pleistocene conditions. Schroedl's model has the following test implication.

- Mean elevation of late Paleoindian components should be higher than those of Clovis, Goshen, and Folsom components.

Data from the Northern Colorado Basin do not support Schroedl's model of increasing use of higher elevations. Although the sample size of Clovis and Folsom finds is small (four for Clovis and nine for Folsom), early Paleoindian peoples appear to have made more use of the higher elevations than did the late Paleoindian people. The four Clovis artifacts were found at a mean elevation of 2415 m (7923 ft); the Folsom artifacts were found at a mean elevation of 2378 m (7802 ft); and the Plano artifacts had a mean elevation of 2280 m (7480 ft). Whether these differences are significant has not been determined. The mean elevations certainly do not support upslope migration during the late Paleoindian period, however. The mean elevation of the Northern Colorado Basin is approximately 2395 m (7858 ft), suggesting that, overall, Paleoindian sites are fairly evenly distributed across the study area in terms of elevation.

Schroedl's observation that Paleoindian materials tend to be concentrated in the vicinities of major rivers may apply in western Colorado. Pitblado (1993) noted such trends in southwestern Colorado, and such patterns can be confirmed through the inspection of Figure 5-1.

Subsistence

Bonnie Pitblado (1993:94), basing her model on Frison's (1992) foothill-mountain concept, asserts that late Paleoindian peoples of southwestern Colorado focused less intensively on big game hunting than did contemporaneous peoples inhabiting the Great Plains. She suggests that the Foothill-Mountain peoples relied more on medium-sized game that were killed individually, rather than en masse, and on gathered plant resources. Pitblado (1993) regards the Foothill-Mountain tradition peoples as subsistence generalists, not big-game specialists. The degree to which Foothill-Mountain tradition subsistence strategies differed from Archaic-era subsistence strategies is not stated. Much of Pitblado's argument is based on the high relative frequency of quartzite projectile points found in western Colorado. She reasons that if intensive use of chert in

Plains projectile point assemblages indicates big-game hunting specialization in that area, then unintensive use of chert in western Colorado may mean less hunting emphasis in western Colorado's mountains and plateaus. An unstated corollary of Pitblado's model is that the Plano complex groups also thought by Pitblado (1993) to have occasionally occupied western Colorado (i.e., the makers of Agate Basin, Hell Gap, Cody, Plainview, and Western Stemmed projectile points) were more dependent on big game hunting than were the peoples of the Foothill-Mountain tradition. Pitblado's (1993:54) data on projectile point material indicate that all of the non-Foothills-Mountain tradition projectile point types were more likely to have been made from chert or other high-quality materials (Table 5-2). Sample sizes for all groups except the Foothill-Mountain group are small, however. Extending Pitblado's reasoning, it is plausible to conclude that the makers of the Agate Basin, Hell Gap, Cody, Plainview, and Western Stemmed points were less focused on big-game hunting than were peoples of the early Paleoindian period, but also may have been less the subsistence generalists as compared to peoples of the Foothill-Mountain tradition. Test implications for Pitblado's subsistence model are presented below.

- Charred seeds should be more common and diverse in macrobotanical samples from western slope Foothill-Mountain components than from components on the Great Plains.
- Foothill-Mountain faunal assemblages should be more diverse than Plano faunal assemblages on the Plains, with higher percentages of small and medium -sized animals.
- Foothill-Mountain components should have higher frequencies of milling implements than should components attributed to other Plano traditions.

Table 5-2. Paleoindian Projectile Point Materials (from Pitblado 1993:54).

Point Series	Quartzite	Non Quartzite	Sample Size
Agate Basin/Hell Gap	38	62	8
Clovis/Folsom	14	86	7
Foothill-Mountain	89	11	45
Plainview	67	33	6
Cody	63	38	8
Western Stemmed	57	43	14

Data from excavated contexts in the Northern Colorado Basin are insufficient for addressing the above test implications. Floral remains are not reported from the three late Paleoindian components, and none yielded identifiable animal bone. The oldest component at the Christmas Rock Shelter (5DT2) yielded grinding slabs; the Caribou Lake (5GA22) and the Soderquist Ranch Paleoindian components (5GN246) did not. Whether the early Christmas Rock Shelter component is representative of the Foothill-Mountain tradition or another Plano tradition is unknown.

Technology

Large, lanceolate projectile points are the hallmark of late Paleoindian lithic technology. Spurred scrapers, common in early Paleoindian components (e.g., Davis 1985), may also continue in use in late Paleoindian contexts in the region (e.g., Reed 1996), but have not been documented at excavated components in the study area. Late Paleoindian artifact classes documented in excavated contexts in the study area include projectile points, manos (Buckles 1971), steep-angled scrapers (Liestman and Gilmore 1988), and cores, concave edge scrapers, and gravers (Buckles 1971).

Because of the dearth of investigated late Paleoindian components in the region, only the most rudimentary lithic technology models have been formulated. The Foothill-Mountain tradition appears to have emphasized the reduction of local quartzite, reflecting more familiarity with local lithic resources and possibly less residential mobility (see Frison 1992; Pitblado 1993). This model has the following test implication.

- Because Kelly and Todd (1988) suggest that the highly mobile early Paleoindian peoples employed primarily a biface reduction strategy, it may be postulated that the less mobile late Paleoindian peoples may have more frequently employed a strategy based on intensive core reduction.

Lithic data from excavated late Paleoindian sites in the study area provide no insight into general lithic reduction strategies, but do support the contention of heavy utilization of quartzite. Two lithic concentrations at the Caribou Lake site attributed to the late Paleoindian period show primary use of red orthoquartzite from an unknown source (Benedict 1985). The Cody knife attributed to this component is made from the same material. The lanceolate projectile point at the Soderquist Ranch site is made from white orthoquartzite. Possibly similar orthoquartzite occurs naturally on the lower flanks of the Uncompahgre Plateau west of Montrose and in the Curecanti National Recreation area a few kilometers east of the site.

As Pitblado (1993) has shown, the projectile points attributed to the Foothill-Mountain tradition are often characterized by parallel-oblique flaking. Flake scars are often oriented from the upper left to the lower right and give the false appearance that the flake scars extend across the point's entire surface (Cassells 1997). These projectile point attributes are evident at the study area's excavated sites; the quartzite, lanceolate points from the Paleoindian components at the Caribou Lake site and the Soderquist Ranch site have parallel-oblique flaking (Benedict 1985; Liestman and Gilmore 1988). The material and flaking pattern of the Midland point found at the Christmas Rock Shelter are unknown.

Chapter 6
THE ARCHAIC ERA

INTRODUCTION

As the data are organized here, the Archaic era dates between 6400 B.C. and 400 B.C. The beginning date overlaps some of the traditionally used terminal dates for the Paleoindian era. This overlap is intentional and reflects a strong body of evidence that suggests that life styles that would be classified as Paleoindian on the Plains co-occurred with early Archaic adaptations farther west and in the mountains. The Archaic era encompasses a long period that archaeologists have envisioned as a relatively stable period when a broad-based, hunter-gatherer lifeway was practiced. It contrasts with the preceding Paleoindian era in that the lifeway was less mobile and was more focused on the use of local resources on a scheduled seasonal basis. The main technological marker is a transition from the use of lanceolate projectile points to the use of stemmed and notched point varieties, and a distinct increase in the overall variability in point styles. The Archaic era contrasts with the succeeding Formative era in some subtle ways. In terms of lifeways, there appears to have been intensification in subsistence efforts, as manifested by limited use of cultigens in areas with suitable growing seasons and more intensive use of processed plant foods elsewhere during the Formative era. In terms of technology, the adoption of the bow and arrow, a decrease in the variability of projectile point styles, and limited use of ceramics are the most visible changes after the Archaic era.

The Archaic era thus defined is simply a span of time during which there are a series of cultural changes and a good deal of cultural continuity. There is no single defining characteristic that satisfactorily separates the Archaic era from the periods on either side of it. Rather, there are elements of continuity and elements of contrast, and the dates where sufficient change has occurred to separate one element from another vary according to what is being examined. The traditional approach of looking at the Archaic as a stage (e.g., Willey and Phillips 1958:107) or as a way of life (Caldwell and Henning 1978:120) is not particularly satisfactory in this study area, because in many ways, an Archaic lifeway was practiced in the region from sometime during the Late Paleoindian period until European trade goods and horses began to transform the indigenous cultures. At the same time, the Archaic lifeway formed a long-term, relatively stable, and very effective and adaptable way for people to live. Rather than agonizing over a satisfactory definition of the Archaic, the authors have chosen simply to deal with the archaeological record of the study area within specific slices of time. For those wishing to pursue this topic, a good, succinct discussion of the nature of the Archaic in the west appears in a recent edited work (Larson and Francis 1997:3-4).

QUALITY AND NATURE OF THE DATABASE

The database for Archaic era in the study area is relatively large, and growing. As of November 1998, 347 radiocarbon ages represented 210 archaeological components from 107 sites in the project database, with radiocarbon ages between 2000 and 8400 B.P. (Appendix B). Geographically, these sites are spread throughout the study area, but the distribution of sites is definitely skewed to reflect areas where mandated cultural resource compliance work has occurred. Thus, Grand, Gunnison, Mesa, Moffat and Rio Blanco counties are probably over represented. A variety of elevations and terrains is represented, however, and each of the drainage basins is represented. Sites of all ages are represented, with a trend of more dates later in the era.

The quality of the database is mixed, with a trend for more recent work to be better than that conducted many years ago. Generally, the later work has more integration of support studies such as pollen, insect, and geology than the older work, and there has been a general refinement in field methods and more liberal use of radiocarbon dating. More important than the variable quality of the database, however, is the fact that a number of researchers are now conducting long-term research in certain areas, or on specific topics with a focus on the Archaic. Examples include Kevin Black and his focus on the Mountain tradition (Black 1991a); Stiger and his colleagues at Western State College and their continuing efforts in the Gunnison Basin (Stiger 1993, 1998b; Rood 1998); the upper Colorado Basin where several groups are working on sites in Middle Park and along the Colorado River, including the BLM, University of Wyoming, Powers Elevation, Metcalf Archaeological Consultants, Inc. and Western Cultural Resource Management; the lower Colorado Basin, again with a number of contributors including the BLM, Grand River Consultants, Alpine Archaeological Consultants, and others; the White River, where the BLM, AERC, and others are building a good Archaic database; and the Yampa Basin, where the BLM and numerous consulting companies are focusing on longer-term problems in a contract context. The increasing continuity in investigations is rapidly improving the quality of the data.

PARTICULARLY IMPORTANT SITES AND PROJECTS

Unlike the record for the Paleoindian era, too many sites contribute to our understanding of the prehistoric record during the Archaic era to single out more than a few as key sites. Early research at sites such as the Taylor Rockshelter (Wormington and Lister 1956) and Hells Midden (Lister 1951) helped to define an Archaic tradition in the area, and continues to have relevance. Though just barely in Utah, Deluge Shelter in Dinosaur National Monument contains one of the region's best stratigraphies (Leach 1970), and has been justifiably utilized in several of the regional chronologies. Though still poorly understood, discovery of burned daub at the Granby and Hill-Horn sites in Middle Park called attention to the possibilities of early Archaic architecture in the mountains (Wheeler and Martin 1994). Discoveries of structural evidence at several sites in the Curecanti National Recreational Area have confirmed this pattern (Euler and Stiger 1981; Jones 1982, 1986). Other sites in the Gunnison Basin, such as the Tenderfoot site (Stiger 1998b) and Elk Creek Village (Rood 1998), continue to contribute to our understanding of mountain archaeology. The Yarmony site in northern Eagle County demonstrates substantial semisubterranean architecture and, probably, winter occupation (Metcalf and Black 1991). Middle Archaic structures were unearthed at Indian Creek in Mesa County (Horn et al. 1987). Late Archaic architecture was demonstrated at Kewclaw in the Colorado River valley near Battlement Mesa (Conner and Langdon 1987) and in Sisyphus Shelter near DeBeque (Gooding and Shields 1985). Many other sites have made important contributions.

Perhaps more significant than individual sites, however, has been the contribution of several major projects. Though difficult to use and now outdated, the Ute Prehistory project in general and further definition of the Uncompahgre complex in particular (Buckles 1971) provided a starting place for looking at the west-central area of the state. The work by the University of Colorado at Dinosaur National Monument (Breternitz 1970), though better known for contributions to Fremont research, excavated several primarily Archaic sites like Deluge Shelter (Leach 1970) and the Lowell Spring Site (Jennings and Wade 1970). The intensive period of research at the Curecanti National Recreation Area in the late 1970s–early 1980s contributed significantly to the excavated database (Euler and Stiger 1991; Jones 1986), and data from the Centuries Research testing at the Mount Emmons project (Black et al. 1981) played a role in developing the concept of a mountain Archaic. Though most of Jim Benedict's sites are not in the Northern Colorado Basin, his series of fine reports should be mentioned in this context as well (Benedict and Olson 1978; Benedict 1981, 1985, 1990, 1996).

Our understanding of the study area's Archaic will be further influenced as the results of several efforts are reported or become better distributed. These major projects include the ongoing work in the Gunnison Basin by Western State College (e.g., Stiger 1998b), excavations of sites by Powers Elevation in the Wolford Reservoir area and near the Williams Fork Reservoir in Middle Park, excavations at a series of sites in west-central Colorado excavated for the TransColorado Pipeline project by Alpine Archaeological Consultants and Centennial Archaeology, and testing and excavations at more than 30 sites in northwestern Colorado by Metcalf Archaeological Consultants and Centennial Archaeology.

Though this study focuses mainly on data from excavated sites, significant contributions to our understanding of the study area have been made by survey projects, of which there have been many that were large in scale and sound in scope. Most of what is understood about settlement patterns and differential use of various terrains was derived from the large number of cultural resource inventories conducted through the late 1970s and early 1980s during the energy boom. Significant contributions were made by Calvin Jennings and his students at the Laboratory of Public Archaeology (LOPA) at Colorado State University and by a number of other organizations and individuals. Most of this work is included in previous syntheses, however, and will be cited here only when specific data are used.

RADIOCARBON RECORD

The radiocarbon record from the project area is depicted as simple frequency histograms in Figure 6-1. The lower histogram depicts all 714 radiocarbon ages that are well affiliated with archaeological components. The upper histogram is modified to eliminate multiple ages for the same component and contains 485 ages. This graph is based on a simple process of examining each component with multiple dates and assigning an "average" to pairs or groups of ages from the same component that overlap. For reasons of simplicity, dates were not tested for contemporaneity, nor was a statistical averaging method applied to the dates. The dates were not manipulated, in part to save time in the analysis, but mainly to avoid imparting a false sense of precision to the database. The archaeological components used in the analysis were defined in a variety of ways by the original researchers, and for the most part data are used here as presented in the site reports. No attempt has been made to standardize a definition of "component" or to adjust definitions. When a component was too mixed to sort out, the data were simply not used in the component table. Vail Pass Camp (Gooding 1981) is a good example: the cultural dates from this important site are included in the bottom graph, but not in the upper graph.

The graphs are presented with an admonition of caution in their use. At least three factors complicate the assumption that fluctuations in the graphs reflect changes in use intensity or population — preservation, visibility, and the nature of subsistence pattern. Given that there were at least two major periods of Holocene erosion in the study area, large portions of the record can be expected to be missing, or at least very differentially preserved. And with the simple passage of time, older parts of the record can be expected to be less visible, either through burial, erosion, or decomposition. Another aspect of this problem derives from the subsistence pattern utilized by the Archaic-era folks. Long-term habitation sites tend to have more archaeological visibility than short-use sites, and sites created by messy activities are more visible than sites where a mess was not made. Sites with a number of features in them (e.g., clusters of prepared roasting or storage pits), will be more visible than a butchering site with unprepared simple hearths, especially when the associated bone is largely decomposed. Because most of the dates in the record derive from pits of one kind or another, it is clear that there is some bias to the more readily visible. In other words, derivation of the data is known, but what is missing is not obvious.

Several researchers in the area have informally suggested that change in the frequency of dates might, in some instances, be related to a shift in subsistence rather intensity of use (Metcalf 1999; Stiger 1998b). When times are good, the focus might shift to large game animals and greater mobility, thus leaving a less visible archaeological record. Though communal kill sites are messy and visible, if preserved, large kills would not necessarily be the norm. In addition to issues of preservation, the locations of kills are less predictable than camps. During times when forage for big game is lower, the shift is back to lower rate-of-return resources with more food processing and less mobility; hence, a more visible archaeological record.

The trends shown by the histograms in Figure 6-1 are similar, with a general increase in date or component frequency through time until 1200 B.P., followed by a rapid decline. This trend in date frequency is common to all of the published date frequency charts in the region, though some variability between regions occurs in peaks and valleys in date frequency. Comparison of the graph of all dates and the component-adjusted graph shows that the overall shape of the histogram is similar, with some exaggeration of the date peaks, especially around 5800 and 1200 B.P. The meaning of the smaller fluctuations in date frequency is open to debate. As some researchers have pointed out, graphing the two-sigma ranges of radiocarbon dates tends to fill in gaps, and some smoothing of the curve can be expected as sample size increases, but some of the fluctuations are likely to be real. The real question is what the variability in date frequency is actually measuring. The answer(s), as alluded to above, are probably complex.

The histograms in Figure 6-2 show the 714 ages in Figure 6-1 divided between ages obtained from elevations at and above 2134 m (7000 ft) and ages from below 2134 m in elevation. The lower graph presents the same information shown as average elevation of date provenience per 100-year and 500-year intervals. The 500-year interval data provide a smoothing that is effective in depicting long-term trends. The 100-year interval data are presented to maintain the variability that underlies longer trends and that probably reflect, in part, the effects of short-interval climatic trends, or even of unusually heavy snow years (e.g., Benedict 1999). Though there is considerable variability on the 100-year scale, the long-term trend is for lower average elevation of occupations after about 7500 B.P. This is followed by a rise in the average after 1600 B.P.

The histograms clearly show differences between date frequency for higher and lower elevations. The high elevations show a more consistent pattern in age frequencies through time, with a major peak between about 5700 and 6400 B.P. Lower elevations reflect lower frequencies until 4000 B.P., after which there is a general increase in date frequency, and the late peak in age frequencies between 1000 and 2000 B.P. is almost entirely a product of the lower elevation sites. This dichotomy has several interesting aspects.

The consistent pattern in age frequencies in terrains above 2134 m (7000 ft) is striking. It might be argued that these higher elevation areas are less affected by geomorphic processes that would either obscure or destroy sites than lower elevations because vegetative communities tend to be more stable, streams are smaller, and expanses of eolian sand fields are fewer. Thus, less skewing of date frequencies should be expected due to issues of preservation than in drier, more geologically active lower settings. In this light, lack of older ages and the abundance of more recent ages in the lower elevation sample might be explained mainly by preservation. Conversely, if conditions for preservation are really better in the higher sample, the consistent age frequency could be interpreted as a consistent pattern of use. Some compelling reasons, however, point toward the assumption that the late peak in radiocarbon ages reflects more than simple preservation, as is discussed later.

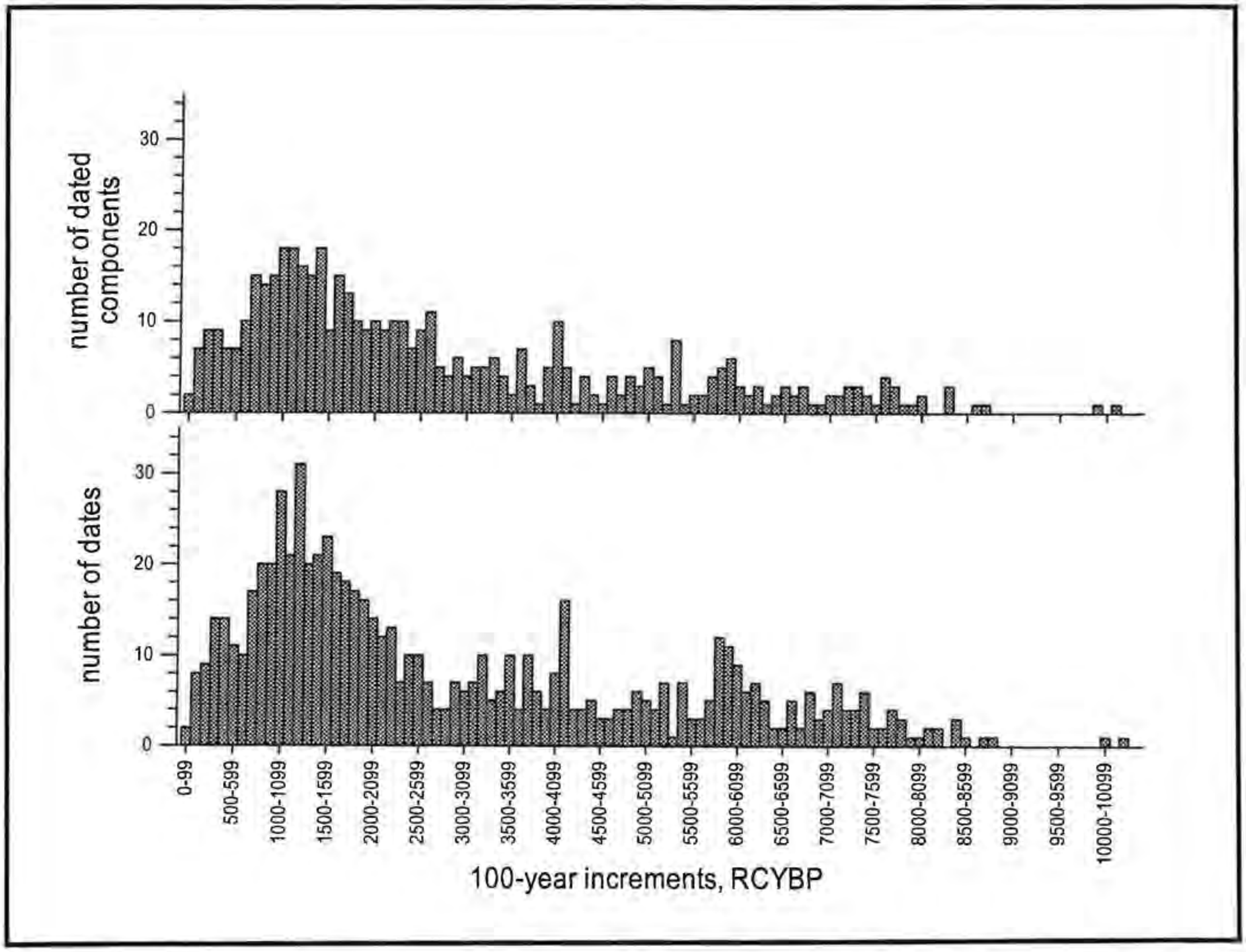

Figure 6-1. Distribution of radiocarbon determinations within the study area.

Fluctuations in the cultural radiocarbon record are in some agreement with the paleoenvironmental record, especially as regards major, long-term trends. The record from higher elevation sites, such as the Gunnison Basin (Fall 1997a, 1997b), suggests conditions generally warmer than modern until around 4000 B.P., followed by generally a cooler and drier "modern" climate. Effective moisture began a general decline after 6000 B.P. In the broader region, maximum Holocene warming and drying occurred variably between about 8000 and 5000 B.P. with the maximum warm-dry period generally dated between about 7400 and 6700 B.P., depending on the site (e.g., Thompson and Pastor 1995:101). The best estimate for the Northern Colorado Basin is around 7300 B.P. Though the evidence has been challenged by some, Benedict (1985:77) has documented the Ptarmigan Advance in the Front Range between 7250 B.P. and 6380 B.P. and has characterized this event as a brief reversal of a warming trend that started about 10,000 B.P. Elsewhere, Benedict has proposed that the mountains formed an Altithermal refugium and has referred to a two-drought Altithermal (Benedict and Olson 1978; Benedict 1979).

The Northern Colorado Basin radiocarbon record broadly reflects the above paleoclimatic characterizations. The high elevation sample has its peak during the period of maximum Holocene warming, generally during the period of maximum regional dryness as well. Around 4000 B.P., when the higher elevation paleoenvironmental record shows a trend to cooler conditions, the radiocarbon record is balanced between the higher and lower elevation sites. This corresponds to widespread cooler and, at least in the lower elevation record, moister conditions. Late in the Archaic record, as the radiocarbon frequencies increase in the lower elevations, climates appear to have been generally in a cool-dry regime much like what is considered "modern." The pattern exhibited here seems to show that the most favorable period for use of the higher terrain was between about 7800 B.P. and 5600 B.P., which corresponds first to the hypothesized period of maximum Holocene temperatures and also to the period when the early architectural dates in the study area occur. This is also the period when the Yarmony site evidences winter use. Interestingly, a dip in radiocarbon frequencies occurs in the high elevation record during the Ptarmigan Advance, and a small rise occurs during this period in the lower elevation record. After 5600 B.P. the high record fluctuates some, but is generally constant. It is likely that use in the higher elevations shifted to a more seasonal pattern during the cooler climatic periods. As such, the elevation of winter sites probably fluctuated as well. The record on the Gunnison Basin shows changing patterns of use around 8000 B.P. and after 3000 B.P. (Stiger 1998b).

A spike in radiocarbon age frequencies occurs about 4100 B.P. in both records, with a dip in both records about 3500 B.P. and about 2800 B.P. A minor peak in the low record occurs about 2400 B.P. coincident with a low in the high record. Though this generally reflects the variability of the apparent climatic record of the last 4,000 years, there is some correspondence between hypothesized climatic events and the radiocarbon record here too. In the UBL record, the period between about 4600 and 3500 B.P. saw the development of a thick cumulic paleosol under relatively stable somewhat moist conditions. The glacial record shows some fluctuations but a trend toward cooler conditions during the Triple Lakes Advances (Benedict 1985:79). If the frequency of cultural radiocarbon ages is factored in, it appears that the period reflects overall favorable conditions in the lower elevations as well as periods of good conditions at higher elevations. Miller (1996a, 1996b) suggests widespread erosion at about 3500 B.P., which appears to be supported by the radiocarbon record, though there is a similar hiatus in ages about 2800 B.P. Finally, a sharp dichotomy exists between the two graphs at 2400 B.P., with a sharp dip in the high record and a minor peak in the low record. This corresponds to the onset of the relatively minor Audubon Advances (ca. 2400 B.P.) in the Front Range glacial sequence (Benedict 1985), and to the second period of cumulic paleosol building in the Yampa Valley record.

Generally through the radiocarbon record there are periods when the high elevation record contrasts with the low, and periods when both records are in agreement. During times of drought at low elevations, it appears that there is more, or at least more visible, use of the high country, as is evident between 7800 and 5600 B.P. During the coolest periods in the high elevations, there is an apparent increase in use of lower elevations, probably a function of both heavier snowpack in the mountains and higher effective moisture at lower elevations. During moderate periods such as existed around 2000 B.C., both records show use, and during suspected erosional periods, both records show dips in date frequency.

MODELING THE ARCHAIC ERA

Space/Time Systematics

Chronology

The Archaic-era cultural chronology in the study area has most often been divided into three time periods, Early, Middle, and Late, following broader regional chronologies such as that for the Northwestern Plains (Frison 1978, 1992) or Great Basin (Madsen 1982), with general convergence on separation dates (Early, 5500-3000 B.C.; [7450-4950 B.P.] Middle, 3000-1500 B.C.; [4950-3450 B.P.] and Late, 1500 B.C. - A.D. 300 [3450-1650 B.P.]). The four-part chronology developed by Schroedl (1976) for the Colorado Plateau has also been referenced (Reed 1984b; LaPoint 1987), as has the chronology for the Wyoming Basin (Metcalf 1987), and others (Jennings 1978). Most recently, Spangler (1995, 2000) has discussed cultural chronology in the Uinta Basin using data from the Yampa and White river drainages. Alternatively, sites have been viewed in terms of prehistoric complexes, most prominently, the Uncompahgre complex (Wormington and Lister 1956; Buckles 1971), and more recently the Uncompahgre technocomplex (Gooding and Shields 1985). Finally, two traditions have been referenced, the Oshara tradition defined for northern New Mexico (Irwin-Williams 1973) and the Mountain tradition defined for a large area of the Rocky Mountains, including this study area (Black 1991a). None of these constructs has proven to be particularly satisfactory. The expansion of the database within the Northern Colorado Basin justifies a rethinking of the cultural chronology.

As a start, it is appropriate to discard all of the chronological schemes that were developed without the use of data from within the study area, except for comparative purposes. It is fruitless to depend on regional chronologies from the Northwestern Plains, Great Basin, or Southwest when there was a distinct pattern of relatively intensive prehistoric occupation based in the Northern Colorado Basin. Black's (1991) Mountain tradition, in part, responds to this problem and a new professional organization, the Rocky Mountain Anthropological Conference was founded specifically to address the growing disparity between old models developed from the traditional North American culture areas and the reality of interpreting a growing database that does not fit these older constructs. The Uncompahgre complex is the only "home-grown" model, but it is dated, and recent work has shown it to be untenable, at least as a cultural-historical framework (Horn et al. 1987:132-139; but see Stiger 1998b). The Wyoming Basin sequence as proposed by Metcalf (1987) is still used in southwest Wyoming with some modifications (e.g., Thompson and Pastor 1995; McNees et al. 1992). The sequence was developed in part with data from the Yampa Basin, but this model was proposed specifically for an area north of the Colorado Basin study unit. Similarly, the phase sequence developed by Schroedl (1976) for the northern Colorado Plateau may have useful elements, but it, too, was developed for a specific area to the west.

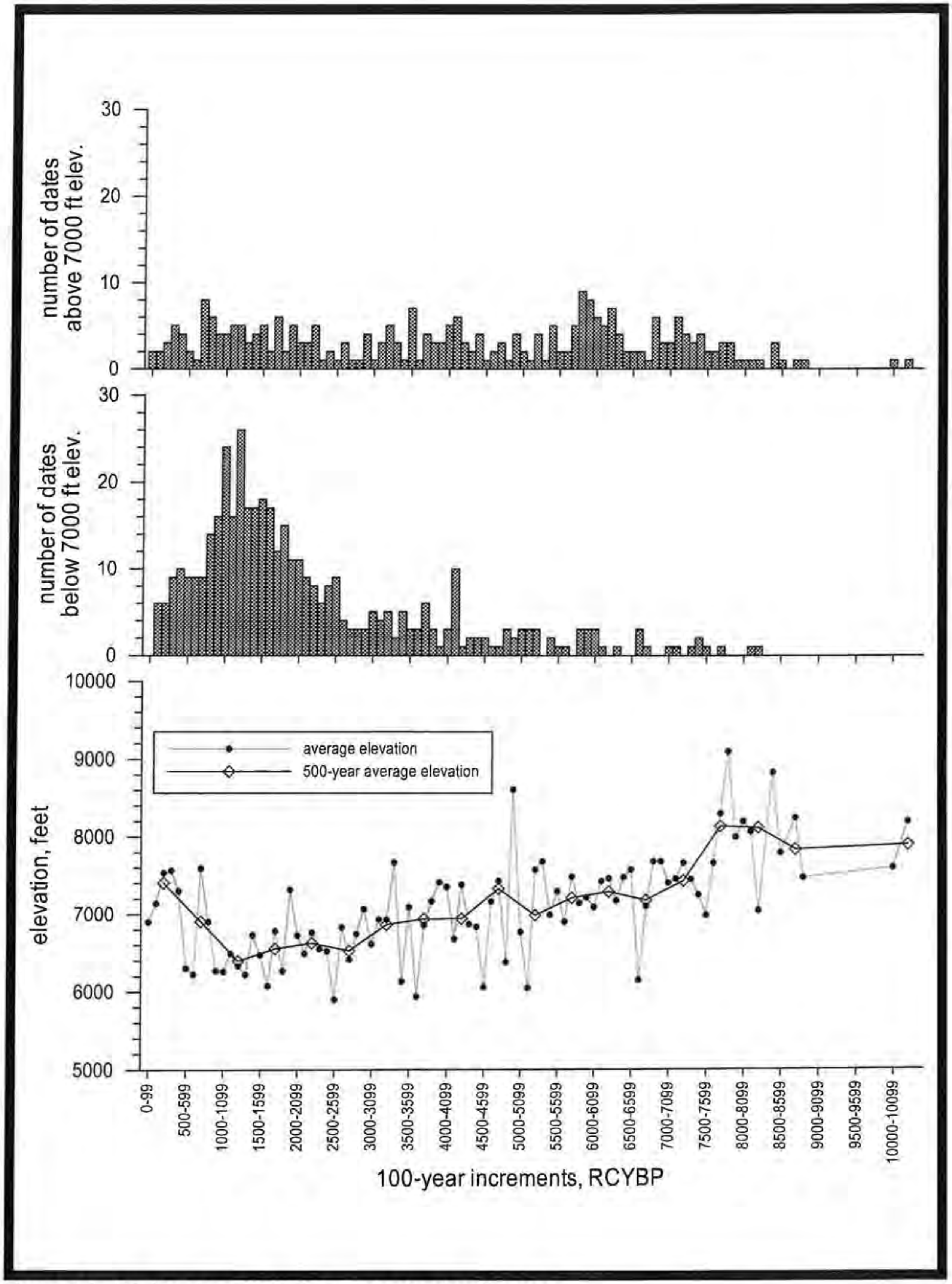

Figure 6-2. Radiocarbon assay frequencies by elevation zone.

It is premature to discuss phases in western Colorado simply because of the variability between subunits within the Archaic record. It seems more fruitful to look at distributions, both temporal and spatial, of traits that seem to be a part of the Archaic technological and adaptive mix. Projectile point styles, cooking and storage pit morphology, habitation structure types, and ground stone technology are all aspects of the Archaic cultures that lived here. Point styles may vary radically between two nearby basins within a temporal period, yet the underlying adaptive pattern might be highly similar. Researchers simply do not yet have an adequate grasp of this variability to construct a single sequence that will account for this variability, if indeed, a single sequence will ever be adequate. It is more likely, given our current understanding of the prehistory, that several major subareas will have differing sequences. Ongoing work in the upper Colorado, Yampa, White, and Gunnison basins is, preliminarily at least, tending in this direction. There are those (e.g., Stiger 1998b; Madsen 1993) who believe that traditional cultural classifications are fundamentally flawed and that a better way is needed to approach variability.

Data presented below suggest a discussion of the Archaic era in four periods, though other frameworks would also work. In this four-part scheme, Pioneer, Settled, Transitional, and Terminal periods are defined. The Pioneer period (8350-6450 B.P.) witnessed the demise of fully nomadic Paleoindian adaptations and the arrival of full-time occupants who established seasonal settlement systems in all of the major basins of the study area, though there is some apparent variability in the nature of these patterns. The Settled period (6450-4450 B.P.) shows a florescence of locally oriented occupations. This period is characterized by use of large numbers of processing features. Evidence points toward a sort of central-place foraging strategy centered on predictable winter habitation areas. Though there is some indication of daub architecture predating this period, the use of pit and basin structures becomes established during this time. The Transitional period (4450-2950 B.P.) has a large degree of continuity with the preceding period but can also be characterized by increasing variability in material culture, perhaps less sedentism in settlement patterns, and possibly by more seasonality in use of the higher elevations. The Terminal period (2950-2350 B.P. [400 B.C.]) is a time of apparent stress on settlement systems and saw experiments with various intensifications in subsistence, including the faint beginnings of a shift to bow and arrow use, early experiments in growing corn, an increasing shift toward processing of seeds and other lower rate-of-return foods. The end date for the period is somewhat arbitrary, and was chosen simply because a number of the trends established during the period come together at about this time to form a more definable entity, the Aspen tradition of the Formative era.

Evaluation of The Mountain Tradition

The concept of a Mountain tradition (Black 1986, 1991a) has served a useful purpose in directing attention to the existence of a rich prehistoric record that stands independent of broader culture areas like the Great Basin or Plains. It has stimulated valuable discussion and debate, and will likely continue to do so. Exploring the various aspects of the prehistoric record that underlie the definition of this tradition will continue to provide a framework for structuring research questions. That said, some valid criticism has been leveled at the construct, both at the nature of the social processes implied by definition of the tradition (Stiger 1998b:19) and at the specific traits listed as diagnostic of the tradition (Horn et al. 1993). At the tradition level, the model is so broad as to be untestable. At the trait level, researchers are not finding data to support the traits as diagnostic. At the same time, it is probably valid to conceive of the Rocky Mountains as the core of long-lived settlement-subsistence systems.

Technology

Architectural Features

One of the major changes in the archaeological record of the Archaic era since the first context was released in 1984 is the widespread recognition of formal and informal habitation structures during the period. Archaic house structures were sporadically reported through the late 1980s and 1990s from a variety of sites in and around the area, including the Windy Gap sites (Wheeler and Martin 1984), Curecanti National Recreational Area (Euler and Stiger 1981, Stiger 1981; Jones 1986); the Mt. Emmons project (Black et al. 1981), Zephyr (Indeck and Kihm 1982), Sisyphus Shelter (Gooding and Shields 1985), the Kewclaw Site (Conner and Langdon 1987), Indian Creek (Horn et al. 1987). Casa de Nada in the Dolores Archaeological Program (Stiger 1986), Yarmony (Metcalf and Black 1991), UBL (McDonald 1998, Rood and McDonald 1998), and Red Army Rockshelter (Pool 1997). Data on many of these structural sites have been summarized in a National Register Multiple Properties Nomination (Black 1991b) and in an in-depth analysis of regional architecture in a Master's thesis by Lane Shields (1998).

Though there are scant data on Paleoindian structures regionally (e.g., Irwin-Williams et al. 1973; Frison 1978), current data suggest that a range of temporary and more permanent house types were used during the Archaic era and that the use of pit and basin structures is a defining characteristic of the regional Archaic cultures. Within the region, the oldest ages on apparently Archaic structural materials is about 7950 B.P. at Windy Gap and at the earliest of the Curecanti sites (Shields 1998:158). House structures are a well-established part of an Archaic era pattern by at least 6250 B.P. and continue to be important to prehistoric adaptations through the Formative era. Both Black (1991b) and Shields (1998) suggest that there are several different types of houses, though their thoughts on this differ. Ephemeral evidence for structures, such as a few postholes, tipi rings, standing wickiups, and rock structures that have been variously interpreted as hunting blinds or habitations, are not considered as formal house types. The key underlying definition of formal houses is that there is some evidence of labor investment in the structures, and the structures themselves appear to have been for long-term as opposed to temporary use.

The Windy Gap structures remain poorly understood. They include extensive amounts of burned mud and relatively large post impressions, leading Shields to conclude that substantial houses were built using wattle-and-daub construction in at least four of the sites (Shields 1998:100). No sites with similar features have been reported elsewhere. Another pattern is identified at Curecanti, where postholes, some with clay collars, stained areas with radiating pole patterns, and other features have been referred to as houses and, in some cases, wickiups. A third pattern consists of true pithouses, which Shields defines as being the most formal type; he includes only the Yarmony houses, and Medicine House in the Hanna Basin of southern Wyoming (Miller and McGuire 1997) in this category. Another pattern includes Sisyphus Shelter, where a rock foundation apparently fronts a basin structure inside the shelter (Shields 1998:100).

Perhaps the most important house type, and by far the most numerous in the database, is the basin house. Basin houses are defined by a number of characteristics including irregular perimeters; variety in outline including oval, elliptical, circular, and subrectangular forms; shallow basins or depressions, sometimes irregular across the house; low walls with shallow and sometimes changing slopes; often lack of wall definition along part of the house arc; undulating floors that often slope with the paleoslope direction; internal features including a number along house perimeters that often contribute to the irregular outline; infrequent evidence of postholes; and adjacent or nearby external features (Shields 1998:63). This definition is based on a sample of excavated structures from 98 sites in a four-state region and includes five sites in the Yampa Valley and several farther south, including Kewclaw and Indian Creek. Shields defines a "basin house core area" as being essentially the same as the physiographic Wyoming Basin and defines this as an area of occupation by a cultural group (Shields 1998:65). The basin house core area is mapped in contrast to an area of the Colorado Mountains identified as Mountain tradition (Shields 1998:47), but it is not clear if the definition of the basin house core area is proposed as a taxonomic equivalent of the Mountain tradition.

The formal definition of basin houses as a house type in the Archaic era is an important contribution, especially for the Yampa Valley portion of the study area, where such houses are numerous. How structures from outlying locales such as the Colorado and Gunnison drainages fit into this overall construct is a matter for future research, but it seems likely that the distribution of vernacular structure types like basin houses will eventually be shown to be a trait common to several adjacent culture areas in much the same fashion as certain projectile point styles or features such as slab-lined pits. Since Yarmony is the sole representative of the most formal house type in the study area, it will be interesting to see if future research shows the Yarmony type to be at the formal end of a continuum of basin house styles, or if there are other examples of formal pit structures. The data are simply too inconclusive at this time to do much with the Windy Gap or Curecanti structural evidence, except to observe the apparent pattern for more substantial structures than simple tents or wickiups emerging from a number of locales in the mountains and in basin settings. Ron Rood (1996:58), who has worked on several sites within the basin house core area, is of the opinion that some of the Curecanti structures are similar to what Shields has defined as basin houses.

The ultimate significance of the various structure types is likely to lie more in what they will yield in the way of behavioral information derived from analysis of site function, subsistence, storage, and measures of mobility rather than specifics of how house types can be used to define prehistoric cultural units. Variability in details of house form and construction method will likely be the norm as the database grows, though it is hoped that some pattern will emerge regarding the use of pole-and-mud construction methods. More important, as several of the models reviewed below suggest, is the range of data for looking at seasonal use patterns, the role of storage and mobility in subsistence strategies, and other implications for human adaptations. Right now it is safe to say that the building of relatively labor intensive habitation structures is one aspect, out of many, that helps to define the characteristics of the Archaic era.

Pits

A wide variety of pits occurs during the Archaic era. Paleoindian hearths are rare and tend to be simple stains or shallow basins. Early in the Archaic era, however, a variety of better defined features occurs, including shallow to deep prepared basins, rock and fire-cracked rock-filled features, and rock- or slab-lined features. Most are fire pits of one sort or another, but some probably functioned for storage, and in few cases, abandoned pits were used for human burials. Fire pits probably had a range of functions, including simple heating, cooking, roasting, and stone boiling. Fire features often are found associated with activity areas or structures and are often the focus of excavations because of this association, as well as because the contents can be dated and analyzed for macrobotanical and faunal samples. Within the Northern Colorado Basin excavation database there are more than 500 features, including not only hearths and firepits, but also storage pits and cists, granaries, and postholes. Postholes, pits, and a few storage features occur during the Archaic.

Considering the importance of pits in the study area, surprisingly little has been done toward understanding more about the function of pits, though archaeologists are beginning to do more with ethnographic descriptions and with experimentation (e.g., Francis 2000). In the study area, Stiger (1998:65) experimented with replicas of feature types represented at the Tenderfoot site. Experiments were done measuring heat output of the same quantity of wood burned in four types of fire pits: slab-lined, unlined, shallow depression, and a shallow cobble-filled feature. Firepit construction influenced fuel consumption rate, heat retention, and charcoal and ash production. The slab-lined pit provided the best heat control and had the best heat retention, and the unlined basin and the shallow depression burned relatively hot and fast. Stiger plans more experimentation following up on these informal experiments.

In the Green River Basin of southwest Wyoming, the Wyoming Department of Transportation excavated a cobble-filled feature almost 2 m in diameter and about 35 cm deep. A layer several cobbles thick was covered with sandy fill. Within the fill, some charred fragments of unidentifiable root matter were recovered. An ethnographic review shows accounts of roasting a variety of roots in similar pits, including wild onion, arrowleaf balsam, mariposa and sego lilies, bitterroot, biscuitroot, yampa, valarian, and camas (Francis 2000:5). Francis has also calculated potential yields for the volume of camas and biscuitroot that could be processed in this feature, suggesting yields on the order of 200,000 to 300,000 Kcal. A number of pits the Northern Colorado Basin have been characterized as roasting or boiling pits, but little has been done to verify this. Most cobble features in the record are considerably smaller than the one excavated in the Green River Basin, however.

The purpose of introducing the above two examples is simply that it points out a needed direction for research on firepits. There are more than 500 dated pits in the database, yet in relatively few cases is the range of functions really well understood. More needs to be done to verify the inferred function of the pits.

In the sample of Northern Colorado Basin fire features, considerable variety is present both in the range of features and in the quality and accessibility of descriptions of them. Some 450 dated fire features in the database contain enough description to classify as to a general type. Using the terminology assigned by the excavators, there are probably more 50 descriptive labels. For this analysis, pits were "forced" into seven categories: simple stains, simple hearths, basin hearths, rock-filled pits, rock-lined pits, slab-lined pits, and fire-cracked rock (FCR) features. Were one to go back through the primary data, finer subdivisions could be made, especially regarding the nature and amount of rock in basin feature fills, and a sample of more than 300 dated pits could still be classified.

Figure 6-3 depicts the temporal distribution of this feature classification, assigning calibrated date centroids in 500-year increments. The top graph shows all dated features on a compressed scale to help visualize how any one feature type relates to the overall sequence of dates. Simple stains and basin hearths appear earliest in time, and along with simple hearths, are important in all time periods. Rock- and slab-lined pits attain importance early in the Archaic, and also show increased frequency of use around 2000 to 2500 B.C. and again in the Formative era. Rock-filled features have generally the same temporal distribution as rock- and slab-lined features. Features that are primarily clusters of FCR occur in the latter half of the prehistoric record. Fluctuations in the relative frequencies of lined and rock-filled pits are likely to be related to shifts in subsistence toward greater processing.

In the Gunnison Basin, firepit characteristics are one of the aspects of technological organization used to look at temporal changes (Stiger 1998b:Table 7.1). Though his classification system differs from the one used here, the temporal distribution is generally similar. Simple, unlined firepits occur in all periods. Specialized boiling pits span the late Paleoindian to Early

Archaic. Large FCR-filled pits occur from about 5800 to 3000 B.P., and smaller FCR pits occur later in time.

Firepits appear to have some of the best untapped data potential of any aspect of the Archaic era record. Much of the needed work can be done from archival sources.

Projectile Points

Projectile point styles in the Archaic era are characterized by diversity. The proliferation in point forms that began during the late Paleoindian era literally explodes during the Archaic era. In the succeeding Formative era, point forms again become less diverse, perhaps reflecting limitations on form imposed by the shift to bow and arrow technology. The reasons underlying the diversity in Archaic projectile point form are not well understood, even though the diversity is widespread. At one time, investigators thought that the multitude of styles indicative of the Archaic would eventually sort themselves into chronological and geographic patterns that would make specific point forms diagnostic of temporal periods, and perhaps areas. This has not been the case, except with a few "types" in a general sort of way. It would appear that the diversity and lack of chronological and spatial patterning is real, and that it is time to move beyond wishful thinking about obtaining an orderly projectile point chronology for the area. Rather, it is time to attempt explanation of this diversity.

The variability in projectile point styles occurs within broad categories including lanceolate, stemmed, side-notched, and corner-notched forms of medium-sized to large atlatl dart points and hafted knives. Within each of these broad categorizations are numerous variations in form. In a recent exercise in futility, Metcalf (n.d.) attempted to generate a typology for the UBL project where points were sorted at two levels, first into series based on overall size and outline and on haft element characteristics (e.g., shape of stem, location of notches), and second by finer details of point form. Using a "splitting" approach, 51 point styles were defined in the hope that some temporal patterning would occur within broader categories such as "large side-notched" and "large corner-notched." In the end, no such patterning could be observed. Rather, points within the finely split types generally overlap other split types in their chronological distributions. It appears that few Archaic-era point forms have usefully restricted temporal or spatial limits in their distribution.

This pattern of apparent chaos is similar to that shown on the Colorado Plateau by Holmer (1978) and to the diversity in styles observed by Francis (1998) in the upper Green River Basin of Wyoming. It contrasts somewhat with a less chaotic pattern on the Great Plains (e.g., Frison 1992; Gregg 1985). Several explanations may underlie the diversity that seems to be characteristic of the mountain, plateau, and high desert environments. One is simply that the Archaic lasted a very long time and, thus, there was time for this variability to occur. Second is a logical extension of the idea that groups became less mobile through a settling-in process. With less movement came fewer opportunities for exchange of materials and ideas, and point styles diverged through this relative isolation. That these divergent styles often co-occur within archaeological components is less easy to explain, though one possibility is that there were periods of stability when people were well adjusted to local environments, and periods of instability when climatic change forced adjustments to local settlement-subsistence systems. Divergence in styles occurred during the stable periods of relative isolation; sharing of styles occurred during periods of settlement adjustment. A simpler explanation is that projectile point styles simply do not carry the kinds of implications about cultural or social identity that archaeologists ascribe to them (see Stiger 1998b:20-21).

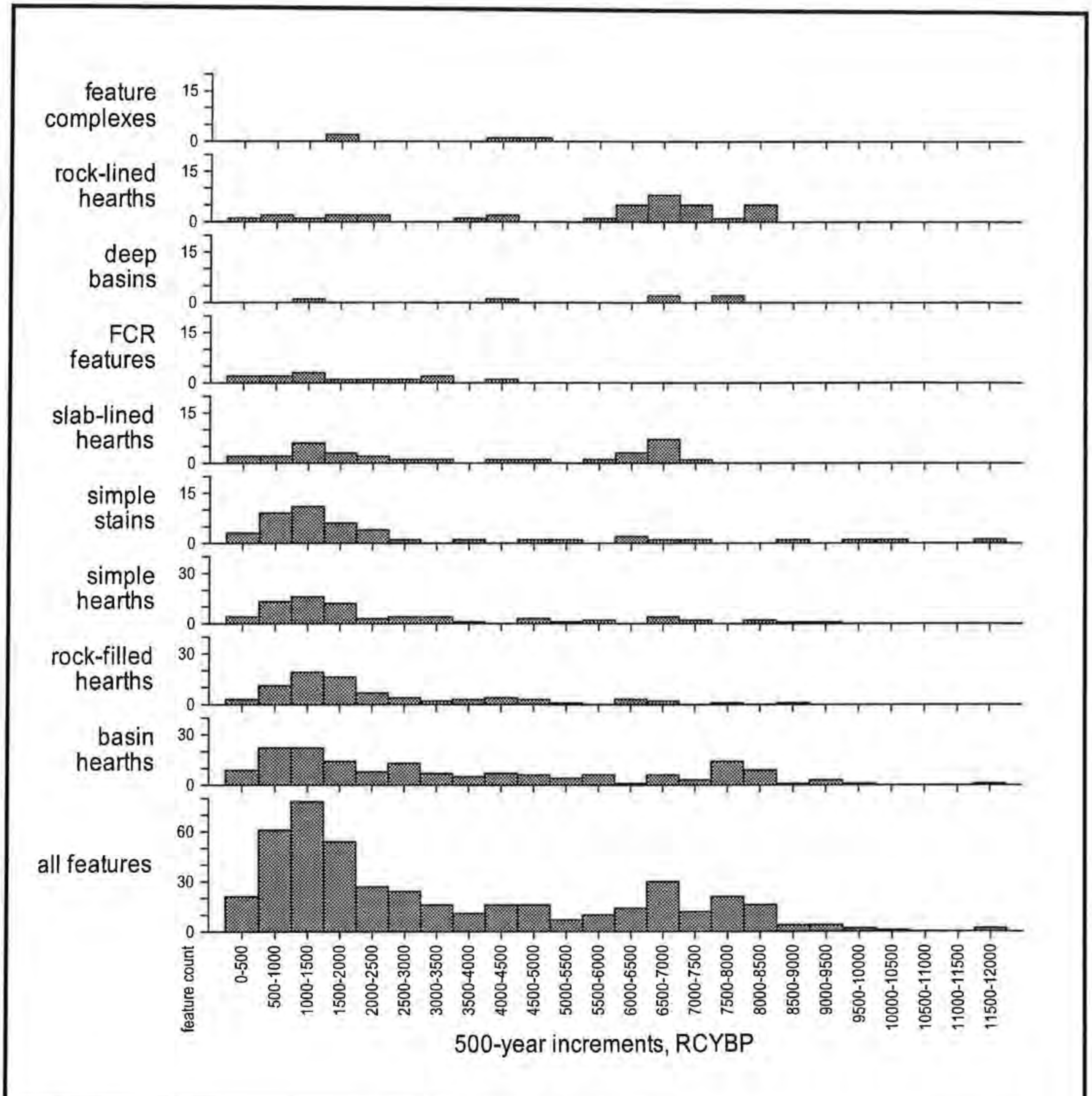

Figure 6-3. Temporal range of firepit types.

Variability in Archaic-era projectile point (or hafted biface) forms includes a range of basic outlines (lanceolate, stemmed, side-notched, and corner-notched) and a range of sizes from medium to large. In general, points are considered to be atlatl dart points, though one cannot entirely rule out the possibility of spear points, or, in the case of several very small points, early experimentation with the bow and arrow. Of course, there are also hafted knives and drills to consider. Lanceolate points within the Archaic era include a few examples that would be classified as Foothill-Mountain types (Pitblado 1998), but that occur in seemingly Archaic-era assemblages (Stiger 1998b:90).

Lanceolate styles that seem to be restricted to the Archaic era include a series of largely unnamed points that are thin in cross section and generally less than 1.5 cm wide and 8 cm in length. Basal treatment varies, but basal grinding is generally absent and there may be a hint of a constriction or of notches on the lateral margins near the base. Within this general category is the Deception Creek point described for the Yampa Valley (Collins 1974; Rood 1993) and other points that have been loosely compared to the Humboldt type which, in the Great Basin, tends to occur between about 8000 and 6000 B.P. (Holmer 1986:101). The few dated contexts for this generic class in the Northern Colorado Basin suggest a primary range from about 8000 to about 5600 B.P., with occasional specimens occurring as late as 4000 B.P. (Metcalf 1998). The other fairly common lanceolate style is the McKean Lanceolate point, generally assigned to the McKean complex dating from after 5000 B.P. to as late as 3000 B.P. (Frison 1991:89). Dates for McKean Lanceolate points in the study area tend to cluster somewhat around the 4000 B.P. age, and the points tend to co-occur with stemmed variants of the McKean complex: Duncan and Hanna points (Metcalf 1987; Frison 1991:101). Metcalf (1987) has suggested that post-Altithermal expansion of bison range may have led McKean hunters into an expanded range, but this speculation remains largely unsupported (Lubinski 2000).

Stemmed points include a variety of styles ranging from contracting stem points generally subsumed under Gypsum, Elko Contracting Stem, and Gatecliff Contracting Stem categories; stemmed-indented base points (Lister 1953), including the Duncan-Hanna McKean variants; and a wide range of unnamed points with straight to convex to distinctly rounded bases. Stemmed points tend to grade into corner-notched points, and a clear definition is not always possible. Holmer (1986:105) favors using the Gatecliff name for contracting stem points, noting a temporal distribution of about 4000 to 1500 B.P. for the eastern Great Basin-northern Colorado Plateau. Contracting stem dart points in our database have a range of ages from about 7800 to 2200 B.P. Other stemmed points appear to have a similar temporal range, though most appear to date prior to 3000 B.P. Duncan-Hanna points of the McKean complex occur mainly in the Yampa Valley, where they date between about 4600 and 3200 B.P., with most specimens clustering around 4000 B.P. Other stemmed-indented or concave-based styles, sometimes called Pinto like (Metcalf and Black 1991), occur with some diversity in form and a range of dates from earlier than 6600 B.P. to as late as about 2000 B.P. The stylistic and temporal distribution does not resemble patterns observed for Pinto materials to the west (Holmer 1986:99), but this may be a reflection of loosely defined types. Finally, Black has been known to refer to rounded base points as "round butts" and to place them within the Mountain tradition lineage.

Side-notched points come by a variety of names including Elko Side-notched, Bitterroot, Northern Side-notched, Hawken, Mallory, and Mt. Albion, among others. The Mallory point is distinguished by high side notches and sometimes occurs in association with McKean complex points on the Northwestern Plains (e.g., Lobdell 1973). Benedict (1975) describes similar points from the Albion Boardinghouse site that are assigned tentative dates of about 5700 B.P. High side-notched points are a regular, though infrequent, style in the study area with dates in the database ranging from about 4000 to 2000 B.P. The Hawken point was originally defined on the

Northwestern Plains (Frison et al. 1976), and the name has been used to describe a variety of vaguely lanceolate points with low side notches (e.g., Larson 1997:110). Other point forms with low side notches include the Elko, Bitterroot, and Northern, among others. Side-notched forms have a variety of basal shapes (concave, straight, convex) and some with very low notches tend to intergrade with corner-notched forms. Dates for side-notched dart points in the database range from about 7000 B.P. to as late as 1280 B.P., but there is a strong tendency for the style to predate about 3500 B.P.

Corner-notched points show an even greater range of size and basal diversity than do side-notched points. Corner-notched points are often subsumed under the essentially useless Elko Corner-notched classification. Holmer (1986:102) notes an age range of 8000 to 1000 B.P., with three date clusters (8000-5500, 5000-3000, and 2000-1000 B.P.). Corner-notched dart points occur in the database with assigned ages from as early as 7800 B.P. to as late as about 500 B.P., with assigned ages peaking between 3000 and 2000 B.P. Assigning a temporal range to a corner-notched, dart-sized hafted biface on the basis of typology is complicated because hafted knives most often appear to be of this style and also occur outside the Archaic era.

Projectile points appear to be only minimally useful as temporal indicators in the Archaic era. In general, broad series show some patterning, but the rule is for diversity within sites and temporal periods. General characteristics include the following.

- Generic lanceolate points tend to predate 5600 B.P. with some occurrence as late as 4000 B.P.
- McKean Lanceolate and other points of the McKean complex cluster around 4000 B.P., but generally occur between about 4600 and 3000 B.P.
- The few contracting stem points in the database occur throughout the Archaic era, but are not represented later in time.
- Other stemmed point types tend to predate 3000 B.P.
- Large to medium, side-notched points tend to predate about 3500 B.P., with a cluster of dates around 7000 B.P.
- Large corner-notched points occur from about 7800 B.P. well into the Formative era, but are more frequent after 4000 B.P.

Archaic-Era Ideology

Relatively few avenues are available to probe aspects of the Archaic record in areas other than technology and settlement-subsistence. Both burials and rock art, contexts where there is opportunity for looking beyond these topics, are rare.

Burials

The number of human burials dating from the Paleoindian and Archaic eras in the study area is small. Within the Rocky Mountain region, only 12 burials have been reported, though more may be unreported (Magennis et al. 2000). One of the early burials is Gordon Creek; the other is the lone 35- 45- year-old male reported from Hour Glass Cave dating to about 8200 B.P. (Mosch and Watson 1993; Hildebolt et al. 1994). In addition to the Hour Glass Cave individual, who was not buried, four burials are reported in the Northern Colorado Basin. The Yarmony burial was of a 60+-year-old female interred in a flexed position with two manos as grave goods (Magennis et al.

2000). At Red Army Rockshelter in the upper Yampa Valley, a 55+-year-old female was discovered and analyzed in situ. She was placed in a reused, slab-lined pit in a flexed position with several bone and stone tools. An associated charcoal date is 5440 ± 50 (Magennis 1994; Pool 1997). The McCoy burial is of a 35- to 45- year old male who was interred in a flexed position in a prepared pit. This burial was accompanied by a cache of stone and bone implements and dates to 3140 ± 50 (Magennis 1996). The youngest Archaic burial is the Dotsero burial. This was also a flexed interment of a 30- to 40- year old male with chipped stone and bone grave goods, dating to 2910 ± 55 B.P. (Hand and Gooding 1980; Rowen 1980).

As Magennis et al. (2000) summarize, the Northern Colorado Basin burials are consistent with a more general pattern in the Middle and Southern Rocky Mountains, where burials are consistently in a flexed position in prepared pits. Grave goods, consisting of ground stone, chipped stone, and bone tools, are present in every case where there was careful excavation and good records were kept. The average minimum age estimate of females is 46; that of males is 37 years. Older individuals, particularly females, are interred within the context of residential bases, while there is a tendency for younger individuals, mainly males, to be buried or to have died in nonresidential settings.

DNA analysis has been conducted on two individuals, the male from Hour Glass Cave and the female from Yarmony. In both cases, mtDNA was extracted by Anne Stone, Pennsylvania State University. The only points of comparison between the two burials is in the 9-base pair (B.P.) deletion, a condition that occurs in some contemporary Native American populations; it is one of four markers characteristic of Native American mtDNA lineages (Stone 1996). The Yarmony individual lacks the 9-B.P. deletion, although the 9-B.P. deletion is present in the Hour Glass Cave individual. The latter individual predates the Yarmony burial by some 1700 years.

All of the burials excavated after 1990 were studied in a context of cooperation with representatives of the respective tribal governments. Involved groups included Southern Ute, Northern Ute, Ute Mountain Ute, and Eastern Shoshone. Because there is much to be gained by modern anthropological methods, it is vitally important that a cooperative relationship between anthropologists and tribal representatives be maintained.

Rock Art

The assignment of rock art to a particular temporal period is problematic, but Cole (1987) suggests that several styles that occur in western Colorado have their roots in the Archaic era. These include the Abstract Rock Art style (1000 B.C.[2950 B.P.] to A.D. 600), which is mapped over much of the Colorado Plateau of western Colorado; the Glen Canyon Style 5 (1000 B.C. [2950 B.P.] to A.D. 400), which appears to be confined generally to the lower Dolores River area south of the Colorado River; and the Barrier Canyon style (500 B.C. [2000 B.P.] to A.D. 500), which covers much of northwestern Colorado. The Uncompahgre style from west-central Colorado is also thought to have roots in the Archaic. The work of Cole (1987; 1990) remains the primary reference for rock art in the study area.

Archaic-Era Subsistence and Settlement

General Models

Various lifeway models are either specific to the Archaic era or overlap it. Some of these models were developed out of land-use planning studies and were intended primarily as predictive models for site locations (e.g., Hurlbett 1977; Burgess et al. 1980). These locational models have, overall, contributed to our current understanding of site distributions relative to landscape and vegetation patterns, even if they function poorly as tools for making predictions about specific locations. Because they depend mainly on surface survey, the models tend not to differentiate well between temporal periods. Other models are aimed more at reconstruction of annual rounds of subsistence activities within or including the study area (e.g., Grady 1980; Benedict 1990; Metcalf and Black 1991, 1997; O'Neil 1993). Some broader-scale models touch on Archaic lifeways in the mountains including the broad spectrum model (Bender and Wright 1988), the Foothill-Mountain Late Paleoindian-Early Plains Archaic discussion of Frison (1997), and a sort of integrative model built around the concept of a Mountain tradition (Black 1991b). Most recently, Stiger (1998b) has presented a synthesis of work in the Gunnison Basin that suggests a fundamental shift in archaeological approaches to the Archaic era. Finally, there is a large and divergent body of theory about hunter-gatherer behavior that is in one way or another incorporated into most of the above models (Bettinger 1991a). The level of interest in regional issues surrounding prehistoric life in the high country is such that two recent, edited works focus on just these issues (Larson and Francis 1997; Madsen and Metcalf 2000).

Current thinking on approaches to modeling Archaic lifeways utilizes cross-cultural and ethnographic information and archaeologically attainable data about mobility, storage, diet breadth, and transport costs. The Northern Colorado Basin, along with most of the Rocky Mountains, became critical habitat during the Paleoindian-Archaic transition in the sense that regional deterioration of climates, along with higher average temperatures, made the higher elevation environments the most attractive they have ever been for hunter-gatherer subsistence. At the same time, the highly mobile Paleoindian lifestyle was breaking down, and resource structure was changing radically, with widespread reduction in big game forage, reduction both in body size and herd size of bison (Smiley 1978), and replacement of grasslands with mixed shrubs. At the same time, human populations appear to have been expanding. As the ability to solve the problem of attaining food shifted away from heavy dependence on the ability to move with the herds, the resource structure of more restricted territories became important to human groups. In short, a more diverse set of local resources replaced a limited set of widespread resources.

As the "settling in" process proceeded, populations occupying the Rocky Mountains were faced with choices about which sets of resources to exploit. For foragers to be successful, it was necessary to make choices between the rich but geographically restricted and highly seasonal resources of the high country and the less rich but more widespread and less seasonal resources of the lower terrains. Mountain plant resources differ from those in the basins in several ways, including a more compressed growing season, sequential ripening of plants depending on elevation and aspect, and a virtual explosion of a wide array of resources about the same time. In contrast, lowland resources tend to be more widely distributed across the landscape, with only a limited number available at the same time. Animal resources present a similar set of contrasts. During the warm season, carrying capacity for grazing-browsing animals is much higher in the mountains, but animal populations are winter-limited by the amount and quality of available winter range (e.g., Grady 1980). In the lowlands, game is more widely distributed, and, in most cases, the locations of herds are less easy to predict.

