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The Archaeology of Colorado's High Country

HISTORY OF RESEARCH

This section describes several of the larger, better-reported archaeological projects in Colorado's high country (Figure 1.1). This description will give the reader a sense of which kinds of sites archaeologists have thought to be most useful for research. I also briefly describe the research approaches and conclusions drawn by the investigators.

I then describe work done in the Upper Gunnison Basin. Included are several smaller projects. Across the high country, innumerable small CRM (Cultural Resources Management) projects have been conducted; I describe only those done in the Upper Gunnison Basin.

JENNINGS'S 1968 SUMMARY

Jennings (1968) summarizes what was known about the Archaic stage in western Colorado. He describes what he considered the eleven most important Archaic sites, nine of which were rockshelter sites that had been excavated by various researchers in the 1940s, 1950s, and 1960s. These eleven sites are located in two small clusters—one cluster near Dinosaur National Monument in northwestern Colorado and one cluster on the Uncompahgre Plateau, near Delta, Montrose, and Grand Junction.

In the Dinosaur cluster are Hells Midden, Thorne Cave, Dripping Rocks Cave, and Lowell Spring. At the time of Jennings's writing, the only radiocarbondated site was Thorne Cave, barely across the state line in Utah. Two samples gave ages of 4230±240 B.P. and 4170±250 B.P. (Jennings 1968:17). Thorne Cave deposits were redeposited alluvial materials, and interpretations other than social relationships with the Desert culture and the High Plains cultures are minimal (Day 1964). Dripping Rocks Cave and Lowell Spring, an open site, (Jennings and Wade 1970) are undated sites.

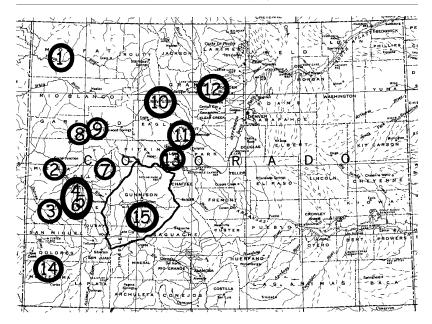


Fig. 1.1. The locations of sites discussed. Sites are identified by numbers. (1) Dinosaur group; (2) Alva and Taylor Sites; (3) Hurst's sites; (4) Moore and Casebier Sites; (5) Buckles's Uncompany sites; (6) Harris Site; (7) Sorrel Deer; (8) Sisyphus Shelter; (9) Kewclaw; (10) Yarmony; (11) Vail Pass; (12) Benedict's Front Range sites; (13) Mt. Bump; (14) Casa de Nada; (15) the Upper Gunnison Basin.

Hells Midden (Lister 1951) is the best-reported site in the Dinosaur cluster. A deeply stratified rockshelter and adjacent open area site, it was excavated over two summer field seasons. The site was undated, and about twenty-eight square meters were excavated. Large amounts of material were recovered. Five hundred forty-seven artifacts were reported recovered from both years' excavations, as well as 7,165 pieces of debitage saved from only one year's excavation (Lister 1951:27). Interpretations by Lister (1951:45–48) briefly compare the recovered artifacts to similar material from California, Arizona, New Mexico, Utah, and Texas.

In the Uncompany Plateau cluster of sites are the Alva, Taylor, Moore, and Casebier Sites reported by Wormington and Lister (1956) and the Tabeguache Cave II, Cottonwood, and Dolores Cave Sites reported by Hurst (1943, 1944, 1945, 1947, 1948).

The goal of excavations undertaken by Wormington and Lister (1956) was the elaboration of the sequence of prehistoric materials and cultures represented in western Colorado. After describing the plentiful material taken from the various caves, the authors conclude with interpretations of cultural (social) relationships among the groups in surrounding regions and groups of the Uncompander Plateau. They suggest the Uncompahgre people were derived originally from a Great Basin source, but that through time "the separation of groups, by distance and geographic barriers, which favored independent development, environmental factors, and influences from other areas" (Wormington and Lister 1956:92) created the local Uncompahgre complex. Thus, this western Colorado Archaic complex had homologous similarities with the Great Basin, Wyoming, and Basketmaker cultures (Wormington and Lister 1956:91).

