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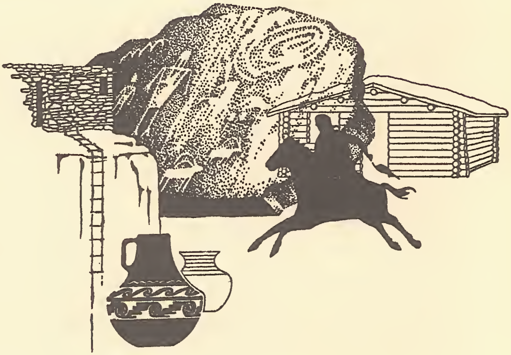
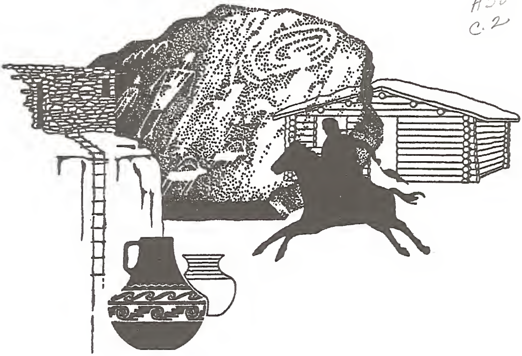


CULTURAL RESOURCE EVALUATION IN CENTRAL UTAH 1977

F. R. Hauck

CULTURAL RESOURCE SERIES
No. 3



CULTURAL RESOURCE EVALUATION IN CENTRAL UTAH 1977

F. R. Hauck

"This report was prepared under contract No. 14-08-0001-16479 to the U.S. Geological Survey, for cultural resource data as a part of an environmental impact statement, but has not been reviewed for conformance with the editorial policy of the Survey."

CULTURAL RESOURCE SERIES

No. 3

FOREWORD

"Cultural Resource Evaluation in Central Utah" represents the third volume in a series of Cultural Resource Monographs published by the Utah State Office of the Bureau of Land Management.

"Cultural Resource Evaluation in Central Utah" was prepared by Dr. F. Richard Hauck and staff of Archaeological-Environmental Research Corporation of Salt Lake City, Utah, under contract to the U.S. Geological Survey and in consultation with the Bureau of Land Management. This study was necessary to analyze the impact coal mining in Central Utah might have on cultural resource values.

William G. Leavell

William G. Leavell
BLM Associate State Director for Utah

ABSTRACT

The Central Coal Cultural Resource study was designed to correlate the cultural data base with the potential adverse impacts related to the development of coal mining.

Class I and II cultural resource inventories were conducted on 3,623,000 acres of BLM and 1,146,000Forest Service-administered lands. By BLM definition, Class I studies provide a review and synthesis of existing cultural resource information while Class II inventories identify and record, by sampling, all cultural resource sites within a study area. The cultural coal project Class II inventory, representing a vegetative stratification of one percent of the total acreage, located 401 cultural sites.

Richard E. Fike

PREFACE AND ACKNOWLEDGMENT

The 1977 Central Coal Project was conducted under a joint USGS, BLM, and U.S. Forest Service contract awarded to AERC in the spring of 1977. The purpose of the project was to evaluate the coal industry-related impact potential upon the cultural resources of 4,769,000 federal acres in east central Utah. To facilitate this study, an extensive records evaluation of both prehistoric and historic data was conducted in coordination with an intensive field survey of 49,760 acres contained in 311 randomly selected sample units of 160 acres each. The final three volume report was completed in the fall of 1977. Elements of all three volumes have been utilized to prepare this publication.

Although the project contract originated in the Washington, D.C. offices of the USGS under the direction of Esther Williams and Mary S. Ridgway, various BLM and U.S. Forest Service personnel in Utah contributed to the contract through the preparations of research criteria and the selection of the sample units. Bruce Louthan, Rowena Dalla, Shelley Dickey and Evan DeBloois participated in this effort. Richard Fike, the BLM archeologist in the Utah State Office, coordinated the proposal development and eventually was designated as the project COAR. Our appreciation is extended to Richard Fike, Evan DeBloois (USFS Region 4 Archeologist), Frank McElwain, (USFS coordinator for the Central Utah Task Force on Coal Development), and all other government administrators who contributed to this project.

Acknowledgment must also go to a number of past and present AERC employees who contributed to the preparation of the initial report. Asa Nielson, the field coordinator for the archeological research, and crew chiefs, T. M. Smith, Michael Bensen, Alan Spencer, Justin Brydson, Dean Schleisman, and Dennis Weder participated in the exhaustive compilation of

field data. Writers and researchers who contributed to the original reports include Lawrence Harmon, geographer; Heidi Roberts, data control; LaMar Drollinger, historian; and Dennis Weder, Andrew McDonald, Garth Norman, Steve Hayes, William Lucius, and myself as archeologists. Laura Leavitt Hauck made an important contribution through logistics and manuscript editing. Finally, my appreciation is extended to all the general field, laboratory and office personnel who participated in the project.

F. R. Hauck
August, 1979

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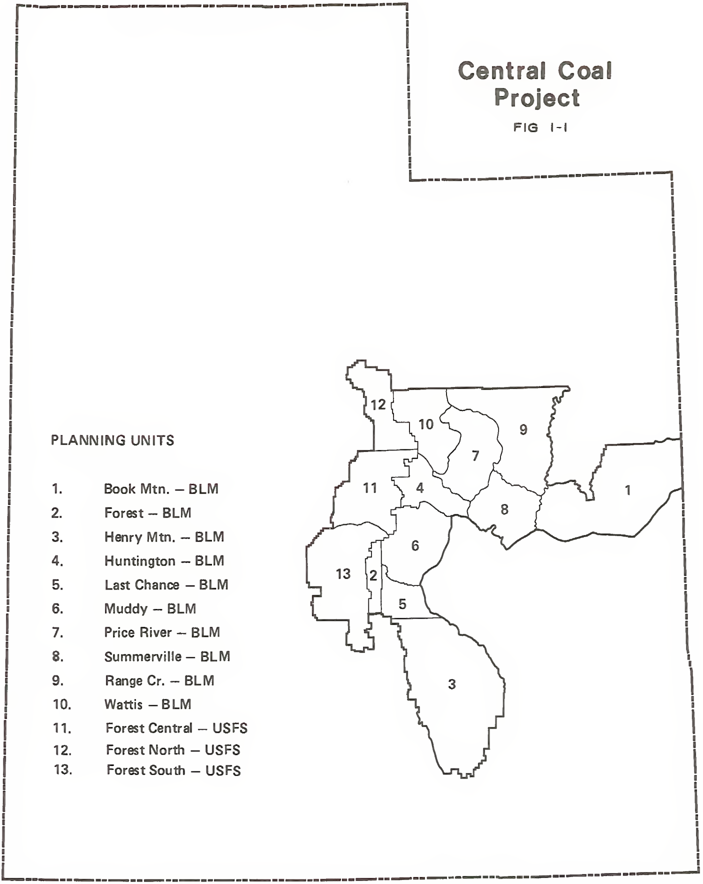
Chapter 1
INTRODUCTION TO THE PROJECT

From May to September of 1977, the Archeological-Environmental Research Corporation of Salt Lake City conducted a cultural resource survey of the Central Coal Project area in two research stages. The first stage was a Class I Survey involving a compilation of previously known and recorded cultural information for the entire project area. The second research stage was an intensive archeological field survey (Class II) of a one percent sample of the study area. The sample consisted of 311 quarter section sample areas of 160 acres each. The purpose of the Central Coal Project has been to correlate the cultural data base with the adverse impact potential related to the development of the coal mining industry in the project area. These syntheses of cultural, environmental, and coal developmental data have resulted in a classification of adverse impacts, an outline of recommended mitigational techniques, and three separate sets of guidelines which can be used by government and industry in planning coal development projects which will have minimal potential for disrupting cultural resources.

The Central Coal Project is composed of ten Bureau of Land Management and three United States Forest Service planning units in east-central Utah. Portions of the study area are in Utah, Carbon, Grand, Emery, Wayne, Garfield, Sevier, and Sanpete Counties. The BLM planning units involved are Range Creek, Price River, Wattis, Huntington, Muddy, Summerville, Book Mountain, Last Chance, Forest, and Henry Mountains. They have a total BLM acreage of 3,623,000 (1,466,228 ha.). The USFS units are Price-Ferron, Salina, and Fremont with 1,146,000 acres (463,786 ha.) of Forest land. These units were divided by the Forest Service into northern, central, and southern sampling strata. The northern and central strata roughly correspond to the Price-Ferron unit.


Central Coal Project
FIG I-1
PLANNING UNITS
1. Book Mtn. – BLM
2. Forest – BLM
3. Henry Mtn. – BLM
4. Huntington – BLM
5. Last Chance – BLM
6. Muddy – BLM
7. Price River – BLM
8. Summerville – BLM
9. Range Cr. – BLM
10. Wattis – BLM
11. Forest Central – USFS
12. Forest North – USFS
13. Forest South – USFS
12
10
9
7
11
4
1
8
6
13
2
5
3

The other units are grouped in the southern stratum (see Figure 1-1). Sample areas are apportioned among the planning units as outlined below:

Planning Unit	Number of Sample Areas
Book Mountain	47
Forest	5
Henry Mountains	64
Huntington	10
Last Chance	10
Muddy	22
Price River	18
Range Creek	29
Summerville	15
Wattis	8
Forest Service Central Stratum	38
Forest Service Northern Stratum	19
Forest Service Southern Stratum	27

The Central Coal Project is in the northwest quadrant of the Colorado Plateau. The Colorado Plateau covers some 130,000 square miles (336,700 square kilometers) between the Rocky Mountains and the Basin and Range Province, and can be subdivided into six sections. The BLM units are all in the Canyon Lands section except for the Range Creek unit, which is in the southern end of the Uintah Basin section. The U.S. Forest Service units are in the High Plateau section (Hunt 1974:426).

The final reports of the Central Coal Project (CCP) were prepared under U.S.G.S. contract in three parts titled, Volumes I, II, and III, and provided to the federal government officials in 1977. A brief summary of each volume has been prepared.

Volume I, entitled, A Summary Report of the 1977 Central Coal Project in Utah, provided a brief synopsis of archeological, cultural, and environmental information engendered during the research, and also reviewed an evaluation of potential impacts to be expected during the development of the coal industry in the area. A variety of methods useful in mitigating potential negative impacts were provided in Chapters 4 and 5 of Volume I.

Volume II, The Cultural Resources of the Central Coal Project Area, contained six chapters which detail the cultural and environmental relationships and information obtained during the project.

Probable Coal Mining Impacts on Cultural Resources in the Central Coal Project Area, reported in Volume III, completed the final investigative reports by evaluating correlations between negative impact types and both cultural and environmental factors in the CCP area.

AERC was informed of the possibility of publishing part of the CCP Report by the Bureau of Land Management, Utah State Office, in the spring of 1979. Our efforts to consolidate cultural information into one manuscript have resulted in several chapters from the original Volume I being integrated with data provided in Volume II. Thus, this new report properly combines the cultural background and archeological research results with the summary of cultural resource sensitivity and a statement of adverse impact potential in the study area.

This newly revised report consists of eight chapters, each dealing with a major body of information necessary for a complete explanation of the background, methods, and results of the various research elements involved in the Central Coal Project.

The first chapter provides a brief introduction to the project while Chapter 2 contains information on the environment of the study area.

Chapter 3 is entitled, "A Summary History of Human Activity in the Study Area," and is broken down into three parts. Part A discusses the prehistoric peoples of Utah, and addresses the way in which the Paleo Indian, Archaic, Fremont, Anasazi, and Shoshonean cultures utilized the available natural resources in order to maintain their existence. Part B discusses the protohistoric period with an emphasis on the interactions between the Indian and Euro-American populations. Part C begins with the earliest known Euro-American entry into the Central Coal Project area, and shows how the various historic peoples have initiated differing patterns of resource exploitation in the area. In this segment, the focus will be on mining activities in the CCP area, with special attention directed toward past coal mining operations.

Chapter 4, a "Report on the Class I Survey," primarily examines the operations of Research Group One (RG-I), which was responsible for researching previously recorded sites in the Central Coal Project area. Part A of Chapter 3 explains site classifications, and provides a list and definition of site types encountered during the various research processes. Part B begins with a general background of the Class I research, including a brief introduction, a statement of sources consulted, an account of time and personnel involved, and a discussion of problems encountered, and the results of the Class I survey. Part C in Chapter 4 provides an outline of the history of archeological research in the CCP area. Whenever possible, specific sites are correlated to the various archeological research efforts which have been previously conducted.

Chapter 5 furnishes a report on the Class II Survey, which involves the field activities of Research Group Two (RG-II). This group discovered and recorded historic and prehistoric sites situated in a one percent sample of the CCP surface area, consisting of 311 sample areas of 160 acres each. Part A explains the research methodology employed by RG-II, including a description of the approach, an enumeration of the crews and the personnel, the dates of survey, and operational details of the survey. Part B, dealing with research results, provides a planning unit description in narrative coordinated with maps and site tables. Part C consists of a correlation between the environmental variables, cultures, and various types of sites discovered during the RG-II survey. Part D concludes the chapter by presenting an inventory and analysis of lithic and ceramic artifacts collected during the archeological research in the CCP area.

Chapter 6 combines the data from both the Class I and the Class II surveys. The narrative is coordinated with each planning unit, and gives special attention to site types, cultural affiliation, chronological ordering, environmental variation, and site density within the study area.

Chapter 7, "Recommendations for Future Research," utilizes the findings of this project to discuss specific cultural resource investigations which are needed in the CCP area. Part A of this chapter reassesses the various data gaps which have become apparent during the research. Recommendations for future research and the rationale behind these recommendations are provided in Part B.

The potentials for adverse impact of cultural resources in the project area are examined in Chapter 8. These impacts are basically related to the coal mining industry; however, the general data provided in the chapter are pertinent to the preservation of both recorded and presently unknown sites regardless of the type of industrial development being initiated.

Chapter 2
THE ENVIRONMENT OF THE PROJECT AREA

The Central Coal Project area has been divided into thirteen subdivisions. Ten are Bureau of Land Management Planning Units, and three are Sampling Strata on lands administered by the U.S. Forest Service (see Figure 1-1). The over-all environment of the project area will first be discussed, with later sections describing the location and environment of the thirteen study units in greater detail. A discussion of the natural vegetation zones used in the report and rationale for their use is included. Coordination between planning units which have archeological sites and those without sites provides additional insight into those environmental factors which are most favorable to human activity.

Part A: The General Environment

GEOLOGY

The geologic structure of the Colorado Plateau is one of layer upon layer. The general trend is a dip to the northeast, but there has been faulting, doming, folding, some intrusion and extrusion, and a large amount of erosion. The results include surface rocks dating from the Paleozoic to the Quaternary and Tertiary volcanics in the High Plateau section and other small areas.

The geologic formations of the study area are as follows (Hunt 1974:430-432):

System	Formation and Member
Quaternary	Alluvium and aeolian deposits, including dunes Colluvium Gravels

System	Formation and Member
	Landslides
	Glacial deposits
	Basalt flows
Tertiary	Sevier River and Parunuweap formations - conglomerates, silts, and volcanics
	Brian Head formation - limestone and volcanic ash
	Duchesne River formation - playa deposits
	Uintah formation - fluviatile deposit
	Bridger formation - fluviatile deposit
	Green River formation - oil shale and other lake deposits
	Colton formation - fluviatile deposit
	Wasatch formation - fluviatile deposit
	Tuscher formation - conglomeratic sandstone
	Ohio Creek conglomerate - conglomeratic sandstone
Cretaceous	North Horn formation - fluviatile and lacustrine shale, sandstone, conglomerate, and limestone
	Mesa Verde formation - deltaic, littoral, coastal plain deposits
	Mancos shale - marine shale
	Dakota sandstone - littoral sandstone
	Cedar Mountain shale - shale
Jurassic	Morrison formation - fluviatile clay and shale
	Summerville formation - sandstone and sandy shale
	Curtis formation - marine sandstone and shaley sandstone
	Entrada sandstone - thick sandstone
	Carmel formation - sandstone, shale limestone, and gypsum

System	Formation and Member
Triassic	Navajo sandstone - massive aeolian sandstone
	Kayenta formation - sandstone and shaley sandstone
	Wingate sandstone - massive sandstone
	Chinle formation - lenticular beds of sandstone, shale, limestone and conglomerate
	Shinarump conglomerate - cross-bedded sandstone and conglomerate
	Moenkopi formation - sandstone and shale
Permian	Kaibab limestone - limestone and limey sandstone
	Coconino sandstone - sandstone
	Cutler formation - sandstone and conglomerate alternating with sandy shale or sandy limestone
Pennsylvanian	Rico formation - sandstone and conglomerate
	Hermosa formation - shale and limestone

GEOMORPHOLOGY

Canyons are the dominating feature of the Canyonlands section. The canyons are mostly incised in Triassic sandstone formations. The Cretaceous and Jurassic formations have shales that erode into badlands between more resistant sandstone features. Where the sandstone strata dip steeply, they form hogbacks known in this area as "reefs". Where they dip less steeply, cuestas or rims result. The highest elevations in the Canyonlands section are in mountains formed by the intrusion of molten materials in stocks and laccoliths. This intrusion caused the layered strata above to dome upwards. The doming reached over 11,000 feet (3,353 m.) in the Henry Mountains. There may also have been some extrusive activity. These high elevations are glaciated at their summits while slightly lower levels exhibit periglacial frost-action boulder fields. Erosional processes dominate the majority of the area, however.

This survey deals with only the Book Cliffs and Roan Cliffs areas of the Uintah Basin section of the Colorado Plateau. These are the southern edges of layers of rock which dip northward under younger Tertiary materials of the Uintah Basin proper, before abruptly surfacing again on the southern flank of the Uintah Mountains. The Book Cliffs are Cretaceous Mesa Verde formation, and the Roan Cliffs are Tertiary Wasatch and Green River formation.

The High Plateaus section of the Colorado Plateau forms its extreme western border within Utah. It is a fault-raised series of plateaus, capped in many areas with lavas. Elevations range from 9,000 to over 11,000 feet (2,743 to 3,353 m.). Tertiary and Cretaceous materials form the bulk of the plateau mass. The faults which created the plateaus are still active, especially on the west.

Surface materials of the Colorado Plateau have not been studied in detail, probably because of their low agricultural potential. Most of the soils are classified as lithosols. Sand dunes, some of them active, are extensive on the plateau surface.

The lowland (as opposed to mountainous) areas of the Colorado Plateau exhibit a full spectrum of desert land forms. Pediments are significant features, especially around the Henry Mountains and at the base of the Book Cliffs on shale formations. Most pediments are partially gravel covered. Mesas, cuestas, and hogbacks exist where resistant sandstone forms the surface. The three are differentiated by flat, gently dipping, and sharply dipping strata respectively. Other desert land forms include arches, bridges, tanks, and alcoves. While the first two are of greater interest to most modern men, the latter two were of most significance in prehistoric times. Tanks or water pockets form as plunge pools beneath waterfalls, as potholes in the sandstone beds of dry rivers, and as wind carved hollows in sandstone layers. They serve as storage pools for water, a precious resource in the desert. Alcoves are shallow caves under overhanging sandstone cliffs. They provided protection as simple rock shelters or for elaborate multiple dwellings for prehistoric peoples.

HYDROLOGY

Drainage over all except the western margins of the High Plateaus section is to the Colorado River. Various types of drainage patterns exist. A trellis pattern is common along hogbacks of the Canyonlands section and in the block-faulted High Plateaus. The Henry Mountains exhibit a radial pattern from the high peaks outwards in all directions. Meandering streams, including deeply entrenched meanders, are common. Drainage anomalies also exist, such as the Price River cutting through the Book Cliffs, or the San Rafael and Muddy Rivers crossing the San Rafael Swell, instead of following easier courses around those obstacles. This indicates possible establishment of stream courses prior to uplift.

CLIMATE

The climate of the Colorado Plateau is generally very dry. Aridity is greatest in the center, while rainfall increases on the higher margins. The study area of this survey contains the driest surfaces of the plateau. The Canyonlands section averages less than eight inches (203 mm.) of rainfall per year with less than six inches (152 mm.) around Hanksville and south of Green River. Three to four inches (76-102 mm.) of the total falls in convectional showers during the summer months of May through September. Part of the reason for the dryness is the rainshadow effect of the high plateaus to the west.

Annual rainfall increases greatly with elevation. The San Rafael Swell receives about 12 inches (305 mm.) at the 8,000 foot elevation (2,438 m.), while the larger mass of the Henrys has greater impact with 12 inches (305 mm.) at

6,000 feet (1,829 m.), over 20 inches (508 mm.) at 8,000 feet (2,438 m.) and above 30 inches (762 mm.) at 11,000 (3,353 m.) feet. Annual rainfall in the Wasatch Plateau area ranges from about 10 inches (254 mm.) at the eastern base to over 40 inches (1,016 mm.) at the highest elevations, with general averages for the plateau being over 25 inches (635 mm.) annually. Between one-half and one-third of the annual precipitation falls in the summer, with the lower fraction applying to the higher locations. Rainfall in the Book and Roan Cliffs area to the east of the Wasatch Plateau ranges between 16 and 20 inches (406-508 mm.) each year.

Aridity in the Colorado Plateau is further exacerbated by the high evaporation rate. Hunt (1974:450) suggests that probably 95 percent of the rainfall is lost by evaporation, seepage, and transpiration. This leaves very little for plants or human requirements.

The lowland areas of the Canyonlands are very hot in summer and cold in winter. Summer temperatures normally exceed 100 degrees F. (43.4 degrees C.) and stations in the area often report the highest temperatures within the state. The forst-free period ranges from about 200 days at the lowest elevations to less than 100 in the mountains and plateaus. In winter or summer, clear skies exist the vast majority of the time, allowing sun energy to enter freely in the day and heat to escape just as freely at night. Winter nights are cold.

Climatic history indicates a recurring succession of dry and wet periods in the region. Wet periods bring deposition of alluvial materials and accumulation of colluvium. Possibly the early human occupants on the Colorado Plateau descended the rivers to lower elevations during the wet periods. Then when drying trends developed and erosion became the predominant agent of land alteration, the humans moved upstream to areas having a more reliable water supply (Hunt 1974:465).

VEGETATION

Vegetation of the Colorado Plateau closely follows climatic differences. The lowlands have desert shrubs of various types, while woodland and forests grow on the plateaus and mountains. Most of the plateau surface is in the Upper Sonoran Zone which prevails up to about 7,500 feet (2,286 m.). Above that is a Transition Zone to 9,500 feet (2,896 m.), followed by the Canadian, Hudsonian, and Alpine Zones. About a quarter of the Canyonlands section is bare rock including canyon walls and rims, badlands, and flats (Hunt 1974:451).

Seven ecozones based on vegetation are defined for the project area. Several of those have more than one sub-zone, or vegetational community. Ecozones and their vegetational communities are: The desert shrub ecozone, which includes the greasewood, saltbush, rabbitbrush, shadscale, and blackbrush-Mormon tea communities; the big sagebrush ecozone; the pinyon-juniper ecozone with juniper, mixed pinyon-juniper, and pinyon communities; the mountain brush ecozone; the ponderosa pine ecozone; the spruce, fir, Douglas-fir, aspen ecozone, which may include communities dominated by any of its major constituents; and a mountain meadow ecozone. Within these ecozones and vegetational communities, smaller habitats were identified in the field. These include such examples as a small sagebrush area within a predominantly pinyon zone and a grassland habitat paralleling a small brook in the big sagebrush ecozone (see Figures 2-1 through 2-16).

The reasoning for utilizing the division of ecozones, vegetational communities, and habitats stems from their value in aiding field identification of site relationship to vegetation patterns. The desert shrubs occupy similar elevation areas and are differentiated primarily by soil-water and salinity conditions. All of the desert shrub zones in the CCP project had some cultural resource sites. Big sage, on the other hand, occupies generally higher elevations and is further differentiated by lack of sites except at the habitat level. The pinyon-juniper ecozone is easy to distinguish in the field and is also emphasized by the large number of sites found within it. Mountain brush occurs at generally higher elevations and again is easily distinguished but more by physiognomy rather than species. The ponderosa pine zones were separated from other conifers and alpine forest trees by a slightly lower bottom elevation, but, more significantly, by a larger propensity for sites than the other forest zones included in the spruce, fir, Douglas-fir, and aspen ecozones. Mountain meadows occupy only very small areas at high elevations within the project and are easily differentiated from other zones.

A second rationale for this division into vegetation regions stems from the available vegetation maps. Hackman's map of the vegetation of the Salina Quadrangle (1973) was especially useful, as were maps provided by the BLM district offices for all but two of the planning units within their jurisdiction. Because the various BLM vegetation maps differed in the way they grouped vegetation types as well as in mapping detail, it became necessary to adopt an overall system, which, although somewhat general, could be applied in the entire area using the resources available. A more detailed description of vegetation species and their general environments includes the following:

Desert Shrub (see Figures 2-1, 2-2, 2-3, 2-4)

The vegetation of the dry lowland areas (between 4,000 and 6,000 feet; 1,220 to 1,829 m.) is mostly desert shrub. This category includes associations dominated by greasewood, mat saltbush, shadscale, blackbrush, and Mormon tea. Greasewood (Sarcobatus vermiculatus) is a phreatophyte which grows between 4,000 and 5,000 feet elevation (1,220-1,524 m.) in highly saline soils where the water table is far below the surface. Salt grass (Distichlis stricta) is more common where the water tables are shallow. In areas where the water is of good quality, this association is joined by rabbitbrush (Chrysothamnus sp.), alkali sacaton grass (Sporobolus airoides), and other phreatophytes (see Hackman 1973).

Mat saltbush (Atriplex corrugata) and shadscale (Atriplex confertifolia) grow sparsely in dry, impervious, saline, fine-grained alluvium in washes and areas underlain by shale. They are found mostly in the 4,000 to 5,000 foot (1,220-1,524 m.) elevation range and may be joined in the wet season by wild buckwheat (Eriogonum sp.), curly grass (Hilaria jamesii), and other plants.

