Final Report on the 2006 Ponderosa Campground Prescribed Burn Survey, Curecanti National Recreation Area, Gunnison County, Colorado

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Executive Summary

The University of Northern Colorado, under contract to the National Park Service, conducted an archeological survey of Ponderosa Campground, Curecanti National Recreation Area, on July 28, 2006. The survey was done as part of an archeological inventory for a larger prescribed burn program under the National Wildlife-Urban Interface (WUI) Program. One small prehistoric site and four isolated finds, associated with ephemeral hunting-gathering activities were documented. The survey's documented cultural resources, when viewed locally and regionally, fit within an annual, seasonal cycle of subsistence procurement and processing common to the region over the past several millennia.

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Introduction

The University of Northern Colorado (UNC) conducted a small mitigation survey of Ponderosa Campground, Curecanti National Recreation Area, on July 28th, 2006. The survey was done as part of a larger prescribed burn project funded under WUI (Wildland Urban Interface), a nation-wide program for hazardous fuels reduction on federal and private lands boundaries.

Ponderosa Campground occupies a northeast-facing mountainside and lower, western Soap Creek terrace in the western Gunnison Basin. It lies just within the National Park Service's Curecanti National Recreational Area, overlooking an inlet of Blue Mesa Reservoir (Figure 1). U.S. Forest Service lands of the Gunnison National Forest are located to the north, east, and west while private land areas are located to the southwest and southeast.

Figure 1. Location of the Ponderosa Campground survey area (green border) in reference to the Curecanti National Recreational Area (National Park Service)

boundary (gray diagonal lines) and those of the Gunnison National Forest (U.S. Forest Service) (green hatched lines) and private lands (no overlay).

The Ponderosa Campground survey was conducted under a National Park Service task order contract under the authority of UNC's membership in the Rocky Mountain Region Cooperative Ecosystem Studies Unit (RM-CESU Agreement Number H1200040001). The survey was accomplished by a four-person archeology team, including the author, with assistance and consultation of National Park Service archeologist Forest Frost. Survey area parameters, established by Mr. Frost, consisted of ~88 acres in a generally steep terrain of northeast-facing mountain slopes and benches, and the western terrace of Soap Creek (see Figure 2 below).

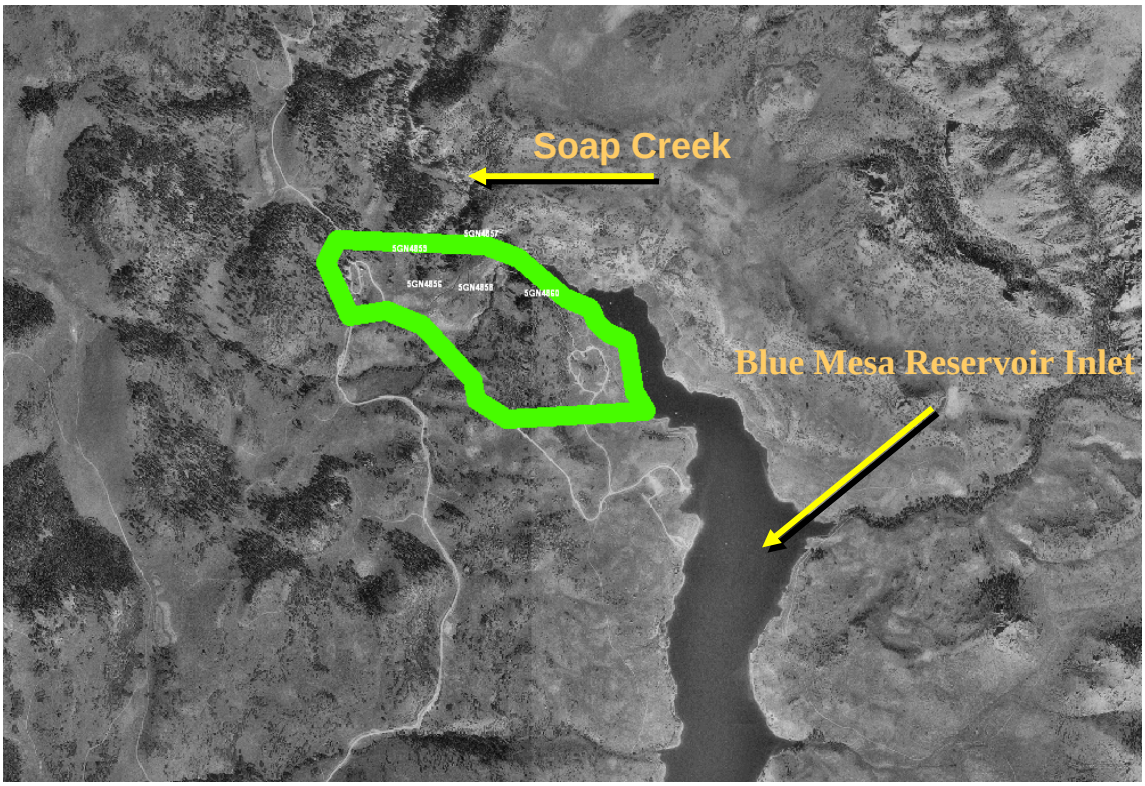

Figure 2. Ponderosa Campground Survey Polygon, shown by the green line. Soap Creek forms the northeastern boundary of the survey area and merges with an inlet arm of Blue Mesa Reservoir in the survey area's lower right hand corner.

Environmental Context

The survey area is situated in the southwest quadrant of the Upper Gunnison Basin's West Elk Mountains. Its location on the western margins of that basin places it near the boundary of two major physiographic provinces-the Southern Rocky Mountains and the Colorado Plateau (cf. Fenneman 1931; Reed and Metcalf 1999: 7-8, Figure 2-1).

Geology

Upland geologic exposures to the west, north and east of the survey area are primarily Tertiary Age West Elk Formation volcanic breccias, andesites, and tuffs (Chronic 1980: 244-226; Tweto 1979; see Figure 3 below, note that the pink area designated Tvl relates to the West Elk Formation). Towering, eroded spires (also known as pinnacles) of West Elk breccia are prominently represented east of the campground. The survey area's local geology consists of Quaternary Landslide deposits of colluvial and alluvial sediments. A map of those deposits surface distributions (coded with the letters Ql) is shown in Figure 3. Outcrops of Cretaceous Age Mancos Shale (Km), with lower, exposed sections of Dakota sandstone (Kd), occur south of the survey area on either side of Soap Creek (see also Figure 3).