The Tabeguache Cave sites were excavated in the 1940s by Hurst of Western State College. Large quantities of cultural material were removed during excavations of stratified deposits. Hurst was attempting to flesh out a sequence of cultures in the area based mainly on projectile point morphology. He was concentrating on linking the earlier hunter-gatherer peoples with the succeeding agricultural people. Hurst's cave sites were undated until recently. These recent radiocarbon assessments are reported in a later chapter.

Jennings (1968) gives his summary interpretation of these two clusters of archaeological material in culture-historical terms. The western Colorado Archaic is considered to be a regional variant of the Desert culture. This Desert culture may have been contemporaneous with the Paleoindian culture, evidence of which was found in the region, as was an Old Cordilleran Cascade point. "There are at least two major traditions present in the area, that of the High Plains big-game hunters of the Llano, Lindenmeier, and Plano cultures as well as that of the Intermontane Tradition as represented by the Old Cordilleran and the regional variant of the Desert Culture, the Uncompahgre Complex. The situation then is one of an ideal laboratory for the study of early man" (Jennings 1968:20).

BUCKLES'S UTE PREHISTORY PROJECT ON THE UNCOMPANGRE PLATEAU

Buckles (1971) reports the results of three years of research in the Uncompahyre Plateau area of western Colorado. Field seasons stretched from 1961 to 1963; thirty-nine sites were investigated, with some subsurface testing. Most sites investigated were rockshelters because sequence building was a goal for the project. "The extent to which each site was excavated depended upon several factors. The ideal was a site with good stratigraphy and material culture in large amounts" (Buckles 1971:40). Two radiocarbon samples were originally processed from these excavations, and a sequence was developed from the many assemblages recovered. Later, an additional five radiocarbon samples were processed (Buckles, personal communication 1997). All the dates came from three rockshelters and ranged from 7140 B.P. to 1280 B.P. Today, some researchers use a simplified version of Buckles's chronology in which only projectile points are considered.

Unfortunately, researchers ignore many of Buckles's important contributions from his work on the Plateau, such as his questioning of traditional methods of inference, especially inference about social and cultural continuities. Buckles draws important conclusions regarding what could be learned and what methods and assumptions needed to be reevaluated. Few other archaeologists have regarded these conclusions, and they have proceeded to interpret the archaeological record using the methods of the earlier researchers. Even fewer have worked toward the development of new methods of inference. This is still the greatest challenge to the region's archaeologists.

VAIL PASS CAMP

Vail Pass Camp was excavated to mitigate the effects of highway construction on a prehistoric and historic camp location in the high mountains, twenty-seven kilometers from the Continental Divide. This site is important because it was one of the first open lithic-scatter sites on which hundreds (453) of square meters were excavated (Gooding 1981). Unfortunately, the area of excavations was not a single large block but was composed of one irregular block about ten by twenty meters and several adjacent trenches. Tools recovered numbered 988, and debitage, 20,606 (Gooding 1981:19). Seventy-two features were found. Thirty-three radiocarbon dates were obtained ranging from 7320 B.P. to 190 B.P. (Gooding 1981:12) with most (all but six) dating to the last 3,000 years.

Gooding's (1981:100) conclusions about the Vail Pass Camp are that the site was used by small hunting and gathering parties sporadically through time. Most likely these parties came from the north and east during some periods and from the south and west during other periods. Gooding (1981:99) suggests that based on tools the site inhabitants had "cultural affiliations with the Northwest Plains, the Central Plains, the Great Basin, and perhaps with the Southwest." Gooding (1981:96–97) believes regional archaeologists have not developed theory for the following reasons: most sites in the area are shallow (nonstratified) and open, with poor preservation (especially of datable charcoal); most archaeological work in the region is atheoretical; most of the archaeological record is derived from an unchanging cultural adaptation; and the prehistoric inhabitants were not local but derived from the Plains, Great Basin, and Colorado Plateau.

SISYPHUS SHELTER

Sisyphus Shelter is a stratified rockshelter excavated in three 35-sq-m blocks (Gooding and Shields 1985). Thirty-two features were located, including a habitation structure, and about 600 pieces of debitage and 403 flaked stone tools were found. Seventeen radiocarbon samples dated the layers from 4400 B.P. to modern.

Interpretations of the site include a brief discussion of archaeological theory (Gooding and Shields 1985:13–17). Here the authors make the point that in their opinion, one cannot do processual interpretation until the facts of culture history are known. This caveat made, Gooding and Shields (1985:129) describe the remains from the site as indicative of unchanging space use, economic pursuits, and lithic technology. Furthermore, "close scrutiny of projectile point types, which should be the hallmark of cultural identity for these occupations," did not yield easy identifications because of a wide diversity of styles found at the site (Gooding and Shields 1985:133).