In the study area, as in the wider region, the constraints of winter survival necessitate a set of decisions about what resources to exploit at what times of the year. Winter constraints include such factors as deep snow, frozen ground, cold temperatures, fat-depleted prey animals, and short days. These factors constrain mobility and necessitate advanced planning, including food storage and caching of other supplies. Too much time spent in the higher elevations might leave people underprovisioned when they move to lower elevation winter sites. The archaeological data suggest multiple strategies for winter survival, all of which involve trade-offs between the transport costs of storage-based solutions against scheduling and other uncertainties inherent in mobility-based solutions. Madsen and Metcalf (2000) review several of these options. One tactic is to send hunting parties into the high terrain to hunt and transport big game animals back to a base (e.g., Bettinger 1991b). This solution is only necessary when local resources are scarce enough to offset the costs of transporting meat over long distances, and has the drawback of splitting up the family group for periods of time. Another tactic is to move family groups sequentially through the high country (Bender and Wright 1988; Benedict 1990). This tactic has the advantage of placing people near high-quality foraging opportunities during much of the year, but results in limited amounts of storable food. The group is limited to whatever load can be carried from summer grounds to the wintering area. A third approach is to locate a strategically placed wintering area where snow and temperatures allow winter living, yet where both lowland and high elevation resources are within a short travel distance (Metcalf and Black 1991). This approach would seem to be the most advantageous, in that it represents a compromise between transport costs and mobility; it is limited, however, because in only a finite number of locations is such a strategy possible.

The variability in possible subsistence strategies is due to several factors, including such things as the resource structure of the particular area, the nature of the climate at any given time, and the size of the population competing for the same set of resources. Models of transhumance such as Benedict once proposed for the Front Range (see also Madsen et al. 2000 for a model for the Uinta Mountains) must account for travel through the broad band of foothills coniferous forest where there are relatively few opportunities for foragers. Such situations favor movement of whole family groups into the mountains during the summer. Conversely, in much of the Northern Colorado Basin, good-quality summer range is in proximity to sheltered valleys and basins, and there is minimal "dead zone" (Bettinger 1991b) that is resource poor. Thus, transport-based solutions might be more effective in such areas than in locales where long reaches of resource-poor terrain divides winter range from summer range. Because the distances between high and low elevations are compressed, the transport costs of moving goods to the base might be less than the cost of foraging for lower ranked resources in the lowlands.

The radiocarbon record, the paleoenvironmental record, and archaeological data all suggest variability in the kinds of solutions prehistoric peoples found to wintering over. The model proposed for the Yarmony site, which is generally accepted as being a winter base, essentially combines two of the basic strategies (Metcalf and Black 1991, 1997). During the coldest part of the year, the houses were the residential base and life was sustained on a combination of stored resources and game that could be hunted in winter range. Spring and summer were probably spent in a foraging mode, with a succession of camps utilized by family groups. By late summer and fall, putting up stores for the winter would be a priority, and transport of goods to the house locale for storage would occur in a shift from a primarily foraging mode to a collector mode.

Benedict (1992) contrasts two models for use of the Colorado Front Range, the "up-down" model and the "rotary engine" model. In the up-down model, which is specifically proposed for the Mount Albion complex, movement was essentially a seasonal transhumance of family groups between foothills winter camps and tundra ecotone summer camps. The rotary engine model pertains to Hogback phase Late Prehistoric groups and involves a more complex set of residential moves of family groups north along the Front Range in the spring, south through North and Middle Parks during the summer, and back over the Front Range in late summer and fall. A particularly compelling part of this model is that it stresses late summer and fall as a time of aggregation of family groups into larger bands (Benedict 1992:31). Grady's (1980) model for the western plateau area of Colorado is essentially an up-down model that stresses summer productivity in the high country and hunting of deer in the lower winter range. In discussing annual seasonal round possibilities in the Grand Junction Resource Area, O'Neil (1993) also utilizes an up-down model, but places winter camps in the pinyon-juniper zone rather than in the desert shrub lowlands as

Grady proposed. O'Neil's model suggests a primary pattern of residential moves with selective use of specialized logistical trips targeting specific resources.

The primary problem with most extant models within the study area is that they are only minimally testable as currently conceived. Larson (1997) and others (e.g., Eckerle 1997; Madsen and Metcalf 2000) have suggested a rethinking of the Archaic and include using analytical tools such as estimating mobility, diet breadth calculations, the nature of storage, and measurements of transport costs as part of a more formal approach to modeling. Stiger (1998b) utilizes a simpler approach that focuses on what the changes in archaeologically observable attributes might mean in terms of how people lived during various periods. He examines changes in use of site space, feature morphology, tool kit composition, and floral and faunal utilization to make inferences about changes in settlement systems.

Hunter-gatherer theory has moved far beyond the usual way that the ubiquitously cited forager-collector model proposed by Binford (1981) is used, though this model underlies current approaches in a fundamental way. Studies that reduce Binford's functional classification of sites generated by hunter-gatherers (i.e., residential bases, field camps, locations, stations, and caches) to a site typology, and have as a goal identifying the "type" of site one is studying, miss the point entirely. The point is to link the range of activities that create such sites with the archaeological record so that patterning in site structure provides clues about the organization of space and activities. Thus, the nature of technological organization and the way that space is used within a site provide a means for inferring patterns of subsistence. Another key aspect of this is the use of energetic costs as a currency for measuring the feasibility of one organizational strategy over another (Bettinger 1991a). The energetic costs of moving, for example, can be compared to the costs of operating as a central-place forager. Kelly (1995) provides an extensive discussion of the kinds of trade-offs that are involved with such choices. Zeanah (1993, 2000) provides a neat case study using an analysis of transport costs for resources in the White Mountains of California to explore circumstances that would favor residential as opposed to logistical moves for central-place foragers.

Researchers in Colorado have been slow to adopt approaches developed from optimal foraging theory for a variety of reasons, opting instead to use Binford's model because it is simpler and appears to rest on more solid assumptions. Yet for most of the 1990s, both approaches have been recognized as compatible tools for examining the prehistoric record. There is no valid reason to ignore either of them in prehistoric models. It is not necessary to accept the premise that diet breadth or transport costs are explanatory models, which they are not, or even to be in agreement with the caloric yield estimates upon which calculations in these models are based. Performing the basic math in these models simply gives one a quick method to test an assumption about subsistence behavior. Using the assumption that human foragers will, on balance, be efficient in food procurement by selecting prey that rewards their work efforts does not rule out personal choice, or irrational behavior, as factors in prehistoric subsistence behavior. Assuming efficient behavior and using projections of caloric return rates simply provides one with a method of looking at subsistence models in a more structured fashion and provides a means of negating the truly absurd assumptions.

If archaeologists are to move forward in the understanding of the Archaic era, it is necessary, in one way or another, to look more seriously at what archaeological data are present and what those data might realistically mean in terms of economic organization and behavior. Stiger (1998b) and to an extent, Metcalf et al. (1991) have approached this from a technological and space-use point of view.

A common approach in the Great Basin is to look at factors such as diet breadth and transport costs (Bettinger 1991a; Simms 1984; Jones and Madsen 1989; Metcalfe and Barlow

1992). As a basic exercise, assume that an active adult consumes an average of 2,400 calories per day, or 876,000 calories per year. Assuming an all-meat diet, this would equate to one individual eating about 17 deer, or 6 elk, or 1,375 cottontails, or 2,920 large rodents, or some combination thereof each year. Even if meat contributed only 30 percent to the diet, an extended family or small band would consume many animals. Under this assumption, a group of four using only deer for the 30 percent meat diet would need 20.4 deer (or 1,650 cottontails) each year. Of course, this is overly simplistic, but it is not unreasonable to make some general projections of the quantity of food a group would need or of the time it would take to acquire it given a set of circumstances.

Caloric yields are commonly estimated based on the kcal/hour that the pursuit, acquisition, and processing of various foods will yield. The energy costs of searching for and transporting resources once they are procured are variables that change depending on circumstance, and form the more dynamic aspect of using this approach. Simms (1984) generated initial estimates for search times and caloric yields for a variety of Great Basin resources, some of which occur in the Northern Colorado Basin. These early estimates have been modified by additional experimental and ethnographic data (e.g., Zeanah 1993, 2000; Madsen 1999b). Researchers have also looked at the energetic costs of transporting resources once they are procured and processed (Jones and Madsen 1989; Metcalfe and Barlow 1992) to gauge the effectiveness of transporting loads of various foods over different distances. Caloric yield estimates of some resources in the study area are presented in Table 6-1.

Table 6-1. Average Energetic Return Rates from Selected Resources.*

Rank	Resource	Avg. Return Rate (Cal/hr)
1	Elk	38,150
2	Deer/sheep	24,771
3	Pronghorn	16,216
4	Jack rabbit	14,438
5	Gopher	9,881
6	Cottontail	9,392
7	Ground squirrel	5,866
8	Mormon cricket	9,229
9	Cattail (pollen)	5,789
10	Deer/sheep @ 10 km distance	3,966
11	Cattail (roots)	3,299
12	13-lined ground squirrel	3,215
13	Duck	2,342
14	Gambel oak (acorns)	2,232
15	Deer/sheep @ 20 km distance	2,154
16	Deer/sheep @ 30 km distance	1,479
17	Tansymustard (seeds)	1,307
18	Bitterroot (roots)	1,237
19	Saltbush (seeds).	1,100
20	Pinyon pine (nuts)	941
21	*Poacae* (grass seeds)	500
22	Sunflower (seeds)	486
23	Great Basin wild rye (seeds)	370
24	Indian ricegrass	345

*From Madsen et al. (2000), Jones and Madsen (1989), Simms (1984); elk estimated from Colorado Division of Wildlife carcass weight data following the same pursuit and handling assumptions used for other big game (Simms 1984).

Basic assumptions like these are inherent in most reconstructions of subsistence, whether consciously or not. Recognizing the tradeoffs inherent in different subsistence strategies simply supplies a backdrop for evaluating our models, wherever they are derived.

Using these kinds of data, resources are ranked according to kcal/hour yield. A basic premise is that higher-ranked resources will be used whenever the search and transport costs are lower than using a lower-ranked resource. As lower-ranked resources are added to the diet, higher-ranked resources are still procured whenever possible. Thus, as lower ranked resources enter the diet, diet breadth increases. Lower-ranked resources tend to be plant foods that require bulk processing, which generally means the addition of processing implements and features to the tool kit. Factors such as storability, predictability, and nutrition might alter choices within this framework, but the costs of these choices can be assessed. The behavior underlying these diet choices leaves an archaeological signature. A camp dedicated to big game hunting will look very different than one dedicated to the processing of pinyon nuts.

Patterns of Floral and Faunal Exploitation

The excavation database for the Northern Colorado Basin permits limited insight into the types of flora and fauna exploited by the region's prehistoric occupants. Interpretations are hindered by sample sizes.

To assess patterns of faunal exploitation through time, bones from relatively well dated components were considered. Because of variation in excavation and analytical strategies, it was seldom possible to precisely assess the relative importance of various animals in subsistence systems. As a result, the presence of certain species was simply tabulated for 250-year-long periods. Tabulated species or faunal groups included rodents, fish, deer, elk, pronghorn, bighorn sheep, bison, and rabbits. A few other faunal groups were also represented in archaeological assemblages, but in low quantities. Identified bones were most common following 1200 B.P. This trend is probably due to the relative abundance of excavated components from this period, as well as factors of bone preservation. Frequencies for most faunal groups peak following 1200 B.P. but are rather evenly distributed throughout the preceding Archaic era. This pattern suggests that the same species were hunted throughout the Archaic era (Figure 6-4). Pronghorn, bison, and elk are poorly represented between approximately 4950 and 6950 B.P., but this may be due to sampling error. Favored prey probably included rabbits, artiodactyls, and rodents. Rodent data are particularly difficult to assess, however, because some types are likely to enter archaeological contexts through natural means. Of the artiodactyls, deer and bison may have been especially desirable. Among the components yielding identified artiodactyl remains, 35 percent of the components yielded mule deer, 31 percent yielded bison, 15 percent yielded pronghorn, 11 percent yielded elk, and 8 percent yielded bighorn sheep. Birds occur in low frequencies throughout the Archaic era and during subsequent eras. Fish remains from well-dated contexts are rare (see Lubinski 1999). Components yielding fish remains have been identified at the Yarmony Pithouse site (Metcalf and Black 1991), DeBeque Rockshelter (Reed and Nickens 1980), the Edge site (La Point et al. 1981), the Empire State site (Miller and Behnke 1985), and Hells Midden (Burgh and Scoggin 1948).

When plotted by county, most of the major faunal groups are widely distributed throughout the study area. It can seldom be established, however, whether animals were killed near the sites of their discovery or were killed elsewhere and transported. Inspection of the distribution of components yielding elk remains suggests that elk may have been procured primarily in the counties with higher elevations, such as Dolores, Gunnison, Eagle, and Grand. Pronghorn are most abundant in the northwestern corner of the study area, in Routt, Moffat, and Rio Blanco counties.

Two components with pronghorn have also been found in Gunnison County. Pronghorn remains have not been found south of the Colorado River west of Gunnison County, though modern herds are present southeast of Grand Junction and were historically present in the Paradox Valley (Kasper 1977). As more data are gathered, it is likely that finer grained geographical and temporal variation in hunting strategies will be identified.

Floral data from chronometrically dated contexts were also tabulated by 250-year-long periods (Figure 6-5). The most common plant types recovered in archaeological contexts that may have been used for food include pigweed or goosefoot (Cheno-Ams); grasses, including Indian ricegrass, chokecherry; cattail; prickly pear cactus; mustard; pinyon nuts; juniper berries; saltbush; and Mormon tea. Frequencies of pinyon and juniper seeds and nuts were not tabulated, because some probably reflect use of these plants for fuel, rather than for food. Like the faunal data, the frequencies of identified species is greatest in the latter portion of the archaeological record, following 1950 B.P., which probably reflects factors of preservation and intensity of archaeological excavation. Plant species also indicate continued use through time. The data suggest that pigweed and goosefoot were especially valuable food resources throughout prehistory.

Modeling Changes in the Gunnison Basin

In synthesizing results of extensive research at the Tenderfoot site and many other Gunnison Basin sites, Stiger (1998b) organizes data around a set of assumptions about the organization of technology and site space as they are inferred to relate to subsistence behaviors. Various attributes of the archaeological assemblages are interpreted as being indicative of certain ranges of behaviors. For example, source analysis of obsidian provides an indication of the size of the system. Projectile points are viewed as essentially useless as temporal markers or as identifiers of social identity, but are important in the organization of technology. Stone tools, in addition to being functionally described, are classified following Binford (1979) into personal gear (knives and projectile points), site furniture (ground stone tools, choppers/hammerstones, and cores), and expedient tools (flake tools that show little modification) (Stiger 1998b:91). Distributions of raw materials relative to their source areas are indicative of the pattern and type of movement. Features of differing construction have differing burning characteristics and indicate differing functions and differing durations of occupation (Stiger 1998b:92).

Using the above approach to data, a regional model or sketch is proposed as a sort of trial balloon guaranteed to contain errors of fact and interpretation, but also is intended as a starting place in making models testable (Stiger 1998b:93-96). Early Paleoindian is present only as surface finds, mainly on high points and near springs. A kill-to-kill pattern of residential moves is inferred, but only as a guess. The Kezar Basin site contains stone-boiling pits with dates ranging from about 8800 to 5800 B.P. After 8000 B.P., houses are present, large fire-cracked rock features occur, and occupation of the Gunnison Basin is inferred to be residential until about 3000 B.P. Sites dating later than 3000 B.P. have only smaller fire-cracked rock features and amorphous stains, and residential bases are located at lower elevations outside the Gunnison Basin. Changing patterns of use are linked to broad-scale climatic changes.

The late Paleoindian era is the first with much data represented, though the sites used (Tenderfoot, Kezar Basin, and Zephyr) better fit into the Pioneer period of the Archaic era as it is defined here. In any event, after 8000 B.P. house structures are present and are inferred as winter residences. Subsistence included bulk processing and storage as well as bison and other big game. Lithic technology is organized around bifacial tools, and both late Paleoindian and Archaic point styles are found. The Kezar Basin site is a reused, nonresidential site with stone-boiling pits.

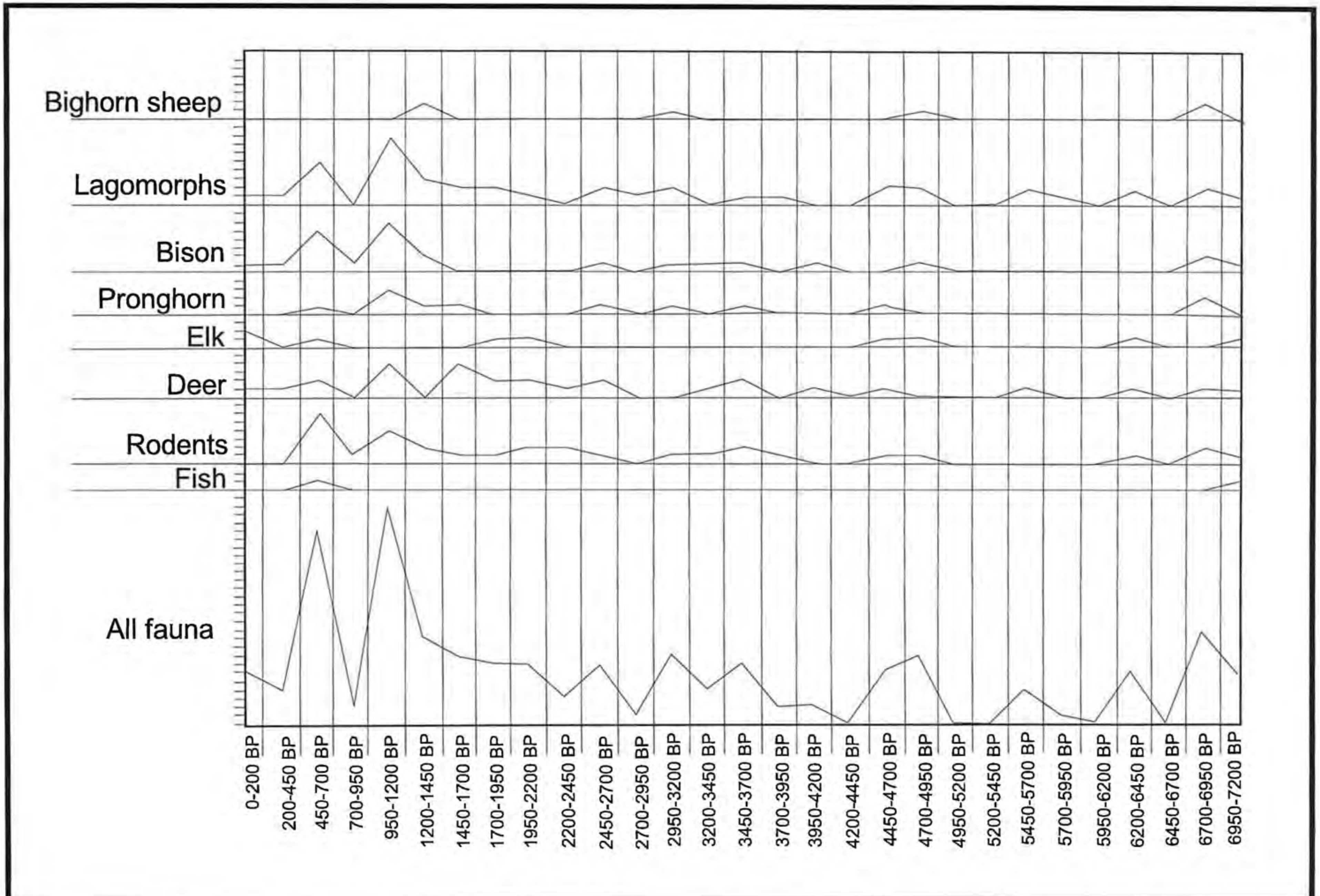

Figure 6-4. Frequencies of exploited faunal types through time.

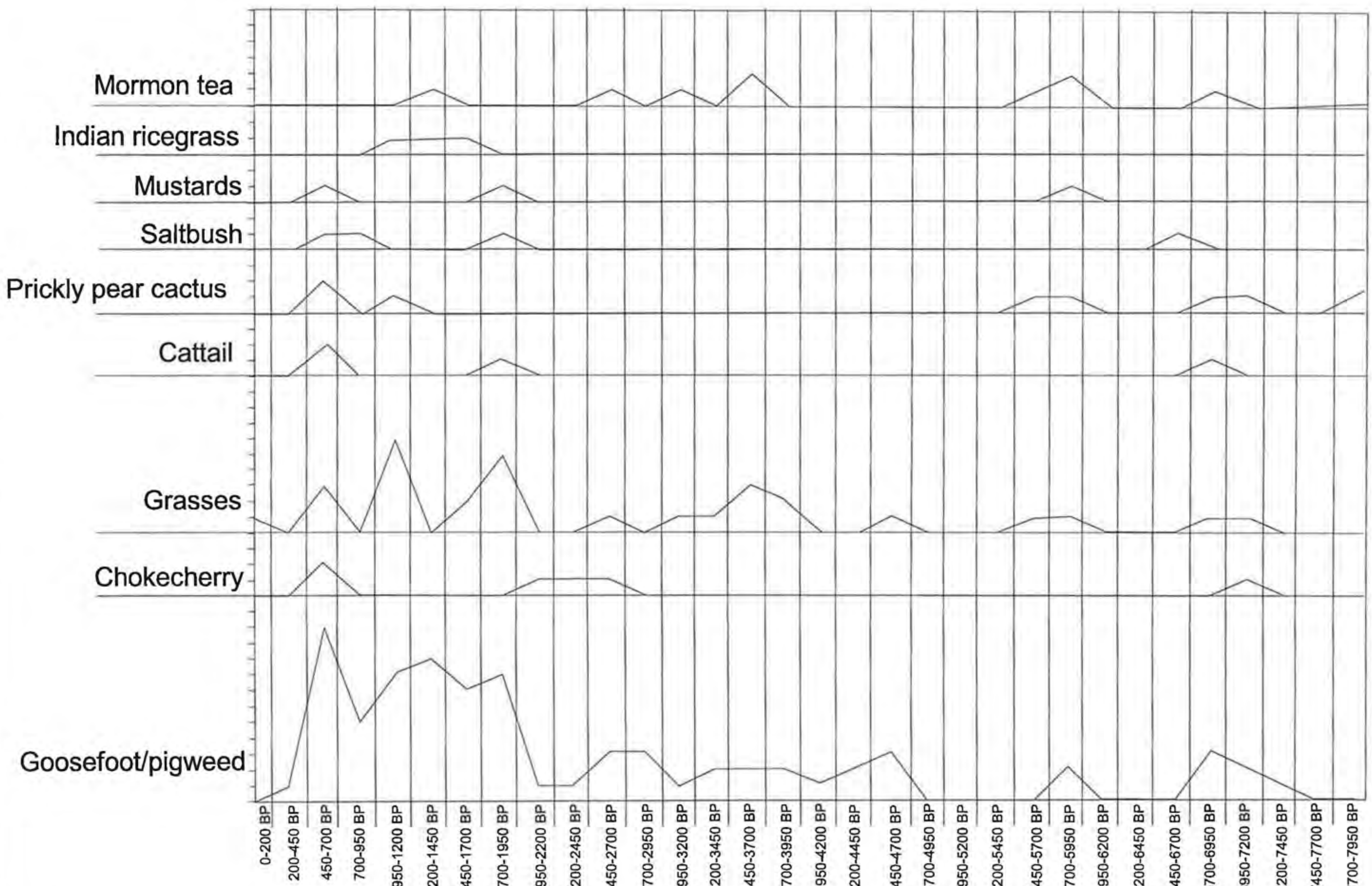

Figure 6-5. Frequency of probable plant foods in archaeological components.

Environmental indications are of a change from an equable climate to a seasonal one, and Stiger's thought is that subsistence was shifting from bulk-procured animal food to bulk-procured plant foods. Subsequent changes in the use of features and houses, as well as the use of site furniture and expedient tools, indicate adaptive stress from changing environments.

A major effect of climatic drying is a shrinking of habitats as life zones retreat to higher elevations. Adaptive stress occurred, measured in several ways. Stone boiling drops from the record by 5800 B.P., and slab-lined firepits of various kinds appear around 6000 B.P. Assemblages change, too, becoming more diverse with more use of site furniture and expedient tools. Floral and faunal remains also become more diverse. Length of stay in winter residences, increased dependence on stored food, and increased variability of short-term camps and special use sites are aspects of the adaptation (Stiger 1998b:94).

The residential sequence of use appears to be briefly interrupted around 5000 B.P. by a cooler period when only a few features and artifacts occur. By 4500 B.P., conditions had again warmed and the residential pattern returned to the Gunnison Basin with some changes. Highly diverse residential sites appear, including some substantial houses and deep middens. The number of ephemeral houses also increases, but maintenance of site space continues. Fire-cracked rock features change, there is a high frequency of use of site furniture and expedient tools, and small mammals are exploited. This ends around 3000 B.P. with environmental change that led to the demise of pinyon and a change to seasonal instead of residential use of the Gunnison Basin. Stiger notes that outside the Gunnison Basin is an apparent increase in residential sites and other signs of adaptive stress, such as the beginning of farming villages and increasing use of game drive systems (Stiger 1998b:95).

Climatic Change and Adaptive Stress

It seems clear at this juncture that the Archaic era was inherently less stable than the rather pervasive traditional picture would indicate. The paleoclimatic data, together with the frequency and nature of adaptive shifts in the archaeological record, suggest that periodic and probably abrupt changes occurred. Madsen et al. (2000) propose, on the basis of ice and sea core records, that as many as nine millennial-scale shifts would have whipsawed the cultures of the region. A convergence of archaeological evidence from the Northern Colorado Basin indicates that a number of shifts occurred, including several that necessitated the Archaic adaptive pattern. In the late Holocene, a series of more erratic shifts necessitated more intensive subsistence, essentially ending the Archaic era. An important goal will be to find tools to assess this changing picture of the nature of the Archaic. One of the more intriguing aspects of Stiger's synthesis is his interpretation of the role and timing of game drives in mountain subsistence systems. He argues that game drives, most of which have been described in the Front Range by Benedict but which also occur less frequently in the interior mountains (e.g., Hutchinson 1990), were used primarily as a means of funding aggregations of people, primarily during times of adaptive stress (Stiger 1998:24). He further suggests that Benedict's (1996:59) data on high-altitude game drives, showing eight use-frequency maxim ranging in age from about 7650 B.P. to 220 B.P. are reflective of adaptive stress. Within a context of reduced carrying capacity and reduced residential mobility, game drives may have functioned to increase subsistence payoff (Stiger 1998b:95).

Whether this particular argument survives scrutiny, it is clear that a growing body of evidence supports the emerging picture of step-wise change. There are many more pieces of the puzzle missing than in place, and data are needed from both archaeological and paleoenvironmental sources.

Altithermal Refugium?

The concept that the Rocky Mountains acted as a refuge for lowland-based cultures during the Altithermal was originally proposed by Benedict (1979). Variations of this concept, and that of Plains abandonment, have continued to play a role in the general debate about the nature of Archaic adaptations (Bender and Wright 1988; Black 1991a; Husted 1993; Larson 1997). Data summarized above suggest that elevations above 2134 m (7000 ft) in the Northern Colorado Basin were differentially utilized through time, with a more visible use pattern occurring generally through middle Holocene time. The radiocarbon record and more detailed data from the Gunnison Basin suggest that owing to climatic change, use of higher elevations shifted from a residential pattern with year-around occupation to a more mobile pattern with winter residences at lower elevations, and with more seasonality in use of the higher terrains. Winter residence in the higher valleys and parks was possible during limited periods when warmer or less seasonal temperatures prevailed. During colder intervals, populations were forced into lower wintering areas, and use of the high country was seasonally restricted.

This simple model probably played out several times through the Archaic era given the increasing evidence for volatility in the climatic record. Current interpretations of the evidence suggest, however, that once people were here, the residential shifts described above occurred largely within the system of resident populations, not as a part of broad-scale migrations (but see Benedict and Olson 1978; Husted 1993). As lower elevation areas receive increased study, more and more sites dating to the Altithermal era are discovered. In Wyoming, where public lands and regulated energy projects are well distributed in the basins and Plains, Early Archaic sites are represented in proportion to other periods (Larson 1997:115). Evidence for wholesale abandonment is just not there.

Other problems with conceiving of the mountains as a refuge have been noted above. There is simply less land area the higher one goes. In addition to being restricted in area, resources tend to occur in narrow elevational bands. Finally, it appears that during maximum Holocene warming, both the upper and lower elevations of conifer forest expanded, essentially eliminating large areas of krumholz-tundra habitat, and changing the character of the lower life zones. There is no doubt that the ever-changing environments had an effect on the prehistoric adaptive systems. At this time archaeologists do not have sufficient grasp on the nature of this variability.

Chapter 7
THE FORMATIVE ERA

INTRODUCTION

The Formative era refers to the extended period when corn was a major subsistence focus in some portions of western Colorado, roughly between 400 B.C. and A.D. 1300 (Jett 1991; Stiger and Larson 1992). Certainly, not all inhabitants of western Colorado were engaged in horticultural practices during this era; the mountains comprising the eastern portion of the Northern Colorado Basin were unsuited for horticulture, as growing seasons were too short for corn, beans, and squash. Because the unit of discussion is an era, however, both horticultural and nonhorticultural groups that occupied the study area between 400 B.C. and A.D. 1300 will be examined herein.

Horticultural groups occupied the Colorado Plateau. These groups often constructed substantial habitation structures and made, or obtained in trade, high-quality pottery. Groups most reliant upon cultigens used two-hand manos to increase grinding efficiency. The remains of horticultural groups are not evenly distributed across the Colorado Plateau. Site file data from OAHP show two major clusters of Formative-era structures, cultigens, ceramics, two-hand manos, and rock art: one in western Rio Blanco and Moffat counties, and one in the lower San Miguel and Dolores river drainages in western Montrose County (Figures 7-1 - 7-6). A third, less distinct cluster occurs south of Grand Junction in the vicinity of Glade Park. The Formative sites in Glade Park and in northwestern Colorado are attributed to the Fremont tradition. The cultural affiliation of the southern Formative-era sites is less clear; some may be Fremont, but most are attributed to the Gateway tradition, thought to be an indigenous horticultural unit. A few undisputed Anasazi sites occur along the southern boundary of the study area.

The nonhorticultural inhabitants of the higher elevations of the Colorado Plateau and of the mountains are discussed in the section on the Aspen tradition. The Aspen tradition is a new construct, provided as reference for hunting and gathering groups contemporaneous with the Formative era that evince certain technological and subsistence innovations that can be used to differentiate them from Archaic and post-Formative-era groups.

ANASAZI TRADITION

Introduction

Evidence of Anasazi occupation of the study area consists of substantial habitation structures, Anasazi pottery, and Anasazi rock art styles. When the boundary between the Northern and Southern Colorado Basin study areas was drawn, an attempt was made to include all structural habitation sites affiliated with the Anasazi tradition in the Southern Colorado Basin. Distributions of artifacts diagnostic of the Anasazi tradition were not considered in study unit definition because Anasazi pottery was known to extend far beyond the Anasazi homeland; Anasazi pottery, for example, is found in small quantities throughout western Colorado and into Wyoming.

According to the OAHP database, eight sites that recorders attribute to the Anasazi and that have possible architecture occur within the Northern Colorado Basin study area. These sites indicate that the effort to exclude Anasazi habitation structures from the Northern Colorado Basin was not entirely successful. No attempt is made to fully describe the Anasazi tradition to account

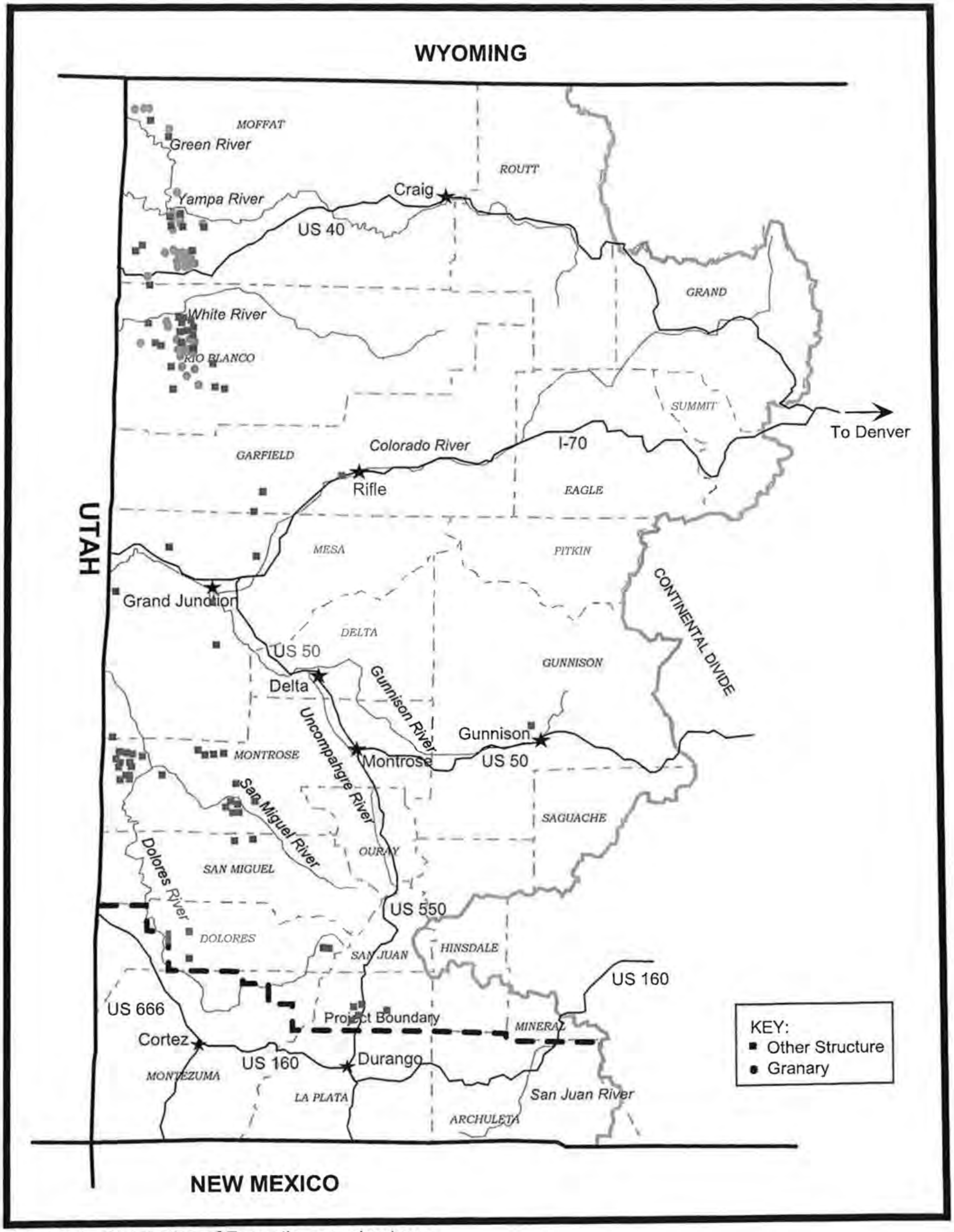

Figure 7-1. Distribution of Formative-era structures.

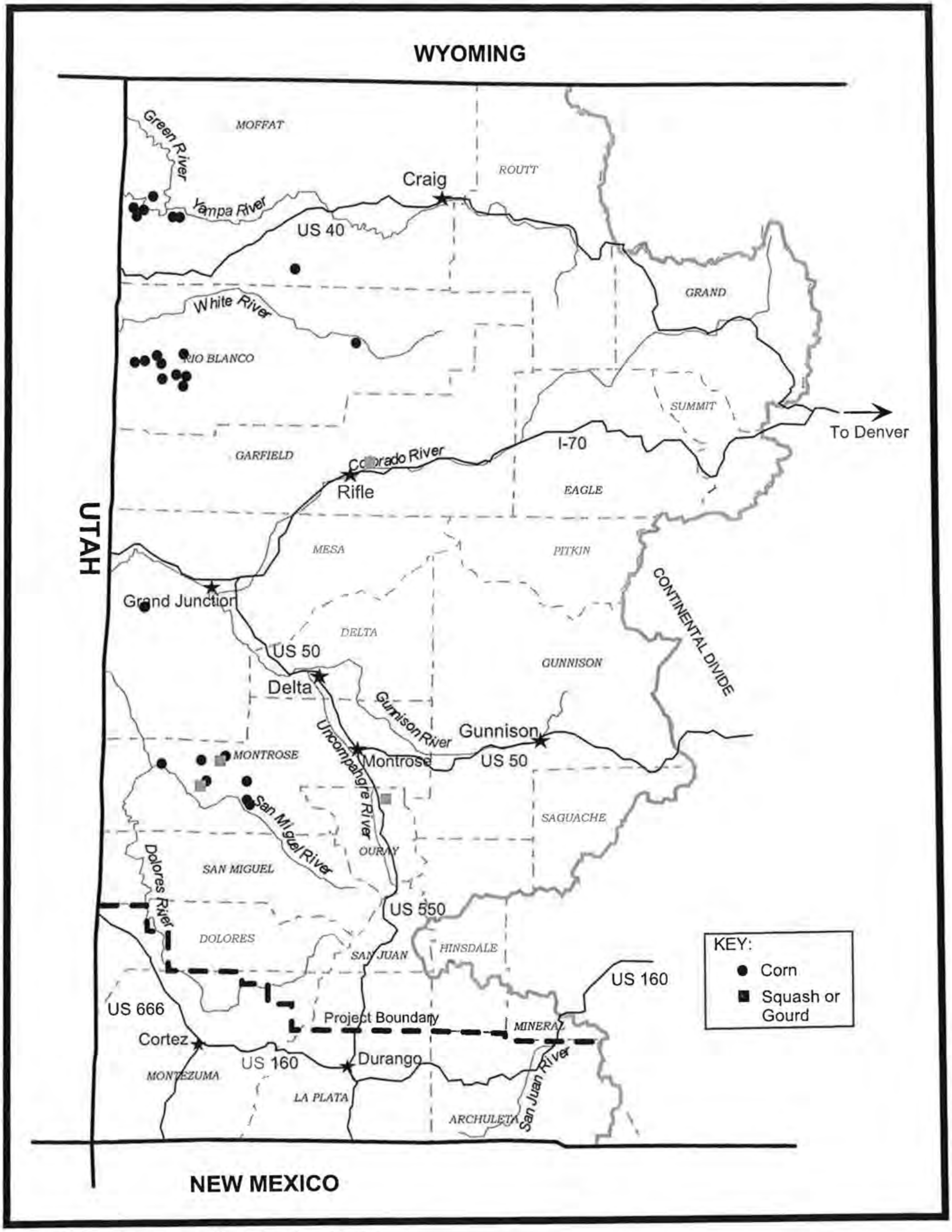

Figure 7-2. Distribution of sites with cultigens.

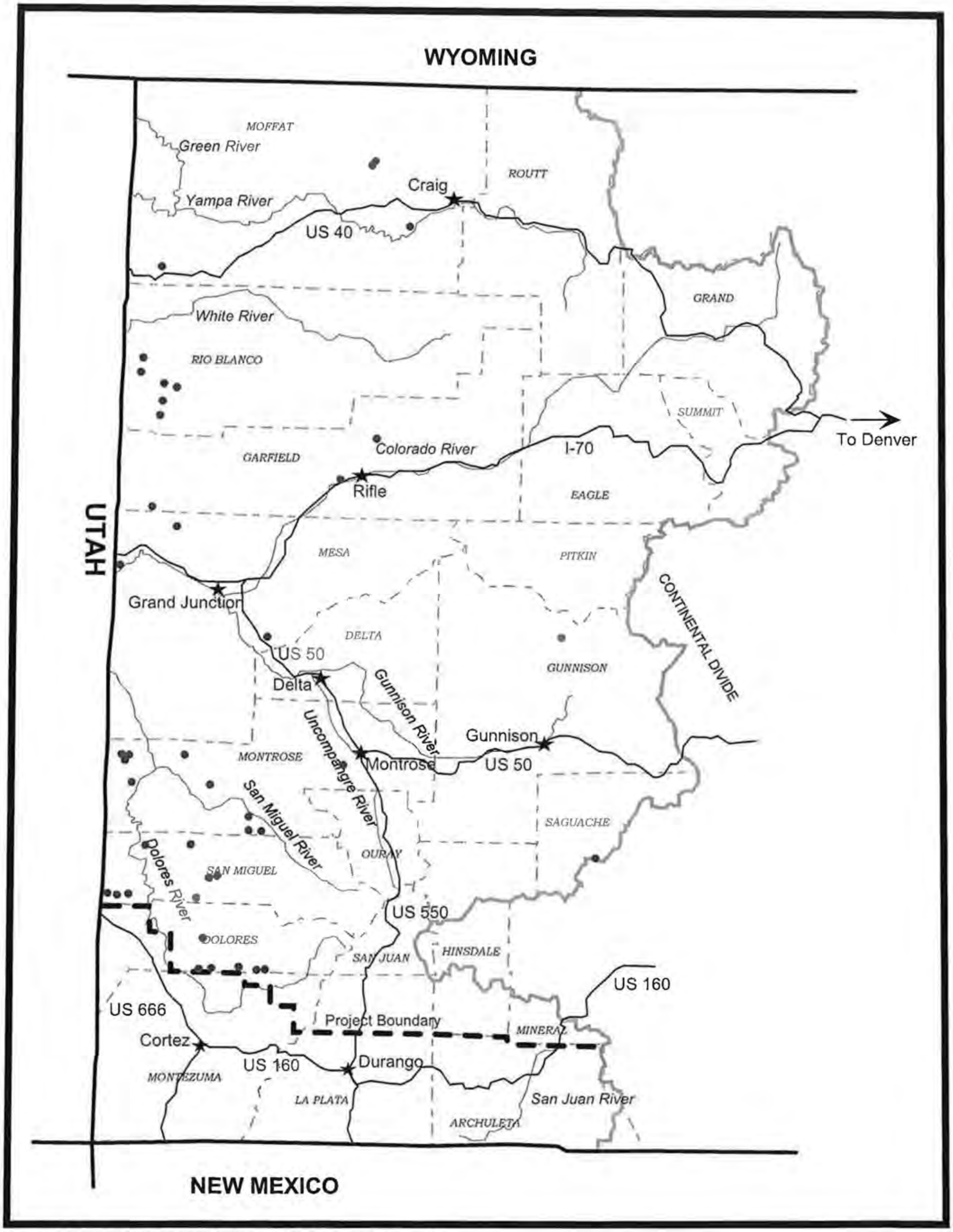

Figure 7-3. Distribution of sites with Anasazi ceramics.

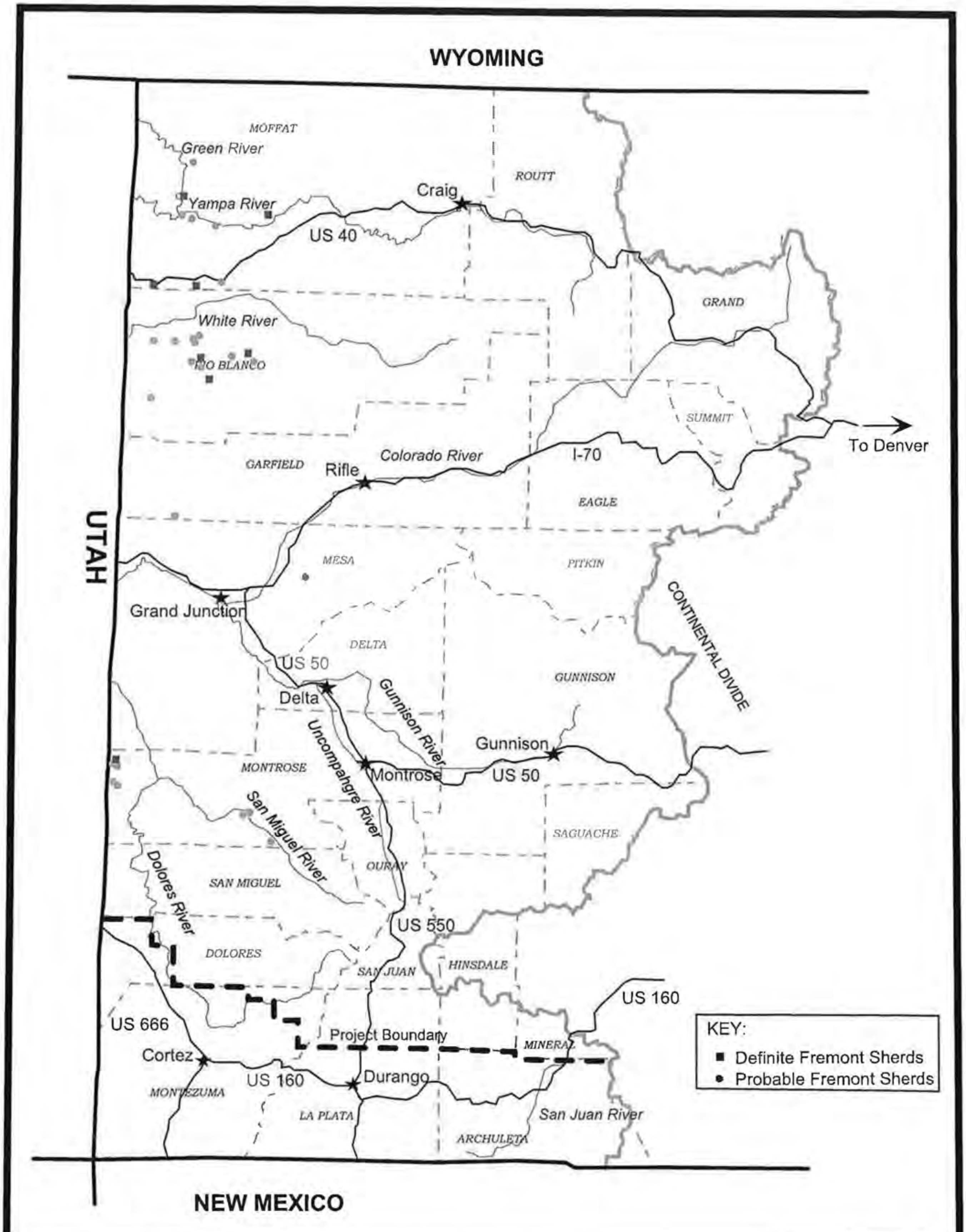

Figure 7-4. Distribution of sites with Fremont ceramics.

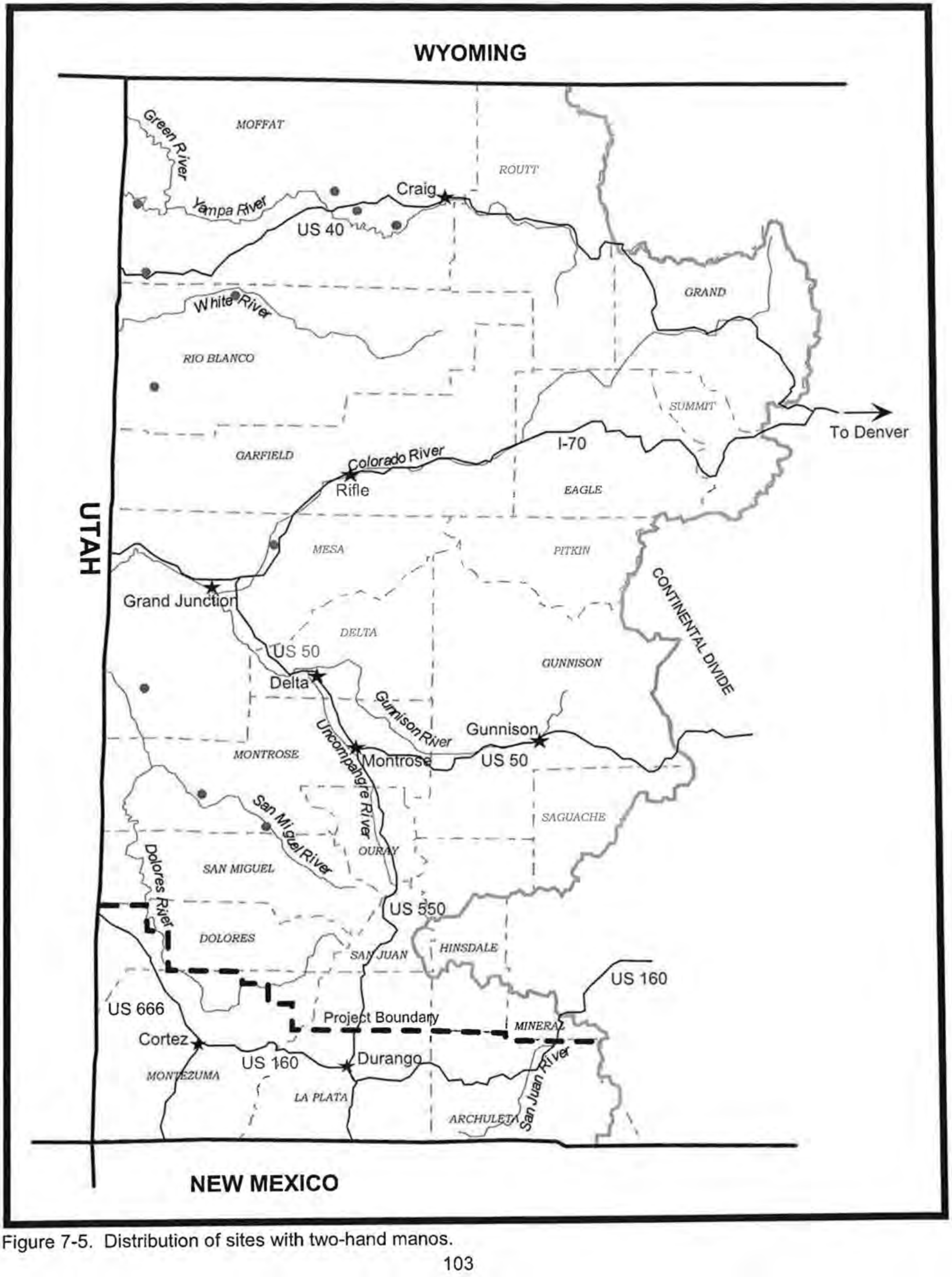

Figure 7-5. Distribution of sites with two-hand manos.

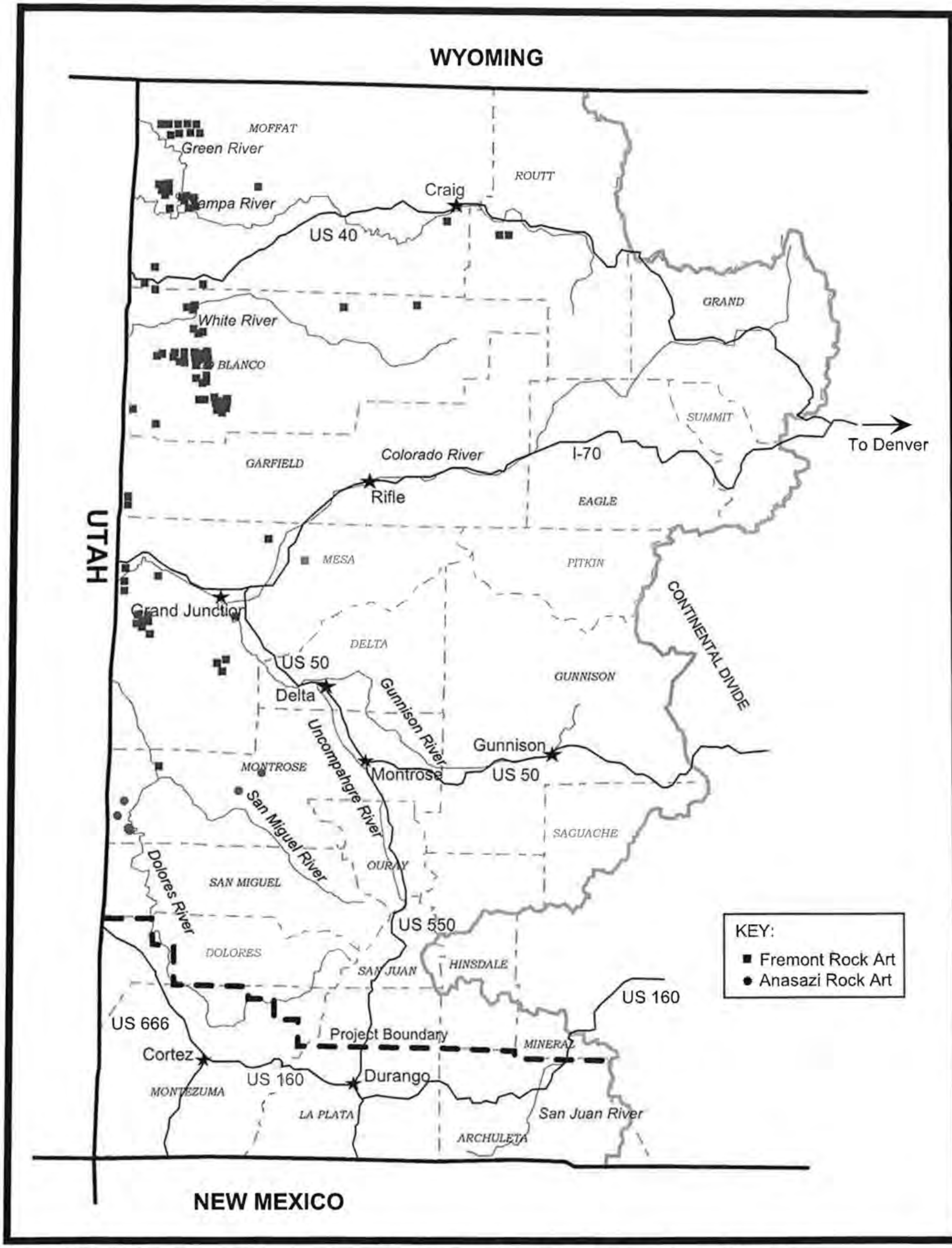

Figure 7-6. Distribution of rock art assigned by site recorders to Fremont and Anasazi traditions.

for these sites; the reader is referred to the prehistoric context document prepared for the Southern Colorado Basin for detailed information on the Anasazi. One or more of the following attributes characterizes the Anasazi sites in the project area.

- Distinctive gray ware, white ware, red ware, and polychrome ceramic traditions after the Basketmaker II period.
- Early pit structures with considerable homogeneity of intramural features, such as antechambers, wingwalls, and sipapus.
- Universal use of kivas for social integration and possibly for ceremonial functions.
- Complex late residential sites, with kivas and rectangular room blocks, sometimes representing multistoried structures.
- Highly patterned residential site layout, with room blocks north of pit structures and middens south of pit structures.
- Water control structures such as canals, reservoirs, check dams, and terraces.
- Complex intraregional relations, with Chaco outliers, Chaco roads, and hierarchical distribution of site types of varying complexity.

Five of the eight structural Anasazi sites in the Northern Colorado Basin are in La Plata County, and three are in Dolores County. Of the architectural sites in La Plata County, three are attributed to the Basketmaker II period, and two are classified as Basketmaker III. The Dolores County sites are attributed to the Pueblo I and II periods. These eight sites are in relatively high elevation zones and probably represent frontier outliers associated with exploitation of mountainous resources.

One structural site, the Tamarron site (5LP326) has been excavated. Situated in the Animas Valley north Rockwood, the Tamarron site revealed a habitation structure similar to those investigated by Morris and Burgh (1954) at Talus Village a few kilometers to the south. The floor was shallowly excavated into a hillslope, and the superstructure consisted of cribbed logs (Reed and Kainer 1978). Floor features included rock-filled basins and slab-lined cists, one of which contained a human burial. Burned fragments of a second human burial were scattered on the floor of the structure. A few corn pollen grains were found. Plant macrofossils consisted of wild or ruderal species. Faunal remains included trout, mule deer, bighorn sheep, marmot, and cottontail bones. Although chronometric dating was unsuccessful, similarities between the Tamarron site and Talus Village clearly indicate Basketmaker II affiliation.

Site 5DL896 in the West Dolores River valley may also be a Basketmaker II site. This apparently nonstructural, aceramic site was excavated by Nickens and Associates in 1987. The site's primary component was chronometrically dated between A.D. 130 and 430, coeval with the Basketmaker II period (Reed and McDonald 1988). Numerous corner-notched arrow points were found that were similar to arrow points found at the Tamarron site. A crusher and a notched bone artifact recovered at the site provided evidence of Anasazi affiliation. No evidence of cultigens was found. Numerous elk, deer, and porcupine bones were recovered; these, in addition to the numerous arrow points, indicated emphasis upon hunting.

Relatively low densities of nonstructural sites with Anasazi ceramics have been found in the San Juan National Forest and other mountainous areas in the southern portion of the study area (e.g., McDonald 1998; Zier 1977). These sites are generally attributed to hunting and gathering activities by either the Anasazi or by other peoples that obtained Anasazi ceramics by either trading or raiding. Duke (1998) suggests that the nature of mountain utilization by the Anasazi may have changed through time. According to Duke, the Anasazi may have directly utilized the mountains during the Pueblo I period, possibly in response to environmental stress in the lower elevations. Direct utilization may have been replaced by material exchange with indigenous, nonhorticultural mountain peoples during the Pueblo II period, as a result of increased Anasazi sedentism (Duke 1998:9.9). The nature of cultural contact along the northern frontier of the Anasazi homeland is an important research topic.

Cole (1987, 1990) has examined the distribution Anasazi rock art in west-central Colorado. According to Cole (1990), Anasazi rock art is found over a broad area on the Colorado Plateau south of the Colorado River. Five rock art sites are attributed to the San Juan Anthropomorphic style, a style believed to date between 100 B.C. and A.D. 700 (Cole 1987:127). One of these sites is on the lower Gunnison River, and the others are in the San Miguel and Dolores canyons. Rock art at Tabeguache Cave I is attributed to the San Juan Anthropomorphic style (Cole 1987). Cole (1987:131) evidently sees an intermingling of San Juan and Uncompahgre complex styles and suggests cultural relation between the makers of the two styles. Cole (1987) attributes eight sites in west-central Colorado to the Abajo-LaSal Anasazi Rock Art style. This style, dated between A.D. 600 and 1200 and common in east-central Utah, was evidently produced in southwestern Mesa County and western Montrose County. Cole (1987:133) perceives the Abajo-LaSal Anasazi Rock Art style as somewhat distinctive from other Anasazi styles, reflecting the degree of other regional differences in material culture. She believes, however, that a separate cultural development is not evidenced by rock art data, and suggests instead that west-central Colorado had "limited or peripheral Anasazi developments" that began with the Basketmaker II period (Cole 1987:145).

In summary, the regional database suggests that Anasazi artifacts are widely but sparsely distributed across the Colorado Plateau portion of the Northern Colorado Basin. Rock art panels with Anasazi rock art styles are uncommon but evident south of the Colorado River. Although Cole, among others, interprets the presence of Anasazi rock art as evidence of Anasazi occupation, other interpretations are also tenable, as is discussed below in the section on the Gateway tradition. Undoubtedly Anasazi structural habitations are rare and are restricted to the vicinity of the study area's southern boundary. Because the cultural affiliation of Formative-era structural sites in the area well north of the Anasazi homeland, as traditionally perceived, remains a topic of debate, a model of Anasazi settlement of the region is presented below.

Anasazi Occupation of West-Central Colorado

The concept of a "peripheral" Anasazi culture characterizing the northern frontier of the Anasazi homeland developed prior to the definition of the Fremont culture. With the definition of the Fremont, the concept largely disappeared except in east-central Utah and west-central Colorado, where sites could not be readily attributed to either the Fremont or the Anasazi (e.g., Pierson 1981). Because there are Anasazi artifacts and rock art styles in west-central Colorado, it may be hypothesized that the Anasazi tradition extended farther to the north than commonly thought.

The Anasazi may have settled west-central Colorado during the Pueblo II period, which dates between A.D. 900 and 1100. In the Four Corners region, this was a period of settlement of moderate and low elevation areas, as the climatic conditions compelling a Pueblo I period settlement of the region's higher elevations ameliorated. Many areas of the Southwest show an increase in site quantities during the Pueblo II period, which may indicate increased populations, more intense use of field houses in areas distant from primary residences, or both (see Reed 1998). Anasazi settlement of west-central Colorado, then, may have been driven by a need to maximize use of areas with great horticultural potential, even outside the traditional Anasazi homeland. This may have occurred primarily in tenth century. According to Mark Varien of the Crow Canyon

Archaeological Center (personal communication 1999), southwestern Colorado is characterized by a relative paucity of tree-ring dates for the period between A.D. 890 and the late 900s, possibly indicating large-scale group movements. This model of Anasazi immigration to west-central Colorado has the following test implications.

- Sites in west-central Colorado yielding corn that date either prior to A.D. 900 or after A.D. 1100 will not evidence Anasazi architecture or other cultural elements that cannot be explained by trade.
- Architecture typical of the Pueblo II period should be evident in west-central Colorado.
- Anasazi rock art should be present in west-central Colorado.
- Regional architectural sites should evince a reliance on horticulture at levels similar to those at Pueblo II period sites in the conventional Anasazi homeland.
- West-central Colorado Formative-era sites should yield almost exclusively Pueblo II period Anasazi ceramics.
- Human skeletal remains from west-central Colorado should evidence more genetic similarities with Anasazi populations than with Fremont or other populations.

Regional archaeological data support some, but not all, of these test implications. Most of the Formative-era sites in the study area that have ceramics yield exclusively Anasazi ceramics. Anasazi ceramics are generally found in relatively low frequencies, however, and there is no evidence of pottery manufacture in the region. The predominance of Anasazi ceramics comprises the most compelling evidence for Anasazi use of the region. Anasazi rock art is also documented in the study area. Cole (1990) has recognized Basketmaker and Pueblo styles in the region. Regional data strongly suggest that Anasazi occupation of the area was restricted to the Pueblo II period. Although there is evidence of early appearance of corn in west-central Colorado, at times coincident with the Basketmaker II and III and Pueblo I periods, architectural styles characterizing these periods in the southwestern corner of the state are absent in the study area. Pueblos and pit structures typical of the Pueblo III period are also absent. Regional data fail to support other test implications, however. Typical Pueblo II architectural structures are absent. Cottonwood Pueblo and Tabeguache Pueblo are among a small number of sites with rectangular masonry rooms, but the layout of the structures is atypical of the Pueblo II period (Figure 7-7). Cottonwood Pueblo has a substantial masonry wall that encloses a large plaza, which is uncommon at Pueblo II sites. Most importantly, however, the west-central Colorado sites consistently lack kivas, which are almost universally found at primary residential sites in the Four Corners region. Limited regional data also suggest important subsistence differences between the west-central Colorado Formative-era structural sites and typical Pueblo II sites. Crane (1977) suggests that Weimer Ranch settlements evidenced relatively minor emphasis upon horticulture. Although data do not permit comparison of the percentages that corn comprised of the diets of the regional occupants, the differences seem significant. Too few data are available on west-central Colorado skeletal populations to permit comparisons to other populations.

In short, it appears that the archaeological evidence from west-central Colorado does not support the existence of a bona fide Anasazi occupation. The degree of cultural continuity characterizing Anasazi culture over broad areas of the American Southwest makes it untenable to maintain that a diluted form of Anasazi culture existed such a short distance from the Anasazi homeland, especially considering similarities in environments.