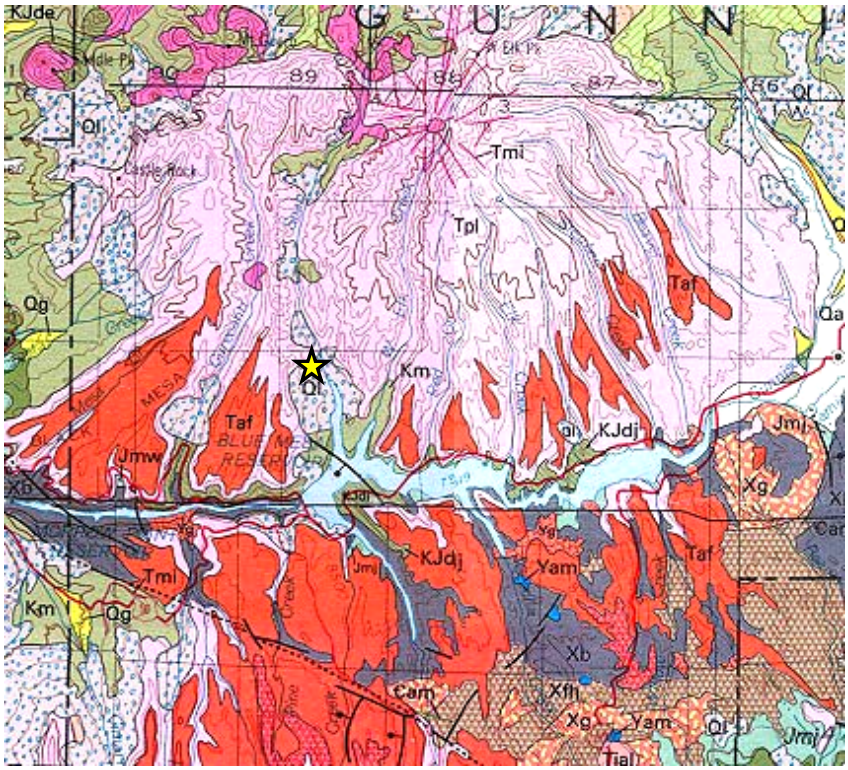

Figure 3. Geologic map of the survey area vicinity extracted from a digitized image of Tweto's (1979) *Geologic Map of Colorado*. The survey area is denoted by a yellow star within a map polygon of Quaternary (landslide) colluvium.

Soil

Survey area soils are primarily derived from upland volcanic formation parent materials and broadly classified as Kubler loam. Kubler series soil types are defined as generally deep and well drained, formed in alluvium or glacial tills, and derived from rhyolite and rhyolitic tuff parent material. They commonly occur on moderately sloping to steep mountain sides (source: www2.ftw.nrcs.usda.gov/osd/dat/K/KUBLER.html). Figure 4 shows a GIS soil map of the survey area and its vicinity.

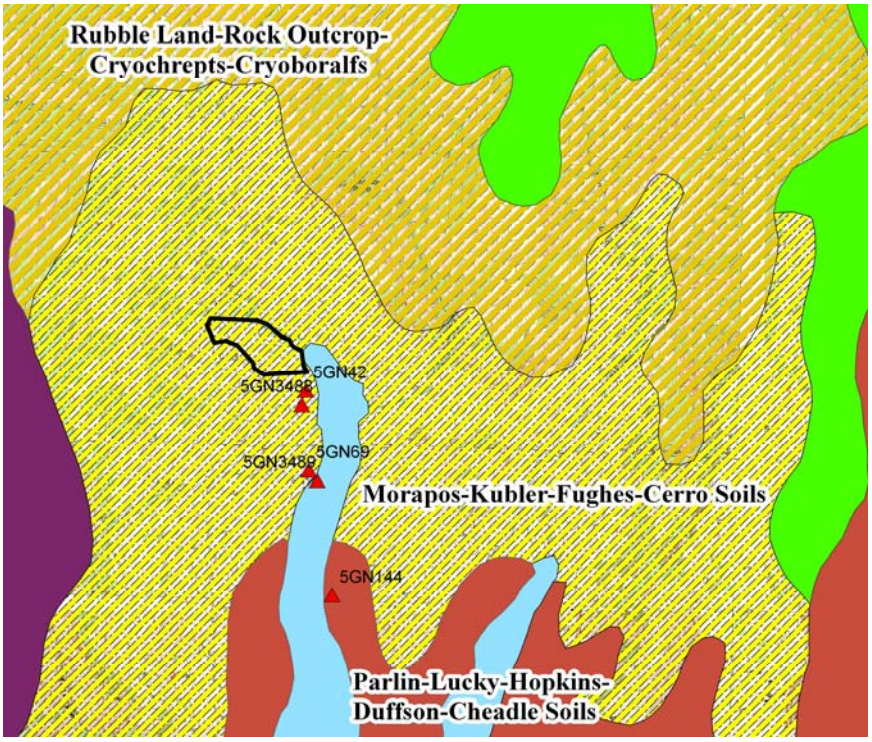

Figure 4. Map showing location of the survey area and local soil class distributions. The survey area is shown as a solid black line polygon.

Flora and Fauna

Ponderosa Campground occurs within an ecological transition zone of big sagebrush and deciduous oak shrublands (see Mutel and Emerick 1992: 87-105 and Woodbury 1962 for details). Plant species common to both ecosystems are interspersed throughout the survey area along with isolated trees (or small stands) of ponderosa pine, the latter more common in a ponderosa pine forest zone at higher, elevation upland locations. In addition to ponderosa pine forest in adjacent uplands, there are also higher elevation forest zones of spruce-fir and aspen where soil, water, and slope conditions support those eco-communities.

Predominant survey area plant species are mountain big sagebrush (*Artemisia vaseyanum*), Gambel's oak (*Quercus Gambelli*), and limited ponderosa pine (*Pinus ponderosa*). Grasses, shrubs, and forbs, many of which have economic and/or medicinal

uses for humans, include slender wheatgrass (*Elymus trachcaulus*), junegrass (*Koeleria macrantha*), Arizona and Idaho fescue (*Festuca* spp.), serviceberry (*Amelanchier* spp.), chokecherry (*Prunus virginianus*), bitterbrush (*Purshia tridentata*), Indian paintbrush (*Castilleja* spp.), common lupine (*Lupinus argenteus*), and maraposa lily (*Calochortus gunnisonii*).

Animals common to the area (Mutel and Emerick 1992: 87-105) are larger herbivores such as mule deer (*Odocoileus hemionus*), elk (*Cervus elephus*), bighorn sheep (*Ovis canadensis*), and pronghorn (*Antilocapra americana*). Buffalo (*Bison bison*) once roamed the Gunnison Basin but were hunted to extinction in the late 19th Century. Smaller mammal species include Nutall's cottontail (*Sylvilagus nutalli*), white-tailed jackrabbit (*Lepus townsendii*), and golden-mantled ground squirrel (*Spermophilus lateralis*). Predator species in the region today include mountain lion (*Felis concolor*), coyote (*Canis latrans*), and the black bear (*Ursus americanus*), the latter technically an omnivore but whose dietary habits are borderline herbivore. Historically present, but now absent, predator species included grizzly bear (*Ursus arctos*) and wolf (*Canus lupis*).

Modern Climate

Modern climate in the Curecanti region is classified as cold and semiarid. More than a century (105 years) of climate records from a nearby Gunnison weather station (www.wrcc@dri.edu) show an annual average precipitation of only 10.43 inches; with July (1.46"), August (1.46"), and September (.99") being the wettest months. The remaining months average less than an inch of precipitation; with November's .58 inches making it the driest month. Most precipitation arrives in the form of rain; with the highest snowfall months being December (10.3"), January (12"), and February (10.2"). Winters

are cold and summers cool; with the coldest winter months averaging well below freezing. The coldest months are December, with an average maximum of 29.9° F. and average minimum of -2.4° F., January, with an average maximum of 25.9° F. and average minimum of -7.2° F., and February, with an average maximum of -31° F. and average minimum of -1.5° F. The warmest (summer) months are June, with an average maximum of 76.1° F. and an average minimum 35.7° F., July with an average maximum of 80.8° F. and average minimum of 42.5° F., and August, with an average maximum of 78.6° F. and an average minimum of 40.8° F.

It should be noted that modern climatic parameters are only broad indicators of past (prehistoric) climatic conditions, known to have varied widely over the past 11,000 years of regional human habitation. Efforts to model prehistoric climate patterns are still in their infancy but some attempts have been made that offer a general sense of what past climatic conditions might have been during different cultural periods (see Reed and Metcalf 1999: 20-28 for a proposed regional paleoclimate model).