Silver leaf buffalo berry (Schepherdia argentea) and Mormon tea (Ephedra sp.) are found in the same elevation zones (4,000-6,000 feet or 1,220-1,829 m.) as shadscale, but with an important difference. The blackbrush-Mormon tea shrub association prefers sandy, non-alkaline soils. The association includes yucca (Yucca sp.), rabbitbrush, prickly pear (Opuntia spp.), and some grasses.

Big Sage (see Figures 2-5, 2-6, 2-7, 2-8)

Gravel-covered terraces and other well-drained, generally sandy and non-saline soils between 5,000 and 7,500 feet (1,524-2,134 m.) are the home of the big sagebrush association. It includes big sagebrush (Artemisia tridentata), rabbitbrush, horsebrush (Tetradymia spp.), winterfat (Eurotia eanata), snakeweed, galleta grass (Hilaria jamesii), blue grama (Bouteloua gracilis), and other grasses and shrubs.

Pinyon-Juniper (see Figures 2-7, 2-8, 2-9, 2-10, 2-11, 2-12)

The top level of the Upper Sonoran Zone, generally between 5,000 and 7,500 feet (1,524-2,286 m.), is a woodland of pinyon and juniper. The lower boundary of this association is the lower, or arid, timberline. This is the lower limit of trees and is established by availability of water. The pinyon-juniper woodland is usually an open forest with trees 10 to 30 feet (3-9 m.) tall. Shrubs and grasses may form sparse understory. Utah juniper dominates the association

Wayne Co.

Figure 2-1

Wayne Co.

Figure 2-2

Figure 2-3 Garfield Co.

Figure 2-4 Grand Co.

Figure 2-5 Sevier Co.

Wayne Co.

Figure 2-6

Figure 2-7 Emery Co.

Figure 2-8 Emery Co.

Figure 2-9 Emery Co.

Figure 2-10 Sevier Co.

Figure 2-11 Emery Co.

Figure 2-12 Sevier Co.

at drier, lower levels. In areas of greater water supply, it is mixed with pinyon pine. Higher, cooler, or wetter areas give way in some areas to pure stands of pinyon and the higher elevation Rocky Mountain juniper. Some of the species involved in this association include Colorado pinyon (Pinus edulis), Utah juniper (Juniperus osteosperma), and one-seed juniper (Juniperus monosperma). Understory species include bitterbrush (Purshia tridentata), mountain mahogany (Cercocarpus montanus), galleta grass, cheatgrass (Bromus tectorum), prickly pear, and Russian thistle (Salsola kali).

Mountain Brush (see Figures 2-13, 2-14)

Mountain slopes in the Henry Mountains and the High Plateaus section have large areas of shrubforms called mountain brush or chaparral at elevations between 7,000 and 9,000 feet (2,134-2,743 m.). Scrub or Gambel's oak (Quercus gambelii), mountain mahogany, serviceberry (Amelanchier alnifolia), bitterbrush (Purshia tridentata), chokecherry (Prunus virginiana), and big sagebrush are the most common plants.

Ponderosa Pine-Montane (see Figures 2-13, 2-15)

This Transition Zone area may also include yellow or ponderosa pine forests at 7,500 to 9,000 feet (2,286-2,743 m.). This association occurs along the eastern rim of the High Plateaus and in the Henry Mountains. Ponderosa pine (Pinus ponderosa) forms open stands with a thick understory of mountain muhly (Muhlenbergia montana), serviceberry, mountain mahogany, bitterbrush, and other shrubs and herbs.

Spruce, Fir, Douglas-fir, Aspen-Montane (see Figure 2-16)

The highest forests, located between 8,500 and 11,000 feet (2,591-3,353 m.) are composed of spruce, fir, Douglas-fir, and aspen. The latter two, Douglas-fir (Pseudotsuga menziesii) and quaking aspen (Populus tremuloides)

Figure 2-13 Emery Co.

Figure 2-14 Sanpete Co.

Figure 2-15 Emery Co.

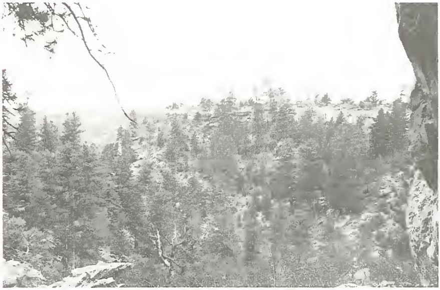


Figure 2-16 Emery Co.

form the lower zone. They mix with Englemann spruce (Picea englemannii) and subalpine fir (Abies lasiocarpa) in the middle zone, while spruce and fir make up the upper part of this association. Understory plants include a variety of grasses, sedges, and shrubs.

Mountain Meadows-Montane

Only at the highest elevations, between 9,000 and 11,600 feet (2,743-3,536 m.) does an Alpine Zone with mountain meadows occur. Sagebrush, grasses, and sedges (Carex spp.) form most of the ground cover. A large number of other herbaceous plants, many of them annuals, complete the association.

There are numerous examples of mixing and interfingering of these vegetation groupings. This is especially obvious along watercourses at the base of mountain areas. At springs, stands of cottonwood (Populus angustifolia or Populus fremontii), willows (Salix spp.), aspen, liveoak, and other phreatophytes are found. Drier, intermittent stream channels are outlined by juniper fingers extending into the lower sagebrush zone or by sagebrush extending into the adjacent blackbrush, shadscale, and saltbush zones.

Part B: The Planning Units

BOOK MOUNTAIN

Location

The Book Mountain Planning Unit (BLM) consists of 757,000 acres (306,358 ha.) in northern Grand County, Utah. Its boundaries are mostly defined by natural terrain features. The western border is the Green River. The northwestern corner of the county is taken up by the Uintah and Ouray Indian Reservation, which is not part of the planning unit. The northern boundary is the Uintah County line, and the eastern border is the Colorado state line. The southern boundary follows Interstate 70 east from the Green River to the west side of Range 23 East, and then continues eastward along the north side of Township 22 South to the Cisco Wash, which it follows to the Colorado River. The canyon of the Colorado River forms the remainder of the southern boundary which terminates at the Colorado state line. Interstate 70 and the D&RGW Railroad traverse the southern edge of the unit and pass through the small settlements of Crescent Junction, Thompson, and Cisco. The Book Mountain unit is contiguous with the Summerville and Range Creek Planning Units, which lie across the Green River to the west.

Environment

The Book Mountain Unit is large, but not environmentally complex. Grand Valley and the Book Cliffs are the two most important land forms. The Grand Valley area is in the Canyonlands section, while the Book Cliffs are in the Uintah Basin section of the Colorado Plateau. The southeastern corner of the unit includes the north bank of the Colorado River Canyon, including Westwater Canyon. Elevations along the lower part of the river are near 4,100 feet (1,250 m.). Along the interstate in the south of the unit are a series of drainages separated by low pediment interfluves. Grand Valley is the name given to a large grouping of those drainages. Elevations range from about 4,100 feet (1,250 m.) at Green River on the west, to about 5,000 feet (1,524 m.) at the drainage divide between the Colorado and Green Rivers just east of Thompson. All of this area below the Book Cliffs has generally moderate slopes with some areas of steep local relief in the form of highly eroded small hills. Pediments along the base of the Book Cliffs slope upward from the low elevations along the interstate to about 5,000 to 5,500 feet (1,524-1,676 m.) at the base of the escarpment. The Book Cliffs rise abruptly as a highly dissected escarpment to over

6,000 feet (1,829 m.). The general elevation continues to rise toward the north until a drainage divide is reached at about the eight to nine thousand foot elevation (2,438-2,743 m.). This divide marks the northern border for most of the Book Mountain Unit, although some of the unit does drain northward into the Uintah Basin. The plateau area north of the Book Cliffs is extremely dissected and difficult to traverse.

Geology

The surface geology of the Book Mountain Planning Unit is relatively simple. The lowest elevations along the Colorado River have small areas of Triassic age rocks on the Chinle, Wingate, and Kayenta formations. Higher elevations north of the river have Jurassic Entrada sandstone, Summerville and Morrison formations followed by the Cretaceous Cedar Mountain formation and Dakota sandstone. Grand Valley and other similar surfaces south of the Book Cliffs are situated upon the various members of the Mancos shale. These members form a series of pediments which are covered by young alluvium along drainages and by pediment gravels on large areas of the interfluves. There are also extensive areas of Quaternary aeolian silt deposits west of Thompson and northeast of Green River. The Book Cliffs consist of the Cretaceous Mesa Verde group, primarily the Blackhawk formation and the Castlegate sandstone. Other formations of the Mesa Verde Group, including the Price River and Tuscher, are found at the top of the cliffs. There are some areas of North Horn formation in the northwestern area of the planning unit. Northward from the Mesa Verde group are large areas of the Tertiary Wasatch formation. Farther north, along the Uintah Basin drainage divide, are areas of the lower and middle units of the Parachute Creek Member of the Green River formation. The unit of the Parachute Creek is the primary oil shale stratum in the area.

Climate

The climate of the Book Mountain Planning Unit is generally arid to semiarid. The lowland areas receive from six to ten inches (152-254 mm.) of precipitation annually. Precipitation increases to the north at higher elevations, but does not surpass twenty inches (508 mm.) anywhere in the unit. About one-third of the annual rainfall occurs in the May-September period with most of that in late summer convectional showers. Temperatures vary according to altitude, with hot summers at lower elevations and cooler temperatures in the uplands. Winters are cold throughout the unit.

Vegetation

The vegetation of this unit is quite complex due to the highly dissected nature of much of the terrain and the variations in altitude, exposure, and soil and water conditions. In general, the lower Grand Valley locality is covered by desert shrub forms, while higher elevations are primarily sagebrush and pinyon-juniper woodland. There are scattered areas of mountain brush, aspen, and Douglas-fir at the highest elevations. Large surfaces of the unit are barren or wasteland, consisting primarily of bare rock and eroded shale badlands.

FOREST

Location

The Forest Planning Unit (BLM) consists of about 83,000 acres (33,590 ha.). The unit is a narrow north-south region along the eastern boundary of Sevier County, Utah. It is crossed by Interstate 70 and Utah Highway 10. Capitol Reef National Park forms its southern boundary. This planning unit adjoins the Fishlake National Forest (Forest Service Southern Sampling Stratum) on the west and north, and the Muddy and Last Chance Planning Units on the east.

Environment

There are three generalized geomorphic divisions and one important transition zone within the Forest Unit. The western border of the unit, which consists of the northern division, follows the escarpment of the Wasatch Plateau in general, although outliers of the plateau extend into the northwestern corner of the unit where elevations rise to nearly 8,000 feet (2,438 m.). A central division crosses the unit diagonally from northeast to southwest and is basically a sloping bench on the flank of the plateau underlain by more resistant rocks. Its elevation rises from just over 6,000 feet (1,829 m.) in the northeast to almost 8,000 feet (2,438 m.) in the southwest. The northern part of the central division is known as Walker Flat. Both highways traverse this division. The lower elevations in the southern third of the unit comprise the third division located near the 6,000 foot (1,829 m.) elevation. The second and third divisions are separated by a highly dissected escarpment and large areas of bare sandstone face known as the Limestone Cliffs. These cliffs are the southwestern extension of the Coal Cliffs and Temple Wash. Several streams, including Ivie Creek, and Quitchupah Creek, cross the planning unit from west to east.

Geology

Geologically, the lowest elevations in the southeast are covered by Quaternary alluvium and pediment gravels. The transitional lower slope up to the central division is formed from the Jurassic Entrada sandstone and Summerville formations of the San Rafael group. They are overlain by Cretaceous Cedar Mountain shale and the Tununk shale, Ferron sandstone, and Blue Gate sandstone members of the Mancos shale. The surface of the central division consists of Blue Gate sandstone, which is buried in large areas by Quaternary alluvial deposits and pediment gravels. Farther west, the escarpment of the Wasatch Plateau is formed by the Emery sandstone and Masuk members of the Mancos shale. They are followed by the Blackhawk and the Price River formations of the Mesa Verde group.

Climate

The climate of the area is semiarid with an average of ten to fifteen inches (254-381 mm.) of precipitation annually. The unit is in a rain shadow area of the Wasatch Plateau. Higher elevations tend to receive greater rainfall than the lower elevations. About half of the rain falls in the summer months. Summer temperatures are very hot except at the higher elevations and winters are cold.

Vegetation

Pinyon and juniper are found at the higher elevations of the northwest corner of the unit in the outliers of the plateau, in the higher elevations of the southern half of the middle division, and in wetter areas of the rest of the unit. Sagebrush occupies the drier flats of the north part of the middle division and the lower southeast corner. Locally drier areas are covered by desert shrubs, such as rabbitbrush, shadscale, and greasewood. Important areas of the escarpment between the lower and the middle divisions are devoid of vegetation, and are essentially bare rock.

HENRY MOUNTAIN

Location

The Henry Mountain Planning Unit (BLM) consists of 1,020,000 acres (412,794 ha.) in Wayne and Garfield Counties, Utah. The northern boundary of the unit is the Emery-Wayne county line. The unit is bordered on the east by the Dirty Devil River and the Glen Canyon National Recreation Area. The western border is Capitol Reef National Park. The park and recreation areas combine to form the southern boundary of the unit. Access is provided by Utah Highways 24, from the west and north, and 95 from the southeast. Utah Highway 276 roughly parallels the southern half of the eastern border within the unit. The Fremont River crosses the northern third of the unit from the west to its confluence with the Dirty Devil. The unit includes the settlements of Hanksville and Caineville. The Last Chance Planning Unit adjoins on the north.

Environment

The planning unit is large and complex. A great range of altitude and geologic formations exist, which in turn allows for the complete vegetation spectrum from alpine forests and mountain meadows to the rachitic shrubs and grasses of the desert.

It is possible to divide the Henry Mountains Unit into four regions. Three of the four exhibit similar characteristics, and are distinct only because of the boundary zones which separate them. They are the low elevation (4,500-6,000 feet/1,372-1,829 m.) areas of the planning unit. The first two make up the northern and eastern parts of the unit. They are separated by the Caineville Reef. The reef is formed by the upthrust western edge of strata which dip steeply to the east. The reef is a southern extension of the San Rafael Reef, and runs roughly from the north to the south where it parallels the eastern side of the Waterpocket Fold. Elevations west of the reef are around 6,000 feet (1,829 m.). There are several basic intrusive tertiary dikes in this region.

The second region is east of the Caineville Reef and continues to the east and south around the base of the Henry Mountains. It is lower, generally about 5,000 feet (1,524 m.), except along the course of the Fremont and Dirty Devil Rivers where elevations below 4,500 feet (1,372 m.) are found, and near the base of the mountains where elevations rise to about 6,000 feet (1,829 m.). This region is separated from the southern region by the Mount Ellsworth-Mount Holms extension of the Henry Mountains.

The third region in the south of the planning unit is much like the second, with elevations averaging 5,000 feet (1,524 m.), except near the base of the mountains and in deep watercourses.

The fourth region of the planning unit is very distinct from the other three. It consists of the laccolithic Henry Mountains, which rise to 11,522 feet (3,512 m.) at Mount Ellen. The Henry Mountains are a structural dome produced as molten rock intruded under a structural basin. The intrusive rock formed stocks which rose higher and widened. At weak points, the molten material squeezed sideways to form laccoliths. Through time, the overlaying materials have eroded away, exposing Tertiary porphyritic intrusives. Mt. Ellen, Mt. Pennell, (11,371 feet/3,466 m.), Mt. Hillers (10,723 feet/3,268 m.), Ragged Mountain (9,113 feet/2,778 m.), and Mt. Ellsworth (8,235 feet/2,510 m.), are the most prominent peaks.

Geology

The surface geology of the unit is representative of a broad spectrum of geologic time from Triassic to the present. A transect east to west in the northern third of the unit north of the Henry Mountains reveals the following succession of strata: The oldest rocks surface to the east with Triassic Kayenta formation, and Wingate sandstone in the lower Dirty Devil Canyon. To the north and west are areas of Navajo sandstone. They are succeeded by Triassic rocks, including Carmel formation, Entrada sandstone and Summerville formation materials of the San Rafael group, and Salt Wash sandstone and Brushy Basin shale of the Morrison formation. To the west are areas of Cretaceous Cedar Mountain shale followed by the Tununk shale, Ferron sandstone, Blue Gate sandstone, and Emery sandstone, all of the Mancos shale. The Blue Gate sandstone occupies the largest surface area of any formation. This succession of strata is interrupted by the Caineville Reef. West of the reef it repeats itself from the Carmel foundation through Tununk shale, then reverses back to the Carmel at the extreme west of the unit on the border of Capitol Reef National Park.

An east to west transect south of the Henrys reveals the same pattern from Navajo sandstone through Tununk shales, except for larger areas of Dakota sandstone appearing from beneath the Tununk. Then the succession does a quick reverse back to Entrada sandstone, except to the northwest. To the northwest, culminating in Tarantula Mesa west of the mountains, the geologic formations continue to become younger, passing successively from the Tununk shale through the Blue Gate, Emery, and Masuk members of the Mancos shale to an undivided formation of the Mesa Verde group at Tarantula Mesa. West of the Tarantula Mesa, the strata quickly reverses back to old rocks at the base of Waterpocket Fold.

Much of the above-mentioned areas are overlain by Quaternary deposits. There are aeolian deposits in large areas along the northeastern boundary of the unit and in the southern region, and gravel-covered pediments around the base of the mountains. There are also small areas of alluvium along some of the drainages.

A transect east to west across the Henrys reveals the same succession of materials, including mixed Cedar Mountain and Brushy Basin shales. Then the succession reverses through the strata to the Carmel formation. Here it is interrupted by Tertiary intrusives, including stocks, laccoliths, and dikes of diorite porphyry. West of the Henrys are areas of mixed Morrison and Cedar Mountain formation, Blue Gate sandstone, Emery sandstone, and the Masuk member of the Mancos Shale.

Climate

The climate of the Henry Mountains Planning Unit is extremely arid except in the higher elevations. Average annual precipitation is less than six inches (152 mm.) in the Hanksville area. It is between six and eight inches (152-203 mm.) in most of the remaining lower areas of the unit. The mountain slopes become abruptly wetter with over 30 inches (762 mm.) on Mt. Ellen, and more than 20 inches (508 mm.) on the high peaks. At lower elevations, about one-half of the annual precipitation falls in summer convectional showers. This proportion diminishes to about one-third at the highest elevations. Summers are extremely hot in the low elevations of the region, with Hanksville often reporting the high for the state of Utah. Winters are cold and relatively dry.

Vegetation

The vegetation of the Henry Mountains Unit embraces the complete spectrum from very sparsely vegetated deserts to mountain meadows above timberline. Greasewood is found on terraces above the permanent streams and along intermittent stream channels. Examples are along the Dirty Devil and Fremont Rivers and other drainages such as Sweetwater Creek, Bull Creek, and Dry Valley Wash.

Salt bush covers large areas north of the Henry Mountains. It grows mostly in dry, impervious, saline alluvium underlain by shale. Shadscale scrub also grows in areas of impervious saline soils mostly at lower elevations such as along the Dirty Devil, but also in huge irregular patches throughout the lowlands of the region.

Blackbush-Mormon tea scrub grows in sandy, non-alkaline soils. This association is found along the eastern margin of the planning unit parallel to the Dirty Devil and Colorado Rivers. Big sagebrush grows in slightly wetter regions on well drained nonsaline soils. It is found over most of geomorphic region one in the northwest of the unit and along the eastern and southern margins of the Henrys in regions two and three. Some patches of sage are also found on the slopes of the Henrys, especially on the west side.

Pinyon-juniper woodland, which requires still more rainfall, occurs in patches in the entire unit, but is really significant only around the flanks of the Henrys, where it covers large areas.

A mountain brush association with scrub oak, mountain mahogany, and sagebrush occurs over small areas of the Henrys, mostly between 8,000 and 9,000 feet (2,438-2,743 m.). At that same general elevation are areas of ponderosa pine. This grades off into Douglas-fir and aspen at higher elevations. The highest peaks are surrounded by areas of Englemann spruce and subalpine fir. The peaks themselves are above timberline and have small areas of mountain meadows with grasses, sages, and sagebrush dominating.

There are some extensive areas of barren rock along the canyon walls of the Dirty Devil and scattered throughout in even smaller, mostly linear, segments of the unit.

A few small irrigated areas exist along the course of the Fremont River between Caineville and Hanksville.

HUNTINGTON

Location

The Huntington Planning Unit (BLM) consists of 161,047 acres (65,176 ha.) in the central-western part of Emery County, Utah. The western periphery of the unit is identical with the eastern boundary of the Manti-LaSal National Forest and part of the southern boundary follows the canyon of the San Rafael River. The Huntington Unit adjoins the Wattis Planning Unit on the north, the Price River Unit on the northeast, the Summerville Unit on the east, and the Muddy Unit on the south. It is crossed by Utah Highway 10, and includes the towns of Huntington, Castle Dale, and Orangeville.

Environment

Most of the Huntington Planning Unit is in the San Rafael River drainage system. Major subdrainages are Buckhorn Wash, Cottonwood Creek, and Huntington Creek. Castle Valley comprises the central part of the unit along Highway 10, running from north to south. Elevations range from 5,500 feet (1,676 m.) to 6,000 feet (1,829 m.) with higher elevations on the west, which consist of several benches forming the foothills of the Wasatch Plateau. These sloping benches rise to about 7,000 feet (2,134 m.) where they meet the cliffed escarpment of the plateau. Small portions of the unit along the escarpment are at elevations of over 8,000 feet (2,438 m.).

The eastern third of the unit is an area of steep sided buttes, mesas, and flat floored valleys deeply incised by canyons and washes. Although the general elevation increases eastwardly, the drainage is in the same direction through steadily deepening canyons.

Geology

The geology of the Huntington Unit is not extremely complex, even though a large span of geologic time is represented. In the lowest canyons at the extreme east of the unit are small areas of Triassic Moenkopi, Chinle, Wingate, and Navajo sandstone formations. Larger areas to the west are covered by Jurassic rocks. The geological series most representative of the eastern third is the San Rafael group with its Carmel formation, Entrada sandstone, Curtis formation, and Summerville formation. Farther west lie bands of Morrison formation, including both Salt Wash sandstone and Brushy Basin shale. Moving to higher elevations to the west, one encounters Cretaceous age materials ranging through the Cedar Tununk shale, Ferron sandstone, Blue Gate shale, Emery sandstone, and Masuk shale. In the Castle Valley area large regions of the Blue Gate shale are overlain by Quaternary gravels and alluvial deposits. Emery sandstone and newer materials form the piedmont benches and escarpments, marking the western boundary of the unit. The highest elevations of the planning unit include narrow strips of Star Point sandstone, Blackhawk formation, Castlegate sandstone, and Price River formation. All of the latter belong to the Cretaceous Mesa Verde group.

Climate

The climate of the Huntington Planning Unit is arid. Average annual rainfall is only about eight inches (203 mm.) in the Castle Valley area, with slightly greater amounts near the Wasatch Plateau on the west. About half of the rainfall occurs in convectional showers in the May-September period. Summers are hot and winters are cold.

Vegetation

The vegetation of the Huntington Planning Unit reflects the climate. The benches and foothills on the west are generally sage-covered, with some areas of pinyon-juniper. Castle Valley, outside the agricultural zone, is covered by desert shrub. The eastern part of the unit has desert shrub grading into grasslands, which in turn grade into pinyon-juniper woodland as elevation increases. Large areas of the unit, mostly exposed bedrock surfaces, are classified as barren or wasteland. The BLM has classified 28 percent of the unit as pinyon-juniper, 26 percent as grassland, 13 percent as sage, 25 percent as desert shrub, and 8 percent as barren, or wasteland.

LAST CHANCE

Location

The Last Chance Planning Unit (BLM) consists of 164,000 acres (66,371 ha.) in the southwest corner of Emery County, Utah. The Sevier County line forms most of the western boundary and the Wayne County line forms most of the southern boundary. The only exception is a small portion of Capitol Reef National Park which intrudes into the extreme southwest corner. Most of the eastern boundary of the unit follows the Muddy Creek drainage. Ivie Creek and Interstate 70 pass through the extreme northern edge of the unit, while Last Chance Wash crosses diagonally through the unit from the west to south boundaries. The unit borders the Forest Planning Unit on the west, the Muddy on the north, the Sinbad and Robbers Roost Units on the east, and the Henry Mountain Planning Unit on the south. The only present day habitations within the unit are a few isolated ranches.

Environment

The Last Chance Planning Unit is a southward extension of the environmental outline of the Muddy Unit. In the extreme northwest corner at elevations up to about 6,500 feet (1,981 m.) is an area corresponding to the Coal Cliffs. In this area, the escarpment is lower and dissected by Ivie Creek and its tributaries into eastward passage through which Interstate 70 passes. Below and to the southeast of the escarpment is the bulk of the planning unit. It has a generally flat surface interrupted by numerous canyons and steep-sided buttes and mesas. The elevation ranges from 5,500 to 6,000 feet (1,676-1,829 m.) over most of the region. The eastern edge of the unit has slightly higher elevations on the edge of the San Rafael Swell and also includes the isolated Cedar Mountain with an elevation of over 7,000 feet (2,134 m.). The extreme southeast includes a southern extension of the San Rafael Reef and the flat lowlands lying beyond. Here the elevation drops below 5,000 feet (1,524 m.)

Geology

The surface geology of the Last Chance Unit ranges in age from the Triassic to the Quaternary. The cap of the Coal Cliffs is Cretaceous Ferron sandstone. The cliffs include Tununk shale and Dakota sandstone. Below the cliffs and extending along the entire western edge of the unit are large areas of Quaternary deposits. They include alluvial and colluvial deposits and pediment gravels interspersed with Entrada sandstone outcroppings. The flat floored central area of the unit has north-south trending areas of Cretaceous Cedar Mountain and Morrison formations followed to the east by Jurassic Summerville, Curtis, Entrada sandstone, and Carmel formations. The latter two cover the widest area. On the eastern margins of the unit in the edges of the San Rafael Swell are surfaces of Triassic Navajo sandstone, and areas of Kayenta, Wingate, Chinle, and Moenkopi formations. The San Rafael Reef is represented by a rapid age reversal back to Cretaceous Morrison formation and Mancos shale members in the south-eastern lowlands. Scattered throughout the central part of the unit are numerous Tertiary diabase dikes and syenite and diabase dikes and sills up to 100 feet (30.48 m.) in thickness.