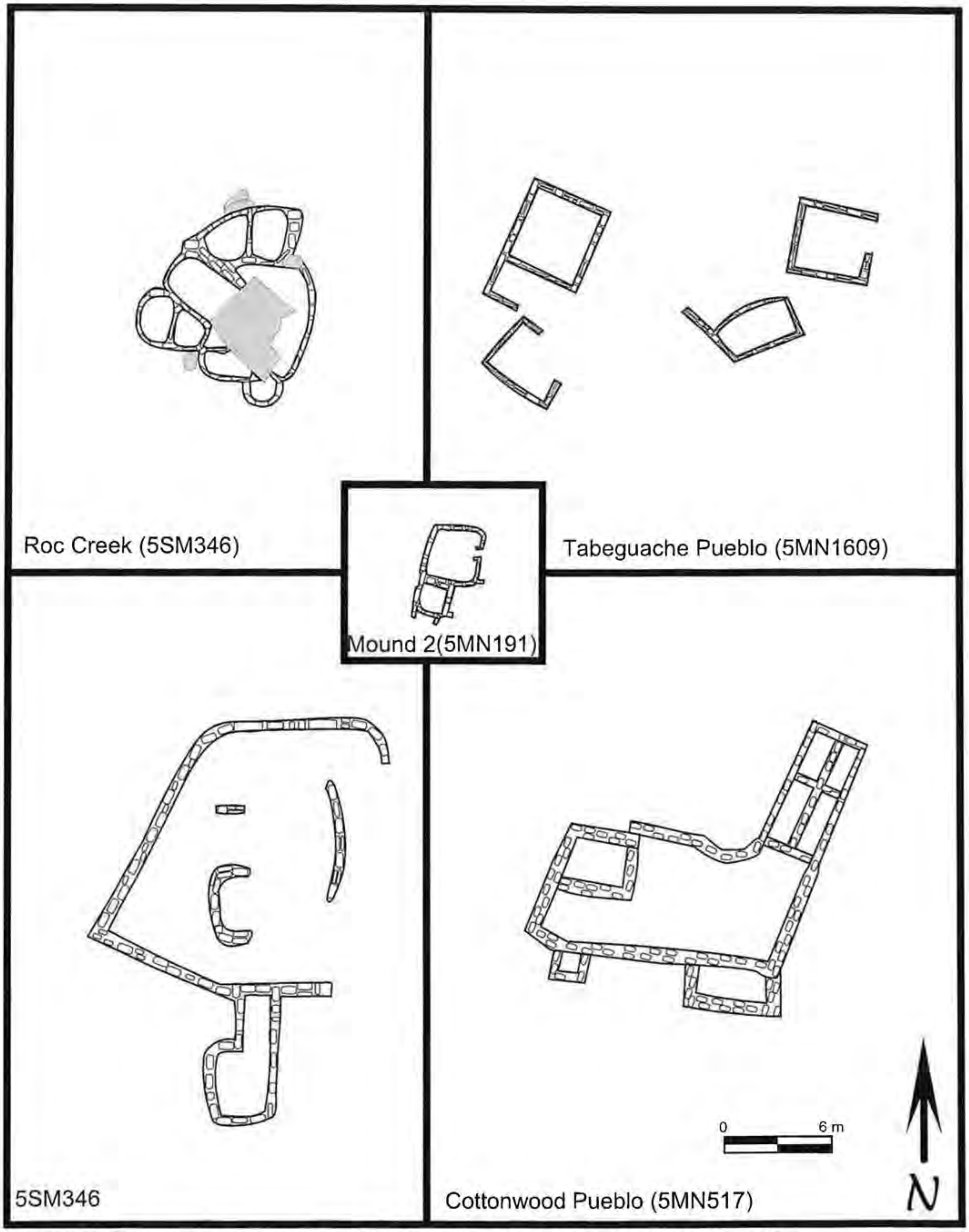

Figure 7-7. Examples of substantial structures in western Montrose and San Miguel counties.
All are drawn at the same scale.

FREMONT TRADITION

Much of central and northern Utah, as well as adjacent portions of western Colorado, was the locus of the Fremont tradition. Initially perceived to represent as much internal cultural homogeneity as the Anasazi, further archaeological research has established that the Fremont unit was characterized by considerable variation, leading to the recognition of regional variants, such as the Uinta, San Rafael, Great Salt Lake, Sevier, and Parowan Fremont (Marwitt 1970). The degree of variation led some archaeologists to reject the Fremont tradition. Madsen (1979) considered the subsistence strategies of the groups commonly referred to as the Fremont and suggested that the traditional Fremont concept be dropped in favor of three archaeological units: Fremont, Sevier, and an unnamed Plains-derived culture of the Uinta Basin. The concept of the Fremont has endured however, though variation has become one of its defining characteristics. In its present usage, the Fremont provides reference for groups north of the Anasazi homeland that relied on horticulture to greatly varying degrees and that shared the following four attributes, as defined by Madsen (1989:9-11):

- One-rod-and-bundle basketry construction
- Moccasins constructed from the hock of a deer or mountain sheep
- Artistic representations, as either clay figurines or rock art motifs, of trapezoidal anthropomorphs with elaborate ornamentation
- A distinct coiled pottery tradition

As Madsen (1989) notes, these attributes often do not occur together within a single component. Basketry and moccasins are perishable and are seldom found on open sites. Elaborate, trapezoidal figurines are uncommon, and associations between rock art figures with Fremont characteristics and archaeological deposits are difficult to establish. This leaves pottery as a particularly important diagnostic element, especially at open sites. The criteria here for assigning sites to the Fremont tradition vary by region. In regions where Fremont affiliation is uncontested, such as in northwestern Colorado, group assignments are more freely made, because the implications of classification error are less substantial. In areas such as western Montrose County, however, where cultural affiliation of Formative-era sites is debated, higher standards are implemented for unit assignments. Open sites in western Montrose County must either yield Fremont pottery types or consist of rock art motifs widely accepted as Fremont.

Evidence of the Fremont tradition is concentrated in three noncontiguous areas in western Colorado. The largest of these, where the evidence is the most tenable, is in the Douglas Creek/Dinosaur area in western Rio Blanco and Moffat counties. The extent of Fremont occupation can be estimated by inspection of Figure 7-4, which depicts the distribution of Fremont ceramics, as indicated by the OAHP database. A second area where Fremont components appear concentrated is in the Glade Park area, southwest of the city of Grand Junction, on the northern end of the Uncompahgre Plateau. The Little Dolores River drains this area. The distribution of the Fremont in the Glade Park area is primarily defined by distributions of Fremont rock art styles. The third area of possible Fremont occupation is in western Montrose County, where several sites with possible Fremont sherds have been found, including one site with possible Fremont pit structures. Because the nature of Fremont occupation appears so variable between the three areas, ensuing discussions of the Fremont occupation of the Northern Colorado Basin are segregated by area.

Quality of the Database

Western Montrose County

The archaeological excavation database for Fremont sites in western Montrose County is meager and of particularly poor quality. Sites dating to the Formative era with substantial architecture, pottery, and evidence of cultigens are relatively uncommon in the region. Several have been excavated by professional archaeologists, however, but most of these investigations occurred in the 1930s and early 1940s, when research objectives were different and before many now-commonplace specialized studies were developed. Other important Formative-era structural sites were investigated in the 1970s by Metropolitan State College under the direction of Dr. Jiri Vondracek. The results of these investigations are generally poorly reported, and many analytical methods are suspect. The only bright spot in the project is Cathy Crane's Master's thesis from Eastern New Mexico University, a brief version of which was published in *Southwestern Lore*, which provided the project's only written record (Crane 1977, 1978). The overall poor quality of archaeological excavation data has greatly limited our understanding of the region's structural Formative-era sites.

Sites with ceramics and masonry are relatively rare in west-central Colorado, so they tend to be highly visible and well known to the local population. Locals have brought many of these sites to the attention of professional archaeologists, which has led to the excavation of a substantial number of these sites by archaeologists. Unfortunately, as discussed above, many of the professional excavations were poorly conducted or poorly reported. Local familiarity with structural sites has also led to vandalism at many of the sites. The ability to clarify many of the questions regarding the horticulturists of western Montrose County through future, controlled excavations has been seriously undermined.

Glade Park Area

The Fremont database for the Glade Park area consists almost entirely of rock art. Excavations in the vicinity have yet to produce unequivocal evidence of Fremont occupation, though radiocarbon dates coeval with the Fremont tradition have been obtained and components with corn have been identified (Wormington and Lister 1956). The Fremont rock art styles are adequately recorded and appear to be properly interpreted as Fremont. Many of the anthropomorphs are characterized by lobed heads, elaborate ornamentation, and trapezoidal bodies (e.g., Greubel et al. 1998), characteristics of Fremont styles. Schaafsma (1971) and Cole (1987, 1990) have published interpretations of the Fremont rock art of Glade Park.

Douglas Creek/Dinosaur Area

The quality of the database for the Fremont tradition in the Douglas Creek/Dinosaur area is considerably better than it is for western Montrose County, and is considerably larger than either the western Montrose County or the Glade Park area database. The OAHP database lists more than 300 Fremont sites in Rio Blanco and Moffat counties, including 25 with Fremont ceramic types. As discussed below, eight excavated sites have yielded chronometric dates contemporaneous with the Formative era in association with artifacts diagnostic of the Fremont tradition. These eight Fremont components have been subjected to between 15 m^2 and 77 m^2 of excavation, suggesting that investigations have generally been extensive enough to adequately characterize the Fremont components. The eight sites have been excavated since 1980, and thus have been subjected to most modern analytic techniques. The quality of reporting is variable, but adequate.

Fremont-Tradition Sites

Western Montrose County

Evidence of a Fremont occupation in western Montrose County is scant and ambiguous. Fremont rock art has not been identified in the area (Cole 1990), and no trapezoidal figurines with elaborate ornamentation have been documented. One-rod-and-bundle basketry has been found at Tabeguache and Dolores caves (Hurst 1940, 1942, 1947), but low numbers of highly portable artifacts can be dismissed as trade items, especially when other diagnostic artifacts are absent. Huscher and Huscher (1943:67) report that they saw a "Fremont River (variant) moccasin" with a one-piece upper and with dewclaws intact in a private collection from the Dolores River drainage. Fremont ceramics are reported at several sites (see Figure 7-4), but in some cases, identifications should be viewed with skepticism.

Two excavated sites have yielded ceramics attributed to the Fremont. Crane (1978:79) reports finding Emery Corrugated and Emery Gray sherds at the Roc Creek site (5MN367) in western Montrose County during an excavation project by Metropolitan State College. The site consisted of eight contiguous, oval masonry rooms built around a large boulder. Pottery temper consisted of crushed igneous rock. Because the temper material was similar to that of the Mesa Verde region, Crane (1977:79) questioned the utility of the artifacts in determining cultural affiliation. Madsen (1977) writes that corrugated Emery Gray ceramics are rare; this, coupled with the discovery of corrugated Anasazi sherds at other sites in the area, implies that the corrugated sherds at Roc Creek may be Anasazi. The classification of the plain gray sherds from the site is also moot because they were not, apparently, classified by a trained ceramist and are not adequately described in the literature. SDSU and CC archaeologists reportedly recovered Fremont ceramics at site 5MN191, the Paradox 1 site, where pit structures and surface structures were found (Kasper 1977). Unfortunately, these artifacts were never described in print because an accidental fire destroyed them (McMahon 1997).

The authors of this context are reluctant to accept the Roc Creek site as Fremont because of serious questions about the ceramic classifications and because the site's architecture is atypical of Fremont architecture. The Paradox 1 site, however, may represent a Fremont occupation, and as such, is the only excavated Fremont site recognized in the study area. Coombs Cave (42GR383), recently excavated across the state line in Utah, has apparently yielded Fremont ceramics, corn, beans, squash, and gourds, and evidence of agricultural terraces (Fawcett 1996); it, too, may represent a Fremont occupation.

The Paradox 1 site covers much of the top of a knoll referred to as Wray Mounds. Jeancon and Roberts first investigated the site in 1924, focusing on several noncontiguous, rectangular surface structures in the northern portion of the site (McMahon 1997). The structures were interpreted as Anasazi "summer homes," or in today's terminology, as field houses, based on architecture and on the discovery of pottery similar to that found on Anasazi sites in the southernmost portion of the state. Woodbury and Woodbury (1932) conducted further excavations at masonry surface rooms atop Wray Mounds in 1931. At least one investigated structure was comprised of contiguous rectangular rooms. Ceramic artifacts recovered in the surface structures were Pueblo I and II period Anasazi varieties. In 1970, SDSU and CC personnel, under the direction of Lois K. Lippold, excavated five blocks at the site in the general area as the Woodburys' excavations. One excavation block was in a midden. Architecture was revealed in three excavation blocks. In one excavation block, designated Unit 1, a pit structure was found that was apparently overlain by a later surface masonry structure. Two pit structure habitations were found in each of two other excavation blocks, designated Units 2 and 3. In Unit 2, a tunnel connected the two pit structures. Multiple surface storage structures were found just west of the pit structures in

Unit 2. SDSU and CC archaeologists interpreted the masonry surface structure in Unit 1 as a Pueblo I-II period Anasazi room block with two or more rooms, situated over a Basketmaker III pit structure (Kasper 1977). The surface structure apparently yielded Anasazi ceramics, whereas the two pit structures in Excavation Unit 2 yielded Fremont ceramics (Kasper 1977). As mentioned above, this cannot be substantiated because the artifacts and most of the associated literature have been destroyed. The temporal relationship between the various pit structures and the surface structures cannot be determined, though the superimposition of one surface structure over a pit structure indicates that at least one pit structure precedes the surface structure.

Few architectural details are available for the pit structures. McMahon's (1997) report on the site, however, includes several photographs recently obtained from Larry Leach of San Diego State University. Although the photographs are not labeled with provenience information, more than one pit structure is apparently represented. Based on observation of these photographs, it appears that the pit structures are circular, between 3 and 5 m in diameter; have clay-lined central hearths; and subfloor storage features. In some cases, the base of the wall is lined with vertical sandstone slabs. The slabs were reportedly covered by adobe or plaster (Kasper 1977). Wall height appears to exceed 1 m in some pit structures. Internal roof supports, presumably posts, are also reported (Kasper 1977).

Because thorough descriptions and maps are unavailable for the pit structures, it is difficult to compare and contrast their attributes to those of other excavated structures. The architectural details discernible from the photographs, however, suggest more similarity with San Rafael Fremont pit structures than with Anasazi pit structures. The Paradox 1 pit structures appear to lack antechambers and wing walls, unlike Basketmaker III and some later Anasazi habitation structures. Unlike Pueblo I pit structures, the Paradox 1 examples are round and lack wing walls, ventilator tunnels, and benches. The structures clearly lack Pueblo II and III period kiva attributes. Residential pit structures dating to the Pueblo II and III periods not classified as kivas generally evidence considerable variation, but often retain some of the aforementioned Anasazi pit structure characteristics (Reed 1998). The absence of Anasazi pit structure attributes and the prevalence of clay-lined central hearths and slab-lined wall bases best supports affinity with the Fremont culture (see Jennings 1978; Marwitt 1970).

The available data on the Paradox 1 site suggest that two components are present. The Fremont component, consisting of pit structure habitations, is the earliest. Assuming that the ceramics purported to be Fremont are correctly classified, the Fremont component probably dates sometime between A.D. 700 and 1200 (Madsen 1977). The site's later component, represented by rectangular masonry surface rooms, of which one is superimposed over a pit structure, apparently yielded Pueblo I or II Anasazi ceramics. Because Pueblo II ceramic assemblages commonly comprise considerable quantities of plain gray, which may be mistaken for indication of an early Anasazi occupation, and may have small frequencies of earlier pottery types, it is likely that a Pueblo II period occupation is represented, dating sometime between A.D. 900 and 1100. A tree-ring specimen submitted to the University of Arizona Laboratory of Tree-ring Research permits refinement of the chronology of the later component. The specimen, apparently from Mound 2, yielded a tree-ring date of A.D. 725-1024 v, indicating site occupation a few years after A.D. 1024 (see McMahon 1997). This suggests that the Fremont component dates sometime between A.D. 700 and 1000. The site's later component is considered *not* to be Fremont, because of the lack of evidence of Fremont ceramics and other artifacts identified by Madsen (1989) as diagnostic of the Fremont culture. As discussed below, the later component is attributed to the Gateway tradition.

Glade Park

Although ample evidence of Formative-era occupation is present in the Glade Park area, Fremont affiliation is clearly evident only at rock art sites. Cole (1987) has identified 12 Fremont rock art sites in the Glade Park area and states that all but one represent the Classic Vernal style. The Sieber Canyon rock art style has also been identified in the Glade Park area (Conner and Ott 1978), but it is considered by Cole (1987) to represent a local variation of the Classic Vernal style.

The cultural affiliation of other types of sites is more difficult to determine. Archaeological inventories in the Glade Park area have found sites with Uinta Side-notched and Bull Creek projectile points — types generally attributed to the Fremont — as well as sites with the less diagnostic Rosegate point series (Conner and Langdon 1987). Sites with masonry architecture, interpreted as habitations and granaries and attributed to the Fremont, have also been found in the Glade Park area on archaeological surveys (Greubel et al. 1998). Fremont ceramics, however, appear to be absent. Excavations, though few, have not yielded unequivocal evidence of Fremont site affiliation. Fremont ceramics, pit structures, or elaborate clay figurines have not been discovered, though Formative-era components, some with corn, have been investigated (Wormington and Lister 1956).

In summary, the Glade Park area has Formative-era components, some of which evidence horticultural practices. Granaries and masonry habitation structures are present in low quantities but have not been investigated and are not clearly attributable to the Fremont tradition. Low quantities of Fremont-style projectile point are known, but Fremont ceramics are extremely scarce or absent. Because Fremont rock art styles are known from the Glade Park area, it appears most likely that local Formative-era components are associated with the Fremont tradition.

Douglas Creek/Dinosaur Area

Approximately 300 sites recorded in western Moffat and Rio Blanco counties have been attributed to the Fremont tradition. Site file data suggest that only 25 or so have yielded Fremont ceramics, so some classifications are clearly more tenable than others. Sites types recorded in the Douglas Creek/Dinosaur area include rock art, open and sheltered artifact scatters, and open and sheltered architectural sites. Most of the sheltered architectural sites represent granaries. These structures are masonry or, less frequently, jacal or adobe (Wenger 1956; Baker 1997). Open architectural sites are relatively uncommon and include substantial masonry structures, such as the Texas Creek Overlook site, 5RB2435 (Creasman and Scott 1987). Baker (1992a, 1995, 1998a, 1998b) has reported rather tenuous ephemeral brush structures at excavated open sites. No undoubted Fremont pithouses have been excavated in the Douglas Creek/Dinosaur area. Baker (1998a) tentatively identified a pit structure at the Rim Rock Hamlet Promontory site (5RB2792), but the authors here believe that the feature's attributes are not sufficiently patterned to indicate an undoubted pithouse. Truesdale (1993a) reported finding a Fremont pithouse in a 1 x 1 m test unit at site 5MF2645 in Dinosaur National Monument, but here, too, the reported evidence is not entirely convincing. Creasman (1981) found vertical slab features at site 5RB685 in the Douglas Creek area that were thought to possibly represent a pit structure, but the site has not been excavated. Personnel from the University of Colorado excavated several Fremont pit structures a few kilometers to the west in the Utah portion of Dinosaur National Monument, so it is certainly plausible that Fremont pit structures are present in the study area (Breternitz 1970). Rock art sites are relatively common and contain styles similar to both the Uinta and the San Rafael Fremont variants (Cole 1987).

Eight sites have been excavated in the Douglas Creek/Dinosaur area that have yielded both chronometric dates and artifacts diagnostic of the Fremont tradition (Table 7-1). These include rockshelters such as Duffy Shelter (5MF435), Burke Rockshelter (5RB123), and White Rockshelters (5RB2829); and open sites such as Sky Aerie Promontory Charnel site (5RB104), Texas Creek Overlook (5RB2435), Rim Rock Hamlet Promontory (5RB2792), and Sandshadow Shelter (5RB2958).

Table 7-1. Dated Components with Diagnostic Fremont Artifacts.

Site No.	Radiocarbon Calibrated Range	Diagnostic Artifacts	Reference
5MF435	A.D. 542 – 689 A.D. 659–974	Uinta Gray sherds; Rosegate, Desert Side-notched, Uinta Side-notched, and Elko Corner-notched points	Arthur et al. 1981
5RB104	A.D. 885–1035 A.D. 895–1115 A.D. 880–1170 A.D. 790–1010	Douglas Arch Gray sherds; Rosegate and Desert Side-notched points	Baker 1998b
5RB123	A.D. 148–688 A.D. 5–786	Salt Lake Gray sherds	Zier and Jepson 1991
5RB2275	A.D. 898–1256	Unidentified gray sherds; Desert Side-notched, Rosegate, and Cottonwood Triangular points	McPherson 1983
5RB2435	A.D. 1414–1631	Uinta Gray sherds and Cottonwood Triangular points	Creasman and Scott 1987
5RB2792	A.D. 25–450 A.D. 615–875 A.D. 885–1035 A.D. 875–1010 A.D. 875–1025	Douglas Arch Gray sherds and Rosegate points	Baker 1998a
5RB2829	A.D. 782–1012 A.D. 609–1014 A.D. 667–1026 A.D. 718–1011 A.D. 885–1249	Unidentified gray sherds and Rosegate points	Hauck 1993
5RB2958	A.D. 1041–1291 A.D. 665–1011 A.D. 785–1162 A.D. 437–666 A.D. 544–776 A.D. 639–968 A.D. 1295–1611	Unidentified gray sherds and Rosegate points	Baker 1995

Particularly Important Sites

Western Montrose County

Sufficient evidence exists to attribute a single site in western Montrose County to the Fremont tradition. This is the privately owned Paradox 1 site (5MN191). Although the site has a long history of archaeological investigations and other cultural impacts, it is likely to retain important buried cultural deposits, especially in the form of additional pit structures. Controlled, state-of-the-art investigation of such deposits is likely to provide important insight into Fremont variability and may explain the existence of an apparently isolated outpost so far from the Fremont homeland.

Glade Park

Because no undoubtedly Fremont sites have been excavated in the Glade Park area, sites of highest concern include unexcavated sites potentially associated with the Fremont tradition. Sites with possible masonry habitation structures are likely to yield the richest and most diverse artifact samples, and so are most likely to yield diagnostic artifacts in well-dated contexts. Structural sites possibly affiliated with the Fremont occupation include 5ME11328, 5ME11352, and 5ME11355 (Greubel et al. 1998). The 12 Fremont rock art sites described by Cole (1987) in the Glade Park area are also important resources, as they comprise firm evidence of Fremont use of the area. These sites include one unrecorded site and sites 5ME10, 5ME13, 5ME458, 5ME465, 5ME529, 5ME538, 5ME540, 5ME677, 5ME724, 5ME792, and 5ME5174.

Douglas Creek/Dinosaur Area

The eight excavated sites listed in Table 7-1 are particularly important sites in the Douglas Creek/Dinosaur area because they have yielded artifacts clearly diagnostic of the Fremont tradition in contexts that have been chronometrically dated. Most probably retain intact cultural deposits suitable for future investigation. The Texas Creek Overlook site (5RB2435) is, perhaps, the most important site of all, because it is one of few sites in the region representing the very late Fremont occupation of the region. Moreover, the report describing the excavations at the site synthesized the small volume of data from other regional sites indicative of a very late Fremont occupation of the area, and helped to gain acceptance of the concept that the Fremont occupation extended beyond the thirteenth century (Creasman and Scott 1987). The Sky Aerie Promontory Charnel site (5RB104) is also particularly important because it has yielded significant information on Fremont human remains. One individual from the site had a hole drilled in a tooth well before death, which represents one of few incidents of prehistoric dentistry (Baker 1998b). Most of the human bones at the site were disarticulated, and three skulls were clustered about a hearth. In his draft report, Baker (1998b) suggests that the human remains were cannibalized. Although not all of the experts who examined the skeletons concur with Baker's conclusion, the site's data should inspire further review of Fremont skeletal populations.

Sites yielding Fremont ceramics should also be regarded as particularly important sites. Fremont ceramics constitute the strongest evidence of Fremont affiliation. Furthermore, the range of variation of Fremont ceramics is not well understood. Hauck (1993) has defined a new Fremont ceramic type, called Douglas Creek Gray, that is characterized by sand temper. Douglas Creek Gray has appeared at several sites in the region (Baker 1998a; Hauck 1993). Other archaeologists and ceramists should evaluate this new type.

Modeling the Fremont Occupation

Space/Time Systematics

Perhaps no other archaeological unit has inspired so much criticism as the Fremont. These criticisms arose in response to the realization that the Fremont tradition was characterized by far more variation than intended when the unit was first defined, which greatly diminished the unit's utility. To better describe the range of variation, regional variants have been defined, such as Marwitt's (1970) Great Salt Lake, Uinta, San Rafael, Sevier, and Parowan Fremont units. Although such variants have been widely used, they too have been subjected to substantive criticism (Madsen 1980). Concerned that even these relatively broad archaeological units might obscure variation in the archaeological record, Simms (1994) has cautioned archaeologists about the shortcomings of archaeological units. In spite of Simms' caveats, however, archaeological units, such as the Fremont and its geographical subdivisions, remain useful for communication about the archaeological record, to both other professionals and to the general public. Synthetic efforts rely on archaeological units to reference cultural change and continuity.

Investigation of the Fremont tradition in the Northern Colorado Basin has the potential to permit analysis and refinement of Fremont archaeological units. Colorado represents the periphery of the area once inhabited by the Fremont, and appears, for the most part, to have been unintensively occupied. Such adaptations represent an important aspect of Fremont behaviors, which can contribute to our understanding about Fremont and the utility of extant archaeological units.

Western Montrose County

With a sample of one excavated but poorly reported Fremont site in western Montrose County, it is premature to evaluate the utility of specific Fremont archaeological units.

Glade Park

Because so few data are available about the Fremont of the Glade Park area, little can be said about the utility of archaeological units. It is likely that data from Fremont components in the Glade Park area will provide insight into the usefulness of units such as the Uinta and the San Rafael Fremont in peripheral areas. The Glade Park area is geographically closest to the area occupied by the San Rafael variant, but rock art styles seem to evidence closest affinity with the Uinta variant (Cole 1987).

Douglas Creek/Dinosaur Area

The Douglas Creek Fremont:

Data collected at Fremont sites in the Canyon Pintado study area along Douglas Creek suggested to Creasman (1981) that the local Fremont adaptations were substantially different from those of the Vernal or San Rafael area. These differences pertain to settlement patterns, subsistence, and rock art. Creasman noted a lack of Fremont village sites in the Douglas Creek area; residential sites were thought to represent singular dwellings. Habitation sites occurred primarily near the mouths of side canyons and often consisted of dry-laid masonry. Middens, when present, were small, suggesting short-term occupations. Relatively few ceramic sites were observed in the Douglas Creek area, further supporting short-term occupation. Beehive-shaped masonry or jacal granaries situated beneath small overhang were commonly found in the Douglas Creek area. The Fremont of the Douglas Creek area were thought to have relied more on hunting and gathering and less on horticulture than the Fremont groups to the west and southwest. Creasman also noted that the Fremont rock art in Canyon Pintado seemed to represent a local stylistic development, which was more similar to San Rafael Fremont rock art than to the Classic Vernal style of the Uinta Fremont. Based on these observed differences, Creasman (1981) defined the Douglas Creek Fremont as a local variant of the Fremont tradition.

Recent Fremont investigations permit assessment of Creasman's Douglas Creek Fremont archaeological unit. These works support Creasman's contention that the study area was primarily occupied on a short-term basis, as evidenced by low quantities of sites with ceramics and the absence of aggregated settlements. With the exception of the very late Fremont Texas Creek Overlook site (Creasman and Scott 1987), recently excavated Fremont habitations have consisted of possible ephemeral brush habitation structures (see Baker 1995, 1998a). Cole (1990:333) seems to agree with Creasman that the rock art of the Canyon Pintado area is different from the Classic Vernal style, supporting definition of the regional variant. Spangler (1995:476), however, asserts that the Douglas Creek Fremont settlement patterns, subsistence practices, and rock art styles are identical to those represented by sites in Utah's Nine Mine Canyon, roughly 110 km (68 mi.) to the west. Spangler does not go so far as to suggest cultural continuity between the Douglas Creek Fremont and the Fremont of the Nine Mile Canyon area, but does suggest similarity in cultural content due to similarity in environmental conditions.

The Douglas Creek Fremont unit appears to have some validity. Because the Fremont culture is regarded as representing a great deal of variability, definition of such units to reflect local adaptations to differing environmental situations will further the understanding of the Fremont tradition. As Spangler (1995) points out, the settlement and subsistence practices and the architecture of the Douglas Creek Fremont are probably not unique. These attributes are probably similar to Fremont sites in Nine Mile Canyon and other areas where conditions were not ideal for intensive reliance on horticulture and population aggregation. Some aspects, however, of the Douglas Creek Fremont may be unique. Steve Baker and F. Richard Hauck have excavated several sites in western Rio Blanco County that have yielded sand-tempered gray ware ceramics (Baker 1995, 1998a; Hauck 1993, 1997). These ceramics, classified into the newly defined Douglas Creek Gray type, appear to be restricted to Rio Blanco County, though this may simply reflect the distribution of recent investigations. The Douglas Creek and the Dinosaur National Monument areas have both yielded evidence of horticultural Fremont occupations dating more recently than A.D. 1300, which may indicate that the general area was the last refuge of peoples attempting to maintain the Fremont lifeway. Whether the Fremont of Colorado's portion of Dinosaur National Monument should be included in the Douglas Creek Fremont unit must be determined by additional studies of rock art, architecture, and distributions of sand-tempered gray ware ceramics. Because the Douglas Creek area may have its own ceramic type and may represent the last homeland of the Fremont, retention of the Douglas Creek Fremont unit seems appropriate.

Phases:

In his recent overview of the archaeology of the Uinta Basin, Spangler (1995) provided a new period sequence that may be useful for the regional expression of the Fremont tradition. Spangler rejected conventional Uinta Basin Fremont phases, such as the Cub Creek and Whiterock phases (Breternitz 1970; Marwitt 1970), because recently obtained chronometric dates indicate that the temporal spans originally suggested for these phases were erroneous. Spangler also rejected the Cliff Creek phase because the single site attributed to the phase did not yield Fremont ceramics, evidence of corn, or other materials commonly associated with the Fremont tradition (Tucker 1986).

Spangler's (1995) phase sequence is comprised of three new periods, termed the Early Fremont, the Uinta Fremont, and the Late Fremont. The Early Fremont period dates between approximately A.D. 1 and 550 and refers to a Basketmaker II-like adaptation. Corn was grown, semipermanent structures were inhabited, and the bow and arrow were used. Ceramics, however, were absent. Because of the hypothesized importance of hunting and gathering during the Early Fremont period, Spangler regards the period as representative of an Archaic lifeway.

The period between A.D. 550 to 1050 is designated the Uinta Fremont period (Spangler 1995). Fremont occupation of the Uinta Basin was most intensive during this period. Substantial residential architecture, corn horticulture, production of gray ware pottery, and human aggregation into small hamlets characterize the Uinta Fremont period, though some degree of hunting and gathering continued (Spangler 1995:479).

The Late Fremont period dates between A.D. 1050 and 1300 (Spangler 1995). He regards this period as largely hypothetical because of the dearth of chronometric dates. No substantial residential sites have been dated to this period in the Uinta Basin, suggesting that horticulture may have been abandoned in favor of hunting and gathering.

Spangler's cultural sequence has its strengths and weaknesses. Because it is a sequence of periods, instead of phases, it can be defined without regard for cultural content, and can be constructed with a relatively small database. The periods, however, appear to reflect cultural developments in the archaeological record, and thus have particular utility. The preceramic Early Fremont period, representing initial horticultural adaptations, has parallels in areas such as Emery County, Utah, where such early Fremont adaptations have been designated the Confluence phase (Greubel 1996), and at the Steinaker Gap site north of Vernal, Utah (Talbot and Richens 1996). At least two sites in the present study area have also yielded corn in contexts dated to the first few centuries A.D., so similar sites may be represented there, too (Figure 7-8). Because sites such as Steinaker Gap show similarities with Fremont culture in spite of being aceramic, the authors are, at this point, inclined to attribute such early horticultural components to the Formative, rather than the Archaic era. Furthermore, it is easier to classify components based on the mere presence or absence of materials such as corn, rather than try to determine the percentage that corn comprised of the diet of various prehistoric peoples. As Spangler suggests, the Uinta Fremont period in the Northern Colorado Basin represents a time of relative reliance on horticulture and the habitation of substantial architectural structures. The Late Fremont period sites in the study area appear to lack substantial architecture, as indicated by Spangler.

Although Spangler's period framework appears useful, the nomenclature is unwieldy. Creasman and Scott's (1987) position is accepted here, with minor reservations, that the Fremont occupation of northwestern Colorado can be traced much later than A.D. 1300 — possibly as late as 1600. A period is needed to reference the Fremont occupation between A.D. 1300 and 1600. Because of the paucity of sites dated to this very late period, and the absence of similar dates in the core area of Fremont occupation, this period is regarded as somewhat tentative; therefore, the authors are disinclined to simply extend Spangler's Late Fremont period an additional 300 years. The very late Fremont occupation should, therefore, be regarded as its own period, which can be subjected to further review. The recognition of a period even later than Spangler's Late Fremont period requires renaming of Spangler's period. The Uinta Basin Fremont period moniker seems inappropriate because subsequent and possibly antecedent periods are no more or no less representative of the Fremont tradition of the Uinta Basin. The authors, therefore, propose that one period be added to Spangler's scheme, and that the periods be named as follows:

Early Fremont period:	A.D. 1 – 550
Scoggin period:	A.D. 550 – 1050
Wenger period:	A.D. 1050 – 1300
Texas Creek Overlook period:	A.D. 1300 – 1600

This period sequence is based upon the following assumptions.

- Components with corn that date between A.D. 1 and 550 reflect continuity with the Fremont tradition.
- Sites dating between A.D. 1050 and 1300 will lack substantial residential architecture.
- Additional Fremont components will be found in the study area that date between A.D. 1300 and 1600.

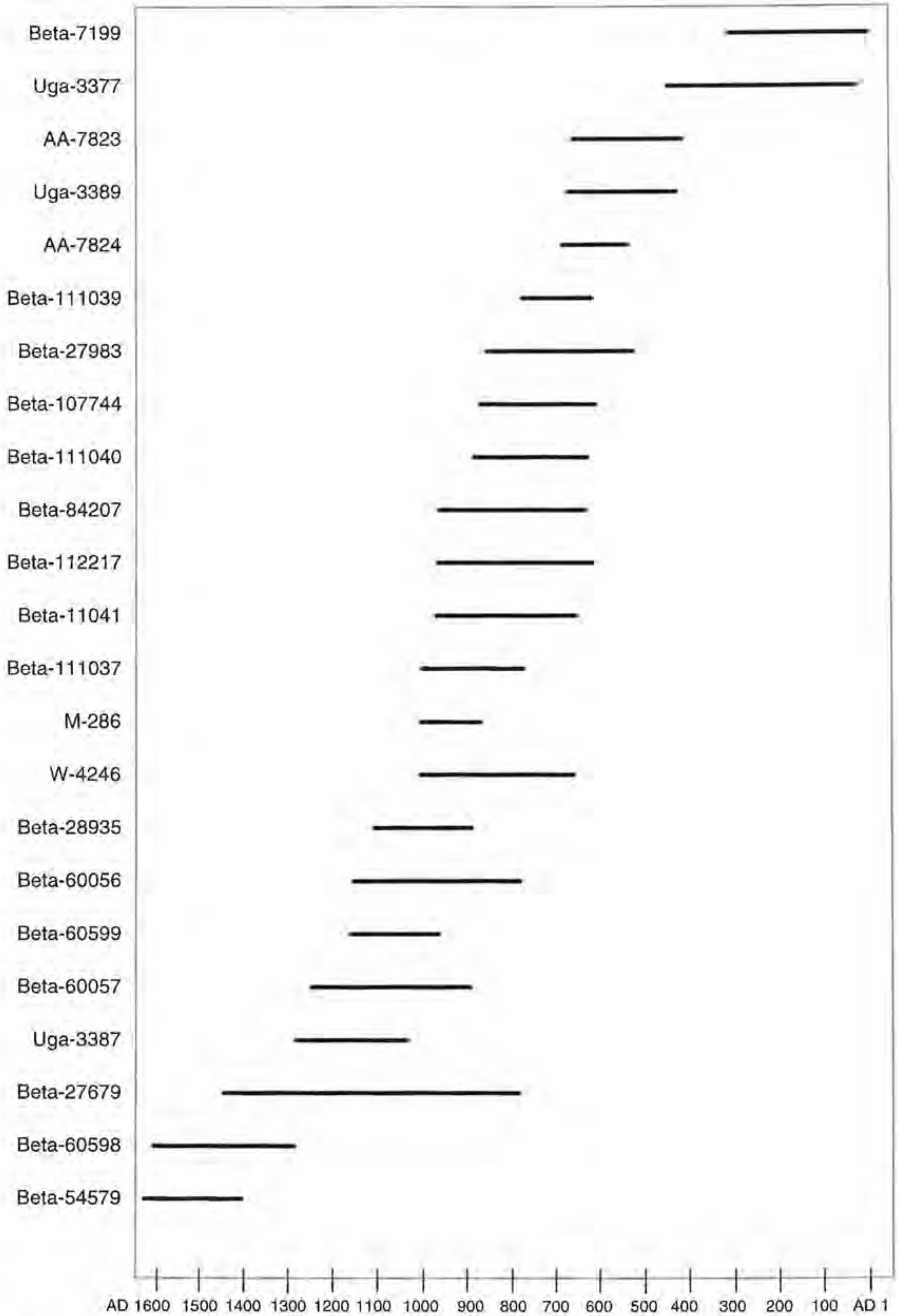

Figure 7-8. Calibrated ranges of Formative-era sites yielding cultigens in Rio Blanco and Moffat counties.

Settlement Patterns

As discussed above, Fremont sites appear to cluster in two, or perhaps, three areas in western Colorado. Fremont sites in all areas are concentrated in the lower elevation zones, as would be expected for peoples incorporating horticulture into their subsistence system. Of the Fremont sites with recorded elevations in the OAHP files, nearly all occur between 1372 m (4500 ft) and 2134 m (7000 ft). If Fremont sites were randomly distributed, they would tend to occur in frequencies proportional to the percentages for nonsite points (Table 7-2).

Table 7-2. Elevations of Fremont Sites.

Elevation Zone (m)	Elevation Zone (ft)	Percent of Area	Percent of Fremont Sites and IFs
Less than 1524	Less than 5000	1	2
1524 – 1828	5000 – 5999	8	56
1829 – 2133	6000 – 6999	28	34
Above 2134	Above 7000	62	8

Western Montrose County

The paucity of sites in western Montrose County that are herein attributed to the Fremont precludes much analysis of settlement patterns. The following two settlement models, however, are amenable for study.

Gilman's Model of Pit Structure Use:

Because the sample of excavated Fremont sites in western Montrose County comprises one site, and its classification is tentative, modeling within most research domains is not feasible. An apparently isolated Fremont site (Paradox 1, 5MN191) with multiple pithouses has implications for settlement patterns, however. Gilman (1987) has examined ethnographic use of pit structures and has identified common elements of settlement and subsistence systems. She found that pit structure use frequently indicated a biseasonal settlement pattern by peoples with a relatively low dependence on agriculture (Gilman 1987:560). With excellent insulation qualities and considerable capacity for resource storage, pit structures represent cold season habitations. Gilman's observations have the following test implications for the Paradox 1 site.

- Fremont components should yield cultigens, but wild plant and animal resources should be well represented.
- As winter habitations, the Fremont components should evince anticipated long-term occupation. The components should, therefore, be characterized by formalized and substantial middens and storage structures, large site size, ornaments, nonlocal artifacts, and other attributes of anticipated long-term habitation (Kent 1992; Reed 1998).
- Faunal remains should be thoroughly processed.
- Faunal fetal remains should indicate winter occupation.

Data excavated at the Paradox 1 site tends to support the test implications listed above, though floral and direct seasonality data are unavailable. As would be expected of a site where the occupants anticipated a lengthy stay, discrete middens are present at the site. Whether these middens are associated with the Fremont or the other Formative-era component cannot presently be determined, however. Substantial storage structures are clearly associated with the Fremont pithouses. Some of these are small subfloor features, but most are large, round masonry surface structures. The capacity of these features is great and would surely support a population for months. Long-term site occupation is also indicated by the faunal assemblages. Kasper (1977) writes that animal bone was relatively abundant, and that large quantities were splintered long bones, evidently processed to extract grease and marrow. Grease would be highly desired at a winter occupation because of peoples' high caloric requirements and because game animals lose body fat over the winter months. With substantial structures, storage features, and possibly middens, winter habitation appears likely and Gilman's settlement model is supported.

Salt Procurement Model:

With present data, the settlement patterns evident in the Paradox Valley during the Formative era are enigmatic. Occupation of the western portion of the valley was relatively intense; Woodbury and Woodbury (1932), for example, recorded 16 "pueblo" ruins in the valley. Moreover, the western end of the valley was apparently the locus of a Fremont pit structure village — the only one identified in western Montrose County, and one of very few in the entire region. Perhaps Formative-era peoples perceived the western end of the valley to be particularly good for farming. It seems more likely, however, that the apparent uniqueness of the settlement pattern is due to the presence a more valuable natural resource — salt. Salt crops out of the Paradox Member of the Hermosa Formation in the Paradox Valley and other nearby salt anticlines, and may also be brought to the surface at local saline springs (Nancy Lamm, personal communication to A. D. Reed, 1998). The availability of salt suggested to Kasper (1977) that it might have been an important trade item. Salt in quantities sufficient to mine or collect tends to be rare on the landscape in most areas, and is uniformly highly desired by people. The proverbial salt mines are archaeological realities in many parts of the world, with great implications for prehistoric exchange systems. The authors join Kasper in speculating that the Fremont component at the Paradox 1 site was established in an area beyond the traditional homeland to control or to exploit local salt resources. This hypothesis has the following test implications.

- Outside the Paradox Valley or similar settings where salt may occur naturally in a manner where it can be collected with prehistoric technology, Fremont sites will be absent in the archaeological record of western Montrose County.
- The material culture of the Paradox 1 site should reflect salt collection or storage.

The key to testing the hypothesis about salt procurement lies in the archaeological deposits of the Fremont component at the Paradox 1 site. The very limited excavation data available for the component makes no mention of mining tools such as digging sticks or an abundance of containers suitable for salt storage. Numerous storage structures with large capacities are associated with the Fremont pithouses, but the excavators did not scrutinize their function.

Glade Park

In a recent cultural resource inventory just west of Glade Park and nearby uplands, Greubel et al. (1998) found that Fremont sites cluster along the Little Dolores River canyon. Fremont sites are also known to occur along major tributaries to the Little Dolores River, such as in Sieber Canyon. Both rock art sites and sites with substantial architectural features are concentrated in the valley settings. According to Greubel et al. (1998), the structural sites tend to occur on benches and ridges above the valley floor. Masonry surface rooms and possible pit structures are present, and some have associated scatters of burned adobe. The structural sites recorded so far lack ceramic artifacts, making determination of cultural affiliation difficult. The occurrence of Fremont rock art in similar settings nearby suggests, however, that the structural sites may be Fremont. That the sites are related to a horticultural unit is suggested by the recovery of a two-hand mano at site 5ME11328 (Greubel et al. 1998). No clear evidence of Fremont utilization of the upland settings was found in the cited inventory, suggesting that Fremont use was concentrated in well-watered areas with high potential for horticulture.

The structural sites found in the Glade Park area appear to represent short-term occupations. The three possibly Fremont structural sites recently recorded by Greubel et al. (1998) were characterized by low numbers of structures, small samples of surface artifacts, no surface ceramics, and no discrete middens. As Kent (1992) points out, sites where the occupants anticipated and realized long-term habitation tend to have formal middens, large site size, and rich and diverse artifact assemblages.

Douglas Creek/Dinosaur Area

Sites in the Douglas Creek/Dinosaur area possibly attributed to the Fremont occupation include ceramic and aceramic open artifact scatters, possible habitation structures, rock art sites, and storage structures. Sites dedicated to storage range from Mantle's Cave (5MF1), where scores of masonry and earthen cists occur in a large alcove (Burgh and Scoggin 1948), to small, isolated overhangs that may contain a single masonry or jacal granary. Storage structures tend to be widely scattered and are seldom clearly associated with habitation sites (Baker 1997). Habitation sites with substantial architecture tend to cluster along major drainages, such as Douglas Creek, and their tributary canyons (see Creasman and Scott 1987). Sites with ephemeral brush structures and nonstructural sites may tend to be more widely dispersed (e.g., Baker 1995).

There seems to be considerable agreement among archaeologists that the Fremont occupation of the Douglas Creek/Dinosaur area of western Colorado was generally by small groups on a short-term basis, with habitation structures restricted to very localized areas. With the possible exception of the Texas Creek Overlook site (Creasman and Scott 1987), structural sites tend to lack well-developed middens, suggesting short anticipated occupation (Creasman 1981; Kent 1992). Ceramics occur in relatively low frequencies, further suggesting high mobility (Spangler 1995:571). Masonry structures usually consist of only one or two structures, and do not appear to represent the degree of aggregation suggested by some of the larger village sites in northwestern Utah, such as Caldwell Village, where more than 20 pit structures were documented (Jennings 1978). Sites with substantial architecture cluster along Douglas Creek and its major tributaries but are absent in nearby areas such as the Texas-Missouri-Evacuation creeks area, the area near Dragon Road southwest of Rangely, and along the White River valley (Gordon et al. 1983; Baker 1992a). Substantial architecture may also be absent in the Colorado portion of Dinosaur National Monument, though Truesdale (1993a) reported finding a possible pit structure in a small test unit.

That the Douglas Creek/Dinosaur area was utilized on a short-term basis by the Fremont is further illustrated by the percentage of nonstructural sites that can be attributed to the Formative era. In Spangler's (1995:517) compilation of radiocarbon dates and associated data from Formative-era sites in northwestern Colorado, roughly twice as many sites lack evidence of pottery, corn, or structures than evince these attributes of horticultural adaptations. This pattern may indicate major reliance upon the hunting and gathering of wild resources (Spangler 1995).

Simms' Model of Fremont Settlement/Subsistence:

The co-occurrence of low numbers of structural sites, which are often associated with ceramics and evidence of horticulture, and nonstructural sites, those with no evidence of corn production or ceramic use, may also indicate that the Fremont engaged in one of the three settlement/subsistence adaptive strategies hypothesized by Simms (1986). As cited by Talbot and Wilde (1989:15), Simms' three Fremont strategies include "(1) localized foraging to supplement horticultural production; (2) a variable strategy represented by periodic shifts between sedentary and mobile settlement; and (3) groups of distinct horticulturists and hunters occupying the same territory." These three models may be evaluated when the following implications are considered.

Localized foraging to supplement horticultural production

- Sites with substantial architecture, evidence of corn, and ceramics should be contemporaneous with sites lacking these attributes.
- Sites associated with a horticultural lifestyle should yield the same types of projectile points as sites associated with wild resource procurement.
- Human skeletal samples from the two sets of sites should reveal similar ratios of stable carbon isotopes.

Periodic shifts between sedentary and mobile settlements

- Sites with substantial architecture, evidence of corn, and ceramics should date to different periods than sites without these attributes.
- Shifts in settlement patterns should be related to periods of paleoenvironmental change.
- The two sets of sites should yield the same types of projectile points or other diagnostic artifacts.
- Human skeletal samples from the two sets of sites may reveal different ratios of stable carbon isotopes, with skeletons from structural habitation sites yielding higher ratios of ^{4}C than skeletons from ephemeral sites. As Coltrain (1993) points out, however, stable carbon isotope studies are poorly suited for identifying short-term fluctuations in diet, because adult bone collagen changes composition very slowly.

Occupation of the same region by distinct horticultural and nonhorticultural groups.

- Sites with substantial architecture, evidence of corn, and ceramics should be contemporaneous with sites lacking these attributes.
- The two sets of sites should yield different diagnostic artifacts.
- Human skeletal populations from nonhorticultural sites should clearly evidence lower ratios of ^{4}C than skeletons from horticultural sites, indicating long-term differences in diet.

Because the sample of excavated sites is small, it is difficult to evaluate which of Simms' settlement models best describes Formative-era data from northwestern Colorado. No stable isotope studies have been completed on human remains from the study area to provide insight into the ratios that ^{3}C and ^{4}C plants comprised of Formative-era diets. Differences in projectile point types cannot be established; both groups yield Rosegate series points. The sample of Uinta Side-notched and other common Fremont projectile point types is too small to determine whether they are solely diagnostic of the Fremont. The radiocarbon data presented by Spangler (1995:517) seem to indicate that horticultural sites and nonhorticultural sites are contemporaneous, and that dates for both groups are interspersed throughout the temporal continuum. Because the data suggest that sites from the horticultural and nonhorticultural groups are contemporaneous and yield similar projectile point types, Simms' model of horticultural groups augmenting their diets through frequent wild and plant procurement forays may be most tenable. If so, the model is likely to be applied only in the general area where Fremont rock art and ceramics occur, where affiliation with the Fremont tradition can be ascribed with some degree of confidence.

Grady's Annual Round Model:

Grady (1980:247) has proposed that the Fremont utilized various elevation zones on a cyclical, seasonal basis. According to Grady's model, the Fremont spent winters in lowland valleys. Corn was planted in or near the lowland valleys in the spring, during which time wild plants and animals in lowland settings were exploited. Fremont peoples would then follow large game into the highlands with the arrival of summer to hunt and gather. With the arrival of fall, groups would collect pinyon nuts and would then return to the lowland valley habitations to harvest corn. Grady's model has the following implications.

- Lowland habitation sites, presumably occupied all winter and a portion of spring, should evince the characteristics of anticipated long-term habitation sites, as described by Kent (1992).
- Pinyon nuts, which could be collected in large volumes and which are suitable for storage, were presumably used for winter subsistence. Pinyon nuts should commonly occur in lowland storage features and in macrobotanical samples.
- Lowland sites should yield faunal data indicative of winter habitation.
- Sites in both highland and lowland settings should yield similar types of projectile points, though frequencies may vary.

Present archaeological data from the Douglas Creek/Dinosaur area do not support Grady's model. Few, if any, sites in Colorado's highlands can be attributed to the Fremont. Although the hypothesized upland Fremont adaptations were highly mobile, small quantities of Fremont ceramics might be expected at highland Fremont sites. Ute sites occasionally yield ceramics in high-altitude settings, in spite of the high degree of mobility ascribed to their lifeway. Fremont ceramics are rare or absent in components above 2164 m (7100 ft), as indicated in the OAHP database (see also Figure 7-4). Fremont rock art is also uncommon in Colorado's highland settings (see Schaafsma 1971). Without diagnostic rock art styles or ceramics, it is difficult to argue for Fremont affiliation of highland sites. It is possible that both upland and lowland sites may have similar projectile points, but projectile points are seldom useful to distinguish contemporaneous groups occupying the same general area.

Too few faunal and floral data indicative of seasonality of site occupation have been recovered to permit assessment of winter habitation of structural sites in valley settings. Other evidence suggests, however, that the structural Fremont sites in the Douglas Creek/Dinosaur area were not winter habitations. As discussed above, the structural Fremont sites in northwestern Colorado are characterized by small size, few structures, and insubstantial middens, contrary to what would be expected for sites where a lengthy (winter-long) stay was anticipated (Kent 1992). Furthermore, Gilman's (1987) work suggests that pit structures were commonly constructed for winter habitation by peoples engaged in at least a biseasonal settlement pattern. Such pit structure habitations occur elsewhere in the Uinta Basin and probably served as winter residences. If pithouse villages in northeastern Utah served for winter habitation, most of the structural sites of the study area probably served for short-term habitation during the spring, summer, or fall.

Macrobotanical data from local Fremont sites also do not support Grady's model. No pinyon nuts have been recovered in macrobotanical samples from structural Fremont sites in the study area. Additionally, granaries often yield evidence of corn but not pinyon nuts.

Problems with Grady's cyclical settlement model may be one of scale. Grady (1980) developed his model with data generated from the Piceance Basin, which is a considerable distance east of that portion of Moffat and Rio Blanco counties where Fremont ceramics, rock art, and substantial structures occur. For the reasons discussed above, it seems unlikely that Fremont use of the Piceance Basin will be identified. It is plausible — indeed, likely — that Fremont settlement patterns were seasonally cyclical. The presence of Fremont pit structures suggests that groups were relatively mobile, employing at least biseasonal settlement patterns (Gilman 1987). Floral and faunal resource potential in the western United States varies seasonally by elevation zone, and virtually all ethnographic and archaeological settlement models for peoples engaged in hunting and gathering indicate seasonal movement between elevation zones to take advantage of maturing resources. The Fremont, however, may have had more restricted annual territories than groups that made no attempt at horticulture, because they were somewhat tethered to cultivated fields and storage facilities. The pithouse villages in the Uinta Basin may have served as winter habitations, and the sites in the Douglas Creek/Dinosaur area of western Colorado may have served as field houses in support of horticulture and for hunting and gathering.

Subsistence

Western Montrose County

Little subsistence data are available for the Fremont occupation of western Montrose County. It is likely that corn was raised and that wild resources were gathered. Kasper's (1977) analysis of faunal remains from the Paradox 1 site indicates that wild animal resources were important.

Glade Park

Excavations at Luster Cave in west-central Utah, and Roth and Little Park Caves near the Little Dolores River have revealed evidence of corn (Wormington and Lister 1956). Faunal remains were also recovered from these sites, but few data were reported. The recovery of corn remains at multiple sites situated near valley bottoms where horticulture might have been possible suggests that Formative-era people of the Glade Park area practiced horticulture. It is likely that hunting and gathering were also practiced. Though undemonstrated, these horticultural sites may be affiliated with the Fremont tradition.

Douglas Creek/Dinosaur Area

Although the subsistence practices of the Douglas Creek/Dinosaur area Fremont may have changed through time or may have varied by location, they can be generally characterized as having incorporated corn horticulture with hunting and gathering. The relative importance of horticulture versus hunting and gathering cannot be adequately evaluated with present data because local human skeletal populations have not been subjected to stable carbon isotope analyses. Coltrain (1993) has established that human populations at large pithouse villages in the Uinta Basin may have relied considerably on corn. She subjected four skeletons recovered at Caldwell Village in northwestern Utah to stable carbon isotope analysis, and concluded that approximately 75 percent of the diet consisted of ^{4}C plants. Plants with a ^{4}C pathway include corn, though some native edible plants also are similarly classified, suggesting a diet similar to that identified by stable carbon isotope studies at Anasazi sites in southwestern Colorado (Coltrain 1993). Whether the Fremont peoples in the Douglas Creek/Dinosaur area were engaged in subsistence practices like those of Caldwell Village is unclear. If the Fremont sites of the Douglas Creek/Dinosaur area represent warm-season occupation by peoples who spent winters in pithouse villages in Utah, then both sets of sites simply represent components of a single subsistence/settlement system. If the Douglas Creek/Dinosaur area Fremont were largely independent of Fremont groups inhabiting pithouse villages in Utah, then it is possible that local groups were less dependent on horticulture.

Several archaeologists imply that Fremont subsistence practices of northwestern Colorado essentially represent a continuation of Archaic subsistence practices, with horticulture simply added alongside hunting and gathering to augment the diet (e.g., Creasman 1981; Hauck 1994). This interpretation suggests that the local Fremont were highly mobile, like Archaic-era groups, and so were not "tethered" to their fields. Coltrain has shown, however, that casual corn cultivation is exceedingly risky. Coltrain (1996:121) points out that corn production requires considerable effort; fields must be prepared, corn must be planted, fields must be irrigated, and weeds and pests must be controlled. She states that numerous experimental studies conducted in the Southwest have shown that untended corn patches seldom survive to harvest, and that those that do survive generally have much lower yields than tended crops (Coltrain 1996:121). Archaeological evidence from the Douglas Creek/Dinosaur area clearly demonstrate that corn production was integrated into Fremont subsistence practices. Corn pollen and macrofossils occur at both architectural and nonstructural sites, apparently throughout the Formative era (Spangler 1995:517). A considerable number of granaries, many with corncobs, have been found in the area, as well as alcoves with numerous storage cists. It seems most likely that the Douglas Creek/Dinosaur area Fremont were less mobile than their Archaic era antecedents, were tethered to their fields during much of the growing season, and hunted and gathered when they could during the growing season.

Palynological, macrobotanical, and archaeofaunal data from excavated Fremont contexts provide some insight into the types of plants and animals consumed. Of the eight chronometrically dated components that yielded Fremont diagnostic artifacts (Table 7-1), floral and faunal data clearly associated with four of the components could be identified. Evidence of corn was found at the Sky Aerie Promontory Charnel site (5RB104), the Texas Creek Overlook site (5RB2435), and the Rim Rock Hamlet Promontory site (5RB2792). Wild plant resources from these sites and the Sandshadow site (5RB2958) are dominated by Cheno-Ams, but prickly pear, nipple cactus, ground cherry, sunflower, Indian ricegrass, and grass remains were also found. Faunal remains recovered at these sites include jackrabbit, cottontail, squirrel, mule deer, and bison. When all Formative-era sites from Rio Blanco and Moffat counties are considered, sagebrush, saltbush, Umbelliferae, pinyon, and cattail can be added to the list of economic flora, and pronghorn and bighorn sheep can be added to the faunal list.

Baker's Cannibalism Hypothesis:

Archaeological excavations at the Sky Aerie Promontory Charnel site (5RB104) revealed the remains of nine disarticulated humans. There was no evidence of intentional burial, though the bones were evidently subjected to considerable postmortem disturbances by recent looters and possibly by post-Fremont aboriginal site occupants (Baker 1998b). Not all bone contexts were disturbed; three skulls were found atop a hearth and were capped by clay. Some human bones found at the site were burned. Because of the unusual bone distributions, Baker solicited the opinions of Sylvia Carnero and Timothy White at the University of California at Berkeley and Christy Turner of Arizona State University. All have expertise in prehistoric cannibalism. Carnero and White inspected the remains for cut marks, perimortem fracture, loss of spongy bone, anatomically patterned burning, and pot polish, all attributes of prehistoric cannibalism. They concluded that one cranium evinced anatomically patterned burning, but that none of the other attributes of cannibalism were evident in the human bone sample (Baker 1998b:6-30). That the three skulls were found capped by clay above the hearth and not removed for consumption was also cited as additional evidence against cannibalism. Turner found evidence of considerable perimortem bone damage in the Sky Aerie collection, but observed that such damage was unlike that common to Mexican or Anasazi cannibalized remains (Baker 1998b:6-33).

Baker (1998b) believes that the postmortem bone damage has obscured evidence that would support the interpretation of cannibalism. He suggests that the low frequency of cut marks and evidence of chopping on the human bones is actually similar to frequencies observed among samples of animal bones that were undoubtedly processed by prehistoric peoples. Furthermore, Baker notes that the Sky Aerie site yielded far fewer large animal bones than expected, and suggests that the site occupants relied on human flesh to make up the difference (Baker 1998b).

Baker (1998b) has not proven that the Fremont of the Douglas Creek/Dinosaur area practiced cannibalism. There is a possibility, however, that other, less-disturbed sites may yield human bones with the attributes for cannibalism presented by Carnero and White (in Baker 1998b). Disarticulated human remains, when found, should be inspected for these attributes.

Technology

The Fremont tradition is characterized by several unique technological innovations and by the incorporation of technologies that supported a less mobile lifeway. Key aspects of Fremont technology are summarized below.

Pottery

A distinctive pottery tradition is one of the diagnostic attributes of the Fremont tradition. Although locally variable, Fremont pottery can be differentiated from that of the Anasazi and Ute traditions. Fremont sites in eastern Utah and western Colorado commonly yield Emery Gray and Uinta Gray types (Madsen 1977). Uinta Gray is the dominant type in the Uinta Basin in northeastern Utah, and Emery Gray is usually predominant in east-central Utah. Both types are reported from Fremont sites in northwestern Colorado (e.g., Arthur et al. 1981; Creasman 1981; LaPoint et al. 1981; Weber et al. 1977). Too few Fremont ceramics have been reported from the Glade Park area to permit determination of the most common type in that area. Fremont ceramics from western Montrose County may be primarily Emery Gray (Crane 1977), but reanalysis would be productive.

Hauck (1993, 1997) and Baker (1995, 1998a, 1998b) have excavated several sites in the Douglas Creek area that have yielded sand-tempered ceramic sherds. The sand or crushed sandstone temper is distinctive from the crushed limestone characterizing Uinta Gray ceramics or the crushed igneous rock characterizing Emery Gray ceramics, leading Hauck (1993) to define a new ceramic type, termed Douglas Creek Gray. Baker (1995) refers to the same type as Douglas Arch Gray. Hauck (1993) states that Douglas Creek Gray can be differentiated from Lino Gray, an early Anasazi ceramic type also characterized by sand temper. Douglas Creek Gray vessels consist of plain jars. Exterior surfaces are generally smooth, though Baker (1998b) identified a few corrugated sherds with sand temper that were classified as Douglas Arch Gray. Present evidence suggests that Douglas Creek Gray is restricted to western Rio Blanco County. The type's range, however, may expand as additional work is completed and the new type is recognized by archaeologists. As with any new type, additional data are needed to better define the range of variation within Douglas Creek Gray and to establish its temporal and geographical limits.

Basketry

According to Adovasio (1980), basketry construction style is a useful indicator of Fremont affiliation. Most baskets from Fremont sites are coiled, though some twined baskets have been found. Coiled baskets evidence eight foundation techniques, only four of which are very common. The four common foundation techniques include 1) close coiling, half-rod-and-bundle stacked foundation; 2) close coiling, half-rod-and-welt stacked foundation; 3) close coiling, whole-rod foundation; and 4) close coiling, three-rod-bunched foundation. Of these, the close coiling, half-rod-and-bundle technique comprises roughly half of the sample and is widely represented at Fremont sites yielding basketry (Adovasio 1980:36). Small quantities of Fremont basketry have been found in western Colorado (e.g., Baker 1997; Burgh and Scoggin 1948; Conner and Langdon 1989; Hurst 1941, 1942, 1947; Wenger 1956).

Moccasins

According to Madsen (1989), the "Fremont" moccasin is diagnostic of the Fremont tradition. The "Fremont" style of leather moccasin was constructed from the hock of a deer or mountain sheep in a manner to retain the dewclaw as a hobnail. The Fremont also made several other styles of moccasins, including one-piece varieties and types composed of separate upper and sole portions that were sewn together (Madsen 1989). Moccasins were stuffed with juniper bark for winter use (Burgh and Scoggin 1948). Moccasins have been recovered in Mantle's Cave in Moffat County (Burgh and Scoggin 1948) and from the Dolores River drainage (Huscher and Huscher 1943:67).

Figurines

Ornate, trapezoidal clay figurines is another defining characteristic of the Fremont tradition. These figurines commonly have clay necklaces, belts, and elaborate hair or head decorations. Some figurines have painted face decorations. The figurines share the same artistic style as many Fremont anthropomorphic rock art motifs. No figurines that are clearly Fremont are known from the study area. A few fragments of clay figurines have been found in western Colorado, but tend to be crude and undiagnostic (e.g., Wenger 1956:48; Wormington and Lister 1956:117; Lister 1951:46).

Projectile Points

Most of the projectile points found in Fremont contexts are small arrow points. Rosegate series points appear to be the most common type found at Fremont sites in the Northern Colorado Basin, but several points similar to the Uinta Side-notched type have also been recovered. Most of the Uinta Side-notched points are from Rio Blanco or Moffat counties, suggesting association with northern Fremont groups, a pattern suggested by Holmer and Weder (1980). One artifact from the study area is similar to the Bear River Side-notched type; it was found at site 5MF436. Several Fremont sites in northwestern Colorado have yielded Cottonwood Triangular and Desert Side-notched projectile points. As Holmer (1986) points out, Cottonwood Triangular and Desert Side-notched points first appear in the region in Fremont contexts, though they are common in Protohistoric-era contexts.

Two-Hand Manos

Two-hand manos were not unique to the Fremont tradition, but were associated with horticultural groups. As Diehl (1996) and Hard et al. (1996) indicate, processing food with ground stone implements is laborious, but increased grinding capacity or efficiency can be obtained by increasing the size of the grinding area on milling implements. Increases in mano size have been correlated with increasing dependency upon horticulture (Hard et al. 1996). A small number of two-hand manos have been identified in western Colorado. As one might expect, these artifacts tend to occur on the Colorado Plateau where horticulture was possible (see Figure 7-5).

Miscellaneous Perishable Artifacts

Mantle's Cave (5MF1), a large alcove overlooking the Yampa River, yielded the majority of perishable Fremont artifacts from the study area. Perishable artifacts recovered there include netting, rabbit fur cloth, feather cloth, a feather and ermine headdress, a deer scalp headdress, buckskin bags, snares, arrow shafts, bone and wood fishhooks, and a plaque of osiers (Burgh and Scoggin 1948). Several cloth fragments were recovered in a Fremont level at Hells Midden (Lister 1951).

Architecture

Only two substantial habitation Fremont structures have been investigated. Researchers from Colorado State University tested a rectangular masonry structure at the Edge site (5RB748), an open architectural site on the point of a bench overlooking Douglas Creek. The structure (Feature 1) was built of wet-laid sandstone blocks. When excavated, walls stood a maximum of 1.6 m high and were between 0.8 and 1.0 m thick. The room measured approximately 5 x 8 m. No information on floor features was presented (LaPoint et al. 1981). More extensive work was conducted at the Texas Creek Overlook site (5RB2435). This site is situated atop a sandstone pinnacle (Creasman and Scott 1987). Three rooms were defined in the structure, all enclosed by a substantial masonry exterior wall. The exterior wall is roughly rectangular, but its shape is partly determined by the configuration of the pinnacle. The western wall abuts the face of a sandstone ledge, so the exterior wall does not completely enclose the structure. The exterior wall is a maximum of 2.1 m high. It is composed of wet-laid sandstone blocks. Most of the sandstone blocks are horizontal. In a few places, vertical posts, vertical slabs, and horizontal logs are incorporated into the wall. The bedrock within the enclosing wall forms three "steps." Areas of soil accumulation within each of the levels were designated rooms. No interior walls are evident. Postholes are pecked into the bedrock beneath Room 1, suggesting that the structure was roofed.