Archeological Context

As noted earlier, the Ponderosa Campground survey area is located in the Curecanti National Recreation Area of the western Upper Gunnison Basin. The Gunnison Basin has been subjected to archaeological investigations since the 1930s. C.T. Hurst, a Western State College (Gunnison) professor and co-founder of the Colorado Archaeological Society, conducted and participated in numerous surveys in the Colorado Mountains and Colorado Plateau in the 1930s and 1940s. Colorado Office of Archaeology and Historic Preservation (OAHP) site files suggest that Hurst, along with members of the Montrose Chapter of the Colorado Archaeological Society, conducted

several informal site surveys in the basin during those decades, but limited information is available on their exact nature or results.

Etienne Renaud (1935c: 6-7), University of Denver professor, briefly visited the Gunnison area in June of 1935 as part of his University of Denver Archaeological Survey of Colorado research program. His field notes contain a brief description of two lithic scatter sites near the town of Gunnison, but he generally failed to conduct investigations of substance in the basin.

The University of Colorado conducted surveys along the Gunnison River in advance of Blue Mesa reservoir construction in the early 1960s (Lister 1962). Shortly afterward, the Gunnison Basin's most extensive archaeological investigations, relevant to this survey, were conducted as part of the creation of the Curecanti National Recreation Area and the downstream Black Canyon of the Gunnison National Park. Early Curecanti investigations encompassed five years of surface surveys and test excavations on both sides of the Gunnison River and were successful in identifying dozens of important sites, most with Archaic through Late Prehistoric cultural affiliations (Dial 1989; Euler and Stiger 1980; Jones 1982, 1984, 1986a, 1986b; Stiger and Carpenter 1980). The Curecanti project marked the first time test excavations and radiocarbon dating of site components were extensively employed in Gunnison Basin archeological studies.

Curecanti National Recreation Area archeological surveys during the 1970s formed the basis of a successful National Register of Historic Places nomination of 6,750 acres (in three discontinuous units) as an archeological district within the recreational area boundaries (National Park Service 1979). The initial 1979 district nomination included 79 prehistoric sites, but a recent Colorado State Office of Archaeology and

Historic Preservation (OAHP) Compass site database search by the author identified more than 200 sites and isolated finds recorded within its current boundaries.

Another extensive survey program in the region, the Mount Emmons Project, was conducted on planned mining tracts along the northeastern mountain tier in 1978 and 1979 (Baker 1981; Black 1983; Black, Horvath and Baker 1981; Mueller and Stiger 1983). By the mid and late 1980s, university and college research programs had made significant advances in documenting Gunnison Basin archeological history. These included a Colorado State University Master thesis survey project in the Monarch Pass area (Hutchinson 1990) and Western State College and the University of New Mexico collaboration in the excavation of the Haystack Cave archaeological and paleontological site between 1978 and 2000 (Binford and Nash 1984; Euler and Stiger 1981; Nash 1987).

Increasingly visible involvement in archeological research by Western State College's Anthropology Department began in the 1990s and has been exemplified by Cultural resource Management (CRM) contract and Colorado State Historic Fund-sponsored projects, notably excavations at the Tenderfoot site (Stiger 1993, 2001a), at Chance Gulch (Pitblado 2001a, 2001b, 2001c), and the Mountaineer Folsom site (Andrew 2003; Stiger 2004, 2006) near the town of Gunnison. On-going investigations at the Mountaineer site by Southern Methodist University and Western State College continue a tradition of inter-academic collaboration begun at the Haystack Cave site in the 1980s. The most recent (1998-2000) investigations of the Haystack Cave site involve three institutions: Western State College, the University of New Mexico, and the University of North Carolina-Wilmington (Emslie 1998a, 1998b, 1998c; Emslie and Nash 2000).

Finally, since the 1980s the region has seen a substantial number of smaller survey and test excavation programs conducted "in-house" or contracted to private CRM firms by federal and state agencies, including this one (cf. Broadhead 1999, 2001; Hammack and Hammack 1986; Liestman and Gilmore 1988; Lyons and Johnson 1993). Many of those projects contributed to increasing the inventory of documented sites within Curecanti Archeological District (cf. Dial 1989; Jones 1993, 1996).

The Survey Area's Prehistoric Record

As of 2006, a minimum number of 2,033 prehistoric sites and isolated finds were listed on the Colorado Office of Archaeology and Historic Preservation Compass Database for Gunnison County. Of that number, 40 were listed as having cultural affiliation with Paleoindian cultural complexes (ca. 11,300-7,500 b.p.), 278 belonging to the Archaic Stage (ca. 7,500-1950 b.p.), 87 being generically Late Prehistoric in origin (1950-1500 b.p.), 2 of Pueblo I/II/III derivation (ca. 1200-650 b.p.) , and 12 being Protohistoric (ca. 1500-140 b.p.) in age (see OAHP 2003; Reed and Metcalf 1999: 56-169; Reed and Gebauer 2004; Reed and Scott 1981; and Stiger 2001a: 26-27 for detailed information on regional cultural histories and chronologies). More than 200 prehistoric sites, ranging from open camps to lithic reduction (tool manufacturing and refurbishment) localities, have been documented within the Curecanti National Recreation Area. Figure 5 shows the distribution of prehistoric sites within and adjacent to Curecanti boundaries.

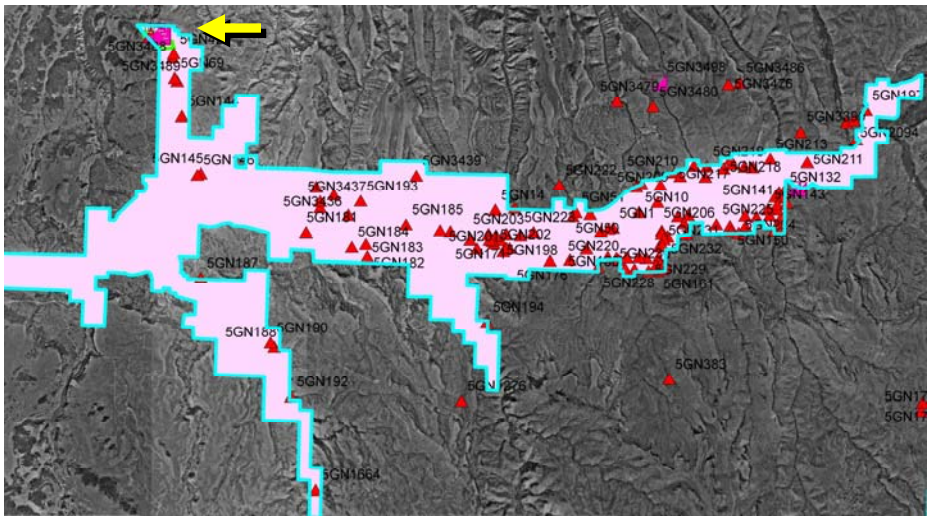

Figure 5. GIS map of prehistoric site distributions within the Curecanti National Recreation Area. The yellow arrow shows the location of the Ponderosa Campground survey area.

A search of OAHP computer site database records and consultation of site forms prepared by the National Park Service but not yet entered in that database revealed 12 sites and isolated finds within a 5 km radius of the survey area. Table 1 provides brief summaries of those resources. A following narrative section provides more complete descriptions of those sites and isolated finds.

Table 1. Summary of prehistoric sites and isolated finds within 5 km of the Ponderosa Campground survey area.