Climate

The climate of the Last Chance Planning Unit is very arid with less than eight inches (203 mm.) of precipitation annually over almost the entire area. The only exception is the extreme southwest of the unit, which is only slightly wetter. About half of the rainfall occurs in the summer May-September period. Temperatures are cold in winter and hot in the summer.

Vegetation

The vegetation of the Last Chance Planning Unit corresponds to an arid environment. Within the arid vegetation types, however, there are important variations due to slight changes in amounts and salinity of the available water. The northwestern point of the unit is grassland with small areas of sage and pinyon-juniper.

The large central region is desert shrub, primarily the Blackbush-Mormon tea association and shadscale shrubs with areas of grasses and sagebrush. Pinyon-juniper occurs only on isolated highlands and along part of the eastern edge of the unit bordering the San Rafael Swell. Much of the central region, most of the eastern periphery, and the southeastern corner of the unit are barren or wasteland. Much of the latter is bare rock or highly eroded shale areas which support almost no vegetation.

MUDDY

Location

The Muddy Planning Unit (BLM) consists of 359,000 acres (145,287 ha.) in western Emery County, Utah. The western boundary is identical with the eastern border of the Manti-LaSal National Forest and follows the Sevier County line on the south. The San Rafael River Canyon and Cane Wash form a large part of the northern and eastern boundaries. Muddy Creek flows through the western periphery of the unit. The Muddy Unit adjoins the Huntington Unit on the north, the Sinbad on the east, the Last Chance on the south, and the Forest Planning Unit and the U.S. Forest Service Central Sampling Stratum on the west. Interstate 70 and Utah Highway 10 cross the unit from west to east and north to southwest, respectively. Coal mining and agriculture comprise the primary economic activities within the unit.

Environment

The landscape of the Muddy Planning Unit can be divided into regions which run roughly northeast-southwest. In the extreme northwest and along the national forest boundary, lie Wasatch Plateau piedmonts with elevations around 7,000 feet (2,134 m.). The next region to the east is the Castle Valley area, which includes Highway 10 and the settlements of Emery, Moore, and Ferron. The average elevation is around 6,000 feet (1,829 m.). To the southeast of the Castle Valley region the geologic strata rise to an escarpment known as the Coal Cliffs or the Molen Reef. The escarpment extends toward the south, reaching the 7,000 foot (2,134 m.) elevation along its southwestern periphery.

The Coal Cliffs escarpment is roughly 1,000 feet (305 m.) high, overlooking to the east and south a large, flat, nearly barren area drained by the Muddy Creek via South Salt Wash and by San Rafael River via North Salt Wash. From these low areas the elevation rises to the east and southeast into the San Rafael Swell, culminating on the 7,921 foot peak (3,414 m.) of the San Rafael Knob.

Geology

The geology of the Muddy Planning Unit is complex due to the structural uplift of the San Rafael Swell. The Wasatch Plateau piedmont consists of Star Point sandstone and Emery sandstone, while Castle Valley has mostly Blue Gate sandstone overlain in large areas by Quaternary alluvial deposits and pediment gravels. Eastward towards the Coal Cliff escarpment, although the elevation increases, a wide band of older Ferron sandstone forms the surface and caps the reef. Below the escarpment are strips of Tununk shale, Dakota sandstone, and Cedar Mountain formation. All of the above are Cretaceous except for the previously noted Quaternary deposits.

Continuing to the southeast one encounters a broad area of Jurassic Morrison formation materials. They are followed by the Summerville and Curtis formations, the Entrada sandstone, and finally, the Carmel formation. The formations on to the southeast become older as the elevation increases, due to the rise of the San Rafael Swell. They include the Triassic Navajo sandstone and Kayenta formation. At the extreme eastern boundary of the unit, small areas of

Chinle formation are encountered.

Climate

The climate of the Muddy Planning Unit is arid, with six to 12 inches (152-305 mm.) of annual rainfall. The highest amount falls only in a very narrow strip on the west side of the planning unit and also on the San Rafael Knob. Most of the planning unit receives eight inches (203 mm.) or less each year; about half falls in the May-September period during convectional storms. Temperatures are cold in the winter and hot in the summer.

Vegetation

Vegetation of the Muddy Planning Unit corresponds closely to climatic differences. Pinyon-juniper woodland is found on the Wasatch Plateau piedmont, on the top of the Coal Cliffs, and in the San Rafael Swell. These areas are slightly wetter and cooler due to their higher elevation. Sagebrush is found on the less favorable margins of the woodland areas and in large parts of Castle Valley. Grasses and desert shrubs occupy much of the low area between the Coal Cliffs and the San Rafael Swell. Large parts of the Muddy Unit are barren or wasteland. They include areas of bare rock as well as eroded badlands in the Mancos shale and Morrison formations.

PRICE RIVER

Location

The Price River Planning Unit (BLM) consists of 289,976 acres (117,353 ha.). Just over half of the unit is in central Carbon County and the remainder is in north-central Emery County. The northern and most of the eastern boundary of the unit roughly follows the Book Cliffs. Part of the western boundary is in the vicinity of the Desert Seep Wash. The Price River crosses the unit from the center of the western border running to the southeast. U.S. Highway 6 and the Denver and Rio Grande Western Railroad roughly parallel the river on the northeast side. This unit adjoins the Summerville Planning Unit to the southeast, the Range Creek on the east and north, the Wattis on the west, and the Huntington Planning Unit on the west and south.

Environment

The Price River Unit has three generalized geomorphic divisions. On the north and east are large areas of alluvial fans and pediments dipping south and west from the Book Cliffs. Elevations reach to over 7,000 feet (2,134 m.) at the edge of the unit and average about 6,250 feet (1,905 m.) at the base of the cliffs. The lower central part of the unit, occupied by the Price River and associated drainages, is mostly 5,000-6,000 feet (1,524-1,829 m.) above sea level. It is a heavily dissected valley. To the south, elevations rise step-like to about 7,500 feet (2,286 m.) into the Red Plateau-Cedar Mountain area.

Geology

Geologically, the Book Cliffs are part of the Cretaceous Blackhawk formation of the Mesa Verde group. The valley area is primarily undivided Cretaceous Mancos shale pediments overlain in large areas on the north and east by Quaternary gravel deposits. There are also some small areas of relatively young alluvium along the river and in some large washes. The southern and western parts of the unit exhibit a great range of strata, beginning with the Jurassic Carmel formation along the lower Price River and rising to the south and west in steps through the Entrada sandstone and Curtis formations of the San Rafael group. Still higher to the south and west are important areas of Salt Wash sandstone and Brushy Basin shale of the Morrison formation. Higher still is the Cretaceous Cedar Mountain formation. There are also important areas of Quaternary colluvial surface materials on slopes and alluvium on mesa tops. Continuing upward, especially on the western edge of the unit, there are successive strata of Dakota sandstone and the Tununk shale, Ferron sandstone, and Blue Gate sandstone members of the Mancos shale formation. In the south and west, the most important formations are the Carmel, the Salt Wash sandstone, the Brushy Basin shale, and the Cedar Mountain shale.

Climate

The climate of the Price River Planning Unit is arid, with an average of less than eight inches (203 mm.) of precipitation in the valley and only an inch or two more on the higher elevations. About one-third falls in summer showers. The area is in a rainshadow formed by the Wasatch Plateau to the west. Summer temperatures may exceed 100 degrees F. (38 degrees C.) several days each year, and winters are cold.

Vegetation

The BLM has classified the vegetation of the unit as follows: 38.1 percent pinyon-juniper, 8.2 percent grassland, 6.1 percent sagebrush, 41.5 percent desert shrub, and 6.1 percent barren or wasteland. The pinyon-juniper association is found at the higher elevations on both the north and east and the south and west of the unit. Juniper alone occupies the lower or drier areas, with mixed pinyon and juniper at wetter locations and pinyon alone in the dampest areas. In some areas of the southern part of the unit, pinyon is found in a mixed association with ponderosa pine.

Desert shrub, including areas of mat saltbush, greasewood, shadscale, and blackbrush occupies large parts of the center of the unit. It is mostly north of the Price River, except in low drainages such as the Desert Seep Wash. In areas slightly more favored by water and soil salinity conditions, such as on the toe of an alluvial fan, are found relatively small patches of grassland or sagebrush. Barren or wasteland areas, mostly rocky slopes, occur along the Book Cliffs and in areas of the southern portion of the unit.

RANGE CREEK

Location

The Range Creek Planning Unit (BLM) consists of 457,000 acres (184,948 ha.) in northeastern Carbon County, Utah. The northern boundary is the Duchesne County line, the eastern boundary follows the Green River, and the southern boundary is the Price River. The western boundary of this planning unit follows the Book Cliffs. There are no large settlements nor important highways within the unit with the exception of Utah Highway 6, which passes through the southwestern corner. Cattle ranching is the prevalent economic activity with some oil and natural gas production and coal mining also being practiced in the East Carbon City area. The unit borders on the Wattis Unit on the northwest, the Price River Unit on the west, the Summerville Unit on the south, and the Rock Mountain Planning Unit and the Uintah and Ouray Indian Reservation on the southeast and east.

Environment

The Range Creek Planning Unit, despite its large size, is not environmentally complex. Except for the lowlands along the Price River in the southeast, where elevations are below 5,000 feet (1,524 m.), the unit is composed of the Book Cliffs, Roan Cliffs, West Tavaputs Plateau, and several important canyons. The Book Cliffs form the southern edge of the Uintah Basin section of the Colorado Plateau.

They rise some 3,000 feet (914 m.) to the 8,000 and 9,000 foot (2,438-2,743 m.) elevations. The highest peak is Patmos Head, at 9,851 feet (3,003 m.). Lying between the Book Cliffs and the Roan Cliffs is the deep Range Creek Canyon. This same structural area in the northwest is occupied by the high flats known as Whitmore Park. The Roan Cliffs, forming the southern margin of the West Tavaputs Plateau, rise to a general level of 9,000 feet (2,743 m.), with the highest peak being Mt. Bartles at 10,047 feet (3,062 m.). The plateau surface dips to the northeast and Nine Mile Creek flows eastward in its own deep canyon along the northern edge of the unit. Desolation Canyon on the Green River marks the passage of that river from the Uintah Basin south into the Canyonlands section of the Colorado Plateau.

Geology

The surface geology of the Range Creek Unit is mostly influenced by the Book Cliff and Roan Cliff topography, which consists of exposed stratigraphic escarpments which extend and dip northward under the younger materials of the Uintah Basin. The lowlands below the Book Cliffs in the southern part of the planning unit are composed of Cretaceous Mancos shale members overlain in spots by pediment gravels and relatively young alluvium. The cliffs themselves are in the Cretaceous Mesa Verde group, and include the Blackhawk formation and Castle Gate sandstone capped by the Price River and Tuscher formations. Behind the cliffs lie areas of North Horn formation and Tertiary Colton, Wasatch, and Green River formations. The Roan Cliffs consist of Green River formation rocks including the Douglas Creek, Garden Gulch, and Parachute Creek members. The Tavaputs Plateau has as its surface material the lower and middle units of the Parachute Creek member; the latter unit being the chief oil shale unit of the region.

Climate

The climate of the Range Creek Planning Unit varies with altitude and exposure. The low southern area is very dry with less than eight inches (203 mm.) of annual precipitation. Precipitation increases rapidly on the Book Cliffs to between 16 and 20 inches (406-508 mm.). The back slope of the cliffs which forms the plateau surface has decreasing rainfall to the northeast, probably due to a rainshadow effect. From one-half to one-third of the precipitation falls in the May-September season of convectional showers. Temperatures also vary with altitude. In general, summers are hot at lower elevations and cool at higher elevations, while winters are cold.

Vegetation

The vegetation pattern of the Range Creek Planning Unit is quite complex. The complexity is primarily due to the highly dissected nature of the terrain, and is also influenced by altitude, exposure, and soil-water conditions. In general, the low-lying southwest corner is covered by desert shrub--mostly shadscale. The Book Cliffs is mostly a region of pinyon-juniper woodland interspersed by areas of sage and mountain mahogany with some Douglas-fir at higher elevations. The Roan Cliffs and Tavaputs Plateau is a complex intermixing of Douglas-fir, aspen, sagebrush, mountain mahogany, grassland, bare rock, and pinyon-juniper. The latter dominates in the north along the southern slopes and ridge lines of Nine Mile Creek, while sage dominates on the north of Nine Mile or Minnie Maud Creek and in the northeast corner of the unit.

SUMMERVILLE

Location

The 235,000 acre (95,104 ha.) Summerville Planning Unit (BLM) is located on the central-eastern boundary of

Emery County, Utah. The northern boundary of the unit follows the Price River and the eastern boundary is the Green River. The San Rafael River Canyon parallels part of the southwestern boundary. The unit is crossed by Interstate 70 not far from the southern boundary, and Highway 6 crosses the unit from the north boundary to the intersection with I-70. The Denver and Rio Grande Western Railroad parallels Highway 6. It adjoins the Book Mountain Planning Unit to the east, the Range Creek to the north, the Price River to the northwest, and the Huntington Planning Unit to the west.

Environment

The Summerville Unit has three generalized geomorphic divisions, an eastern plateau, western hills, and a central valley. The northeastern quarter, bordered by the west and south-facing Book Cliffs, is an area of dissected plateaus and mesas reaching elevations of just over 6,000 feet (1,830 m.). The major feature is known as the Beckwith Plateau. The western half of the unit is hilly. The southwestern third forms the eastern flank of the San Rafael Swell, and reaches nearly 6,000 feet. In the northwest are lower hills formed partly by the multi-branched Summerville Wash and associated interfluves.

The central valley area is primarily drained by Saleratus Wash, running from northwest to southeast, and is an eroded lower region with elevations in the neighborhood of 4,000 to 4,500 feet (1,220-1,370 m.). This valley features the location of the railroad and highway. Interstate 70 extends from the southeast corner of the planning unit and passes through the San Rafael Swell area on the west of the unit.

Geology

Geologically, the Book Cliffs are part of the Cretaceous Blackhawk formation, while the Beckwith Plateau is topped by the Price River formation. Both formations are part of the Mesa Verde group. The western hill area is principally underlain by Cretaceous Cedar Mountain shale and Jurassic Brushy Basin shale and Salt Wash sandstone of the Morrison formation. It also has smaller areas made up of the Summerville and Curtis formations of the San Rafael group. Farther west are large areas of Triassic Navajo sandstone. The central valley region is mostly undivided Cretaceous Mancos shale overlain in large areas by Quaternary gravels. These are especially noticeable on pediments at the base of the Book Cliffs. There are also relatively young alluvial deposits along the Salteratus Wash, other washes, and the Green River.

Climate

The climate of the Summerville Unit is arid, with an average of less than 8 inches (203 mm.) of rainfall per year in the valleys and only an additional inch or two on the highest elevations. About one-third falls in summer. Temperatures exceed 100 degrees F. (38 degrees C.) several days each year, and winters are cold.

Vegetation

The BLM has classified the vegetation of the unit as follows: 36.7 percent pinyon-juniper, 54.7 percent desert shrub, 5.4 percent barren waste, and 3.2 percent grassland. The pinyon-juniper association is found at the higher elevations in both the northeastern plateau and the western hill sections of the unit. Most of the lower central region is classified as desert shrub. The grasslands are found in relatively small scattered areas, both in the central and western sections. Barren and waste land, mostly rocky slopes, occurs in relatively greater portions of the eastern plateaus, but also in important areas along the southwestern boundary of the unit. There are also small, privately owned, irrigated areas, primarily concentrated near the town of Green River.

WATTIS

Location

The Wattis Planning Unit (BLM) consists of 121,000 acres (48,969 ha.) in northwestern Carbon and northern Emery Counties, in Utah. The western boundary of the unit parallels the Manti-LaSal National Forest and the northern boundary is the Carbon County line. The Wattis Unit adjoins the Range Creek and Price River Planning Units on the east and the Huntington Planning Unit on the south. The unit is crossed by Highway 6, State Highway 10, and the Denver and Rio Grande Western and Utah railroads. The unit is drained by the Price River system, which flows from the Scofield Reservoir through the northern and eastern margins of the unit. The unit includes the cities of Price, Helper, and Wellington, as well as numerous coal mining towns, including Wattis. Agriculture and the mining industry provide the primary economic base for the communities within this planning unit.

Environment

The Wattis Planning Unit can be divided into three regions. The lower, easternmost region (mostly east of Highway 10) is generally flat with scattered, isolated hills. The elevation is generally between 5,000 and 6,000 feet (1,524-1,829 m.). The middle region lying primarily between the 6,000 and 7,000 foot (1,829-2,134 m.) elevations is made up of highly dissected foothills, benches, and pediments at the base of the Wasatch Plateau on the west and the Book Cliffs on the north. The third region rises across the escarpment to the north to elevations of over 9,000 feet (2,743 m.). Most of this region is very highly dissected except for small, relatively flat areas above the escarpment in the northeast corner of the unit. The Wattis Unit thus comprises the transition area at the junction of the Canyonlands, High Plateaus, and Uintah Basin sections of the Colorado Plateau.

Geology

The geology of the Wattis Planning Unit is relatively simple to define. Most of the lower eastern region, as well as the eastern half of the middle region, is made up of Blue Gate sandstone of the Cretaceous Mancos shale. The sandstone is overlain in important areas, both on the south of the unit and along the Book Cliffs north of Price, by gravels on pediments and benches, and by young alluvium in drainages. Northwest of the Utah Railroad are successive surfaces of Emery sandstone and Masuk members of the Mancos shale, Star Point sandstone, Blackhawk formation, and Castle Gate sandstone of the Mesa Verde group. The latter three formations include most of the Book Cliff escarpment. At higher levels in the third region of the unit are the Price River, North Horn, the Tertiary age, and Flagstaff Limestone surface rocks.

Climate

The climate of the Wattis Planning Unit varies according to elevation and exposure. The higher elevations on the north are cool, and receive between 16 and 30 inches (406-762 mm.) of annual precipitation. The lower elevation areas have cold winters and hot summers with between 8 and 16 inches (203-406 mm.) of annual rainfall. Between one-half and one-third of the annual precipitation falls between May and September. The larger fraction applies to the drier areas.

Vegetation

The vegetation of the planning unit in general reflects the climate. In the dry southeastern region, grassland and desert shrubs predominate. Within the slightly wetter central area, the vegetation is mostly brushland and pinyon-juniper woodland. The higher areas of the northwest are about one-third aspen and pine, with the remainder mostly shrubs and grasses. There are irrigated agricultural areas scattered within the planning unit, the most important of which is in the far south.

FOREST CENTRAL SAMPLING STRATUM (USFS)

Location

The U.S. Forest Service Central Sampling Stratum includes 350,740 acres (141,944 ha.) in the Manti-LaSal and Fishland National Forests in Sanpete, Emery, and Sevier Counties, in Utah. The Sanpete and Castle Valleys border the region on the west and on the east. The study area adjoins the Wattis, Huntington, and Muddy Planning Units (BLM) on the east, and is between the Forest Northern and Forest Southern Sampling Strata on the north and south respectively. Utah Highway 29 traverses the area from Castle Dale to Ephraim. The area has several important coal mines along its eastern margins. Joe's Valley Reservoir lies in the center, and large areas are used for grazing throughout its extent.

Environment

Almost the entire area of the Forest Central Sampling Stratum is part of the Wasatch Plateau, making it a segment of the High Plateaus section of the Colorado Plateau. It is made up of a series of plateau ridges separated by north-south tending faults. Fault scarps on the east are very abrupt, with as much as 3,000 feet (914 m.) difference within a half mile of horizontal distance. Elevations rise to over 10,000 feet (3,048 m.) on several mountains. Within this sample region, especially on the south, there are numerous high plateaus having relatively level surfaces.

Geology

The surface geology of this sampling stratum is influenced primarily by the series of north-south faults which created the Wasatch Plateau. The easternmost zone of faults enters the northeast corner of the area and continues south below the eastern slopes of East Mountain. The second major fault zone is located in the center of the plateau in the Joe's Valley area. This zone continues southward and becomes the eastern escarpment of the plateau just south of Ferron Creek. The third fault zone forms the western escarpments of the plateau.

Within the fault zone regions, the surface geology is not complex. The lower brows of the escarpments are Cretaceous Price River formation. At higher levels are found large areas of North Horn formation. The highest plateau surfaces are Tertiary Flagstaff limestone. Within the canyons and along the escarpments, older rocks form the surface. They are mostly the Cretaceous Mesa Verde group composed of Star Point sandstone, Blackhawk formation, and Castle Gate sandstone. There are also small areas of Quaternary landslide and alluvial materials.

Climate

The climate of the region is cool because of elevation, and has an average annual precipitation of between 16 and 40 inches (406-1,016 mm.). The driest areas are in the lower flanking valleys on the east and west of the region. Between one-fourth and one-third of the year's rainfall normally occurs during the period from May through September. Winter temperatures are cold and summers are cool.

Vegetation

The vegetation cover of the region varies with altitude and rainfall. Drier, lower elevations along the escarpments and canyon bottoms are covered with pinyon-juniper woodland, interspersed with sage. The plateau is capped by the spruce, fir, Douglas-fir, and aspen association. High peaks and plateau surfaces have areas of sage, mountain brush, and mountain meadow. Ponderosa pine dominates the brow of the eastern escarpment.

FOREST NORTH SAMPLING STRATUM (USFS)

Location

The Forest Service Northern Sampling Stratum includes 180,192 acres (72,924 ha.) in the Manti-LaSal National Forest in Utah County, Sanpete County, and Carbon County, Utah. On the west is the Sanpete Valley, to the north is Soldier Summit Pass traversed by Highway 6 and the Denver & Rio Grande Western Railroad. To the east are the Carbon County Lowlands around Price. The study area adjoins the Wattis Planning Unit (BLM) on the east and the Forest Central Sampling Stratum on the south.

Environment

Virtually the entire area of the northern sampling stratum is part of the Wasatch Plateau, and this is part of the High Plateaus section on the western edge of the Colorado Plateau. It is made up of a series of north-south plateaus separated by faults. Fault scarps on the east and west, as well as within the plateau section, are very abrupt, with as much as 3,000 feet (914 m.) of vertical local relief within a half mile (.8 km.) or less horizontal distance. Elevations rise to over 10,000 feet (3,048 m.) in several areas. Within this sample region there are fewer areas of relatively level plateau surfaces than can be found in the Forest Central Sampling Stratum to the south. High level areas of significant size are found only on Gentry Mountain and along the top of the western escarpment of the plateau. The size and location of these high altitude level surfaces appear to be an important factor in the location of cultural resource sites as discussed below.

Geology

The geology of the sampling stratum is influenced primarily by the series of north-south faults which created the Wasatch Plateau, and is made more complicated by the east-west faults located in the north of the unit west of

Scofield Reservoir. The surface of the eastern half of the plateau is composed of rocks from the Cretaceous Mesa Verde group. These include primarily Star Point sandstone and the Blackhawk formation as well as small areas of Castle Gate sandstone and Price River formation. The western half of the plateau is mostly topped by the North Horn formation with large areas of younger Flagstaff limestone. Both are found along the western edge of the Wasatch Plateau. In the more complex northwestern part of this unit there are areas of Tertiary Green River formation and small regions of undivided Cretaceous and Jurassic rocks, Cretaceous Emery sandstone and Indianola formations and early Tertiary Andesitic Pyroclastic rocks.

Climate

The climate of the region is cool because of elevation, and has an average annual precipitation of between 20 and 40 inches (508-1,016 mm.). The driest areas are at lower elevations on both the west and east slopes. About one-third of the year's rainfall normally occurs in the period from May-September.

Vegetation

The vegetation cover of the region varies with altitude and rainfall. Drier, lower elevations along the escarpments and canyon bottoms are covered by pinyon-juniper woodland, interspersed with sage. The plateau is capped by the spruce, fir, Douglas-fir, and aspen association. High peaks have areas of sage, mountain brush, and mountain meadow. Areas of ponderosa pine dominate the brow of the eastern escarpment.

<u>FOREST SOUTH SAMPLING STRATUM</u> (USFS)

Location

The Forest South Sampling Stratum includes 251,847 acres (101,922 ha.) on National Forest lands in the Fishland

and Manti-LaSal National Forests in Sevier and Wayne Counties in Utah. It is bounded on the east by the Forest Planning Unit of the BLM, on the southeast by Capitol Reef National Park, on the south by the Dixie National Forest, on the west by the Sevier River Valley, and on the north by the Manti-LaSal National Forest. It is crossed by Interstate 70 and is accessible by Utah Highway 24 and Utah Highway 25. The latter ends within the region at Fish Lake.

Geology

The Wasatch Plateau enters the northern part of the region, with areas of high level surface and abrupt escarpments on the east and west. The high plateau is covered by large areas of Tertiary Flagstaff limestone and Cretaceous North Horn formation. The Price River formation of the Mesa Verde group forms the surface of important parts of the lower eastern margin of the plateau. South of the Salina Creek-Ivie Creek drainages, most of the region is covered by Tertiary and Quaternary extrusive materials and Quaternary alluvial and colluvial deposits. The most important extrusives include large areas of undifferentiated latite and basaltic andesite flows, areas of tuff of Osiris, and flows of Olivine basalt. Quaternary deposits include alluvial sands, gravels, and silts, colluvial deposits, and large landslide deposits, especially in the southeast of the region. Fish Lake occupies a structural depression within the area of extrusive flows. Drainage in that area is generally to the southeast with the Fremont River being the most significant stream.

Elevations in this part of the Wasatch Plateau on the north of the survey area rarely exceed 9,000 feet (2,743 m.). In the southern volcanic area the highest peak is Mt. Marvine at 11,600 feet (3,536 m.). There are several other peaks over 10,000 feet (3,048 m.).