Baker (1992a, 1995, 1998a) has excavated several shallow features at Fremont sites in the Douglas Creek area that have been interpreted as ephemeral brush structures. Evidence of structures is tenuous, consisting of indistinct charcoal stains interpreted as possible post holes, "pole-butt" impressions, and irregular floor features (Baker 1995). Baker suggests that burned brush structures are represented. Although it is likely that the Fremont constructed brush structures, the charcoal stains described by Baker are not sufficiently patterned to permit classification as architecture.

A number of granaries have been investigated in northwestern Colorado. Unlike habitation structures, granary architectural details are usually evident at unexcavated sites, because most occur beneath overhangs where little soil accumulates. Northwestern Colorado granaries may occur as single units or consist of a cluster of two or three adjacent units. Individual units generally range from 0.8 m to 2.0 m in diameter and stand up to 1.5 m high (Wenger 1954; Baker 1997). Walls may consist of wet-laid masonry, adobe bricks, or a combination of adobe bricks and sandstone (Baker 1997). Many are "beehive" shaped, reducing in diameter with wall height. Entrance was usually through the top, which was probably capped by a sandstone slab or similar seal. The storage features were constructed to keep rodents and predators from gaining entrance.

Social Organization

Discussion of Fremont social organization is rare in the regional literature, hindering modeling efforts. Baker (1998b) observes that Fremont sites in the Douglas Creek area generally consist of single structures, indicating occupation by a single household. In no cases are more than three structures or rooms present, so small numbers of people invariably occupied Fremont sites in the area. There are no instances of ceremonial structures, though Baker (1998b) suggests that cannibalism at the Sky Aerie Promontory site may have served as a socially integrative activity.

One problem in modeling Fremont social organization is that archaeologists are unsure whether the Fremont sites in the Douglas Creek/Dinosaur area represent all aspects of the settlement system, or whether they represent seasonal occupations by peoples dispersed from pithouse village sites in Utah. Little progress is possible until this is clarified through comparisons of skeletal populations, identification of season of site occupations, and distribution of pottery traits.

Ideology

In a small way, Fremont ideology is manifest by its artistic expression. Fremont rock art sites cluster in northwestern Colorado and, to a lesser extent, in the Glade Park area. No Fremont rock art has been positively identified in western Montrose County; Formative-era rock art panels there are stylistically more similar to Anasazi styles (Cole 1990). The rock art styles of the Glade Park area and northwestern Colorado are generally attributed to the Classic Vernal style (Schaafsma 1971; Cole 1990). Classic Vernal-style anthropomorphs are characterized by large, trapezoidal bodies, simple heads, and elaborate ornamentation. Ornaments often depicted include necklaces, earrings, and headdresses. Additionally, painted facial designs are often depicted, even in petroglyphs. The ornate clay figurines diagnostic of the Fremont tradition display the same attributes as Classic Vernal style rock art. Schaafsma (1971) suggests that the ornate rock art anthropomorphs and clay figurines served a ceremonial function. Cole (1990) agrees with Schaafsma's assessment, and adds that warrior motifs, as represented by anthropomorphs holding shields, weapons, or scalps, and motifs depicting hunting, may also represent shamanistic activities.

PLAINS WOODLAND TRADITION

Four sites in the Northern Colorado Basin have yielded cord-marked pottery attributed to the Plains Woodland tradition. Forty-two cord-marked sherds were recovered at the Caribou Lake site (5GA22), just west of the Continental Divide in Grand County (Benedict 1985). Benedict (1985) mentions that cord-marked pottery has been found at one other site in Grand County: 5GA1, an apparently unexcavated site in Middle Park. Amateur archaeologist Monte Sanburg of Montrose donated a cord-marked sherd to the Ute Prehistory project, which was evidently found somewhere in the vicinity of Montrose (Buckles 1971). Recently, Naze (1994) found two cord-marked sherds at the Crying Woman site (5GA1208), a multicomponent site in Middle Park.

The paucity of cord-marked pottery in the study area suggests limited trade or incursion west of the Continental Divide by Plains Woodland peoples. When such trade or incursion occurred, Middle Park appears to have been the primary destination.

GATEWAY TRADITION

West-central Colorado sites with masonry habitation structures, Anasazi pottery, corner-notched arrow points, and corn have been attributed to various cultural units over the decades. The archaeological units employed to describe these sites have changed through the years in response to the growing understanding of the variability in the area's archaeology. To the earliest investigators, the Formative-era sites in west-central Colorado were Anasazi (e.g., Woodbury and Woodbury 1932). The Formative-era sites in west-central Colorado were recognized to share some, but not all, attributes of Anasazi sites in the Four Corners region, so variation was explained by west-central Colorado's location along the periphery of the Anasazi homeland. The frontier was evidently perceived as an area where Anasazi were less influenced by Anasazi norms, perhaps because of longer lines of communication or because local environments required different adaptations. Attribution of local sites to the peripheral Anasazi was not universal, however; Huscher and Huscher (1943), for example, argue that the structural sites were the remains of Athabaskan groups enroute from their original homelands in Canada to the Southwest. Morss (1931) first defined the Fremont culture in Utah. The Fremont concept evolved to a point that it was considered a tradition largely independent of the Anasazi tradition, though certain influences from the Anasazi were undeniable. By the 1970s, Formative-era sites in west-central Colorado were being attributed to the Fremont (e.g., Toll 1977), largely because many of the circular stone structures were similar to those excavated by Wormington at the Turner-Look site in east-central Utah (Wormington 1955), and because the local sites lacked many attributes characterizing Anasazi sites. Since the 1960s, there have also been those advocating that Formative-era sites in west-central Colorado were most appropriately attributed to a separate, indigenous group that was considerably influenced by both the Fremont and the Anasazi traditions (Crane 1977:105; Reed 1984b; Solomon 1992). Albert Schroeder (1964:77) first advanced this position in his analysis of the cultural affiliation of C. T. Hurst's Formative-era caves and "pueblos" in western Montrose County. Reed (1997a) suggests that the Formative-era sites represent a distinct tradition and proposes that it be known as the Gateway tradition. According to Reed (1997a:24) the Gateway tradition is characterized by the following attributes:

- Limited reliance upon corn horticulture.
- Manufacture of small corner-notched projectile points, such as the Rosegate series.
- Procurement through trade small quantities of Anasazi and, much less frequently, Fremont ceramics. Such trade with the Anasazi may have occurred primarily during the period between A.D. 900 and 1050.
- Apparent lack of ceramic production.
- Habitation of circular and rectangular masonry surface structures. In a few cases, rooms may be contiguous.
- Possible habitation of pit structures.
- Relatively short-term use of habitation structures, as indicated by shallow middens.
- Construction of granaries and storage cists in rockshelters.
- Rock art with both Anasazi and Fremont influences.

The Gateway tradition is tentatively dated between 400 B.C. and A.D. 1250, coterminous with corn horticulture in the area. Corn appears in the archaeological record of east-central Utah between 400 B.C. and A.D. 60 (Jett 1991) and in Cottonwood Cave in western Montrose County between 158 B.C. and A.D. 216 (Stiger and Larson 1992).

Though unnamed until recently, the Gateway tradition appears to have some utility for describing local variation in the archaeological record, having endured for some 35 years. That the tradition has attributes of both Anasazi and Fremont cultures is undeniable, and is, in fact, one of its defining characteristics. Gateway tradition sites yield almost exclusively late Anasazi ceramic types and may have rectangular rooms or room blocks. Key elements of Anasazi culture are absent, however, including use of kivas, highly patterned site layout, extensive use of pit structures, and evidence of local ceramic production. These attributes spread with Anasazi culture across northwestern New Mexico, southwestern Colorado, southeastern Utah, northern Arizona, and southern Nevada and are evident at practically any Anasazi site in these areas. It seems unlikely that these traits would not be manifest in sites only 100 km (62 mi.) north of Mesa Verde if an Anasazi incursion is represented. Gateway tradition sites also have circular masonry architecture that is similar to Fremont habitations in Utah (e.g., Wormington 1955; see also Spangler 1994). The few diagnostic attributes of Fremont culture common to all recognized regional variants, such as one-rod-and-bundle basketry, moccasins, trapezoidal anthropomorphs depicted as clay figurines or as rock art, and distinct Fremont pottery types (Madsen 1989), are generally absent at the structural sites in west-central Colorado. The authors are reluctant to expand the definition of Fremont culture to include sites that do not share these basic Fremont traits; to do so would be to make the Fremont unit much less useful for describing variability in the archaeological record.

Quality of the Database

The archaeological database for Gateway tradition sites is meager and of generally poor quality. As shown below, only 10 masonry surface structures dating to the Formative era have been excavated in west-central Colorado, all by projects beset with major problems. The Paradox 1 site (5MN191) was excavated to varying degrees by pioneers in Colorado archaeology in the 1920s and 1930s, and then by a SDSU and CC field school in 1970 (McMahon 1997). The results of Jean Jeancon and Frank Roberts' excavations at the site in 1924 were never reported. The State Historical Society's excavations in 1931 were briefly reported (Woodbury and Woodbury 1932), but research objectives and reporting standards were different nearly 70 years ago. SDSU and CC archaeologists probably employed more modern field methods than their predecessors, but all artifacts and most associated literature were destroyed by fire before a report was prepared. Limited documentation of SDSU and CC excavations are included in a published report on the site's faunal remains (Kasper 1977) and in photographs recently compiled by the OAHP (McMahon 1997). C. T. Hurst conducted excavations at Cottonwood Pueblo and Tabeguache Pueblo in the late 1940s, but the resulting reports can only be regarded as preliminary in nature (Hurst 1946, 1948). After a nearly 30-year hiatus in excavation research in western Montrose County, Metropolitan State College excavated Formative-era structures at Weimer Ranch and in Roc Creek. This project had significant problems with field supervision, which caused such a disturbance among the archaeological community that the CCPA was founded to oversee compliance with professional ethics. Metropolitan State College's investigations were ultimately reported by Cathy Crane (1977), a graduate student at Eastern New Mexico University, using field notes provided by the project's director. Although Crane's thesis is an important contribution, more detailed information about field methods, architecture, and artifacts would have probably been reported under more typical circumstances. No controlled excavations have been conducted at regional Formative-era structural sites since the mid-1970s. This, coupled with the overall quality of past excavation reports, makes certain that interpretation of Formative-era sites will remain contentious until additional, problem-oriented field research is conducted.

Gateway-Tradition Sites

Gateway tradition sites occur in relatively low frequencies in San Miguel, Montrose, Delta, and Mesa Counties and appear to cluster in western Montrose County in the vicinity of the San

Miguel River (Huscher and Huscher 1939; Crane 1977). Because the Gateway tradition has only been recently defined, it is not possible to query the OAHP site database about distributions of Gateway tradition sites. If distributions of masonry structures, Anasazi ceramics, and sites with corn are any indication, it appears that fewer than 30 sites possibly attributable to the Gateway tradition have been recorded in west-central Colorado.

Compared to other archaeological units in the Northern Colorado Basin, a large percentage of Gateway tradition sites has been excavated. Excavation data are available for 11 sites (Table 7-3), more than a third of the known Gateway sites. The Huschers tested or excavated several other sites in the region, but these are difficult to identify because the sites were not formally recorded and because excavation data are sparsely reported (Huscher and Huscher 1943).

Excavated sites have revealed both individual circular stone structures and more complex structures with contiguous rooms. The more complex sites include Paradox 1, Cottonwood Pueblo, Tabeguache Pueblo, and Roc Creek sites. Virtually nothing is known about Hill Pueblo, excavated by Hurst shortly before his death (Crane 1977).

The authors believe that the Paradox 1 site has two components: a Fremont component with at least four or five pit structures and a later Gateway component consisting of a masonry surface structure. The Gateway component has multiple, rectangular structures, including Mound 2 excavated by Woodbury and Woodbury (1932) and the surface structure encountered in Excavation Unit 1 by SDSU and CC (Kasper 1977).

Tabeguache Pueblo consists of two to four rectangular structures. Hurst (1946) identified four main structures, but some of these may have been contiguous. The northwestern structure appears to have at least four rooms; other structures appear to consist of single rooms (see Figure 7-7).

Cottonwood Pueblo consists of four small rooms or room blocks, connected by a wall that encloses a large courtyard. Hurst (1948) excavated the northwestern room block (called Lone Tree House), revealing four contiguous, rectangular rooms. Metropolitan State College later excavated the southeastern room block, what Hurst had identified as "House 3." Investigations there revealed north and east walls, but apparently no south wall. Crane (1977:25) questions whether the structure was roofed or whether it represented an open work area. The southeastern structure yielded scores of projectile points and scrapers, along with large quantities of bone tools, bone beads, sherds, and unworked bone fragments. A radiocarbon date was processed for the structure (see Table 7-3). Metropolitan State College also excavated the two western rooms or room blocks, but the results of these investigations are essentially unknown (Crane 1977).

The Roc Creek site, also investigated by Metropolitan State College, may also represent a complex Gateway tradition structure. This site is composed of eight oval, masonry rooms constructed around a large boulder on a north-facing slope. Limited excavations revealed the presence of internal hearths. Artifacts recovered included ground stone, projectile points, sherds, bone tools, and bone beads. Corncobs were also found (Crane 1977).

The ceramic artifacts from the Roc Creek site were inspected by Crane and were tentatively classified as Uinta Gray, Emery Gray, and Emery Corrugated — all Fremont varieties. Crane (1977) noted, however, that the Emery Gray and Emery Corrugated sherds were tempered with crushed igneous rock, like Mesa Verde-region Anasazi ceramics. Because Crane did not subject sherds from the Roc Creek site to petrographic analyses, it is difficult to evaluate her observations about temper from the Roc Creek site. This is critical, because both Mesa Verde-region Anasazi gray wares and Emery Gray are made from crushed igneous rock. Geib and Lyneis' (1993) petrographic analyses of sherds classified as Emery Gray and Sevier Gray from south-central Utah reveal that Emery Gray sherds commonly contain one of two temper types. The most common temper type — representing the "typical" Emery Gray sherd from the San Rafael Swell area — was derived from light-colored basaltic andesite. Less common was a diorite porphyry temper, probably procured from the Henry Mountains laccolith (Geib and Lyneis 1993:179). The diorite porphyry from the Henry Mountains area is evidently easily confused with gray ware tempers from the Mesa Verde region. Because the classifications of the Roc Creek site ceramics were tentative, and because Emery Gray is seldom corrugated (Madsen 1977), there seems to be considerable likelihood that the ceramic classifications are in error. The Roc Creek site is, therefore, tentatively attributed to the Gateway tradition.

The majority of structures excavated at Weimer Ranch by Metropolitan State College were noncontiguous, round structures. According to Crane (1977:16), most of the stone structures are 5 to 6 m in diameter, are built of unshaped sandstone blocks, rarely have doorways, and have unlined interior hearths. Low quantities are sherds and high quantities of grinding stones and projectile points were recovered in most circular stone structures. At Weimer Ranch, circular stone structures were excavated at the Wagon Bend, Middle Hill, Hill I, and Weimer IV sites.

Table 7-3. Excavated Gateway Tradition Sites.

Site	Chronometric Date Range	Diagnostic Ceramics	Reference
Paradox 1 (5MN191)	A.D. 1024 (tree-ring)	Possible Mancos B/w, Mancos Gray, Moccasin Gray, corrugated	Woodbury and Woodbury 1932
Roc Creek (5MN367)	A.D. 845-955	Possible Emery Corrugated, Emery Gray, and Uinta Gray (problematic)	Crane 1977
Creek Knoll (5MN368)	–	Corrugated	Crane 1977
Weimer IV (5MN368)	–	Gallup B/w, Moccasin Gray, Cortez B/w, Mancos B/w	Crane 1977
Battleship (5MN368)	–	White ware	Crane 1977
Cottonwood Pueblo (5MN517)	A.D. 1–1064	Mancos B/w, Wingate B/r, corrugated, Cortez B/w, Deadman's B/r	Hurst 1948; Crane 1977
Hill I (5MN517)	–	Cortez B/w, Mancos Gray, Moccasin Gray	Crane 1977
Hill Pueblo	–	—	Crane 1977
Middle Hill (5MN652)	–	—	Crane 1977
Wagon Bend (5MN653)	A.D. 515–645	Cortez B/w, Chapin B/w	Crane 1977
Tabeguache Pueblo (5MN1609)	–	Mancos B/w, possible Mancos Gray, corrugated	Hurst 1946

Particularly Important Sites

Because of the dearth of structural sites dating to the Formative era in west-central Colorado, and because of the lack of high-quality excavation data from such sites, any site with probable affinity with the Gateway tradition that retains contextual integrity should be regarded as a particularly important cultural resource. Whether some of the best examples of the Gateway tradition retain integrity of cultural deposits is uncertain. The four rooms or room blocks at Cottonwood Pueblo appear to have been excavated by either Hurst or Metropolitan State College. The value of the court yard deposits and the presence and integrity of any associated middens are unknown. Tabeguache Pueblo appears to have been completely excavated. At Weimer Ranch, all circular structures at all sites except Weimer IV were excavated. The Weimer IV, Roc Creek, and Paradox 1 sites appear to retain high potential for intact cultural deposits and should be managed accordingly.

Several unexcavated Gateway tradition sites should also receive special management consideration. Site 5SM346, also designated HHC (Huscher and Huscher 1943), consists of a masonry wall 1 m high enclosing a large compound, in which three possibly circular structures are situated (see Figure 7-7). The site is southwest of Redvale on the western rim of Hamilton Creek, on land administered by the BLM. The area of architecture measures approximately 32 x 24 m. Burned adobe was recently observed at the site. Surface artifacts are abundant and include small, corner-notched projectile points; no pottery has been recorded. No vandalism is apparent at the site.

Site 5SM57 is another large site with rectangular structures that should be regarded as a very important resource. The site, situated on public land a few kilometers west of Norwood, Colorado, is on the north rim of Naturita Canyon. The site was visited by the Huschers and partly excavated by the Woodburys in the 1930s; considerable damage to the site was reported at that time (Huscher and Huscher 1943). In a recent site revisitation, Alpine Archaeological Consultants personnel observed discarded screens and recent vandals' pits, yet maintain that the site has important cultural deposits (Pfertsh 1999).

Modeling the Gateway Tradition

Space/Time Systematics

The Gateway tradition has been formally defined only recently (Reed 1997a), and it has been subjected to limited substantive criticism. To date, Todd McMahon (1997) has been the tradition's major critic. McMahon rejected Gateway tradition affiliation for the Paradox 1 site in favor of Fremont affiliation. His compilation of photographs from the site, thought by regional archaeologists to have been lost, provide important support for his position, and the authors concur that the site's early component with pithouses does, indeed, represent a San Rafael Fremont occupation.

McMahon (1997) also considers the applicability of the Gateway tradition to other Formative-era sites in the region, and concludes that they, too, should be regarded as Fremont, citing similarities in ceramics, circular house structures, and rock art. He argues that the Fremont concept should remain in use until the relationship with Fremont sites to the west is better understood, and implies that the definition of Fremont culture should be expanded to account for local variation. Disagreement with McMahon is possible on several points. First, the authors are not convinced that Fremont rock art is much in evidence in west-central Colorado. The trapezoidal figures illustrated by McMahon (1997:37) as evidence of Fremont affiliation appear to be well within the range of typical Anasazi rock art styles (see Cole 1990:121; Schaafsma 1992:11). Second, little similarity in ceramics is seen between the west-central Colorado Formative-era sites and contemporaneous sites in central Utah. Fremont ceramics are reported from very few sites in the region, and classifications are frequently problematic. Moreover, sites reported to have Fremont ceramics are far outnumbered by those yielding exclusively Anasazi ceramics. It is agreed that circular stone structures appear similar to those found at some eastern Utah Fremont sites, such as Turner-Look (Wormington 1955), but comparisons are difficult because architectural details of circular stone structures in west-central Colorado are so poorly reported. Fremont archaeologists have not identified attributes of circular stone structures that are unique to Fremont culture, so it may be premature to ascribe Fremont affiliation based on surface structure architecture. McMahon's assertion that ties between the west-central Colorado Fremont and those to the west in Utah need to be better understood is, of course, correct, but considerable data do exist that demonstrate little continuity in Fremont site distributions. The excavations of Utah State University at Coombs Cave (42GR383) east of Moab have possibly revealed a Fremont component (Fawcett 1996), but little effort has been made to determine the site's cultural affiliation and ceramic typologies have not been reported. Even if Coombs Cave is a Fremont site, it is in an area with few other Fremont sites, as indicated in the cultural resource overview completed for the BLM's Grand Resource Area (Horn et al. 1994). Formative-era sites of the Grand Resource Area, like west-central Colorado, are characterized by Anasazi sherds — not Fremont sherds. In eastern Utah, the Fremont culture is primarily manifested north of Arches National Monument and west of the Colorado River (Horn et al. 1994). Coombs Cave and the early component at the Paradox 1 site appear to represent isolated Fremont sites in a region mostly occupied by non-Fremont peoples.

The authors further take issue with McMahon's implication that the definition of the Fremont should be expanded to account for the Formative-era sites of west-central Colorado. Archaeological units are most useful when they restrict the amount of variability that they describe, and there is little point in expanding the Fremont concept to include sites that lack all of the four attributes that Madsen (1989) has identified as diagnostic of Fremont culture. McMahon (1997) points out that mtDNA studies among samples of Fremont and Anasazi skeletons collected in other regions have indicated significant differences between the two populations, and that similar studies may provide insight into the cultural affiliation of this region's Formative-era populations. The authors suggest that the Gateway tradition concept is more useful for describing the region's Formative-era components until similar DNA studies shed light on the issue.

Because of the nature of the database for Formative-era sites in west-central Colorado and because no consensus has been reached about the utility of the Gateway tradition, it is entirely appropriate for archaeologists to consider various taxonomic units to describe the region's cultural resources, including the Gateway, Fremont, and Anasazi traditions. This is especially true because multiple, Formative-era groups may have occupied west-central Colorado at different times or in different areas. Even if most sites can be attributed to indigenous peoples, the Fremont may have established outposts in the region. The Anasazi may have made forays into the region to collect resources or to trade, or may have attempted settlement during the Pueblo II period when they expanded into other areas of the Southwest.

Settlement Patterns

Crane's Settlement Model

In her thesis on the Weimer Ranch structural sites, Crane (1977) presents a settlement model in which structural sites served as primary habitations, from which emanated logistical forays to outlying nonstructural sites where floral and faunal resources were procured. The primary sites are located in side canyons, overlooking arable lands on the valley floor, with access to permanent water. Between one and 12 masonry surface rooms may have been occupied at any one time at a residential site. Crane (1978) suggests that the primary residential sites were occupied year-round, based on the types of macrobotanical remains recovered from features. Although no direct evidence was found at Weimer Ranch indicative of winter habitation, cold-season habitation is also suggested by the quality of shelter afforded by the structures, by the existence of storage facilities, and by the presence of formalized waste disposal areas (middens), the latter of which indicate anticipated long-term habitation (Kent 1992). The secondary sites were more broadly distributed across the landscape, occurring at the location of hunted or gathered resources. Crane (1977:42) notes that association between the secondary sites and the primary residential sites may be difficult to discern, because ceramics and architecture will not be evident at the secondary sites. Crane's settlement model has the following test implications.

- Pollen studies of sediments in valley bottoms near structural sites should provide evidence of cultivation.
- Faunal remains indicative of seasonality of site occupation should demonstrate all-season occupation of structural sites.
- Structural sites and contemporaneous nonstructural, secondary sites should yield the same varieties of projectile points.
- Some nonstructural, secondary sites should yield low quantities of Anasazi pottery.
- Structural sites should be restricted to elevation zones where horticulture is possible.

The archaeological data from regional, Formative-era sites tentatively support some of the above test implications. No pollen studies have been conducted at possible fields, and faunal studies have not provided clear indication of seasonality of occupation at structural sites. However, nonstructural sites dating to the Formative era with Anasazi ceramics and small, corner-notched projectile points are well documented in the region (e.g., McDonald 1998) and possibly represent the secondary sites hypothesized by Crane (1977). Even more common are sites without Anasazi ceramics but with small, corner-notched projectile points that date to the Formative era (e.g., Reed 1997a). As discussed below in the section on the Aspen tradition, not all sites with small corner-notched points may be affiliated with the Gateway tradition. Formative-era structural sites appear to cluster in the region's lower elevations, where horticulture was probably possible (see Figure 7-1), but there are some exceptions. Huscher and Huscher (1943) excavated a substantial masonry structure at the Jeff Lick Stone Circles site (5MN3462) atop the Uncompahgre Plateau at an elevation of 2914 m (9560 ft). This site consists of at least four stone structures. Artifacts at the site are not abundant but are sufficiently diverse to support seasonal habitation. No ceramics have been recovered at the site, although the discovery of small corner-notched projectile points suggests contemporaneity with the structural sites of the lower elevations.

Subsistence

Gateway tradition peoples appear to have cultivated corn, as evidenced by the recovery of corn macrofossils within habitation structures (e.g., Huscher and Huscher 1943; Crane 1977), by the construction of granaries, and, to a lesser extent, by the occupation of substantial structures on a long-term basis. The limited data on Gateway tradition subsistence suggests, however, that hunting and gathering may have remained the primary subsistence focus (Crane 1977). That hunting continued to be important is suggested by abundance of projectile points in the Weimer Ranch assemblages and by high frequencies of animal bone. A variety of wild plant foods were also found at Weimer Ranch, leading Crane (1977:33) to propose the following seasonal model. According to Crane, edible herbs were collected in the spring, and deer were harvested prior to their migration into the higher elevations. Corn was planted in early June, after which mutton grass seeds were harvested, some of which were parched for long-term storage. Logistically organized groups would then travel to the higher elevations to hunt. In August, skunkbush berries, mariposa lily, and wild onion were collected, and by September, goosefoot seeds were harvested and parched for storage. Corn was harvested in early autumn, after which juniper berries, pinyon nuts, and acorns were collected. People subsisted primarily upon stored foods and local hunting during the winter (Crane 1977). Crane's model has the following implications, though the state of the regional database precludes addressing any of them with data independent of those considered by Crane.

- Stable carbon isotope analyses of human skeletons from Gateway tradition contexts will evidence relatively low ratios of ^{4}C to ^{3}C plants when compared to other Formative-era groups, indicating greater consumption of wild plant foods than populations more dependent upon corn.
- Other regional, Formative-era structural habitation sites should yield floral and faunal remains indicative of year-round occupation.
- As long-term habitations, structural sites should yield large quantities of animal bone, much of which should evidence intensive processing.

Technology

The advent of the Gateway tradition is marked by the appearance of several new types of technology. Pit structures, which first appear in regional Archaic-era contexts, are largely or entirely replaced by masonry surface structures. These may be either round or rectangular. Round habitations, such as those documented by Crane (1977) and by Huscher and Huscher (1943), tend to be 5 or 6 m in diameter, lack evidence of doorways, and may have interior hearths and subfloor storage pits. Round structures generally occur individually, but contiguous rounded rooms are present at the Roc Creek site. Rectangular rooms are more often but not always found as contiguous units. Little is known about the distribution of interior features in these structures, though interior hearths have been documented. Several sites, such as Cottonwood Pueblo and site 5SM346, have substantial walls enclosing or connecting possible habitation structures. The purpose of the enclosing walls is unclear, because excavations have not occurred within the enclosed areas. At the Paradox 1 site, McMahon (1997:35) recognizes that rectangular masonry surface structures postdate pit structures, and suggests an architectural sequence from round pit structures to round masonry surface structures to contiguous, rectangular surface structures. This progression in architectural styles is associated with increased population, resulting in greater reliance upon horticulture. These trends, in turn, required greater flexibility to expand structures for habitation and storage, resulting in the development of rectangular room blocks (McMahon 1997:35). Dates from Gateway tradition sites provide very tentative support for the architectural progression noted by McMahon. A rectangular, multiroom surface structure at the Paradox 1 site, Mound 2, yielded a tree-ring date indicating site construction shortly following A.D. 1024 (see Table 7-3). The Roc Creek site, a structure comprised of contiguous, oval rooms, has a calibrated radiocarbon range between A.D. 845 and 955, suggesting occupation slightly earlier than at the Paradox 1 site. The effects of the possible use of old wood in construction makes precise dating of the occupation difficult, however. The circular structures at Weimer Ranch are best dated by Anasazi ceramics. Both the circular structures excavated at various sites at Weimer Ranch and a rectangular structure at the Cottonwood Pueblo site yielded Cortez and Mancos Black-on-white pottery, indicating possible contemporaneity.

In terms of portable technology, small, corner-notched projectile points, thought to have tipped arrows, characterize the Gateway tradition. These points are commonly classified as Rosegate points, a type attributed by Holmer (1986) to the period between A.D. 300 and 1000. Solomon (1992:81) suggests that some of the "small" points in the Huscher collection from regional structural sites may have tipped darts, so both bow and arrow and dart and atlatl technologies may have been present, at least during some periods. Ceramics were acquired, primarily between A.D. 900 and 1100. Present evidence suggests that the most ceramics were brought from the Mesa Verde region and were not manufactured in west-central Colorado. Kilns, caches of clay, and artifacts commonly associated with pottery production have not been documented in the region. Gateway tradition manos appear to be the one-hand variety. As Mauldin (1993) has shown, mano size can be correlated with intensity of reliance upon horticulture; that Gateway tradition manos are small suggests limited reliance upon cultigen processing. Little information is available about lithic reduction strategies employed by Gateway tradition peoples.

Social Organization

From her analysis of Weimer Ranch data, Crane (1977) has developed a model of Gateway tradition social organization in which the sites composed of circular stone structures were characterized by a slightly different level of organization than sites composed of rectangular, contiguous structures. Crane has observed that sites with circular habitation structures may be comprised of a single habitation structure or a relatively low number of contemporaneous habitation structures, suggesting fairly small hamlet populations. The basic socioeconomic unit was the independent household, consisting of a nuclear family, or possibly an extended family. Crane notes that these sites do not have architectural structures that served for social integration. Through time, populations are thought to have increased, and contiguous structures, such as Cottonwood Pueblo, were built. Occupation of contiguous rooms by multiple households implies more inter-household interaction and cooperation, and suggests the existence of a more complex level of social organization. Crane's model has the following test implications.

- Sites with contiguous rooms should generally date later than sites with individual rooms.
- At sites composed of noncontiguous structures, contemporaneous households will evidence a considerable degree of redundancy in terms of artifacts and cultural features, reflecting a high degree of household autonomy.
- Sites composed of contiguous rooms should evidence specialized functions, such as storage or habitation.
- Sites with contiguous structures should evidence higher populations than sites composed of noncontiguous structures.

As discussed above, the chronology of architectural types is not well established. That structures with contiguous rooms date later than isolated structures should be regarded as a working hypothesis. Crane's (1977) observation of redundancy in activities between noncontiguous structures seems credible but cannot be addressed further with data from other sites. Whether contiguous rooms evidence similar levels of redundancy cannot be determined, though Crane (1977:23) suggests that one of the four rooms excavated by Hurst at Cottonwood Pueblo may have been a storage room. The other three rooms, with hearths, are thought to represent habitation rooms.

Sites with contiguous structures do not clearly evidence higher population levels than sites with multiple, noncontiguous structures, though structure contemporaneity is more difficult to establish where structures are noncontiguous. Assuming that all four rooms or room blocks at Cottonwood Pueblo were roofed — which Crane doubts — the site would have had a roofed area of about 46 m^2. The five discernible rooms at Tabeguache Pueblo had a roofed area of approximately 135 m^2. Actual population can be estimated through cross-cultural studies of historic and ethnographic groups. Lightfoot (1994:149) cites a worldwide study by Brown (1987) that indicates an average of 6.2 m^2 of roofed area per person and a study by Dohm (1990) of nineteenth and twentieth century Navajo habitations that indicates an average of 9.7 m^2 of roofed area per person. Using these two figures, Cottonwood Pueblo was probably occupied by five to seven people, and Tabeguache Pueblo may have been inhabited by 14 to 22 people. In comparison, the Weimer IV site, with five noncontiguous circular structures, may have been occupied by 12 to 19 people, if all structures measured 5.5 m in diameter and were simultaneously occupied.

That the occupants of noncontiguous structures lacked architecture of social integration is not supported by site 5SM346, where apparently circular structures are enclosed by a substantial masonry wall. The wall, surrounding a cluster of circular structures that may have been habitations, suggests a lesser degree of household autonomy than if each structure was surrounded by its own wall. The enclosing wall at Cottonwood Pueblo may also define communal space, if each room block represented a different household — a debatable assumption (see Crane 1977).

Site Structure

The site structure of Gateway tradition components is poorly understood. Data from the Paradox 1 site suggest that middens are not always located south of room blocks in the manner characterizing Anasazi sites, though it is not possible to determine the association between middens and structures.

Extraregional Relationships

Gateway tradition peoples evidently maintained trading relations with the Anasazi, especially during the Pueblo II period. This trade focused almost exclusively on ceramic artifacts. Ocean shells, copper, macaw feathers, turquoise, and other items common to Anasazi exchange systems do not appear to have entered west-central Colorado. Interaction with Fremont peoples is also likely, as evidenced by similar styles of masonry architecture and, possibly, by infrequent trading of Fremont ceramics. Interaction with the Fremont may have intensified if, as has been hypothesized above, isolated Fremont outposts were occupied in the Gateway tradition homeland.

Ideology

No rock art sites have been attributed directly to the Gateway tradition. Cole (1987; 1990), however, discusses regional Formative-era rock art, and attributes it to the Anasazi tradition. Cole's (1987) Abajo-LaSal Anasazi rock art style, thought to date between A.D. 600 and 1200, is regarded as a distinctive variant of Anasazi rock art, having Uncompahgre complex influences. This suggests some degree of cultural continuity with Archaic-era peoples, as might be expected if the Gateway tradition represented an indigenous development. The overriding Anasazi styles, suggest, at least, strong cultural influence from the Anasazi culture. Perhaps the inhabitants of the two areas shared certain religious elements.

ASPEN TRADITION

Introduction

Within Colorado and the entire surrounding region, cultural systems were changing during the Formative era, as attested by widespread adoption of horticulture in the Southwest, and the variable use of cultigens by the Fremont to the west and Early Ceramic Period peoples to the east. In the Wyoming Basin, intensifications in subsistence can be seen in seed procurement (Smith 1988, 1992), episodic mass kills of pronghorn (Lubinski 2000), large numbers of pit features with associated ground stone, and by a general increase in the number – or at least visibility – of sites. This led to the definition of the Uinta phase (Zier et al. 1983; Metcalf 1987), a taxonomic unit that has become better defined over time, but which is still in use (Thompson and Pastor 1995). No taxonomic equivalent exists in the Northern Colorado Basin, even though almost half of the dated components in the database are post-Archaic in age. As is evident from the above discussions of the Anasazi, Gateway, and Fremont traditions, relatively few sites are ascribed to these traditions, and the distribution of these sites is confined to geographically restricted locales in the western-most part of the study area. Essentially, these three traditions are horticultural-based subsistence systems and their core areas are defined by the effective limits of economically viable gardening. This limitation excludes most of the Northern Colorado Basin .

Archaeological evidence suggests that the Northern Colorado Basin was not immune to the symptoms of economic or population stress experienced in other areas. The number of radiocarbon ages increases dramatically, as shown in Figure 6.1, and there is also in increase in the use of prepared fire pit features (Figure 6.3). The Gunnison Basin, apparently used by full-time residents through much of the Archaic era, appears to have been used only seasonally after about 1000 B.C. (Stiger 1998b:94-95). Stiger suggests that winter abandonment of the Gunnison Basin; increasing use of residential sites; use of substantial houses at places like Abiquiu, Casa de Nada, and Kewclaw; the spread of corn farming out of the Southwest; and increasing use of game drives in the high mountains are responses to environmentally induced stress on adaptive systems. Variability in Fremont subsistence systems to the west appears to be the norm, with increasing evidence of periodic shifts, odd mixes of foraging and farming, and variable patterns of mobility (e.g. Simms 1986; Madsen 1989; Metcalf 1993). The Northern Colorado Basin study unit encompasses the same sort of variability, though the role of farming, like in the Wyoming Basin, was constrained to the very western valleys of the state. The Aspen tradition is proposed here as a taxonomic unit for use in describing the variability among nonhorticultural cultural systems in the Northern Colorado Basin between about 400 B.C. and A.D. 1300.

It is suggested here that the post-400 B.C. database should be reexamined from a perspective that focuses attention on variability in subsistence systems. Traditional traits that have been used to order the data – projectile points, pottery styles, house types – appear to have little utility in ordering the record. Variability in point styles decreases as bow-and-arrow use becomes widespread, with forms centering first around small, corner-notched points until about A.D. 1000, followed by a shift to side-notched forms. These forms are prevalent, with only minor differences, across much of the west. Ceramics are mostly absent. Where they do occur, sherds are usually ascribed to the Anasazi, Fremont, or Woodland traditions. Low frequencies of vernacular, inconsistently tempered generic gray wares show up at sites, and gradually, researchers are resisting the temptation to assign these sherds to categories like Emery Gray, Uinta Gray, Great Salt Lake Gray, and Promontory Gray. A persistent preoccupation with assigning sites to geographically distant taxonomic units has masked the real story, which the authors believe will be found in exploring the numerous ingenious ways localized groups coped with the various stresses on their subsistence systems. External trade and alliances are probably a part of this picture, as suggested by such things as distributions of obsidian, real occurrences of trade wares, and geographic extensions of rock art motifs. The prevailing pattern is probably one of local groups using a variety of means to earn a living.

As a place to start, the Aspen tradition is defined as a taxonomic equivalent to the Gateway and Fremont traditions discussed above, and as a sort of parallel construct to the Uinta phase of the Wyoming Basin. The proposed time span of 400 B.C. to A.D. 1300 serves to separate it from the preceding Archaic era and the following Protohistoric era. The beginning date must be viewed as approximate. The transition from the Archaic era is marked by a series of changes, including the adoption of cultigens in subsistence, a shift to the use of bow-and-arrow technology, the adoption of ceramics, and a gradual broadening, or intensification of the hunted and gathered subsistence base. There is an apparent shift in group mobility patterns, and an apparent increase in reliance on the use of prepared firepits for food processing. All of these changes become apparent in the archaeological record at some time between about 500 B.C. and A.D. 1, and there is no single "date" that is satisfactory as a beginning age. By 400 B.C. cultigens were present in the region, the settlement shifts noted by Stiger (1998b:96) had occurred, there is some evidence for early use of the bow-and-arrow, and the increase in the number of radiocarbon ages is apparent. The ending date of A.D.1300 is likewise arbitrary, but corresponds generally to the end of the Formative era as it has been traditionally defined for horticultural-based traditions. Specific to the ending of Aspen tradition, there is a decline in the number of radiocarbon ages, an apparent shift in the nature of pit feature use, disappearance of generic Fremont-like gray wares, and replacement of small, corner-notched arrow points by side-notched point forms.

Quality of the Database

The database for the Formative era contains 344 radiocarbon ages from 64 components representing about 45 sites in eight counties. Many more sites can be tentatively assigned to the Aspen tradition on the basis of small, corner-notched projectile points or generic gray ware ceramics. Based on the excavation database used for this study, the distribution of known Aspen tradition sites appears to be skewed towards the lower elevation counties, and toward the lower elevations of the major river drainages (Figure 7-9). Obviously, if Aspen tradition sites can be identified on the basis of geography and the presence of small, corner-notched projectile points, many more sites could be added through an examination of surface survey data and distributions might change. In the case of the Aspen tradition, there is a good database. The problem at this time is that these data have not yet been examined from the perspective of subsistence variability or other aspects of the proposed Aspen tradition.

Particularly Important Sites

Of the at least 45 sites with some excavation data, many are important to the Aspen tradition, yet few can be singled out as individually critical. Rather, fleshing out the Aspen tradition will require piecing together data from a number of sites. Excavated sites of this age are most numerous in Rio Blanco, Moffat, Mesa, and western Garfield counties. In general, these sites are of interest because of their elevation and their proximity to the area where horticulture was part of the subsistence mix. Sites in the Douglas Creek area where Douglas Creek Gray has been defined (Hauck 1993; Baker 1998a) are of interest because they allow exploration of adaptive diversity, whether one labels them Fremont or not. There are also a number of sites where diagnostic Fremont traits do not occur, which provides the opportunity to compare data sets. Site 5RB2449 (Babcock 1984) and Alimony Alcove (Hauck 1994:1887) are of interest simply because of evidence of *Chenopodium* procurement.

Additional clusters of Aspen tradition components are found in Moffat County, though here exploitation of sagebrush-grassland steppe is a factor rather than exploitation of pinyon-juniper canyonlands, as is prevalent in Rio Blanco County. Several sites excavated by Centennial Archaeology (Kalasz et al. 1990) date from this period, as do several unreported sites excavated by Metcalf Archaeological Consultants on the Uinta Basin Lateral (Kalasz 1999; McDonald 1998). These sites are located in the extreme southern physiographic Wyoming Basin and have similarities to Uinta phase sites. Mesa and western Garfield counties have several excavated sites, including a cluster from the Battlement Mesa project (Conner and Langdon 1987), and an assortment of smaller projects (e.g., Tickner 1997).

Other clusters of Aspen tradition sites occur in the upper Gunnison Basin (Jones 1982, 1986a; Stiger 1998) and in the Upper Colorado drainage (Benedict 1985; Liestman 1984; Metcalf et al. 1991). Utilization of upland environments provides a contrasting area for comparing subsistence data.

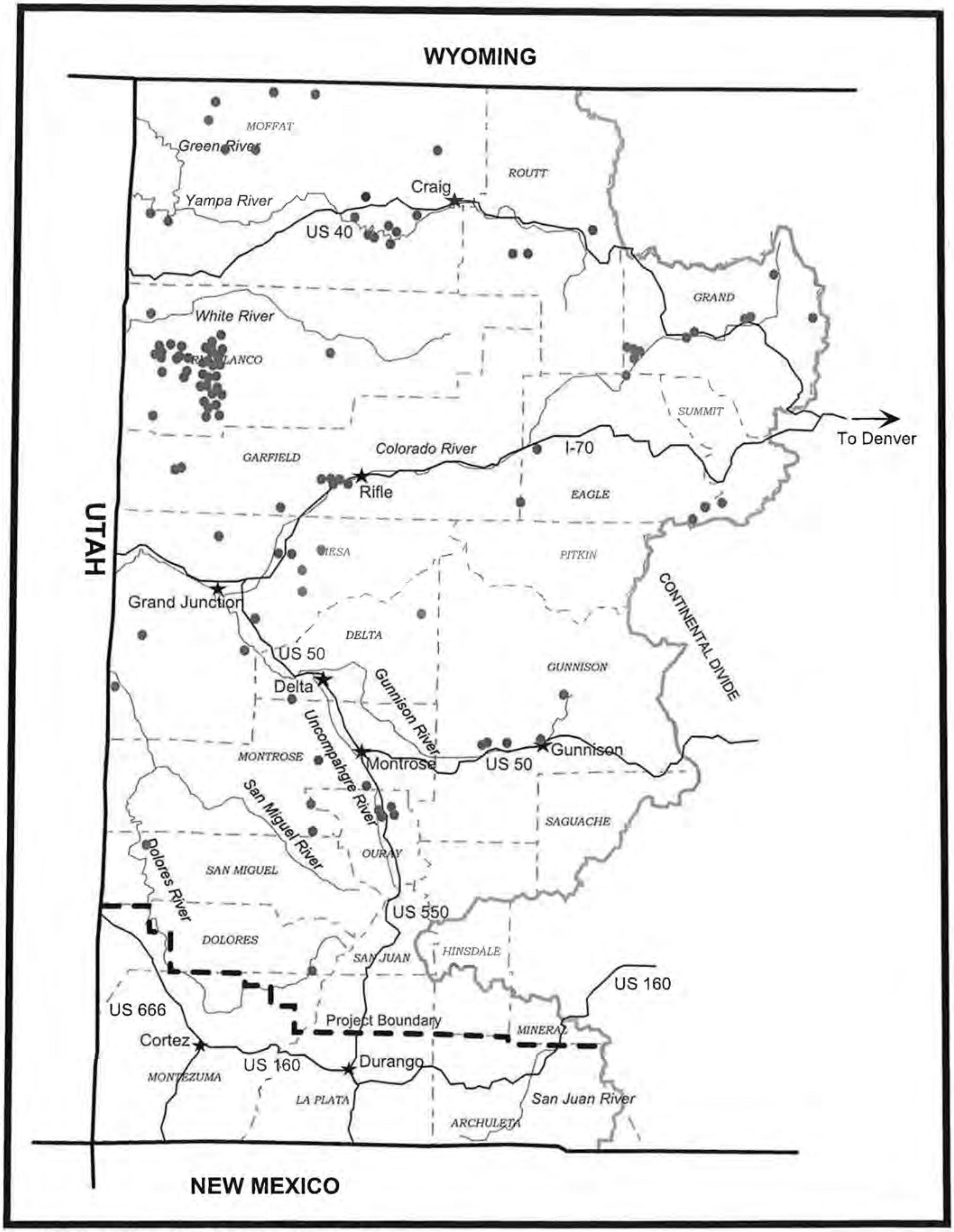

Figure 7-9. Distribution of Aspen tradition sites.

Modeling the Aspen Tradition

Radiocarbon Record

Perhaps the most dramatic, and potentially most misleading, aspect of the Formative -era radiocarbon record is the rapid increase in date frequency after 400 B.C. As was noted earlier, much of this increase can be attributed to dates on multiple pit features from sites below 2134 m (7000 ft) in elevation. The frequency of dates in the radiocarbon record from the higher elevations remains relatively consistent with earlier periods, though there appears to be a shift in use patterns from a year-around pattern to a warm-season pattern underlying the consistent numbers. Frequently, an abrupt rise in radiocarbon frequency is taken to signify an increase in populations, and this may be a factor in the increase of radiocarbon ages for the period. Alternatively, a subsistence system that utilizes frequent use of processing features may be a contributing factor in high radiocarbon date numbers, because such features are quite visible in the archaeological record and tend to be easily discovered during archaeological investigations. In turn, a reliance on foods that require specialized processing is suggestive of increasing stress on subsistence systems. The date frequency peaks about A.D. 700, after which there is rapid decline in date frequencies, bottoming out about A.D. 1300.

Some combination of population growth and climatic stress probably underlies this pattern, but no completely satisfactory explanation has yet emerged. The shift to seasonal use of the Gunnison Basin posited by Stiger (1998) is reflected by a drop in the frequency of high-elevation dates and an increase in low-elevation date frequency at about 800 B.C. General regional cooling with higher effective moisture at low elevations may be a factor influencing settlement. In the Yampa Valley record, a second episode of weak cumulic soil building occurs after 1000 B.C., and there is evidence of more discrete paleosols at about 200 B.C. and more definitely around A.D. 200-400. Low-elevation dates peak between about A.D. 900 and 1100 and are steady in the high-elevation record, perhaps an indication of all-around good times. Drought in the late A.D. 1100s is supported by a bump in the high-elevation date record, and a near-crash in date frequencies in the high record in the late A.D. 1300s is mirrored by higher date frequencies in the low record. Some interplay between highland and lowland resource utilization can be posited on this basis, though considerable detail needs to be worked out.

Pit Features

Data presented on pit morphology and distribution in Chapter 6 are also relevant to examination of subsistence organization in later periods. The frequency of all dated features increases during the Formative era, as noted above (Figure 6.3). Of seven feature types used in the analysis, all but rock-lined features show some increase in use. Increased use of rock-filled basins is perhaps the most obvious, but simple basin hearths show a less dramatic increase. Increased processing, either through stone boiling or roasting, would seem to be indicated. As noted for the Archaic era, functional and content analysis of the various feature types would appear to have some of the strongest potential for testing models of shifting mobility and subsistence. The fact that more than half of all the radiocarbon ages from the study area derive from features postdating 400 B.C., suggests a need for more thorough study of the organizational context of feature use.

Structures

The range of shallow pit, brush, and rock habitation structures attributed to Fremont-related occupations has already been reviewed. Stiger (1998b) suggests that use of substantial houses shifting to lower elevations after 1000 B.C. marks a shift of winter residential patterns to lower elevations. Within the basin house type defined by Shields (1998), a significant number of structures in the regional database date between A.D. 150 and 900. This includes a cluster of sites in the Browns Park area of Utah (McKibbin 1992) and a number of sites in the southern Wyoming Basin, but only a structure from 5GN42 (Jones 1986) is located explicitly in the Colorado Basin study area. The regional pattern is for the use of basin houses to mimic an increase in feature use.

Other structure types suspected during the Aspen tradition include tipi rings (Metcalf et al. 1991) and wickiups, and other informal brush and rock structures. So far, most of the sites with structures in the study area have been attributed to other Formative-era traditions. The database is still too small to evaluate the meager but variable record of structure use over most of the study area.

Chapter 8
PROTOHISTORIC ERA

INTRODUCTION

The Protohistoric era refers to aboriginal occupation of western Colorado between the end of horticultural-based subsistence practices of the Formative era and the final expulsion of the Ute to reservations in A.D. 1881. The beginning date of the Protohistoric era is somewhat ambiguous; the Anasazi emigrated to what are now New Mexico and Arizona by A.D. 1300, approximately the same time that Gateway tradition peoples to the north either emigrated or altered their lifeway to a degree that their tradition became unrecognizable to archaeologists. The Fremont tradition, however, began to contract geographically at approximately A.D. 1250, but evidently endured until approximately A.D. 1500 in areas peripheral to the Fremont homeland, such as in northwestern Colorado. For purposes herein, A.D. 1300 will be used as the start of the Protohistoric era, because so few people appear to have attempted to maintain a horticultural lifeway between A.D. 1300 and 1500. Furthermore, there is evidence of the immigration of a new hunting and gathering group at or shortly before A.D. 1300 (Reed 1994).

Protohistoric-era peoples in the Northern Colorado Basin were highly mobile hunters and gatherers. Before extensive exposure to Euroamerican culture, these people constructed wickiups for shelter, manufactured brown ware ceramics, and hunted with bows and arrows. Arrows were tipped with Desert Side-notched and Cottonwood Triangular projectile points.

Eastern Ute contact with Spaniards commenced in the early 1600s, and by approximately 1650, the Ute in the study area had obtained enough horses to adopt an equestrian lifeway. This adoption permitted expansion of annual territories and increased cultural contacts with other groups, especially the inhabitants of the Great Plains and the Pueblos and Spanish to the south. Later Protohistoric-era components frequently contain small quantities of Euroamerican artifacts obtained in trade.

Historic records indicate that the Ute were the primary occupants of the Northern Colorado Basin since the late eighteenth century, though the Shoshone may have occupied the extreme northwestern portion of the study area, north of the Yampa River. The Dominguez-Escalante Expedition journal reported, but evidently did not encounter, Yamparica Comanches in the study area north of the Colorado River (Warner 1995). The Comanche, linguistically related to the Ute and Shoshone, may have inhabited portions of the Great Basin or Rocky Mountains prior to their emigration to the Southern Plains (Cassells 1997; Yenne 1998). Virtually all subsequent historic records from the region indicate regional occupation by the Ute, however. Because of the preponderance of historic data pointing to Ute occupation of the region, sites dating to the late eighteenth century and later are widely regarded as Ute. Diagnostic artifacts found at these late sites, such as Uncompahgre Brown Ware ceramics and Desert Side-notched and Cottonwood Triangular projectile points, evidence continuity from the preceding centuries. Consequently, sites in the study area yielding these artifacts — especially Uncompahgre Brown Ware — are frequently attributed to the Ute or their ancestors (Reed 1994).

QUALITY OF THE DATABASE

The quality of the archaeological database for the Protohistoric era has increased dramatically in recent years. Whereas the regional research designs published in 1984 noted a paucity of sites attributed to the Protohistoric era (Grady 1984; Guthrie et al. 1984; Reed 1984b), sites attributed to this era are now well represented in the archaeological database. The site files at the OAHP list 739 Protohistoric-era components, representing approximately 5 percent of all components, including those of unknown affiliation. This increase has come about because of the increased volume of archaeological investigations in the study area and because the temporal span of certain artifact types has become better understood.

Currently, 29 Protohistoric-era components yielding both diagnostic artifacts and chronometric dates have been excavated (Table 8-1). Of these, 23 have been excavated since the publication of the last regional research designs. Additional Protohistoric-era components have been excavated as part of the TransColorado natural gas pipeline archaeological mitigation program, but are, as yet, unreported.

PARTICULARLY IMPORTANT SITES

As discussed below, many important research questions can be applied to Protohistoric-era components, so any site with a Protohistoric component with contextual integrity should be regarded as an important cultural resource. The data potential of many of the excavated sites listed in Table 8-1 has not been exhausted, so such sites should continue to be regarded as important resources.

Protohistoric sites are uniquely suited for providing insight into intrasite patterning of activity areas at earlier open artifact scatters. Ephemeral brush structures are occasionally discernible at Protohistoric-era sites, which tend to disappear without a trace with the passage of time. Protohistoric-era sites with brush structures can provide insight into patterns of artifact and feature distributions around definite structures, which can aid in the interpretation of sites where such structures have disappeared. It is likely that most of the early hunting and gathering campsites once had ephemeral brush structures. Protohistoric sites with definite brush structures are, therefore, regarded as particularly important cultural resources.

Table 8-1. Dated Components with Diagnostic Protohistoric-Era Artifacts.

Site No.	Radiocarbon Calibrated Range	Diagnostic Artifacts	Reference
5DT271	A.D. 1660–1950	Uncompahgre Brown sherds	Baker 1991
5EA433	A.D. 1432–1644	Uncompahgre Brown sherds, metal and glass artifacts	Conner 1988
5GA22	A.D. 1043–1399 A.D. 1034–1394	Uncompahgre Brown sherds, Cottonwood Triangular point	Benedict 1985
5GA1172	A.D. 1307–1437 A.D. 1036–1289	Cottonwood Triangular, Desert Side-notched points	Metcalf et al. 1991
5GA1208	A.D. 1031–1393	Desert Side-notched point	Naze 1994
5GF1336	A.D. 1025–1283	Intermountain sherds	Rhodes 1986
5GF1341	A.D. 645–944	Desert Side-notched point	Rhodes 1986
5GN41	A.D. 1310–1638 A.D. 1327–1635	Uncompahgre Brown sherds, Desert Side-notched points	Dial 1989
5GN42	A.D. 134–408	Desert Side-notched	Jones 1986a
5GN1664	158 B.C.–A.D. 130 381 B.C.–A.D. 60	Cottonwood Triangular point	Rossillon 1984
5GN2478	193 B.C.–A.D. 80 A.D. 560–786	Cottonwood Triangular and Desert Side-notched points	Rood 1998

Table 8-1. Dated Components with Diagnostic Protohistoric-Era Artifacts.

Site No.	Radiocarbon Calibrated Range	Diagnostic Artifacts	Reference
5ME4971	A.D. 1660–1950	Desert Side-notched point	Nickens and Associates 1986
5ME5997	A.D. 1305–1611	Desert Side-notched point, Mancos and Tusayan Corrugated sherds	Conner et al. 1998
5MF435	A.D. 886–1158 A.D. 881–1152 A.D. 884–1155 A.D. 890–1162 A.D. 895–1168 A.D. 1012–1282	Desert Side-notched point	Arthur et al. 1981
5MF436	A.D. 570–783 A.D. 599–886	Cottonwood Triangular point	Arthur et al. 1981
5MF1900	158 B.C.–A.D. 635	Cottonwood Triangular and Desert Side-notched points	Gleichman and Spears 1985
5MF2544	A.D. 1657–1950	Cottonwood Triangular point	Kalasz et al. 1990
5MF2631	A.D. 1290–1439	Intermountain sherds, Desert Side-notched points	Murcray et al. 1993
5MN41	A.D. 1741 (tree-ring)	Uncompahgre Brown sherds, Desert Side-notched point	Buckles 1971
5MN42	A.D. 1763 (tree-ring) A.D. 1762 (tree-ring)	Brass knife blade	Buckles 1971
5MN2629	A.D. 1025–1386	Uncompahgre Brown sherd	Greubel 1989
5RB104	A.D. 1425–1640 A.D. 1250–1395	Desert Side-notched point	Baker 1998b
5RB804	A.D. 821–1950	Intermountain sherd	LaPoint et al. 1981
5RB2275	A.D. 898–1256	Brown ware sherd, Cottonwood Triangular point	McPherson 1983
5RB2926	A.D. 1529–1950	Desert Side-notched, Cottonwood Triangular points	Baker 1993
5RB3060	A.D. 972–1230	Desert Side-notched point	Baker 1995
5RB3182	A.D. 1046–1411 A.D. 1424–1638 A.D. 1409–1641 A.D. 1225–1439	Uncompahgre Brown sherd, Desert Side-notched point	Baker 1996
5RT345	A.D. 883 – 1029	Uncompahgre Brown sherd	Pool 1997
5RT11	196 B.C. – A.D. 766	Desert Side-notched point	O'Neil 1980a

MODELING THE PROTOHISTORIC-ERA OCCUPATION

Space/Time Systematics

Regional Taxonomic Schemes

Regional archaeologists have developed several taxonomic schemes for the Protohistoric era. Buckles' (1971) dissertation on the Ute Prehistory project resulted in the definition of the Escalante and Camel Back phases to subsume most of the Protohistoric era. The Escalante phase, dating between A.D. 1500 and 1880, refers to components that are probably related to Ute occupation of the area, as evidenced by such artifacts as brown ware ceramics and such structures as wickiups. Data from seven sites were used in the phase's definition. Because the phase commences about the same time as Spanish arrival in the new world, phase components may evince impacts from European culture. The Camel Back phase, represented at two of the sites Buckles (1971) investigated, is attributed to the period between A.D. 1300 and 1500. The relationship of the Camel Back phase to Ute culture is less certain.

Nearly 20 years after Buckles defined the Escalante and Camel Back phases, Reed (1988) proposed a phase sequence for the region's Protohistoric era to reflect the expanded database. Four phases were defined. The first, and most tentatively defined, was the Chipeta phase, dating between A.D. 1250 and 1400. Chipeta phase components were characterized by Desert Side-notched and Cottonwood Triangular projectile points. Uncompahgre Brown Ware, however, appeared to be absent from components dating to this period. The Canalla phase, dating between A.D. 1400 and 1650, witnessed the addition of Uncompahgre Brown Ware to artifact assemblages. The Canalla phase was thought to represent a pre-equestrian Ute lifeway. At approximately A.D. 1650, regional Utes appear to have acquired horses in sufficient quantities to shift to a more equestrian lifeway. With the adoption of the horse, Ute contacts with Plains Indians and Europeans increased, leading to the development of Ute culture of popular perception. Reed (1988) refers to the period between A.D. 1650 and 1880 as the Antero phase. A fourth phase, the Reservation phase, pertains to Ute archaeology following the removal of Utes from the region.

At the same Ute symposium where Reed presented his phase sequence, Baker (1988) presented a phase sequence based upon Leacock and Lurie's (1971) model of aboriginal culture change resulting from conquest by Euroamerican culture. Leacock and Lurie defined five phases that characterized continental patterns of culture change. The Late Precontact phase refers to a traditional aboriginal culture, unaffected by European contact. The Early Contact phase is a time of integration of some elements of Euroamerican culture, archaeologically manifested by the acquisition of limited quantities of Euroamerican items. Horses were generally acquired during the Early Contact phase, altering traditional lifeways in many ways. Early Contact phase groups, however, still maintained considerable political autonomy. Baker (1996) renamed the Early Contact phase of western Colorado the Rivera Archaeological phase, and suggested that it lasted until about 1775, when direct contact between the Ute and the Spanish began. Leacock and Lurie's (1971) Middle Contact phase was characterized by increased acquisition of Euroamerican trade goods; participation, to a limited degree, in Euroamerican economy; and rapid culture change. Relations with Euroamericans became increasingly hostile. In western Colorado, Utes participated in the fur trade and adopted a highly equestrian lifeway. Baker (1996) refers to the Middle Contact phase in the study area as the Robidoux Archaeological phase and attributes it to the period between 1775 and 1860, ending with the first definition of Ute reservations. The Late Contact phase represents a period of loss of territory, political and economic autonomy, and traditional culture. This phase is locally referred to by Baker (1996) as the Chief Ouray and Chief Douglas archaeological phases, which are attributed to the period between 1860 and 1881. During this period, Utes were removed to reservations. Leacock and Lurie's (1971) last phase, termed the Recent Contact phase, is characterized by reemergence of interest in traditional culture and increased political and economic power. Baker (1996) now refers to this period between 1881 and 1900 as the Fort Duchesne phase.

O'Neil (1993) has suggested that the Protohistoric era be divided into two periods, termed the Early Numic and the Protohistoric. The Early Numic period is thought to date between roughly A.D. 1300 and 1650, at which time the horse was integrated into Ute culture. O'Neil's Protohistoric period extends from 1650 to 1800.

Several of the proposed phase or period sequences discussed above have significant problems. Buckles' (1971) Escalante phase is well defined and incorporates data from seven excavated components. His Camel Back phase, however, is defined with data from only two sites, both of which lack chronometric control, and is difficult to differentiate from Buckles' other phases on the basis of material culture. Reed's (1988) phase sequence includes two phases that should be discarded. Recent evidence has shown that Uncompahgre Brown Ware ceramics do, indeed, extend throughout the Protohistoric era, so there is no justification for the recognition of the Chipeta phase (see Reed 1994). The Reservation phase has proven to be useless, because Ute reservations were only delimited in portions of the study area between A.D. 1860 and 1881, and sites dating to this period would not exhibit significant differences in archaeological content from sites dating to the Antero phase.

Leacock and Lurie's (1971) model is terrific for showing the progression of typical cultural processes as aboriginal groups succumb to the onslaught of an expanding culture with demographic and technological dominance. It is not, however, useful as an archaeological phase sequence. The archaeological database is too small to permit determination of key classificatory events. Phase criteria, such as the relative importance of trade goods, the rapidity of culture change, and the integrity of core cultural institutions, are ill-suited for small samples of archaeological sites characterized by limited or no Euroamerican trade goods and chronometric dating techniques that typically delimit many decades or even a few centuries. Also, three of the five phases defined by Leacock and Lurie postdate about A.D. 1820 in western Colorado. Our sample of sites dating to this period is especially small and restricted to a few sites that can be accurately cross-dated through analysis of Euroamerican trade items. Present data do not permit distinguishing three phases in a roughly 80-year period with archaeological data. At some point, it may be possible to employ Leacock and Lurie's phase sequence in archaeological studies, but currently, their model seems better suited to historical studies.

With the present state of the Protohistoric-era database, the archaeological record is best divided into pre- and postcontact phases or periods, as Buckles (1971) and O'Neil (1993) have done. These two units reflect important differences in both aboriginal lifeways and the material constituents of archaeological sites. The point in time dividing these two units is somewhat arbitrary, because the time of initial impacts to Ute culture by European culture cannot be precisely determined. The Utes in western Colorado acquired horses and probably other items of European material culture decades before there was much direct contact with the Spanish, and European diseases may have swept through the study area well in advance of direct contact. The date of A.D. 1650 is proposed here to approximate initiation of substantial influence from European culture. The Utes are believed to have acquired the horse in substantial numbers at roughly this time, which permitted the transformation from a pedestrian to an equestrian lifeway (Pettit 1990).

The authors propose that the Protohistoric period be divided into the Antero and Canalla phases, thereby retaining the phases defined previously by Reed (1988). These terms make fewer assumptions about the language of the early Protohistoric era inhabitants than O'Neil's Early Numic period, and, with our use of the Protohistoric-era concept, avoid having a Protohistoric period within the similarly named era, as O'Neil's nomenclature would require. The Antero and Canalla phase names also have the advantage of being described and utilized in published literature (Reed 1988; Schaafsma 1996).

The Canalla phase begins at approximately A.D. 1100, when Uncompahgre Brown Ware appears in the region's archaeological record (Reed 1994) and terminates at A.D. 1650. Projectile points include the Desert Side-notched and Cottonwood Triangular types. Wickiups and similar brush structures were inhabited, and people were engaged in pedestrian hunting and gathering. Toward the end of Canalla phase, European trade goods might appear in limited quantities.

The Antero phase, dating A.D. 1650 to 1881, represents a shift to a fully equestrian lifestyle and is characterized by the addition of Euroamerican trade goods into Ute material culture. Desert Side-notched and Cottonwood Triangular projectile points continue in use, but were probably increasingly replaced by metal projectile points and firearms. Uncompahgre Brown Ware was manufactured. Common Euroamerican trade items include glass beads, metal cone tinklers, cartridges, tin cans, and bits.