Site No.	Site Type	Function/Activity	Cultural Period (s)
5GN42	Lithic/groundstone scatter, Open camp, Architectural	Hunting/game processing Plant gathering & processing, Lithic tool manufacture & refurbishment	Late Paleoindian, Late Archaic, early Late Prehistoric
5GN69	Lithic/groundstone scatter, Open camp	Hunting/game processing Plant gathering & processing, Lithic tool manufacture & refurbishment	Early Archaic, early Late Prehistoric
5GN144	Lithic/groundstone scatter, Open camp	Hunting/game processing Plant gathering & processing, Lithic tool manufacture & refurbishment	Early (or Late) Archaic, Late Archaic/early Late Prehistoric

5GN3488	Lithic scatter, open camp	Hunting/game processing, lithic tool manufacture/refurbishment	Middle Archaic
5GN3489	Lithic/groundstone scatter, open camp	Hunting/game processing, plant gathering & processing, lithic tool manufacture & refurbishment	Late Paleoindian (Cody Complex)
5GN3494	Isolated find, single chert flake,	Tool refurbishment	Unknown
5GN3643	Isolated find, partial chert projectile point	Hunting	Late Archaic ?
5GN3644	Isolated find, three quartzite flakes	Tool refurbishment	Unknown
5GN3645	Isolated find, single quartzite flake	Tool refurbishment	Unknown
5GN3646	Isolated find, quartzite ovate scraper/knife	Game processing	Unknown
5GN3647	Isolated find, single chalcedony flake	Tool refurbishment	Unknown
5GN3648	Lithic/groundstone scatter, open camp	Hunting/game processing, plant gathering & processing, lithic tool manufacture & refurbishment	Late Archaic, early-mid Late Prehistoric, late Late Prehistoric-Early Historic

Of 12 cultural resources within a 5 km survey area radius, 6 are classifiable as sites and 6 as isolated finds (having 10 or fewer artifacts). Figure 6 shows the locations of those resources relative to the survey area and its inclusive sites.

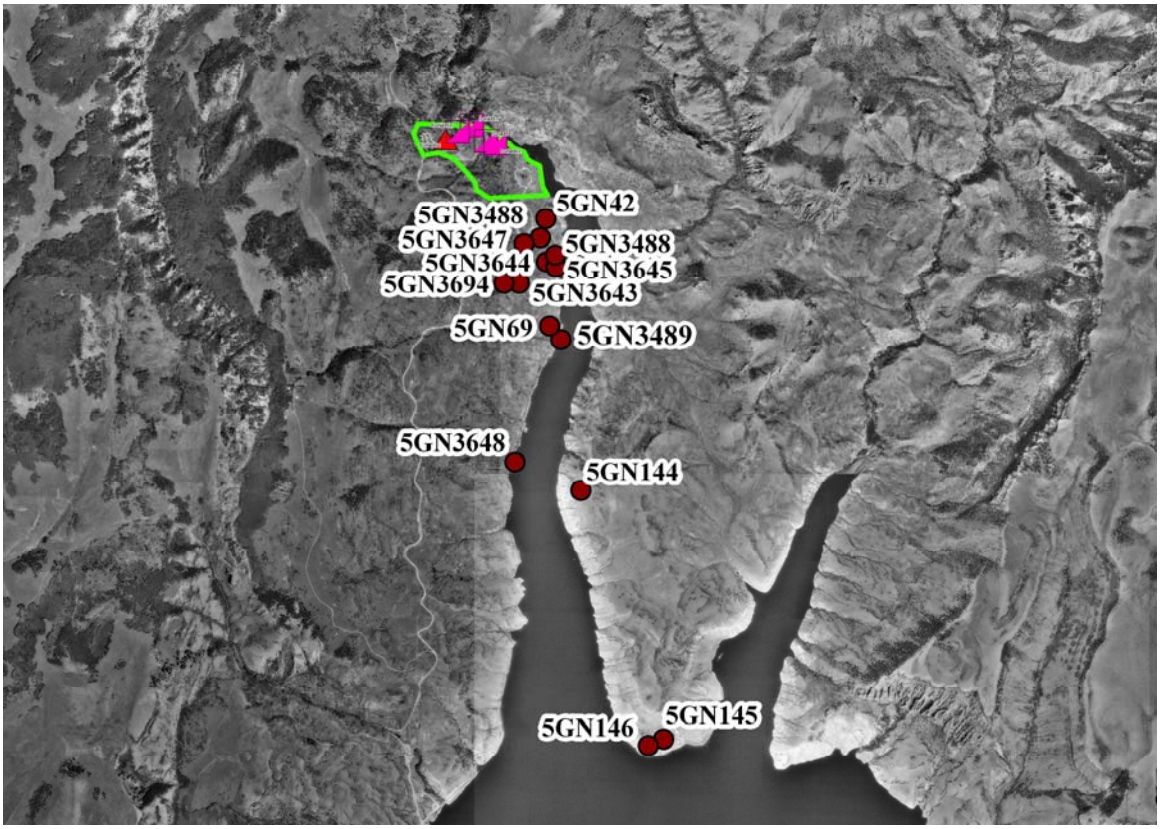

Figure 6. GIS map showing locations of sites and isolated finds within a 5 km radius of the survey area. Two sites shown on the map, 5GN145 and 5GN146, are outside the 5 km radius and not described in text.

In order to establish a generalized context of prehistoric cultural resources in the immediate survey area, each resource is described below in two sub-sections, one dealing with sites and the second with isolated finds.

Sites in the Ponderosa Campground survey area

5GN42 is one of the best documented sites outside the survey area. It is a lithic and groundstone scatter, representing a series of short-term hunting and gathering camps, situated on a hillside bench east of Soap Creek. Test excavations in 1981 revealed ca. 16 cm of buried cultural deposits in several 1 x 1 m test units (Jones 1981, 1986). Burnt wood and clay recovered at a depth of ~15 cm were interpreted as reflecting the former

presence of a wood-frame (branch), clay-sealed habitation structure. Artifacts, mainly found on the surface, included 2 projectile points, a large (40 x 40 x 4 cm) metate, and assorted lithic tool debitage. The projectile points consisted of a serrated, triangular, corner-notched Late Archaic (ca. 3,000-1,900 b.p.) type and a small, later Late Prehistoric (ca. 900-250 b.p.) side-notched point type. Tool debitage consisted of mainly secondary stage manufacturing and re-tooling flakes, of which half were local quartzite and the remainder locally available jasper and agate. Obsidian, possibly of local origin, was also reported.

Several charcoal samples were recovered from test excavation units and submitted for radiocarbon-dating (cf. Jones 1984, 1986: 18-25). Dating results (Table 2) supported projectile point evidence of a Late Archaic occupation, but also indicated the existence of a possible early Late Prehistoric presence. A later Late Prehistoric component is represented by the side-notched point. What was surprising were 3 radiocarbon dates between ca. 8,800 and 7,670 b.p., suggesting a possible Late Paleoindian presence at the site, a possibility not documented by diagnostic artifacts.

Table 2. List of Radiocarbon Dates from 5GN42 Test Excavations

Radiocarbon Dates	Laboratory Numbers
Late Paleoindian Period	
8796±140 b.p.	Beta-8123
8271±210 b.p.	Beta-8120
7674±330 b.p.	Beta-8119
Late Archaic Period	
2204±60 b.p.	Beta-1822

1823±50 b.p.	Beta-3279
early Late Prehistoric Period	
1627±70 b.p.	Beta-8121

5GN69, another prehistoric camp, is a lithic-groundstone scatter, situated on a low mountain slope rise west of the Blue Mesa Reservoir shoreline. The site once overlooked Soap Creek, but its channel was submerged with filling of the reservoir more than forty years ago. Prior to reservoir flooding, the site had been located 30-40 m upslope from the creek. A small, spring-fed tributary of Soap Creek, Saddle Creek, is located on the mountain slope ~120 m southeast of the site.