Climate

The climate of the region is cool because of elevation, and the area has an average rainfall of between 10 and 35 inches (254-889 mm.). The driest areas are at the lowest elevations on both west and east, and the wettest are on the highest mountain peaks. An average precipitation figure for the whole region is about 20 inches (508 mm.). About one-third of the year's rainfall normally comes in the period from May through September.

Vegetation

The vegetation cover of the region varies with altitude and rainfall. Drier, lower elevation areas are covered by pinyon-juniper woodland, interspersed with sagebrush. The Wasatch Plateau is capped by the spruce, fir, Douglas-fir, aspen association, as are corresponding elevations to the south. The transition zone between the plateau and the extrusive area has large areas of mountain brush which extend southward along the western slopes of the Fish Lake Mountains. Because of its overall high elevation, the southern region has large mountain meadow areas. There are also small areas of ponderosa pine along the top of the eastern escarpment in the northern half of the region.

Part C: Man's Utilization of the Environment

Man has lived on the Colorado Plateau for many thousands of years. To do so, he has utilized the available natural resources. The degree of dependence on one or another resource has varied according to the demands and technology of a given culture. The culture history of the area is discussed elsewhere. The following is a synthesis of uses for those natural resources present or likely to have been present.

Water is a basic resource necessary to sustain life, both in terms of direct intake by human beings and as a requirement for the protection of their food supply. The scarcity of water in the lowland areas of the survey has been mentioned previously. The result is utilization by human beings of all available water sources, including, but not limited to, seeps, springs, streams, rivers, flash floods, and slope runoff. During wetter periods of the past, small lakes were present. The full extent of their use has not been evaluated. There does appear to be a relationship between archeological sites and water sources. For instance, many sites occur on higher elevations overlooking springs or streams. Also, human activities are more concentrated in areas with usable vegetation and animal life, which in turn depend on water. Evidence is also accumulating that some irrigation on a small scale was practiced by prehistoric groups.

Next to water, the most basic natural resource is soil. Soils of this region are not well studied and mostly are classified as lithosols, or thin soils on parent material. Some direct use of soil for agricultural purposes has taken place in alluvium deposits along stream channels. Deposition and removal of alluvial fill follow the cycles of climatic change, with deposition in wet periods and erosion in dry ones. For example, the period around 900 A.D. was wet, and both cultivated areas and population were expanding. By about 1300 A.D., a dry period brought a cultural abandonment and migration out of many areas. At the present, central Utah is undergoing a dry period with resulting removal of alluvial material. Soils, especially clays, were also widely used in making pottery and adobes, in chinking cracks in stone structures, and in wattle and daub type construction.

The natural vegetation of the region has been utilized by human beings in almost every conceivable way. It has been used for food, clothing, construction materials, tools, fuel, dyes, and ornaments. Some vegetative materials which are consumed either directly or after processing include pinyon nuts, acorns, wild onions, tobacco, various berries, Mormon tea, prickly-pear, and other edible plants. Several

The Black Knoll subphase begins at approximately 8300 B.P. and continues until about 6200 B.P. (Schroedl 1976). Subsistence during this period was based on generalized gathering and hunting techniques. A large variety of plant, animal, and insect resources were utilized. Hunting was primarily limited to deer and mountain sheep, although antelope and bison were also utilized. The trapping of rabbits and small rodents was also an important source of protein.

The prevalent utilization of caves and rockshelters as habitations in conjunction with the aridity of the area has resulted in conditions suited to the preservation of normally perishable materials. Due to the excellent preservation, it is known that the spear thrower (atlatl) was the implement used for hunting. The atlatl was used with a two or three component shaft and stone dart point throughout the Archaic phase. The Black Knoll subphase of the Archaic was characterized by two types of dart points, the Pinto and the Northern Side Notch (Schroedl 1976).

The Castle Valley subphase of the Archaic began about 6200 B.P. and ended about 4500 B.P. Subsistence techniques and the utilization of caves were the same as the earlier Black Knoll subphase but dart point styles changed and also diversified. Dart points such as Rocker Base, Sudden Side Notch, and Hawken Side Notch appeared early in the Castle Valley subphase and continued to be utilized until the end. During the later part of the Castle Valley subphase, Humboldt dart points appeared and quickly became the dominant style (Schroedl 1976).

The Green River subphase of the Archaic began about 4500 B.P. and ended about 3300 B.P. and has a western and eastern variant (Schroedl 1976). Both variants are characterized by subsistence techniques unchanged from earlier Archaic subphases. The two variants are distinguished by differences in dart points. Gypsum and San Rafael Side Notch dart points are associated with the western variant and Duncan-Hannah and an unidentified triangular corner notch dart point are associated with the eastern variant. The dart points of the eastern variant exhibit a Plains influence.

The Dirty Devil subphase of the Archaic began about 3300 B.P. and has been given an arbitrary termination date of 1500 B.P. (Schroedl 1976). Subsistence techniques were unchanged during the early portion of the subphase, but evidence of corn horticulture in the late Dirty Devil subphase has been found at several locations: Cowboy Cave (Jennings et al in preparation), Cottonwood Cave in western Colorado (Hurst 1948), and Clyde's Cavern in central Utah (Winter 1973). At all three locations, corn caches were found which dated generally between 1600 B.P. and 2000 B.P.

The dart points characteristic of the Dirty Devil subphase are the gypsum point which continued from the Green River subphase as the predominant projectile point. The very late portion of the Dirty Devil subphase evidenced the advent of the bow and arrow. At Cowboy Cave (Jennings et al in preparation), Rose Springs arrowheads were recovered from the uppermost level and were dated between 1500 and 1600 B.P.

The entire Archaic phase is characterized by a gathering and hunting subsistence mode and a sequence of dart point styles which have been defined through the analysis of excavated cave and rock shelter sites. Transient habitation of these caves during the annual migratory round is the most widely accepted interpretation of the Archaic subsistence pattern.

The atlatl was the universal Archaic hunting implement until the very last centuries of the Archaic phase.

However, the advent of the bow and arrow around 1600 to 1500 B.P. does not seem to have eliminated the utilization of the atlatl during the late Archaic. Gypsum dart points continued to be manufactured even after the appearance of Rose Spring arrowheads at Cowboy Cave (Holmer in Jennings et al in preparation).

The last centuries of the Archaic also witnessed the first evidence of corn horticulture.

FREMONT-ANASAZI PHASE

The Fremont culture of Utah has traditionally been divided into five regional variants: Parowan, Sevier, Great Salt Lake, Uintah, and San Rafael. However, a recent reevaluation has resulted in a three fold division. The Sevier culture now includes the Sevier, Great Salt Lake, and Parowan variants; the Uintah variant is replaced by an, as yet, unnamed northeastern Utah culture; and the San Rafael variant is designated as the Fremont culture. No cultural entity has been defined that can take into account the variation present between these three groups or areas. The differences are ascribed to separate origins (Madsen and Lindsay 1977).

All of these Utah cultures are characterized by the utilization of permanent dwelling, ceramics, and some degree of corn horticulture. According to Madsen, the Sevier culture (ca. 1300-650 B.P.) can be distinguished from the Fremont culture because of the former's primary dependence on wild foods collected from marshland environments west of the Wasatch Plateau. Madsen notes that Sevier villages are normally located near marshland or riverine biomes and consist of deep semisubterranean dwellings which are frequently clay lined. In addition, adobe surface storage structures are prevalent.

The Fremont culture is found east of the Wasatch Plateau and north of the Colorado River and dates from between 1500 to 700 B.P. The Fremont culture relied heavily on corn horticulture and is characterized by a settlement pattern which is also distinctly different from the Sevier culture (Madsen and Lindsay 1977). Fremont culture villages are relatively small and are located adjacent to permanent streams. Fremont culture architecture also differs from that of the Sevier; rock-lined semisubterranean dwellings and coursed masonry surface storage structures predominate. In addition, Anasazi tradewares are considerably more prevalent in the Fremont culture sites than in the Sevier culture sites.

The unnamed plains-derived culture of northern and northeastern Utah existed from about 1300 to 650 B.P. (Madsen and Lindsay 1977). This culture was dependent upon hunting of bison and the collecting of wild plants. The dwellings are normally shallow basin structures without any clear evidence of the type of superstructure utilized. Unlike the coiled pottery of the Sevier, Fremont, and Anasazi cultures, the unnamed culture produced pottery by the paddle and anvil techniques. It is important to note that there is a considerable spatial overlap of the unnamed culture and the Fremont culture traits in the northern portion of the latter's distribution. There is insufficient data at the present to determine whether the spatial trait overlap is due to alternate occupation, simultaneous occupation by the two cultures, or a combination of these two possibilities.

Hunting activities among the Sevier, Fremont, and unnamed cultures are evident from the many varieties of small arrowheads which have been recovered from excavations. Small stemmed corner notched and side notched points (variously called Rose Spring and Desert Side Notch) are present in all three cultures. However, sites from the southern portion of the Fremont culture area exhibit a distinctive type of arrowhead which is a long, thin triangular point with a shallow concave base. These points, tentatively named Bull Creek points, have been found in several sites in proportions roughly related to the percentage of Kayenta ceramics. Coombs Village (Lister and Lister 1961), Bull Creek, north of the Henry Mountains (Jennings et al in preparation), Snake Rock Villege (Aikens 1967), Old Woman (Taylor 1957), and Poplar Knob (Taylor 1957) sites all have both Bull Creek points and Kayenta ceramics.

Dart points, the Elko series and Gypsum in particular, are also found in association with Fremont sites. This association has been used by Schroedl (1976) to verify the indigenous development of the Fremont culture from Archaic antecedents. Dart points, during the Archaic, were used as both projectile points and knives (Weder in Jennings et al in preparation) but their function in the Fremont context has not yet been evaluated.

In reference to Utah, the Mesa Verde and Kayenta variants of the Anasazi culture are of particular importance. The San Juan Anasazi culture was centered around the Four Corners area where Colorado, New Mexico, Arizona, and Utah meet. The Kayenta Anasazi inhabited the extreme southern periphery of Utah from the San Juan River west to central Utah. Kayenta influence is evident in a narrow band of sites running from Coombs Village northwards past the Henry Mountains to the Snake Rock Village site adjacent to Interstate 70 on the east side of the Wasatch Plateau.

The Anasazi cultures developed over a time span roughly coincident with the Fremont culture to the north. The period from 1 A.D. to 500 A.D. is known as the Basket Maker II subphase, which is characterized by an Archaic style artifact trait list with the addition of corn and squash cultivation and the use of shallow round pithouses reinforced with stone, log and mud mortar walls. Ceramics were not present and the atlatl was still the hunting implement in use. Basket Maker II times were a period of gradually increasing population (Plog 1974:94-95).

The Basket Maker III subphase (450 A.D. to 750 A.D.) encompassed a period of general population decline (Plog 1974). Several changes in traits occurred during this subphase, however. Ceramics began to be manufactured, the bow and arrow was introduced, beans were added as a cultigen, and the dwellings included deep (three to four feet), rectangular semisubterranean pithouses.

The Pueblo I subphase lasted from 750 A.D. to 900 A.D. and was the beginning of a gradual population increase which peaked just before 1300 A.D. In the San Juan area, dwellings consisted both of subsurface kivas and surface structures of jacal, adobe, or masonry construction with associated surface storage rooms. Dwellings in the Fremont and Kayenta culture areas tended to remain primarily semisubterranean. Subsistence was based primarily on the corn-beans-squash trio of cultigens but hunting with bow and arrow was still of importance.

The Pueblo II subphase began about 800 A.D. and lasted until around 1100 A.D. Population was still increasing during this period. The San Juan Anasazi sites began to grow in size and were characterized by clusters of contiguous surface room blocks. The Kayenta dwellings of this period remained primarily pithouses. Cultivation of corn, bean, and squash, and hunting with the bow and arrow were still the basis for subsistence.

The Pueblo III subphase (1100 A.D. to 1300 A.D.) again was a period of population increase until approximately 1275 A.D. when a decline began, to be later followed by complete abandonment of sites by the San Juan, Kayenta, and

Fremont peoples. During the height of the Pueblo III period, the San Juan Anasazi were typically living in multistory masonry buildings sometimes packed into the cramped quarters of large alcoves. Fremont and Kayenta dwellings, however, continued to be primarily pithouses although two Kayenta sites in Arizona, Betatakin and Keet Seel, were similar to the San Juan multistory cliff dwellings. The subsistence during the Pueblo III subphase continued to be based on the cultivation of corn, beans, and squash and hunting with the bow and arrow. The quality of the ceramics in southern Utah reached its peak before the abandonment.

The area of Utah encompassed by the Central Coal Project includes regions occupied by the Fremont and Sevier cultures. The Fremont culture was evidently influenced in art, ceramics, and agriculture by the Kayenta Anasazi and San Juan Anasazi. Site types within the Central Coal Project area include small villages of semisubterranean pithouses located along permanent stream courses and adjacent to marshlands. Characteristic artifacts found with the Central Coal Project area include dart points, arrowheads, and ceramics. The arrowheads are of the Rose Springs, Desert Side Notch, and Bull Creek types. The ceramics include Emery and Sevier graywares, Kayenta Polychrome wares, Ivie Creek Black on White ware, and some San Juan Black on White ware. The dart points (or knives) include the Elko series and Gypsum types.

SHOSHONEAN PHASE

The Shoshonean populations, who were the sole inhabitants of Utah at the time of Euro-American contact, have been in the Great Basin region since approximately 650 B.P. Their origin has been the subject of considerable controversy, however. Several hypotheses have been expressed.

One hypothesis maintains that the Shoshoneans came from the southwest of the Great Basin at about the time of the dispersal of the Sevier, Fremont, and Anasazi agriculturalists (Madsen 1975 and Lamb 1958). Gunnerson's hypothesis (1962) states that the Fremont, Sevier, and Virgin cultures were Shoshonean peoples who had taken up horticultural and ceramic techniques diffused from the Anasazi, but later reverted to an Archaic subsistence style after a climatic change which made agricultural subsistence techniques unproductive. A third hypothesis maintains that the Fremont peoples came from the Northwest Plains, became horticulturalists through diffused influence from the Anasazi cultures, but were forced to move eastward by the Shoshonean expansion coming out of the Great Basin.

Regardless of which hypothesis is correct, Shoshonean groups (Ute, Paiute, Shoshone, and Bannock) were inhabiting the Great Basin into eastern Utah at ca. 1300 A.D., roughly coincident with the disappearance of the Fremont and Sevier cultures.

The Shoshonean subsistence pattern was quite similar to the Archaic adaptation. Small familial bands were engaged in a gathering and hunting subsistence utilizing a wide variety of nondomesticated plant, mammal, and insect species.

Very little archeological evidence is available for this time period. Two characteristic artifact types can generally be associated with the Shoshonean occupation of Utah. The bow and arrow was utilized for hunting and a type of arrowhead, the Desert Side Notch point, is generally associated with the Shoshonean occupation (Hester and Heizer 1973). The Shoshoneans also utilized ceramics to a small degree. Shoshonean ceramics are easily distinguished from Sevier, Fremont, and Anasazi wares by the former's relative crudeness. Shoshonean ceramics are typically thick walled, have large temper particles, were poorly smoothed, exhibit little decoration, and were fired in an oxidizing atmosphere.

Part B: The Protohistoric Period

The prehistoric Shoshonean occupation of the Intermountain West continued up to the through the period of White contact. The Indian groups inhabiting the area of eastern Utah within which the Central Coal Project is located came to be called the Utes.

PRECONTACT

The Utes are a group belonging to the Shoshonean (Uto-Aztecan) linguistic family of which there are three branches: Ute-Chemehuevi, Shoshoni, and Mono-Paviotso. The Ute-Chemehuevi branch includes those groups which came to be known as the Utes, Southern Paiutes, and Chemehuevi. Although there is little archeological evidence, the Utes probably were characterized by a social organization and subsistence mode quite similar to all of the other aboriginal groups in the Great Basin and Colorado Plateau. The Utes were pedestrian gatherers and hunters who utilized a relatively large area of western Colorado and eastern Utah (Steward 1974).

The Utes were grouped into loosely organized bands consisting of extended families. Leadership was present only for subsistence task groups. The Utes could be reliably distinguished from the other contemporary aboriginal groups only in terms of linguistic differences.

Group territoriality was developed only in a statistical sense. A particular Ute band might consider a certain area as a home, but the seasonal round of each band was highly variable from year to year. The area with which any band was most familiar was not exclusively utilized by that band. Intermarriage among the various Ute bands tended to maintain linguistic unity but blur the definition of a territorial homeland for any particular band. Except for those Utes who were utilizing the aquatic resources around Utah Lake, local populations were small and mobile (Steward 1974).

EARLY CONTACT

The presence of the Spanish colony at Santa Fe by 1598 resulted in the first contact between the Utes and Euro-American groups. The relationship which developed between the Utes and the Spaniards was consistently friendly and resulted in the spread of the horse among the Ute bands. When the Utes obtained the horse, a change in their subsistence occurred. The equestrian Ute was able to travel more widely and more effectively and concentrate on bison hunting (O'Neill 1973).

The utility of the horse was strongly mitigated by environmental factors, however. The maintenance of a large horse herd required substantial supplies of grass which generally limited the advantage of the horse to those areas where grass was plentiful such as western Colorado, the Uintah Basin, and along the western slopes of the Wasatch Mountains. The supply of grass also determined the distribution of the bison. The horse was therefore not equally valuable to all of the Ute bands. The bands in Colorado were able to support their horses whereas those bands in Utah, eastern Utah in particular, were unable to utilize the horse effectively and were more likely to eat a horse than ride it.

Considerable trading activity with the Utes was occurring during the 17th and 18th centuries. Of particular importance was slave trade (O'Neill 1973). The Utes were able to conduct slave raids on neighboring tribes (especially the Navajo) because of their equestrian status. They then exchanged their slaves for horses and other Spanish

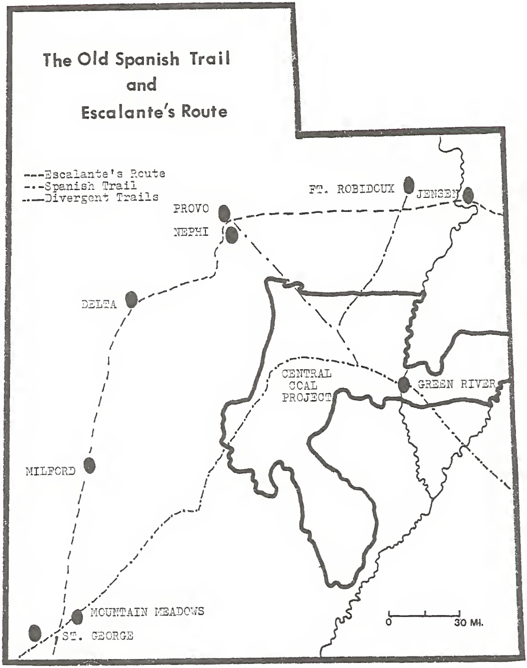


Figure 3-1. The Old Spanish Trail and Escalante route.

goods. Whether the slaves were exchanged with traders travelling into Ute territory or were driven by the Utes to Spanish settlements is unknown because of the lack of documented evidence. Until the 1770's there was little official Spanish interest in the territory of the Utes. However, at that time King Charles III of Spain decided that an exploration of the areas north of Santa Fe would be beneficial to Spanish control. His developing interest was a reaction to the growing influence and explorations by the British and French in the west. Charles III felt that it was important to ensure control of trade by the Spaniards since he considered the British and French traders as a threat to Spanish rule (O'Neill 1973).

The first documented Spanish exploration of the area north of Santa Fe was the Dominguez-Escalante Expedition of 1776-1777. This expedition was also the first officially sponsored exploration, the purpose of which was to find a route between Santa Fe and the Spanish settlements in California. Although the expedition was unsuccessful in reaching its goal, it did extensively explore the territory occupied by the Utes who, in all recorded instances, welcomed the Spaniards.

A trail was eventually established between Santa Fe and California which came to be known as the Spanish Trail (see Figure 3-1). The origins of the Spanish Trail are obscure; however, this trail was probably utilized in prehistoric times as evidenced by its association with archeological sites.

LATE CONTACT

Beginning in the early 1800's the fur trade became active in Utah. The Arze-Garcia expedition traded for furs with the Utes at Utah Lake in 1813 and soon thereafter trappers began to actively exploit the area. Etienne Provost was a member of the Choteau-DeMun exploration of 1815 to 1817 and subsequently founded his own trapping company which operated primarily within Ute territory. He was subsequently killed by the Utes near the site of the city which now bears his name (O'Neill 1973).

During this time, more detailed information on the Shoshonean peoples of the area was recorded. In particular, specific Ute bands are mentioned with reference to their respective territories. Within the Central Coal Project boundaries three Ute bands were active. In the northwest corner of the CCP area was located the Tumpanuwache band which was primarily centered around Utah Lake. The Pahvant band occupied the southwest corner of the Central Coal Project area and the Weeminuche band was located in the east (O'Neill 1973).

The Adams-Onis treaty of 1819, which gave Mexico its independence, resulted in an influx of Americans to Santa Fe. Most of the Americans came to engage in trapping. The newly arrived trappers caused a considerable increase in traffic along the Spanish Trail and an increase in competition for the available fur resources. This competition was not welcomed by the Utes, who were no longer consistently friendly with the Euro-Americans.

Although there were a large number of independent trappers operating in Utah, their activities have not been well documented. Antoine Robidoux was an important trapper, who by 1824 was operating primarily in the Uintah Mountains. William Ashley and Peter Skene Ogden were trapping in the northern Ute territory during the summer of 1824 and at about the same time Jedediah Smith was exploring eastern Ute territories to evaluate their trapping potential (O'Neill 1973).

The growing traffic along the Spanish Trail had an important effect on the local Ute bands. Wakara, a

Tumpanuwache leader, became quite powerful in the 1820's by conducting horse raids in southern California and returning to Utah by way of the Spanish Trail (Lyman and Denver 1970). He enhanced his power and wealth by exacting tribute from travelers along the trail and by the trading of stolen horses and Pahvant and Paiute slaves (O'Neill 1973). In addition, Wakara and his band actively engaged in fur trapping.

By the late 1830's there was considerable competition for the fur resources of Utah and western Colorado. Robidoux established a permanent fort and trading center in 1837 near White Rocks in the Uintah Basin to capitalize on the beaver-laden streams of the Uintah Mountains.

The prosperity of the fur trade was not destined to last very long, however. The fierce competition over trapping areas led to widespread disruptive conflicts and, most importantly, the demand for furs used to make the beaver skin hats which were fashionable in Europe and the eastern United States declined rapidly about 1840 as the fashions changed. Fort Robidoux was burned in 1844 by the Utes, who apparently blamed the trappers for the declining value of their furs (O'Neill 1973; Lyman and Denver 1970).

The decline of the fur trade had a serious impact on the Ute bands of Utah. The entire economic base of the Utes began to disintegrate after 1840. The trading activities with Santa Fe began to dwindle with the decline in the horse and slave trade. The termination of Mexican control of the area in 1846 and the subsequent loss of contact for slave trade into Mexico (Lyman and Denver 1970) was very disruptive to the relationships existing between Utah and Santa Fe.

During the declining years of the fur trade, the largest invasion of Ute territory occurred. Beginning in 1847, Mormon pioneers began to move into Utah and rapidly swelled their numbers through immigration. At first there was little conflict with the Utes because the major Mormon settlement, Salt Lake City, was on the periphery of the Ute territory and the earliest Mormon expansion was to the north. In 1849, Fort Utah (later to become the town of Provo) was founded near Utah Lake on the traditional campsite of the Tumpanuwache band. Since the Tumpanuwache band, still under the leadership of Wakara, had been forced to revert to their earlier mode of subsistence due to the decline of the fur trade, their utilization of the resources around Utah Lake became of vital importance. The conflicting interests in the Utah Lake vicinity escalated into a series of raids and counterraids during the 1850's which became known as the Walker War. In the end, the Utes were forced to leave the valley and moved east across the Wasatch Mountains (O'Neill 1973).

The next few years were difficult for the Utes, who were being gradually forced to split up into small bands and resume a subsistence mode similar to the precontact period. Some of the bands, however, chose to raid Mormon settlements and farms to obtain cattle so that they could avoid starvation. These raids became more prevalent during the 1860's. Raids were conducted on the Mormon settlers west of the Wasatch and the Utes returned to the unsettled areas east of the Wasatch with the stolen cattle (O'Neill 1973). Although several bands were responsible for these raids, one man by the name of Black Hawk became the focus of the blame for all the raiding.

The areas east of the Wasatch Mountains remained under Ute domination for several years. A Mormon attempt to colonize at Moab was undertaken in 1855, but the Mormon settlers were harassed by the Utes and forced to return to Salt Lake City. It was not until 1877, by which time the Utes had been removed to the Uintah Reservation, that Mormon colonists were able to safely settle east of the Wasatch Mountains (O'Neill 1973).

Part C: The Historic Period

The history of the east-central coal areas of Utah begins with the exploration and colonization efforts of the Spanish during the last quarter of the 18th Century. East-central Utah was first explored and mapped by the Dominguez-Escalante Expedition of the 1776-1777, in its efforts to establish a line of communication between the Spanish settlements of New Mexico and Monterey, California (Miller 1968), (See Figure 3-1).

Though the Dominguez-Escalante Expedition failed to achieve this end, subsequent attempts from the new Mexico settlements and the travelings of Spanish and American fur trappers, traders, and frontiersmen resulted in a connecting route known as the Old Spanish Trail (Miller 1968:Map 20). Along this route, which came up from Santa Fe through the San Juan country, across the Colorado River at Moab, over the Green River at the present site of Green River, across the San Rafael Desert into Castle Valley, then south through Salina Canyon to southwestern Utah and southern California, passed thousands of horses, and numerous trading, trapping, and Indian slave trade expeditions (Miller 1968), (see Figure 3-1).