Corrections in Dating for the Old Wood Problem

As alluded to above, one of the primary problems in Protohistoric-era archaeology is precise chronometric dating. Radiocarbon determinations often have calibrated ranges covering many decades, and may have ranges extending to the present. That calibrated ranges span decades or centuries is seldom a problem in the more ancient archaeological eras, but is problematic when dealing with contexts that can be interpreted with historic documentation. Tree-ring samples are much more precise than radiocarbon assays, but are seldom available in Protohistoric contexts, unless discernible wickiups are present with poles that have not been extensively weathered. Compounding the problems of both radiocarbon and tree-ring dating is the frequent use of long-dead wood for construction or fuel. Before the introduction of the metal axe, woodcutting was very labor intensive. Much labor could be avoided by using dead wood, because such wood could be toppled without tools and could be easily stripped of branches. Furthermore, dead wood lacks sap, which probably made it more attractive for use in habitation structures. Dead wood was also more suitable for use as fuel.

To account for the difference between the date of a tree's death and the time of human use, Baker (1993) advocates adding 300 years to Protohistoric radiocarbon dates when old fuels or structural elements are represented. Although unstated, similar adjustments would probably be advocated for tree-ring samples, as well. Baker's model has the following implications.

- Independent dating methods, such as thermoluminescence dating of sherds, should date 300 years later than radiocarbon samples collected from the same context.
- Dead wood should persist on the landscape for at least 300 years. Moreover, various microenvironmental settings should have similar probabilities of forest fires.

Jaynie Hirschi, a student at Colorado State University, is writing a Master's thesis on correction factors for old wood dating that deals directly with Baker's methods. Hirschi's work should be most useful. The authors here are uncomfortable with Baker's use of an arbitrary 300-year constant. Such a constant should be developed scientifically from discrete contexts dated by both radiocarbon and independent dating techniques. To date, these conditions have not been met. Brown and his colleagues (1998) recently completed a dendrochronological study of the length of time that it takes windthrown lodgepole pine and Engelmann spruce to decay in the subalpine forests near Fraser, Colorado, that may provide insight into the sagacity of the 300-year constant. The study found that trees felled when live decayed in approximately 150 years in subalpine environments. The researchers noted, however, that factors such as tree size, health immediately prior to death, and microenvironmental setting may affect decomposition rates. Trees that stood after death, though not included in the study, were believed to endure longer, because they were drier and, hence, better resistant to decomposition (Brown et al. 1998). It may be argued that the sites in Baker's (1993) study area are within lower pinyon and juniper woodlands, where conditions are considerably drier than the subalpine forests, and that the drier settings are less conducive for decomposition. Brown et al. (1998) point out, however, that the effects of drier settings are at least partly offset by warmer conditions, which provide a longer growing season for the biological agents of decomposition. The prevalence of forest fires in a region would also have an effect on the availability of dead wood. In short, the availability and duration of dead wood seems dependent on a wide range of variables that are likely to vary within and between forests.

Tree-ring dates from Ute wickiups on the Uncompahgre Plateau west of Montrose also seem to undermine the 300-year constant. Buckles (1971) sampled three wickiups at sites 5MN41 and 5MN42 and received tree-ring dates between A.D. 1741 and 1763. Because wickiups tend to be fragile and because dead wood may have been used for construction, it is likely that the wickiups were actually occupied in the latter half of the nineteenth century. It is highly unlikely that the wickiups date after 1881, when the Utes were removed to reservations. The old wood problem at the Uncompahgre Plateau wickiups, then, was probably on the order of 100 years. On the other hand, Benedict (1989) conducted thermoluminescence dating of brown ware sherds from the Caribou Lake site in Grand County, and also obtained an AMS radiocarbon date from soot deposits on a sherd. The radiocarbon determination suggested a date approximately 300 years older than the thermoluminescence date.

Differentiation of Ute and Shoshone Components

Historic accounts of Ute and Shoshone distributions indicate a boundary somewhere north of the Yampa River (Callaway et al. 1986; Grady 1984). This boundary may have shifted through time, or may have been largely irrelevant to the region's aboriginal occupants, especially before Ute acquisition of the horse. There are, however, differences in language and pottery, so the two populations probably made some degree of ethnic distinctions. Archaeological research at Protohistoric-era sites in the vicinity of the Yampa River may be able to differentiate Ute from Shoshone components.

Ute and Shoshone peoples, both speakers of Numic languages, share many elements of material culture. Both groups manufactured Desert Side-notched and Cottonwood Triangular projectile points, Shoshonean knives, and brown ware pottery, and both groups lived in wickiups. Shoshone pottery, known as Intermountain Ware, is somewhat different from Ute pottery. Intermountain Ware vessels commonly have a flat base, with the vessel walls flaring progressively above the base (Frison 1991; Larson and Kornfeld 1994). Ute pottery, on the other hand, usually has a pointed base, a slightly constricted neck, and a slightly everted rim. Steatite vessels, also with flat bases, were carved by the Shoshone, but not the Ute. Sites in Colorado near the Wyoming border with carved steatite vessels or with Intermountain Ware vessels complete enough to determine vessel shape would represent strong evidence of Shoshone occupation of the study area.

Archaeological data currently provide only limited support for Shoshone occupation of the study area. Flat-bottomed Intermountain Ware vessels have been found at the Crying Woman site (5GA1208) in Middle Park (Naze 1994), at site 5RT1334 near Steamboat Springs (Kevin Black, personal communication 1999), and at several sites along Colorado's Front Range (Larson and Kornfeld 1994). These artifacts are too widely distributed and sparse to clearly indicate Shoshone occupation of the study area. The presence of Ceremonial Style rock art in the study area provides limited evidence of Shoshone occupation of the region; this rock art style is not restricted to the Shoshone. According to Cole (1990), a few rock art panels with Ceremonial Style elements have been recorded in the Yampa Basin. Cole suggests that the Ceremonial Style dates between A.D. 1300 and 1700.

Settlement Patterns

Protohistoric-era sites are dispersed throughout the study area. As shown in Figure 3-1, wickiup sites occur most often in the western portion of the study area, but this is thought to primarily reflect the distribution of pinyon and juniper woodlands. Sites in the OAHP database attributed to the Ute occur in all elevation zones. Higher than expected relative frequencies of Ute sites occur below 1829 m (6000 ft) and fewer than expected sites occur above 3048 m (10,000 ft), based on the distribution of nonsite elevations in the study area (see Chapter 2; Reed 1994:Figure 22.3). These deviations, however, may be due to unequal cultural resource inventory coverage.

Archaeological data tentatively suggest a subtle shift in settlement/subsistence strategies at the beginning of the Protohistoric era. Whereas Archaic-era peoples appear to have employed a "collector" strategy, with relatively high logistical mobility, Protohistoric-era peoples appear to have employed more of a "forager" strategy, with relatively high residential mobility (Binford 1980). Archaic structural sites, such as Yarmony House, represent anticipated long-term habitations where resources were brought from various procurement locations for storage for winter consumption. Such substantial structures have not been documented during the Protohistoric era, however, suggesting more residential mobility (see Baker 1993). Dial (1989:135) suggests that Protohistoric-era peoples were "serial specialists" who executed residential mobility as food resources came into fruition as seasons progressed (see Binford 1980). Again, residential mobility is seen to have been favored over logistical mobility.

Basic patterns of movement across annual territories are thought to have been generally similar to those characterizing the Archaic era, given the nature of the region's topography. Winters were spent in the lower elevations, probably in deer and elk winter ranges, where snow depths were manageable and where trees were available for shelter and fuel. Pinyon and juniper woodlands may have been especially well suited for winter habitation. According to Opler (1963), populations were relatively dispersed in the winter months; individual sites may have been occupied by extended families. Occasionally, families would gather for communal rabbit hunts or trading expeditions (Opler 1963). With the arrival of spring, lowland riparian habitats along major rivers were evidently exploited (Grady 1980). Groups constituting a band would gather for the annual bear dance (Opler 1963). As the temperature rose and snow melted, groups would disperse to the high country, timing their ascent to efficiently exploit maturing food resources. Summers were times of plenty, so populations frequently aggregated (Petersen 1977). Deer, elk, bison, and pronghorn were hunted. Occupation of the highlands continued into the fall, until snows began to drive game animals back into the lower elevations. During the fall, berries, nuts, and other late-maturing resources were exploited; these and animal products were probably prepared for winter storage. This settlement model has the following test implications.

- With a more forager-like settlement/subsistence strategy, Protohistoric-era sites should evidence higher relative frequencies of habitation sites and lower relative frequencies of specialized, resource procurement locations than Archaic-era sites.
- Protohistoric-era sites should have fewer and less formalized storage facilities than Archaic-era sites.
- Protohistoric-era habitation sites thought to have served for winter occupation should evince shorter anticipated length of occupation than Archaic-era winter habitations. Accordingly, Protohistoric-era sites should be characterized by less substantial architecture, less formal storage structures, smaller site size, less patterned waste disposal, and less diverse and rich artifact assemblages (see Kent 1992).

- Floral and faunal remains sensitive to seasonality of site occupation should evidence summer and fall use of the higher elevations and winter and spring use of the lower elevations.

Interpretations of Protohistoric-era settlement patterns are hampered by the small sample of excavated components. As the database grows, it should be possible to determine whether Protohistoric-era sites are more likely to have served for habitation than Archaic-era sites, and so reflect more of forager strategy. Consistent criteria for assignment of site function need to be applied, however, and corrections need to be made to account for the disappearance of ephemeral brush habitation structures at Archaic sites. Protohistoric-era components are no more likely to have had ephemeral habitation structures than Archaic-era components, so perceived differences probably reflect preservation. Regional data confirm that Protohistoric-era groups constructed less substantial storage features than Archaic- or Formative-era groups. Slab-lined storage cists, subfloor cists, and granaries are absent in Protohistoric-era contexts. Excavated Protohistoric-era cultural features consist almost exclusively of hearths; no storage features have been documented. Inventory data indicate that the Ute used some tree platforms for storage, but these are much less substantial than cists and granaries. It seems plausible that tree platform storage structures were for short-term storage at inhabited sites because unattended platforms are vulnerable to raiding by animals. Substantial residential architecture, often a hallmark of winter habitation, is uniformly lacking during the Protohistoric era. The absence of substantial habitation architecture and long-term storage facilities supports the notion of high residential mobility.

Subsistence

Until the destruction of traditional lifeways following the 1860s, Protohistoric-era peoples were exclusively hunters and gatherers. Bettinger and Baumhoff (1982) suggest that Numic-speaking peoples were able to expand their range across the Great Basin and into adjacent physiographic provinces because they employed a more labor-intensive hunting and gathering strategy than their indigenous competitors. Unfortunately, subsistence data yielded by chronometrically dated components are scanty, and few comparisons can be made. Macrobotanical, palynological, and faunal data from excavated sites provide some insight into the types of biological resources exploited for food, but the data do not permit assessment of the relative importance of those resources, especially in a diachronic sense.

Exploited fauna include mule deer, elk, bison, pronghorn, bighorn sheep, cottontail, jackrabbit, and rodents. Chub (a fish) were identified in the faunal collection at site 5RB748 (LaPoint et al. 1981). Historic records indicate that mounted Utes hunted bison on the Great Plains, which suggests that bison may have been less commonly procured in pre-equestrian components. Regional data, however, do not bear this out. Bison bones have been recovered in early (Baker 1996; Conner et al. 1998; Dial 1989; Murcray et al. 1993; Naze 1994) as well as late (Baker 1991, 1993, 1995) Protohistoric-era contexts.

Macrobotanical and palynological data from excavated Protohistoric-era sites in the study area indicate consumption of goosefoot, grass seeds, mustard, saltbush, and cattails. Other plant foods probably consumed include pinyon nuts, juniper berries, skunkbush berries, serviceberries, hackberry seeds, and possibly saltbush seeds, knotweed, chokecherry, and chickweed (Reed 1994).

Technology

The Protohistoric era is marked by the appearance of new types of pottery, projectile points, and, possibly, bifaces. Wickiups are apparent in the archaeological record at this time, though similar ephemeral structures were almost certainly constructed in preceding periods.

Pottery

Uncompahgre Brown Ware is the primary ceramic type of the region's Protohistoric era. The large majority of these vessels are wide-mouthed jars with slightly flaring rims; slightly constricting necks; wide, low shoulders; and conical, somewhat pointed bases (Buckles 1971:517). A few instances of vessels with rounded bases are also known (Buckles 1971). Jars are generally between 20 and 30 cm tall. Firing atmospheres were poorly controlled, resulting in friable fracture characteristics and considerable variation in surface color. Colors range from dark brown to light reddish brown. Most vessels appear to have been manufactured by coiling and scraping (Buckles 1971). Material used for temper is variable and appears to reflect local availability of suitable materials. Surface treatment also varies considerably. Buckles (1971) has defined two types of Uncompahgre Brown Ware based upon differences in surface treatment — Plain and Fingertip-impressed. The plain vessels were simply smoothed, whereas the fingertip-impressed vessels were characterized by aligned rows of fingertip or fingernail impressions covering the entire exterior surface. More recent investigations have also documented stick-impressed sherds (Benedict 1985; Nickens and Associates 1986; Alexander 1979; Commonwealth Associates 1978) and, less commonly, corrugated brown ware sherds (Greubel et al. 1998; Reed 1990). Buckles (1971) has observed that fingertip-impressed pots generally had conical bases, whereas the plain variety was more likely to have a rounded base.

Compared to ceramic types of the Mesa Verde region Anasazi, the understanding of Uncompahgre Brown Ware ceramics is incomplete. Several important research questions about the ceramic type need to be resolved, pertaining to chronology, classification, and construction technique; some are presented below.

Chronology

In a review of chronometrically dated brown ware sherds from Protohistoric-era components in western Colorado and eastern Utah, Reed (1994) asserts that the ceramics appear in the region's archaeological record at approximately A.D. 1100. This assertion has the following test implications.

- If Uncompahgre Brown Ware ceramics appear in the region as early as A.D. 1100, then this date may roughly mark the arrival of the Ute or their ancestors in the region.
- An arrival of Ute peoples or their ancestors at approximately A.D. 1100 suggests that the study area was, for a few centuries, simultaneously inhabited by both horticulturists, such as the Fremont and the Gateway tradition peoples, and by strict hunters and gatherers.
- Chronometric dating techniques other than dendrochronology and radiocarbon analysis should corroborate an early appearance of Uncompahgre Brown Ware.

Radiocarbon data from regional sites tend to support the arrival of Protohistoric-era brown ware ceramics at approximately A.D. 1100 (Reed 1994). Several sites with such sherds have yielded radiocarbon determinations with associated calibrated ranges between A.D. 1000 and 1300, and it seems unlikely that all such components have a true calendar date near the latest end of the calibrated range. Other artifacts commonly attributed to Protohistoric-era groups in the region, such as Desert Side-notched and Cottonwood Triangular projectile points, appear to date before A.D. 1100, and thus support the ceramic chronology.

Baker (1996) has challenged such an early appearance of Uncompahgre Brown Ware ceramics in the region, citing the old wood problem. According to Baker, prehistoric use of dead wood results in inaccurate assessment of the date of site occupation by a factor of approximately 300 years. Adding 300 years to the A.D. 1100 date would mean that the ceramics appeared in the region at approximately A.D. 1400, well after most regional horticultural groups had emigrated or changed their lifeways.

Interpretation of ceramic chronology will be enhanced by the application of thermoluminescence dating of sherds, a technique unaffected by the old wood problem. Currently, sherds from only a single site in the study area have been subjected to thermoluminescence dating. Benedict (1989) conducted thermoluminescence dating of several brown ware sherds recovered at the Caribou Lake site (5GA22); these yielded an average age of 325 ± 25 B.P. (ca. A.D. 1625). Interestingly, Benedict (1989) also processed a radiocarbon sample from the soot covering the exterior of these sherd, and obtained a determination with a calibrated range indicative of a date of roughly three hundred years earlier.

Buckles (1971) has posed a second chronological hypothesis relating to Uncompahgre Brown Ware that merits examination. Data from the Ute Prehistory project suggested to Buckles that vessel shape and surface treatment might have changed through time, with conical-based, fingertip-impressed vessels dominating early assemblages, and plain, globular vessels dominating later assemblages. The limited chronometric data from the study region do not appear to support Buckles' observation. Although fingertip-impressed pottery in the study region may be dominant before A.D. 1300, plain pottery has been dated to the period between A.D. 1025 and 1386 at site 5MN2629 (Greubel 1989), as early as Fingertip-impressed pottery at site 5GF1336 (Rhodes 1986).

Although Buckles (1971) attributes differing relative frequencies of Plain and Fingertip-impressed types to changes in cultural preferences through time, variation in vessel surface treatment may also reflect the preferences of discrete Protohistoric-era social groups. Only limited evidence suggests that groups other than the Ute or their ancestors once occupied the study area. It is, perhaps, more plausible that different bands may have manufactured different types of Uncompahgre Brown Ware. Because the amount of labor to construct either ceramic type is roughly equivalent, it is unlikely that ceramic type preference reflects levels of group mobility. It is also difficult to conceive that different vessel surface treatments reflect different vessel functions, as vessel shapes are generally similar, or that one ceramic type would be better suited for use in one elevation zone than the other. That cultural factors may be reflected is suggested by the distribution of Plain and Fingertip-impressed ceramics from excavated contexts within the study area. Although the sample of excavated sites with brown ware ceramics is small, it appears that Plain type is prevalent in the eastern and southern portions of the study area, and that Fingertip-impressed type is dominant in the northwestern portion of the study area (Figure 8-1). Moreover, there are no known instances of a single excavated component yielding both Fingertip-impressed and Plain Uncompahgre Brown Ware ceramics. That ceramic variation may reflect ethnic differences is also suggested by studies of obsidian sources. Protohistoric-era sites in the northern portion of the study area tend to yield obsidian from sources in Idaho or western Utah, whereas sites in the southern portion of the study area tend to yield obsidian from sources in north-central New Mexico. This suggests access to different trading networks. Future studies of brown ware ceramics should consider both the temporal and the geographical contexts of ceramic samples.

Typology

From his work on the Ute Prehistory project, Buckles (1971) defined the Uncompahgre Brown Ware ceramic tradition, which was composed of a Plain type and a Fingertip-Impressed type. Frequently, archaeologists use Uncompahgre Brown Ware as a ceramic type, instead of as a

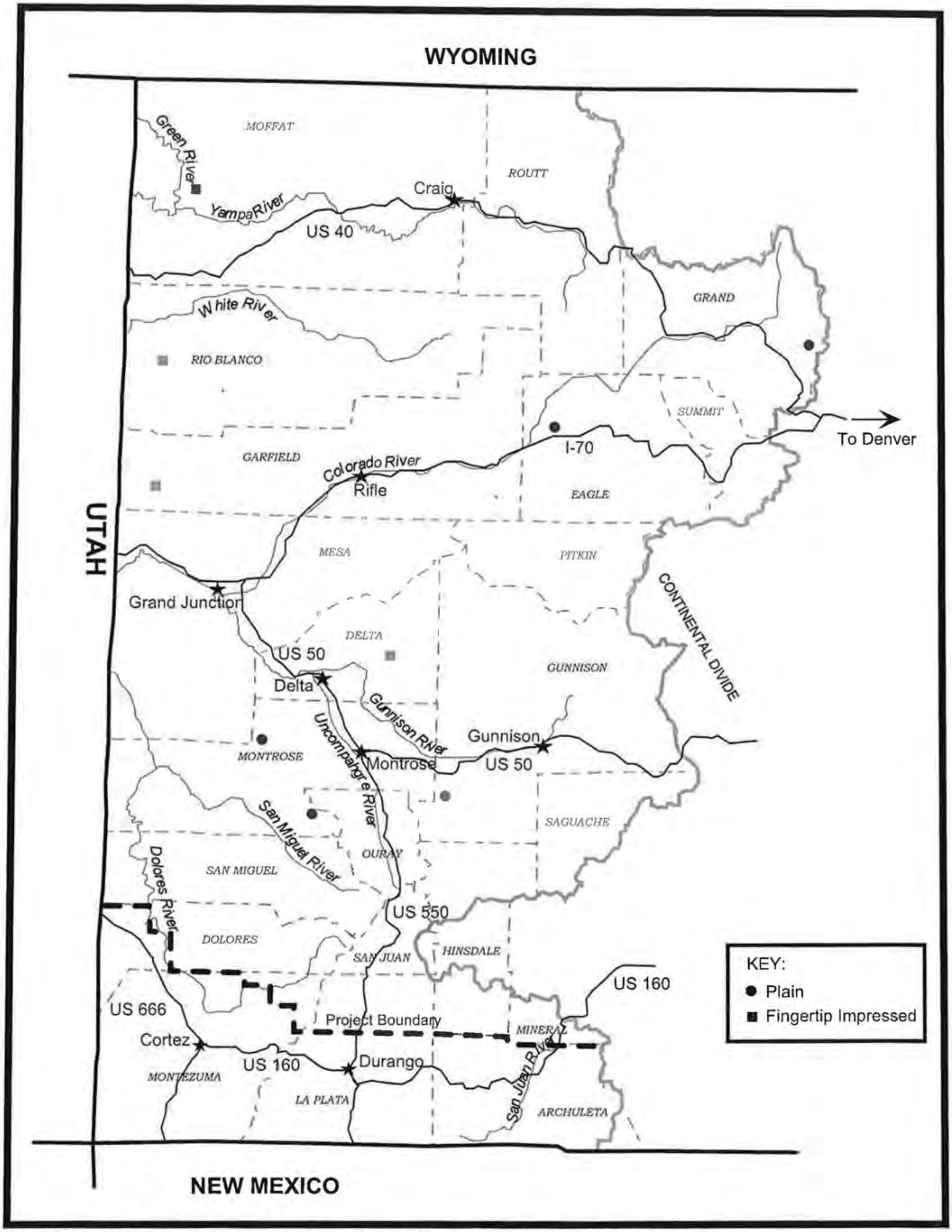

Figure 8-1. Distribution of Uncompahgre Brown Ware pottery from excavated contexts.

tradition, which can result in the loss of important information if surface treatment is not explicitly addressed. It is important to differentiate the two ceramic types because of possible temporal and cultural implications. As discussed above, Buckles (1971) has hypothesized that the Plain type may have been most popular in the later portion of the Protohistoric era, a hypothesis that merits further examination.

The range of variation is less well understood for the Plain type than for the Fingertip-Impressed type. Although there are several complete or reconstructed conical-based, fingertip-impressed vessels in various collections, there is, apparently, only one round-bottomed, plain pot documented in the region. This single vessel is from a private collection, reportedly from Montrose County (Buckles 1971:517). Buckles (1971:520-522) writes that the preponderance of evidence from potsherds suggests that Plain type vessels had rounded — not conical — bases, and adds that Plain type pottery may have been characterized by smaller vessel size, thinner walls, weaker shoulders, flaring rims, and more cylindrical shapes than Fingertip-impressed type vessels. However, with only one complete Plain type vessel, assessment of the range of vessel shape variability is impossible.

Refinement of ceramic types may be possible through petrographic analyses to determine temper materials. Several petrographic studies have been conducted on regional brown ware ceramic samples, which indicate considerable variation in temper material type. Temper materials identified through petrographic analysis include rhyolite (Dial 1989), andesite (Baker 1991, 1996; Hill 1989), chalcedony (Dial 1989), gneissic granite grus (Hill and Kane 1988), and granite (Benedict 1985; Baker 1991; Hill 1996). Many sherds are also micaceous, but it is often difficult to determine whether mica was a natural constituent of the clay used for paste or was part of the temper. Temper variation is usually attributed to local availability of suitable materials. Although temper is used to differentiate ceramic types in other regions, it would be premature to advocate defining new brown ware types in the Northern Colorado Basin on the basis of temper material with present data. Nonetheless, it is important to understand the distribution of sherds with various temper materials, because such might provide insight into band settlement patterns or trade. Samples of brown ware sherds from excavated contexts should be routinely subjected to petrographic analysis.

Construction

Debate in recent years centers on the method of vessel wall thinning during construction of Uncompahgre Brown Ware. Macroscopic examination of Uncompahgre Brown Ware sherds suggests to most analysts that vessel walls were coiled and then thinned by scraping or wiping (e.g., Buckles 1971; Dial 1989). Hill and Kane (1988), however, observe through petrographic analysis that nonplastic particles within Uncompahgre Brown Ware sherds are aligned, suggesting to them that thinning was done with the paddle-and-anvil technique. Particle alignment is attributed to the compression of the plastic clay during paddle-and-anvil thinning; such compression is implied to be absent when vessel walls are scraped. Anasazi and Navajo ceramics subjected to petrographic analysis evidently lack such particle orientation, as would be expected with coiled and scraped ceramics (Hill and Kane 1988).

Ethnographic data do not indicate the most likely method of vessel thinning; cases for both paddle-and-anvil (Barber 1876) and scraping (Smith 1974; Stewart 1942) techniques have been documented. Certainly, more ceramic research is necessary to determine vessel-thinning methods. Research may find that both methods were used by the makers of local brown ware ceramics, or that some of the paddle-and-anvil specimens were manufactured by nonlocal (i.e., non-Ute) Protohistoric-era peoples (Buckles 1988). Alternatively, Hill and Kane may be in error in that particle alignment is not exclusively a product of the paddle-and-anvil technique. Margaret Lyneis

(1993) of the University of Nevada at Las Vegas argues that nonplastic particle alignment is a function of particle shape and the degree of compression. Elongated particles are far more likely to evidence alignment than rounded particles, regardless of the degree of compression, and Lyneis has observed alignment of mica in ceramics that were undoubtedly thinned by coiling. Lyneis (1993) argues that sufficient compression can occur during coiling and scraping to align elongated particles, so that particle alignment alone is not diagnostic of paddle-and-anvil construction.

Projectile Points

Protohistoric-era projectile points in the study area primarily consist of Cottonwood Triangular and Desert Side-notched types. Of course, low frequencies of earlier projectile point types occasionally occur in Protohistoric-era contexts as a result of mixing of artifacts from multiple components and aboriginal collection and curation of older point types; additionally, some error in classification is inevitable.

Desert Side-notched projectile points have a broad geographic distribution, occurring on the high Plains at Late Prehistoric period sites, in northwestern New Mexico on Dinetah phase Navajo sites, and probably on contemporaneous sites in other regions (Reed 1994:195). In western Colorado, they are frequently attributed to Ute occupations, primarily because the region was the homeland of the Ute during the Historic period. Furthermore, Desert Side-notched points in the study area tend to occur in association with Uncompahgre Brown Ware ceramics — most likely a Ute ceramic type —and not at sites yielding ceramic types attributed to other cultural groups.

According to Holmer, Desert Side-notched points from the Colorado Plateau generally date between A.D. 1200 and 1700. In the Northern Colorado Basin, Desert Side-notched points are most abundant in the period suggested by Holmer, but some appear in earlier dated contexts. Four single-component sites dating prior to A.D. 1000 have yielded Desert Side-notched points. These sites (5GF1341, 5MF1900, 5RB2926, and 5RT11) suggest that Desert Side-notched points may have appeared as early as approximately A.D. 1 (see O'Neil 1980a; Gleichman and Spears 1985). For various reasons, however, it may be prudent to await additional data on Desert Side-notched points to accumulate before extending the type's temporal range to A.D. 1.

Cottonwood Triangular projectile points appear on the Colorado Plateau sometime between A.D. 950 and 1150 at some Fremont sites but are most commonly found at Numic sites postdating A.D. 1300 (Holmer 1986). Cottonwood Triangular points from dated, single-component sites in the study area tend to date after A.D. 1000, though earlier dates were obtained at sites 5MF1900 (Gleichman and Spears 1985) and 5RB2926 (Baker 1993). At the latter site, the excavator considered the radiocarbon-derived dates too early.

Bear River Side-notched and Uinta Side-notched points occur in very low frequencies in the northern portion of the study area in contexts that may temporally overlap the Protohistoric-era. Uinta Side-notched points tend to occur in contexts also yielding Fremont ceramic types, however. The common association of Uinta Side-notched points with Fremont ceramics, coupled with their distribution in the vicinity of the study area's primary Fremont occupation, suggests that Uinta Side-notched points are diagnostic of Fremont culture, and not the Protohistoric-era Ute.

Rosegate projectile points are also found in apparent association with Fremont ceramics at sites such as 5MF435, 5RB2275, and 5RB2958. More commonly, Rosegate points occur in Gateway and Aspen tradition components. Rosegate projectile points have been recovered in components dating after A.D. 1000 in the study area, but not in association with Uncompahgre or Intermountain brown wares and not in single-component sites. When only single-component sites are considered, regional Rosegate points date between approximately 650 B.C. and A.D. 1000, generally before the appearance of brown ware ceramics in the study area.

Structures

Ethnographic records indicate that the Eastern Ute inhabited wickiups, domed willow shelters, and tipis, and utilized sweatlodges, menstrual huts, and ramadas. All of these structural types were built around a pole framework and were relatively unsubstantial, indicative of a highly mobile lifeway.

Wickiups are the most enduring form of habitation structure. These conical structures were probably constructed throughout Ute history and prehistory, even after tipis became common following Ute adoption of the horse as a beast of burden. As described by Smith (1974), Buckles (1971), Sanfilippo (1998), and Scott (1988), wickiups generally consisted of a free-standing, three- or four-pole frame, over which small poles, boughs, juniper bark, hides, or canvas were secured as closing materials. Poles were propped against the ground and not set into prepared holes. Although variable in size (Scott 1988), most wickiups measured 3 to 4.5 m in diameter and stood roughly 2 m high. Wickiups intended for winter use tended to be relatively large (Smith 1974). Floors were unprepared and were never excavated. Some wickiups had central hearths; others had exterior hearths. According to Smith's (1974) informants, juniper bark or reed mats may have been placed on the floor. In addition to the free-standing wickiups, some brush habitation structures incorporated living trees. Poles were leaned against a tree and covered with closing materials, forming a sheltered area beneath less than half of the area protected by the tree. Scott (1988) notes that the lean-to type of wickiups were less formally constructed than the free-standing wickiups and seldom contained hearths.

Probably following A.D. 1650, the Utes began to use tipis. According to Smith (1974), most Eastern Ute tipis had a four-pole foundation, augmented by other poles to comprise a framework of 12 to 20 poles. Smaller tipis compose of eight poles were also built. A covering of sewn elk or bison hides was stretched over the pole frame. A central hearth warmed the tipi. Noncontiguous stones encircled the bases of some, but not all, tipis, presumably to secure the closing material or to anchor poles. Such stones have been identified as "tipi rings" in archaeological literature (e.g., Metcalf et al. 1991).

According to Callaway et al. (1986: 348), one Eastern Ute band, the Weeminuche, also constructed domed willow houses. These structures were approximately 4.6 m in diameter and 2.5 m high and were covered by willow boughs. They were reportedly built for summer use and probably lacked interior hearths. Domed willow houses are unknown in the archaeological record, though this may be due to the ephemeral nature of the structures and their location in riparian habitats.

Eastern Ute sweatlodges were approximately 2.7 m in diameter and 1.5 m high. Smith (1974) writes that the sweatlodge superstructure consisted of willows that were stuck in the ground in a circular manner and bent together for lashing, forming a dome-shaped structure. Callaway et al. (1986) state that sweatlodges were constructed after the manner of conical wickiups, presumably with pinyon or juniper poles. In either case, the superstructure was covered with closing material and was banked with soil for insulation (Smith 1974). Rocks were heated outside in a fire and transported inside to a central depression. A few sweatlodges, such as site 5RB1805, have been identified in archaeological contexts in the study area (Gordon et al. 1983).

According to Smith (1974), the Ute constructed menstrual huts on a monthly basis. Menstrual huts were evidently similar in design to sweatlodges, though less carefully built. No undoubted menstrual huts have been identified in the archaeological record. Smith also reports that historic Ute peoples constructed summer shades, or ramadas. These were rectangular with flat roofs that were covered with brush (Smith 1974). None have been documented in prehistoric contexts, but this is not surprising considering the insubstantial nature of ramadas.

Because standing brush structures are relatively rare in the study area (see Scott 1988) and because fallen ephemeral structures are difficult to identify, few have been subject to intensive investigation. Consequently, many lines of research can be applied to their study. Scott (1988:52) suggests that future research include investigation of intrasite site layout, determination of whether structure construction techniques changed through time, and analysis of wickiup site settlement patterns. Additionally, research should focus on determination of structure function, the contemporaneity of structures at a single site, and season of occupation.

Social Organization

Historic and ethnographic data indicate that the Utes were organized by bands consisting of multiple-family groups who were usually related and who shared common annual territories (Smith 1974). During the equestrian period, the Northern Colorado Basin was the home of the Tabeguache, Weeminuche, Parianucs, and the Yampa bands (Marsh 1982). Men worthy of respect because of their personal characteristics, which might include hunting or fighting prowess, verbal skills, and wisdom, headed bands. Although all bands probably had leaders, Euroamericans who desired a more explicit division of authority than is typical of band organization may have thrust the role of "chief" on Utes. It seems likely that band organization was most complex during the equestrian period, when it became advantageous to aggregate for defense, raiding, and trading. Certainly, the power of band chiefs was greatest during the equestrian period (Callaway et al. 1986:354). As with bands elsewhere across the world, band membership was relatively fluid (Smith 1974).

Bands appear to have dispersed and aggregated at various times of the year in response to the availability of food. Residential units (households) may have aggregated to form large bands during the summer months when food was most abundant (see Callaway et al. 1986). Such aggregation permitted the formation of trading parties and the execution of other large-scale communal activities. These summer aggregations may have been composed of more than 100 people, representing up to 20 households (Callaway et al. 1986; Smith 1974). When bands were dispersed, Colorado Ute sites were generally inhabited by five to 10 households (Smith 1974), with each household occupying a tipi.

The understanding of Ute social organization is based on historic and ethnographic data, and thus pertains primarily to an equestrian society. Social organization may have been somewhat less complex when Protohistoric-era groups were exclusively pedestrian. Ethnographic and archaeological data suggest, however, that the early Protohistoric-era groups were also organized at a band level, though bands may have been considerably smaller. The social organization of early Protohistoric-era peoples is worthy of archaeological investigation, and studies of household organization may be especially productive.

Site Structure

The understanding of Protohistoric-era site structure is limited. Until recently, excavations at regional Protohistoric-era sites did not expose broad areas but focused, instead on structures or cultural features. Such an approach makes discerning patterns of artifact disposal and feature locations difficult. The study of site structure is important, however, if one is to assess length of site occupations and identify culturally determined patterns of site layout.

In many cultures, the location of architectural features and intrasite activity areas is highly regular (e.g., Brugge 1986). Such patterning has not been established for Ute sites, though it may be determined through further research. Ethnographic and archaeological data suggest that doorways for habitation structures opened to the east or northeast, though some of historic Ute indicated that doorways were simply oriented away from prevailing winds (Smith 1974; Huscher and Huscher 1943). When hearths were present within habitation structures, they were centrally located, as would be expected in a combustible brush structure or tipi. Exterior hearths, when present, appeared to cluster just outside the structure doorway (Baker 1996; Buckles 1971:1254). Middens have been documented at Protohistoric-era habitation sites, but their placement does not seem to be consistent (e.g., Murcray et al. 1993). Future research may prove that midden placement reflected anticipated length of site occupation.

The spatial distribution of habitation structures does not appear to have been highly patterned. At the Sand Wash Wickiup site, structures were spaced roughly 5 to 15 m apart (Murcray et al. 1993). Buckles (1971:1257) cites Harold Huscher's notes that state that wickiup placement followed no discernible plan. At sites investigated by Buckles (1971), wickiups tended to be out of sight from each other, except, possibly, for pairs. It is unlikely that on-site distributions of wickiups were random. Archaeologists may be able to discern patterns through use of the nearest-neighbor statistic or similar statistics, and may find that patterns vary by length of anticipated site occupation and the quantity of site households.

Just as distributions of site features and activities can be diagnostic of particular cultural groups, so, too, can site abandonment practices. The Anasazi, for example, frequently burned their pit structures upon abandonment, even though considerable effort was necessary to render the earthen and timber superstructure combustible (Wilshusen 1988). Utes appear to have made a practice of leaving wickiups intact upon abandonment. Nineteenth-century American explorers observed that Utes seldom reoccupied a site from one year to the next, but camped nearby the abandoned, intact structures, giving the appearance of past occupation by a very large tribe (Petersen 1977:9). Other abandonment practices may be discernible through archaeological research.

Demography

Radiocarbon data from Ute components in eastern Utah and western Colorado indicate that occupation of the study area by Protohistoric-era peoples was continuous, with the possible exception of the period between A.D. 1650 and 1750 (Reed 1994, 1988). The sample of radiocarbon dates for the Protohistoric era in eastern Utah and western Colorado exceeds 100, so the observed paucity of dates in the period between A.D. 1650 and 1750 is unlikely to be the result of sampling error. Reasons for the apparent hiatus are unknown, but may include epidemics (Reed 1988) or changes in settlement patterns caused by drought. Currently, there is no firm evidence of an epidemic, though epidemics are known to have had a devastating effect upon many Native American groups. According to Ramenofsky (1987:173), aboriginal populations catastrophically declined because of the introduction of European diseases. Ramenofsky (1987) states that epidemics tended to occur in two major episodes. The first epidemic usually preceded initial historic documentation, often occurring in the sixteenth or seventeenth century. The second occurred a century or so later, when contact became frequent between Native American groups and Euroamericans as lands were explored and settled by the Euroamericans. If disease was responsible for population declines during the 1600s in western Colorado, then the following test implications may be observed in the archaeological record.

- Mass burial sites dating to the 1600s may be discovered.
- Sites immediately postdating the epidemic may either be smaller in size, to reflect population decreases, or fewer in number, if the survivors aggregated.
- Few additional site components should be identified that date to the period between A.D. 1600 and 1700.

Currently, no Protohistoric-era burials with multiple individuals have been found in the project area. Data are too scant from well-dated components to assess variation in site size or quantity.

Severe drought may also have been the cause of the apparent gap in the radiocarbon record. Recently, tree-ring evidence is emerging that indicates a severe drought in the western United States between A.D. 1565 and 1585 (Brasher 1998). It seems plausible that a severe drought would have affected settlement patterns by compelling abandonment of the lower elevations, except along major rivers. Restriction of the area suitable for habitation could have resulted in the discovery of fewer sites dating to the drought period, assuming that archaeological investigations have not been biased toward identifying sites in areas where water would have invariably been available. Total abandonment of the study area seems unlikely, especially because mountain environments would have been more likely than adjacent physiographic provinces to receive precipitation during drought periods. The drought hypothesis has the following test implications.

- Tree-ring data from the study area will indicate a severe drought between A.D. 1565 and 1585.
- Components dating to the drought period will occur along major rivers or in the higher elevations.
- Components dating to the drought period will evidence changes in subsistence practices, as plant and animal productivity and distributions are affected by drought.

No archaeological data from the study area have been applied to the test implications listed above. Whether there was a drought between A.D. 1565 and 1585 can be tested by tree-ring studies from either site or nonsite contexts. The concentration of Ute sites in high elevations and along rivers during the period of drought can be tested, although modern, intensive use of valley bottoms for agriculture may hinder identification of sites in those settings. Discerning changes in subsistence practices will require excellent dating of components.

Extraregional Relationships

Studies of the extraregional relationships problem domain during the Protohistoric era are comparatively complex because of the incursion of Euroamerican culture. This incursion was manifested by the introduction of diseases, horses, metal and glass artifacts, slave trade, and eventual destruction of traditional Ute lifeways. Although the historic record can provide a framework for the understanding of Ute and Euroamerican contact and conflict, archaeology can contribute much to the study, as the historic record is far from complete.

Nonhistoric evidence of extraregional relationships is manifested primarily as aboriginal trade items or as atypical rock art styles. The occurrence of a flat-bottomed, Intermountain ware vessel at site 5GA1208 in Grand County may indicate Ute trade with the Shoshone (see Naze 1994). Obsidian also was more frequently traded. Trace-element analysis of obsidian artifacts recovered from Ute components in the northern portion of the project area has shown that obsidian was obtained from distant sources in south-central Utah, Yellowstone, and eastern Idaho (Truesdale 1989; Pool 1994; Walker-Buchanan 1998). Ute inhabiting the southern portion of the study area may have traded for obsidian from north-central New Mexico (Baker 1991; Pool 1994).

There is limited archaeological evidence that groups other than the Ute were present in the study area during the Protohistoric era. Cole (1987) identifies two rock art sites in west-central Colorado that probably represent the activities of peoples other than the Ute. Site 5GF1339 in the Book Cliffs contains a pictograph in the Biographic Style, which has ties to the Northwestern Plains. Cole (1987) suggests that either Comanche or Shoshone made the pictograph, probably after A.D. 1750. A pictograph in Horsefly Creek west of the Uncompahgre Valley appears to depict Ganaskidi, a Navajo deity (Cole 1987, 1990). Cole (1987) suggests that the figure was made by either a Navajo or a Ute familiar with Navajo mythology, probably sometime between A.D. 1700 and 1880. Stiger (1998a) reports finding a pictograph depicting Navajo Yei figures north of Gunnison.

Ideology

Protohistoric-era ideology in the archaeological record is most obviously represented by rock art. Buckles (1971) attributes rock art of the Uncompahgre Plateau to the Ute when historic phenomena are depicted. He defines two styles: the Early Historic Ute Indian style, dating between approximately A.D. 1650 and 1830, and the Late Historic Ute Indian style, dating between 1830 and 1880 (Buckles 1971). Cole (1990) retains Buckles' Ute rock art styles. Buckles recognizes some degree of continuity in rock art styles extending into prehistory, but does not indicate just how far back into prehistory such continuity extends. Cole (1987:221) states that the Ute rock art styles display too few similarities with the earlier Uncompahgre complex rock art styles to conclusively indicate cultural relationships. That Ute and Uncompahgre complex rock art styles are distinctive supports the hypothesized immigration of Ute ancestors into the region sometime following the Archaic era.

Buckles (1971) and Cole (1987, 1990) have dominated rock art research in the study area. Their work has been comprehensive and of high quality. Regional rock art studies would benefit, however, through the involvement of additional students. Rock art studies have traditionally been of a subjective nature, so additional personal perspectives would be helpful. Quantitative approaches to rock art studies might also be beneficial, especially if rock art from multiple regions are compared and contrasted. Rock art studies would also benefit from the application of specialized dating studies, such as AMS radiocarbon dating of paint pigments.

Ute ideology is also reflected by burial practices. Nickens (1988b) describes 20 human burials from western Colorado and eastern Utah that are probably Ute. Most are classified as crevice burials, dating to the nineteenth century.

Chapter 9
DIRECTIONS FOR FUTURE RESEARCH

RESEARCH PROGRESS

Advances in science are often thought to follow a "punctuated equilibrium" pattern, where periods of innovation and rapid advance are followed by periods of only modest gain. In a review of the 1984 RP-3 contexts that pertain to the Northern Colorado Basin, the authors were struck by how similar the present research questions are to those published 15 years ago. The basic concepts behind most of the models herein presented can be found in the 1984 documents. This suggests that our gains in understanding the prehistory of the study area have been incremental, rather than revolutionary.

There have been, however, substantial contributions to the body of substantive knowledge since the RP-3 contexts were published. In 1984, no undoubtedly Paleoindian components had been identified in the study area. A considerable quantity of Paleoindian projectile points had been found, mostly as isolated finds or on sites with later components. Paleoindian occupation of the study area was suspected but not demonstrated. Since 1984, undoubtedly Paleoindian components yielding radiocarbon dates and diagnostic Paleoindian artifacts have been identified along the Continental Divide, in Middle Park in Grand County, and in the Gunnison Basin. These components have unequivocally established the presence of Goshen, Plano, and Foothills Mountain tradition peoples in western Colorado. Pitblado's (1993) review of regional Paleoindian projectile points and subsequent application of the Foothill-Mountain tradition model has also furthered our understanding of late Paleoindian settlement and subsistence systems. Excavation data from Paleoindian-era components are scant, however, limiting interpretation of lifeways.

The RP-3 contexts pertaining to western Colorado identified several important research objectives for the Archaic stage. These included a better understanding of the transition between Archaic and Paleoindian lifeways; determining whether occupation of the region was continuous; determining whether the region served as a refuge during times of lowland drought; and discerning whether the mountains supported an indigenous population. Insight has been gained over the past 15 years into most of these research topics; additionally, the expanding database of excavated sites has resulted in increased use of local cultural chronologies. As shown in Chapter 6, the beginning of the Archaic era has been extended to approximately 6400 B.C., nearly a millennium earlier than asserted in the RP-3 documents. The nature of the Paleoindian to Archaic transition remains poorly understood, however, though the degree of lifeway change at the transition is now thought to have been less radical than believed in 1984, as a result of application of the Foothill-Mountain tradition model and inferences that this unit was characterized by a generalized subsistence system. In 1984, gaps in the radiocarbon record at approximately 2000 B.C. and 4300 B.C. were noted and thought to represent sampling error or population movements (Reed 1984b). The radiocarbon database now available indicates that these possible hiatuses were probably due to sampling error (see Figure 6-1). Emerging data tend to undercut the model of the Southern Rocky Mountains as a refuge during times of environmental stress in lowland settings. As described in Chapter 6, changes in the intensity of use of various elevation zones in the study area can be attributed to diachronic changes in the settlement patterns of local groups, rather than broad-scale migrations. In 1984, the implications of recent discoveries of substantial Archaic architecture at Windy Gap and at Curecanti were just being realized (Guthrie et al. 1984). Occupation of mountain environments by indigenous groups was realized as plausible. The ability to address this line of research was greatly augmented in 1987 when the Yarmony House pit structures were discovered in the Colorado River valley (Metcalf and Black 1991). In 1991, Kevin Black published his definition of the Mountain tradition, which advocated year-round occupation of the mountains. Although the utility of the Mountain tradition remains a topic of debate, the concept resulted in a valuable refinement of Archaic-era settlement patterns.

Important advances have also been made in the archaeology of Formative-era horticultural groups since the publication of the RP-3 contexts. Research problems identified in those contexts included the nature of the Archaic- to Formative- stage transition, the cultural affiliation of Formative groups in western Montrose and San Miguel counties, the importance of corn in the diets of regional Formative-era groups, dating of occupations, and the nature of utilization of mountain environments by peoples otherwise engaged in horticulture. The understanding of the transition from strictly hunting and gathering lifeways to lifeways incorporating horticulture has been furthered by the chronometric dating of corn from Cottonwood Cave in western Montrose County (Stiger and Larson 1992). The Cottonwood Cave dates and several others from eastern Utah sites indicate that corn was grown in the study area at least as early as about 270 B.C. Technological items associated with these dates suggest that corn was integrated into a relatively mobile lifeway. Whether the appearance of corn indicates immigration of new groups or mere adaptation by local groups is unknown. Similar questions remain for the Fremont of northwestern Colorado.

Archaeologists continue to debate the utility of various archaeological units used to describe regional Formative-era groups. The 1984 context for west-central Colorado reiterated Schroeder's (1964) position that Formative-era groups in that area were best regarded as an in situ development, distinct from either the traditional Fremont or Anasazi traditions. This development has since been named the Gateway tradition (Reed 1997a), a concept herein employed. McMahon (1997) has made a case that not all Formative-era components in western Montrose and San Miguel counties are best attributed to the Gateway tradition; at least one site in the Paradox valley probably represents a Fremont-tradition occupation. Additional excavation data, derived from state-of-the-art field methods, are sorely needed to evaluate the utility of the Gateway tradition. Such work is also necessary to address the relative importance of horticulture in Formative-era subsistence systems. During the past 15 years, no clear evidence that horticultural groups utilized mountainous environments has emerged, though sites in high-altitude settings occasionally yield Formative-era ceramics (e.g., McDonald 1998). The paucity of data supporting ties between lowland and highland settings has led to the development of the Aspen tradition as a referent for the highland adaptation.

Considerable gains have also been made in the archaeology of Protohistoric-era groups. For reasons not fully understood, relatively few sites dating to the Protohistoric era had been identified or excavated prior to 1984. The RP-3 contexts identified this phenomenon as a major gap in the research. Since the RP-3 contexts were published, 23 Protohistoric sites yielding both chronometric dates and diagnostic artifacts have been reported, and much of this work has been synthesized (Reed 1994).

Important research topics identified in the RP-3 contexts for the Protohistoric era included Ute origins; whether the archaeological remains of the Ute could be differentiated from those of other contemporaneous groups, such as the Shoshone; and whether Ute immigrants were able to supplant the region's original occupants through use of lower-ranked resources. Recent excavation data from the study area has tended to support the hypothesis that the ancestors of the Ute immigrated to the area, probably sometime following A.D. 1100. Uncompahgre Brown Ware ceramics, which may be the most diagnostic artifact associated with the Ute tradition, appear at or shortly following this date (Reed 1994). In spite of the growth of the excavation database, it remains impossible to determine whether the Ute immigrants employed more labor-intensive subsistence practices than those of the peoples they encountered. Such patterns cannot yet be discerned from the macrobotanical, faunal, and artifactual data. Because the quantity of excavated Protohistoric-era sites has increased in recent years, it is increasingly possible to differentiate Ute archaeological remains from those of other ethnic groups. Sanfilippo (1998) has recently pointed out archaeological differences between Ute and early Navajo architectural sites. Whether Ute sites can be differentiated from Shoshone or Comanche components remains unknown, as these groups were linguistically and culturally more similar to the Ute, especially before the integration of the horse into Protohistoric-era culture.

Insight into chronology and prehistoric demographic trends has resulted from the expansion of the radiocarbon database since 1984. Then roughly 250 radiocarbon dates had been processed from sites within the Northern Colorado Basin. As evidenced here in Appendix B, at least 768 radiocarbon dates have been derived from the study area. The expansion of the database will permit comparisons between drainage units or other divisions, because sample sizes are becoming large enough that differences will not invariably invoke sampling error as an explanation.

With the expansion of the excavation database has come revisions in archaeological units. There is much less reliance on archaeological units defined from data outside the study area. Some of the archaeological units defined from small samples of sites of little chronometric control within the study area have been replaced. Archaeological units will constantly change as the understanding of variation in the archaeological record increases. Changes in archaeological units, when successful, will foster increasing precision in communication about the archaeological record.

INTERREGIONAL ISSUES

Studies of interregional relationships in the prehistory of western Colorado have evolved. Early in the history of investigations, comparisons were made out of necessity to distant places; there simply was no other way to place the findings in context. As the database increased and there were more local sites to compare, a more localized focus evolved, such as that used in the Ute Prehistory project (Buckles 1971). As the number of cultural resource management studies increased, there was a tendency to cite work, especially for material culture comparisons, from the Great Basin and Northwestern Plains. This is, in part, an artifact of publication histories — the University of Utah has been active in Great Basin and Colorado Plateau archaeology for more than 50 years and a steady stream of publications has flowed from that institution. The same is true of the University of Wyoming. Archaeologists at the Colorado institutions have, for the most part, been interested in the Plains and the Southwest, leaving the story of the Colorado Basin mainly to the gray literature.

More recently, archaeologists active in the Northern Colorado Basin have begun to refocus on more localized sequences. Examples from the time-space systematics domain, for example, might include Reed's (1997a) proposal of a Gateway tradition, or Baker and Reed's differing views on a Ute temporal sequence. At the same time, interregional links in cultural systems continue to be recognized in areas such as exchange systems (e.g., McDonald 1994), distributions of obsidian, and the influx of corn horticulture to the region. Archaeologists disagree about the degree of movement of people and ideas, whether mass migrations can be recognized in the record, and the extent that social identity can be deduced from the archaeological record. For example, Benedict and Olson's (1978) Mount Albion complex and Black's (1991a) Mountain tradition depend on some form of migration to explain their origins. Some have been critical of this idea (Stiger 1998b), although others continue to work in these directions. The perspective taken in this context is essentially neutral. The emphasis here is to work on problems with more limited scope; for example, consideration of specific subsistence behaviors or variability in use of pits through time would be productive research topics. In essence, the authors advocate more emphasis on what is termed middle-range theory.

CURRENT THEORETICAL ORIENTATIONS

To interpret the past, archaeologists employ two sets of intellectual tools: 1) an overarching, general theoretical paradigm, and 2) various theories that seek to provide explanation of observed phenomena in the context of the general paradigm (Binford 1981:23). General theory employed by archaeologists practicing in western Colorado is mostly represented by new archaeology, cultural ecology, behavioral archaeology, evolutionary archaeology, and postprocessual archaeology. Most archaeological reports from the study area, however, make no mention of the general theory driving the research, and those that do are seldom able to effectively tie project results back to the general theory. The dearth of discussion pertaining to general theory probably reflects the realization that contributions to general theory are most likely to result from broad, synthetic rather than site-specific studies. Although practicing archaeologists undoubtedly subscribe to different general theoretical paradigms, general theoretical perspective seems to have little effect on archaeological methods.

Middle-range theory provides the link between an overlying theoretical orientation and specific behaviors represented by the archaeological record. It provides a context for interpretation of limited sets of phenomena through the formulation of theories pertaining primarily to the subject limited sets. The middle-range theories are successful only as far as they are subject to the overarching general theory. According to Binford (1977:6), middle-range theory addresses: "a) how we get from contemporary facts to statements about the past, and b) how we convert the observationally static facts of the archaeological record to statements of dynamics." To a large extent, extant systems provide the basis for understanding the past, providing insight into universal, governing principles of behaviors comprising the limited set under observation. Particularly important middle-range research has included ethnoarchaeological research, site formation processes, experimentation in artifact reproduction and use, and optimal foraging theory (Bettinger 1991a). According to Bettinger (1991a), observation of contemporary systems is not a prerequisite for middle-range research, for it is the validity of the laws thought to govern behaviors of limited sets, and not their representation in the modern world, that defines good middle-range theory.

Although most current regional archaeological research makes little mention of general theory, middle-range theory is well represented. The frequent application of middle-range theory represents an important new direction in regional research. This is not to say that research conducted decades ago ignored middle-range theory, for key types of middle-range theory, such as ethnographic analogy, have long been employed. The best of current research, however, is likely to employ many different middle-range approaches, possibly including Binford's (1983) forager and collector model of hunter-gatherer settlement/subsistence patterns for the interpretation of site function and logistical organization; site structure studies, based on ethnographic observations, to interpret length of site occupation and the function of various activity areas (e.g., Kroll and Price 1991; Kent 1987); comparison of debitage samples to experimentally produced assemblages to interpret prehistoric lithic reduction strategies (e.g., Greubel 1996); and determination of component integrity through size-sorting of excavated artifacts and comparisons to experimental studies focusing on the effects of gophers on soils (e.g., Bocek 1986, 1992). Other middle-range approaches might include analyses of caloric return from various food resources to determine economic costs associated with subsistence systems, or use of ethnographic data to derive population estimates from room sizes. Because most aspects of the archaeological record can be interpreted through middle-range theory, individual applications are too numerous to list and continue to evolve.

NEW RESEARCH APPROACHES

Several new research approaches have emerged in recent years that greatly facilitate interpretation of the archaeological record. The most important of these is the reporting of excavation data by analytic unit. An analytic unit is, simply, the smallest meaningful unit of space and time that the archaeologist can discern at a site. At some sites, an analytic unit may comprise an entire component. At other sites, it might be possible for the archaeologist to recognize multiple activity areas within a component; each activity area would comprise a distinct analytic unit. Presentation of all important data by analytic unit allows other researchers to scrutinize interpretations about analytic unit function, age, technology, and other research domains. Associations between artifacts and cultural features can be more clearly established, and components can be more explicitly defined. Variation in artifacts is better understood, because artifacts from different components or activity areas are not combined. The outdated practice of including all feature and artifact descriptions in a single section of a report where precise spatial and temporal associations are not explicitly stated should be avoided.

Archaeologists practicing in the Northern Colorado Basin also tend to excavate larger blocks than in years past. This has come about in response to research questions pertaining to site structure, which can provide insight into the duration of site occupation, social organization, and cultural affiliation. Excavation of large blocks of contiguous 1 x 1 m units also maximizes the chances that subtle cultural features, such as brush habitation structures, are discerned, as well as activity areas characterized by limited artifact disposal.

Recent investigations also reflect increased concern for chronometric dating. Excavators tend to collect and process more radiocarbon samples than in the past, which results in a fuller understanding of the number of components represented at a site, may allow for date averaging, and permits more refined interpretation of the meaning of obtained radiocarbon ages. Recent Protohistoric-era research also tends to employ methods that increase the precision of radiocarbon dating. Because use of long-dead wood by site occupants may affect interpretations of site dating, archaeologists have begun to focus on collecting annuals or relatively short-lived woody specimens for radiocarbon analyses. Thermoluminescence dating is also emerging as a means of augmenting dating interpretations because the old wood problem is circumvented by this independent dating technique.

Several new specialized techniques have been developed that have proven or potential application in the study area. Ground-penetrating radar, electrical resistivity, proton magnetometer, and similar technologies have improved considerably in recent years, owing mainly to improvements in computer software. These technique could be especially important during testing phases. The primary drawback to the technique is that few businesses have been established to provide the service in a timely manner, restricting use by the cultural resource management industry. This same drawback applies to thermoluminescence dating. This dating technique is not new, but has enormous potential for ceramic studies. Currently, few institutions provide this service, and it usually takes more than a year to have samples processed. On the other hand, protein residue studies can be economically contracted on short order and can aid in the interpretation of prehistoric subsistence practices. These studies can determine the presence of animal or plant proteins on stone tools, interiors of ceramic vessels, or on the rock constituents of cultural features, and can even determine the type of animal that was processed. In spite of the technique's potential, however, recent applications of protein residue studies should be critically examined.

Chapter 10
MANAGEMENT CONSIDERATIONS

DATA GAPS AND RESEARCH OBJECTIVES

Management of the cultural resources in the Northern Colorado Basin should, ultimately, be guided by research needs. Sites with potential to yield data that can address some of the research questions posed in the preceding sections should be regarded as significant resources, worthy of protection or scientific investigation. This section summarizes the research needs for the various archaeological units examined herein.

Some of the important gaps in our understanding of the region's prehistory are geographical. Portions of the study area are poorly represented in the archaeological record. The cultural resources of the region's major valley floors are underrepresented, because most of these lands are privately owned and are infrequently examined by archaeologists whose work is driven by federal historic preservation legislation. Aboriginal use of the major valley floors was likely intensive, because such areas were probably well suited for hunting, horse grazing, and horticulture. Although additional inventory of major valley bottoms is desirable, many of the aboriginal cultural resources in these areas have been destroyed by modern agricultural and residential developments. It is unlikely that the scope of prehistoric use of the region's major valley floors can ever be fully understood. For a variety of other reasons, the southeastern portion of the study area is also underrepresented in the archaeological record. Comparatively few intensive archaeological investigations have occurred in the mountainous terrain of Mineral, Hinsdale, Saguache, Ouray, San Juan, and northern La Plata counties.

Paleoindian Era

The majority of the data gaps in the region's archaeological record are temporal, rather than geographical. This is especially true for the Paleoindian era. The Paleoindian era spanned approximately five millennia, yet is represented by less than a half-dozen excavated components. The excavation database for the Paleoindian era is so small that any Paleoindian component with contextual integrity should be regarded as a highly significant resource. Investigation of additional Paleoindian components may yield important data pertaining to the following problem domains, and may provide insight into associated research objectives.

Space/Time Systematics

- The utility and applicability of Paleoindian archaeological units, particularly the Foothill-Mountain tradition, should be evaluated.
- Pitblado's (1993) interpretation that the study area was occasionally occupied by late Paleoindian groups unaffiliated with indigenous Foothill-Mountain tradition peoples should be scrutinized.

Settlement Patterns

- Although survey data are providing an indication of the general distribution of Paleoindian sites, additional excavation data are needed to permit better interpretation of chronology and to permit more tenable interpretation of site function and season of occupation.

- Regional data are needed to test Kelly and Todd's (1988) model of early Paleoindian settlement patterns, which are thought to represent high residential and logistical mobility.
- The manner and timing of Paleoindian use of various elevation zones require additional examination, from both synchronic and diachronic perspectives.
- Frison and Kornfeld's (1995) suggestion that Middle Park may have been occupied year-round by Goshen tradition peoples has important implications for early Paleoindian settlement patterns and should be tested in future studies.
- Reasons for the apparent clustering of Paleoindian artifacts near major river systems, as noted by Schroedl (1991), should be determined.

Subsistence

- The relative importance of faunal and floral resources at regional Paleoindian sites should be examined, in part to determine whether subsistence practices changed through time.
- Foothill-Mountain tradition subsistence practices should be compared and contrasted to those of the Archaic era.

Technology

- Kelly and Todd's (1988) assertion that early Paleoindian lithic technology was adapted to a highly mobile lifeway needs to be evaluated with regional data.
- Early Paleoindian lithic technology should be compared and contrasted to Foothill-Mountain tradition lithic technology to determine whether the latter represented a less-mobile lifeway.

Social Organization

- Little is presently known about the size and composition of Paleoindian groups in western Colorado.

Origins and Transitions

- In addition to the research objectives discussed above, research into Paleoindian origins is appropriate. There is presently no evidence of a Pre-Clovis occupation of the region, but we cannot confidently assert that such evidence will never be found in the study area. The Clovis and Goshen traditions probably represent an immigration, but the regional database is insufficient for accurately determining the timing of such.
- At some point, large, lanceolate projectile points characteristic of the late Paleoindian era ceased being made, replaced by smaller point types attributed to the Archaic era. Additional research is needed to determine the nature of the change from Paleoindian to Archaic projectile point technologies, and to understand the underlying reason for the change.

Archaic Era

The quantity of well-dated, Archaic-era components now exceeds 200. Although the comparatively large database has permitted better interpretations of Archaic lifeways than for the preceding Paleoindian lifeways, one must consider that the Archaic era spanned approximately 6,400 years, and that the entire study area was occupied during the Archaic era. From such a perspective, it is clear that the sample of Archaic components is actually small. Our ability to discern important culture changes through time and between geographic subdivisions of the western slope can only benefit from additional archaeological excavations. Future work at Archaic components should address the research objectives herein presented. These are briefly reiterated below.

Space/Time Systematics

- Four new periods have been defined herein for the Archaic era of the Northern Colorado Basin. The utility of the Pioneer, Settled, Transitional, and Terminal periods should be evaluated.

Settlement Patterns

- As the quality of regional paleoenvironmental models has increased, it has become possible to attribute certain changes in regional settlement patterns to environmental changes. Regional data suggest that the nature and intensity of settlement of various elevation zones changed in response to environmental changes. The higher elevations appear to have been most favored during periods of lowland drought, and were less intensively occupied during periods of glacial advances. Additional data are needed to confirm or refute these interpretations.
- Patterns of residential mobility appear to have changed through time in the Archaic era, probably in response to paleoenvironmental changes. During some periods, substantial habitation structures were built in mountainous environments; in other periods, use of the higher elevations appears to have been more seasonal. These trends need further examination and explanation.

Subsistence

- The database is inadequate for discerning meaningful temporal or geographical trends in Archaic subsistence practices. Although present data tentatively suggest that similar types of flora and faunal were exploited through time, additional data will almost certainly benefit the quality of interpretations.
- Although it is important to identify the types of flora and fauna exploited, it is also important to tie such observations into middle-range theory. Efforts should be made to examine topics such as diet breadth or the energetic costs of resource processing or procurement, so that the cultural implications of noted trends can be discussed.

Technology

- The range of variation in Archaic habitation structures is only beginning to be understood. Additional technological data are sorely needed from structural sites.

- As discussed above, some Archaic-era firepit types are more frequent during some periods than others. Additional work is needed to confirm these observations and to explain the trends.
- Efforts to determine the temporal and geographical distribution of Archaic-era projectile point types often fail to reveal clear patterns. It is unclear whether this is due to sampling error, prehistoric reuse of earlier points, poor association between dated features and projectile points, or other factors. Continued efforts should be made to determine the range of temporal and geographic variation for Archaic-era projectile points.

Origins and Transitions

- The reasons for the transition between the Paleoindian and Archaic lifeways — and the degree of cultural change represented — are poorly understood and require examination.
- In some parts of the study area, the Archaic hunting and gathering lifeway was supplanted by one incorporating horticulture, substantial masonry habitation structures, ceramics, and bow-and-arrow technology. Whether the Archaic peoples of these areas simply adopted new technologies and subsistence practices or were pushed out by immigrants bringing with them a horticultural-based lifeway is not fully understood and merits further examination, in spite of difficulties in identifying ethnic groups in archaeological contexts.

Formative Era

Although a considerable number of Formative-era components have been excavated in the study area, numerous data gaps and elementary research problems remain. In part, this situation can be attributed to the generally poor quality of excavation and reporting of Formative-era sites in western Montrose County. Additional excavation data are needed to address the following problem domains and research objectives for the Formative era.