HARRIS SITE

Tucker (1989) reports the results of research at the Harris Site, a rockshelter near Montrose. Although only a few square meters were tested, the artifact counts were extremely high; 6,700 artifacts were collected. The site was stratified, and three radiocarbon dates were reported, from 3510 B.P. to 2730 B.P. Tucker's interpretations, although based on limited evidence, describe the chronology of the site and activities at the site.

Sorrel Deer

Baker (1991) describes small-scale testing at two open lithic-scatter sites, one a game drive and the other a camp site. One 2-x-5-m block, two 3-x-4-m blocks, and several scattered small test pits were dug. Nineteen artifacts were recovered from the game drive site and 182 flaked stone artifacts from the camp. Five radiocarbon dates were processed from the campsite; all yielded ages of less than 2,000 years.

Baker (1991:213) echoes the sentiment of Gooding and Shields (1985:13– 17) when he states, "On the basis of the limited data available to date from Grand Mesa, it would seem to be most unwise to attempt processual explanations at this time. For a time yet we may need to be content with our roles in developing the regional cultural history." Although he cautions against deriving meaning from the archaeological record, he does suggest processes of cultural development (migration, diffusion, and independent invention) in the area based on similarities between the area's stone tools and those found in New Mexico assemblages (Baker 1991:212). He concurs with an accepted hypothesis of a long, singleethnic presence (Baker 1991:8, inaccurately attributed by Baker to Buckles 1971).

YARMONY PIT HOUSE SITE

The Yarmony Site is an open site located near the Colorado River, close to State Bridge in western Colorado. Metcalf and Black (1991) describe the work done at the site. A block excavation of 66 sq m was executed over what the authors describe as a single pithouse. A nearby pithouse was also tested. Numerous floor features were found in the house; unfortunately, areas outside the structures were only minimally tested.

The site was rich in artifacts. Over 4,000 pieces of debitage, 331 flaked stone tools, 140 ground stone tools, and 28 pieces of worked bone and antler were recovered.

Most of the interpretation of the site describes the prehistoric lifeway with special emphasis on the settlement pattern. It is important to note that Metcalf and Black (1991:207–221) argue for winter residence in western Colorado. This is in direct contrast to Gooding's (1981) idea that the prehistoric occupants of the Colorado mountains spent only short periods of time there, mostly staying on the Plains, in the Great Basin, or on the Colorado Plateau.

Metcalf and Black (1991:202–204) argue for projectile point affinities between Yarmony material and material from the northern Colorado Plateau, rather than material from the northern Plains. The description of hafted bifaces (projectile points) are the most detailed material descriptions in the report (Metcalf and Black 1991:89–99). Each type description features an "Age/Affiliation" and a "Discussion" section. These detailed descriptions compare the point styles to those of material recovered from other sites. These comparisons assign the artifacts a time range, a geographical range, and an ethnic affiliation. The Yarmony Site is influential in Black's (1991) theoretical paper on Archaic origins.

The most important contribution made by Metcalf and Black (1991) is the attempt to distinguish occupations of differing seasons and types in western Colorado. The authors reason, for instance, that differing frequencies of debitage, storage pits, features, and houses can be used to differentiate among winter residential, summer base, and special-use sites. They argue for several operational definitions; this is a relatively new kind of argument in western Colorado archaeology.

Some ambiguities can be found in their definitions. For instance, a winter residence is said to be recognizable as such because of the presence of houses showing complexity and patterning, yielding both high artifact densities and plentiful storage facilities (Metcalf and Black 1991:218). Although the definitions of "complexity," "patterning," "high densities," and "plentiful" are known to the authors, they are not explicated. Furthermore, it is not specified if the time span of a winter residence was one month, four months, or more or less time. The authors do not address how one might evaluate this variation or any other variation found in their hypothetical settlement system. Because it is doubtful that Archaic settlement was consistent year after year all across the Colorado mountains and through long-term environmental changes, an accurate evaluation of this variability in seasonal residence is potentially important to an explanation of culture change and stability.

BENEDICT'S COLORADO FRONT RANGE MATERIAL

Benedict is a prolific writer on Colorado mountain archaeology. His reports are plentiful and timely and serve as a standard toward which all archaeologists should strive. Changes in the structure of his reports perhaps reflect changes in the direction of Colorado archaeology. I briefly describe each major report in chronological order.