By the 1830's the trail was well established, portions of its route being followed in 1853 by explorer, John C. Fremont and government surveyor, John W. Gunnison, who reported several sets of well-worn tracks near Green River where Interstate 70 presently runs. Other sections of the trail still remain near the Big Hole Wash in Emery County. The primary route of the Old Spanish Trail, plus divergent trails to Utah Lake, Fort Robidoux, and Fort Kit Carson, brought the first extended contact into the area encompassed by the Central Coal Project (Miller 1968: Map 20).

Though forts and trading posts were scattered sparsely through southern and central Utah, the first attempts at organized settlement were undertaken by the Mormon Church. In 1855 the Elk Mountain Mission passed southward through Castle Valley to the area of Moab, intending to establish a permanent settlement, but Indian hostility forced a quick retreat. The combination of hostile Indians, the desolate appearance of the region, the hardships involved in securing sufficient water for irrigation, and doubts about the quality of the soil caused further attempts at colonization of the eastern area of what was then Sanpete County to be dropped for over 20 years (McElprang et al 1949:16).

At a priesthood meeting at Mt. Pleasant on September 22, 1877, encouragement was given to settle Castle Valley; soon after, 75 men from Sanpete Stake were called with Christian G. Larsen as leader. Very few responded, however, because of the aforementioned reasons. Orange Seely was subsequently given the responsibility of superintending the founding of settlements, and another call for colonizers was issued by the Church in the fall of 1878. Some of the earliest settlers of the area, who dwelt in dugouts in hills or washes until log houses could be erected, were Elias and John Cox, Ben Jones, William Avery, and Anthony Humbel. By the fall of 1878, the crops were sufficient and the situation stable enough for the families of these men to join them, a sure sign of an intent to remain (McElprang et al 1949).

Work progressed on the agricultural settlements of Castle Valley, and roads were built through the Wasatch

Mountains to the more stable areas of western Sanpete County. Additionally, in the fall of 1878, the "Star-Mail Route" was opened between Salina and Ouray, Colorado; it followed the paths of the Old Spanish Trail and the "Gunnison" Trail of years before (McElprang et al 1949: 19-21). In just three years the towns of Castle Dale, Wilsonville, Ferron, Greenriver (Blake), Huntington, Lawrence, Molen, and Orangeville had been established, and the Legislative Assembly in February 1880, created Emery County, which embraced all of present-day Carbon, Emery, and Grand Counties (Lever 1898:593).

Though the Central Coal area was settled for its agricultural and grazing possibilities, it was the area that inspired active settlement and set the mining-dominated industrial base that central and eastern Utah retains to the present.

The first recorded discovery of coal in eastern Utah was by the Gunnison Expedition of 1853 (Powell 1976:13), when they located deposits of coal approximately three miles east of present-day Emery. The isolated location of the Gunnison find, coupled with the hope that the deposits already discovered at Coalville and Wales would prove sufficient for the territory's needs, caused Gunnison's discovery to be forgotton. The subsequent failure of the efforts at Wales to produce good coking coal, and the Union Pacific Railroad's monopolization and price fixing on the deposits at Coalville, caused a reevaluation of the potential coal producing areas east of the Sanpete settlements (Powell 1976:13).

As a result, the first effort to exploit the newly found eastern coal deposits was undertaken in 1875 at Connellsville in the upper reaches of Huntington Canyon. The Fairview Coal Mining and Coke Company was organized by men from New York, Salt Lake City, and Fairview. Eleven coke ovens were constructed, and the coke was hauled by wagon into Springville. The expense involved with the hauling and the questionable quality of the coke produced caused the failure and abandonment of Connellsville by 1878, after only three years of operation (Powell 1976:13).

The next development of coal resources was begun in the Pleasant Valley area, also in 1875. The Pleasant Valley Coal Company, headed by Milan O. Packard, constructed a wagon road from Springville up Spanish Fork Canyon to Pleasant Valley coal lands in 1876; 1877 saw the opening of the Number 1 Mine in Winter Quarters Canyon (Powell 1976:14). A narrow gauge rail line was completed from Springville through Spanish Fork Canyon in October of 1879 by the Pleasant Valley Railroad Company, as the haul to Springville by the wagon road occupied four days in good weather, while in winter the road was impassable. This Pleasant Valley area proved to be extremely productive. The first three large scale mines in eastern Utah were established in this area when the Mud Creek Mine was reopened in 1882, followed by the 1884 opening of the Union Pacific Mine at Scofield, just east of Winter Quarters (Powell 1976:15).

From the earliest times, the railroads sought to control the supply of coal in the territory, e.g., the Coalville resources and Union Pacific Railroad's control over that source. During the early 1880's, the Denver and Rio Grande Railroad was extending its lines from Colorado through Utah. Though originally graded through Castle Valley and Salina Canyon, the route of the railroad was altered, going through Price and Spanish Fork Canyon and thus taking in the rich coal areas of what was to become Carbon County (McElprang et al 1949:22).

Further expressing its interest in eastern Utah coal, the Denver and Rio Grande Western (Denver and Rio Grande's Utah holdings) purchased the independently owned

Pleasant Valley Railroad Company and Pleasant Valley Coal Company in 1882. Shortly thereafter, Union Pacific Railroad Company (UPRR) penetrated the Pleasant Valley area in order to protect its threatened monopoly on Utah coal (Powell 1976:16). The UPRR formed the Utah Central Coal Company in 1882 and opened the Union Pacific Mine near Scofield in 1884. With the Denver and Rio Grande's Pleasant Valley Coal development (1882), the establishment of Utah Fuel Company in 1887, and the creation of Utah Central Coal of Union Pacific, the railroad companies almost totally dominated the ownership and production of the Utah mines until the early 1900's (Reynold et al 1948:195).

After the initial burst of activity of the late 1870's and early 1880's, there was a dearth in a new mine south of Scofield, opened in 1888. Shortly thereafter, a new coal area was discovered and began production. In 1888 a mine was opened at Castle Gate on the Price River near the mouth of Price Canyon. In about 1899 a new mine began operations at Sunnyside just 24 miles east of present-day Price at the base of the Book Cliffs. The Sunnyside Number 2 Mine also began its production in 1899 with the coal obtained there and also at Castle Gate being utilized for coking purposes (Powell 1976:17-18).

In 1906, the first of the coal operations which would remain free from railroad control began production at Kenilworth, three miles east of Helper. This enterprise was financially backed by James Wade and F. A. Sweet and was called the Independent Coal and Coke Company because of its unique ownership status. Sweet, one of Utah's most prominent coal authorities, also opened a mine on the middle fork of Miller Creek in 1908 and named the camp, Hiawatha (Reynold et al 1948:213). This locality at the foot of Gentry Mountain about eighteen miles southeast of Price was the scene of further coal mining development in 1911, when Black Hawk mine was opened by Brown and Eccles. Just a few miles to the south in northern Emery County, a small wagon mine was purchased by the Castle Valley Fuel Company and the town, Mohrland, named from the initials of the company's four major figures--Mays, Orem, Heiner, and Rice--was begun. Mr. W. H. Wattis undertook the last development in this area in 1916 at Wattis, several miles north of Hiawatha on the flank of Castle Valley Mountain.

In the early 1900's, coal was discovered in Grand County by Henry Ballard who sold his holding to the American Fuel Company in 1910. Some of the most modern equipment available was brought into this location; most of the coal was utilized for railroad locomotives as it was of good steaming variety. The mining methods were so efficient and the product so desirable that at the time of 1928, Sego had become the busiest coal camp in Utah, supporting some 500 people in a hodge-podge of housing developments (Daughters of the Utah Pioneers of Grand County 1972:154).

The decade from 1911-1920 saw an increase in activity in the coal regions of east-central Utah, with many new mines being opened in hitherto undeveloped areas within the Utah coal producing regions. In 1911, Frank Cameron prospected the region around Panther Canyon on the Price River, and in 1914 the first coal was shipped out by the Utah Fuel Company which had leased the properties to Cameron for development. Cameron also developed and opened a small camp at the base of Castle Rock about five miles northwest of Helper. Located directly on the main line of the Denver and Rio Grande Western Railroad, the camp's name was changed many times, as was its ownership. Originally known as Bear Canyon, it soon was called Cameron, for its developer, then Rolapp, and finally Royal (Reynolds et al 1948:244).

In 1912, Jesse Knight, one of the most prominent men in Utah mining history, bought 1600 acres of coal land west of Helper to provide coal for his smelting operations in the Tintic District. His mine, at what eventually became known as Spring Canyon, began production in 1913, and was the first of many mines in the Spring Canyon District, one of the most prolific coal producing areas in eastern Utah. Soon after the establishment of Storrs (Spring Canyon), F. A. Sweet opened another mine in Spring Canyon at Standardville, so called because it was considered to be the standard for the development of future mining camps. Nineteen fourteen saw the opening of the Latuda Mine and camp by Liberty Fuel Company, while mines were opened in 1916 at Peerless and Rains. The last mining development undertaken in the Spring Canyon District was Mutual Coal Company's Mutual and Little Standard operations, begun in 1921 and 1925, respectively.

The final major coal producing area to be opened in east-central Utah was the Gordon Creek District. This region had first been prospected in 1908, but was really brought to prominence in 1920 by A. E. Gibson, the superintendent of the Spring Canyon Mine. Mines were developed in this area up until 1925 by Consumers Mutual Coal Company, National Coal Company, and Sweet Coal Company. The operations of all three companies ceased by 1950 (Carr 1972:81).

After the development of the Gordon Creek area, further work on the coal regions was undertaken in areas that had been opened previously. In 1922, Columbia Steel Company opened a mine at Columbia near the location of Sunnyside in order to further exploit the excellent coking coal obtainable from that region. One very late development of the same coal veins that supported the Columbia operation was initiated in Horse Canyon in 1942 by the United States government to aid steel production at its Geneva plant (Reynolds et al 1948:252). Both mine and steel plant were taken over by U.S. Steel after WWII, and continue in operation to the present.

Most of the mines in east-central Utah continued production through the heavy demand years of WWI and the years of prosperity that followed, but a combination of overdevelopment, the increased use of other natural fuels, rising costs associated with expensive underground haulage, and the Depression of the late 1920's and early 1930's caused several camps to be abandoned. Among the first mines to succumb were the long exploited Pleasant Valley mines. Winter Quarters near Scofield was closed down in 1928, while Scofield and Clearcreek experienced reductions of operations during the early 1920's and 1930's respectively. Rains was also forced to cut back on operations in 1930. Despite these setbacks, as of 1929, there were twenty-two coal mines operating in Carbon, Emery, and Grand Counties, the production of these mines providing 98% of the state's output (Sutton 1949:852).

Economic and production difficulties continued to plague Utah's coal industry during the decade of the 1930's, forcing the closure of the Mutual and Mohrland mines in 1938. World War II brought a temporary respite to the general downward trend with many mines achieving their highest production levels during the war years and immediately thereafter.

The decade of the 1950's signalled the end for a great number of the eastern Utah coal mining operations as the adaptation of coal for new uses was insufficient to keep pace with this fuel's replacement in many of its traditional roles. The increasing use of natural gas for heating homes and heavy industry use, and the railroad's switch to diesel power were among the developments which severely hurt the coal industry. This bleak picture has drastically changed with the advent of America's "energy shortage," and new technologies for coal use in the future have caused an upswing in coal production in east-central Utah. Mines which were closed or kept running with skeleton crews have begun to increase operations during the last decade, and the possibility of a new sustained burst of coal mining activity definitely exists (Alexander 1963:244-247).

The second region within the Central Coal Project area to undergo early mining development was the Henry Mountains region, encompassing some two thousand, five hundred square miles in Wayne and Garfield Counties. Though well populated by legend, the Henry Mountains were generally avoided by early American settlers because of the aridity and ruggedness of the region. As late as the 1860's, the Henry Mountains District was blank on government maps. So little of them was known, that in 1853 John Gunnison mistakenly identified the Henrys as being the Abajo (Blue) Mountains, which lie almost one hundred miles to the east. The Henrys were not described and named until 1869 when John Wesley Powell made his first exploration of the Colorado River. In a subsequent 1871-1872 expedition under Powell, Professor A. N. Thompson led a party of men through the Henrys by way of Penn-Ellen Pass, and ascended some of the principal peaks. The quaquaversal dipping of the rock formations, and the presence of unique igneous rock intrusions caused special studies of the Henry Mountains to be undertaken by Grove Karl Gilbert in 1875 and 1876. In 1878 the Powell Survey produced the first fairly accurate map of the area with the name "Henry Mountains" attached (Ekker 1971:69).

This isolated range of peaks abounds with legends of early Spanish mining exploitation, including the "Old Spanish Mine", the gold from which was taken to Taos, New Mexico, via the Old Spanish Trail and the Bear's Ears Trail. At the Old Spanish Mine, as was their policy elsewhere on the continent, the Spaniards forced the native population to work the mines. The Spaniard's treatment of the Indian workers was so brutal that the Indians eventually rebelled against their Spanish taskmasters, killing all they could find. The mines were sealed and disguised with elaborate care, and the mining areas guarded by the Indians to insure that the whites would never return to enslave them again (Ekker 1970:1-8).

The earliest non-Spanish effort to exploit the mineral wealth of the Henrys was undertaken around 1868 by two men named Burke and Bowen. Burke had located gold ore in Mt. Pennell, but the Indians had run off his stock, taken his camp equipment, and driven him out of the country. On his tortuous return from the mountains, he encountered Ben Bowen, a soldier of fortune, who was running a stage station at Desert Springs. Burke, convinced he had rediscovered the "Old Spanish Mine", told his story to Bowen, and the two men made plans to return to the diggings as soon as Burke had recovered from the rigors of his ordeal.

The two men made their way to Minersville, near present-day Beaver, where they equipped themselves for the journey and solicited financial support from members of the Minersville community. They then struck out for the Henry Mountains, acquiring a cook and guide named Blackburn as they passed through Rabbit Valley in western Wayne County. Arriving at the mountain, the party camped along what is known as Corral Creek. Burke led the others directly to the outcropping of a rich gold-bearing ledge, where they broke off about 400 pounds of gold-laden quartz.

Before returning to Minersville for mining tools, blasting powder, and other needed supplies, the party carefully covered their diggings and cached their tools under nearby trees. On the return trip, the group elected to follow a different route, and became lost in the harsh, trackless desert which surrounded the mountains. During their wanderings, a small pool of water was discovered, and despite the warnings of Blackburn, Burke and Bowen drank heartily. Within an hour, both men were seriously ill. The party slowly managed to make their way to Pleasant Creek, and eventually to Blackburn's place in Rabbit Valley. It was here that the men first heard of the Indians' curse placed upon anyone who dared reopen the workings of the Old Spanish Mine.

Bowen, especially, was profoundly impressed by the legend and let it be known that he wanted no more part of the enterprise. The other partners, especially those in Minersville, had profited handsomely from the venture and finally convinced Bowen to return for more gold. Burke and Bowen once again headed for Rabbit Valley to pick up Blackburn, but while waiting for him to arrange his affairs, Bowen was suddenly taken ill and died. Four days later Burke also died. Significantly, none of the other partners made the slightest attempt to revive the affair, until some time later Blackburn journeyed to the scene of the old works. Blackburn was unable ever to locate the scene of their earlier find, though he made three trips into the Henrys. He gained nothing but "thirty years of sickness in my family and bad luck" for his efforts (Ekker 1970:10-13). A prospector named James Shinn and a companion attempted to prospect the Henry Mountains, but like Burke, they were expelled by the Indians. Many white men discovered in the Henrys by the Indians were not so lucky as Butler or Shinn (Ekker 1970:10-13).

Isolated attempts like those recounted above were the only efforts to exploit the mineral deposits of the Henry Mountains until the "San Juan Gold Rush" of the 1880's. During the first settlement efforts in southeastern Utah, gold was discovered along the San Juan and Colorado Rivers. Carl Shirts began prospecting the Burro Bar near Hall's Crossing in 1882, and Cass Hite discovered placer gold at

Dandy Crossing (Hite) in 1883. He was soon joined by Bert Sebolt and a man named Goss. These men later produced gold from the Ticaboo and Good Hope Bars as well as from the original location. In 1888, four Californians, including Haskell and Brown, prospected the New Year and California Bars. They set up a small boiler on the California Bar, using coal that they mined at the head of Hansen Creek. Another early prospector of the San Juan-Colorado River region was a man named Kohler, who began the North Wash placer.

The rush of miners, many of whom were from other nearby mining states, overflowed the river regions and extended into the Henry Mountains. All the upper portions of Straight Creek on the eastern side of Mt. Pennell were explored; many mines were opened and a camp called Ruth was built. Two Californians settled on what is now known as the Rico No. 1 and built a crude arrastre to reduce the ore that was taken out of their works on Mt. Pennell.

During the work on Straight Creek, Jack Sumner and J. W. Wilson began to prospect the gravel benches of Crescent Creek, which headed in the upper elevations of Mt. Ellen. They worked up the creek until in 1890, when Sumner and Jack Butler discovered gold in a fissure at the head of Crescent Creek. They named their find the Bromide Mine, because of the ore's similarity to the bromide ores of Colorado. By 1893, a five-stamp mill had been constructed, half a dozen other prospects made, and about one hundred men were working the Bromide Basin (Ekker 1971:70-72).

Down the mountain a mile or so below the Bromide Basin property, a camp called Eagle City was established. This camp was closely associated with Bromide, but placer mining was carried on here exclusive of the work done above on the steep sides of Mt. Ellen (Dickey 1976:12). In addition to the ubiquitous conglomeration of tents and other temporary dwellings, Eagle City boasted a dozen homes, three stores, two saloons, a hotel, a dance hall, and a post office. At one time, Eagle City was one of the biggest towns in southern Utah, exceeding the size of contemporary Hanksville. The Denver and Rio Grande Western Railroad even went so far as to make a preliminary survey of a spur route from the main line at Green River to Eagle City, anticipating production over one hundred tons of ore a day. Unfortunately, the Bromide fissure, though paying well for a short time, terminated abruptly at a fault line, and by 1900, Eagle City had become a ghost town (Ekker 1971:70-72).

At roughly the same time as the decline of the Bromide and Eagle City ventures, Al Starr started a mine at the head of Mine Canyon on Mt. Hillers, but no production was obtained. Another fissure mine was developed by a man named Woodruff on the south side of Mt. Hillers. Kimball and Turner also produced a small quantity of gold from another fissure mine in the Bromide Basin (Ekker 1971:70). In the early 1900's, Frank Lawler of Hanksville undertook a different type of operation about a mile below Eagle City. Lawler believed that if he could remove all the soil and gravel from the creek bed, he would find placer gold that had washed down from Eagle City on the bedrock (Ekker 1970:14). Another extraordinary mining operation was the attempt by the Hoskinini Company to obtain gold by dredging the river channel above the mouth of Bull Frog Creek. Much labor and a great deal of money was spent to establish this operation, but the venture did not achieve success (Ekker 1971:70).

Gold was produced from the Cornelius Ekker-Frank Lawler placer claim on the Crescent Creek benches beginning in 1919. This claim has been a small but steady producer of gold--and the most successful venture for gold in the Henry Mountains area. A remarkable development was begun at the mouth of Straight Creek Canyon in 1918 by E. T. Wolverton and his partner, Gates. Wolverton believed his Rico development to be located at the site of the legendary Old Spanish Mine. Wolverton, working almost without outside aid, constructed a mill to crush the ore from his workings at the divide between Corral and Straight Creek Canyons. The mill, though now no longer extant, was so well constructed that even fifty years later the twenty foot water wheel could be turned by a push of the hand (Dickey 1976:2).

Most of the remaining development of mining in the Henry Mountains region was directed toward the radioactive minerals: carnotite, radium, vanadium, and uranium. Uranium mining in the west probably began indirectly in conjunction with the efforts to find gold and silver ores in the last half of the 19th Century. Many sources of uranium-bearing ores were located by miners, ranchers, and sheepherders, who were seeking the more "important" minerals. Utah deposits occurred in the eastern and southeastern portion of the state around basin margins of the Green and Colorado Rivers.

Near the Henry Mountains, uranium deposits were discovered in the Grand Wash area near Fruita, on the lower Muddy River, at the Hanksville and Notom Bench areas, and at Temple Mountain on the San Rafael Swell. These deposits and other finds in the area, have been worked, closed, and reopened several times as the demand for the minerals rose and fell. Peak periods of uranium mining took place during World War II years (vanadium), and the period from 1947 to 1956 (uranium), (Sorensen 1963:281).

The precious metals, gold and silver, attracted the first miners to the Henry Mountains. Because of the widespread faulting and volcanic activity of the past, deposits of these minerals usually terminated without warning.

The attempts to attain gold and silver thus degenerated into small, largely individual efforts to eke a living from the mountains. This pattern, in large part, repeated itself in the later exploitation of the uranium ores, which reached its peak by 1955, though the basic problem here was one of supply and demand. Mining in the Henry Mountains has thus been characterized by sporadic flare-ups of frenzied activity, followed by much longer lulls when scant development was undertaken.

Coal, the primary focus of the CCP, has been of little importance in the history of the Henry Mountains Region, at least up to the present. The Henry Mountains coal field lies in both Wayne and Garfield Counties. Coal has been mined at the north end of the basin in small amounts, but there has been no commercial production from this source. Part of the vast Kaiparowits coal field lies within Garfield County, the coal being of high volatile C bituminous rank. There has been considerable exploration in the past several years, but no commercial coal production as yet from this field (Utah Mining Association 1967:40-41 and 97-98).

Ever since the earliest intrusions in the 1800's, mining has never been the primary support of the people who reside in the Henry Mountains region. The economic basis of this sparsely populated area is cattle and sheep raising in the higher elevations, and agri ulture in the low lying areas. The first known effort to make a living from the Henrys other than by mining was by Bean and Forest, two stockmen from Colorado. They brought their herds to the Henry Mountains in 1878, but by 1881 their cattle had become so wild and unmanageable that they sold them to Tescher, a rancher from Moab, who moved the herd to more accessible terrain. At this time, the Henrys were also used as a hideout by renegades and outlaws. Cap Brown, and others of his kind, were able to stay clear of the law in the high reaches of the mountains.

The first settlers to pass through the region were Mormon members of the 1879 San Juan Mission. They crossed the Colorado at rugged Hole-in-the-Rock (halfway between the mouths of the Escalante and San Juan Rivers) on their way to establish a settlement at Bluff. This arduous road constituted the major wagon route between the southern Utah settlements and the San Juan regions until an easier crossing was discovered in 1881, 35 miles upriver at Hall's Crossing

In the fall of 1882, Elijah Behunin and his family moved down the Fremont River by wagon and entered the Henry Mountains region near Capitol Wash, the wagon being the first vehicle to enter the area. They reached the site of Caineville on November 28, 1882, and were soon joined by Chauncy Cook, Mosiah Behunin, William Stringham, and Jorgen Jorgensen. Blue Valley, later called Giles, was settled in 1883 by the Hyrum Burgess and Jonathan Hunt families. In the spring of 1883, Ebenezer Hanks, Ebenezer McDougall, Charles Gould, Joseph Sylvester, and Samuel Gould and his wife moved from Washington County to the junction of the Fremont and Muddy Rivers. This outpost was initially called Graves Valley, but was renamed Hanksville in honor of Ebenezer Hanks in 1885, when the town was granted a post office. In 1887, D. N. Dalton and James Huntsman founded Mesa (also called Elephant) about three miles east of Caineville. Clifton (Kitchentown), just east of Blue Valley, was established in 1889 by Vert Avery (Ekker 1971:69-70). Other early farming settlements in the area were Fruita (1884), Notom (1886), and Aldridge (1890), (Carr 1972:118-119).

Ranches were founded in the Henrys during the late 1880's. The Granite Ranch was started by Burr in 1889. In 1890, Al Starr established a ranch on the south side of Mt. Hillers, and R. E. Tomlinson set up another ranch by Bull Creek at the head of the Fairview Benches. In 1892, Gene Sanford and Benson started the Sanford Ranch and Voight founded the Lower Ranch on the north slopes of Mt. Hillers. Around 1895, Fred Hoyes built his ranch by the Fremont River at the west end of Blue Dugway, seven miles above Caineville.

The first real "boom" in the cattle business in the Henry Mountains occurred during the early 1900's, when large herds of cattle were introduced to the southwest portion of the Henrys by Thompson, Yates, and Al Stevens. McClennan maintained large herds to the north and east of the mountains. Later, McInyre, Sanford, and the Browns also had large herds in the area, as well as Burr and the Starr brothers. Small herds of sheep were introduced before 1890 by Giles and Rust and larger herds later by I. J. Riddle and McAlister (Ekker 1971:69-70).

Chapter 4

REPORT ON THE CLASS I SURVEY (RG-I)

Part A provides a series of site definitions used in the Central Coal Project research process. Part B, Archival Research, details the activities of Research Group I (RG-I) during the search for previously recorded cultural resource sites. This segment of the chapter is further subdivided into three sections, each dealing with a specific aspect of the Class I research process. The first section is a general background on the research, describing the tools and methods employed to accurately record the site data. This discussion is followed by sections giving a description of the sources utilized and the general results of the search. Part C is a history of archeological research in the Central Coal Project area. This part of Chapter 4 narrates chronologically and by planning unit the development of the archeological fieldwork which constituted the basis for much of the Class I research data. Chapter 4 correlates with Appendix A, A Site Summary Table by Planning Unit found in the original report, which lists all of the sites recorded by Research Group I. This table coordinates both historic and prehistoric sites with location, site type, and record repository.

Part A: Site Definitions and Types

For purposes of this report, a site is defined as any locus of human activity identifiable through either archeological techniques or through documentary research. A prehistoric site located in the field must contain a minimum of four flakes or associated artifact fragments within a five meter radius. Further, a cultural resource is defined as any physical remains of human activity which was initiated or deposited prior to 1930. The identification of cultural resource sites then, involves both temporal and spatial judgements as well as efforts to pinpoint the specific cultural originators of the sites through diagnostic artifacts or structures. To aid in the diagnostic and identification processes, it becomes necessary to classify various types of cultural resource sites according to the differing activities which took place at these locations. The following paragraphs will be devoted to an explanation of the differences between cultural resource site categories.