Space/Time Systematics

- The application of archaeological units such as the Anasazi and the Fremont at Formative-era sites in the study area warrants continued evaluation. Although application of these units appears to be appropriate at some sites, at other sites, application of these units requires incorporation of such a range of cultural variation into the units' definition as to make them virtually meaningless.
- The Gateway tradition unit is provided as reference for local manifestations of horticultural, Formative-era adaptations of west-central Colorado at sites where typical attributes of the Fremont or Anasazi tradition are not manifested. The Gateway tradition has not been subjected to much criticism, however, and the utility of this unit should be examined.
- Formative-era sites in the Glade Park area have been attributed to the Fremont culture. Supporting data are limited, however. Additional examination — especially controlled excavation — of such sites is needed.
- The Douglas Creek Fremont archaeological unit, first defined by Creasman (1981), appears to have merit, especially in light of recent discoveries of sand-tempered

ceramics that seem to be distinctive from other regional Fremont types. The unit, nonetheless, merits further evaluation, and its geographical extent needs to be established.

- Four periods have been proposed herein to divide the Fremont tradition of northwestern Colorado; these include the Early Fremont, Scoggin, Wenger, and Texas Creek Overlook periods. The utility of these periods should be examined.
- A new archaeological unit, the Aspen tradition, has been proposed herein as reference for nonhorticultural adaptations of the study area that were contemporaneous with traditions incorporating a horticultural lifeway. The Aspen tradition is thought to represent an upland hunting and gathering adaptation. The usefulness of this construct merits published criticism, either with or without the benefit of additional excavation data.

Settlement Patterns

- The presence of Anasazi ceramics at Formative-era sites in western Montrose and San Miguel counties may reflect expansion outside the traditional Anasazi homeland during the Pueblo II period. This long-enduring hypothesis requires further consideration, especially in light of settlement and demographic studies conducted in the Southern Colorado Basin study area.
- The relationship between Formative-era structural habitation sites and outlying nonstructural sites requires additional examination.
- The nature and extent of Fremont settlement of the Paradox Valley area of western Montrose County need illumination.
- Present data suggest that Fremont habitation of northwestern Colorado was generally short-term. Additional data are needed to determine whether the Colorado Fremont sites represent a complete settlement system or whether they represent seasonal use by Fremont occupying more substantial architectural sites in Utah.
- The settlement systems proposed by Simms' (1986) for the Fremont merit further evaluation to illuminate the degree of Fremont mobility.

Subsistence

- The relative importance of horticulture in the subsistence systems of the Fremont and Gateway traditions needs further examination. Stable carbon isotope analyses may prove to be the most productive means of addressing this issue.
- The manner in which Formative-era horticulturists exploited wild plants and animals probably differed from that of nonhorticulturalists. Additional comparative data are needed.

Technology

- The range of variation in habitation structures at Formative-era sites in western Montrose and San Miguel counties needs further examination. These architectural data should be carefully compared and contrasted to those from undoubtedly

Fremont or Anasazi contexts. Aspen tradition structures should be compared and contrasted to regional sites inhabited by horticulturists.

- If possible, ceramic assemblages from western Montrose and San Miguel counties that have been classified as Fremont should be reexamined; the results should be published.
- The range of technological variation and geographic extent of sand-tempered Douglas Arch Gray should be further studied.

Social Organization

- The social organization of all Formative-era traditions merit furthers study.

Origins and Transitions

- Whether Formative-era groups, such as the Gateway and Fremont, represent in situ developments or immigration is poorly understood and is in need of additional study.
- Following approximately A.D. 1300, horticulture ceased to be either necessary or practical over much of the Colorado Plateau, resulting in important cultural changes. The nature of these changes and explanations for these changes should continue to be explored.
- Limited excavation data suggest that Fremont lifeways endured in northwestern Colorado and northeastern Utah until A.D. 1500 or 1600. Additional data are necessary to substantiate and explain this observation.

Protohistoric Era

The expansion of the archaeological database in recent years for the Protohistoric era has permitted the formulation of increasingly complex research questions. Protohistoric-era sites remain, therefore, of great research importance, though data are comparatively abundant. Important research domains and objectives are summarized below.

Space/Time Systematics

- The utility of the Antero and Canalla phases should be evaluated.
- The "old wood problem" requires further consideration to permit precise dating of Protohistoric-era components.
- In spite of difficulties inherent in differentiating ethnic groups in the archaeological record, efforts should continue to distinguish the sites of the Ute, Shoshone, Comanche, and other groups.

Settlement Patterns

- Archaeological and ethnohistoric data suggest that Ute settlement patterns were characterized by considerable residential mobility. The apparent absence of substantial habitation structures suggests that residential mobility was comparatively great during both warm and cold seasons. Additional archaeological data are needed to better illuminate Ute settlement patterns.

- Adoption of the horse as a beast of burden probably had an important impact on Ute settlement patterns, beyond simply permitting wider movements for hunting, raiding, and trading. Efforts should be made to compare and contrast pedestrian and equestrian settlement patterns.

Subsistence

- The degree to which the subsistence practices of Protohistoric-era groups differed from those of Archaic-era and Aspen-tradition peoples is poorly understood.

Technology

- Further study should be made of the range of variation in Protohistoric brown ware ceramics and of the cultural implications of such variation.
- Further investigation of wickiup variability may provide important insight into length of site occupation and, possibly, season of occupation.

Social Organization

- Through analysis of site structure and layout, it may be possible to detect differences in the social organization between equestrian and the earlier pedestrian groups.

Demography

- Reasons for the apparent dearth of radiocarbon dates between A.D. 1600 and 1700 should be explored.
- Additional work is needed to document the presence of aboriginal groups other than the Ute in western Colorado during the Protohistoric era.

Origins and Transitions

- Although evidence seems to suggest that the Ute or their ancestors immigrated into western Colorado following roughly A.D. 1100, immigration has not been proven.

SITE SIGNIFICANCE

Assessment of site significance is one of the most challenging tasks routinely faced by archaeologists. Because cultural resources are a finite and nonrenewable resource, careful management is crucial. Thoughtful assessment is important because classification as significant or insignificant determines whether a site is protected; subjected to mitigative measures, such as archaeological data recovery; or is left vulnerable to construction impacts or other agents of degradation. Determination of site significance is subjective, however, because significance is a relative quality. The significance of a site may change as research questions are answered or are generated, or, in the case of ethnic significance, in response to political or social events. Determinations of significance at prehistoric sites are especially subjective, however, because they are almost always made prior to extensive archaeological excavation. This compels archaeologists to assess the potential of a site to yield information important to prehistory, based on surface data or limited testing data, which often provide an incomplete understanding of the nature of subsurface cultural deposits. It is expected, therefore, that competent and concerned archaeologists may occasionally differ on issues of site significance, because they are dealing with projections.

Such differences of opinion generally reflect various levels of comfort regarding possible classificatory error. From a purely scientific standpoint, it may be better to risk classifying a site with little research potential as significant than to risk classifying a site with great research potential as insignificant. The logical end to this approach would be to regard virtually any prehistoric site as significant. Cultural resource management, however, operates within a political and economic milieu. As Tainter and Lucas (1983:710) point out, there is concern about the cost of historic preservation and a "widespread perception that archaeologists are overly zealous in their insistence on protecting sites whose value non-archaeologists do not understand." Such concerns were, in part, responsible for recent Congressional attacks on the Advisory Council on Historic Preservation and other aspects of historic preservation legislation, and therefore must be addressed. Although scientific and not political factors should be the basis for site evaluations, it is unrealistic to regard all sites as significant. Perhaps the best way to balance scientific interests with those of political opposition is to accept a certain degree of risk of significance misclassification and to continue examining each site on an individual basis, classifying as significant only those sites where a strong case can be made.

Prehistoric site significance is generally evaluated in terms of scientific research potential. Therefore, significant sites will have the potential to answer some of the research questions presented herein, or similar research questions posed in project-specific research designs. By citing research questions widely regarded as important, a strong case can made for site significance. Such an approach will also allow for the recognition of limited activity and other outwardly unimpressive sites as significant. The sites with the highest potential for answering important research questions will, nonetheless, have the following attributes.

Contextual Integrity: Sites with contextual integrity have artifacts and features in proveniences that provide insight into the distribution of cultural activities. Artifact proveniences at such sites reflect prehistoric patterns of disposal, as well as prehistoric scuffage or trampling, rather than erosional processes or postoccupational cultural activities. Contextual integrity is the single most important criterion to be considered during site evaluations. It is not, however, the only criterion. In some areas, such as mountainous environments, the integrity of many prehistoric sites has been compromised by erosional agents, such as burrowing mammals or frost heave. Certainly, the large majority of sites in such a region should not be regarded as insignificant. In such areas, preference should be given to single-component sites or sites with horizontally distributed components.

Discrete Components: Many archaeological sites consist of a "palimpsest" of occupations, where artifacts associated with one occupations cannot be distinguished from another. When artifact samples from various components are mixed, the degree of variability is increased, thereby making difficult the interpretation of site function, mobility, lithic reduction strategies, and other research concerns. Single-component sites or sites where components are clearly separated — either vertically or horizontally — are less likely to be affected by artifact mixing, and so are more appropriate for interpretation.

Potential for Features or Structures: Sites with intact cultural features or structures are likely to yield samples suitable for chronometric dating and analysis of subsistence practices. Because these fundamental data are so important for site interpretation, sites with features or structures are valued above sites without them.

Potential for Buried Cultural Deposits: Sites that are entirely surficial have usually been severely impacted by erosion. Artifact burial, on the other hand, implies at least some degree of soil stability or even aggradation, indicating possible protection of artifacts and features. It should be stressed, however, that important buried cultural deposits can occur within 10 cm or so of the surface, and that the depth of cultural deposits is not directly related to research potential. As the highly significant Tenderfoot site near Gunnison has shown (Stiger 1993), sites with only a few centimeters of soil can contain buried cultural features and artifacts in archaeologically meaningful contexts. On the other hand, soils at some sites with deep cultural deposits have been badly mixed by slope wash or bioturbation and retain little contextual integrity.

The field methods necessary to determine whether sites have the above attributes must be determined on a case-by-case basis. In some cases, one or more of these attributes will be apparent on a site's surface at the time of site recording. In other cases, they will become apparent only after test excavation, or even only after the completion of extensive archaeological data recovery and associated analyses.

METHODS

Field, analytic, and reporting methods are, generally, of relatively high quality. Much of the credit for this quality of work can be attributed to the guidelines and standards established by the state and federal agencies that oversee archaeological work in the state. As always, however, there is room for improvement. Some of the practical aspects of archaeological inquiry that can be improved are presented below, many of which have been brought to our attention by Jim Green and Margaret Van Ness of OAHP.

Inventory

For the most part, field methods employed during archaeological inventory are adequate. Thorough site documentation is essential, because many sites will never be excavated, or even revisited. Accuracy of site plotting on maps has been improved through increasing use of Global Positioning System units. Through limited use of inventory data for this project, the authors have been frustrated at times, by unsupported assignment of cultural affiliation. Site attributes considered to be diagnostic should be clearly stated, and diagnostic artifacts, such as projectile points, should be illustrated in detail.

Site Testing

The objectives of site testing may include assessment of site significance, determination of site integrity or the degree of impacts from past construction projects, or site characterization. Because objectives are variable, the amount of appropriate testing is also variable. A single test unit or trowel hole may be adequate for demonstrating soil depth or establishing the association of artifacts with a suspected cultural feature. Limited testing may also be adequate to establish site integrity. Data from a few trowel holes, or one or two formal test units, should seldom be construed as adequate characterization of a site, however. These sample sizes are simply inadequate, and the probability that cultural features or important activity areas will be missed is great. To adequately characterize a site requires a considerable expenditure of time and money and the excavation of a substantial sample.

Testing data are also sometimes incorrectly used to repudiate site significance. Although it may be tenable to dismiss a lithic scatter with artifacts buried less than 10 cm as insignificant, it has been repeatedly demonstrated that important archaeological information can be recovered from shallow cultural deposits. As discussed earlier in this chapter, factors like contextual integrity, discreteness of components, and potential for features are more important for significance evaluations than simple depth of artifact burial.

Excavation

The key to adequate excavation is to let the project research design determine the level of effort. Research designs should be explicit, with clear hypotheses or research questions. Associated site treatment plans should be detailed and oriented toward efficient collection of the data needed to address the research design. When field supervisors are familiar with project research designs, they are in a better position to determine if adequate data have been collected or whether a site is unlikely to yield the desired data, whatever the amount excavated.

Reporting

The reporting guidelines published by OAHP have improved the quality of reporting. There is room for improvement, however. Efforts should be made to ensure that all topics included in the guidelines are explicitly addressed. According to OAHP personnel, some archaeological reports focus almost exclusively on the sites investigated by their projects and inadequately interpret project sites in the context of other regional sites. Identification of regional patterns in prehistory contributes more to the body of substantive knowledge than identification of site-specific patterns. Better effort is also necessary to integrate the results of ancillary studies into report texts. Although it may be appropriate to include ancillary studies as appendixes or separate chapters of a report, it is crucial that archaeologists incorporate ancillary study results in sections on archaeological interpretations. For example, an archaeological description of a hearth is incomplete if it lacks information on associated chronometric ages, macrobotanical remains, faunal remains, and similar topics. Radiocarbon ages should always be reported in the manner described in *American Antiquity (1992:749-770)*. The inclusion of all pertinent information pertaining to a unit of analysis in a single section is also appropriate for inventory reports. Inventory reports should include sections where all aspects of a site are presented, including site description, site significance recommendations, assessment of potential effect, and management recommendations. Such sections should be accompanied by high-quality maps and illustrations.

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APPENDIX A

Annotated Bibliography of Major Testing and Excavation Reports

Arthur, Christopher S., Jeffrey L. Brower, Susan M. Collins, J. Earl Ingmanson, Calvin H. Jennings, George J. Krause, and Laura M. Viola

1981 *Archaeological Investigations along the Colowyo Coal Company Railroad Spur in Moffat County, Colorado*. Reports of the Laboratory of Public Archaeology, No. 52. Colorado State University, Fort Collins.

The Laboratory of Public Archaeology at Colorado State University conducted investigations at 14 sites threatened by the construction of a railroad spur in southeastern Moffat County. Investigations commenced with a proton magnetometer survey; this resulted in the identification of seven sites for controlled excavation. These investigations resulted in the identification of Archaic and Late Prehistoric period components. The report is a valuable contribution to the regional literature and contains excellent and varied ancillary study data.

Baker, Steven G. (editor and compiler)

1980 *Baseline Cultural Resource Surveys and Evaluation in Primary Impact Areas of the Mount Emmons Project: 1978 and 1979 Field Seasons*. Centuries Research, Inc., Montrose, Colorado. Submitted to the Gunnison National Forest, Delta, Colorado.

In 1978 and 1979, Centuries Research, Inc. conducted archaeological inventory and test excavations in the vicinities of Gunnison and Crested Butte for the Mount Emmons Project. The work was funded by Amax, Inc., which was planning to develop a molybdenum mine. A total of 25,614 acres, within several large blocks, was inspected for cultural resources. Eighty-four prehistoric sites were recorded, 14 of which were shovel tested, and five of which were subjected to controlled test excavations. Controlled excavations entailed digging between 10 and 25 1 m x 1 m units, most of which were noncontiguous. One tested site, 5GN344, yielded an arrangement of postholes that were interpreted as the remains of a wickiup-like brush structure. The structure is tenuously attributed to the Archaic stage.

Baker, Steven G.

1991 *Ephemeral Archaeology on the Mountain of the Sorrel Deer*. Bureau of Land Management, Cultural Resource Series Number 32. Denver.

In 1986, Centuries Research conducted excavations at two sites at Colorado Westmoreland's Orchard Valley coal mine north of Paonia. Limited work was completed at the Ridge Site (5DT771), a lithic scatter situated atop a narrow saddle in a rugged, mountain setting. The presence of a 2-m-long alignment of unstacked rock near a game trail atop the saddle aided in the interpretation of the site as a game driveway. No dates or diagnostic artifacts were found. More extensive work was conducted at the Roatcap Game Trail Site (5DT271). Three horizontally distributed components were identified there. Component 1 was evidently Ute, as evinced by Uncompahgre Brownware ceramics and Desert Side-notched points. Dating of the component is problematic; radiocarbon dates extend to recent times, possibly because of a brush fire that is still evident. Component 2 is radiocarbon dated to approximately A.D. 760; this date is corroborated by a small corner-notched projectile point. With the most sparse evidence, a habitation structure is identified. Component 3 evidently dates to A.D. 10. The report contains valuable information on sherd petrography, archaeofauna, and archaeological pollen and macrofossils.

Baker, Steven G.

1992a *The Pedestal House Site (5RB733) in the Canyon Pintado National Historic District, Rio Blanco County, Colorado: Construction Monitoring and Archaeological Evaluation.* Centuries Research, Inc., Montrose, Colorado. Prepared for the Bureau of Land Management, Meeker, Colorado.

In 1990, Centuries Research, Inc. conducted archaeological monitoring of construction and limited excavation at the Pedestal House site (5RB733) along Douglas Creek south of Rangely, Colorado. The purpose of the investigation was to assess the effects of past construction. Test excavations revealed hearth or roasting pits and a sample of lithic artifacts. Radiocarbon data and a Rosegate projectile point suggest contemporaneity with the Fremont tradition. One heavily eroded area revealed a small trench with greasewood charcoal thought by Baker to represent a hearth; it was associated with a 1-m-square area thought to represent an occupation surface. Baker tentatively asserts that the feature represents an ephemeral Fremont habitation structure, and suggests short-term occupation of the Douglas Creek area by the Fremont.

Baker, Steven G.

1993 *Numic Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: The Burned Cedar and Corrugated Pot Sites (5RB2926 and 5RB2982).* Centuries Research, Inc., Montrose, Colorado. Prepared for the Bureau of Land Management, Meeker, Colorado.

In 1989, Centuries Research, Inc. conducted excavations at two sites south of Rangely, Colorado, for Chandler and Associates. The work was conducted to aid in the determination of site significance. Both sites were near a planned gas well and were believed to be threatened by indirect impacts. At the Burned Cedar Site (5RB2926), 15 m^2 were excavated, resulting in the recovery of a small sample of lithic artifacts and animal bone. A possible hearth was found, which was dated between A.D. 182 and 670. Diagnostic Desert Side-notched points were found, indicative of Numic affiliation. The radiocarbon date — which Baker dismisses as too early — is, nonetheless, taken as evidence of Numic and Formative stage contemporaneity. The Corrugated Pot Site (5RB2982) yielded fragments of a Mesa Verde Corrugated pot (ca. A.D. 1100-1300) and 18 lithic artifacts. An apparent hearth was found and dated; like the hearth at the Burned Cedar Site, the radiocarbon date was early and discordant with diagnostic artifacts. The corrugated pot is believed to best represent the time of site occupation. The site is attributed to the Ute, though no Ute diagnostic artifacts were found.

Baker, Steven G.

1993 *Fremont and Numic Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: The Sandshadow and New Sites (5RB2958 and 5RB3060).* Centuries Research, Inc., Montrose, Colorado. Prepared for the Bureau of Land Management, Meeker, Colorado.

In 1989 and 1990, Centuries Research, Inc. conducted mitigative excavations at two sites south of Rangely, Colorado, that were threatened by well pad access road construction. Three brush habitation structures were reportedly found at the Sandshadow Site, in association with small quantities of lithic and gray ware ceramic artifacts. The sherds were classified as Douglas Arch Grayware, a new type characterized by sand temper. Radiocarbon determinations were variable and were generally thought to be too early. Dating problems were attributed to prehistoric use of old wood, leading Baker to suggest that 300 years be added to area radiocarbon dates from wood charcoal to better approximate occupation dates. The adjusted dates put the occupation later than the period conventionally held for the Fremont, suggesting to Baker that the site was a very late Fremont manifestation, similar to the Texas Creek Overlook site reported by Steven Creasman and Linda Scott. Dating of the Sandshadow Site and the very presence of structures at the site should be reviewed cautiously by the reader. The second site described, the New Site (5RB3060), is a small Numic site with Desert Side-notched and Cottonwood Triangular points. A possible hearth yielded a radiocarbon date with a calibrated range of A.D. 850 to 1130; it was rejected as too early because of "old wood" problems.

Baker, Steven G.

1996 *Numic Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: Ute Rancherias and the Broken Blade Wickiup Village (5RB3182).* Centuries Research, Inc., Montrose, Colorado. Prepared for the Bureau of Land Management, Meeker, Colorado.

Centuries Research, Inc. conducted archaeological excavations at the Broken Blade Wickiup Village in 1992 for Chandler and Associates. The site is southwest of Rangely, Colorado. A well pad access road was constructed near the site, and excavations were conducted to mitigate potential indirect impacts. Sixty-four square meters were excavated, focusing upon Feature Area 9 where the remains of a wickiup were reportedly found. Structural evidence consisted of an indistinct charcoal stain surrounding a hearth. The hearth was dated between A.D. 1040 and 1410; to account for use of old fuel wood, Baker suggests that 300 years should be added to that date. He suggests that the site was probably occupied between A.D. 1730 and 1850. Artifacts recovered include Desert Side-notched projectile points, Uncompahgre Brownware ceramics, and obsidian; these suggest Ute origin. Trace-element analysis of the obsidian indicates a Wright Creek, Idaho source. Some ceramics were subjected to petrographic analysis.

Baker, Steven G.

1997 *Fremont Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: Granaries and Rock Art in Shavetail Basin (5RB3180, 5RB3286, 5RB3290, 5RB3512).* Centuries Research, Inc., Montrose, Colorado. Submitted to Bureau of Land Management White River Resource Area, Meeker, Colorado.

Centuries Research, Inc. conducted investigations at five Fremont sites in 1992 for Chandler and Associates. The sites were investigated as a means to mitigate possible indirect impacts resulting from improved road access into a planned gas field. The Shavetail Trail Rock Art Gallery (5RB3286) was documented, and four small granary sites were subject to limited excavations. The four granary sites were situated beneath rock alcoves. The Clinging Cliff Granaries site (5RB3288) had three masonry granaries; some Fremont and Ute rock art was found nearby. Twigs from a granary were radiocarbon dated to sometime between A.D. 660 and 990. The Mud Loaf Granaries site (5RB3290) consisted of two adobe-brick granaries. A corncob found at the site was chronometrically dated to the period between A.D. 620 and 970. At the Tres Monadas Cave site (5RB3180), a single masonry granary and a small basket fragment was found. The site was radiocarbon dated to sometime between A.D. 780 and 1170. The last site investigated, Solo Monada Granary (5RB3512) is a masonry granary dating sometime between A.D. 1020 and 1270.

Baker, Steven G.

1998a *Fremont Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: The Rim Rock Hamlet Promontory (5RB2792).* Centuries Research, Inc., Montrose, Colorado. Submitted to Bureau of Land Management, White River Resource Area, Meeker, Colorado.

This report described Centuries Research's 1992 and 1993 excavations at the Rim Rock Hamlet Promontory site south of Rangely, Colorado. The work was conducted to mitigate possible indirect impacts resulting from improvement of road access into a planned gas field. Excavations revealed a Fremont component, with Douglas Arch Grayware, lithic artifacts, corn macrofossils, and animal bone. The author infers a brush wall and a possible pithouse from minimal data. Radiocarbon determinations suggest an occupation sometime between A.D. 875 and 1035. Other specialized studies conducted include sherd petrography, palynology, and macrobotany.

Baker, Steven G.

1998b *Draft Fremont Archaeology on the Douglas Creek Arch, Rio Blanco County, Colorado: The Sky Aerie Promontory Charnel Site (5RB104).* Centuries Research, Inc., Montrose, Colorado. Submitted to Bureau of Land Management, White River Resource Area, Meeker, Colorado.

In 1993, Centuries Research, Inc. conducted excavations at the Sky Aerie Promontory Charnel Site south of Rangely, Colorado, to determine the extent of site vandalism and to mitigate possible indirect impact to the site resulting from gas developments in the area. The extent of past vandalism was found to be significant. The most notable discovery at the site consisted of the remains of nine humans. The bones were disarticulated; in one case, three skulls were clustered about a hearth. Several experts examined the skeletal evidence. Although some experts believed that the human remains were not clearly cannibalized, Baker makes a case for cannibalism. One human tooth had been drilled while the individual was alive to produce a conical hole; this important find represents one of few examples of prehistoric dentistry. Several radiocarbon dates were processed; these indicate that the main site occupation occurred between A.D. 890 and 920, or thereabouts. These dates — in addition to the discovery of plain gray and corrugated sherds and charred corn — indicate Fremont affiliation. A later radiocarbon date and the discovery of a Desert Side-notched point suggest reoccupation of the site, probably by Ute peoples. Pollen, faunal, and macrobotanical data are included in the report. A possible Fremont habitation structure was excavated.

Benedict, James B.

1985 *Arapaho Pass: Glacial Geology and Archaeology at the Crest of the Colorado Front Range.* Center for Mountain Archaeology, Research Report No. 3. Ward, Colorado.

Benedict's report discusses the archaeology and glacial geology of two sites, both in the vicinity of Arapaho Pass in Boulder and Grand Counties. The Arapaho Pass Game Drive Site is on the eastern slope, and the Caribou Lake Site (5GA22) is on the western slope. The Caribou Lake Site is at an elevation of 3,400 m (11,155 feet), just above present timberline. Excavation of the Caribou Lake Site revealed evidence of a Paleoindian component, consisting of a Cody complex projectile point base and a radiocarbon date of 8460 ± 140 from a hearth. A sample of other artifacts was attributed to the Paleoindian component. Multiple Late Prehistoric components were also detected, though difficult to spatially differentiate; many were detected through radiocarbon dating of hearths. One circular stone ring with a central hearth was attributed to the Late Prehistoric occupation. Other important finds include cord-marked Woodland pottery sherds dated by thermoluminescence study to 830 years ago, and plain and punctate pottery sherds similarly dated to 330 years ago. The plain and punctate sherds were attributed to a Ute occupation. Samples of sherds were also subjected to petrographic analysis.

Black, Kevin D.

1982 *Final Report of Archaeological Investigations: Peak 8 and Peak 9 Inventory, and 5ST161 Test Excavations, Breckenridge Ski Area, Summit County, Colorado.* Metcalf Archaeological Consultants, Inc., Eagle, Colorado.

This report describes the results of a 1,705-acre area at the Breckenridge Ski Area. Thirteen sites were recorded, one of which, the Carter Gulch Site (5ST161), was test excavated. The site is situated at 3,152 m (10,340 feet) elevation. Forty-two square meters were excavated with controlled methods, revealing two hearths. Radiocarbon and macrobotanical samples were collected and processed. Surface and excavation data indicated that three components are present, including a surficial Late Prehistoric component, a Late Archaic component, and a substantial Early Archaic component. Obsidian artifacts were especially abundant.

Black, Kevin D.
1986 *Mitigative Archaeological Excavations at Two Sites for the Cottonwood Pass Project, Chaffee and Gunnison Counties, Colorado.* Metcalf-Zier Archaeologists, Inc., Eagle, Colorado. Ms. on file at National Park Service, Interagency Archaeological Services. Denver, Colorado.

In advance of planned improvements to the Taylor Park and Cottonwood Pass roads in Gunnison and Chaffee Counties, the Federal Highway Administration, with the assistance of the National Park Service's Interagency Archaeological Services branch, contracted with Metcalf Archaeological Consultants, Inc. to conduct mitigative excavations at two prehistoric sites. The Runberg Site (5CF358) is on the eastern slope; it revealed Paleoindian, Archaic, and post-Archaic components. The Park Cone Scraper Site (5GN289) is on the western slope, immediately south of Taylor Reservoir in Taylor Park. Site elevation is 2,865 m (9,400 feet). Excavation of 72 m^2 resulted in the identification of four activity areas and four occupations. The site — a short-term campsite — appears to have been most intensely occupied during the Late Archaic period. Radiocarbon, pollen, macrobotanical, faunal, and obsidian trace element studies were conducted, adding important information concerning high-altitude archaeological sites. Project data provided the impetus for Black to present the Mountain tradition concept, which posits year-round mountain habitation by indigenous groups employing "collector" settlement strategies.

Breternitz, David A.
1970 Archaeological Excavations in Dinosaur National Monument, Colorado-Utah, 1964-1965. *University of Colorado Studies, Series in Anthropology* No. 17. Boulder.

Between 1963 and 1965, the University of Colorado conducted cultural resource inventory and excavations within Dinosaur National Monument for the National Park Service. This volume reports on excavations at 20 aboriginal sites, 13 of which were in Utah, and 7 of which were in Colorado. Many of the sites in Utah were characterized by Fremont pit structures and surface masonry rooms. The Colorado sites lacked habitation architecture; six are classified as open campsites or chipping stations, and one is classified as a rockshelter. The excavated Colorado sites include the Lowell Spring Site (5MF224), Deerlodge Midden (5MF202), Disappointment Circle (5MF196), Site 5MF132, Baker Cabin Spring Site (5MF190), The Seeps Campsite (5MF138), and Serviceberry Shelter (5MF81). No radiocarbon samples were processed for any of the Colorado sites. The Lowell Spring Site revealed evidence of stratified Fremont and Archaic components. Deerlodge Midden yielded a metal arrow point and Shoshone sherd, indicative of a Ute or Shoshone component, underlain by a probable Archaic component. Serviceberry Shelter had extensive, stratified cultural deposits. The various components were probably Archaic. The other sites in Colorado revealed comparatively less information. In his review of the project, Breternitz defined the Cub Creek phase for the western (primarily Utah) portion of the Monument, a Fremont unit dating roughly between A.D. 1000 and 1200.

Buckles, William G.
1971 *The Uncompahgre Complex: Historic Ute Archaeology and Prehistoric Archaeology of the Uncompahgre Plateau, West Central Colorado.* Ph.D. Dissertation, Department of Anthropology, University of Colorado. University Microfilms, Ann Arbor.

The Ute Prehistory Project was conducted during the early 1960s under the overall direction of Robert H. Lister of the University of Colorado with funds provided by the National Science Foundation. William G. Buckles was in direct charge of field and analytic work. The overall project objective was to define the prehistory of the Ute. Thirty-nine sites on the eastern flanks of the Uncompahgre Plateau west of Montrose and Delta were excavated to some degree, and 17 rock art sites were recorded. The resulting data were compiled in Buckles' dissertation — a 1,400-page work that includes detailed discussions of artifacts, site attributes, and rock art styles. The dissertation presents a phase sequence which, unfortunately, is tied to very few chronometric dates and is based upon rather small samples of sites. Although Buckles believes that the project was unsuccessful in determining the cultural affiliation of clearly prehistoric components, several important contributions were made. The project better defined the Uncompahgre Complex, which had been defined several years earlier by H.M. Wormington and R. Lister, and in so doing, provided important baseline data for subsequent archaeological investigations. Uncompahgre Brown Ware was defined as a ceramic type, and excellent descriptions of Ute wickiups were presented. Buckles' dissertation remains one of the most important and useful works on the archaeology of west-central Colorado.

Burgh, Robert F., and Charles F. Scoggin
1948 The Archaeology of Castle Park, Dinosaur National Monument. *University of Colorado Studies, Series in Anthropology* No. 2. Boulder.

In 1939 and 1940, Charles Scoggin and Edison Lohr of the University of Colorado Museum conducted archaeological inventory and excavation in Castle Park in the Yampa Valley of Dinosaur National Park. Efforts focused upon Mantle's Cave, where approximately 530 m^2 was excavated. Before the results were reported, Charles Scoggin was killed in combat in Italy. In 1947, Robert Burgh revisited the project area and conducted test excavations at Hells Midden. Shortly thereafter, Burgh completed a report on the Museum's investigations. Mantle's Cave (5MF1) is a large north-facing rockshelter with over 50 storage cists. Excavations revealed that the site was used primarily for storage; nonetheless, a plethora of artifacts — many perishable — were found. Artifacts include baskets, moccasins, fishhooks, snares, netting, and a flicker feather and ermine headdress. Corn and squash remains were also found. Burgh compared the material culture to that found in nearby regions, and concluded that the site was affiliated with the Fremont culture. At Hells Midden, a rockshelter, stratified cultural deposits extending at least 3 m below the ground surface were identified.

Burney, Michael S.
1985 *A Preliminary Report on the Results of Limited Test Excavations Conducted at High Altitude Sites 5GA784, 5GA787 and 5GA842 Northwest of Tabernash, Grand County, Colorado.* Western Archaeological Consultants, Inc. Submitted to the Forest Service.

Michael Burney's Master's thesis presents surface and limited testing data from three sites in Middle Park. One of the sites yielded Archaic projectile points and a Scottsbluff Paleoindian point; another site is noteworthy because a cluster of ceramics were found. The sherds were tentatively identified as Ute.

Cassells, E. Steve

1995 *Hunting the Open High Country: Prehistoric Game Driving in the Colorado Alpine Tundra.* Ph.D. Dissertation, Department of Anthropology, University of Wisconsin-Madison.

E. Steve Cassells' dissertation is based upon data from the Sawtooth game drive site (5GA55/5BL523). The site is situated along the crest of the Continental Divide in the Indian Peaks Wilderness area at elevations ranging between 3,505 m and 3,705 m (11,500 and 12,155 feet). The site consists of 59 stone blinds, 13 drive walls, and cairns. Limited excavations were conducted at 11 blinds, along a drive wall, and in a suspected butchering area. Material evidence analyzed included stone artifacts, soils for phosphate analysis, blood residue from artifacts, charcoal for radiocarbon determinations, and lichens for age estimations. The site was determined to have been utilized to a minor degree by Middle Archaic peoples, though most evidence is associated with Late Prehistoric occupations. Three separate construction episodes are discerned. Considerable attention is given settlement patterns in mountain environments, especially models based on the Mountain tradition and upon James Benedict's "piston engine" and "rotary engine" concepts.

Conner, Carl E., and Danni L. Langdon

1983 *Battlement Mesa Community Project - Cultural Resources Study.* Grand River Institute, Grand Junction, Colorado. Ms. on file, Office of Archeology and Historic Preservation, Denver.

In 1981, Grand River Institute contracted with the Mackinaw Development Corporation to conduct archaeological inventory and testing at the planned Battlement Mesa Community near Parachute, Colorado. Thirteen prehistoric sites and several historic sites were tested, resulting in the processing of 22 radiocarbon samples and the recovery of a considerable quantity of artifacts. Two sites are especially noteworthy: the Kewclaw Site (5GF126) and the Avian Paradise Site (5GF134). Excavations at the Kewclaw Site revealed a pit structure habitation, with walls up to 60 cm high, postholes, and floor features. Two radiocarbon samples were processed from pit structure contexts; when averaged, an occupation of approximately 1095 B.C. is indicated. The implications of substantial Late Archaic habitation structures are examined. The Avian Paradise Site yielded six cultural features and a large sample of Rose Springs projectile points.

Crane, Cathy Janet

1977 *A Comparison of Archaeological Sites on the Uncompahgre Plateau and Adjacent Areas.* Master's thesis, Department of Anthropology, Eastern New Mexico University, Portales.

In the 1970s, Metropolitan State College conducted archaeological excavations at several sites in western Montrose County characterized by circular masonry structures and Puebloan ceramics. The only significant reporting of these investigations were by Cathy Crane, who published an article on the excavation in *Southwestern Lore* and who wrote a Master's thesis on the investigations at Eastern New Mexico University. Crane's thesis is not a typical report of excavations, but important artifact and ancillary study data are, nonetheless, included. Data from the Weimer Ranch site and other, similar sites are compared and contrasted with data from Fremont and Anasazi sites in an attempt to determine cultural affiliation. Craned concludes that an indigenous expression of the Formative stage is represented that borrowed attributes of Fremont and Anasazi culture.

Creasman, Steven D.

1981 *Archaeological Investigations in the Canyon Pintado Historic District, Rio Blanco County, Colorado.* Reports of the Laboratory of Public Archaeology No. 34. Colorado State University, Fort Collins.

In 1976 and 1977, the Laboratory of Public Archaeology at Colorado State University conducted a cultural resource inventory of the Canyon Pintado Historic District along Douglas Creek, south of Rangely, Colorado. A total of 134 sites were recorded in the 13,000-acre project area. Site types included rock art, granaries, promontory structures, and artifact scatters. Two sites, the Brady site (5RB726) and Dripping Brow Cave (5RB699), were test excavated. The Brady site yielded eight Uintah Gray sherds and radiocarbon dates indicative of a Fremont occupation. The stratified Dripping Brow Cave site contained Late Archaic, Fremont, and Protohistoric components. Inventory data were used to derive a site prediction model, using site and nonsite categories as basic independent variables. Much subsequent predictive modeling was based on this pioneering effort. The majority of site data pertained to the Fremont culture. Comparison to San Rafael and Uintah Fremont variants, however, compelled Creasman to suggest that Fremont variation could be better communicated through the definition of a separate variant, termed the Douglas Creek Fremont.

Daniels, Donna C., and Richard D. Spencer

1982 *Evaluation and Testing of Eight Sites in Pitkin County, Colorado.* Cultural Resource Consultants, Inc. Submitted to the Office of Archaeology and Historic Preservation, Denver.

In 1982, Cultural Resources Consultants, Inc. conducted limited investigations at eight cultural resource sites along the Basalt-Malta transmission line in Pitkin County. Site 5PT86 was the most intensively investigated site, where three backhoe trenches were dug and 28 square meters were excavated with controlled methods. Although no radiocarbon samples were processed, a Middle Archaic component was indicated by a projectile point. Faunal and palynological studies were conducted.

Dial, Janis L.

1989 *The Curecanti Archaeological Project: The Late Prehistoric Component at Pioneer Point.* Midwest Archeological Center Occasional Studies in Anthropology No. 24. Lincoln.

In 1982, personnel from the National Park Service's Midwest Archeological Center conducted excavations at site 5GN41 at Pioneer Point in advance of planned park developments. Excavations revealed three hearths with associated artifacts and animal bone. Radiocarbon data indicate site occupation between A.D. 1403 and 1468. Artifact recovered included Uncompahgre Brown Ware ceramics and projectile points similar to the Desert Side-notched and Cottonwood Triangular types. The site was interpreted as a short-term campsite occupied by the Ute. The report excels in its discussion of artifacts and spatial patterning.

Euler, Robert T., and Mark A. Stiger

1981 1978 *Test Excavations at Five Archaeological Sites in Curecanti National Recreation Area, Intermountain Colorado.* Ms. on file, Midwest Archeological Center, Lincoln.

In 1978, the personnel from the National Park Service's Midwest Archeological Center conducted test excavations at five sites in the Curecanti National Recreation Area in advance of planned construction at the Elk Creek Development area. The purpose of the testing program was to evaluate

site significance and to aid in the formulation of mitigation strategies. Two sites, 5GN189 and 5GN205, yielded especially important results. Site 5GN189, a volcanic vent cave on Haystack Hill, yielded Pleistocene faunal remains and small quantities of cultural materials. Site 5GN205, the locus of the most extensive investigations, yielded the remains of an Archaic habitation structure. This evidence consists primarily of a cluster of 20 pounds of burned adobe, some with log impressions. The report also contains faunal, palynological, and radiocarbon data.

Fetterman, Jerry, and Linda Honeycutt

1995 *Report and Addendum to the Philadelphia Creek Replacement Project, Rio Blanco County, Colorado: Excavations at 5RB3042.* Woods Canyon Archaeological Consultants, Yellow Jacket, Colorado. Submitted to the Bureau of Land Management, Meeker, Colorado.

At the request of Northwest Pipeline Corporation, Woods Canyon conducted excavations at site 5RB3042 to mitigate the effects of planned pipeline replacement. The site is on the floodplain of Douglas Creek, south of Rangely, Colorado. Excavations revealed eight roasting pits, one hearth, and a small sample of artifacts. Four radiocarbon samples were processed, which indicated site occupation between A.D. 15 and 615. Faunal and macrobotanical remains collected from the features were processed. The site is interpreted as a resource processing location.

Frison, George C., and Marcel Kornfeld

1995 *Interim Report on the 1994 Testing, Data Recovery, and Analysis at Three Paleoindian Sites in Grand County, Colorado, and Summary of Current Investigations.* Technical Report No. 6b, Department of Anthropology, University of Wyoming, Laramie.

The University of Wyoming has been conducting testing and data recovery at Paleoindian sites in the vicinity of Little Wolford Mountain in Middle Park. Folsom, Goshen, and Cody complex components have been identified, along with bison bone. The chipped stone material is almost all of local origin, suggesting to the authors that the Paleoindian occupants of Middle Park may have lived there the year-round.

Gleichman, Carol L., and Steve Spears

1985 *Archaeological Investigations in the Fortification Creek Valley.* Highway Salvage Report No. 56. Colorado Department of Highways, Denver.

This volume describes the result of test excavations at three aboriginal sites along Colorado State Highway 13 north of Craig, Colorado. The Dry Cottonwood Creek Site (5MF1885), reported on by Spears, revealed a midden covering 36 m^2. Two radiocarbon samples and a relatively large sample of artifacts were recovered; these suggest site occupations during the Archaic stage. Gleichman presents the results of testing at two sites (5MF1899 and 5MF1900) in the Fortification Creek Valley. Little was recovered at 5MF1889, but site 5MF1900, the Fortification Creek Site, yielded an unlined hearth and a relatively large sample of artifacts. Radiocarbon and artifact data indicate an occupation during the eighteenth century, possibly by the Shoshone. The distribution of artifacts at the site are so restricted that disposal by a single individual is suggested.

Gooding, John D.
1981 *The Archaeology of Vail Pass Camp*. Highway Salvage Report No. 35. Colorado Department of Highways, Denver.

Gooding's report describes the Colorado Department of Highways investigations at site 5ST85, a multicomponent sherd and lithic scatter atop Vail Pass. A total of 453 m^2 was excavated, mostly in a contiguous block. Forty-two hearths, a possible stone ring, and other cultural features were revealed; 32 of the features yielded radiocarbon determinations. Over 300 projectile points were recovered, 116 of which were diagnostic. Ground stone artifacts and other formal flaked tools were also found. Projectile point data were used to infer site use by peoples with cultural ties to the Plains, the Great Basin, and perhaps the Southwest. Definition of components was especially difficult because occupations could not be stratigraphically recognized and because they tended to overlap horizontally.

Gooding, John D., and William Lane Shields
1985 *Sisyphus Shelter*. Colorado Bureau of Land Management Cultural Resources Series No. 18. Denver.

In 1980, archaeologists associated with the Colorado Department of Highways conducted archaeological excavations at the Sisyphus Rockshelter (5GF110), a multicomponent site in the Colorado River valley along Interstate Highway 70 between the towns of Parachute and DeBeque. Excavations were conducted at two sheltered and one open area within the site. Ten strata were defined on the basis of radiocarbon determinations and on natural stratigraphic changes. Occupations ranging between the Archaic and the Late Prehistoric periods were identified. A possible habitation structure, evident as a slab-lined floor with apparent subfloor features, was discovered in a level dating to the Terminal Archaic period. Pollen, faunal, and radiocarbon studies were conducted. The report, published by the Colorado Bureau of Land Management, contains a useful compilation of regional radiocarbon dates.

Hand, O. D.
1993 *Cultural Resource Investigations along US Highway 40 West of Steamboat Springs, and Test Excavations at the Wolf Creek Pictograph Site (5RT90), Routt County, Colorado.* Colorado Department of Transportation Research Series 2, Denver.

The Colorado Department of Transportation conducted documentation and test excavation at the Wolf Creek Pictograph site (5RB90) east of Hayden, Colorado, in 1988. Two trenches, encompassing 6.6 square meters, were excavated, exposing hearth features and artifacts. Multiple components were found at the site. A Paleoindian component is tentatively indicated by the surface find of a lanceolate projectile point. Early and Middle Archaic components are indicated by radiocarbon data. Two pieces of daub were found in one of the Archaic components, leading the authors to suggest that a structure was present. Shoshonean or Ute sherds were also found that indicate a Protohistoric component. The report includes rock art drawings.

Hand, O. D., and John D. Gooding
1980 Excavations at Dotsero, 5EA128. *Southwestern Lore* 46 (1-2):25-35.

This article describes the results of limited excavations at 5EA128 by Colorado Department of Highways archaeologists. The work was conducted in response to the discovery of human remains by highway engineers along the route of a planned segment of Interstate Highway 70. The site is just north of the Eagle River, at the edge of a lava flow that emanated from the Dotsero Crater. Thorough inspection of the site revealed interment of the skeleton in an excavated area in the lava scree, along with four other room-like structures and two lithic concentrations. The room-like structures were built in the lava scree and are thought to represent hunting blinds. Several hearths were found elsewhere on the site. The human skeleton was radiocarbon dated and was attributed to the Terminal Archaic. Appendices by Edward Rowen, Steven Emslie, and Charles Wheeler present the results of faunal and human skeletal analyses.

Hartley, John D.
1984 *Archaeological Investigations at Three Sites in the Jerry Creek Land Exchange Mesa County, Colorado.* Grand River Consultants, Grand Junction, Colorado. Submitted to the Bureau of Land Management, Grand Junction, Colorado.

In 1983 and 1984, Grand River Consultants, Inc., conducted archaeological data recovery at sites 5ME429, 5ME431, and 5ME4632 in Mesa County, Colorado. The three sites were part of the Jerry Creek Land Exchange project. Relatively little excavation was conducted; the most extensive work was done at 5ME431, where 23 square meters were dug. Hearth features were revealed that were chronometrically dated to the Archaic stage.

Hauck, Richard
1993 *Archaeological Excavations (1988-1992) in Douglas Creek-Texas Mountain Locality of Rio Blanco County, Colorado.* Archeological-Environmental Research Corporation, Bountiful, Utah. Submitted to the Bureau of Land Management, Meeker, Colorado.

Between 1988 and 1992, Archaeological-Environmental Research Corporation conducted archaeological excavations at 12 sites for Conoco, Inc. The work was conducted in advance of energy-related construction activities south of Rangely, Colorado. As evidenced by the project's 19 radiocarbon dates and diagnostic artifacts, components dated between A.D. 100 and 1260. Two sites yielded sand-tempered gray ware sherds that were classified as a new Fremont ceramic type: Douglas Creek Gray Ware. The type is described a similar to the Fremont Uinta Gray type, except for the temper material, and appears to be coeval with that type. Various new phases are presented but are not defined.

Hauck, Richard
1997 *Archaeological Excavations (1993-1996) in the Douglas Creek-Texas Mountain Locality of Rio Blanco County, Colorado.* Archeological-Environmental Research Corporation, Bountiful, Utah. Submitted to the Bureau of Land Management, Meeker, Colorado.

This report describes Archeological-Environmental Research Corporation's testing and mitigative excavations in the Douglas Creek vicinity south of Rangely, Colorado, between 1993 and 1996. The work was conducted for Conoco, Inc., in advance of gas well developments. The majority of sites were test excavated; some of these revealed hearths that were dated and sampled for macrobotanical remains. The most extensive work was conducted at Alimony Alcove (5RB3657), a stratified rockshelter with Middle Archaic through Late Prehistoric components. Seven radiocarbon samples were processed from the site; in all, 13 radiocarbon samples from six sites are discussed. Obsidian trace-element analysis was also conducted on five specimens. Extensive interpretation of macrobotanical data is presented. One of the report's strengths is that research objectives driving data recovery are extensively examined in the project synthesis section.

Horn, Jonathon, Alan D. Reed, and Stan A. McDonald

1987 *Archaeological Investigations at the Indian Creek Site, 5ME1373: A Stratified Archaic Site in Mesa County, Colorado.* Nickens and Associates, Montrose, Colorado. Ms. on file at the Bureau of Land Management, Grand Junction, Colorado.

During the winter of 1984, archaeological excavations were conducted at the Indian Creek Site (5ME1373) by Nickens and Associates. The work was conducted in advance of construction of the Rifle-San Juan 345 kV transmission line for Colorado-Ute Electric Association. The site is southeast of Grand Junction in the Mancos Shale lowlands at the base of the Grand Mesa, east of the Gunnison River. Ninety-four cultural features were documented at the site, including surficial hearths and roasting pits, hearths in arroyo cutbanks, and features in a 100-m^2 excavation block. In addition to numerous hearths and roasting pits found in the excavation block, three saucer-shaped depressions were identified. The depressions measured approximately 3 m in diameter, lacked interior features, and in some cases, were apparently associated with postholes. They are interpreted as habitation structures. Sixteen radiocarbon dates were processed from the site; most clustered between 3790 and 2000 B.C. Unsuccessful attempts were made to attribute site components to William Buckles Uncompahgre Complex phases, leading to rejection of the phase sequence. The concept of an Uncompahgre Technocomplex, however, was retained.

Hurst, Clarence T.

1940 Preliminary Work in Tabeguache Cave — 1939. *Southwestern Lore* 6:4-18.

1941 The Second Season in Tabeguache Cave. *Southwestern Lore* 7(1):4-19.

1942 Completion of Work in Tabeguache Cave. *Southwestern Lore* 8(1):7-16.

1943 Preliminary Work in Tabeguache Cave II. *Southwestern Lore 9(1):10-16.*

1944 1943 Excavation in Cave II, Tabeguache Canyon, Montrose County, Colorado. *Southwestern Lore* 10(1):2-14.

1945 Completion of Excavation of Tabeguache Cave II. *Southwestern Lore* 11(1):8-12.

1946 The 1945 Tabeguache Expedition. *Southwestern Lore* 12:7-16.

Between 1939 and 1945, C. T. Hurst directed Western State College's Tabeguache Expedition, which resulted in the excavation of three sites in the general vicinity of Nucla, Colorado, in western Montrose County. Work initially focused upon Tabeguache Cave. This north-facing alcove, reportedly completely excavated, revealed a retaining wall and several slab-lined cists. Many perishable artifacts were recovered, including one-rod-and-bundle foundation basketry, dart foreshafts, bone awls, matting, cordage, and a feather bundle. The feather bundle has recently been described in *Southwestern Lore* (Zugelder and Rood 1998). Thousands of corn cobs, husks, stalks, and kernels were recovered; squash and wild plant remains were also found. Hurst attributed the site to the peripheral Basket Maker II culture. A second alcove site, designated Tabeguache Cave II, was excavated between 1942 and 1944. Components identified at this stratified site were attributed to the Ute, Basket Maker II, and pre-Basket Maker II groups. Ute pottery was found in the upper levels. Other artifact found at the site included dart foreshafts, tanned deer hide, manos, metates, and various chipped stone artifacts. Corn and squash seeds were found. In 1945, excavations focused upon Tabeguache Pueblo, an open masonry site. Wall tops were exposed, indicating the presence of both contiguous and noncontiguous rooms. Two "houses" were completely excavated and two were partly excavated. Burned roofing material and jacal were found in the room fill, along with the remains of masonry walls. Artifacts recovered included small corner-notched projectile points, ground stone, and Anasazi pottery. Diagnostic pottery types included Mancos Black-on-white and what appears to be Mancos Gray, suggesting occupation coeval with the Pueblo II period. The results of the Tabeguache Expedition were reported in a series of short articles in *Southwestern Lore*.

Hurst, Clarence T.
1947 Excavations at Dolores Cave — 1946. *Southwestern Lore* 12:8-17.

In 1946, C.T. Hurst and crew completely excavated Dolores Cave along the Dolores River in western Montrose County. Stratified cultural deposits were not detected, though up to one third of the deposits had been previously looted. The main occupation was attributed to the Basket Maker II culture, based on the presence of limited quantities of corn and on the absence of ceramics. Several perishable artifacts were recovered, including rush matting, dart and arrow foreshafts, coiled basketry with one-rod-and-bundle foundation, cordage, deer skins, an owl feather bundle, and a wooden knife. Some of these artifacts were recovered in a bundle, interpreted as a medicine bundle. Chipped and ground stone artifacts were also found. A single hearth was identified. No specialized studies were conducted.

Hurst, Clarence T.
1948 The Cottonwood Expedition, 1947: A Cave and a Pueblo Site. *Southwestern Lore* 14:4-19.

Western State College conducted a two-week field session during the summer of 1947. Two sites, both east of Nucla, Colorado, along State Highway 90, were investigated. One site, the Cottonwood Pueblo, was comprised of four masonry rooms or room blocks and a connecting wall. One room block was excavated, revealing four contiguous rooms. Artifacts recovered included corner-notched projectile points, one-hand manos, and Pueblo II period Anasazi ceramics. No specialized studies were conducted. The other site, Cottonwood Cave, yielded perishable materials, including yucca sandals and a cache of shelled and unshelled corn. The corn was analyzed and described by Edgar Anderson of the Missouri Botanical Gardens. Later, Hurst and Anderson published a more thorough description of the corn cache in *American Antiquity* (Hurst and Anderson 1949). No ceramics were found at Cottonwood Cave. Hurst attributed the site to the Basket Maker culture.

Huscher, Betty H., and Harold A. Huscher
1943 *The Hogan Builders of Colorado*. The Colorado Archaeological Society.

The Huschers conducted archaeological investigations in western Colorado in the late 1930s and early 1940s, focusing upon structural sites. Some of their most valuable observations were never published, especially those concerning Ute wickiups and tree platforms; this information primarily appears in copies of their 1939 field notes. The 1943 publication addresses prehistoric masonry structures north of the Anasazi homeland. Several structures were excavated, providing information about architecture and associated Puebloan pottery, small corner-notched projectile points, and other artifact classes. The Huschers attribute the masonry structures to Athapaskan groups migrating from homelands in Canada and Alaska to the current homelands of the Apache and Navajo in the Four Corners area, a position that currently has little support. Because of the dearth of excavation data from masonry structures in the region, however, the Huschers' work remains an important resource.

Indeck, Jeff, and Allen J. Kihm

1982 *Zephyr: A Site for Sore Eyes.* Highway Salvage Report No. 38, Colorado Department of Highways, Denver.

In 1980, the Colorado Department of Highways conducted archaeological excavations at the Zephyr site (5MN1068) to mitigate the effects of planned improvement of U.S. Highway 50. The site is east of Montrose, a short distance from Cerro Summit. Excavations were extensive; 235 m^2 were dug in the main site area. In spite of the extensive excavation, only two hearth features were found. Radiocarbon dating was unsuccessful because of sample contamination from coal. Projectile point types found at the site indicate an Archaic affiliation.

Jones, Bruce A.

1982 *The Curecanti Archaeological Project: 1980 Investigations in Curecanti National Recreation Area, Colorado.* Midwest Archeological Center Occasional Studies in Anthropology, No. 8. Lincoln, Nebraska.

This report describes archaeological excavations conducted at the Curecanti National Recreation Area in 1980. Ten prehistoric sites were investigated in advance of park construction projects. Multiple features were excavated, resulting in nine radiocarbon determinations. Faunal and macrobotanical studies were also conducted.

Jones, Bruce A.

1986 *The Curecanti Archaeological Project: 1981 Investigations in Curecanti National Recreation Area, Colorado.* Midwest Archeological Center Occasional Studies in Anthropology, No. 14. Lincoln, Nebraska.

Jones' 1986 report is another in a series describing archaeological investigations at Curecanti National Recreation Area in advance of developments aimed at improving visitor facilities. During the 1981 field season, 13 cultural resource sites were investigated to varying degrees. Particularly important sites investigated include the Kezar Basin site (5GN191), 5GN53, and 5GN247. The Kezar Basin site, located along the shore of Blue Mesa Reservoir, had been exposed to wave action, exposing 185 hearths and related features. Ninety-seven features were excavated. Sites 5GN53 and 5GN247 yielded evidence of Archaic structures. Several pieces of burned clay were found at 5GN42. Feature 9 at 5GN247 was a 2-m-diameter, shallow depression, with an apparent floor and floor features. At Feature 19 at 5GN247, burned clay with impressions of grass or needles was recovered. The project contributed 26 radiocarbon determinations, as well as important macrobotanical, palynological, and faunal data.

Kalasz, Stephen M., Christian J. Zier, Bridget M. Ambler, Michael McFaul, and Margaret A. Van Ness

1990 *Excavation of Archaeological Sites 5MF2539 and 5MF2544 for the Craig-Bonanza Project, Moffat County, Colorado.* Centennial Archaeology, Inc., Fort Collins, Colorado. Prepared for J. F. Sato and Associates, Inc. and U.S. Department of Energy Western Area Power Administration, Loveland, Colorado.

At the request of J.F. Sato and the Western Area Power Administration, Centennial Archaeology, Inc. conducted archaeological excavation at two sites west of Craig, Colorado, near the Yampa River. The sites were threatened by construction of the Craig-Bonanza 345 kV transmission line. Relatively little information was retrieved from site 5MF2539, though several hearths and a small sample of artifacts were recovered. Four radiocarbon dates indicated occupations between A.D. 700 and

1000 and between A.D. 1316 and 1468. Site 5MF2544 yielded considerably more information; it appears to have been occupied by Late Archaic, Late Prehistoric/Pre-Shoshonean, and by Protohistoric peoples. Eight radiocarbon dates from the site were processed; diagnostic artifacts include Desert Side-notched projectile points. Both sites yielded faunal and macrobotanical information.

Kasper, Jan C.
1977 Animal Resource Utilization at Colorado Paradox Valley Site. *Southwestern Lore* 43(1):1-7.

Janice Kasper's thesis on the faunal remains excavated at the Paradox 1 site by California State University represents one of the only documents concerning excavations at an important structural site in the western end of Montrose County. The site had been previously excavated in the 1930s by George and Edna Woodbury. Kasper's work includes important site data to establish the context for her faunal interpretations. Site features include rectangular masonry surface structures, circular pit structures, surface and intramural storage cists, and middens. Architectural units are attributed to the Basketmaker III and Pueblo I-II period Anasazi and to the Fremont. Because of her research focus, Kasper assigns cultural affiliation rather uncritically. A condensed version of her thesis was published in *Southwestern Lore* in 1977.

La Point, Halcyon J., Howard M. Davidson, Steven D. Creasman, and Karen C. Schubert
1981 *Archaeological Investigations in the Canyon Pintado Historic District, Rio Blanco County, Colorado, Phase II — Inventory and Test Excavations*. Reports of the Laboratory of Public Archaeology No. 53. Colorado State University, Fort Collins.

In 1979, Colorado State University's Laboratory of Public Archaeology (LOPA) conducted cultural resource inventory and test excavations in the Douglas Creek area south of Rangely, Colorado. The survey was oriented toward understanding the settlement patterns of the area adjacent to the Canyon Pintado Historic District. A sample of quadrats and transects outside of the previously surveyed district were inspected, totaling 1,682 acres. Forty-four sites were found. The upland areas outside of Douglas Creek were found to be characterized by lithic scatters rather than structural sites. Survey data were used to refine a predictive model for site location. Three sites were test excavated. Additional work was conducted at Dripping Brow Cave (5RB699), where LOPA had previously worked. Late Archaic, Fremont, and Protohistoric components were identified. The Edge site (5RB748) , a rectangular, masonry structure attributed to the Fremont culture, was also tested. Also tested was the Gnat Home site (5RB804). Test excavations yielded radiocarbon and other ancillary study samples.

Liestman, Terri L.
1984 *Archaeological Excavations at the Pontiac Pit Site: A Multi-component Campsite in the Rocky Mountains*. Midwest Archeological Center, Lincoln, Nebraska.

The National Park Service's Midwest Archeological Center conducted archaeological excavations at the Pontiac Pit site (5GA217) in 1982 and 1983. The site is in the western portion of Rocky Mountain National Park near the North Fork of the Colorado River. Excavations yielded a fairly large sample of lithic artifacts and evidence of 27 cultural features. Features, consisting primarily of hearths and roasting pits, yielded 15 radiocarbon determinations. Experimental and scanning electron microscopy data provided insight into heat treatment of lithic material.

Liestman, Terri L., and Kevin P. Gilmore

1998 *Archaeological Mitigation of the Soderquist Ranch Site (5GN246) Gunnison County, Colorado*. Highway Salvage Report No. 62, Colorado Department of Highways, Archaeological Unit, Denver.

In 1987, personnel associated with the Colorado Department of Highways conducted mitigative excavations at the Soderquist Ranch Site along US Highway 50 east of Cimarron, Colorado. Eighteen cubic meters were excavated in generally noncontiguous units. Soils were found to be deep, but disturbed. Projectile points found in surface and subsurface contexts indicate site occupation by Plano, Archaic, and Protohistoric groups. Only one radiocarbon assay was made, collected in a non-feature context. Trace-element analysis of obsidian artifacts indicate that materials emanated from Rio Grande Pleistocene terraces near Cochiti, New Mexico.

Lister, Robert H.

1951 *Excavations at Hells Midden, Dinosaur National Monument*. University of Colorado Studies in Anthropology No. 3, Boulder.

The University of Colorado Museum conducted excavations at Hells Midden in Dinosaur National Monument in 1948 and 1949. The site, a rockshelter, is in Castle Park, along the Yampa River canyon. A 2 m by 10 m trench was excavated. Cultural deposits were found to a depth of 4.6 m. A Fremont component was identified in the uppermost levels, as indicated by Fremont gray ware pottery, corn, and textile fragments. The lower levels are affiliated with the Archaic stage. Several hearths were found, but no chronometric dates were obtained.

Lutz, Bruce J.

1978 *The Test Excavations of 5ME217: A Rockshelter in Mesa County, Colorado*. Office of Public and Contract Archaeology, University of Northern Colorado. Submitted to the Bureau of Land Management, Grand Junction, Colorado.

This report describes the results of test excavations at a prehistorically occupied rockshelter in Cactus Park, southeast of Grand Junction, Colorado. Two conjoined trenches, together comprising 8 m^2, were excavated, exposing stratified cultural deposits. Cultural features were encountered and dated. The report includes the results of palynological and faunal studies.

McAndrews, Kelly, Linda Honeycutt, and Jerry Fetterman

1997 *Excavations at the Little Spring Creek Site, Rio Blanco County, Colorado*. Northwest Pipeline Corporation. Woods Canyon Archaeological Consultants, Yellow Jacket, Colorado. Submitted to the Bureau of Land Management, Meeker, Colorado.

In 1995, Woods Canyon conducted archaeological excavations at the Little Spring Creek site to mitigate the effects of pipeline reconditioning. Excavations revealed a historic Euroamerican component and at least four Archaic components. Ten radiocarbon dates and three protein residue samples, as well as pollen, macrobotanical, and faunal samples, were collected and processed. Radiocarbon data indicate site occupation between 4800 and 4300 B.C. and between 3700 and 3400 B.C.

McDonald, Kae

1998 *Archaeological Excavations at the Fallen Deer Site (5SM2578)*. Metcalf Archaeological Associates, Eagle, Colorado. Submitted to the USDA Forest Service, Norwood, Colorado.

In 1997, Metcalf Archaeological Consultants, Inc. conducted excavations at the Fallen Deer Site (5SM2578) to mitigate the effects of a potential land exchange. The site is on the Uncompahgre National Forest northwest of Placerville, on the north side of the San Miguel River, near the Montrose/San Miguel County line. The site was tested, and a 12 m² block excavated. No cultural features were found, but a sample of artifacts and animal bones were recovered. One obsidian flake was subject to trace-element analysis. Artifacts include small side-notched projectile points and 17 sherds; sherd types include Mancos Gray, Mancos Corrugated, unidentified plain gray, and unidentified white ware. The ceramics indicate an occupation between A.D. 910 and 980. Based on diagnostic artifacts, a Pueblo II Anasazi occupation is suggested. Early Archaic and Ute components may also be present at the site.

McDonald, Stan A.

1987 *Site Testing and Monitoring between Montrose, Colorado and Southern Ute Tribal Reservation Lands, Colorado, along the Rifle-San Juan Transmission Line, Montrose, Ouray, San Miguel, Dolores, Montezuma, and La Plata Counties.* Report No. 24. Nickens and Associates, Montrose, Colorado. Submitted to the Bureau of Land Management, Montrose, Colorado.

In 1986, Nickens and Associates conducted archaeological testing and monitoring along a segment of the planned Rifle-San Juan 345 kV transmission line. Of the 13 tested sites, significant data were recovered at two sites. A hearth was excavated at site 5MN2922 west of Montrose that provided macrobotanical information and a radiocarbon date between A.D. 1035 and 1250. Site 5LP1754 in La Plata County revealed evidence of Archaic and Anasazi components.

Metcalf, Michael D., and Kevin D. Black

1991 *Archaeological Excavations at the Yarmony Pit House Site, Eagle County, Colorado.* Cultural Resource Series No. 31. Bureau of Land Management, Colorado.