5GN69 test excavations (1981) revealed shallow (10-15 cm), discontinuous, buried, cultural deposits, with only 3 of 9 1x1 m test units producing cultural materials (Jones 1986: 62-67). Artifacts recovered from surface and sub-surface contexts included 2 projectile points and several unifacial/bifacial tool fragments (scrapers, knives, denticulates, spokeshaves…). Two groundstone fragments made of local welded tuff were also recovered along with substantial amounts of tool manufacturing/re-tooling debitage. One of the projectile points was an elongated, triangular, convex-base, shallow corner-notched type common during Early Archaic times (ca. 7,500-4,500 b.p.). The second point is much later in origin. It is a triangular, deeply corner-notched example with pronounced tangs, corresponding to the well-known Rose Spring type of the early late Prehistoric Period (ca. 1,900-900 b.p.). Comments on 5GN69's past function by its excavators noted it likely represented multiple occupations associated with monitoring of

area game-trails and a hunting and "…short-term collecting camp for wild vegetal resources." (Jones 1986: 65).

5GN144 is a small, open camp lithic scatter situated on the west slope of a high ridge line separating Soap Creek and West Elk Creek. Artifacts collected at the site included 2 quartzite projectile points, a biface tip, 2 sandstone manos, and 37 secondary and tertiary stage manufacturing/re-tooling flakes. The majority of flakes (34) were a white to gray quartzite of local origin. Another flake was chalcedony and 2 others were local welded tuff (breccia). The projectile points were an Early (or possibly Late) Archaic (ca. 7,500-4,500/3,000-1,900 b.p.) elongated, triangular, convex-base, shallow corner-notched type. The second point was a triangular, stemmed, flat based, wide corner-notched type belonging to a Late Archaic or early Late Prehistoric time range (ca. 3,000-900 b.p.).

5GN3488 was a light lithic scatter on an east-facing, lower mountain slope bench overlooking the now submerged (in Blue Mesa Reservoir) Soap Creek. Its artifact inventory consisted of 3 tool fragments and a small number of secondary and tertiary flakes. Documented tools included 2 quartzite projectile point fragments, both relatively intact. One of the points is ovate with a hint of very shallow notching on one side. The opposite basal section is missing. Its point type and cultural affiliation is uncertain but it may be later Late Prehistoric (ca. 800-300 b.p.) in origin. The type and cultural affiliation of the second point are more definitive. The second point consists of the lower two-thirds of a shouldered, stemmed Middle Archaic (ca. 4,500-3,000 b.p.) type, classified in the Great Basin as Pinto or in the Rocky Mountains and Central Plains as McKean. A third formal tool was an extremely well-made ovate, chert knife-scraper. Other noted artifacts

were 47 quartzite and 15 chert flakes associated with tool manufacture and/or refurbishment.

One of the most impressive sites in the survey area vicinity is 5GN3489. It consists of two adjacent lithic scatter concentrations (designated A and B) on the south side of Saddle Creek, a small spring-fed tributary of a section of Soap Creek now submerged in Blue Mesa Reservoir. Area A is located on a bench area 15-20 m upslope from Area B. Area B is situated on a extruding extension of shoreline that in most normal runoff years is submerged in the reservoir. Although the site was not formally tested in its 2000 survey, its Colorado State site form notes the presence of partially intact, shallow subsurface deposits and buried features (hearths). This was confirmed by a trowel test along the site's eroded shoreline margins which exposed 20-25 cm profile of dark, organic-rich soil below a 5 cm thick surface sand layer. The organic layer, almost certainly cultural in origin, was superimposed over a clay deposit.

The higher elevation Area A produced 15 lithic quartzite and chert flakes, the product of what appears to have been one or more limited episodes of tool manufacturing or refurbishment. Area B, on the margins of Blue Mesa Reservoir, had more substantial cultural remains, producing a complete chert projectile point, a partially intact chert, spurred scraper/engraver, a sandstone metate fragment, seven whole and partial manos, and 86 quartzite and chalcedony secondary and tertiary manufacturing stage flakes. All documented artifacts were found on the site's surface, although some may have been repositioned through soil turbation shallowly buried (~5 cm) cultural deposits. The single recovered projectile point, made of red chert, was a classic stemmed, lightly shouldered, transverse-flaked type belonging to the Late Paleoindian Cody Complex (ca. 9,400-8,300

b.p.). A second formal tool, a spurred graver, reinforces the existence of a Paleoindian age for the site because that tool type, although occasionally found in later cultural periods, is often considered a "marker" artifact for earlier Paleoindian components, particularly the Folsom Period. Pending test excavation and radiocarbon-dating, it is unclear whether the buried cultural layer in Area B represents an intact Paleoindian component. However, that possibility makes 5GN3489 an intriguing candidate for further investigation, particularly in light of the fact that its eastern margins are eroding into Blue Mesa Reservoir.

The final site to be discussed is 5GN3647, a lithic-groundstone open camp situated on a lightly sloping terrace located 152 m west of the Blue Mesa Reservoir low-water shoreline when the site was surveyed in May 2001. However, during normal to high-water reservoir level periods (not the case during its survey), most of the site is under water. The original, now submerged, channel of Soap Creek is located off-shore. The site's artifact scatter was distributed on either side of a small, spring-fed tributary of the now-submerged Soap Creek.

Although water erosion of the site's surface was determined to be extensive, a 2001 shovel test indicated that 10-20 cm of buried cultural deposits remained largely intact. Artifacts recovered from 5GN3647 included 3 projectile points, 2 quartzite scrapers, 4 biface knives, several mano and metate fragments, and 54 chert, chalcedony, and quartzite debitage flakes. The 3 projectile points consisted of a triangular, corner-notched and serrated Late Archaic (ca. 3,000-1,900 b.p.) type, a small early-mid Late Prehistoric (ca. 1,900-1,000 b.p.) corner-notched point, and an unnotched, later Late Prehistoric or Early Historic (ca. 1,000-250 b.p.) type. The existence of multiple

occupations at the site appear to represent short-term hunting and plant-gathering camps situated adjacent to a good water source (Soap Creek and its spring-fed tributary) and mountainside game gazing areas.

Isolated Finds in the Survey Area Vicinity

A total of 6 isolated finds (IF) have been documented within 5 km of the Ponderosa Campground survey area boundaries (see table 1 above for details). All appear to represent brief, single activity events, ranging from lost weapons components during hunting (projectile points or point fragments) to game processing (scrapers, knives…) and tool-refurbishment (secondary or tertiary stage flakes). Their locations are all on mountain or mesa slopes well back from the Soap Creek stream corridor where foraging game and game trails would have commonly occurred. Only 1 IF, 5GN3643, represented a potentially diagnostic tool, an ovate biface with a missing tip and largely missing basal section. However, an intact portion of 1 lower blade side and its upper base section show a possible, shallow side/corner notch indentation suggesting the tool may have served as either a projectile point, possibly Late Archaic (ca. 3,000-1,900 b.p.) in affiliation, or a hafted knife. The remainder of isolated finds consisted of individual flakes or small flake scatters, reflecting very short-term, likely single event cultural activities associated with game or plant food procurement and processing.