It was determined that all cultural resource sites should first be categorized on a cultural contact basis. Thus, Prehistoric Sites are those sites which indicate an absence of cultural contact with Euro-American cultures. Protohistoric Sites are those sites whose artifactual associations include both prehistoric style tools and objects and artifacts acquired through trade with Euro-American peoples. Historic Sites are those sites whose artifacts, structures, or documented history indicate they were established after the time of the first Mormon settlement of 1847. It is obvious that there can exist a definite temporal association between the three periods, thus the need arises for careful examination and evaluation of all diagnostic artifacts related to any given site.

The types of cultural resource sites which would be primarily of a prehistoric or protohistoric origin are explained below.

Lithic Scatters are the most numerous type of cultural resource sites encountered during CCP research. They are characterized by the presence of lithic tools, chips, cores, or flakes, and may vary in size from a radius of five meters to an area of several hundred meters. Lithic scatters are, of course, encountered throughout the entire temporal range of man's existence in the area.

Hunting Sites are located along game trails, in saddles, and near watering and grazing areas. They are indicated by the presence of projectile points, point fragments, secondary flakes, or retouched lithic chips exclusive of other cultural remains. They, like lithic scatters, occur throughout all time and cultural ranges.

Kill-Butchering Sites are distinguished from hunting sites by the predominance of butchering tools, including knives, choppers, scrapers, utilized flakes, and sometimes the distal ends of broken projectile points which have been extracted from dead game.

Quarry Sites are locations where lithic material was mined for tool manufacture. Such sites show the presence of hammerstones, flakes, cores, core shatter, and sometimes unfinished tools.

Temporary Camps are non-architectural sites which were occupied over short periods of time, usually by few individuals. They are characterized by hearths or fire pits, scattered tools, and occasionally small grinding tools and ceramics. Historic camps are typified by discarded historic debris and circular, rock-rimmed fire pits.

Extended Camps are also non-architectural, and often indicate extensive occupation during a single period of time, or repeated use through time. Extended camps often include rock shelters and can exhibit a great variance in size and complexity.

Single Habitation Sites are generally the locus of a family or small extended family-living quarters. They are defined by artifacts and architectural features, either on or below the earth's surface. These habitation-activity structures vary from pit houses and kivas to elaborately walled surface structures.

Multiple Habitation Sites exhibit indications of occupation by multiple families, either contemporaneously or through a span of time. The primary differences between single and multiple habitation sites lie in size and complexity.

Petroglyph Sites consist of figures that have been pecked or etched into rock faces, while Pictographs are forms of rock art that have been painted or otherwise applied to a common rock surface. Both petroglyph and pictograph sites are common throughout the study area.

Burial Sites range from scattered interments in shallow holes, habitation floors, or rock clefts, to extensive cemeteries. Burial sites are often indicated by rock piles, mounds, burial offerings, and exposed human bone.

Rock Shelter Sites vary greatly in size, intensity of use, and function. Their size ranges from a small overhang which provides protection for one person from sun, wind, or rain, to giant alcoves providing protection to a number of contemporaneous families. They vary in content from a small lithic scatter to complex architectural structures with walls, doors, and a full spectrum of household artifacts and debris.

Granaries are small storage shelters constructed of stone, branches, and mud. They frequently contain maize remnants, and could also be used to store basketry, pottery, and grinding implements.

Cists, another type of storage structure, consist of subterranean storage pits usually lined with sandstone slabs. They may also contain food remnants and artifacts.

Though many types of historic sites are unique from pre- and protohistoric sites, historic man engaged in some of the same types of activities as the earlier inhabitants of the Central Coal Project area. Therefore, it is possible to discover such site types as hunting sites, quarries, temporary camps, extended camps, simple and multiple habitations, and burials in the historical context, as well as in the prehistoric and protohistoric periods. The differences between these sites of similar types, but very dissimilar cultures and temporal ranges, lie in the artifact associations. Metal artifacts such as shell casings, metal knives, horseshoes, buttons, and wire, or various glass items are indicative of historic period activity, while trade beads and lithic tools indicate a protohistoric context.

Other site types which are generally historic are catalogued below.

Mine and Quarry Sites include many possible evidences of man's attempts to exploit the mineral resources of the area. These include mine portals, mine service areas, mine transportation routes, overburden areas, and habitation areas.

Cabins are usually associated with either agricultural or livestock raising occupations, and also occur in association with small-scale mining efforts.

Mills are indicative of ore, wheat, or lumber processing operations. In the Central Coal Project area, the two most commonly found types of mills are sawmills and grist mills.

Kilns are usually associated either with mining development, i.e., charcoal and coke kilns, or with the construction, e. g., lime kilns.

Corrals, which were used for containing various kinds of livestock, are generally found in association with water resources and historic single habitation sites.

Wells include agricultural wells, and oil, gas, or geothermal wells. Since 1900 there has been a high activity in well drilling in the CCP area.

Roads and Trails provide a means of connecting multiple and single habitations with both natural and man-made resources. In certain cases, trails which originated in prehistoric times are presently in use by modern man and have often been upgraded into road and railroad systems having great economic value.

Railroads serve the same purposes as roads and trails, as a conduit for transportation and communication systems. However, because of the tremendous amounts of capital required to build and operate a railway system, their location frequently signals the presence of resources which can be exploited for profit. Coal and cattle were the two industries which inspired the railroad development in east-central Utah.

Trash Dumps are an extremely useful type of cultural resource site in a diagnostic sense. It is possible to learn a great deal about a prehistoric or historic culture from the materials that man has discarded.

The final type of cultural resource that bears mention is the Isolated Artifact. Isolated artifacts occur throughout all temporal and spatial ranges and have been discarded by all cultures. Isolates are particularly valuable, as they often are indicators of the existence of a particular culture at a specific location.

Part B: Archival Research

GENERAL BACKGROUND

The Existing Site Data Compilation for the Central Coal Project explored many possible sources of information. Some sources yielded hundreds of recordable sites, others did not yield even one. The list of site sources checked includes: the Antiquities Section of the Utah State Historical Society, the Office of Historic Preservation of the Utah State Historical Society, the American West Center of the University of Utah, the Charles Redd Center of Brigham Young University, the State Office of the Bureau of Land Management, the Fishlake National Forest Supervisor's Office, the library of the Utah State Historical Society, the Anthropology Departments of the University of Utah and Brigham Young University, and the site files of the Archeological-Environmental Research Corporation.

The bulk of the information on the 1,747 sites incorporated into the Class I survey was acquired from the card system and site report copies of the Antiquities Section of the Utah State Historic Society, about 80% of the sites being generated from this source alone. Other sources of site records which yielded significant numbers of sites were the State Office of the Bureau of Land Management, the Regional Office of the U.S. Forest Service, and the files of AERC. In addition to the above-mentioned sources, short trips to the Richfield District Office of the Bureau of Land Management and the Richfield Zone Office of the U.S. Forest Service, enabled over 200 more recorded sites to be added to the compilation of data.

Sources which yielded smaller numbers of recorded sites or information of a clarifying or explanatory nature were: the Office of Historic Preservation of the Utah State Historical Society, the library of the Utah State Historical Society, the site files of the Archeological-Environmental Research Corportaion, and the Departments of Anthropology of the University of Utah and Brigham Young University.

The American West Center of the University of Utah and the Charles Redd Center of Brigham Young University did not yield any sites for this project, but are potentially useful sources for cultural resource survey work in other areas of Utah. These institutions have no ordered system of recording sites; their projected use would seem to lie in the realm of consultative agencies for specific problems encountered in future cultural resource surveys.

The Research Group I (Class I) crew consisted of research group members, J. Dykman, D. Wadley, H. Roberts, and Research Group I Supervisor, L. Drollinger. The crew members were assigned specified tasks within the larger framework of the Class I effort. These specific tasks took into account previous experience or contact with the individual agencies to be consulted and special employment situations as they arose. As a result, J. Dykman, holding an M.A. in Anthropology, consulted the records of BYU's Anthropology Department. H. Roberts, a student in anthropology at the University of Utah, was able to gain access to the Anthropology Department's records. D. Wadley, a graduate student in history, was assigned to work from the Emery and

Grand County Summaries; L. Drollinger, through contacts previously established by the RG-I Director, Dr. F. R. Hauck, studied and recorded the information from the other institutions consulted.

Time spent on the compilation of Class I data is estimated at 350 hours for the entire research group crew. This estimate accounts for time used in consulting records, eliminating superfluous or inaccurate data, recording pertinent data, and organizing the data according to a county-by-county system. Subsequent to this county-by-county organization, the cards that were generated by Research Group I were checked for duplication, organized on a planning unit basis, and coded onto optical-scan computer sheets for future utilization as a research tool. (None of these functions are included in the above man-hour estimate; only functions relative to raw data compilation are involved in the Class I.)

The problems which RG-I had to deal with were numerous, time-consuming, and principally had to do with inadequate or insufficient information on the original site report forms.

The first problem encountered in the Class I research involved the reproduction of site form data: Which method would provide the most efficient, yet effective means of recording and compiling the great number of sites within the survey area? Because of concerns over logistics, handling, and cost-effectiveness, the best answer appeared to be in reproducing site report data onto site cards. The site cards provided a means of reducing bulky, hard-to-synthesize blocks of data into a concise series of coded numbers and letters. (See sample site card in Appendix B.) These numbers and letters were easily adaptable to tabulation and computerization, a necessary function for determining concentrations of cultural resources and providing workable mitigation and planning procedures.

The problem of missing information is especially acute on site reports that were filed before the mid-1960's. For example, the location of sites was poorly reported on many of the older archeological reports. Such descriptions as "3 miles below Nutter's Ranch," made the accurate location of many important sites impossible. The lack of an accurate location caused insurmountable difficulties in determining the elevation of a site, the vegetation zone of the site, or the geological formation upon which the site rested. All these pieces of information are important in understanding the relation of cultural resources to environmental factors, a key in resource use planning.

Another type of valuable information frequently missing from site reports was the recording individual/ institution. When both were available, they were recorded; in the absence of either, the recording individual or institution, whichever piece of information was present, was recorded. In some cases, however, nothing was present for recording purposes.

In addition to the above, other types of information most frequently missing from site reports were designations of land ownership and useable geomorphological descriptions. When the first piece of information was not included, it invalidated some of the statistical uses for the site, and necessitated a laborious cross-checking process to attempt to establish land ownership. If the geomorphological information was not present, and there was no way to obtain this data from other sources, the possibility of relocating a site in the future will be greatly complicated.

The second major source of difficulty in compiling existing site data was the lack of a universal numbering system for all sites. The existing permanent Smithsonian numbering system has not been utilized by all the various agencies involved. In many instances, site reports exist that have never been given permanent Smithsonian numbers. This problem creates a very confusing situation, duplication of effort became very probable and frequent backtracking became necessary to maintain order in the recording of site data.

Another major problem has to do with the different systems used by contracting agencies to classify site data. Where the Utah State Historical Society uses a county-by-county system, the Forest Service records are organized by drainage systems within each forest unit. The Bureau of Land Management, while maintaining records in a manner similar to that of the Historical Society, actually orients its information on a planning unit basis, making it necessary to reorganize all the collected data into a similar system. This difficulty was relatively easy to correct, though it did consume a good deal of time for reorganization.

It is realized that the various agencies involved in maintaining site records have different functions to perform, and as a result, differing ways that they can use the records in their possession. However, it appears that if the permanent state site records system was employed by all agencies, future work would be much easier, and exchange of data between agencies would be facilitated. One possible way of standardizing records consists of organizing all sites according to township and range figures, while assigning each site a permanent state number. Organization of sites by township and range would provide an unexcelled degree of flexibiliby when using site record information, and would exclude no agency or individual from making use of the common stockpile of knowledge.

CULTURAL RESOURCE SITE RECORD SYSTEMS

As was briefly mentioned in the preceding section, the site records systems of the various institutions consulted are organized differently (although the forms themselves are very similar), because of the different uses to which they are put. Some further elaboration on these systems follows:

The U. S. Forest Service maintains records of all sites which have been reported on Forest Service lands. Most of the surveys on Forest Service lands have been generated through land exchanges with other government agencies or sales of Forest lands for various uses. The Forest Service site records system is the most difficult to work with for someone who is not thoroughly familiar with the system. First, the sites are broken down into the different forests (i.e., Manti-LaSal, Fishlake, etc.), and given a Forest Service site number. Then they are placed into a filing system according to the various forests to which they belong. During the course of this process, permanent Smithsonian site numbers are assigned.

The Bureau of Land Management has records that are broken down according to counties, and further organized on a numerical progression system according to permanent Smithsonian site numbers. Because of this organization system, BLM site records relate well with the site records system employed by the Antiquities Section of the Utah State Historical Society. Recording of site data is no problem here until all information has been gathered, then the dual aspect of the BLM's records system comes into focus. All information gathered under the "county" system must be redirected into Bureau of Land Management Planning Units, which are based on various geographical and physical determinants.

The records system most frequently encountered during the existing site data compilation was the county-by-county, permanent Smithsonian site numbering system administered by the Antiquities Section of the Utah State Historical Preservation Office. The permanent Smithsonian site numbering system is available to all individuals qualified to do cultural resource survey work in Utah. It constitutes the only all-inclusive system for the recording and registration of cultural resource sites in the state, and is of great importance because of that fact. The major difficulty in utilizing this system lies in its filing of all site reports by numerical sequence rather than by township and range locations, which are easier to utilize during a records search.

All other records systems for compiling site data were adaptations of the system employed by the Historical Society, and therefore, no further mention of those systems is necessary.

GENERAL RESULTS

The majority of archeological sites which were previously recorded in the project area are located in the Forest South, Henry Mountain, and Forest Units, which contain over 300 sites each. The Muddy Planning Unit has nearly 300 sites, while the Range Creek Unit demonstrates a significant reduction, containing only ca. 150 known sites prior to the AERC survey. The remaining seven units all had less than 61 known sites at the time of the records search.

The total numbers of various kinds of sites (not site types which incorporate total units within a given site) distinguished by earlier researchers include 578 lithic scatters, 12 hunting or kill-butchering sites, 38 quarries, 493 camps, 121 single habitations (containing architecture), 127 multiple habitation, 117 petroglyphic or pictographic, 14 burial sites, and 138 rockshelter sites. A total of 109 sites were unclassified.

The total number of culturally identified sites recorded during the records search include 3 Paleo Indian, 2 Early Archaic, 53 Middle Archaic, 14 Late Archaic, 682 Fremont, 9 Shoshonean, 12 Protohistoric (containing associations of both prehistoric and early Anglo-American artifacts), and 64 Historic sites. A total of 918, or 52% of the 1,747 sites were culturally unidentified by the earlier researchers.

An evaluation of published information indicates that about 40 archeological sites in the study area have been excavated and reported in available manuscripts and publications.

The total number of unpublished sites partially excavated by professional and amateur archeologists or subjected to extensive destruction by vandals is unknown, but significantly exceeds the number of reported excavations perhaps by a ratio of 1:30.

Part C: Previous Archeological Research in the Project Area.

A search of the available archeological literature was conducted to identify those cultural resource sites within the Central Coal Project area which have been excavated. In addition, the available published survey reports were reviewed in order to ascertain the relative degree of survey intensity among the various planning units.

The results of excavation and published survey reports for each planning unit are included. Excavation reports include all excavated sites, as of the end of August 1977. Several known survey reports were not readily available during the preparation of this summary; however, their references are included in the bibliography.

Table 4-1 is a graphic summary of the results of previous archeological research within the Central Coal Project boundaries. Only published reports or manuscripts have been used in compiling this review.

The Henry Mountain Planning Unit has had the greatest number of excavations, while the Last Chance, Price River, Summerville, Wattis, and Forest North Planning Units have had no excavations at all. The excavations are highly biased toward Fremont sites, while excavation of Archaic sites appear to have been neglected (see Figure 4-1).

BOOK MOUNTAIN

Excavation

In the area of the Book Mountain Planning Unit, four archeological sites have been excavated. The results are reported by H. M. Wormington (1955) under the auspices

TABLE 4-1

Summary of Previous Archeological Research in the Project Area

Excavated Cultural Components

Planning Unit	Sites Excavated	Paleo Indian	Archaic	Fremont	Kayenta	Sites Noted*
Book Mountain	4			4		10
Forest	4			4		76
Henry Mountains	12			11	1	129
Huntington	3			3		7
Last Chance	0					23
Muddy	5	1	2	4		48
Price River	0					3
Summerville	0					0
Range Creek	5			5		42
Wattis	0					5
Forest Central	2		1	2		25
Forest North	0					23
Forest South	4		1	3		302

*Number of sites noted in published Survey Reports

of the Denver Museum of Natural History.

All of the sites were excavated after 1939, but the actual date is not specified. Wormington's Site 1 consisted of a dry-laid circle of stones on the surface, and was only tested. No artifacts were found by which the cultural affiliation of the structure could be firmly established, but similar structures are known for the Fremont culture.

Site 2 was investigated by Elmer Smith of the University of Utah. Five dry-laid circles of stones constitute this site. Testing failed to turn up any artifacts, but as before, an affiliation with Fremont culture seems likely.

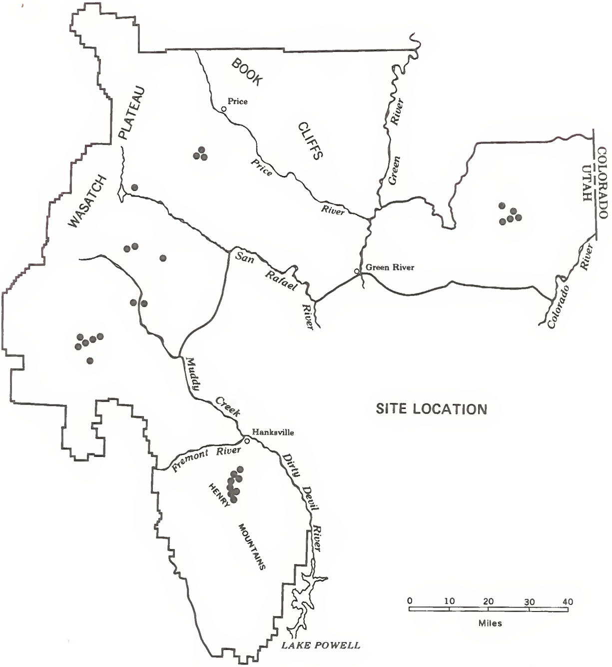


FIG.4-1

Excavated sites in the project area

Site 3 (42Cr314), the Turner-Look site, was also investigated by the Denver Museum of Natural History. Here eight of nine household structures were excavated, and the cultural affiliation was shown to be with the Fremont culture, based on calcite and basalt-tempered plain-gray pottery. Anasazi ceramics were also present in small amounts.

Site 4 was a slab-lined cist, probably constructed during the Fremont period. The excavating agency was again the Denver Museum of Natural History.

Survey

Other archeological sites in the Book Mountain Planning Unit have been identified by survey. From an archeological survey of Utah conducted between 1952 and 1957 by the University of Utah, J. H. Gunnerson (1957) reports six archeological sites (42Gr273-278) in the Book Mountain region. They include three rockshelters (one with pictographs), two pictograph panels, and another display of both pictographs and petroglyphs. The rockshelter with the pictographs also contained corncobs, indicating probable Fremont utilization.

More recently, D. L. Berge (1977a) in a Brigham Young University survey, has reported four additional archeological sites (42Gr726-729) for the Book Mountain region. These include two campsites (one identified as Fremont), a pictograph panel, and a lithic scatter.

<u>FOREST</u>

Four archeological sites within the Forest Planning Unit have been excavated. The Poplar Knob site (42Sv21), was excavated in 1955 as a field school project conducted jointly by the University of Utah and the University of Michigan. D. C. Taylor (1957) reported the findings which center around three surface masonry structures of Fremont culture.

The ceramics recovered were 86% plain-gray ware, the remainder consisting of San Juan and Kayenta Anasazi wares dating roughly from 1075-1175 A.D.

In 1956 and then again in 1957, brief excavations were carried out at the Snake Rock Village site (42Sv5) by J. H. Gunnerson (1957) as part of a larger University of Utah archeological survey project. In 1964, the University of Utah completely excavated the site (Aikens 1967). In all, thirty-one structures were uncovered in what was found to be a Fremont culture village.

The occupation at Snake Rock Village was divided into three phases. Structures 1 through 8 are associated with Occupation 1 which predates the other components. Structures 9 through 17 relate to Occupation 2, while Structures 18 through 31 are associated with Occupation 3. The structures of Occupation 1 and 2 consist of pithouses, either boulder or clay-lined and surface structures of jacal or puddled clay. Occupation 3 is characterized by irregular surface boulder circles with unprepared floors and few artifacts. One pithouse was found to be associated with Occupation 3.

All three occupations at Snake Rock Village are classified as Fremont, although the ceramic evidence from Occupation 3 structures is very limited. The ceramics are predominantly (99.4%) typical Fremont wares, although some Kayenta wares were recovered and identified specifically as Coombs Village variants of Kayenta ceramics.

The remainder of the excavating in the Forest Planning Unit was done in salvage operations by the University of Utah in 1974 (Wilson and Smith 1976). Involved were the Old Road site (42Sv454), where Fremont ceramics were found within an activity area which probably once included a household structure now destroyed, and the Ivie Ridge site (42Sv456), where two Fremont semisubterranean mud-plastered structures were investigated. The ceramic evidence from both sites is predominantly Fremont (900-1200 A.D.) although one San Juan Anasazi sherd was recovered from the Old Road site.

Survey

Five separate surveys have added to the number of known archeological sites in the Forest Planning Unit. A 1973 survey by C. Helm (Helm 1973) for the University of Utah located thirty-eight archeological sites, and twenty more were found by Helm (Helm 1974) in 1974. Also in 1974, D. L. Berge (1974) of Brigham Young University, conducted a survey in the area, finding additional archeological sites. Two others were located in 1975 in a Brigham Young University survey by B. D. Louthan and D. L. Berge (1975). In a 1976 survey, F. R. Hauck (1976a) of AERC located two sites.

The sites found by these survey parties included Fremont structures and ceramics, lithic scatters of unknown cultural association, and Archaic lithic scatters.

HENRY MOUNTAINS

Excavation

In the Henry Mountains Planning Unit, fifteen archeological sites have been excavated, all as part of a University of Utah project undertaken in 1976 and 1977. Preliminary reports by J. D. Jennings (1976, 1977) outline each season's work.

At only four of the fifteen excavated sites did excavation amount to more than testing. In the 1976 field season, a shallow pithouse of Fremont affiliation was excavated at the Playa site (42Wn337) and at the Gnat Haven site (42Wn229); a deep pithouse with associated Kayenta ceramics was excavated at the Nina's Hill site (42Wn230); and a rectangular adobe-walled surface structure and a circular semisubterranean pithouse with associated Fremont ceramics were excavated at the North Point site (42Wn231).

Excavations at the North Point site continued in 1977, when a second circular pithouse there was also excavated. Radiocarbon dates ranged from A.D. 735±65 at the North Point site, to A.D. 1080±55 at the Nina's Hill site.

The other eleven archeological sites were only tested. These included Fremont pithouses at the Alice Hunt site (42Wn261), the Charles B. site (42Wn326), and the Basket Hut site (42Wn991); five Fremont storage cists were tested at the Hillside Cache site (42Wn996); and elsewhere two charcoal deposits (42Wn975 and 42Wn981) were tested, each with no accompanying artifacts, and thus of uncertain cultural affiliation.

Two stone piles, two depressions, a rock-strewn mound, and surface scatters of Fremont ceramics and lithics (42Wn233, 959, 970, 974, and 1000), were also tested.

Survey

Other archeological sites in the area of the Henry Mountains Planning Unit are known from surveys which began in the 1950's with a University of Utah project (Gunnerson 1957). Later in 1966, another archeological survey was conducted by Alice Hunt (manuscript on file in the archeology laboratory of the University of Utah).

More recently, additional archeological surveys were conducted in 1973 and 1974 by the University of Utah (Helm 1973, 1974), in 1976 by Brigham Young University (Berge 1976b), in 1977 by AERC (Hauck, Norman, and Weder 1977b), and by the University of Utah (Jennings 1977).

The several hundred known archeological sites within the Henry Mountains Planning Unit include a large number of Fremont habitation sites and various lithic scatters of Archaic or unknown association.

HUNTINGTON

Excavation

Within the Huntington Planning Unit three archeological sites have been excavated. All were excavated in a 1970 University of Utah project reported by D. B. Madsen (1975). Sites involved included the Windy Ridge Village site, where three Fremont structures were excavated; the Crescent

Ridge site, where two Fremont structures were uncovered; and the Power Pole Knoll site, where a single Fremont structure was excavated.

Windy Ridge Village (42Em73) consists of three surface structures. Structure 1 was constructed of sandstone slabs supported by a low earthen embankment around the outside of the structure. Plain-gray Fremont ceramics were recovered, and a radiocarbon date of 1260±120 B.P. was obtained from the structure.

Structure 2 was constructed of mixed masonry and adobe. The ceramics from Structure 2 include Fremont plain-gray wares and painted wares. Radiocarbon results indicated an occupation date of 980±110 B.P.

Structure 3 is a three-sided formation of sandstone boulders without any artifacts, prepared floor, or floor features. No trade wares were found in any of the excavations.

At the Crescent Ridge site (42Em74), one surface structure was completely excavated and another surface structure was tested. Structure 1 was constructed of sandstone slabs surrounded by a low, earthen embankment. Fremont plain-gray ware was found, and samples yielding a radiocarbon date of 1170±100 B.P. were recovered. Structure 2 is an elongated oval of sandstone boulders. Limited testing did not reveal any subfloor features.

The Power Pole Knoll site (42Em75) consists of one surface structure built of sandstone boulders. The scant ceramic evidence recovered indicated that the structure was of a Fremont-affiliated occupation.

Survey

Archeological survey in the area goes back to 1935, with the investigation of a large pictograph panel by A. B. Reagan (1935a). Little else in the way of archeological survey occurred until a University of Utah project in the 1950's (Gunnerson 1957) reported two archeological sites (42Em41-42).

After that, there was another lapse in archeological survey in the area until this decade when a series of Brigham Young University surveys in 1974 located an undetermined number of sites (Berge 1974).