In 1987 and 1988, Metcalf Archaeological Consultants conducted excavations at Yarmony House (5EA799) along the Colorado River in northern Eagle County. The work was initially conducted to mitigate the effects of planned highway improvements. Excavations revealed two substantial pithouses, dated 6300 B.P. and 6000 B.P. Other components were also detected and investigated at the site, but the pit structures were the focus of research. Geoarchaeological, archaeofaunal, macrobotanical, malacological, and palynological studies were conducted, which aided in interpretation of site paleoenvironment and subsistence practices. A relatively large sample of artifacts was also recovered and analyzed. The pit structures were relatively deep and had floor features such as hearths and storage cists. Ethnographic data suggests that the substantial structures were winter habitations. A model for Early Archaic settlement patterns was presented.

Metcalf, Michael D., Ronald J. Rood, Patrick K. O'Brien, and Bret R. Overturf

1990 *Kremmling Chert Procurement in the Middle Park Area, Colorado: 5GA1144 and 5GA1172.* Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Submitted to J. F. Sato and Associates, Golden, Colorado. Ms. on file, Office of Archaeology and Historic Preservation, Denver.

In 1989, Metcalf Archaeological Consultants, Inc. conducted mitigative investigations at two sites to be impacted by improvement of Western Area Power Administration's Kremmling-Windy Gap transmission line. Both sites are southeast of Kremmling, Colorado, near the Colorado River. Site 5GA1144 is a campsite/quarry, evidently used over a long period of time, primarily for the extraction

and processing of Kremmling chert. One quarry pit, where chert was mined, was tested. Site 5GA1172 was investigated more intensively. This large site is characterized by at least three quarry pits, six stone circles, and a number of artifact concentrations. One quarry pit was excavated, yielding a huge quantity of chipped stone, as well as wooden, antler, and bone excavation tools. Four stone circles thought to represent habitation structures were at least partially excavated. None revealed undoubted internal features. At Feature 10, a block comprising 53 m^2 was excavated, and the pattern of artifact distributions was studied. Artifact distributions suggest cleaning of structure and/or performance of waste-producing activities outside of the habitation area. Radiocarbon determinations from a juniper digging stick and an extramural hearth indicate site occupation during the Late Prehistoric period.

Muceus, Cheryl, and Robert Lawrence.
1986 Prehistoric Sites Report. In: *Old Dallas Historical Archaeological Program: Dallas Creek Project*, by W.G. Buckles, M. Rossillon, C. Haecker, R. Lawrence, C. Muceus, N. Buckles, S. Hilvitz, R. Moore, and M. Anderson, pp. 57-130. Bureau of Reclamation, Salt Lake City.

Between 1979 and 1980, archaeological inventory and mitigative excavations were conducted within the planned pool area of Ridgway Reservoir south of Montrose, Colorado. The project was directed by William G. Buckles of the University of Southern Colorado, under contract with ESCA-Tech and MESA Corporation. Although the primary project focus was on historic sites, six prehistoric sites were excavated. The sites, 5OR167, 5OR179, 5OR182, 5OR198, 5OR243, and 5OR317, were all open lithic scatters along the Uncompahgre River. Twenty-four radiocarbon samples, mostly collected from hearths, were processed, revealing Archaic and Late Prehistoric components. Relatively large samples of pollen and macrobotanical samples were also processed; a macrobotanical sample from 5OR243 yielded an apparent squash or gourd seed. Forty-three obsidian artifacts from 17 sites were subject to trace-element analysis, revealing that most came from north-central New Mexico.

Murcray, Dirk, Kevin W. Thompson, Steven D. Creasman, Jana V. Pastor, and Barbara Amidon
1993 *Archaeological Investigations at the Sand Wash Wickiup Site, Moffat County, Colorado.* Western Wyoming Community College. submitted to the Bureau of Land Management, Craig, Colorado.

Western Wyoming College conducted a field school at the Sand Wash Wickiup site (5MF2631) in 1991. The site is in northwestern Colorado in the Wyoming Basin. Four standing or collapsed wickiups were identified, two of which were excavated. The two excavated wickiups contained central hearths. Recovered artifacts included fingertip-impressed brown ware ceramics, Cottonwood and Desert Side-notched projectile points, and a clay ball. Although excavations were not extensive, an excellent report was produced that contributes to the understanding of Ute technology and site structure.

Murray, Susan D. and David E. Johnson
1997 Test Excavations at the Irish Canyon Rockshelter. *Western Wyoming College Contributions to Archaeology* 11. Submitted to the Office of Archaeology and Historic Preservation, Denver.

In 1984, Western Wyoming College conducted test excavations at site 5MF606, the Irish Canyon Rockshelter. Sixteen square meters were excavated along a trench. Stratified cultural deposits were revealed; diagnostic artifacts suggest the presence of Archaic and Late Prehistoric components. Ancillary study data pertain to radiocarbon, faunal material, and palynological studies. A fairly large sample of artifacts was recovered, including gray ware and brown ware ceramics.

Naze, Brian
1994 *The Crying Woman Site: A Record of Prehistoric Human Habitation in the Colorado Rockies*. Master of Arts Thesis, Department of Anthropology, Colorado State University, Fort Collins.

The Crying Woman site (5GA1208) was the subject of Brian Naze's Master's thesis from Colorado State University. The site is in the headwaters of the Colorado River in Middle Park. Investigations were primarily restricted to surface artifacts and features, though two excavation units were dug. The large site was found to be multi-component, with occupations by Paleoindian, Archaic, and Late Prehistoric peoples. Surface features documented include three tipi rings and a cluster of daub that is thought to represent a substantial habitation structure. One of the excavation units was situated at the location of the discovery of a Folsom projectile point. Artifacts from the unit included a spurred scraper and probably channel flakes from fluting; together, these artifacts strongly suggest the presence of a Folsom tradition component. The other excavation unit yielded a radiocarbon date and projectile point types that may indicate a Numic component. At other locations on the site, possible Dismal River, Intermountain Tradition, and Woodland cord-marked pottery were found.

Nickens and Associates
1986 *Site Testing and Monitoring between Rifle, Colorado and Montrose, Colorado: Mitigation of Effect on Cultural Resources for the Colorado-Ute Electric Association Rifle to San Juan Transmission Line Project, Garfield, Mesa, Delta, and Montrose Counties.* Report # 21. Nickens and Associates, Montrose, Colorado. Submitted to the Bureau of Land Management, Montrose, Colorado.

This report describes the results of archaeological testing and monitoring conducted along a segment of the planned Rifle-San Juan 345 kV transmission line. Testing at most sites was minimal. Four of the investigated sites yielded important information; 14 radiocarbon dates were processed from sites 5ME4957, 5ME4959, and 5ME4971, and a wash from a buried mano found at site 5GF1232 yielded *Cucurbita* pollen. The dated components were attributed to Late Prehistoric and Protohistoric periods. Feature 1 at site 5ME4971 yielded a radiocarbon date between A.D. 1335 and 1435 and a charred seed tentatively identified as a corn kernel. The charred seed was badly deteriorated. If the charred seed is, indeed, corn, it is one of the latest prehistoric examples of corn in the region. The *Cucurbita* pollen from site 5GF1232 may be either wild gourd or a cultivated squash. The authors note that wild gourd does not presently grow in the vicinity of the site and that Cucurbita pollen is not wind-borne. The age of the component containing the Cucurbita pollen is unknown.

O'Neil, Brian
1980 Highway Salvage Excavations at Walton Creek (5RT11), Routt County, Colorado. *Southwestern Lore* 46 (1-2):3-24.

In 1978, the Colorado Highway Department conducted salvage excavations at site 5RT11, which was threatened by construction of an alternate segment of U.S. Highway 40. The site is near the Yampa River, south of Steamboat Springs, Colorado. Excavations revealed a hearth, 10 projectile points, and a sample of other chipped and ground stone artifacts. One radiocarbon assay and the majority of projectile points indicate a Late Prehistoric occupation.

O'Neil, Brian

1980 *Phase II, Mitigation of Adverse Effects of the Sugarloaf Project at the Lay Site, 5MF476.* Powers Elevation, Denver, Colorado. Prepared for Energy Fuels Corporation, Steamboat Springs, Colorado.

In 1978 and 1979, Powers Elevation conducted test excavations at the Sugarloaf-Lay Site (5MF476) to aid in the determination of site significance. The site had been previously recorded and subjected to sampling by proton magnetometer. Ten 2 m by 2 m test units were dug. Testing confirmed that some of the magnetic anomalies previously identified were, indeed, cultural features. Fifty hearths and one rock alignment were identified at the site, most exposed on the surface. A large artifact sample was collected, and six radiocarbon dates were processed. Chronometric and artifact data indicate multiple occupations by Archaic and Late Prehistoric peoples.

Painter, Mary W.

1994 *Mitigative Excavation of Archaeological Site 5RB234, Rio Blanco County, Colorado.* Centennial Archaeology, Inc., Fort Collins, Colorado. On file at the Office of Archaeology and Historic Preservation, Denver.

Painter's report describes archaeological data recovery by Centennial Archaeology, Inc. at site 5RB234 along Douglas Creek, south of Rangely, Colorado. Thirteen square meters, divided among three blocks, were excavated to mitigate possible impacts from improvement of State Highway 139. Several hearths were encountered, which provided radiocarbon, macrobotanical, and faunal data. The three radiocarbon determinations and the discovery of a Rose Spring Side-notched point indicate a site occupation between 1700 and 700 B.P.

Pitblado, Bonnie L.

1993 *Paleoindian Occupation of Southwest Colorado.* Master of Arts Thesis, Department of Anthropology, University of Arizona.

Pitblado's Master's thesis comprises one of the most important contributions to Paleoindian research in western Colorado. One hundred and sixty-six Paleoindian projectile points from that portion of western Colorado west of the Continental Divide and south of the Colorado River were analyzed, then compared and contrasted to conventional Paleoindian types described elsewhere. Her research suggests that Clovis and Folsom peoples may have infrequently inhabited the study area. Occupation of the area was more intensive during the Plano tradition, possibly by people representing multiple complexes. She attributes the major occupation of the study area, however, to the Foothill-Mountain complex, similar to the unit defined by George Frison in Wyoming's mountains. The Foothill-Mountain tradition was apparently less focused upon big game hunting than the complexes adapted to the Great Plains; indeed, the inferred generalist subsistence practices are used to argue for closer cultural affinity with Great Basin Paleoindian groups. Pitblado synthesized her thesis in an article published by *Southwestern Lore* in 1994.

Pool, Kelly J.

1993 *Cyprus Twentymile Coal Company: Rock Art Reconnaissance and Recording, Testing at 5RT345, and Treatment Plan for 5RT345, Routt County, Colorado.* Metcalf Archaeological Consultants, Inc., Eagle, Colorado.

Site 5RT345 was subject to limited test excavations in 1993 by Metcalf Archaeological Consultants, Inc. The site is near the Cyprus Twentymile Coal Mine in central Routt County. Excavation of 5 m^2 in two units exposed six components, representing Protohistoric and Archaic occupations. Fifteen hearth features were found, which provided radiocarbon determinations. Of special interest was the discovery of a possible occupation floor with two floor features. The possible structure is attributed to the Middle Archaic period. The report also contains a treatment plan and rock art illustrations.

Pool, Kelly J.

1997 *The Red Army Rockshelter (5RT345): Final Report of Data Recovery Excavations, Routt County, Colorado.* Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Cyprus Twentymile Coal Company, Oak Creek, Colorado.

Archaeological excavations were conducted at the Red Army Rockshelter (5RT345) southeast of Craig, Colorado, in 1994 by Metcalf Archaeological Consultants, Inc. The work was conducted for Cyprus Twentymile Coal Company to mitigate the effects of ground subsidence resultant from underground mining. Excavation of 29 m^2 revealed seven stratified components, ranging in age from the Early Archaic to the Protohistoric stage, as evidenced by 11 radiocarbon dates and by numerous diagnostic artifacts. Diagnostic artifacts included Uncompahgre Brown Ware ceramics and various projectile point types. One hundred and twenty-one cultural features were identified, including one Early Archaic and one Middle Archaic pit structure, an Early Archaic human burial, and numerous hearths. The pit structures were relatively substantial, suggesting cool or cold weather habitation. Eight obsidian artifacts were subjected to trace-element analysis. One of the report's mains strengths is presentation of excavation data organized by component.

Reed, Alan D.

1981 *Archaeological Investigations of Two Archaic Campsites Located along the Continental Divide, Mineral County, Colorado.* Nickens and Associates, Montrose, Colorado. Submitted to the USDA Forest Service, Durango, Colorado.

In 1981, Nickens and Associates contracted with the Colorado Division of Wildlife to conduct archaeological excavations at two sites in the San Juan National Forest in advance of water diversion ditch improvements. The two sites, 5ML45 and 5ML46, are situated along the Continental Divide at approximately 3,475 m (11,400 feet) elevation. Four radiocarbon samples were processed, indicating Early, Middle, and Late Archaic components. Especially interesting is a radiocarbon determination of 7860 ± 190 B.P. obtained at Concentration C at 5ML45. Obsidian samples were subject to obsidian hydration analysis; pollen and macrobotanical data samples were also processed.

Reed, Alan D.

1982 *Archaeological Investigations at 5EA484: An Open Archaic Site in the Colorado Rockies.* Nickens and Associates, Montrose, Colorado. On file at the Bureau of Land Management, Glenwood Springs, Colorado.

Nickens and Associates conducted excavations at site 5EA484 in 1981 to mitigate the effects of planned construction of the planned Basalt-Crystal transmission line. The site is atop a bench overlooking the town of El Jebel in the Roaring Fork Valley. A total of 200 m^2 was excavated, mostly in scattered units. Excavations revealed four slab-lined or unlined hearths or roasting pits and a 40-cm-diameter concentration of burned adobe. The burned adobe was thought to possibly represent the remains of a structure, though data were admittedly sparse. Three radiocarbon determinations were obtained; these indicated Late Archaic and early Formative-era occupations. Pollen, macrobotanical, and obsidian hydration studies were also conducted.

Reed, Alan D.
1997 *Archaeological Test Excavations at Watershed Rockshelter (5ME213), Mesa County, Colorado.* Alpine Archaeological Consultants, Inc., Montrose, Colorado. Submitted to the Bureau of Land Management, Grand Junction, Colorado.

In 1996, Alpine Archaeological Consultants test excavated the Watershed Rockshelter (5ME213) under contract with the Bureau of Land Management. The site, situated on the western flank of Grand Mesa west of Palisade, was part of a potential land exchange project. Two test trenches, comprising 3.3 cubic meters of soil, were excavated. Cultural deposits were found to extend 1.3 m below the ground surface. Terminal Archaic, Late Prehistoric and Ute components were identified. Radiocarbon, protein residue, pollen, and macrobotanical studies were completed. In 1998, the site was subjected to extensive archaeological data recovery as part of the TransColorado Natural Gas Pipeline Project. The report of those excavations is in preparation.

Reed, Alan D., and Paul R. Nickens
1980 *Archaeological Investigations at the DeBeque Rockshelter: A Stratified Archaic Site in West-Central Colorado.* Nickens and Associates, Montrose, Colorado. Ms. on file, Bureau of Land Management, Grand Junction, Colorado.

In 1979, Nickens and Associates excavated a 12-m-long trench through the DeBeque Rockshelter (5ME82) to assess the nature of archaeological deposits that had been subject to illicit excavation. Rockshelter soils were deep; 20 strata, including 7 cultural strata, were identified. Artifact densities were rather low, but palynological, malacological, faunal, and geomorphological data were examined. Seven radiocarbon dates were processed; these indicated that the rockshelter was occupied between approximately 5090 and 610 B.C. by Archaic stage peoples.

Reed, Alan D., M. C. Pope, Ronald J. Rood, and Sharon Manhart
1997 *Archaeological Data Recovery at the Escalante Game Drive Site (5DT192), Delta County, Colorado.* Alpine Archaeological Consultants, Inc., Montrose, Colorado. Submitted to the Bureau of Land Management, Uncompahgre Resource Area, Montrose, Colorado. Report on file at the Colorado Office of Archaeology and Historic Preservation, Denver.

In April 1992, the Chipeta Chapter (Montrose) of the Colorado Archaeological Society undertook archaeological investigations at the Escalante Game Drive site (5DT192) northwest of Delta, Colorado. Twenty-seven hunting blinds and several rock and brush fences were recorded, and a model of the game drive system was developed. Additionally, two eroding hearths were excavated, providing evidence of site use between A.D. 687 and 980. The discovery of a Desert Side-notched projectile point suggests later site use, as well.

Rood, Ronald J.
1998 *Archaeological Excavations at 5GN2478: Elk Creek Village, Curecanti National Recreation Area, Gunnison County, Colorado* (revised). Report Prepared for the Colorado Historical Society.

Western State College field school personnel conducted controlled mitigative excavations at the Elk Creek Village site in 1995. The site is in the Curecanti National Recreation Area on the shore of Blue Mesa Reservoir. Wave action had exposed the site and threatened its destruction. Approximately 50 m² were excavated in several blocks. Excavations revealed a number of cultural features, several of which were interpreted as habitation structures. Especially important is Feature 1 in

Block B, where burned clay was found in a shallow basin, with apparently associated postholes and a peripheral sandstone slab. A substantial habitation structure is represented. Other structures may also be present at the site, but are more ephemeral and yielded less compelling evidence. Nine radiocarbon determinations were processed. The report organizes data presentation by site component, which is especially helpful for interpretations.

Rossillon, Mary P.

1984 *The Curecanti Archaeological Project: The Archaeology of Marion, An Historic Railroad Camp in Curecanti National Recreation Area, Colorado.* Midwest Archeological Center Occasional Studies in Anthropology No. 9, Lincoln, Nebraska.

The National Park Service's Midwest Archeological Center conducted mitigative excavations at the Marion site in 1984. The site is south of Blue Mesa Reservoir along a tributary to the Gunnison River. The site is primarily a railroad construction camp, dating to 1889. Beneath the historic component, however, at least three prehistoric components were discovered, at least two of which were horizontally discrete. A radiocarbon assay from one component indicated an occupation between 170 B.C. and A.D. 205. A second component is dated to the period between A.D. 855 and 1040. A third, less well-defined component is represented by late-style projectile points. Noteworthy is the large amount of bone recovered, indicating procurement of mule deer, antelope, and bison.

Stiger, Mark A.

1993 *Archaeological Investigations at the Tenderfoot Site.* Western State College, Gunnison.

Between 1991 and 1998, Mark Stiger of Western State College has conducted field schools at the Tenderfoot site. The site is just south of Gunnison. Surface artifact collections and controlled archaeological excavations have been conducted. Surface artifact collections within a 300 by 500 m block have been repeated over several years. Substantial quantities of artifacts have emerge between collection episodes because of various agents of soil disturbances. Interestingly, significant differences are apparent between the surface artifact samples, though collected in the same area. Excavations have included a 313-m^2-area in a large block, which have revealed approximately 50 cultural features. Radiocarbon dating of cultural deposits have permitted the identification of seven major occupation episodes, dating between 1700 BP. And 7500 BP. Research at the Tenderfoot Site has illustrated the scientific importance of relatively shallow mountain sites. Reports to date have been preliminary, but a final monograph is nearing completion.

Stiger, Mark A. and Mark Larson

1992 A Radiocarbon Date from the Cottonwood Cave Corn Cache and Problems Interpreting the Origins of Farming in Western Colorado. *Southwestern Lore* 58(2): 26-36.

C.T. Hurst of Western State College excavated a corn cache in Cottonwood Cave on the western side of the Uncompahgre Plateau in 1947. The cache consisted of shelled and unshelled corn, wrapped in a juniper bark bundle and buried to a depth of 76 cm beneath the modern ground surface. Recently, Western State College archaeologists subjected a sample of the shelled corn to radiocarbon analysis. A radiocarbon determination of 2220 ± 80 B.P. was obtained, indicating corn caching at approximately 270 B.C. This date constitutes the first reliable chronometric date from Cottonwood Cave. The implications of early corn production are discussed.

Stiger, Mark A., and Ronald J. Rood
1994 *Archaeological Evaluation and Damage Assessment of 5HN65, Hinsdale County, Gunnison National Forest.* Western State College, Gunnison, Colorado.

Archaeologists from Western State College assessed unauthorized construction damage to site 5HN65 in 1994. The site is in the Gunnison National Forest near Cebolla Creek. Twenty m^2 were excavated. No cultural features were found, and the artifact sample was relatively small. Obsidian artifacts were common. Artifacts are especially well analyzed; these data are appended to the report.

Stiger, Mark A.
1981 *1979 Investigations at Seven Archaeological Sites in Curecanti National Recreation Area.* Midwest Archeological Center, Lincoln, Nebraska.

In 1979, the National Park Service's Midwest Archeological Center conducted archaeological test excavations at five sites in the Curecanti National Recreation Area. The work was conducted to evaluate cultural resource sites threatened by planned construction in the Iola and Willow Creek area. Work was most extensive at site 5GN10, where 35 2 m x 2 m units were excavated. Numerous hearths were excavated, providing important chronometric and macrobotanical data. The work provided the foundation for Stiger's contention that pinyon pine was once distributed in the Gunnison Basin, a resource thought to have important ramifications about prehistoric use of the area.

Tanner, Russell L., and Steven D. Creasman
1986 *The Sand Wash Site.* Contributions to Archaeology Number 2. Archaeological Services, Western Wyoming College. Submitted to the Bureau of Land Management, Little Snake Resource Area, Craig, Colorado.

This report describes the results of the excavation of 14.6 m^3 at the Sand Wash Site north of the Little Snake River in northwestern Colorado. Three cultural features were found, one of which was subject to radiocarbon dating. Excavations revealed that the site is stratified and multicomponent, occupied between approximately 3500 and 1000 B.P. Pollen and faunal studies were completed.

Truesdale, James A.
1993a *Archaeological Investigations at Two Sites in Dinosaur National Monument: 42UN1724 and 5MF2645.* Selections from Division of Cultural Resources No. 4, Rocky Mountain Region, National Park Service, Denver.

Investigations at site 5MF2645 in Dinosaur National Monument consisted of surface artifact collection, excavation of a 1 m^2 unit, and recovery of two human skeletons. Human remains, buried at the base of a cliff, consisted of an adult female and a newborn infant. A pit structure was reportedly discovered in the 1 m^2 test unit excavated some distance away from the burial, though evidence supporting a structure's existence is not clearly presented. Radiocarbon samples from the burial and the test unit are used to assign Fremont affiliation. Because the radiocarbon dates were somewhat earlier than expected, prior to David Breternitz's date range for the Cub Creek phase, five radiocarbon samples from five sites on the Utah side of the monument that had been collected by Breternitz and the University of Colorado were processed. These five radiocarbon determinations are also early, suggesting to Truesdale that the Cub Creek phase began 900 to 400 years earlier than previously thought.

Tucker, Gordon C., Jr.
1981 *Mitigative Excavations at 5RT139, An Archaic Campsite in Routt County, Colorado.* Nickens and Associates, Montrose, Colorado. On file at the Office of Archaeology and Historic Preservation, Denver.

In 1979, site 5RT139 was recorded by Western Cultural Resource Management, Inc. Site constituents included 10 hearth features and a Scottsbluff projectile point. The point suggested that a late Paleoindian component was present. In 1980, Nickens and Associates conducted archaeological monitoring and limited test excavations oriented towards determining the presence or absence of a Paleoindian component. Six excavation units were dug with controlled techniques, and archaeologists monitored backhoe trenching and mechanical surface stripping. Twenty-one hearth features were identified. Nine radiocarbon dates were processed, six of which resulted in modern dates, indicative of contamination by recent burning events. The other three dates were prehistoric, but were characterized by large standard deviations. Two late Paleoindian diagnostic artifacts and an Archaic projectile point were recovered. Project data failed to confirm the presence of an intact Paleoindian component.

Tucker, Gordon C., Jr.
1986 *Results of Archaeological Investigations along the Chevron CO2/PO4 Pipelines in Northeastern Utah and Northwestern Colorado.* Nickens and Associates, Montrose, Colorado. Submitted to the Bureau of Land Management, Vernal, Utah.

This report describes Nickens and Associates 1985 mitigative excavations along the Chevron CO^2/PO^4 pipelines in northwestern Colorado and northeastern Utah. Investigations were conducted at 15 sites, only two of which are in Colorado. These two sites, 5RB2686 and 5RB2685 are northwest of Rangely. Site 5RB2686 was subjected to limited testing, which revealed a Late Archaic hearth. Eleven m^2 were excavated at 5RB2686; one Archaic hearth was discovered there. Radiocarbon, pollen, and macrobotanical samples were processed. The report's greatest contributions pertain to sites in Utah. At the Cocklebur Wash Site (42UN1476), for example, three pit structure habitations with hearths and storage pits were discovered, dated roughly between A.D. 350 and 600. Although no cultivars or Fremont ceramics were found, the Cocklebur Wash Site was attributed to the early Fremont culture. The Cliff Creek phase was proposed to describe the Fremont occupation of the region between A.D. 350 and 600.

Tucker, Gordon C., and the Colorado Archaeological Society, Chipeta Chapter
1989 *The Harris Site: A Multi-Component Site of the Uncompahgre Plateau, West-Central Colorado.* Bureau of Land Management Cultural Resource Series No. 28. Denver.

Between 1984 and 1987, members of the Chipeta Chapter of the Colorado Archaeological Society conducted investigations at the Harris Site west of Montrose, Colorado. Work was conducted to mitigate the effects of site vandalism. Surface data and test excavation data were collected. Radiocarbon determinations indicate initial occupation of the site at approximately 1500 B.C. The lowermost level, however, stratigraphically inferior to the earliest radiocarbon date, yielded a Plano projectile point. Much of the recovered material was attributed to Archaic components. A historic Ute component was also found, manifest as a scatter of lithic, metal, and glass artifacts, in apparent association with a surficial rock alignment. The metal and glass artifacts indicate a horse-mounted Ute occupation dating between A.D. 1870 and 1881. Abundant rock art, primarily consisting of incised lines, was documented at the site and attributed to the Uncompahgre Style of rock art.

Wheeler, Charles W., and Gary Martin

1984 *Windy Gap: Aboriginal Adaptation to Middle Park, Grand County, Colorado. Western Cultural Resource Management.* Prepared for Northern Colorado Conservancy District. Ms. on file, Office of Archaeology and Historic Preservation, Denver.

In 1981 and 1982, Western Cultural Resource Management, Inc. conducted archaeological investigations of 10 sites along the Colorado River near Granby, Colorado, in Middle Park. The focus of investigation soon concentrated upon two sites where fragments of daub were recovered. The origin of the daub was carefully considered, and it was determined to represent constituents of prehistoric habitation structures and associated cultural features. The structures at the Granby (5GA151) and the Hill-Horn (5GA680) sites were among the first Archaic stage habitation structures identified in Colorado. The identification of substantial habitation structures in Archaic contexts led to revisions in perceptions of settlement patterns and gave rise to the concept of a mountain tradition.

Wormington, H.M., and Robert H. Lister

1956 *Archaeological Investigations on the Uncompahgre Plateau in West Central Colorado.* Proceedings of the Denver Museum of Natural History No. 2.

Wormington and Lister's report on archaeological excavations conducted on the Uncompahgre Plateau provided the basis for the definition of the Uncompahgre complex, a concept that was to affect perceptions of regional archaeology for decades. Field work was conducted during two periods: from 1937 to 1939 and in 1951 and 1952. Both phases were conducted by the Denver Museum of Natural History, though the University of Colorado Field School was a partner during the 1951 and 1952 field seasons. Excavations were conducted at eight sites; these include the Moore, Taylor, Alva, Luster, and Roth rockshelter sites and three open sites along the arroyo in Sieber Canyon. Additionally, data from two rockshelter sites in Little Park excavated by local amateur Al Look were reported. Although no radiocarbon dates were processed, the sites were dated, in some cases, through geomorphological studies and through artifact cross-dating. In addition to stone artifacts, a few pottery sherds were found, as well as perishable artifacts. Human burials were recovered at Roth and Luster Caves. Corn was found at several sites. Data from the Moore, Casebier, and Taylor Rockshelters formed the basis for the definition of the Uncompahgre complex. Material culture traits associated with these sites are compared and contrasted to other published archaeological units in surrounding regions, resulting in the assertion that the Uncompahgre complex represents a local variant of the Desert Culture.

Zier, Christian J., and Daniel A. Jepson

1991 *Test Excavations of Three Prehistoric Sites in the Marathon Land Exchange, Lower Piceance Creek Area, Rio Blanco County, Colorado.* Centennial Archaeology, Inc., Fort Collins, Colorado. Submitted to the Colorado Division of Wildlife.

In 1990, Centennial Archaeology, Inc. conducted limited test excavations at three sites along Piceance Creek southwest of Meeker, Colorado. Two rockshelters and one open site were investigated through analysis of surface artifacts and excavation of two or three meter-square units. Artifact, radiocarbon, macrobotanical, and faunal samples were collected and processed. Late Prehistoric components were identified. Importantly, the report compiles mostly unpublished information on Colorado State University's 1972 excavations at the Burke site in the Piceance Basin. Excavations at the Burke rockshelter (5RB123) revealed Late Prehistoric period radiocarbon dates and Great Salt Lake Gray ceramics attributed to the fourth century A.D.

APPENDIX B

List of Chronometric Dates

CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5SM2578		*	AD 910 - AD 980	AD 945	1005	McDonald 1998
5RB699		*	AD 1130-1230	AD 1180	770	Creasman 1981; LaPoint et al. 1981
5MF745		*	AD 575 - AD 725	AD 650	1300	Arthur et al. 1981
5MN191	MCX-4	*	AD 725-1024V	AD 1024	926	Woodbury 1932
5MN367	Uga-926	*	AD 845-965	AD 905	1045	Crane 1977
5MN653	Uga-1375	*	AD 515-645	AD 580	1370	Crane 1977
5MF745		*	AD 575 - AD 725	AD 650	1300	Arthur et al. 1981
5MN368	Uga-1274	*	AD 1010-1150	AD 1080	870	Crane 1977
5RB726		*	AD 660 - AD 760	AD 710	1240	Creasman 1981
5RB2284	Beta-5505	**MODERN**	MODERN		0	McPherson 1983
5DT271	Beta-20209	**70 ± 60**	AD 1675 - AD 1950	AD 1950	137.5	Baker 1991
5ME4971	Beta-14325	**80 ± 80**	AD 1660 - AD 1950	AD 1950	145	Nickens and Assoc. 1986
5RB2318	Beta-5503	**110 ± 90**	AD 1644 - AD 1950	AD 1833	153	McPherson 1983
5DT271	Beta-18088	**140 ± 50**	AD 1660 - AD 1950	AD 1813	145	Baker 1991
5MF2544	Beta-32354	**150 ± 50**	AD 1657 - AD 1950	AD 1809	146.5	Kalasz et al. 1990
5GA1499	Beta-45567	**160 ± 60**	AD 1647 - AD 1950	AD 1807	151.5	Rupp 1991
5ST303	Beta-111477	**160 ± 60**	AD 1647 - AD 1950	AD 1807	151.5	Hand and Jepson 1998
5DT271	Beta-35123	**180 ± 40**	AD 1654 - AD 1950	AD 1801	148	Baker 1991
5MN42	TRL #UTE 4	**187 ± 0**	AD 1763	AD 1763	187	Buckles 1971
5MN42	TRL #UTE 5	**188 ± 0**	AD 1762	AD 1762	188	Buckles 1971
5ST85	Uga-1146	**190 ± 65**	AD 1529 - AD 1950	AD 1798	210.5	Gooding 1981
5RB2926	Beta-35116	**200 ± 60**	AD 1529 - AD 1950	AD 1795	210.5	Baker 1993
5MN41	TRL #UTE 2	**209 ± 0**	AD 1741	AD 1741	209	Buckles 1971
5RB13	Beta-5502	**210 ± 90**	AD 1477 - AD 1950	AD 1793	236.5	McPherson 1983
5GA22	Alpha-493	**210 ± 29**	*	*	*	Benedict 1985
5RB2284	Beta-5504	**230 ± 50**	AD 1525 - AD 1950	AD 1663	212.5	McPherson 1983
5RB2372	Beta-5282	**230 ± 90**	AD 1460 - AD 1950	AD 1663	245	Sciscenti and Griffiths 1982
5MF2544	Beta-32357	**230 ± 60**	AD 1515 - AD 1950	AD 1663	217.5	Kalasz et al. 1990

*Date is a thermoluminescence date, tree-ring date, or a radiocarbon date that was not reported in the referenced report.

CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GA55	Beta-39157	**255 ± 60**	*	*	*	Cassells 1995
5RB699	Uga-3388	**265 ± 75**	AD 1456 - AD 1950	AD 1652	247	Creasman 1981; LaPoint et al. 1981
5MF435	Uga-2730	**300 ± 85**	AD 1438 - AD 1950	AD 1641	256	Arthur et al. 1981
5GA22	Alpha-491a	**310 ± 43**	BC 4781 - BC 4357	BC 4539	6519	Benedict 1985
5MF2544	Beta-32350	**320 ± 60**	AD 1446 - AD 1950	AD 1537	252	Kalasz et al. 1990
5GA22	Alpha-462b	**320 ± 45**	AD 1484 - AD 1950	AD 1655	233	Benedict 1985
5GA22	Alpha-491b	**330 ± 46**	BC 6352 - BC 5697	BC 5985	7974.5	Benedict 1985
5MF435	Uga-2732	**335 ± 65**	AD 1439 - AD 1950	AD 1564	255.5	Arthur et al. 1981
5GA22	Alpha-491c	**340 ± 48**	BC 3696 - BC 3366	BC 3575	5481	Benedict 1985
5GF130	DIC-	**340 ± 270**	AD 1175 - AD 1950	AD 1569	387.5	Conner and Langdon 1987
5GF1335	Beta-13328	**350 ± 60**	AD 1438 - AD 1663	AD 1591	399.5	Rhodes 1986
5RB699	Uga-2426	**355 ± 65**	AD 1434 - AD 1665	AD 1595	400.5	Creasman 1981; LaPoint et al. 1981
5ME6377	Beta-37841	**360 ± 90**	AD 1410 - AD 1950	AD 1600	270	Pointkowski 1990a
5GA151	Beta-3668	**360 ± 100**	AD 1405 - AD 1950	AD 1600	272.5	Wheeler and Martin 1982, 1984
5MF436	Uga-2743	**375 ± 90**	AD 1406 - AD 1950	AD 1485	272	Arthur et al. 1981
5EA433	Beta-3836	**390 ± 50**	AD 1432 - AD 1644	AD 1478	412	Conner and Wignall 1981
5RB104	Beta-111038	**410 ± 50**	AD 1425 - AD 1640	AD 1533	418	Baker 1998b
5RB3182	Beta-55303	**410 ± 50**	AD 1424 - AD 1638	AD 1462	419	Baker 1996
5ME4957	Beta-14314	**420 ± 70**	AD 1405 - AD 1647	AD 1454	424	Nickens and Assoc. 1986
5ME4971	Beta-14324	**420 ± 70**	AD 1405 - AD 1647	AD 1454	424	Nickens and Assoc. 1986
5MF2631	Beta-52690	**420 ± 60**	AD 1409 - AD 1641	AD 1454	425	Murcray et al. 1993
5RB3182	Beta-55304	**420 ± 60**	AD 1409 - AD 1641	AD 1454	425	Baker 1996
5ST85	WSU-1751	**430 ± 90**	AD 1321 - AD 1657	AD 1449	461	Gooding 1981
5GA55	Beta-39158	**430 ± 60**	*	*	*	Cassells 1995
5RB2435	Beta-7199	**430 ± 50**	AD 1414 - AD 1631	AD 1449	427.5	Creasman and Scott 1987
5GA22	Alpha-462c	**450 ± 63**	AD 1407 - AD 1638	AD 1449	427.5	Benedict 1985
5GN41	Beta-3277	**460 ± 70**	AD 1327 - AD 1635	AD 1441	469	Dial 1989; Jones 1986a
5RB699	Uga-3381	**460 ± 60**	AD 1400 - AD 1627	AD 1441	436.5	Creasman 1981; LaPoint et al. 1981

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GN41	Beta-5563	**470 ± 80**	AD 1310 - AD 1638	AD 1438	476	Dial 1989; Jones 1986a
5MF2539	Beta-32348	**470 ± 80**	AD 1310 - AD 1638	AD 1438	476	Kalasz et al. 1990
5RB3574	Beta-64574	**480 ± 50**	AD 1400 - AD 1484	AD 1436	508	Hauck 1997
5ME5997	Beta-32043	**510 ± 70**	AD 1305 - AD 1611	AD 1426	492	Conner et al. 1998
5OR182	Beta-1971	**510 ± 60**	AD 1309 - AD 1479	AD 1426	556	Buckles et al. 1986
5ME4971	Beta-14323	**510 ± 70**	AD 1305 - AD 1611	AD 1426	492	Nickens and Assoc. 1986
5GF110	DIC 1657	**520 ± 55**	AD 1309 - AD 1466	AD 1421	562.5	Gooding and Shields 1985
5RB748	Uga-3377	**520 ± 75**	AD 1300 - AD 1611	AD 1421	494.5	LaPoint et al. 1981
5RB2958	Beta-66108-CAMS	**530 ± 80**	AD 1295 - AD 1611	AD 1415	497	Baker 1995
5MF2539	Beta-32346	**540 ± 60**	AD 1302 - AD 1455	AD 1410	571.5	Kalasz et al. 1990
5GA1172	Beta-36207	**560 ± 40**	AD 1307 - AD 1437	AD 1405	578	Metcalf et al. 1991
5GF110	DIC 1658	**580 ± 55**	AD 1295 - AD 1439	AD 1400	583	Gooding and Shields 1985
5MF2631	Beta-49093	**590 ± 60**	AD 1290 - AD 1439	AD 1398	585.5	Murcray et al. 1993
5RB3180	Beta-60055	**590 ± 80**	AD 1270 - AD 1450	AD 1360	590	Baker 1997
5MF2544	Beta-32355	**600 ± 50**	AD 1292 - AD 1431	AD 1333	588.5	Kalasz et al. 1990
5MF2544	Beta-32351	**600 ± 80**	AD 1278 - AD 1447	AD 1333	587.5	Kalasz et al. 1990
5GF134	DIC-	**620 ± 45**	AD 1290 - AD 1417	AD 1347	596.5	Conner and Langdon 1987
5ST278	Beta-11428	**630 ± 100**	AD 1225 - AD 1449	AD 1353	613	Black 1985a
5MF745	Uga-2749	**645 ± 80**	AD 1243 - AD 1435	AD 1364	611	Arthur et al. 1981
5RB3182	Beta-55305	**650 ± 90**	AD 1225 - AD 1439	AD 1367	618	Baker 1996
5RB2372	Beta-5279	**670 ± 80**	AD 1225 - AD 1427	AD 1300	624	Sciscenti and Griffiths 1982
5RB804	Uga-3378	**670 ± 270**	AD 821 - AD 1950	AD 1300	564.5	LaPoint et al. 1981
5GF134	DIC-	**680 ± 65**	AD 1237 - AD 1408	AD 1298	627.5	Conner and Langdon 1987
5RB2873	Beta-33793	**690 ± 50**	AD 1259 - AD 1398	AD 1295	621.5	Hauck 1993
5RB104	Beta-119160	**700 ± 50**	AD 1250 - AD 1395	AD 1323	627	Baker 1998b
5RB817	Uga-2496	**705 ± 60**	AD 1227 - AD 1400	AD 1291	636.5	Gordon et al. 1978
5ST85	WSU-1760	**720 ± 90**	AD 1165 - AD 1411	AD 1288	662	Gooding 1981
5RB2372	Beta-5290	**720 ± 70**	AD 1213 - AD 1401	AD 1288	643	Sciscenti and Griffiths 1982

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RB699	Uga-2422	**725 ± 60**	AD 1219 - AD 1395	AD 1287	643	Creasman 1981; LaPoint et al. 1981
5RB3182	Beta-55302	**740 ± 100**	AD 1046 - AD 1411	AD 1284	721.5	Baker 1996
5RB2828	Beta-33790	**740 ± 80**	AD 1165 - AD 1401	AD 1284	667	Hauck 1993
5RB699	Uga-2423	**740 ± 85**	AD 1162 - AD 1403	AD 1284	667.5	Creasman 1981; LaPoint et al. 1981
5GA22	I-5450	**765 ± 90**	AD 1043 - AD 1399	AD 1279	729	Benedict 1985
5MF3852	Beta-86552	**770 ± 40**	AD 1216 - AD 1296	AD 1278	694	Tickner 1995
5GA698	Uga-4499	**775 ± 75**	AD 1057 - AD 1389	AD 1276	727	Kranzush et al. 1982
5GA217	Beta-6878	**780 ± 50**	AD 1172 - AD 1298	AD 1275	715	Liestman 1984
5GA217	Beta-6879	**780 ± 50**	AD 1172 - AD 1298	AD 1275	715	Liestman 1984
5MF435	Uga-3155	**785 ± 95**	AD 1029 - AD 1397	AD 1271	737	Arthur et al. 1981
5GA22	I-6480	**785 ± 90**	AD 1034 - AD 1394	AD 1271	736	Benedict 1985
5GA22	Alpha-492b	**790 ± 111**	*	*	*	Benedict 1985
5GA1208	Beta-35691	**790 ± 90**	AD 1031 - AD 1393	AD 1263	738	Naze 1994
5GA701	Uga-4501	**795 ± 195**	AD 882 - AD 1470	AD 1258	774	Kranzush et al. 1982
5RB234	Beta-39162	**800 ± 60**	AD 1063 - AD 1298	AD 1253	769.5	Crum 1991; Painter 1994
5GA869	Beta-84866	**800 ± 50**	AD 1164 - AD 1293	AD 1253	721.5	Martin and McNess 1995
5GA22	Alpha-492c	**800 ± 112**	BC 4454 - BC 3981	BC 4242	6167.5	Benedict 1985
5MN2629	Beta-36043	**810 ± 90**	AD 1025 - AD 1386	AD 1245	744.5	Greubel 1989
5GA217	Beta-6880	**810 ± 50**	AD 1161 - AD 1291	AD 1245	724	Liestman 1984
5GF134	Beta-	**820 ± 70**	AD 1036 - AD 1298	AD 1229	783	Conner and Langdon 1987
5RB2958	Beta-35118	**830 ± 60**	AD 1041 - AD 1291	AD 1225	784	Baker 1995
5ST85	WSU-1749	**830 ± 100**	AD 1013 - AD 1386	AD 1225	750.5	Gooding 1981
5GF134	Beta-	**830 ± 70**	AD 1031 - AD 1296	AD 1225	786.5	Conner and Langdon 1987
5RB3339	Beta-54578	**830 ± 100**	AD 1013 - AD 1386	AD 1225	750.5	Baker 1992c
5GN1668	Beta-3276	**840 ± 80**	AD 1022 - AD 1298	AD 1222	790	Jones 1986a
5GA1172	Beta-38512	**840 ± 60**	AD 1036 - AD 1289	AD 1222	787.5	Metcalf et al. 1991
5RB699	Uga-2421	**850 ± 65**	AD 1028 - AD 1289	AD 1218	791.5	Creasman 1981; LaPoint et al. 1981
5ST85	TX-2647	**860 ± 60**	AD 1028 - AD 1285	AD 1214	793.5	Gooding 1981

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RB3512	Beta-60059	**870 ± 60**	AD 1020 - AD 1270	AD 1145	805	Baker 1997
5GF1336	Beta-13329	**870 ± 60**	AD 1025 - AD 1283	AD 1195	796	Rhodes 1986
5RB3366	Beta-58802	**880 ± 100**	AD 983 - AD 1298	AD 1141	809.5	O'Brien 1998
5RB2210	Beta-	**880 ± 70**	AD 1016 - AD 1285	AD 1176	799.5	Crum and Wignall 1981
5MN2922	Beta-19355	**880 ± 50**	AD 1028 - AD 1277	AD 1176	797.5	McDonald 1987
5MF1	AA-7823	**882 ± 60**	AD 1021 - AD 1281	AD 1172	799	Truesdale 1993b
5GA217	Beta-6883	**890 ± 50**	AD 1025 - AD 1276	AD 1168	799.5	Liestman 1984
5MF435	Uga-2737	**895 ± 70**	AD 1012 - AD 1282	AD 1166	803	Arthur et al. 1981
5GA217	Beta-7210	**900 ± 180**	AD 775 - AD 1410	AD 1165	857.5	Liestman 1984
5GA22	Alpha-492a	**910 ± 127**	*	*	*	Benedict 1985
5GA55	Beta-39154	**915 ± 60**	AD 1012 - AD 1260	AD 1131	814	Cassells 1995
5ME4645	Beta-7928	**940 ± 50**	AD 1010 - AD 1222	AD 1115	834	Conner and Davenport 1996
5RB1463	Beta-13040	**940 ± 50**	AD 1010 - AD 1222	AD 1115	834	Conner and Langdon 1989
5MF745	Uga-2750	**945 ± 115**	AD 884 - AD 1289	AD 1112	863.5	Arthur et al. 1981
5RB748	Uga-3389	**950 ± 70**	AD 978 - AD 1250	AD 1100	836	LaPoint et al. 1981
5GF134	Beta-	**950 ± 80**	AD 966 - AD 1272	AD 1095	831	Conner and Langdon 1987
5ST85	Uga-1144	**950 ± 70**	AD 978 - AD 1250	AD 1097	836	Gooding 1981
5RB2025	Beta-	**950 ± 55**	AD 996 - AD 1222	AD 1095	841	Williams 1981; Williams and Wignall 1981
5RB2873	Beta-42350	**960 ± 80**	AD 898 - AD 1256	AD 1037	873	Hauck 1993
5RB2275	Beta-5501	**960 ± 80**	AD 898 - AD 1256	AD 1037	873	McPherson 1983
5RB3060	Beta-41950	**960 ± 70**	AD 972 - AD 1230	AD 1037	849	Baker 1995
5MF436	Uga-2744	**970 ± 65**	AD 972 - AD 1222	AD 1032	853	Arthur et al. 1981
5RB2828	Beta-42349	**980 ± 80**	AD 893 - AD 1230	AD 1028	888.5	Hauck 1993
5OR198	Beta-1969	**980 ± 60**	AD 972 - AD 1215	AD 1028	856.5	Buckles et al. 1986
5RB3498	Beta-56585	**980 ± 50**	AD 983 - AD 1180	AD 1028	868.5	Hauck 1993
5ST85	TX-2640	**990 ± 60**	AD 966 - AD 1205	AD 1025	864.5	Gooding 1981
5RB2829	Beta-42348	**990 ± 90**	AD 885 - AD 1249	AD 1025	883	Hauck 1993
5RB2873	Beta-34176	**990 ± 230**	AD 627 - AD 1416	AD 1025	928.5	Hauck 1993

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5MF476	Uga-2947	**995 ± 65**	AD 896 - AD 1213	AD 1024	895.5	O'Neil 1980
5GA696	Uga-4498	**995 ± 80**	AD 889 - AD 1224	AD 1024	893.5	Kranzush et al. 1982
5MF1	AA-7824	**1000 ± 52**	AD 969 - AD 1167	AD 1022	882	Truesdale 1993b
5MF2544	Beta-32353	**1000 ± 50**	AD 972 - AD 1165	AD 1022	881.5	Kalasz et al. 1990
5MF435	Uga-2734	**1010 ± 60**	AD 895 - AD 1168	AD 1020	918.5	Arthur et al. 1981
5RB3498	Beta-54589	**1010 ± 50**	AD 900 - AD 1162	AD 1020	919	Hauck 1993
5GF110	DIC 1662	**1010 ± 55**	AD 898 - AD 1165	AD 1020	918.5	Gooding and Shields 1985
5GN1664	Beta-8117	**1020 ± 70**	AD 888 - AD 1178	AD 1017	917	Rossillian 1984
5RB3290	Beta-60056	**1030 ± 90**	AD 620 - AD 970	AD 795	1155	Baker 1997
5MF2656	Beta-27983	**1030 ± 60**	AD 890 - AD 1162	AD 1014	924	Truesdale 1989
5MF435	Uga-2739	**1030 ± 60**	AD 890 - AD 1162	AD 1014	924	Arthur et al. 1981
5RB104	Beta-84207	**1040 ± 70**	AD 880 - AD 1170	AD 1025	925	Baker 1998b
5RB104	Beta-111039	**1040 ± 50**	AD 895 - AD 1115	AD 1005	945	Baker 1998b
5MF435	Uga-2733	**1045 ± 60**	AD 886 - AD 1158	AD 1008	928	Arthur et al. 1981
5RB3180	Beta-60054	**1050 ± 90**	AD 780 - AD 1170	AD 975	975	Baker 1997
5MF436	Uga-2746	**1055 ± 70**	AD 879 - AD 1161	AD 1001	930	Arthur et al. 1981
5MF435	Uga-2729	**1055 ± 60**	AD 884 - AD 1155	AD 1001	930.5	Arthur et al. 1981
5MF606	Beta-10049	**1060 ± 50**	AD 888 - AD 1038	AD 997	987	Murray and Johnson 1997
5RB2792	Beta-111040	**1060 ± 50**	AD 885 - AD 1035	AD 960	990	Baker 1998a
5RB2829	Beta-33788	**1060 ± 60**	AD 718 - AD 1011	AD 888	1085.5	Hauck 1993
5RB104	Beta-107744	**1060 ± 50**	AD 885 - AD 1035	AD 960	990	Baker 1998b
5MF435	Uga-2728	**1065 ± 60**	AD 881 - AD 1152	AD 993	933.5	Arthur et al. 1981
5RB1873	Dic-2264	**1070 ± 50**	AD 885 - AD 1033	AD 989	991	Babcock and Scott 1982
5RB2958	Beta-35120	**1070 ± 80**	AD 785 - AD 1162	AD 989	976.5	Baker 1995
5MF2539	Beta-34349	**1080 ± 50**	AD 883 - AD 1029	AD 984	994	Kalasz et al. 1990
5RT345	Beta-78992	**1080 ± 50**	AD 883 - AD 1029	AD 984	994	Pool 1997
5MF429		**1085 ± 90**	AD 773 - AD 1164	AD 981	981.5	Stevens 1981
5RB2764	Beta-37373	**1090 ± 60**	AD 819 - AD 1033	AD 978	1024	Zier and Jepson 1991

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RB2792	Beta-112217	**1090 ± 40**	AD 875 - AD 1025	AD 950	1000	Baker 1998a
5MF436	Uga-2745	**1090 ± 85**	AD 775 - AD 1159	AD 978	983	Arthur et al. 1981
5GN1664	Beta-8118	**1090 ± 60**	AD 819 - AD 1033	AD 978	1024	Rossillian 1984
5MF3065	Beta-89628	**1100 ± 70**	AD 782 - AD 1037	AD 973	1040.5	Thompson 1996
5GN318	Gx-7112	**1105 ± 145**	AD 655 - AD 1241	AD 970	1002	Black et al. 1981
5RB2792	Beta-11041	**1113 ± 40**	AD 875 - AD 1010	AD 942	1008	Baker 1998a
5RB699	W-4250	**1120 ± 50**	AD 789 - AD 1017	AD 906	1047	Creasman 1981; LaPoint et al. 1981
5RB733	Beta-40454	**1120 ± 60**	AD 782 - AD 1023	AD 906	1047.5	Baker 1992a
5RT139	RL-1427	**1130 ± 230**	AD 445 - AD 1300	AD 914	1077.5	Tucker 1981
5RB104	Beta-111037	**1130 ± 50**	AD 790 - AD 1010	AD 900	1050	Baker 1998b
5RB2829	Beta-33785	**1140 ± 50**	AD 782 - AD 1012	AD 893	1053	Hauck 1993
5RB733	Beta-40453	**1150 ± 70**	AD 709 - AD 1020	AD 891	1085.5	Baker 1992a
5RB726	W-4246	**1150 ± 50**	AD 778 - AD 1006	AD 891	1058	Creasman 1981
5DL775	Beta-8392	**1160 ± 50**	AD 775 - AD 998	AD 888	1063.5	King and Bradley 1985
5RB2446	Beta-6100	**1170 ± 70**	AD 684 - AD 1014	AD 886	1101	Head and Ruest 1982
5RB2449	Beta-7451	**1170 ± 60**	AD 709 - AD 1006	AD 886	1092.5	Babcock 1984
5GF129	DIC-	**1170 ± 75**	AD 679 - AD 1017	AD 886	1102	Conner and Langdon 1987
5RB2829	Beta-33787	**1170 ± 90**	AD 667 - AD 1026	AD 886	1103.5	Hauck 1993
5DT192	Beta-55978	**1180 ± 50**	AD 718 - AD 985	AD 883	1098.5	Reed et al. 1997
5GA55	Beta-50909	**1180 ± 55**	AD 708 - AD 990	AD 883	1101	Cassells 1995
5RB234	Beta-75957	**1180 ± 60**	AD 688 - AD 998	AD 883	1107	Crum 1991; Painter 1994
5DT271	Beta-18089	**1190 ± 60**	AD 683 - AD 990	AD 881	1113.5	Baker 1991
5RB2449	Beta-7449	**1190 ± 50**	AD 708 - AD 979	AD 881	1106.5	Babcock 1984
5ME6144	Beta-32044	**1190 ± 60**	AD 683 - AD 990	AD 881	1113.5	Conner et al. 1998
5ME213	Beta-099940	**1200 ± 40**	AD 718 - AD 963	AD 872	1109.5	Reed 1997b
5RB2958	Beta-35119	**1200 ± 80**	AD 665 - AD 1011	AD 872	1112	Baker 1995
5MF2726	Beta-75343	**1200 ± 80**	AD 665 - AD 1011	AD 872	1112	Tickner and Chandler 1994
5GF134	DIC-	**1210 ± 430**	BC 50 - AD 1621	AD 840	1164.5	Conner and Langdon 1987

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GF110	DIC 1663	**1210 ± 50**	AD 683 - AD 968	AD 840	1124.5	Gooding and Shields 1985
5RB699	Uga-3385	**1220 ± 65**	AD 667 - AD 979	AD 789	1127	Creasman 1981; LaPoint et al. 1981
5ME4645	Beta-7932	**1220 ± 60**	AD 670 - AD 974	AD 789	1128	Conner and Davenport 1996
5RB2921	Beta-35113	**1220 ± 60**	AD 670 - AD 974	AD 789	1128	Baker 1992b
5MF2539	Beta-32347	**1220 ± 50**	AD 679 - AD 962	AD 789	1129.5	Kalasz et al. 1990
5RB699	Uga-1920	**1225 ± 85**	AD 655 - AD 1002	AD 788	1121.5	Creasman 1981; LaPoint et al. 1981
5ME213	Beta-099936	**1230 ± 40**	AD 683 - AD 891	AD 786	1163	Reed 1997b
5EA799	Beta-23787	**1230 ± 60**	AD 667 - AD 968	AD 786	1132.5	Metcalf and Black 1991
5MF435	Uga-2735	**1240 ± 70**	AD 659 - AD 974	AD 782	1133.5	Arthur et al. 1981
5GA22	I-6482	**1240 ± 90**	AD 645 - AD 998	AD 782	1128.5	Benedict 1985
5GF134	Beta-	**1250 ± 90**	AD 640 - AD 990	AD 779	1135	Conner and Langdon 1987
5RB1463	Beta-13041	**1250 ± 60**	AD 662 - AD 956	AD 779	1141	Conner and Langdon 1989
5OR198	Beta-2455	**1250 ± 70**	AD 656 - AD 968	AD 779	1138	Buckles et al. 1986
5RB2829	Beta-33786	**1250 ± 110**	AD 609 - AD 1014	AD 779	1138.5	Hauck 1993
5MF2725	Beta-75342	**1250 ± 70**	AD 656 - AD 968	AD 779	1138	Tickner and Chandler 1994
5RB3288	Beta-60058	**1260 ± 100**	AD 600 - AD 990	AD 795	1155	Baker 1997
5MF1	RL-11	**1260 ± 150**	AD 538 - AD 1037	AD 776	1162.5	Truesdale 1993b
5GA55	Beta-39155	**1265 ± 60**	AD 657 - AD 892	AD 774	1175.5	Cassells 1995
5RB2958	Beta-38476	**1270 ± 80**	AD 639 - AD 968	AD 732	1146.5	Baker 1995
5GF134	Beta-	**1270 ± 80**	AD 639 - AD 968	AD 732	1146.5	Conner and Langdon 1987
5GF1341	Beta-13512	**1280 ± 70**	AD 645 - AD 944	AD 739	1155.5	Rhodes 1986
5RB699	Uga-3380	**1280 ± 70**	AD 645 - AD 944	AD 739	1155.5	Creasman 1981; LaPoint et al. 1981
5DT2	Beta-12980	**1280 ± 70**	AD 645 - AD 944	AD 739	1155.5	Buckles 1971
5RB3657	Beta-79383	**1280 ± 60**	AD 653 - AD 889	AD 739	1179	Hauck 1994, 1997
5RB690	Uga-2166	**1285 ± 200**	AD 393 - AD 1170	AD 743	1168.5	Kranzush 1979
5RB3657	Beta-79832	**1290 ± 60**	AD 650 - AD 886	AD 746	1182	Hauck 1994, 1997
5RB3499	Beta-56588	**1290 ± 50**	AD 656 - AD 881	AD 746	1181.5	Hauck 1993
5MF2277	Beta-13489	**1290 ± 70**	AD 639 - AD 891	AD 746	1185	Hoefer 1985

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RB726	W-4249	**1300 ± 50**	AD 653 - AD 874	AD 690	1186.5	Creasman 1981
5MF2645	Beta-28935	**1300 ± 70**	AD 633 - AD 889	AD 690	1189	Truesdale 1989; 1993a
5RB3499	Beta-56591	**1300 ± 50**	AD 653 - AD 874	AD 690	1186.5	Hauck 1993
5DT2	Beta-13995	**1300 ± 70**	AD 633 - AD 889	AD 690	1189	Buckles 1971
5MF476	Uga-2951	**1310 ± 60**	AD 639 - AD 881	AD 685	1190	O'Neil 1980
5GF134	Beta-	**1320 ± 70**	AD 616 - AD 884	AD 680	1200	Conner and Langdon 1987
5GA55	Beta-39156	**1325 ± 60**	AD 630 - AD 868	AD 678	1201	Cassells 1995
5RB2792	Beta-60599	**1330 ± 70**	AD 615 - AD 875	AD 745	1205	Baker 1998a
5ST85	WSU-1759	**1330 ± 90**	AD 608 - AD 881	AD 676	1205.5	Gooding 1981
5MF436	Uga-2740	**1330 ± 80**	AD 599 - AD 886	AD 676	1207.5	Arthur et al. 1981
5ST85	TX-2653	**1330 ± 70**	AD 561 - AD 891	AD 676	1224	Gooding 1981
5RB3643	Beta-76195	**1330 ± 50**	AD 639 - AD 786	AD 676	1237.5	Hauck 1997
5RB804	Uga-3379	**1350 ± 60**	AD 608 - AD 786	AD 668	1253	LaPoint et al. 1981
5ST85	TX-2651	**1350 ± 580**	BC 763 - AD 1950	AD 668	1356.5	Gooding 1981
5GF128	DIC-	**1360 ± 50**	AD 615 - AD 776	AD 665	1254.5	Conner and Langdon 1987
5ST85	TX-2655	**1360 ± 70**	AD 594 - AD 790	AD 665	1258	Gooding 1981
5GA55	Beta-50908	**1365 ± 65**	AD 596 - AD 785	AD 664	1259.5	Cassells 1995
5MF436	Uga-2742	**1370 ± 65**	AD 570 - AD 783	AD 662	1273.5	Arthur et al. 1981
5RB3290	Beta-60057	**1370 ± 90**	AD 530 - AD 860	AD 695	1255	Baker 1997
5GN2478	Beta-85139	**1370 ± 70**	AD 560 - AD 786	AD 662	1277	Rood 1998
5RB707	Uga-1924	**1375 ± 60**	AD 596 - AD 778	AD 661	1263	Creasman 1977
5RB3498	Beta-56592	**1380 ± 80**	AD 544 - AD 790	AD 660	1283	Hauck 1993
5RB2828	Beta-34175	**1380 ± 140**	AD 411 - AD 973	AD 660	1258	Hauck 1993
5ME4519	Beta-8092	**1380 ± 200**	AD 248 - AD 1028	AD 660	1312	GRI 1983
5ME4769	Beta-12836	**1390 ± 50**	AD 598 - AD 757	AD 657	1272.5	GRI 1985
5GA22	I-5451	**1400 ± 95**	AD 444 - AD 861	AD 654	1297.5	Benedict 1985
5RB2764	Beta-37374	**1400 ± 80**	AD 537 - AD 783	AD 654	1290	Zier and Jepson 1991
5RB2958	Beta-38475	**1400 ± 70**	AD 544 - AD 776	AD 654	1290	Baker 1995

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GA22	I-14900	**1410 ± 80**	AD 534 - AD 779	AD 651	1293.5	Benedict 1985
5MF2639	Beta-28934	**1410 ± 80**	AD 534 - AD 779	AD 651	1293.5	Truesdale 1989
5RB363	Uga-1497	**1410 ± 140**	AD 389 - AD 956	AD 651	1277.5	Creasman et al. 1977; Creasman 1981
5RB2958	Beta-38477	**1420 ± 50**	AD 550 - AD 682	AD 646	1334	Baker 1995
5ME4645	Beta-7929	**1420 ± 80**	AD 452 - AD 776	AD 646	1336	Conner and Davenport 1996
5MF435	Uga-2727	**1425 ± 60**	AD 542 - AD 689	AD 644	1334.5	Arthur et al. 1981
5MF660	Uga-2975	**1440 ± 95**	AD 423 - AD 779	AD 635	1349	Kainer and Treat 1979
5ME6378	Beta-37842	**1450 ± 80**	AD 431 - AD 756	AD 628	1356.5	Piontkowski 1990b
5GA700	Uga-4500	**1450 ± 295**	BC 36 - AD 1214	AD 628	1361	Kranzush et al. 1982
5RB715	Uga-1923	**1450 ± 60**	AD 534 - AD 677	AD 628	1344.5	Creasman 1977
5GA151	Beta-3774	**1450 ± 60**	AD 534 - AD 677	AD 628	1344.5	Wheeler and Martin 1982, 1984
5RB3657	Beta-68678	**1470 ± 80**	AD 422 - AD 686	AD 610	1396	Hauck 1994, 1997
5Rb699	Uga-3387	**1470 ± 70**	AD 430 - AD 677	AD 610	1396.5	Creasman 1981; LaPoint et al. 1981
5RB234	Beta-75956	**1470 ± 80**	AD 422 - AD 686	AD 610	1396	Crum 1991; Painter 1994
5GF128	Beta-	**1480 ± 60**	AD 437 - AD 666	AD 605	1398.5	Conner and Langdon 1987
5DL775	Beta-8393	**1480 ± 50**	AD 449 - AD 661	AD 605	1395	King and Bradley 1985
5RB2958	Beta-35117	**1480 ± 60**	AD 437 - AD 666	AD 605	1398.5	Baker 1995
5ME4959	Beta-14321	**1490 ± 50**	AD 443 - AD 658	AD 600	1399.5	Nickens and Assoc. 1986
5EA484	RL-1588	**1490 ± 120**	AD 267 - AD 779	AD 600	1427	Reed 1982
5ME4957	Beta-14313	**1490 ± 80**	AD 415 - AD 677	AD 600	1404	Nickens and Assoc. 1986
5MF2645	Beta-27679	**1500 ± 70**	AD 418 - AD 666	AD 596	1408	Truesdale 1989; 1993a
5ME4959	Beta-14316	**1500 ± 70**	AD 418 - AD 666	AD 596	1408	Nickens and Assoc. 1986
5RB2764	Beta-37376	**1510 ± 80**	AD 403 - AD 669	AD 586	1414	Zier and Jepson 1991
5MN1365	Uga-3317	**1515 ± 85**	AD 392 - AD 670	AD 558	1419	Horvath 1980
5GA22	I-6481	**1515 ± 90**	AD 384 - AD 675	AD 558	1420.5	Benedict 1985
5SM790	RL-1830	**1520 ± 120**	AD 256 - AD 767	AD 553	1438.5	Scott and Nickens 1984
5RB3042	Beta-78593	**1530 ± 60**	AD 414 - AD 652	AD 548	1417	Fetterman and Honeycutt 1995
5GN1835	Beta-66833	**1530 ± 90**	AD 346 - AD 669	AD 548	1442.5	Stiger 1993, 1997