Gunnison Region Lithic Material Sources

Determining sources of stone (lithic) tool materials provides important information for inferring migratory movements of prehistoric hunter-gatherer populations and reconstructing lithic technologies. Lithic source material studies for the Gunnison Basin and its surrounding region remain limited in scope and number, but some important

information for reconstructing local versus more exotic use of lithic resources is available. In 1997, Stiger published information on a limited survey of non-quartzite, mainly chert and obsidian, sources as part of a Colorado State Historic Fund grant project. Results of the survey were later published as an appendix in his 2001 book, *Hunter-Gatherer Archaeology of the Colorado High Country*. Although Stiger described several primary and secondary source lithic quarry sites in his two reports, they provided little specific information on geologic provenance for those sources. Black (2000: 134-136, Appendix 9.1-144-145), in an edited conference proceedings article on Colorado mountain lithic sources, lists more than 40 quarries, primarily quartzite, within the Gunnison Basin and its environs. Within the upper Gunnison Basin itself (Gunnison County), both primary and secondary quartzite tool sources are ubiquitous and, as commented, by Black (2000: 135) "…the ground is literally paved with quartzite for long stretches in many areas." Fair to excellent quality quartzite and sandstone for flaked and ground stone tools primarily come from Jurassic deposits (Junction Creek and Morrison). Dial (1989: 61) and Liestman (1985) report a relative abundance of unworked and culturally worked quartzite cobbles from several Curecanti sites, the quartzite in question originating from the Junction Creek member of the Jurassic age Wanakah Formation (see O'Sullivan 1992, 2004 for details). Smaller amounts of chert and jasper also occur as secondary cobbles and gravels and may also have eroded from the same Junction Creek source. Other Mesozoic (Cretaceous) sandstone and quartzite formations (primarily the Dakota and Burro Canyon formation) occur in extreme western Gunnison Basin areas, including Curecanti. Black (2000: 134) has noted the existence of petrified wood sources near the town of Parlin.

Several important volcanic source materials occur in southern, southeastern, and western sections of the Gunnison Basin, including Curecanti. Its western hills and mesas, particularly in the vicinity of the Black Canyon of the Gunnison, are capped by welded ash flow deposits. Welded tuff from one formation, Sapinero, has been reported as being used for stone tools at several area sites and worked welded tuff rock at the earlier noted Haystack Cave site also contained nodules of red volcanic jasper.

Extensive primary and secondary Tertiary age volcanic deposits (rhyolite, andesite, welded tuff, basalt, obsidian, and volcanic chert) occur in southern uplands of the Gunnison Basin and in San Juan Mountain flanks to the south. Particularly good tool-material producing volcanic deposits, some associated with large quarry sites, are found within a 30 km radius of Cochetopa Dome, a heavily eroded dome and caldera outside the southeast corner of the Gunnison Basin. Cochetopa Dome itself is one of the few known obsidian sources in the Colorado Rockies, but provides only small nodules unsuited for most tool uses (Stiger 1997, 2001b).

Lithic source studies were conducted as part of multi-year excavations of the Chance Gulch site in the uplands southeast of Gunnison (Pitblado et al. 2005; Stamm 2001). They documented the existence of locally available clast materials, including Tertiary Age breccia, Fish Canyon tuff, West Elk breccia, and Precambrian quartzite, some of which had been used for tool manufacturing at the site. An attempt was also made to identify quartzite sources through geochemical (XRF) and Ultra-violet florescence analysis, with limited success (Pitblado et al. 2005).

At least three chert sources are known for the Gunnison Basin. Stiger (1997, 2001b) and Andrews (2003) noted existence of a white chert from the Cochetopa Dome area, but provide limited details on its characteristics and geological provenance.

Ponderosa Campground Survey Methods and Data Analysis

Standard field survey techniques were used to identify and document archeological sites and isolated finds within the designated Ponderosa Campground survey area. The survey crew walked north-south transects in a zigzag pattern from the survey area's upper mountain slopes to its boundary with Soap Creek. Each lower slope survey transect was marked with 30 cm long wire flags, delineating the starting survey line for each subsequent transect. The previous flag line was retrieved by the end (upper slope) team member during each transect. Figure 7 illustrates the shape, relative size, and local landscape features of the survey area.

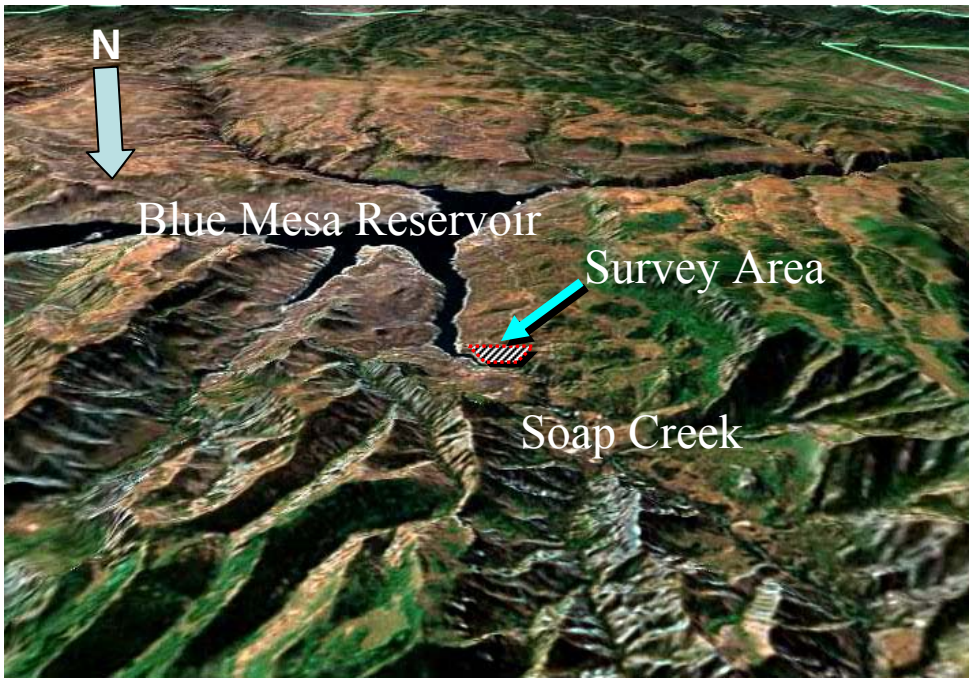

Figure 7. Orthographic overview of Ponderosa Campground Survey Area (small polygon) and its relationship to the surrounding landscape. Background imagery extracted from GoogleEarth™ web site.

UNC surveyors maintained 10 meter intervals throughout the pedestrian survey. As surface artifacts or features were identified, they were flagged and temporarily left in place while the survey team continued completion of each transect. Later, the survey team returned to flagged areas for more intense (2-4 m interval) survey coverage. Then each site or isolated find locality was documented using survey forms that addressed Colorado State Site form data requirements and recorded standard National Park Service condition assessment (CIS) protocol information. Spatial data for all cultural resources were collected using a sub-meter Global Positioning System unit (a Trimble Geo-XT™) for site mapping (including the positions of all artifacts) or individual IF location recording. Detailed descriptions of artifacts and features of sites and IFs were recorded on customized artifact and feature record forms and keyed to spatial coordinates simultaneously being logged on the GPS unit's electronically-stored data dictionary files. Lithic tools were described, measured, and all tools and a representative sample of lithic debitage were field-photographed using a 5.0 megapixel digital camera. The need for artifact collection was minimized due to the above high resolution recording process and only unusual or formal tools were retrieved for later laboratory analysis.

On completion of field survey, GPS data were differentially corrected in the Trimble Pathfinder computer program using Gunnison region GPS base station correction logs downloaded from Internet base station web sites. GPS points collected in the survey were subsequently determined to have three-dimensional precision at one standard deviation (1 δ) ranging .3 to .5 meters. Differentially corrected data sets, with their associated data dictionary information, were exported to the Access™ database program, processed into appropriate report formats, and then saved as Excel™ and dBase IV™

files. Excel™ spreadsheet files of GPS spatial data were imported into the Surfer™ mapping program to produce detailed site maps while dBase IV™ spatial data were assembled into a multi-variable (resource number and individual descriptive and UTM position data for all artifacts and features, along with interspersed contour point data) data file for each cultural resource. The aggregate data file for the complete project area and all its inclusive cultural resources was imported into the ArcGIS™ program for Geographic Information System-based map production and GIS predictive location modeling if desired at a later stage of research.