Two sites (42Em646-647) were found in a 1976 project (Louthan and Berge 1975), another (42Em724) in a 1976 project (Berge and Benson 1977), and one more (42Em960) in 1977 (Berge 1977b). The survey reports indicate that most sites are of unknown cultural association.

LAST CHANCE

Excavation

No archeological excavation has been done in the Last Chance Planning Unit.

Survey

Gunnerson (1957) reports seven archeological sites for the area from a state wide archeological survey by the University of Utah in the 1950's. Several other sites in the area are reported by Berge (1972) from a Brigham Young University survey in 1974. In a 1976 survey by AERC (Hauck 1976a), sixteen additional sites were located in the Last Chance Planning Unit. The results of these surveys provided information on Archaic and Fremont sites and on various lithic sites of unknown cultural association.

MUDDY

Excavation

In the Muddy Planning Unit five archeological sites have been excavated, four of them by the University of Utah. These include the Silverhorn site (42Em8), a rockshelter pithouse (Gunnerson 1957), the Clyde's Cavern site (42Em177), a rockshelter (Wylie 1972), and the Innocents Ridge site (42Em6), with five Fremont structures. The remaining site, Pint Size Shelter (42Em625) was excavated by the Antiquities

Section of the state of Utah (Lindsay and Lund 1976).

The Silverhorn site was located by an amateur collector who recovered a fluted point from the site. A limited test excavation of this shallow rock shelter by Gunnerson (1956) revealed 12 occupation strata but no additional diagnostic tools.

Gunnerson also excavated the Emery site (1957), which consisted of two structures. A pithouse was uncovered, which revealed no evidence of any wall preparation, although the pithouse floor had been made of adobe. Evidence of a surface jacal structure was also found. The ceramics recovered were Fremont plain-gray wares.

Clyde's Cavern excavations were reported by Wylie (1972). His excavations revealed nine occupation strata, the lowest three of which are attributed to Archaic culture groups. From stratum 4 through 9 evidence of Fremont occupation was recovered. Stratum 4 contained Fremont plain-gray ware and also painted and corrugated ceramics. Wylie maintained that both Fremont and Pueblo occupation of Clyde's Cavern was indicated by the recovered ceramics.

The Innocents Ridge site consists of five structures, which indicate a sequence of construction during which earlier structures were scavenged for building materials.

Structure 1 is a semisubterranean dwelling with a clay floor, but unprepared walls. The ceramics were primarily Fremont plain-gray wares, although one Kayenta sherd was recovered. Structure 2 is a three room surface storage unit made with adobe and irregular cobbles. Structure 3 is a wet-laid masonry-surface dwelling in which Fremont plain-gray wares and one Kayenta sherd were found. Structure 4, also a wet-laid masonry-surface dwelling, gave possible evidence of two occupations since the floor had been renewed. The ceramics from Structure 4 are entirely Fremont plain-gray wares. Structure 5 is a wet-laid masonry-surface dwelling with Fremont plain-gray wares in association. The five structures were dated to between 1125 A.D. and 1225 A.D. on the basis of the ceramic evidence.

Pint Size Shelter is a two-component site excavated in 1975 and reported by Lindsay and Lund (1976). The lower strata are associated with a late Archaic occupation and are bracketed by radiocarbon dates of 4520±210 B.P. and 3390±170 B.P. The upper strata are a Fremont occupation based on the presence of plain-gray ceramics. Since no structures were found, the upper strata of Pint Size Shelter have been interpreted as a Fremont campsite. The earliest Fremont occupation stratum was radiocarbon-dated to 1790±100 B.P.

Survey

A number of archeological surveys have been performed within the Muddy Planning Unit. The earliest reconnaissance, which located thirty-seven sites, was a survey conducted in the 1950's by the University of Utah (Gunnerson 1957). In another University of Utah project, Gunnerson (1962) reported on some clay figurines and atlatl paraphenalia from the area that were in a private collection. A 1973 survey by the University of Utah (Helm 1973) relocated several sites from Gunnerson's earlier survey (1957), while another University of Utah survey in 1974 (Helm 1974), located two new sites for the area.

Three subsequent Brigham Young University surveys found three additional archeological sites (Berge 1974, Louthan and Berge 1975, and Berge and Benson 1977).

In another 1976 survey by AERC (Hauck 1976a), three more archeological sites were located in the Muddy Planning Unit.

These survey reports indicate a large proportion of the recorded sites are associated with the Fremont culture. Lithic scatters, rockshelters, and pictograph-petroglyph sites of both Archaic and unknown affiliation are also reported.

PRICE RIVER

Excavations

No archeological sites have been excavated in the Price River Planning Unit.

Survey

Reported survey activities in the Price River Planning Unit are limited. Reagan (1935b) reports an extensive series of pictograph and petroglyph panels. Another pictograph site was located by a Brigham Young University party (Berge 1977c). A 1976 AERC survey located a single lithic scatter (Hauck 1976b). Archeological information concerning the prehistoric occupation of the Price River Planning Unit is very limited at the present.

SUMMERVILLE

Excavation

No archeological excavation has been undertaken within the Summerville Planning Unit.

Survey

Although eighteen sites have been previously recorded within the Summerville Planning Unit, none has been included in any descriptive report. The sites reported include primarily petroglyph/pictograph panels and lithic sites of unknown cultural association.

RANGE CREEK

Excavation

Five archeological sites have been excavated within the Range Creek Planning Unit, all in 1936 by the University of Utah in Nine Mile Canyon (Gillin 1955). Two of the five Fremont structures were excavated and the others were tested at the Valley Village site (no site number on record). A circular, rock-lined semisubterranean dwelling and a surface, dry-laid masonry and adobe circular structure were excavated. Fremont plain-gray wares were recovered, although a small number of painted and incised gray-wares were also reported. Gillin dated the Valley Village site to the Pueblo I or II period on the basis of ceramic associations.

Gillin also excavated the Beacon Ridge site (no site number on record), where a circular, rock-lined, semisubterranean dwelling was uncovered. Associated ceramics included Fremont plain-gray wares, and some painted, corrugated and incised wares, which Gillin dated to the Pueblo I and/or II periods.

The Sky House site (42Cbl) in Nine Mile Canyon is a single surface dwelling constructed of adobe blocks with three storage cists along one side of the dwelling. A burial was recovered from one of the cists. Ceramics recovered included Fremont plain-gray wares and both black-on-gray and black-on-white wares.

Site N.M.28 consists of several possibly associated structures. One structure is a circular adobe wall. Another circular structure of dry-laid masonry and four more stone structures are mentioned. All six sites were tested, but evidently very little cultural material was found.

Site N.M.21 is a structure of dry-laid masonry with six associated small, round, stone structures. One sherd of Fremont plain-gray ware was recovered.

Survey

The earliest recorded archeological survey in the Range Creek Planning Unit was in 1894 by Professor Montgomery of the University of Utah who described some ruins in Nine Mile Canyon. Later archeological surveys by the Peabody Museum of Harvard University in 1928 (Morss 1931), and 1953 (Morss 1954), found a number of sites in the area. Morss' report (1954) describes the unfired clay figurines from the Pillings Cave.

Several local caves and pictograph panels were investigated by the Laboratory of Anthropology at Santa Fe in 1933 (Reagan 1933). Some possible ruins in Range Creek

Canyon were reported by L. L. Leh in a 1936 publication in University of Colorado Studies.

In the 1950's, eleven sites (42Em9-19) were located in the area by a University of Utah survey (Gunnerson 1957). More recently, AERC surveys in 1976 and 1977 (Hauck 1977a, 1977c), located twenty-eight sites (twenty lithic scatters, four campsites, a structure, and two petroglyph/pictograph sites). The sites reported in the above source are primarily Fremont-associated.

WATTIS

Excavation

No archeological sites have been excavated within the Wattis Planning Unit.

Survey

Only two survey reports have been published which pertain to the Wattis Planning Unit. A single site, a rock circle (42Cb27) was found by the University of Utah's state-wide archeological survey (Gunnerson 1957), and four sites are described in a Brigham Young University report (Berge 1976a), all of which are lithic scatters of unknown cultural affiliation.

FOREST CENTRAL

Excavation

Within the area of the Forest Central Planning Unit, two archeological sites have been excavated. At 42Em5, one of two Fremont structures was excavated by the University of Utah (Gunnerson 1957). At the Joe's Valley Alcove site (42Em693), excavation was performed by the U.S. Forest Service in 1974.

The structure at Site 42Em5 is a rectangular surface dwelling built of sandstone boulders, with an adjacent storage room. The ceramics recovered were Fremont plain-gray ware.

Joe's Valley Alcove, a small rockshelter, contained both Archaic and Fremont components (E. DeBloois, personal communication). Three beds were reported, Bed I containing early Archaic point types dated by radiocarbon at 8210±220 B.P. and 6200±190 B.P. Bed II, a late Archaic occupation, was radiocarbon-dated at 2460±120 B.P. and 2410±130 B.P. Bed III which contained remains of corn, squash, and Fremont plain-gray ware, was radiocarbon-dated to 1410±100 B.P.

Survey

Other sites are known in the area from archeological survey. Five were found in a 1950's survey by the University of Utah (Gunnerson 1957). Two more were found in another University of Utah survey in 1963 (Day 1963). In Brigham Young University surveys, one site was found in 1975 (Louthan and Berge 1975), and another in a later survey (Berge 1977b). A survey by AERC in 1977 (Hauck 1977d) found one site, and another by AERC in 1977 (Hauck and Weder 1977) found sixteen more archeological sites for the area of the Forest Central Planning Unit. The survey reports indicate that most of the sites recorded are Archaic lithic scatters, although several Fremont sites and one Shoshonean site were also found.

FOREST NORTH

Excavation

No archeological sites have been excavated within the Forest North Planning Unit.

Survey

Only one survey report (Matheny 1971) by Brigham Young University has been published. During the survey, eleven prehistoric sites (nine unidentifiable lithic scatters and two Fremont sites), and twelve historic sites were located.

FOREST SOUTH

Excavation

In the Forest South Planning Unit, four archeological sites have been excavated by the University of Utah. In 1955 a joint field school was operated by the University of Michigan. The joint field school excavated five Fremont dwellings and two granaries at the Old Woman site (42Sv7), (Taylor 1957). Also in the 1950's at the Round Springs site (42Sv23), a Fremont semisubterranean dwelling was excavated (Gunnerson 1957). In 1974, two Fremont semi-subterranean dwellings were excavated at the Fallen Woman site (42Sv455), (Wilson and Smith 1976). Also in 1974 at the Sudden Shelter site (42Sv6), excavations by the University of Utah revealed a series of Archaic occupations (Jennings, Schroedl and Holmer in preparation).

The Old Woman site consists of five dwellings, two granaries, and a rock square. Three of the dwellings are semisubterranean, with adobe plastered walls. One dwelling was a surface jacal structure, and the fifth structure was built of coursed adobe. The granaries were also built of coursed adobe. The ceramics from the five dwellings were predominantly Fremont plain-gray ware, but small amounts of San Juan and Kayenta wares were recovered. Based on the ceramics, the site was dated to 1075-1175 A.D.

On a nearby hilltop a rock square was found, but test excavation did not reveal any associated artifacts or floor features.

At the Round Spring site, a single boulder-lined semisubterranean dwelling was excavated. Fremont plain-gray wares were recovered.

At the Fallen Woman site two structures were excavated. Both structures were semisubterranean dwellings without any wall preparation. An earth oven, pit, and midden were also excavated. The ceramics recovered included Fremont plain-gray, black-on-gray, and black-on-white wares. One

San Juan black-on-white sherd was recovered. Based on the ceramic evidence, the structures were dated between 800-1200 A.D.

The Sudden Shelter excavation in 1974 uncovered a series of 22 strata which spanned a time range between 8000 B.P. and 3000 B.P. As a result of the relatively continuous sequence of occupations, a well defined projectile point typology for the Archaic was established.

Survey

A number of surveys have reported archeological sites in the area of the Forest South Planning Unit. A 1950's survey by the University of Utah found ten sites there (Gunnerson 1957). In subsequent surveying in the area by the University of Utah, twenty-six sites were located in a 1973 survey (Helm 1973), and twenty-five more in a 1974 survey (Helm 1974). A Brigham Young University survey located other sites in the area in 1974 (Berge 1974). Two Forest Service surveys entered the area in 1975. One located twenty-five new sites (Gillio 1975e); the other found ninety-five new sites (Smith 1975). Fifty-three more archeological sites were located in the area in 1975 by an AERC survey (Hauck 1975).

A large scale intensive survey of about 4500 acres was conducted by AERC in 1977 (Hauck, et al n.d.). During the survey, 185 sites were recorded, including 13 already reported by Gillio (1975e).

The reported surveys indicate a heavy utilization of the Forest South Planning Unit area by both Archaic and Fremont cultural groups.

Chapter 5
REPORT ON THE CLASS II SURVEY (RG-II)

This chapter provides in four parts, the archeological information gathered during the surface reconnaissance of about 49,000 acres in thirteen planning units of the Central Coal Project in central Utah. The survey was carried out between May and September 1977.

Research methods and field techniques are described in Part A. AERC's research approach, personnel, and operational details are defined. The final segment addresses the problems of site significance and provides evaluation of both the BLM and AERC's Forest site rating systems.

Part B is an evaluation and correlation of the research results obtained from the field work. Site densities within each planning unit and by sample area are provided. The newly found cultural resources in each of the thirteen planning units are described in conjunction with the specific environmental factors appertaining to each historic and prehistoric site.

The entire project area is the focus of Part C. Here general correlations are made between sites, cultures, and environments for the newly documented 401 archeological sites.

The chapter ends with a descriptive evaluation of the diagnostic projectile points and biface blades observed during the survey. Sketches of projectile points and diagnostic knife blades have been provided in Figures 5-14 through 5-35 to permit further evaluation by professional archeologists. Ceramic and ground stone artifacts are not represented in this report.

Part A: Research Methodology

The Class II (RG-II) inventory methodology

utilized during the Central Coal Project recorded 401 newly discovered historic and prehistoric cultural sites. The research consisted of four sequential phases. Phase I included the preliminary research preparatory to entering the field and began with AERC's reception of sample area designations and working maps from the federal agencies. Weekly assignments of sample areas to each crew were based on coordination of crew and vehicle capabilities with sample areas. Certain crews and their vehicles were best able to survey samples located in the more difficult terrain. Crew assignments were made not only to facilitate the surveys but to headquarter each crew within a reasonable distance to each week's assigned areas in order to minimize travel time. Assignments for each week were made on the preceding Saturday by the RG-II Director, F. R. Hauck, and by Asa Nielson, the Team Leader.

The second phase involved actual field work. AERC crews, upon receiving their assigned sample areas, would travel to the research locality and use topographic maps and compass bearings as a means of locating each sample area. Available section markers were recorded when found, and the crews would then set about surveying the assigned units by walking transects with each crew member spaced between five and twenty meters apart depending on the terrain and vegetation. In open terrain having limited vegetation, crews would walk wider transects running parallel to the known section lines. Parallel transects along contours were utilized in more complex terrain. Limited access terrain presented special problems. Steep colluvial slopes were walked in transect whenever the terrain permitted, while on the steepest, most dangerous slopes, crew members conducted spot checks of the alcoves and terraces that could be reached. Canyon walls were climbed only on talus slopes. In the few sample areas where vertical canyon walls precluded an intensive survey of the higher elevations, the canyon floors were carefully examined for cultural remains.

Upon the discovery of a historic or prehistoric cultural site in a sample area, the crew chief conducted an evaluation to determine the site's periphery and loci of activity. During this evaluation the crew chiefs and their assistants recorded pertinent data on the site form, the site card, and on the topographic map while members of the crews took photographs and marked the location of diagnostic artifacts as directed. At the conclusion of the site evaluation, a check was conducted to insure that no flagging or refuse was left on the site which would indicate its location to vandals.

Phase three of AERC's Class II methodology consisted of the laboratory evaluation period. During this phase, site forms, site cards, and maps related to the 401 newly discovered sites were edited, photographs and artifacts processed, and both cultural and environmental data were extrapolated from the record and placed into a system most conducive to computerization and cross reference card retrieval. Environmental and archeological information recorded on site forms and site cards (see Appendix B of the original report for copies of each recording system) was carefully edited and transferred to optical scan computer sheets for direct input into the terminal, thus eliminating the intermediate key-punch phase. Cross tabulations and Chi-square statistical evaluations were conducted through the Statistical Package for the Social Science (SPSS) software system. In addition to the computerized information, staff members prepared special matrices, tables, and charts on all facets of the project as a means of maximizing an understanding of the data within the time and budget constraints presented by the contract.

The final phase of the project was the report preparation period in which the complex array of information was correlated, edited, and prepared for publication. For guidance toward an inclusive and viable product, AERC prepared during the summer of 1977 a series of preliminary reports on the project. Each report updated the data base and aided the planning and compilation of the final reports.

PERSONNEL

RG-II field operations began May 16, 1977, with a one week field excursion conducted by the project director in the Paradise Lake region of the Forest South Sampling Stratum. Three crews of four personnel each began the survey and two additional crews were formed in the third week of the project. The total team strength varied between four and five crews throughout the summer until September 2, when the field work was concluded.

Field personnel included Asa Nielson, Team Leader, with Dennis Weder, Alan Spencer, Michael Smith, Michael Benson, Dean Schliesman, Justin Brydson, and Bruce Verhaaren as crew chiefs. Assistant crew chiefs included Michael Benson, Dean Schliesman, Casey Shumway, Marian Jacklin, Samuel Kennette, Kayla Benson, Patty Britten, Fred Gierke, James Alexander, Alan Lichty, and Wes Carpenter. David Wall, Kevin Elkington, Gary Pruett, Alan Carpenter, Glen Larson, Diana Rosati, Mark Stoddard, Todd Mortensen, Sandra Coleville, Steven Madrigal, Jeffery Bentley, Fred Gierke, David Lyon, and Robert Bickford served as archeological technicians during the summer.

OPERATIONAL DETAILS

Crew research efficiency was evaluated each weekend by F. R. Hauck and Asa Nielson through checking each crew's weekly summary reports, site reports, artifacts, and sample area data sheets. The RG-II director and the team leader also periodically worked with the crews in the field during the summer in order to insure quality control and to handle any logistic or administrative needs.

RG-II logistics were handled by Laura Hauck, the Secretary-Treasurer of AERC who purchased the food and general field items required during the survey. She maintained an inventory on each crew's needs and had all the food boxes and coolers prepared by the time the RG-II personnel were ready to depart for the field each Monday morning at 6 a.m.

Every week each crew completed between one and seven sample areas of 160 acres for a mean of four sample areas per crew per week over a sixteen week period. Major factors which occasionally reduced the number of sample areas inventoried by any one crew in a given week included extremely difficult terrain, heavy site densities, vehicle breakdowns, and access problems across private lands.

SITE SIGNIFICANCE

Two evaluation systems were used as basic aids by the crew chiefs in assigning significance ratings to RG-II sites. On BLM administered lands the Cultural Resource Evaluation System (CRES) was employed. This system is explained below. Sites discovered on National Forest lands were assigned an S-I through S-III rating depending on their quality of artifacts and cultural remains. The AERC Forest S-I rating is similar to the BLM S-1 while the S-II encompasses both the BLM S-2 and S-3 ratings. The lower or least significant AERC Forest rating of S-III is similar to the CRES S-4 rating.

Cultural Resource Evaluation System

S-1 "In general, S-1 sites show a clear potential for yielded, or have yielded, highly significant scientific/educational information and are clearly important in terms of national, state, and local known use. Normally, the S-1 rating will be assigned to those sites that are in relatively good condition and are unique or representative, and/or have important associations and display some of the qualities expressed in other criteria.

S-2 "S-2 sites are usually not particularly unique, representative, nor do they have important associations. The condition of the site usually is only fair. Such sites are commonly large but do not have great antiquity and have only limited depth potential. Many abandoned aboriginal camps and villages, abandoned homesteads, small mining campsites, cemeteries, railbed, roads, and trails will be S-2. Contemporary sites may become highly significant from standpoints of national, state, and local history and culture, but they cannot be clearly and immediately assessed as such. More historical perspective is needed.

S-3 "The S-3 rating indicates that the main worth of the site is its potential for contributing data toward solving larger problems such as reconstruction of paleo-environments and human use patterns. Such sites commonly show little (if any) depth and very few features; they may have great antiquity but be very small, or they may be very large but show no great concentration of materials. Many seasonal aboriginal camps, hunting and gathering activity areas, isolated finds, etc., will be S-3. Dumps, isolated domestic and nondomestic buildings and materials, and small mining operations will often fall here.

S-4 "The S-4 rating is assigned only to properties that have minimal information-retrieval possibilities."

Part B: Research Results

A total of 401 historic and prehistoric cultural sites were discovered during the Class II (RG-II) survey of the Central Coal Project of central Utah. The locations of these sites by planning unit are summarized in Table 5-1.

Evidence from the RG-II survey, as shown in Column 8 of Table 5-1, indicates that the Forest Planning Unit has the highest average density of eight sites per sample area.

	General Sample Area Totals		Sites by Planning Unit				Sample Area Comparisons			
Column	1	2	3	4	5	6	7	8	9	10
PLANNING UNITS	Total	Without Sites	Previously Recorded Class I	Newly Recorded Class II	Totals	Site Density[2] Class II	With Sites Class II	Site Density[3] Class II	% of Planning Unit Area[4] Class II	Density Ranking[5] Class II
Book Mountain	47	38	40	26	66	0.55	9	2.8	19	ML
Forest	5	2	306	25	331	5.00	3	8.3	60	H
Henry Mountains	64	31	373	121	494	1.87	33	3.6	51	ML
Huntington	10	7	25	7	32	0.70	3	2.3	30	ML
Last Chance	10	6	41	8	49	0.80	4	2.0	40	L
Muddy[1]	22	15	289	51	340	2.36	7	7.4	38	MH
Price River[1]	18	9	14	52	66	2.88	9	5.7	50	M
Range Creek	29	24	149	8	157	.27	5	1.6	17	L
Summerville	15	7	18	19	37	1.26	8	2.3	53	ML
Wattis[1]	8	7	40	1	41	.12	1	1.0	12	L
Forest Central	38	25	61	40	101	1.15	13	3.0	34	ML
Forest North	19	18	28	2	30	.10	1	2.0	05	L
Forest South[1]	27	18	363	41	404	1.51	9	4.5	33	M
Total	312	207	1747	401	2148	-	105	-	33	-
Overall Density (from totals)		-	-	-	-	1.29	-	3.82	-	ML
Percentage of Sample Areas with Sites (from totals)		-	-	-	-	-	-	-	34	-

Note: Class I = the existing site records of the entire planning unit

Class II = AERC survey selected quarter sections of a one percent sample area

[1]These Class II totals reflect one historic site in each unit, with two in Book Mountain

[2]Average number of Class II sites per sample area by planning unit. (Column 4 divided by Column 1).

[3]Average number of Class II sites per sample area with sites. (Column 4 divided by Column 7)

[4]This figure represents the percentage of quarter sections that contain at least one site in each planning unit. (Column 7 divided by Column 1)

[5]This figure is a ranking based upon the density ratings in Column 8.

Key:
L = 0 to 2 (Low)
ML = 2.01 to 4 (Moderately Low)
M = 4.01 to 6 (Medium)
MH = 6.01 to 8 (Moderately High)
H = 8.01 to 10 (High)

Table 5-1. Comparison of Class I and Class II site totals and densities between planning units

Henry Mountains, Muddy, Price River, and Forest South are of moderate density ranging from three to seven sites per quarter section. Cultural resources in Wattis, Forest North, Range Creek, and Last Chance Planning Units are least dense.

The Range Creek RG-II survey shows an overall low site density, but there is a moderately high site density in the Nine Mile Canyon area and in certain other canyons on the Green River drainage, as revealed in the RG-I and RG-II surveys.

Comparison of RG-I and RG-II planning unit site totals in Table 5-1 reflects the extent of prior surveys in the different units. For instance, Price River RG-II survey results show a moderately high site density in contrast to only five previously known sites found in the existing records (RG-I). This and comparable figures on Table 5-1 indicate where the greatest need lies for further research in the areas of greatest site density potential. These are also the areas that present the greatest concern for preservation of cultural resources in considering potential land use projects (see Chapters 3 and 4, Volume III of the original report).

The majority of the 401 historic and prehistoric sites recorded by AERC during the Class II Survey were in the Henry Mountain Planning Unit (121) with both the Muddy and Price River providing ca. 50 new sites and the Forest Central and Forest South Units ca. 40 sites each. The remaining eight planning units furnished less than 26 sites per unit.

A total of 239 lithic scatters were recorded, which comprised 59% of the total number of sites. There were also 41 quarries, 45 temporary campsites, and 24 hunting or kill-butchering sites.

In terms of geological location, 214 sites (53%) were found in formations of Cretaceous age, while another 106 sites or 26% of the total were found in Jurassic formations. The Cedar Mountain, Entrada and formations composed of Quaternary period alluvial and aeolian deposits accounted for over 25 archeological sites each.

The majority of sites recorded were found on land surfaces which included terraces, rims, benches, ridges, and saddles. A total of 246 sites or 61% of the total recorded were found on these geomorphic locations which feature a view of the surrounding terrain and where erosion and alluvial deposition has been marginal.

Sites were found in the entire range of vegetation zones with the possible exception of mountain meadows. The largest majority of newly recorded sites (43%) were found in pinyon-juniper associations, while the next highest clustering (24%) occurs in arid desert shrub associations.

A total of 348 archeological sites (86%) were found between the 4,000 and 8,000 foot (1,220-2,438 m.) elevations. Approximately 52% of the 401 sites are situated in the 5,000 foot to 7,000 foot (1,524 m.-2,134 m.) elevation zone, while 28% of the total are in the 5,000 foot to 6,000 foot (1,524 m.-1,829 m.) elevations.

When considering site density by rainfall zones, some 63% of the 401 new sites were found within the six inch to eleven inch (152 mm.-300 mm.) annual rainfall isohyet. A total of 348 sites or 86% of the total are situated within the six to sixteen inch (152 mm.-406 mm.) annual rainfall isohyet. In reference to summer rainfall, 73% of the sites were located within the zero to five inch (0-127 mm.) rainfall zone.