MOUNT ALBION COMPLEX (BENEDICT AND OLSON 1978). This report describes the environmental and social history of the Rocky Mountain National Park region. Excavations at two high-elevation sites are described. Although over sixty square meters were excavated on the two sites, no one block exceeded 4-x-5 m, with most of the area consisting of several 1- or 2-m-wide shallow trenches. Radiocarbon dates from the sites demonstrate occupation from 7650 B.P. to 5330 B.P. Artifacts were plentiful at the sites. Pieces of debitage numbered several thousand, and tools, several hundred. Benedict and Olson (1978) hypothesize population movements based on projectile-point style similarities and population measured by radiocarbon date frequency.

FOURTH OF JULY VALLEY (BENEDICT 1981). This report continues the exploration of the regional glacial chronology and social continuities. Excavations at two high-elevation sites are described. Forty-one square meters were excavated at the

Fourth of July Site in an irregular pattern with a length of 14 m and widths ranging between 2 m and 6 m. Stone artifacts recovered number 1,425, and radiocarbon dates of 5880 B.P. and 6045 B.P. were obtained.

The Ptarmigan Site in the same valley was also investigated, with an irregular excavation block of 43 sq m, yielding 1,427 artifacts. An averaged radiocarbon age of the occupation is given as 6380 B.P.

Interpretations given are of the social origin of the occupants of the site, activities performed at the site, and environmental history of the site.

ARAPAHO PASS (BENEDICT 1985A). Two sites, a game-drive system and a camp site, are described in this report. Excavations took place only at the camp site, where three areas were tested with blocks of 32 sq m, 24 sq m, and 20 sq m. Eight radiocarbon samples gave dates from 8460 B.P. to 765 B.P. An inferred structure was found, as well as 2,214 flaked stone artifacts, 5 ground stone artifacts, and 416 potsherds. Interpretations are made about the glacial chronology of the area and about the ethnic affiliation of the prehistoric residents.

OLD MAN MOUNTAIN (BENEDICT 1985B). Here, near Estes Park, Benedict expected to find a camp site, but surface collections did not bear this out. So, using ethnographic analogy, Benedict deemed it to be a vision-quest site. He then devised a set of characteristics of ritual sites to aid in their recognition in the archaeological record. These characteristics are as follows: the location does not seem to be a good camp site; the location is in a high place, remote yet accessible, with a good view, and beautiful surroundings; and artifacts brought to the location and found at the site include potsherds, obsidian flakes, cobbles, burned bone, projectile points, and well-made stone tools.

CONEY CREEK VALLEY (BENEDICT 1990). At the Coney Lake Site, Bendict excavated 36 sq m in an irregular block. Eight radiocarbon samples placed the occupations between 5710 B.P. and 1200 B.P. The excavation effort recovered 3,042 flaked stone artifacts and fifty-eight ground stone artifacts. Benedict uses this site to examine an occupation by the makers of stemmed, indented-base points, the local environmental sequence, and the prehistoric settlement system. Benedict interprets the settlement system as including autumn communal game-drive hunts in the high country, from which large amounts of dried meat were packed to winter base camps in the Front Range foothills.

BODE'S DRAW (BENEDICT 1993). Excavation at Bode's Draw Site yielded 149 flaked stone artifacts and 113 ground stone artifacts from a block of 27 sq m. Four radiocarbon samples place the occupations between 2270 B.P. and 820 B.P. Benedict's interpretation defines women's work areas there. The criterion for recognizing these gender-specific areas is the presence of projectile points and debitage in some areas, indicating men's work, with women's areas indicated by the presence of scrapers, grinders, and projectile points used for tasks other than hunting or warfare.

GAME DRIVES OF ROCKY MOUNTAIN NATIONAL PARK (BENEDICT 1996). In this report, Benedict describes two more game-drive systems. He also interprets how these sites were used and who used them. Again, he argues that the drives were part of a seasonal round, used to acquire large quantities of meat for storage and use in the lower Front Range area. Benedict relies on ethnographic analogy to amplify the record of what occurred at the sites.

OTHER RESEARCH IN THE UPPER GUNNISON BASIN

Most of the many archaeological research projects that have been conducted in the Upper Gunnison Basin are described in the gray literature of CRM. A few have been published, of which brief descriptions follow.