Prior to the survey, a master ArcGIS™ project was created with all known recorded sites and isolated finds for the Curecanti National Recreational Area and its inclusive Gunnison Basin region. With subsequent addition of hydrology and environmental data layers, an ArcGIS™ project was produced that can be used in modeling site location patterns for subsequent archeological research in the Curecanti National Recreational Area. However, due to the limited scope and goals of the Ponderosa Campground survey, no attempt was made to do GIS site modeling and the assembled GIS project was only used to produce maps for this report (see below).

Colorado State Site and Isolated Find forms were completed within 10 days of the survey and submitted to the National Park Service in paper and .pdf formats along with a preliminary project report (cf. Brunswig 2006). The following section provides an expanded narrative and analysis of survey results previously provided in the earlier site forms and preliminary report.

Ponderosa Campground Survey Results

One prehistoric site and four isolated finds were identified during the Ponderosa Campground survey (see Figure 8).

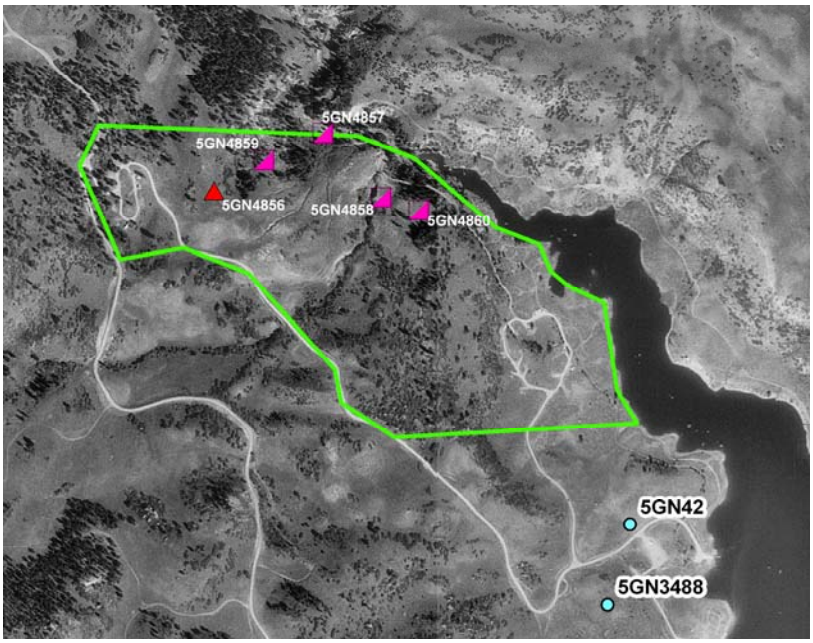

Figure 8. ArcGIS™ map of the Ponderosa Campground survey area. Locations of the survey's only identified site and four isolated finds are superimposed over a geo-referenced aerial photograph of the survey area and its immediate environs.

The survey's single site, 5GN4856, was located on a mountain slope bench in the upper survey area above a natural spring. Four stone tools and thirty secondary and tertiary manufacturing stage flakes were mapped, described, and photographed. Figure 9 shows an overview of the site facing northeast while Figure 10 is a site map generated from sub-meter GPS data by the Surfer™ mapping program.

Figure 9. Overview of 5GN4856 to NE. Orange flags mark locations of individual artifacts.

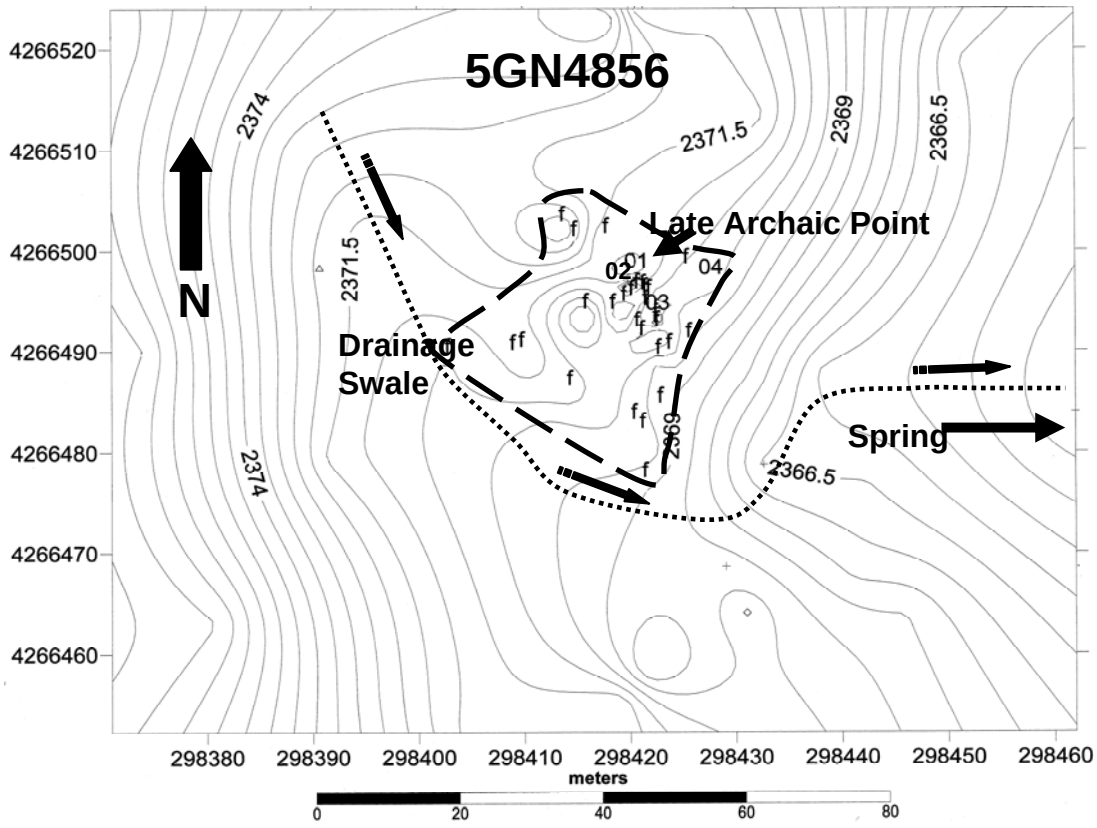

Figure 10. 5GN4856 site map generated from GPS data in the Surfer™ mapping program. Lower case f's represent individual flakes while numbers refer to tool

locations. The location of the Late Archaic projectile point fragment (001) is directly labeled as such. The dashed line shows the limit of site artifact scatter.

The site's only culturally-diagnostic artifact was a dark brown (Munsell No. 7.5YR 3/2) quartzite, corner-notched projectile point fragment, provisionally identified as Late Archaic (3,000-1,900 b.p.) in cultural affiliation (Figure 11).

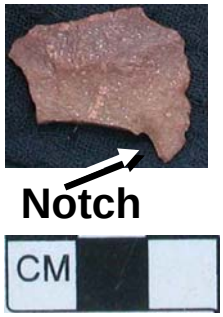

Figure 11. Projectile point fragment (5GN4856-001). The arrow points to remnants of a corner-notch.

The sites' remaining three tools consisted of a formal, hafted scraper (5GN4856-002) made of chalcedony, an informal (utilized flake) knife/scraper of quartzite (5GN4856-003), and a petrified wood scraper (formal tool) (5GN4856-004) (Figure 12a, b, c).