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5ME217	DIC 974	**1540 ± 55**	AD 414 - AD 642	AD 544	1422	Lutz 1978
5RB2449	Beta-7450	**1540 ± 60**	AD 410 - AD 648	AD 544	1421	Babcock 1984
5MF436	Uga-2747	**1545 ± 65**	AD 399 - AD 650	AD 543	1425.5	Arthur et al. 1981
5RB2921	Beta-35114	**1550 ± 70**	AD 388 - AD 652	AD 541	1430	Baker 1992b
5GA151	Beta-4949	**1555 ± 200**	AD 69 - AD 890	AD 540	1470.5	Wheeler and Martin 1982, 1984
5RB234	Beta-75955	**1560 ± 70**	AD 380 - AD 648	AD 538	1436	Crum 1991; Painter 1994
5ME4959	Beta-14320	**1560 ± 80**	AD 339 - AD 654	AD 538	1453.5	Nickens and Assoc. 1986
5GA151	Beta-3419	**1560 ± 70**	AD 380 - AD 648	AD 538	1436	Wheeler and Martin 1982, 1984
5RB2926	Beta-35115	**1560 ± 120**	AD 239 - AD 681	AD 538	1490	Baker 1993
5MF1791	Beta-10050	**1570 ± 80**	AD 267 - AD 652	AD 535	1490.5	Tanner and Creasman 1986
5RB123	Uga-1045	**1575 ± 135**	AD 148 - AD 688	AD 533	1532	Zier and Jepson 1991
5ME213	Beta-099937	**1580 ± 30**	AD 417 - AD 559	AD 494	1462	Reed 1997b
5RB1460	Uga-	**1590 ± 710**	BC 1259 - AD 1950	AD 445	1604.5	Knox and Gordon 1980; Knox 1981
5ME217	DIC 972	**1590 ± 50**	AD 387 - AD 602	AD 445	1455.5	Lutz 1978
5ME1203	Beta-6017	**1590 ± 110**	AD 234 - AD 663	AD 445	1501.5	Martin 1982; Crum 1983
5GF128	Beta-	**1610 ± 60**	AD 267 - AD 602	AD 432	1515.5	Conner and Langdon 1987
5ME213	Beta-099938	**1610 ± 30**	AD 401 - AD 543	AD 432	1478	Reed 1997b
5RB234	Beta-39163	**1610 ± 50**	AD 344 - AD 593	AD 432	1481.5	Crum 1991; Painter 1994
5EA128	DIC 1256	**1610 ± 55**	AD 338 - AD 597	AD 432	1482.5	Hand and Gooding 1980; Emslie 1980; Rowen 1980; Wheeler 1980
5RB123	Uga-1046	**1620 ± 195**	AD 5 - AD 786	AD 427	1554.5	Zier and Jepson 1991
5RB2982	Beta-35121	**1620 ± 100**	AD 229 - AD 647	AD 427	1512	Baker 1993
5RB3498	Beta-56593	**1630 ± 90**	AD 234 - AD 630	AD 423	1518	Hauck 1993
5ME1057	Beta-36037	**1640 ± 70**	AD 248 - AD 597	AD 419	1527.5	Greubel 1991
5RB3657	Beta-80407	**1640 ± 50**	AD 263 - AD 545	AD 419	1546	Hauck 1994, 1997
5RB726	Uga-2420	**1645 ± 65**	AD 250 - AD 561	AD 417	1544.5	Creasman 1981
5DL896	Beta-22769	**1650 ± 90**	AD 221 - AD 611	AD 415	1534	Reed and McDonald 1988
5RB699	Uga-3383	**1650 ± 60**	AD 252 - AD 546	AD 415	1551	Creasman 1981; LaPoint et al. 1981
5GF122	DIC	**1660 ± 75**	AD 234 - AD 592	AD 412	1537	Conner and Langdon 1987

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5ME431	Beta-8501	**1680 ± 120**	AD 83 - AD 635	AD 397	1591	Tickner 1997; Hartley 1984
5OR243	Beta-2456	**1680 ± 60**	AD 238 - AD 539	AD 397	1561.5	Buckles et al. 1986
5ME4959	Beta-14322	**1680 ± 110**	AD 119 - AD 620	AD 397	1580.5	Nickens and Assoc. 1986
5RB3653	Beta-68676	**1690 ± 70**	AD 220 - AD 542	AD 389	1569	Hauck 1994
5ME217	DIC 973	**1690 ± 55**	AD 238 - AD 532	AD 389	1565	Lutz 1978
5RB3657	Beta-79385	**1690 ± 50**	AD 243 - AD 448	AD 389	1604.5	Hauck 1994, 1997
5MF2544	Beta-32356	**1700 ± 60**	AD 228 - AD 532	AD 382	1570	Kalasz et al. 1990
5RB3042	Beta-78594	**1710 ± 60**	AD 220 - AD 447	AD 360	1616.5	Fetterman and Honeycutt 1995
5RB2829	Beta-34174	**1710 ± 110**	AD 79 - AD 601	AD 360	1610	Hauck 1993
5RB3042	Beta-78595	**1710 ± 60**	AD 220 - AD 447	AD 360	1616.5	Fetterman and Honeycutt 1995
5RT11	DIC 1390	**1730 ± 225**	BC 196 - AD 766	AD 274	1665	O'Neil 1980
5OR198	Beta-2641	**1730 ± 50**	AD 220 - AD 425	AD 274	1627.5	Buckles et al. 1986
5ST85	WSU-1748	**1730 ± 100**	AD 79 - AD 548	AD 274	1636.5	Gooding 1981
5RB699	W-4248	**1740 ± 50**	AD 150 - AD 421	AD 281	1664.5	Creasman 1981; LaPoint et al. 1981
5MF1900	Beta-10833	**1740 ± 150**	BC 36 - AD 635	AD 281	1650.5	Gleichman and Spears 1985
5GN1835	Beta-85702	**1750 ± 70**	AD 124 - AD 434	AD 289	1671	Stiger 1993, 1997
5GA22	I-12391	**1750 ± 80**	AD 87 - AD 447	AD 289	1683	Benedict 1985
5RB726	Uga-2424	**1760 ± 275**	BC 389 - AD 860	AD 296	1714.5	Creasman 1981
5RB2764	Beta-37375	**1760 ± 90**	AD 75 - AD 532	AD 296	1646.5	Zier and Jepson 1991
5ME4959	Beta-14317	**1770 ± 60**	AD 123 - AD 417	AD 304	1680	Nickens and Assoc. 1986
5GN42	Beta-3279	**1770 ± 50**	AD 134 - AD 408	AD 304	1679	Jones 1986a
5RB715	Uga-1921	**1775 ± 65**	AD 89 - AD 419	AD 308	1696	Creasman 1977
5GN1835	Beta-97569	**1780 ± 80**	AD 75 - AD 428	AD 249	1698.5	Stiger 1993, 1997
5DL896	Beta-22770	**1780 ± 85**	AD 71 - AD 433	AD 249	1698	Reed and McDonald 1988
5DL896	Beta-22772	**1780 ± 80**	AD 75 - AD 428	AD 249	1698.5	Reed and McDonald 1988
5RB2792	Beta-60598	**1790 ± 100**	AD 25 - AD 450	AD 238	1712	Baker 1998a
5MF1827		**1800 ± 60**	AD 83 - AD 399	AD 239	1709	Conner and Langdon 1986
5EA484	RL-1590	**1800 ± 120**	BC 36 - AD 538	AD 239	1699	Reed 1982

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GF127	DIC-	**1800 ± 80**	AD 65 - AD 420	AD 239	1707.5	Conner and Langdon 1987
5RB3657	Beta-79384	**1820 ± 50**	AD 83 - AD 343	AD 230	1737	Hauck 1994, 1997
5GN1835	Beta-77626	**1820 ± 40**	AD 117 - AD 331	AD 230	1726	Stiger 1993, 1997
5ST85	WSU-1753	**1820 ± 100**	BC 2 - AD 428	AD 230	1737	Gooding 1981
5RB704	Uga-1922	**1825 ± 100**	BC 6 - AD 426	AD 226	1740	Creasman 1977
5RB699	Uga-3384	**1825 ± 60**	AD 73 - AD 379	AD 226	1724	Creasman 1981; LaPoint et al. 1981
5OR179	Beta-2637	**1840 ± 50**	AD 75 - AD 331	AD 215	1747	Buckles et al. 1986
5RB699	Uga-2425	**1845 ± 90**	BC 6 - AD 410	AD 157	1748	Creasman 1981; LaPoint et al. 1981
5RB2829	Beta-42347	**1850 ± 60**	AD 58 - AD 336	AD 190	1753	Hauck 1993
5ST85	WSU1762	**1860 ± 90**	BC 36 - AD 399	AD 141	1768.5	Gooding 1981
5OR182	Beta-2151	**1860 ± 90**	BC 36 - AD 399	AD 141	1768.5	Buckles et al. 1986
5ME4959	Beta-14323	**1860 ± 80**	AD 25 - AD 330	AD 141	1772.5	Nickens and Assoc. 1986
5ME4959	Beta-14315	**1860 ± 60**	BC 2 - AD 383	AD 141	1759.5	Nickens and Assoc. 1986
5OR182	Beta-2639	**1870 ± 70**	AD 4 - AD 336	AD 135	1780	Buckles et al. 1986
5GN1835	Beta-66834	**1870 ± 60**	AD 18 - AD 325	AD 135	1778.5	Stiger 1993, 1997
5RB363	Uga-1495	**1875 ± 75**	BC 6 - AD 339	AD 132	1783.5	Creasman et al. 1977; Creasman 1981
5RB699	Uga-3382	**1895 ± 70**	BC 34 - AD 323	AD 122	1805.5	Creasman 1981; LaPoint et al. 1981
5ME1057	Beta-36033	**1900 ± 110**	BC 158 - AD 398	AD 120	1830	Greubel 1991
5RB3042	Beta-78592	**1900 ± 50**	AD 11 - AD 240	AD 120	1824.5	Fetterman and Honeycutt 1995
5RB3339	Beta-54579	**1900 ± 60**	BC 3 - AD 311	AD 120	1796	Baker 1992c
5ME431	Beta-8500	**1910 ± 100**	BC 115 - AD 375	AD 98	1820	Tickner 1997; Hartley 1984
5OR182	Beta-2640	**1910 ± 90**	BC 91 - AD 336	AD 98	1827.5	Buckles et al. 1986
5GA22	I-12390	**1930 ± 80**	BC 91 - AD 315	AD 80	1838	Benedict 1985
5ST114	Uga-4164	**1930 ± 315**	BC 785 - AD 690	AD 80	1997.5	Arthur 1981
5DT271	Beta-18840	**1940 ± 410**	BC 902 - AD 961	AD 76	1920.5	Baker 1991
5ST161	Beta-3019	**1940 ± 90**	BC 158 - AD 320	AD 76	1869	Black 1982a
5GN1835	Beta-66829	**1950 ± 90**	BC 166 - AD 315	AD 72	1875.5	Stiger 1993, 1997
5RB2212	Beta-	**1950 ± 70**	BC 92 - AD 236	AD 72	1878	Crum and Wignall 1981

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5MF435	Uga-2726	**1955 ± 60**	BC 55 - AD 221	AD 69	1867	Arthur et al. 1981
5ME4959	Beta-14318	**1970 ± 70**	BC 115 - AD 224	AD 59	1895.5	Nickens and Assoc. 1986
5RB2686	Beta-12969	**1970 ± 160**	BC 381 - AD 416	AD 59	1932.5	Tucker 1986
5RB3653	Beta-68677	**1970 ± 80**	BC 166 - AD 235	AD 59	1915.5	Hauck 1994
5MN519	Beta-36438	**1980 ± 70**	BC 158 - AD 216	AD 42	1921	Stiger and Larson 1992
5OR243	Beta-2643	**2000 ± 50**	BC 103 - AD 121	AD 12	1941	Buckles et al. 1986
5RB1463	Beta-13042	**2000 ± 60**	BC 158 - AD 130	AD 12	1964	Conner and Langdon 1989
5GN1664	Beta-8116	**2000 ± 60**	BC 158 - AD 130	AD 12	1964	Rossillian 1984
5OR179	Beta-1968	**2010 ± 100**	BC 348 - AD 235	AD 5	2006.5	Buckles et al. 1986
5OR182	Beta-2638	**2030 ± 80**	BC 199 - AD 136	BC 17	1981.5	Buckles et al. 1986
5ME1057	Beta-36039	**2030 ± 65**	BC 190 - AD 121	BC 17	1984.5	Greubel 1991
5DL896	Beta-22767	**2030 ± 90**	BC 348 - AD 200	BC 17	2024	Reed and McDonald 1988
5RB1872	Dic-2263	**2040 ± 75**	BC 199 - AD 125	BC 35	1987	Babcock and Scott 1982
5MF435	Uga-3736	**2045 ± 60**	BC 192 - AD 82	BC 37	2005	Arthur et al. 1981
5GF110	DIC 1661	**2050 ± 65**	BC 196 - AD 111	BC 39	1992.5	Gooding and Shields 1985
5ME4645	Beta-7930	**2050 ± 110**	BC 373 - AD 223	BC 39	2025	Conner and Davenport 1996
5GN2478	Beta-85140	**2050 ± 60**	BC 193 - AD 80	BC 39	2006.5	Rood 1998
5OR243	Beta-1970	**2060 ± 60**	BC 196 - AD 76	BC 44	2010	Buckles et al. 1986
5ME1057	Beta-36032	**2060 ± 130**	BC 392 - AD 240	BC 44	2026	Greubel 1991
5MF3048	Beta-58790	**2080 ± 70**	BC 353 - AD 76	BC 139	2088.5	O'Brien and McDonald 1998
5ST85	TX-2654	**2100 ± 60**	BC 385 - AD 120	BC 101	2082.5	Gooding 1981
5GF110	DIC 1798	**2100 ± 55**	BC 349 - AD 20	BC 101	2114.5	Gooding and Shields 1985
5ST85	WSU-1758	**2100 ± 100**	BC 354 - AD 54	BC 101	2100	Gooding 1981
5MN40	Isotope 820	**2100 ± 200**	BC 761 - AD 382	BC 101	2139.5	Buckles 1971
5EA128	DIC 1257	**2100 ± 60**	BC 354 - AD 54	BC 101	2100	Hand and Gooding 1980; Emslie 1980; Rowen 1980; Wheeler 1980
5ME3972	Beta-12932	**2110 ± 100**	BC 389 - AD 115	BC 113	2087	Hartley 1985
5ME1373	Beta-12614	**2110 ± 80**	BC 373 - AD 72	BC 113	2100.5	Horn et al. 1987
5MF435	Uga-2731	**2110 ± 60**	BC 357 - AD 20	BC 113	2118.5	Arthur et al. 1981

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5ST85	TX-2656	**2110 ± 130**	BC 401 - AD 197	BC 113	2052	Gooding 1981
5ST85	Uga-1145	**2120 ± 60**	BC 361 - AD 13	BC 136	2124	Gooding 1981
5MF1818		**2130 ± 60**	BC 365 - AD 6	BC 164	2129.5	Conner and Langdon 1986
5GN1664	Beta-8115	**2130 ± 80**	BC 381 - AD 60	BC 164	2110.5	Rossillian 1984
5GN247	TX-3626	**2140 ± 130**	BC 407 - AD 130	BC 172	2088.5	Stiger 1981; Jones 1986a, 1986b
5ST85	DIC 873	**2150 ± 60**	BC 373 - BC 8	BC 180	2140.5	Gooding 1981
5GA217	Beta-7204	**2150 ± 90**	BC 394 - AD 60	BC 180	2117	Liestman 1984
5ME4957	Beta-14312	**2170 ± 100**	BC 401 - AD 60	BC 192	2120.5	Nickens and Assoc. 1986
5MF435	Uga-2725	**2175 ± 95**	BC 400 - AD 23	BC 193	2138.5	Arthur et al. 1981
5GN207	Beta-2103	**2200 ± 100**	BC 801 - BC 201	BC 323	2451	Jones 1982
5GN207	Beta-2102	**2200 ± 210**	BC 407 - AD 13	BC 323	2147	Jones 1982
5ME1203	Beta-6019	**2210 ± 90**	BC 405 - BC 8	BC 315	2156.5	Martin 1982; Crum 1983
5RB1463	Beta-13039	**2220 ± 90**	BC 407 - BC 36	BC 303	2171.5	Conner and Langdon 1989
5ST85	TX-2652	**2220 ± 70**	BC 399 - BC 57	BC 303	2178	Gooding 1981
5OR243	Beta-2644	**2220 ± 80**	BC 403 - BC 45	BC 303	2174	Buckles et al. 1986
5MF1827		**2230 ± 60**	BC 398 - BC 112	BC 287	2205	Conner and Langdon 1986
5ME217	DIC 971	**2250 ± 75**	BC 407 - BC 100	BC 274	2203.5	Lutz 1978
5MF2544	Beta-32352	**2250 ± 70**	BC 405 - BC 112	BC 274	2208.5	Kalasz et al. 1990
5RB699	Uga-3386	**2255 ± 55**	BC 401 - BC 176	BC 271	2238.5	Creasman 1981; LaPoint et al. 1981
5ST85	TX-2650	**2260 ± 80**	BC 414 - BC 100	BC 367	2207	Gooding 1981
5ME213	Beta-099939	**2260 ± 40**	BC 395 - BC 194	BC 367	2244.5	Reed 1997b
5ME4645	Beta-7931	**2270 ± 70**	BC 409 - BC 164	BC 371	2236.5	Conner and Davenport 1996
5MN43	Beta-13054	**2280 ± 80**	BC 512 - BC 124	BC 376	2268	Buckles 1971
5DL896	Beta-22768	**2290 ± 95**	BC 756 - BC 101	BC 380	2378.5	Reed and McDonald 1988
5OR179	Beta-2635	**2300 ± 100**	BC 761 - BC 101	BC 384	2381	Buckles et al. 1986
5MN3760	Beta-45803	**2300 ± 80**	BC 751 - BC 172	BC 384	2411.5	Conner and Hutchins 1992
5OR167	Beta-2454	**2320 ± 90**	BC 761 - BC 172	BC 390	2416.5	Buckles et al. 1986
5ME1373	Beta-12624	**2330 ± 400**	BC 1405 - AD 1808	BC 392	1748.5	Horn et al. 1987

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5MF2649	Beta-27983	**2340 ± 100**	BC 773 - BC 172	BC 394	2422.5	Truesdale 1989
5GN289	Beta-11187	**2350 ± 120**	BC 795 - BC 113	BC 396	2404	Black 1986
5MF435	Uga-2738	**2362 ± 75**	BC 764 - BC 205	BC 399	2434.5	Arthur et al. 1981
5GF128	Beta-	**2400 ± 60**	BC 766 - BC 376	BC 406	2521	Conner and Langdon 1987
5GA217	Beta-7203	**2410 ± 540**	BC 1859 - AD 676	BC 408	2541.5	Liestman 1984
5GA217	Beta-7207	**2410 ± 90**	BC 795 - BC 244	BC 408	2469.5	Liestman 1984
5GF110	DIC 1660	**2410 ± 70**	BC 780 - BC 372	BC 408	2526	Gooding and Shields 1985
5MF3006	Beta-59395	**2420 ± 100**	BC 801 - BC 207	BC 504	2454	Graham 1998
5RB1872	Dic-2262	**2430 ± 55**	BC 774 - BC 391	BC 449	2532.5	Babcock and Scott 1982
5MF3048	Beta-58788	**2430 ± 60**	BC 780 - BC 388	BC 584	2534	O'Brien and McDonald 1998
5RB3657	Beta-78019	**2440 ± 60**	BC 1786 - BC 391	BC 434	3038.5	Hauck 1994, 1997
5ME82	RL-1222	**2440 ± 120**	BC 819 - BC 201	BC 434	2460	Reed and Nickens 1980
5RB3651	Beta-68675	**2460 ± 70**	BC 797 - BC 391	BC 745	2544	Hauck 1997
5GF126	Beta-	**2500 ± 50**	BC 796 - BC 405	BC 631	2550.5	Conner and Langdon 1987
5ME82	RL-1218	**2510 ± 120**	BC 898 - BC 372	BC 709	2585	Reed and Nickens 1980
5GN1835	Beta-85708	**2520 ± 80**	BC 819 - BC 399	BC 764	2559	Stiger 1993, 1997
5ME4769	Beta-12835	**2520 ± 70**	BC 810 - BC 403	BC 764	2556.5	GRI 1985
5MF2998	Beta-58775	**2520 ± 70**	BC 810 - BC 403	BC 607	2556.5	O'Brien and McDonald 1998
5GF129	Beta-	**2530 ± 70**	BC 815 - BC 405	BC 767	2560	Conner and Langdon 1987
5EA484	RL-1589	**2530 ± 120**	BC 907 - BC 380	BC 767	2593.5	Reed 1982
5RB2984	Beta-35122	**2570 ± 70**	BC 833 - BC 419	BC 789	2576	Baker 1990
5ME431	Beta-98529	**2570 ± 80**	BC 844 - BC 409	BC 789	2576.5	Tickner 1997; Hartley 1984
5RB363	Uga-1496	**2570 ± 80**	BC 844 - BC 409	BC 789	2576.5	Creasman et al. 1977; Creasman 1981
5GF126	Beta-	**2590 ± 70**	BC 844 - BC 518	BC 794	2631	Conner and Langdon 1987
5GN289	Beta-14919	**2650 ± 180**	BC 1259 - BC 380	BC 806	2769.5	Black 1986
5RB2448	Beta-7448	**2660 ± 90**	BC 994 - BC 539	BC 809	2716.5	Babcock 1984
5ME635	RL-1132	**2660 ± 130**	BC 1117 - BC 407	BC 809	2712	Alexander and Martin 1980
5GN210	Beta-2106	**2660 ± 80**	BC 977 - BC 558	BC 809	2717.5	Jones 1982

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5MN3760	Beta-49464	**2670 ± 70**	BC 929 - BC 767	BC 813	2798	Conner and Hutchins 1992
5GN247	Beta-3286	**2690 ± 80**	BC 1000 - BC 767	BC 821	2833.5	Stiger 1981; Jones 1986a, 1986b
5ME635	RL-1130	**2690 ± 120**	BC 1121 - BC 518	BC 821	2769.5	Alexander and Martin 1980
5MN40	Isotope 821	**2695 ± 180**	BC 1311 - BC 394	BC 824	2802.5	Buckles 1971
5ST85	WSU-1761	**2700 ± 105**	BC 1113 - BC 546	BC 826	2779.5	Gooding 1981
5MN2341	Beta-25625	**2730 ± 200**	BC 1405 - BC 393	BC 842	2849	Tucker and CAS 1989
5ST85	DIC 874	**2740 ± 95**	BC 1121 - BC 777	BC 881	2899	Gooding 1981
5MF2995	Beta-58881	**2760 ± 90**	BC 1126 - BC 792	BC 959	2909	Spath and Pool 1998
5GF126	Beta-	**2770 ± 60**	BC 1036 - BC 807	BC 905	2871.5	Conner and Langdon 1987
5ST85	WSU-1757	**2770 ± 100**	BC 1198 - BC 790	BC 905	2944	Gooding 1981
5ST85	Uga-1143	**2775 ± 70**	BC 1115 - BC 804	BC 907	2909.5	Gooding 1981
5GA151	Beta-4947	**2780 ± 220**	BC 1505 - BC 395	BC 910	2900	Wheeler and Martin 1982, 1984
5MF1818		**2820 ± 70**	BC 1160 - BC 817	BC 964	2938.5	Conner and Langdon 1986
5OR243	Beta-2642	**2830 ± 60**	BC 1154 - BC 830	BC 955	2942	Buckles et al. 1986
5RT345	Beta-69753	**2830 ± 60**	BC 1154 - BC 830	BC 955	2942	Pool 1997
5ST85	WSU-1756	**2850 ± 100**	BC 1308 - BC 807	BC 998	3007.5	Gooding 1981
5ST85	TX-2648	**2860 ± 80**	BC 1263 - BC 826	BC 1003	2994.5	Gooding 1981
5EA809	Beta-20743	**2890 ± 60**	BC 1260 - BC 905	BC 1033	3032.5	Rood 1986
5GF126	Beta-	**2900 ± 60**	BC 1263 - BC 909	BC 1044	3036	Conner and Langdon 1987
5EA128	DIC 1195	**2910 ± 55**	BC 1263 - BC 920	BC 1100	3041.5	Hand and Gooding 1980; Emslie 1980; Rowen 1980; Wheeler 1980
5GN2460	Beta-74317	**2920 ± 70**	BC 1371 - BC 910	BC 1115	3090.5	Jones 1995
5GA217	Beta-6881	**2920 ± 50**	BC 1262 - BC 931	BC 1115	3046.5	Liestman 1984
5GN247	Beta-3281	**2950 ± 90**	BC 1406 - BC 905	BC 1148	3105.5	Stiger 1981; Jones 1986a, 1986b
5GA186	Beta-76592	**2950 ± 60**	BC 1377 - BC 941	BC 1148	3109	Frison and Kornfield 1995
5ME635	RL-1131	**2970 ± 220**	BC 1731 - BC 768	BC 1164	3199.5	Alexander and Martin 1980
5GN247	Beta-5562	**3010 ± 70**	BC 1416 - BC 1009	BC 1231	3162.5	Stiger 1981; Jones 1986a, 1986b
5MF2998	Beta-58778	**3020 ± 70**	BC 1420 - BC 1020	BC 1220	3170	O'Brien and McDonald 1998
5RB2685	Beta-12967	**3030 ± 75**	BC 1430 - BC 1020	BC 1264	3175	Tucker 1986

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5ME1057	Beta-36035	**3030 ± 80**	BC 1437 - BC 1009	BC 1264	3173	Greubel 1991
5RB312	Beta-96078	**3060 ± 70**	BC 1444 - BC 1115	BC 1311	3229.5	Hauck 1997
5RB2448	Beta-7447	**3090 ± 120**	BC 1613 - BC 998	BC 1336	3255.5	Babcock 1984
5OR167	Beta-2000	**3095 ± 130**	BC 1629 - BC 947	BC 1333	3238	Buckles et al. 1986
5GN247	Beta-3285	**3130 ± 190**	BC 1873 - BC 867	BC 1404	3320	Stiger 1981; Jones 1986a, 1986b
5GN212	Beta-2098	**3140 ± 80**	BC 1591 - BC 1170	BC 1409	3330.5	Stiger 1981; Jones 1982
5MF2998	Beta-75926	**3140 ± 70**	BC 1523 - BC 1219	BC 1371	3321	O'Brien and McDonald 1998
5RB2685	Beta-12968	**3140 ± 130**	BC 1683 - BC 1021	BC 1409	3302	Tucker 1986
5GA151	Beta-5136	**3170 ± 70**	BC 1599 - BC 1264	BC 1423	3381.5	Wheeler and Martin 1982, 1984
5MF2998	Beta-58776	**3180 ± 60**	BC 1591 - BC 1311	BC 1451	3401	O'Brien and McDonald 1998
5OR167	Beta-1999	**3180 ± 100**	BC 1678 - BC 1204	BC 1428	3391	Buckles et al. 1986
5GN2460	Beta-74316	**3200 ± 60**	BC 1607 - BC 1319	BC 1442	3413	Jones 1995
5GN1835	Beta-76619	**3210 ± 80**	BC 1675 - BC 1270	BC 1485	3422.5	Stiger 1993, 1997
5OR167	Beta-1998	**3215 ± 110**	BC 1738 - BC 1216	BC 1480	3427	Buckles et al. 1986
5GA217	Beta-7209	**3230 ± 50**	BC 1613 - BC 1403	BC 1510	3458	Liestman 1984
5GF110	DIC 1698	**3240 ± 75**	BC 1681 - BC 1324	BC 1512	3452.5	Gooding and Shields 1985
5GA151	Beta-5137	**3240 ± 350**	BC 2459 - BC 771	BC 1512	3565	Wheeler and Martin 1982, 1984
5GN2478	Beta-85133	**3260 ± 80**	BC 1734 - BC 1328	BC 1517	3481	Rood 1998
5ME6938	Beta-58010	**3270 ± 90**	BC 1743 - BC 1324	BC 1519	3483.5	Conner 1993
5MF2998	Beta-58779	**3270 ± 70**	BC 1731 - BC 1404	BC 1568	3517.5	O'Brien and McDonald 1998
5MF1124	Beta-58107	**3290 ± 110**	BC 1873 - BC 1316	BC 1524	3544.5	O'Brien 1993
5GN247	Beta-3282	**3300 ± 90**	BC 1851 - BC 1400	BC 1526	3575.5	Stiger 1981; Jones 1986a, 1986b
5MF3610	Beta-58800	**3300 ± 80**	BC 1746 - BC 1409	BC 1578	3527.5	McDonald 1998
5GN2478	Beta-85135	**3320 ± 70**	BC 1746 - BC 1428	BC 1556	3537	Rood 1998
5ME82	RL-1215	**3340 ± 130**	BC 1937 - BC 1320	BC 1618	3578.5	Reed and Nickens 1980
5ML46	RL-1591	**3390 ± 130**	BC 2019 - BC 1405	BC 1679	3662	Reed 1981
5ME1373	Beta-12625	**3400 ± 60**	BC 1876 - BC 1522	BC 1682	3649	Horn et al. 1987
5ST85	Uga-1147	**3420 ± 65**	BC 1885 - BC 1524	BC 1720	3654.5	Gooding 1981

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5MN2341	Beta-26648	**3460 ± 100**	BC 2027 - BC 1517	BC 1744	3722	Tucker and CAS 1989
5GA680	Beta-3359	**3460 ± 90**	BC 2013 - BC 1522	BC 1744	3717.5	Wheeler and Martin 1984
5GN1668	Beta-3274	**3470 ± 80**	BC 1973 - BC 1529	BC 1747	3701	Jones 1986a
5GF110	DIC 1801	**3480 ± 160**	BC 2200 - BC 1419	BC 1757	3759.5	Gooding and Shields 1985
5MF1885	Beta-10832	**3490 ± 90**	BC 2032 - BC 1529	BC 1846	3730.5	Gleichman and Spears 1985
5GN2478	Beta-85134	**3500 ± 60**	BC 1967 - BC 1676	BC 1842	3771.5	Rood 1998
5MF2637	Beta-27678	**3500 ± 70**	BC 2013 - BC 1632	BC 1842	3772.5	Truesdale 1989
5MN2341	Beta-25624	**3510 ± 270**	BC 2572 - BC 1139	BC 1810	3805.5	Tucker and CAS 1989
5GN2478	Beta-85137	**3520 ± 70**	BC 2027 - BC 1676	BC 1817	3801.5	Rood 1998
5GN1835	Beta-85703	**3530 ± 80**	BC 2113 - BC 1673	BC 1824	3843	Stiger 1993, 1997
5GA151	Beta-	**3570 ± 60**	BC 2114 - BC 1742	BC 1891	3878	Wheeler and Martin 1982, 1984
5GN1835	Beta-76618	**3570 ± 60**	BC 2114 - BC 1742	BC 1891	3878	Stiger 1993, 1997
5GN2478	Beta-85138	**3570 ± 70**	BC 2130 - BC 1697	BC 1890	3863.5	Rood 1998
5GN247	Beta-3278	**3590 ± 60**	BC 2130 - BC 1748	BC 1925	3889	Stiger 1981; Jones 1986a, 1986b
5ME1373	Beta-12633	**3590 ± 110**	BC 2273 - BC 1673	BC 1925	3923	Horn et al. 1987
5ME431	Beta-8499	**3620 ± 220**	BC 2577 - BC 1429	BC 1956	3953	Tickner 1997; Hartley 1984
5GF110	DIC 1772	**3620 ± 95**	BC 2273 - BC 1698	BC 1956	3935.5	Gooding and Shields 1985
5GF110	DIC 1799	**3660 ± 80**	BC 2278 - BC 1776	BC 1996	3977	Gooding and Shields 1985
5GA687		**3680 ± 100**	BC 2393 - BC 1755	BC 2034	4024	Martin 1981
5MF428		**3700 ± 550**	BC 3631 - BC 797	BC 2083	4164	Stevens 1981
5MF2998	Beta-58777	**3730 ± 70**	BC 2330 - BC 1922	BC 2126	4076	O'Brien and McDonald 1998
5GN1835	Beta-66840	**3740 ± 80**	BC 2451 - BC 1907	BC 2136	4129	Stiger 1993, 1997
5MF429		**3740 ± 325**	BC 3022 - BC 1324	BC 2136	4123	Stevens 1981
5GA151	Beta-4269	**3750 ± 70**	BC 2398 - BC 1942	BC 2139	4120	Wheeler and Martin 1982, 1984
5GN222	Beta-5564	**3760 ± 210**	BC 2869 - BC 1619	BC 2165	4194	Jones 1986a, 1986b
5MF3007	Beta-67419	**3770 ± 70**	BC 2453 - BC 1971	BC 2212	4162	Graham 1998
5GA151	Beta-4945	**3775 ± 165**	BC 2617 - BC 1741	BC 2156	4129	Wheeler and Martin 1982, 1984
5GF110	DIC 1800	**3780 ± 80**	BC 2460 - BC 1950	BC 2154	4155	Gooding and Shields 1985

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RT90	Beta-28306	**3790 ± 130**	BC 2573 - BC 1789	BC 2196	4131	Hand 1993
5ME1057	Beta-36042	**3800 ± 75**	BC 2462 - BC 1980	BC 2199	4171	Greubel 1991
5GN10	TX-3629	**3810 ± 130**	BC 2582 - BC 1884	BC 2257	4183	Stiger 1981
5ME1057	Beta-36040	**3830 ± 120**	BC 2582 - BC 1924	BC 2280	4203	Greubel 1991
5GA151	Beta-4706	**3840 ± 90**	BC 2558 - BC 1984	BC 2284	4221	Wheeler and Martin 1982, 1984
5ME431	Beta-8502	**3850 ± 70**	BC 2476 - BC 2044	BC 2288	4210	Tickner 1997; Hartley 1984
5GA680	Beta-3566	**3870 ± 100**	BC 2582 - BC 1989	BC 2327	4235.5	Wheeler and Martin 1984
5GA217	Beta-7202	**3920 ± 160**	BC 2882 - BC 1935	BC 2411	4358.5	Liestman 1984
5GN10	TX-3631	**3940 ± 260**	BC 3095 - BC 1689	BC 2458	4342	Stiger 1981
5MN1068	Uga 3727a	**3965 ± 110**	BC 2870 - BC 2138	BC 2464	4454	Indeck and Kihm 1981
5ME1373	Beta-12628	**3980 ± 60**	BC 2616 - BC 2311	BC 2467	4413.5	Horn et al. 1987
5MF1124	Beta-58108	**4020 ± 80**	BC 2869 - BC 2312	BC 2529	4540.5	O'Brien 1993
5RT345	Beta-78994	**4030 ± 70**	BC 2866 - BC 2346	BC 2523	4556	Pool 1997
5ME1373	Beta-12622	**4040 ± 70**	BC 2869 - BC 2361	BC 2518	4565	Horn et al. 1987
5MF2993	Beta-59391	**4060 ± 70**	BC 2874 - BC 2408	BC 2641	4591	Pool 1998
5GN344	GX-7115	**4065 ± 380**	BC 3638 - BC 1528	BC 2578	4533	Black et al. 1981
5GA217	Beta-7206	**4070 ± 170**	BC 3033 - BC 2060	BC 2581	4496.5	Liestman 1984
5GN1835	Beta-76620	**4070 ± 70**	BC 2876 - BC 2457	BC 2581	4616.5	Stiger 1993, 1997
5RT345	Beta-69752	**4080 ± 60**	BC 2874 - BC 2463	BC 2585	4618.5	Pool 1997
5MF2993	Beta-59390	**4110 ± 90**	BC 2899 - BC 2457	BC 2678	4628	Pool 1998
5GN10	TX-3630	**4120 ± 90**	BC 2907 - BC 2459	BC 2654	4633	Stiger 1981
5GN2460	Beta-74315	**4130 ± 70**	BC 2888 - BC 2470	BC 2659	4629	Jones 1995
5GF110	DIC 1803	**4130 ± 125**	BC 3016 - BC 2337	BC 2659	4626.5	Gooding and Shields 1985
5GF110	DIC 1804	**4130 ± 85**	BC 2907 - BC 2463	BC 2659	4635	Gooding and Shields 1985
5MF3187	Beta-58808	**4130 ± 80**	BC 2899 - BC 2466	BC 2683	4632.5	McDonald 1998
5ME82	RL-1213	**4140 ± 150**	BC 3086 - BC 2284	BC 2687	4635	Reed and Nickens 1980
5OR317	Beta-2152	**4145 ± 90**	BC 2915 - BC 2464	BC 2691	4639.5	Buckles et al. 1986
5GN1835	Beta-66830	**4150 ± 150**	BC 3092 - BC 2288	BC 2692	4640	Stiger 1993, 1997

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5MF476	Uga-2949	**4150 ± 115**	BC 3016 - BC 2409	BC 2692	4662.5	O'Neil 1980
5GA151	Beta-3161	**4160 ± 110**	BC 3016 - BC 2459	BC 2740	4687.5	Wheeler and Martin 1982, 1984
5MF476	Uga-2952	**4165 ± 70**	BC 2910 - BC 2498	BC 2747	4654	O'Neil 1980
5GA217	Beta-7205	**4170 ± 110**	BC 3023 - BC 2461	BC 2754	4692	Liestman 1984
5ME1373	Beta-12631	**4170 ± 220**	BC 3360 - BC 2061	BC 2754	4660.5	Horn et al. 1987
5MF476	Uga-2953	**4185 ± 75**	BC 2917 - BC 2502	BC 2772	4659.5	O'Neil 1980
5GN169	Beta-49244	**4190 ± 150**	BC 3292 - BC 2347	BC 2774	4769.5	Jones 1996
5GN247	TX-3620	**4230 ± 410**	BC 3905 - BC 1686	BC 2878	4745.5	Stiger 1981; Jones 1986a, 1986b
5MF476	Uga-2950	**4260 ± 90**	BC 3087 - BC 2586	BC 2885	4786.5	O'Neil 1980
5GN810	Beta-54053	**4260 ± 70**	BC 3030 - BC 2621	BC 2885	4775.5	Conner 1992
5GN10	TX-3618	**4290 ± 290**	BC 3650 - BC 2045	BC 2897	4797.5	Stiger 1981
5GN1835	Beta-76616	**4300 ± 70**	BC 3087 - BC 2696	BC 2905	4841.5	Stiger 1993, 1997
5ME1373	Beta-12629	**4300 ± 80**	BC 3095 - BC 2628	BC 2905	4811.5	Horn et al. 1987
5MF3187	Beta-67414	**4310 ± 70**	BC 3092 - BC 2699	BC 2896	4845.5	McDonald 1998
5GN204/205	TX-3157	**4398 ± 90**	BC 3350 - BC 2787	BC 2976	5018.5	Euler and Stiger 1981
5GA680	Beta-3569	**4400 ± 70**	BC 3336 - BC 2885	BC 2974	5060.5	Wheeler and Martin 1984
5GF110	DIC 1773	**4400 ± 95**	BC 3354 - BC 2784	BC 2974	5019	Gooding and Shields 1985
5ME82	RL-1217	**4430 ± 150**	BC 3610 - BC 2625	BC 3066	5067.5	Reed and Nickens 1980
5GA151	Beta-3775	**4430 ± 70**	BC 3347 - BC 2896	BC 3066	5071.5	Wheeler and Martin 1982, 1984
5GN1835	Beta-85707	**4440 ± 70**	BC 3350 - BC 2904	BC 3060	5077	Stiger 1993, 1997
5ST85	WSU-1750	**4510 ± 120**	BC 3616 - BC 2887	BC 3178	5201.5	Gooding 1981
5ME1373	Beta-12623	**4560 ± 470**	BC 4345 - BC 1955	BC 3342	5100	Horn et al. 1987
5GN204/205	TX-3150	**4563 ± 300**	BC 3971 - BC 2464	BC 3343	5167.5	Euler and Stiger 1981
5ME1373	Beta-12630	**4580 ± 100**	BC 3626 - BC 2925	BC 3349	5225.5	Horn et al. 1987
5GA151	Beta-4945	**4665 ± 140**	BC 3707 - BC 2926	BC 3463	5266.5	Wheeler and Martin 1982, 1984
5RB3691	Beta-85263	**4670 ± 80**	BC 3640 - BC 3109	BC 3460	5324.5	McAndrews et al. 1997
5ST85	WSU-1755	**4690 ± 120**	BC 3702 - BC 3046	BC 3423	5324	Gooding 1981
5GN204/205	TX-3151	**4697 ± 80**	BC 3647 - BC 3145	BC 3418	5346	Euler and Stiger 1981

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GA217	Beta-6882	**4710 ± 120**	BC 3709 - BC 3097	BC 3407	5353	Liestman 1984
5RB3691	Beta-85269	**4770 ± 60**	BC 3666 - BC 3371	BC 3575	5468.5	McAndrews et al. 1997
5GA239	Beta-3420	**4770 ± 70**	BC 3666 - BC 3371	BC 3575	5525	Wheeler and Martin 1984
5EA799	Beta-28131	**4790 ± 70**	BC 3703 - BC 3372	BC 3561	5487.5	Metcalf and Black 1991
5GA680	Beta-3568	**4820 ± 80**	BC 3773 - BC 3374	BC 3635	5523.5	Wheeler and Martin 1984
5MF2991	Beta-70415	**4820 ± 70**	BC 3756 - BC 3378	BC 3567	5517	Rood and McDonald 1998
5MF1885	Beta-10831	**4850 ± 110**	BC 3935 - BC 3366	BC 3643	5600.5	Gleichman and Spears 1985
5ME82	RL-1214	**4890 ± 160**	BC 3990 - BC 3346	BC 3662	5618	Reed and Nickens 1980
5ML45	RL-1593	**4900 ± 180**	BC 4070 - BC 3335	BC 3685	5652.5	Reed 1981
5ML45	RL-1592	**4900 ± 160**	BC 4030 - BC 3349	BC 3685	5639.5	Reed 1981
5OR167	Beta-2001	**4920 ± 270**	BC 4334 - BC 2925	BC 3697	5579.5	Buckles et al. 1986
5MF3048	Beta-58789	**4920 ± 80**	BC 3939 - BC 3530	BC 3735	5684.5	O'Brien and McDonald 1998
5GN222	Beta-5565	**4950 ± 220**	BC 4243 - BC 3110	BC 3708	5626.5	Jones 1986a, 1986b
5GA680	Beta-3567	**4960 ± 80**	BC 3951 - BC 3547	BC 3743	5699	Wheeler and Martin 1984
5ST161	Beta-3020	**5000 ± 100**	BC 3986 - BC 3547	BC 3781	5716.5	Black 1982a
5RB3691	Beta-85270	**5020 ± 100**	BC 4030 - BC 3636	BC 3791	5783	McAndrews et al. 1997
5ME82	RL-1216	**5050 ± 160**	BC 4232 - BC 3389	BC 3879	5760.5	Reed and Nickens 1980
5ME82	RL-1219	**5070 ± 160**	BC 4244 - BC 3525	BC 3869	5834.5	Reed and Nickens 1980
5GN1835	Beta-97299	**5070 ± 80**	BC 4033 - BC 3694	BC 3869	5813.5	Stiger 1993, 1997
5ME82	RL-1220	**5130 ± 170**	BC 4337 - BC 3543	BC 3957	5890	Reed and Nickens 1980
5RB3691	Beta-85273	**5140 ± 120**	BC 4238 - BC 3669	BC 3961	5903.5	McAndrews et al. 1997
5RT345	Beta-78993	**5170 ± 70**	BC 4218 - BC 3795	BC 3972	5956.5	Pool 1997
5MF3003	Beta-58781	**5190 ± 90**	BC 4232 - BC 3786	BC 4009	5959	O'Brien and McDonald 1998
5RB3691	Beta-85271	**5200 ± 80**	BC 4229 - BC 3799	BC 3985	5964	McAndrews et al. 1997
5MF3048	Beta-58791	**5200 ± 100**	BC 4311 - BC 3781	BC 4046	5996	O'Brien and McDonald 1998
5MF2991	Beta-70419	**5210 ± 70**	BC 4227 - BC 3811	BC 4019	5969	Rood and McDonald 1998
5ST161	Beta-3021	**5230 ± 80**	BC 4244 - BC 3812	BC 4024	5978	Black 1982a
5GA1513	Beta-46637	**5230 ± 210**	BC 4466 - BC 3633	BC 4024	5999.5	Frison and Kornfield 1995

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GA151	Beta-4704	**5250 ± 70**	BC 4244 - BC 3949	BC 4014	6046.5	Wheeler and Martin 1982, 1984
5GA672	Beta-2974	**5290 ± 100**	BC 4343 - BC 3823	BC 4124	6033	Wheeler and Martin 1984
5GN1835	Beta-46616	**5330 ± 70**	BC 4337 - BC 3981	BC 4191	6109	Stiger 1993, 1997
5GN196	Beta-2101	**5410 ± 130**	BC 4498 - BC 3965	BC 4297	6181.5	Jones 1982
5GN206	TX-3622	**5420 ± 160**	BC 4565 - BC 3828	BC 4287	6146.5	Stiger 1981
5GN191	Beta-3287	**5430 ± 90**	BC 4458 - BC 4005	BC 4280	6181.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5RT345	Beta-75012	**5440 ± 60**	BC 4436 - BC 4102	BC 4274	6219	Pool 1997
5RB3691	Beta-85267	**5460 ± 80**	BC 4460 - BC 4086	BC 4333	6223	McAndrews et al. 1997
5GN810	Beta-54052	**5460 ± 70**	BC 4456 - BC 4103	BC 4333	6229.5	Conner 1992
5RB3691	Beta-85264	**5470 ± 70**	BC 4458 - BC 4151	BC 4336	6254.5	McAndrews et al. 1997
5GA128	Beta-5995	**5500 ± 70**	BC 4465 - BC 4169	BC 4344	6267	Wheeler and Martin 1984
5GN1835	Beta-66841	**5550 ± 120**	BC 4681 - BC 4090	BC 4359	6335.5	Stiger 1993, 1997
5MF2991	Beta-70417	**5550 ± 70**	BC 4522 - BC 4252	BC 4387	6337	Rood and McDonald 1998
5GN191	Beta-3289	**5600 ± 120**	BC 4720 - BC 4170	BC 4410	6395	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5RB3691	Beta-85265	**5610 ± 70**	BC 4584 - BC 4336	BC 4456	6410	McAndrews et al. 1997
5GN10	TX-3628	**5610 ± 560**	BC 5593 - BC 3104	BC 4456	6298.5	Stiger 1981
5RT139	RL-1434	**5700 ± 180**	BC 4942 - BC 4159	BC 4529	6500.5	Tucker 1981
5GN210	Beta-2105	**5730 ± 140**	BC 4909 - BC 4330	BC 4544	6569.5	Jones 1982
5GN1835	Beta-46619	**5770 ± 50**	BC 4772 - BC 4469	BC 4646	6570.5	Stiger 1993, 1997
5GN191	Beta-3290	**5770 ± 80**	BC 4803 - BC 4609	BC 4646	6656	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN191	Beta-3294	**5790 ± 90**	BC 4896 - BC 4457	BC 4634	6626.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5MF2991	Beta-70418	**5800 ± 110**	BC 4918 - BC 4369	BC 4644	6593.5	Rood and McDonald 1998
5GN1835	Beta-46618	**5810 ± 60**	BC 4803 - BC 4514	BC 4697	6608.5	Stiger 1993, 1997
5GN222	Beta-3284	**5810 ± 100**	BC 4909 - BC 4457	BC 4697	6633	Jones 1986a, 1986b
5RB3691	Beta-85268	**5820 ± 80**	BC 4899 - BC 4468	BC 4711	6633.5	McAndrews et al. 1997

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GN191	Beta-49242	**5820 ± 60**	BC 4816 - BC 4525	BC 4711	6620.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5MF3572	Beta-67423	**5830 ± 90**	BC 4909 - BC 4466	BC 4688	6637.5	Pennefeather, O'Brien and McDonald 1998
5GN10	TX-3625	**5860 ± 600**	BC 5944 - BC 3374	BC 4737	6609	Stiger 1981
5GN222	Beta-3280	**5860 ± 90**	BC 4934 - BC 4504	BC 4737	6669	Jones 1986a, 1986b
5GN191	Beta-3293	**5860 ± 90**	BC 4934 - BC 4504	BC 4737	6669	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN191	TX-3155	**5861 ± 170**	BC 5207 - BC 4351	BC 4736	6729	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN10	TX-3619	**5880 ± 160**	BC 5206 - BC 4363	BC 4774	6734.5	Stiger 1981
5GN191	TX-3646	**5895 ± 950**	BC 6593 - BC 2480	BC 4780	6486.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5RB2729	Beta-14093	**5920 ± 330**	BC 5448 - BC 4040	BC 4792	6694	Baker 1986
5RB3691	Beta-85266	**5920 ± 100**	BC 5052 - BC 4539	BC 4792	6745.5	McAndrews et al. 1997
5GN191	Beta-3292	**5920 ± 120**	BC 5068 - BC 4505	BC 4792	6736.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5ME82	RL-1223	**5930 ± 180**	BC 5253 - BC 4366	BC 4799	6759.5	Reed and Nickens 1980
5GN1835	Beta-46617	**5940 ± 80**	BC 5031 - BC 4615	BC 4807	6773	Stiger 1993, 1997
5MF3065	Beta-89629	**5950 ± 90**	BC 5056 - BC 4606	BC 4831	6781	Thompson 1996
5GA128	Beta-3666	**5960 ± 230**	BC 5332 - BC 4345	BC 4887	6788.5	Wheeler and Martin 1984
5GA680	Beta-3565	**5960 ± 90**	BC 5060 - BC 4615	BC 4887	6787.5	Wheeler and Martin 1984
5GN1835	Beta-45837	**5960 ± 80**	BC 5052 - BC 4630	BC 4887	6791	Stiger 1993, 1997
5GN1835	Beta-46615	**5980 ± 80**	BC 5060 - BC 4711	BC 4879	6835.5	Stiger 1993, 1997
5GN191	TX-3152	**5984 ± 120**	BC 5215 - BC 4571	BC 4878	6843	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN1870	Beta-49236	**5990 ± 200**	BC 5314 - BC 4401	BC 4875	6807.5	Jones 1996
5MF3003	Beta-58780	**6000 ± 80**	BC 5069 - BC 4718	BC 4894	6843.5	O'Brien and McDonald 1998
5MF3003	Beta-67417	**6010 ± 80**	BC 5194 - BC 4722	BC 4958	6908	O'Brien and McDonald 1998
5GA1513	Beta-46636	**6015 ± 55**	BC 5055 - BC 4783	BC 4909	6869	Frison and Kornfield 1995

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5EA799	Beta-25076	**6030 ± 100**	BC 5217 - BC 4715	BC 4928	6916	Metcalf and Black 1991
5GN212	Beta-2099	**6040 ± 200**	BC 5416 - BC 4464	BC 4933	6890	Stiger 1981; Jones 1982
5GN2193	Beta-49239	**6050 ± 140**	BC 5267 - BC 4608	BC 4937	6887.5	Jones 1993
5EA799	Beta-25079	**6080 ± 100**	BC 5249 - BC 4774	BC 4949	6961.5	Metcalf and Black 1991
5MF3572	Beta-58601	**6080 ± 90**	BC 5227 - BC 4782	BC 5005	6954.5	Pennefeather, O'Brien and McDonald 1998
5GN212	TX-3623	**6095 ± 250**	BC 5480 - BC 4405	BC 4968	6892.5	Stiger 1981; Jones 1982
5GN1835	Beta-46614	**6100 ± 80**	BC 5227 - BC 4805	BC 4992	6966	Stiger 1993, 1997
5GA151	Beta-4948	**6100 ± 125**	BC 5275 - BC 4722	BC 4992	6948.5	Wheeler and Martin 1982, 1984
5GA151	Beta-4944	**6120 ± 100**	BC 5263 - BC 4791	BC 5050	6977	Wheeler and Martin 1982, 1984
5ME82	RL-1221	**6150 ± 190**	BC 5440 - BC 4608	BC 5063	6974	Reed and Nickens 1980
5RB2729	Beta-14092	**6150 ± 130**	BC 5328 - BC 4778	BC 5063	7003	Baker 1986
5GN1835	Beta-76614	**6160 ± 70**	BC 5257 - BC 4914	BC 5067	7035.5	Stiger 1993, 1997
5GN10	TX-3621	**6170 ± 210**	BC 5477 - BC 4580	BC 5129	6978.5	Stiger 1981
5GN191	Beta-49243	**6210 ± 120**	BC 5421 - BC 4841	BC 5165	7081	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN212	Beta-2104	**6210 ± 110**	BC 5411 - BC 4852	BC 5165	7081.5	Stiger 1981; Jones 1982
5GA680	Beta-3422	**6220 ± 110**	BC 5416 - BC 4862	BC 5160	7089	Wheeler and Martin 1984
5GN191	Beta-3283	**6240 ± 130**	BC 5435 - BC 4846	BC 5150	7090.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN191	Beta-3291	**6270 ± 140**	BC 5443 - BC 4853	BC 5228	7098	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5EA799	Beta-25077	**6290 ± 70**	BC 5477 - BC 4853	BC 5252	7115	Metcalf and Black 1991
5EA799	Beta-23788	**6290 ± 150**	BC 5411 - BC 5062	BC 5252	7186.5	Metcalf and Black 1991
5GN10	TX-3627	**6310 ± 340**	BC 5818 - BC 4462	BC 5258	7090	Stiger 1981
5EA799	Beta-21197	**6320 ± 90**	BC 5435 - BC 5058	BC 5262	7196.5	Metcalf and Black 1991
5EA799	Beta-25075	**6330 ± 110**	BC 5443 - BC 2003	BC 5265	5673	Metcalf and Black 1991
5GN2192	Beta-49240	**6350 ± 210**	BC 5611 - BC 4799	BC 5273	7155	Jones 1996
5RT90	Beta-28307	**6370 ± 70**	BC 5437 - BC 5146	BC 5283	7241.5	Hand 1993

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5RT139	RL-1435	**6430 ± 180**	BC 5627 - BC 4946	BC 5368	7236.5	Tucker 1981
5GN1835	Beta-85701	**6480 ± 150**	BC 5621 - BC 5076	BC 5389	7298.5	Stiger 1993, 1997
5GN1835	Beta-46613	**6520 ± 80**	BC 5578 - BC 5278	BC 5437	7378	Stiger 1993, 1997
5GN191	TX-3647	**6545 ± 160**	BC 5695 - BC 5145	BC 5441	7370	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5DT2	Beta-14424	**6600 ± 110**	BC 5668 - BC 5288	BC 5518	7428	Buckles 1971
5GA1107	Beta-27103	**6620 ± 300**	BC 6017 - BC 4916	BC 5552	7416.5	Rood 1989
5DT2	Beta-13056	**6650 ± 200**	BC 5941 - BC 5222	BC 5545	7531.5	Buckles 1971
5DT2	Beta-13055	**6660 ± 100**	BC 5692 - BC 5526	BC 5543	7559	Buckles 1971
5GN1835	Beta-61922	**6690 ± 70**	BC 5675 - BC 5443	BC 5578	7509	Stiger 1993; 1997
5GN1870	Beta-49237	**6700 ± 120**	BC 5755 - BC 5348	BC 5582	7501.5	Jones 1996
5OR167	Beta-2002	**6710 ± 270**	AD 1145 - BC 5072	BC 5586	3913.5	Buckles et al. 1986
5ST85	WSU-1752	**6750 ± 120**	BC 5819 - BC 5436	BC 5597	7577.5	Gooding 1981
5GN1835	Beta-76615	**6810 ± 70**	BC 5765 - BC 5528	BC 5646	7596.5	Stiger 1993, 1997
5GN53	Beta-3273	**6820 ± 130**	BC 5950 - BC 5445	BC 5666	7647.5	Jones 1986a
5GN1835	Beta-61919	**6830 ± 70**	BC 5788 - BC 5538	BC 5672	7613	Stiger 1993, 1997
5GN1835	Beta-66835	**6830 ± 110**	BC 5941 - BC 5489	BC 5672	7665	Stiger 1993, 1997
5GN212	Beta-2097	**6860 ± 190**	BC 6043 - BC 5389	BC 5691	7666	Stiger 1981; Jones 1982
5GA680	DIC-2328	**6860 ± 100**	BC 5944 - BC 5527	BC 5691	7685.5	Wheeler and Martin 1984
5ST85	Uga-1148	**6885 ± 1153**	BC 8320 - BC 3349	BC 5706	7784.5	Gooding 1981
5GN1835	Beta-85705	**6970 ± 60**	BC 5954 - BC 5684	BC 5779	7769	Stiger 1993, 1997
5GN1835	Beta-46620	**6990 ± 110**	BC 6012 - BC 5609	BC 5817	7760.5	Stiger 1993, 1997
5GN1835	Beta-66832	**6990 ± 80**	BC 5977 - BC 5672	BC 5817	7774.5	Stiger 1993, 1997
5GN1835	Beta-61921	**7000 ± 70**	BC 5973 - BC 5690	BC 5837	7781.5	Stiger 1993, 1997
5GN1835	Beta-85700	**7010 ± 80**	BC 5987 - BC 5684	BC 5846	7785.5	Stiger 1993, 1997
5GN1835	Beta-66837	**7040 ± 110**	BC 6110 - BC 5667	BC 5913	7838.5	Stiger 1993, 1997
5EA684	Beta-12754	**7050 ± 150**	BC 6175 - BC 5597	BC 5910	7836	Black 1985b
5GN1835	Beta-66838	**7100 ± 80**	BC 6111 - BC 5752	BC 5955	7881.5	Stiger 1993, 1997
5GN1835	Beta-66831	**7110 ± 90**	BC 6120 - BC 5740	BC 5958	7880	Stiger 1993, 1997

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SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5DT2	Beta-13888	**7140 ± 110**	BC 6178 - BC 5731	BC 5971	7904.5	Buckles 1971
5GN1835	Beta-76617	**7160 ± 90**	BC 6173 - BC 5804	BC 5980	7938.5	Stiger 1993, 1997
5GA151	Beta-2976	**7170 ± 200**	BC 6409 - BC 5610	BC 5985	7959.5	Wheeler and Martin 1982, 1984
5GN1835	Beta-85704	**7180 ± 110**	BC 6188 - BC 5771	BC 5990	7929.5	Stiger 1993, 1997
5GA151	Beta-5132	**7190 ± 280**	BC 6541 - BC 5524	BC 5995	7982.5	Wheeler and Martin 1982, 1984
5GN1835	Beta-66836	**7220 ± 80**	BC 6183 - BC 5883	BC 6014	7983	Stiger 1993, 1997
5GN1835	Beta-97300	**7240 ± 100**	BC 6224 - BC 5869	BC 6041	7996.5	Stiger 1993, 1997
5GN204/205	TX-3156	**7270 ± 110**	BC 6361 - BC 5878	BC 6093	8069.5	Euler and Stiger 1981
5GN1835	Beta-85699	**7280 ± 90**	BC 6339 - BC 5955	BC 6091	8097	Stiger 1993, 1997
5RT345	Beta-78995	**7300 ± 80**	BC 6341 - BC 5970	BC 6086	8105.5	Pool 1997
5ST85	WSU-1754	**7320 ± 160**	BC 6454 - BC 5836	BC 6127	8095	Gooding 1981
5GN2192	Beta-49241	**7350 ± 120**	BC 6317 - BC 5958	BC 6174	8087.5	Jones 1996
5GN1835	Beta-85706	**7350 ± 100**	BC 6386 - BC 5975	BC 6174	8130.5	Stiger 1993, 1997
5GA1183		**7360 ± 110**	BC 6414 - BC 5971	BC 6176	8142.5	Wheeler, Lennon and Paterson 1988
5GN57	Beta-3272	**7400 ± 100**	BC 6420 - BC 6000	BC 6186	8160	Jones 1986a
5GN1835	Beta-76613	**7450 ± 100**	BC 6457 - BC 6042	BC 6226	8199.5	Stiger 1993, 1997
5GA670	Beta-2973	**7460 ± 190**	BC 6609 - BC 5893	BC 6288	8201	Wheeler and Martin 1984
5GN191	Beta-3295	**7460 ± 110**	BC 6464 - BC 6028	BC 6288	8196	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5MF3003	Beta-75927	**7470 ± 90**	BC 6457 - BC 6055	BC 6256	8206	O'Brien and McDonald 1998
5MF3003	Beta-67416	**7470 ± 90**	BC 6457 - BC 6055	BC 6256	8206	O'Brien and McDonald 1998
5GN1835	Beta-61920	**7550 ± 90**	BC 6534 - BC 6179	BC 6383	8306.5	Stiger 1993, 1997
5MF3003	Beta-75928	**7580 ± 120**	BC 6604 - BC 6171	BC 6388	8337.5	O'Brien and McDonald 1998
5GN191	TX-3624	**7660 ± 240**	BC 7046 - BC 5990	BC 6457	8468	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5GN246	Beta-23846	**7670 ± 70**	BC 6602 - BC 6374	BC 6459	8438	Liestman and Gilmore 1988
5GA1183		**7700 ± 110**	BC 6755 - BC 6252	BC 6466	8453.5	Wheeler, Lennon and Paterson 1988
5EA1009		**7710 ± 80**	BC 6632 - BC 6383	BC 6469	8457.5	Mosch and Watson 1993
5GN164	Beta-49238	**7720 ± 110**	BC 6991 - BC 6266	BC 6474	8578.5	Jones 1996

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CHRONOMETRIC DATES FOR THE NORTHERN COLORADO RIVER BASIN

SITE NUMBER	LAB NUMBER	RADIOCARBON DATE	CALIBRATION RANGE	MEDIAN	BP MEDIAN	REFERENCE
5GA1178		**7770 ± 200**	BC 7231 - BC 6179	BC 6547	8655	Wheeler, Lennon and Paterson 1988
5GA128	Beta-2975	**7820 ± 80**	BC 6999 - BC 6457	BC 6600	8678	Wheeler and Martin 1984
5GN1835	Beta-46621	**7820 ± 80**	BC 6999 - BC 6457	BC 6600	8678	Stiger 1993, 1997
5ML45	RL-1594	**7860 ± 190**	BC 7267 - BC 6253	BC 6616	8710	Reed 1981
5GA680	Beta-3192	**7960 ± 140**	BC 7268 - BC 6462	BC 6860	8815	Wheeler and Martin 1984
5GA1513	Beta-76593	**8090 ± 60**	BC 7259 - BC 6768	BC 7036	8963.5	Frison and Kornfield 1995
5MF3003	Beta-67418	**8140 ± 140**	BC 7486 - BC 6613	BC 7050	8999.5	O'Brien and McDonald 1998
5EA1009		**8170 ± 100**	BC 7473 - BC 6771	BC 7135	9072	Mosch and Watson 1993
5RB2727	Beta-14086	**8180 ± 70**	BC 7421 - BC 7005	BC 7182	9163	Baker 1986
5MF3003	Beta-67415	**8210 ± 90**	BC 7479 - BC 7004	BC 7242	9191.5	O'Brien and McDonald 1998
5MN1068	RL-1481	**8250 ± 240**	BC 7862 - BC 6547	BC 7269	9154.5	Indeck and Kihm 1981
5GA1178		**8420 ± 120**	BC 7604 - BC 7091	BC 7450	9297.5	Wheeler, Lennon and Paterson 1988
5GA22	I-5449	**8460 ± 140**	BC 7875 - BC 7091	BC 7495	9433	Benedict 1985
5MN1068	Uga 3727b	**8470 ± 115**	BC 7832 - BC 7262	BC 7498	9497	Indeck and Kihm 1981
5RB2728	Beta-14089	**8550 ± 110**	BC 7896 - BC 7326	BC 7540	9561	Baker 1986
5MN1068	WSU-2476	**8580 ± 130**	BC 7935 - BC 7320	BC 7546	9577.5	Indeck and Kihm 1981
5GA151	Beta-4705	**8730 ± 140**	BC 8034 - BC 7491	BC 7819	9712.5	Wheeler and Martin 1982, 1984
5RB2728	Beta-14091	**8750 ± 120**	BC 8030 - BC 7508	BC 7811	9719	Baker 1986
5GN191	TX-3149	**8807 ± 100**	BC 8034 - BC 7549	BC 7911	9741.5	Jones 1986a and 1996; Stiger 1981; Euler and Stiger 1981
5RB2728	Beta-14088	**9100 ± 120**	BC 8403 - BC 7936	BC 8083	10119.5	Baker 1986
5RB2728	Beta-14087	**9970 ± 140**	BC 10165 - BC 8992	BC 9237	11528.5	Baker 1986
5GN204/205	TX-3154	**10094 ± 830**	BC 11763 - BC 7488	BC 9706	11575.5	Euler and Stiger 1981
5GA1513	CAMS-16081	**10240 ± 70**	BC 10386 - BC 9395	BC 10095	11840.5	Frison and Kornfield 1995
5MF2642	Beta-27681	**11900 ± 240**	BC 12592 - BC 11365	BC 11922	13928.5	Truesdale 1989

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APPENDIX C

Computer Database: Excavated Components (available at the Colorado Office of Archaeology and Historic Preservation)

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Prehistory of Colorado: A Publication Series

funding provided by
State Historical Fund
Colorado Historical Society
Project # 97-P1-015

90000
9 780874 807080

ISBN 0-87480-708-5