CURECANTI NATIONAL RECREATION AREA

The National Park Service (NPS) has test excavated many sites near Blue Mesa Reservoir in the Curecanti National Recreation Area. The reports of these excavations vary widely in their quality and distribution. A summary report of seventy-three radiocarbon dates on archaeological material within Curecanti has been published (Jones 1984). A synthesis of the important Curecanti research is eagerly awaited.

Euler and Stiger (1981) report the first NPS test excavations in the Gunnison Basin. Important discoveries included a well-preserved house of cribbed log and plastered mud dating to about 4500 B.P. An unlined firepit yielded a Paleoindianage radiocarbon date (10,000 B.P.) and was associated with Levallois stone-reduction technology commonly seen in Folsom assemblages. At the Kezar Basin Site (5GN191), which produced radiocarbon dates from about 6000 B.P. to 8800 B.P., seventy-six features were mapped, including many paired "boiling pits." The Kezar Basin was suffering severe erosion at this time.

Stiger (1981) describes continued work in Curecanti. Further testing was done at the Kezar Basin Site. More structural remains were found at Site 5GN10. A slab-lined storage pit was found associated with a structure and a slab-lined firepit, the latter of which produced a radiocarbon date of 4419±219 B.P. The storage pit is approximately the same size as one of the storage pits at Tenderfoot (Feature 28, 5550±120 B.P.); both storage pits contained manos. A minor amount of testing was done at the Iola Site (5GN212).

Jones (1982) reports the Curecanti excavations conducted during the 1980 field season. Radiocarbon dates ranging from 2000 B.P. to 7000 B.P. were obtained, with most falling between 4000 B.P. and 6500 B.P. A variety of features was found, including slab-lined and unlined hearths with both shallow and steep basin-shaped cross sections. Some contained only charcoal; some contained rock. The variation in features was noted and explained as possibly representing differing behaviors of people or differing feature functions.

The 1981 test excavations are reported by Jones (1986a), and includes work at thirteen sites. Two sites produced evidence of Protohistoric or Historic Indian components. Again a variety of features was found in the excavations, including hearths, burned-clay concentrations, and basins. Radiocarbon dates from 474±70 B.P. to 7684±110 B.P. were obtained, with most falling between 5000 B.P. and 7000 B.P. Identified faunal remains include deer, elk, and rabbit. Jones (1986a:213) considers the identification and examination of the many hearths at the Kezar Basin Site to be a major contribution of this fieldwork.

Jones (1986b) provides a brief overview of the 1982 excavations in Curecanti. A minor amount of work was done at Sites 5GN204/205, 5GN222 (Dry Creek Site), and 5GN247. The Dry Creek Site produced a slab-lined hearth dated 5099±220 B.P., from which a deer humerus was recovered. A second radiocarbon date of 3873±210 B.P. came from overlying dark fill. At Site 5GN247 a large basin was excavated, yielding a radiocarbon date of 3100±70 B.P. and 260 pounds of fire-cracked rock. This basin appears similar to Features 7 and 14 at the Tenderfoot Site.

Other important 1982 excavations include the Marion Site (5GN1664) and the Pioneer Point Site (5GN41). Rossillon (1984) reports the excavations at the Marion Site along the Lake Fork of the Gunnison River. Although the major orientation of the excavation was toward the historic archaeology of a railroad camp, three prehistoric components were discovered. These three components were defined by radiocarbon dates of 1060±46 B.P. and 2047±48 B.P. from two of five hearths and by the presence of "Late Prehistoric" points. The prehistoric occupations do not overlap spatially and can be analytically separated. Bones of deer, antelope, and bison were found, indicating exploited species. A mano was recovered, perhaps evidence of plant-food use. The stone tools and debitage recovered were interpreted as evidence of a biface reduction technology.

Dial (1989) describes the excavations at the Pioneer Point Site (5GN41) and interprets the site as temporarily occupied in summer or fall by hunters and gatherers. Activities at Pioneer Point include the manufacturing and use of stone tools and the processing and consumption of large game, chenopodium seeds, and grasses. Dial considers this interpretation to be consistent with Black's (1983b) settlement model. Brownware ceramics were recovered from the Pioneer Point Site and two radiocarbon dates of 460±70 B.P. and 470±80 B.P. were obtained from firepits.