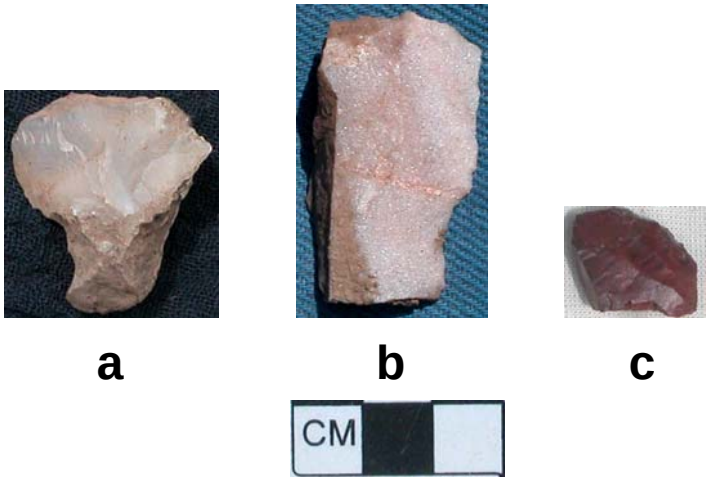

Figure 12a, b, c. Lithic tools from 5GN4856.

Several secondary flakes had weathered cortex sections, indicating they had likely come from locally available materials. Tool and debitage materials consisted of quartzite, chert, chalcedony, silicified (welded) volcanic tuff, petrified wood, and 1 obsidian. Except for the obsidian flake, all the site's lithic artifacts were made of materials available from area geological sources, particularly secondary source quartzite, chert, and chalcedony from the Wanakah Formation's Junction Creek member. Welded tuff artifacts almost certainly were derived from local West Elk breccia or West Gunnison Basin Fish Canyon tuff sources. A single obsidian flake recovered during survey and submitted to the Geochemical Research Laboratory (California) was subjected to non-destructive energy dispersive x-ray fluorescence (edxrf) analysis. Comparison of trace element composition ratios with a Geochemical Research Laboratory reference database showed its obsidian matched that of "the Cerro del Medio (a.k.a. Valles Rhyolite) chemical type, erupted in the Jemez Mountains of northern New Mexico" (Hughes 2006; cf. Appendix A). The Cerro del Medio source corresponds well with an apparent Gunnison Basin obsidian source pattern documented in Stiger's (2001c) list of 45 analyzed obsidian samples from 10 Gunnison County sites. All but 3 samples from that list originated at New Mexico locations and 2 came from the same Cerro del Medio source as the 5GN4856 example. The site is inferred as having served as a short-term hunting/game and/or plant processing camp, possibly over multiple periods of use.

The survey's 4 isolated finds consisted of 5GN4857 (a single chert secondary flake), 5GN4858 (a chalcedony flake scraper and chert shatter flake), 5GN4859 (a quartzite knife), and 5GN4860 (a quartzite secondary retouch flake). All were found on eroded terrace knolls and benches above and west of Soap Creek.

The most significant isolated find, 5GN4859, was a pinkish gray (Munsell 7.5 YR 6/2) bifacially-flaked knife/scraper with a graver (or drill) "beak" at one end (see Figure 13). It was found on a high terrace bluff top more than 10 m above and overlooking Soap Creek. The survey's remaining isolated finds consisted of informal tools or flakes. All isolated finds represent short-term, mainly single event, activities associated with re-working weapons or processing game animals and/or plant foods.

Figure 13. Photograph of 5GN4859 knife-scraper with graver or drill tip.

Conclusion

All cultural resources documented in the Ponderosa Campground survey reflect short-term hunting and gathering activities associated with primary procurement and early stage processing of animal and plant products. They correspond closely to previously reported classes of cultural resources in the immediate survey area, with the exception of short-term, multi-component camp occupations on terraces or benches adjacent to Soap Creek. Survey area sites and isolated finds represent residual components of seasonally-scheduled hunter-gatherer subsistence systems over more than 9,000 years. Those systems, to varying degrees and in different time periods, would have approximated Black's (1982: 165-168; 1983: 21-23) Gunnison Basin seasonal

transhumance model which portrays Archaic through historic lifeways as characterized by late spring/summer/early fall exploitation of upland (higher mountain) migratory game (elk, deer, bighorn sheep, etc.) and economic plants, and cold season (late fall/winter/early spring) exploitation of lower elevation, sheltered valley ecosystems. Dial (1984: 134-135) has suggested that, if Black's seasonal transhumance model is valid, prehistoric warm season, upland-based cultural activities would have likely been characterized by a residentially mobile, foraging-based subsistence sub-system while cold season activities would have been more sedentary in nature and tied to longer-term camps and a more logistically organized economic resource procurement strategy. This author has documented the existence of similar prehistoric seasonal transhumance patterns in the Rockies of north central Colorado, with the exception of that region's high-altitude, warm-season hunting-gathering sub-systems (often involving constructed game drive complexes) which appear to have been logistically (centrally) organized and often operating from residentially long-term base camps (Brunswig 2004, 2005, *in press*). While the precise role of the Curecanti sites and isolated finds in an annual seasonal subsistence cycle is uncertain, they likely represent elements of either cold season subsistence patterns or intermediate short-term visits to the area during migratory movements to and from higher elevation, warm season resource territories.

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Appendix A

Obsidian Source Analysis Report on a Secondary Flake from 5GN4856

Geochemical Research Laboratory Letter Report 2006-77

August 8, 2006

Dr. Robert H. Brunswig
Director, School of Social Sciences
Candelaria Hall 2200
University of Northern Colorado
Greeley, Colorado 80639

Dear Bob:

The table below present energy dispersive x-ray fluorescence (edxrf) data generated from the analysis of an obsidian flake from archaeological site 5GN4856, Curecanti National Recreation Area, Colorado. The research reported here was completed pursuant to your letter request of August 2, 2006. Laboratory equipment, protocol and analysis conditions, and comparative literature references are the same as I reported last year for samples from North Park Valley (Hughes 2005).

Quantitative Composition Estimates for an Obsidian Flake from 5GN4856, Colorado

Cat. Number	Trace Element Concentrations											Ratio	Obsidian Source (Chemical Type)
	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	
5GN4856, Surface	nm	nm	158 ±4	8 ±3	47 ±3	156 ±4	53 ±3	nm	nm	nm	nm	25	Cerro del Medio, New Mexico
U.S. Geological Survey Reference Standard													
RGM-1 (measured)	nm	nm	151 ±4	103 ±3	25 ±3	213 ±4	9 ±3	nm	nm	nm	nm	64	
RGM-1 (recommended)	32	15	149	108	25	219	9	807	1600	279	1.86	nr	

Values in parts per million (ppm) except total iron [in weight %] and Fe/Mn intensity ratios; ± = x-ray counting uncertainty and regression fitting error at 120-360 seconds livetime. nm= not measured. nr= not reported.

Edxrf data in the enclosed table indicate that this flake from 5GN4856 was made from obsidian of the Cerro del Medio (a.k.a. Valles Rhyolite) chemical type, erupted in the Jemez Mountains of northern New Mexico. I hope this information will help in your analysis and interpretation of cultural material from this site. Please contact me at my laboratory ([650] 851-1410; e-mail: rehughes@silcon.com; web site: www.geochemicalresearch.com) if I can provide any further assistance or information.

Sincerely,

Richard Hughes

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

REFERENCE

Hughes, Richard E.
2005 Energy Dispersive X-ray Fluorescence Analysis of Obsidian Artifacts from Three Sites in North Park Valley, North-Central Colorado Rocky Mountains. Geochemical Research Laboratory Letter Report 2005-77 submitted to Robert H. Brunswig, University of Northern Colorado, December 9, 2005.