MONARCH PASS

Hutchinson (1990) reports a game-drive system along the Continental Divide on the eastern margin of the Upper Gunnison Basin. Stone tools and debitage, ground stone, and ceramics were recovered. Three radiocarbon dates were obtained from the site, giving ages of 350±60 B.P., 1060±60 B.P., and 720±60 B.P.

COCHETOPA DOME

Lyons and Johnson (1993) describe the Old Agency Fortified Site near Cochetopa Dome. They believe the site is a fortified defensive one. I believe this site is part of a game-drive system. Radiocarbon dates of 1370±60 B.P. and 140±60 B.P. came from this site.

Lake Fork

O'Neil (1985) has described the Blue Mesa Project test excavations at 5GN1691. Twelve square meters (a small fraction of the total site area) were

test-excavated and numerous tools—including points, scrapers, bifaces, perforators, and ground stone—were found. No features or datable material were found. The site is interpreted as a high-elevation, resource-procurement site.

Mount Emmons Project

The Mount Emmons Project included survey and test excavations at a number of areas to be disturbed by planned mining development (Black 1983b; Black et al. 1980; Black et al. 1981). The researchers dated most archaeological sites by projectile point chronology and assumed that sites that were smaller and had less subsurface archaeological material were less significant than deeper and larger sites (Baker 1981:205).

Among the many sites recorded and tested was 5GN344, interpreted as a high-elevation, short-term camp site. Stone tools, including projectile points and ground stone, were recovered. The remains of a structure were also discovered. A radiocarbon date of 4065±380 B.P. was obtained from fill located sixteen horizontal meters from the structure. This site is at an elevation higher than that of the Curecanti excavations and is not located near the bottoms of the river valley.

WESTERN AREA POWER ADMINISTRATION (WAPA)

A Class III archaeological survey was completed along WAPA access roads in the Gunnison Basin (Rood 1993). Over 120 archaeological sites were recorded during the project, demonstrating the high site density present in the Gunnison Basin. Site types recorded during this project include lithic-procurement sites, stone circles, and camps. A wide range of lithic-scatter variability, in terms of site size and densities, was noted. Unfortunately, the only subsurface excavations associated with this project consisted of one or two test pits and some surface lithic analysis quadrats (Pope 1994).

MILL CREEK SITE EVALUATION

Stiger and Rood (1994) report the results of a mapping and testing project on a lithic-scatter site near Slumgullion Pass, Hinsdale County. The site had been damaged by a timbering operation in the Gunnison National Forest. The subsurface testing was limited in area, but subsurface remains were found. No features were located. The site was believed to be eligible for inclusion on the National Register of Historic Places.

Elk Creek Village

Rood (1998) reported the results of a cooperative project among Western State College, the National Park Service, and the Colorado Historical Society. The Elk Creek Village Project conducted emergency archaeological excavations on a badly eroded site along the shores of Blue Mesa Reservoir in Curecanti National Recreational Area. The excavations revealed several occupations, including one with early (3000 B.P.) house structures and a later one with windbreak/sunshade structures.

URANIUM MILL TAILINGS REMOVAL ACT (UMTRA) PROJECT

Uranium mill tailings near Gunnison were moved to a permanent repository several miles away. This federal cleanup project necessitated road, facility, and barrow area construction. Numerous sites were discovered during this process and mitigative archaeological work was done and reported by Conner and Hutchins (1993). Several prehistoric firepits were located, and ancient trees (an apparently natural deposit) were also located and dated.

U.S. West Phone Line Project

Powers Elevation conducted survey and salvage recovery of archaeological deposits damaged by construction during the installation of buried phone line along U.S. Highway 50. Harrison (1993) describes several features located during this installation, including a single-use firepit dated to about 5000 B.P., the only such feature from a 500-year period of anomalously low prehistoric activity in the Gunnison Basin.

SUMMARY OF GUNNISON BASIN ARCHAEOLOGICAL RESEARCH

The Upper Gunnison Basin has been the scene of several archaeological research projects. A wide variety of feature types has been discovered, including fire-cracked-rock-filled basins, rock-lined firepits, paired boiling pits, unlined small firepits, slab-lined storage pits, unlined storage pits, rock-lined storage pits, houses, game-drive systems, and fortified sites. Many of the sites have yielded radiocarbon dates between 3000 B.P. and 8000 B.P. Later occupations are present, but they are generally smaller and located further from the Basin bottom than are the earlier ones. Future research will produce data for more detailed comparisons.