Both the Bureau of Land Management and AERC vegetation classification systems were used to compute site density correlations (cf. Table 5-2). The Bureau of Land Management vegetation types were the basis of the sample area selections made by the BLM and include the barren, sage, shrub/brush, grasses, and pinyon-juniper types. AERC recognizes six general ecozones: alpine, montane, mountain brush, pinyon-juniper, arid transitional, and arid. These have subzones that are generally complimentary with the BLM vegetation types. AERC had to employ the ecozone, subzone, and habitat/community ecological approach in order to adequately evaluate the vegetational context of the archeological sites recorded in the Class II survey. Sample areas defined within the barren zone type by the BLM frequently contained small pinyon-juniper habitats where the cultural resources were discovered. Hence, AERC's designation of the sites within a pinyon-juniper habitat in the data compiled in Chapter 4 of Volume II, although correct and valuable, was not always relatable to BLM statistical evaluations in terms of vegetation type per se. Hence, the need for two different sets of data relating site numbers to vegetation as a means of providing a predictive base. The first set provided in Part A, Chapter 6 is a basic statement of Class I and Class II site densities by specific ecozones and/or habitats wherein the sites were recorded. This information demonstrates that 48% of the identifiable Class I sites plus all of the Class II sites were found either in the pinyon-juniper ecozone, subzones, or pinyon-juniper habitats. The arid transitional ecozone contained 19% of all identifiable sites, while only 3% of the sites were recorded in a montane ecozone or habitat. The mountain brush and arid ecozones each respectively contained 2% and 18% of the Class I and Class II sites.

To aid in evaluating site density by the BLM vegetation type system explained above, AERC initiated a separate evaluation involving all the Class II sites found in BLM defined vegetation types and then computing a series of percentages based on these correlations. A total of 318 sites in the Book Mountain (26), Forest (25), Henry Mountain (121), Huntington (7), Last Chance (8), Muddy (51), Price River (52), Range Creek (8), Summerville (19), and Wattis (1) Units were evaluated. (The National Forest Units were not included, since vegetation-type data were not submitted to AERC for these sampled planning units.) The evaluation of these 318 sites to BLM vegetation types demonstrates that the

BLM pinyon-juniper type contained 46% of the sites found in these ten planning units. The desert shrub type contained 34%, barren--2%, grassland--11%, confier--0%, the mountain scrub--3.7%, and the sage type--2%.

Planning Unit Summaries

In the following planning unit summaries, two methods of data presentation are available. The narrative format duplicates and expands on the information presented in tabular and map form. Cross referencing between the narrative and the table map formats can be accomplished using the parenthesized table and figure numbers provided at the end of each major division in the narrative discussion.

Map references are keyed to planning unit maps showing the locations of surveyed sample areas and the number of archeological sites discovered within those sample areas. The tables relate sites to environmental factors, sample areas, and show site types, vegetation type, elevation, significance rating, and site size. The cultural affiliation, diagnostic artifacts, and temporal range of those sites having definable diagnostic traits are also shown on various tables.

References are also presented to tables showing geologic site relationships. These tables list each site within a planning unit and relate each site to a specific epoch and, in the Cretaceous and Jurassic periods, to specific formations within those epochs. The narrative discusses the more specific geological identifications which are available from the survey data.

A third form of table demonstrates geomorphic site relationships. All archeological sites are listed by planning unit and topographic location and soil horizon associated with each site are presented.

The integrated use of a narrative description keyed to tables and maps results in a relatively complete picture of the nature of the RG-II investigations undertaken in each planning unit.

BOOK MOUNTAIN

An intensive field survey of an approximate one percent sample, stratified according to vegetation type and furnished by the Moab District of the Bureau of Land Management, was carried out by AERC in August 1977. The survey consisted of the forty-seven quarter section sample areas described in Table 5-2.

Twenty-six cultural resource sites were discovered during the RG-II research phase in nine of the forty-seven sample areas. Eighteen of those twenty-six sites fell in the southeastern corner of the unit, between the Colorado River and the Grand Valley. The remainder are in the western half of the unit, mostly in the lower elevations along the edge of the Book Cliffs, while two are on the pediment below the cliffs. Sample area 107, in the eastern part of the unit (see Figure 5-1), has eight sites, while its neighbor area, 1924, has four sites. The remaining sites are distributed among the other seven sample areas.

Half of the sites from this planning unit are in desert-shrub vegetation and half in pinyon juniper woodland. The desert-shrub sites include the eight in area 107, three in area 3796, and the two on the pediment in area 2868. The remaining sites are all in juniper except for two sites in area 4709, which are in mixed pinyon-juniper.

The two pediment sites were found on Quaternary alluvial gravels. All the remaining sites, except the three in area 3796, are on Cretaceous deposits. Included are four sites on the undivided Mesa Verde Group, and one site (42Gr758) in the Castlegate sandstone formation of that group.

Nine sites (including the eight in area 107) are in the Mancos shale, while seven were recorded in the Dakota sandstone of the Cretaceous. The remaining three sites, all in area 3796, are in the Jurassic Morrison formation (see Table 5-3).

TABLE 5-2

BOOK MOUNTAIN PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
532	Pinyon-Juniper	T.16S., R.21E., Sec. 12 NE¼	-
4077	Mountain Brush	T.19S., R.19E., Sec. 3 NW¼	-
30	Pinyon-Juniper	T.19S., R.17E., Sec. 22 SE¼	-
4154	Pinyon-Juniper	T.19S., R.16E., Sec. 24 SE¼	-
4152	Pinyon-Juniper	T.19S., R.16E., Sec. 23 SE¼	-
4320	Pinyon-Juniper	T.20S., R.17E., Sec. 8 NE¼	1
2653	Desert Shrub	T.21S., R.16E., Sec. 1 NE¼	-
2824	Desert Shrub	T.21S., R.17E., Sec. 19 NE¼	-
1248	Pinyon-Juniper	T.19S., R.20E., Sec. 21 SW¼	-
4311	Pinyon-Juniper	T.19S., R.21E., Sec. 33 NE¼	-
1343	Pinyon-Juniper	T.19S., R.20E., Sec. 31 SW¼	-
1383	Pinyon-Juniper	T.20S., R.20E., Sec. 10 NE¼	-
4483	Pinyon-Juniper	T.20S., R.21E., Sec. 7 SE¼	-
4545	Pinyon-Juniper	T.20S., R.19E., Sec. 18 SW¼	-
4556	Pinyon-Juniper	T.20S., R.20E., Sec. 18 SE¼	2
4667	Pinyon-Juniper	T.20S., R.20E., Sec. 26 NW¼	-
4709	Pinyon-Juniper	T.20S., R.21E., Sec. 30 SE¼	2
4691	Pinyon-Juniper	T.20S., R.19E., Sec. 29 SW¼	-
4785	Pinyon-Juniper	T.21S., R.19E., Sec. 7 NE¼	1
2725	Pinyon-Juniper	T.21S., R.19E., Sec. 7 SE¼	-
2805	Big Sage	T.21S., R.19E., Sec. 13 SE¼	-
3025	Desert Shrub	T.21S., R.18E., Sec. 35 NE¼	-
2868	Desert Shrub	T.21S., R.21E., Sec. 17 SE¼	2
3078	Pinyon-Juniper	T.16S., R.26E., Sec. 21 SW¼	-

TABLE 5-2 (page 2)

BOOK MOUNTAIN PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
823	Mountain Brush	T.16S., R.25E., Sec. 31 SW¼	–
244	Pinyon-Juniper	T.17S., R.26E., Sec. 7 NW¼	–
276	Big Sage	T.17S., R.26E., Sec. 17 SE¼	–
888	Pinyon-Juniper	T.17S., R.22E., Sec. 10 NW¼	–
397	Desert Shrub	T.17S., R.22E., Sec. 21 SW¼	–
403	Big Sage	T.21S., R.22E., Sec. 26 NE¼	–
3313	Pinyon-Juniper	T.17S., R.24E., Sec. 35 NE¼	–
1431	Desert Shrub	T.18S., R.25E., Sec. 6 SE¼	–
1477	Pinyon-Juniper	T.18S., R.24E., Sec. 12 SE¼	–
1046	Big Sage	T.18S., R.22E., Sec. 9 NW¼	–
1103	Pinyon-Juniper	T.18S., R.22E., Sec. 20 SE¼	–
1116	Pinyon-Juniper	T.18S., R.22E., Sec. 28 NW¼	–
1823	Desert Shrub	T.19S., R.24E., Sec. 20 SW¼	–
3592	Pinyon-Juniper	T.19S., R.26E., Sec. 7 NE¼	3
1873	Desert Shrub	T.19S., R.23E., Sec. 27 SE¼	–
1924	Pinyon-Juniper	T.19S., R.25E., Sec. 34 SW¼	4
3796	Desert Shrub	T.20S., R.25E., Sec. 18 SW¼	3
107	Desert Shrub	T.20S., R.25E., Sec. 30 NW¼	8
2217	Pinyon-Juniper	T.20S., R.24E., Sec. 27 NE¼	–
2149	Desert Shrub	T.20S., R.22E., Sec. 19 SW¼	–
2429	Pinyon-Juniper	T.21S., R.22E., Sec. 17 NW¼	–
2461	Desert Shrub	T.21S., R.22E., Sec. 15 SE¼	–
2519	Desert Shrub	T.21S., R.22E., Sec. 24 SE¼	–

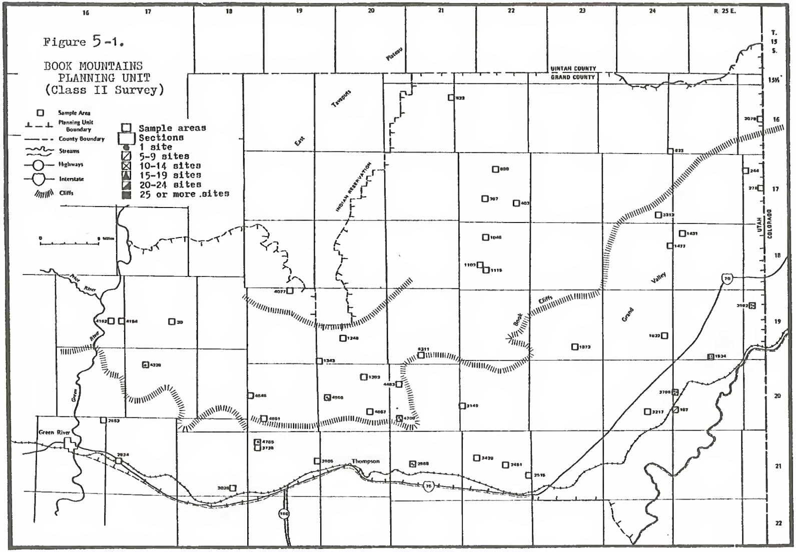


Figure 5-1. Book Mountain Planning Unit Class II Survey.

TABLE 5-3

GEOLOGIC/SITE RELATIONSHIPS

BOOK MOUNTAIN PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Gr740						X				
741						X				
742						X				
743						X				
744						X				
745						X				
746						X				
747					X					
748					X					
749					X					
750					X					
751					X					
752					X					
753					X					
754					X					
755								X		
756								X		
757								X		
758				X						
759					X					
760				X						
761				X						
762	X									
763	X									
764				X						
765				X						
Sub total 26	2	0	0	5	9	7	0	3	0	0

TABLE 5-4

GEOMORPHOLOGIC/SITE RELATIONSHIPS

BOOK MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Gr740			Rs														
741					Al												
742			Al														
743			Rs														
744			Rs														
745	Rs																
746									Al								
747									Al								
748										Al							
749										Al							
750										Al							
751			Al														
752			Al														
753			Al					Bd									
754													Ae				
755													Ae				
756																	
757			Al														
758	Rs																
759	Rs																
760								Rs									
761								Rs									
762									Al								
763									Al								
764								Cl									
765										Cl							
Sub totals 26	3	0	8	0	1	0	0	4	4	4	0	0	2	0	0	0	0

Al = alluvial
Ae = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

TABLE 5-5

TABULAR DESCRIPTION

BOOK MOUNTAIN PLANNING UNIT (26 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Gr740	BM 3592	4920	-	S-4	-	-	30m. x 10m.	
42Gr741	BM 3592	4880	-	S-4	-	-	25m. x 25m.	
42Gr743	BM 1924	4460	-	S-4	-	-	30m. x 30m.	
42Gr744	BM 1924	4460	-	S-4	-	-	75m. x 75m.	
42Gr745	BM 1924	4450	-	S-4	-	-	80m. x 80m.	
42Gr746	BM 1924	4600	-	S-4	-	-	7m. x 7m.	
42Gr747	BM 107	4400	-	S-4	-	-	25m. x 25m.	
42Gr748	BM 107	4400	-	S-4	-	-	80m. x 30m.	
42Gr749	BM 107	4400	Pinto point	S-4	Early Archaic	8000-6000	30m. x 60m.	
42Gr751	BM 107	4440	-	S-4	-	-	200m.x 75m.	
42Gr752	BM 107	4400	-	S-4	-	-	15m. x 15m.	
42Gr753	BM 107	4400	-	S-4	-	-	15m. x 15m.	
42Gr754	BM 107	4440	-	S-4	-	-	175m.x 50m.	
42Gr755	BM 3796	4640	-	S-4	-	-	15m. x 15m.	
42Gr756	BM 3796	4680	-	S-4	-	-	8m. x 8m.	
42Gr758	BM 4320	5200	-	S-4	-	-	5m. x 5m.	
42Gr758	BM 4785	5420	-	S-4	-	-	20m. x 15m.	
42Gr760	BM 4556	6700	-	S-4	-	-	20m. x 10m.	
42Gr761	BM 4556	6760	-	S-4	-	-	10m. x 10m.	
42Gr762	BM 2868	4500	-	S-4	-	-	3m. x 3m.	
42Gr765	BM 4709	5600	-	S-4	-	-	3m. x 3m.	
Hunting/Kill								
42Gr742	BM 3592	4932	-	S-4	-	-	5m. x 5m.	

TABLE 5-5 (page 2)

TABULAR DESCRIPTION

BOOK MOUNTAIN PLANNING UNIT (26 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
<u>Quarry</u>								
42Gr757	BM 3796	4640	-	S-4	-	-	10m. x 10m.	
<u>Single Habitation</u>								
42Gr750	BM 107	4400	-	S-4	-	-	15m. x 15m.	
<u>Historic</u>								
42Gr763	BM 2868	4500	Dated metal tab	S-3	Historic	1850-1910	100m.x100m.	Door post, outhouse
42Gr764	BM 4709	5600	Bottle glass Tin cans	S-3	Historic	-	20m. x 20m.	12 flakes observed; Prehistoric component

Half of the twenty-six sites are located in alluvial soils in a variety of geomorphic locations. Five are located on drainage channels, one on a mesa top, four on benches, and three on terraces. Two sites were found on colluvial soils, one each on a ridge and a terrace. Aeolian soils account for two sites, both on hillocks. Eight sites were found on residual soils, three on rims, three on drainages, and two on ridges. One site was found on a ridge of bedrock (see Table 5-4).

Twenty of the sites are at elevations between four and five thousand feet (1,220-1,524 m.), four are between five and six thousand feet (1,524-1,829 m.), and two are between six and seven thousand feet (1,829-2,134 m.), (see Table 5-5).

Twenty-one of the twenty-six sites are lithic scatters alone, and one site is a lithic scatter in conjunction with a historic stone structure (42Gr763). The remaining sites include one kill/butchering site, one quarry, one single habitation, and one historic cabin site (see Table 5-5).

All the sites were evaluated according to the BLM Cultural Resource Evaluation System. (See part A of this chapter for a description of CRES.) Twenty-four sites were given the lowest significance rating (S-4) with the two historic sites being rated as S-3. No sites were recorded with either an S-2 or S-1 rating (see Table 5-5).

Correlations between available environments and site locations are sketchy. However, as has been noted previously, half of the sites in the planning unit are in association with the pinyon-juniper ecozone, with most of the sites being situated in geomorphic locations overlooking other areas, i.e., terraces, rims, ridges, etc. The noticeable lack of sites in the higher elevations of the northern part of the unit and in the low areas of the southern region can partially be attributed to terrain. The lowland areas are very arid with sparse vegetation and are generally quite eroded. The highland areas are also very rugged and difficult to traverse.

TABLE 5-6

FOREST PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
24	Grass & Big Sage	T.24S., R.5E., Sec. 17 NE¼	12
151	Rabbit Brush	T.22S., R.5E., Sec. 13 SE¼	7
218	Barren-Waste	T.25S., R.5E., Sec. 15 NW¼	6
364	Pinyon-Juniper	T.22S., R.5E., Sec. 23 SE¼	-
406	Desert Shrub	T.24S., R.5E., Sec. 1 NW¼	-

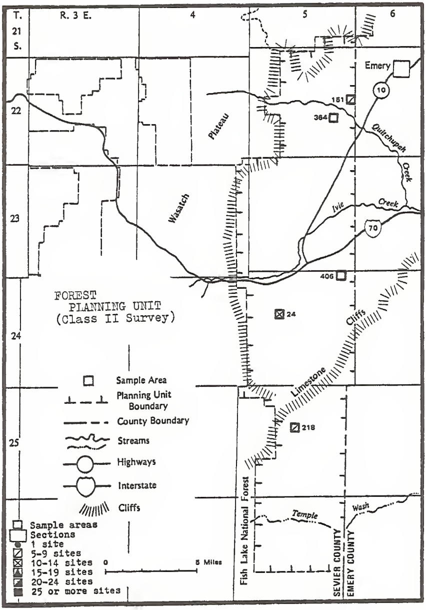


Figure 5-2. Forest Planning Unit
Class II Survey.

FOREST

An intensive field survey of an approximate one percent of the surface of this planning unit, stratified by the Richfield District of the Bureau of Land Management according to vegetation type, was carried out by AERC in early June 1977. The survey consisted of the five quarter-section sample units described on Table 5-6.

No cultural resource sites were located in two of the five sample areas (406 and 364). A total of twenty-five sites were recorded from the remaining areas, which include 24, 151, and 218 (see Figure 5-2). Although the three sample areas with sites were classified as non-pinyon-juniper by the BLM, all twenty-five sites were found in association with juniper or pinyon-juniper woodlands; four of the twenty-five sites were located in clearings within the woodlands. Because of the data retrieved by RG-II in this planning unit, it can be said that a clear association between cultural resources and the pinyon-juniper ecozone exists, despite the sample area vegetation classification assigned by the BLM (see Table 5-6).

Sites were also evaluated as to their geologic and geomorphologic settings. Twelve sites were found on Quaternary deposits, all of which were on alluvial or aeolian slopes or deposits, except for 42Sv1058, which occurred on a gravel deposit. Seven sites were located on the Cretaceous Mancos shales; five on the Masuk member (42Sv1042-44, 1046-47) and one each on the Emery (42Sv1045) and Blue Gate (42Sv1048) sandstone members. The remaining sites were found on the San Rafael group of the Jurassic; three on the Summerville formation (42Sv1039-41), and three in the Entrada sandstone (42Sv1036-38), (see Table 5-7).

Of the sites found on colluvial slopes or deposits, four were on drainage channels, one on a terrace, and one on a hill. The remaining sites all were located on residual soils: eight on mesa tops, four on ridges, one on a terrace, four in saddles, and two on slopes (see Table 5-8).

TABLE 5-7

GEOLOGIC/SITE RELATIONSHIPS

FOREST PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Sv1034	X									
1035	X									
1036									X	
1037									X	
1038									X	
1039									X	
1040									X	
1041									X	
1042					X					
1043					X					
1044					X					
1045					X					
1046					X					
1047					X					
1048					X					
1049	X									
1050	X									
1051	X									
1052	X									
1053	X									
1054	X									
1055	X									
1056	X									
1057	X									
1058	X									
Sub total 25	12	0	0	0	7	0	0	0	6	0

TABLE 5-8

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Sv1034								Rs									
1035			Cl														
1036										Cl							
1037														Cl			
1038			Cl														
1039										Rs							
1040			Cl														
1041			Cl														
1042					Rs												
1043					Rs												
1044					Rs												
1045					Rs												
1046					Rs												
1047					Rs												
1048					Rs												
1049								Rs									
1050								Rs									
1051								Rs									
1052											Rs						
1053											Rs						
1054											Rs						
1055											Rs						
1056																Rs	
1057																Rs	
1058					Rs												
Sub totals 25	0	0	4	0	8	0	0	4	0	2	4	0	0	1	0	2	0

Al = alluvial
Ae = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

TABLE 5-9

TABULAR DESCRIPTION

FOREST PLANNING UNIT (25 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Sv1034	F 24	7350	-	S-3	-	-	10m. x 10m.	
42Sv1035	F 24	7260	-	S-3	-	-	20m. x 20m.	
42Sv1038	F 218	6150	-	S-4	-	-	40m. x 40m.	
42Sv1040	F 218	6200	-	S-4	-	-	30m. x 30m.	
42Sv1042	F 151	6240	-	S-4	-	-	20m. x 15m.	
42Sv1046	F 151	6260	-	S-4	-	-	10m. x 10m.	
42Sv1049	F 24	7500	-	S-4	-	-	100m.x100m.	
42Sv1051	F 24	7550	-	S-4	-	-	100m.x100m.	
42Sv1052	F 24	7500	-	S-4	-	-	200m.x200m.	
42Sv1053	F 24	7573	-	S-4	-	-	20m. x 20m.	
42Sv1054	F 24	7565	-	S-4	-	-	20m. x 20m.	
42Sv1055	F 24	7520	-	S-4	-	-	40m. x 40m.	
42Sv1056	F 24	7550	-	S-4	-	-	10m. x 10m.	
42Sv1057	F 24	7550	-	S-4	-	-	300m.x 50m.	
Quarry Site								
42Sv1036	F 218	6280	Sev. ceram.	S-4	Fremont	1150- 700	30m. x 15m.	
42Sv1037	F 218	6200	-	S-4	-	-	20m. x 20m.	
42Sv1039	F 218	6650	-	S-4	-	-	100m.x100m.	
42Sv1041	F 218	6600	-	S-4	-	-	400m.x200m.	
Temporary Camp								
42Sv1044	F 151	6240	-	S-4	-	-	15m. x 5m.	1 met.; 2 firepits
42Sv1045	F 151	6350	-	S-4	-	-	5m. x 5m.	1 firepit

TABLE 5-9 (page 2)

TABULAR DESCRIPTION

FOREST PLANNING UNIT (25 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
T. Camp (cont.)								
42Sv1047	F 151	6300	-	S-4	-	-	15m. x 15m.	1 firepit
42Sv1048	F151	6300	-	S-4	-	-	10m. x 10m.	Bone fragments; 1 firepit
42Sv1050	F 24	7520	Point ceramics	S-3	Paiute	600 - Protohist.	120m.x120m.	2 metates; poss. firepit
Extended Camp								
42Sv1043	F 151	6240	-	S-4	-	-	15m. x 15m.	1 firepit
Single Habitation								
42Sv1058	F 24	7550	-	S-2	-	-	50m. x 50m.	Several metates; several firepits

The elevations of the sites varied between five and eight thousand feet (1,524-2,038 m.) above sea level. Thirteen of those sites fell between six and seven thousand feet (1,829-2,134 m.), and twelve between seven and eight thousand feet (2,134-2,438 m.), (see Table 5-9).

Several types of human activity are represented by these sites. Fourteen sites were classified as lithic scatters, four as quarry sites, five as temporary camps, one as an extended camp, and one as a single habitation (see Table 5-9). Only two sites could be identified as to their cultural affiliation: 42Sv1036 is a small quarry site classified as Fremont on the basis of Sevier ceramics, and 42Sv1050 appears to be a proto-historic Paiute temporary camp based on Shoshonean ceramics and a projectile point.

All sites were evaluated according to the BLM Cultural Resource Evaluation System. Twenty-one sites were designated as S-4, two lithic scatters and one temporary campsite as S-3, and one extended campsite as S-2 (42Sv1043). No sites were given the highest rating of S-1 (see Table 5-9).

In relation to topographic features, it was found that seventeen of the twenty-five sites are on locations which command a view of adjacent lower areas, i.e., mesas, ridges, saddles, etc. This is possibly an aid to hunting and/or defense. Habitation sites were all found on mesa tops, and quarries were discovered in association with chert deposits in the Summerville formation. One anomaly in the planning unit is the lack of sites in sample area 364, a pinyon-juniper woodland area. As previously demonstrated, there exists a definite association of prehistoric sites and pinyon-juniper vegetation, but the lack of sites in area 364 may be partially due to steep, rugged terrain, or lack of adequate water resources.

HENRY MOUNTAINS

An intensive field survey of an approximate one percent of the surface area of this planning unit, stratified

TABLE 5-10

HENRY MOUNTAIN PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
4937	Desert Shrub	T.28S., R.11E., Sec. 26 SW¼	10
3064	Desert Shrub	T.29S., R.12E., Sec. 28 SE¼	3
2900	Desert Shrub	T.20S., R.12E., Sec. 13 NW¼	-
4615	Desert Shrub	T.30S., R.12E., Sec. 31 SE¼	-
1073	Pinyon-Juniper	T.30S., R.11E., Sec. 28 SW¼	-
2659	Desert Shrub	T.31S., R.12E., Sec. 13 NE¼	1
2669	Desert Shrub	T.31S., R.12E., Sec. 15 SE¼	-
2764	Desert Shrub	T.31S., R.11E., Sec. 14 SE¼	-
908	Pinyon-Juniper	T.31S., R.11E., Sec. 34 SE¼	-
2353	Desert Shrub	T.31S., R.12E., Sec. 10 NE¼	2
3010	Desert Shrub	T.29S., R.13E., Sec. 29 NW¼	6
3020	Desert Shrub	T.29S., R.13E., Sec. 29 SW¼	7
4367	Desert Shrub	T.28S., R.10E., Sec. 28 NE¼	-
4412	Desert Shrub	T.28S., R.9E., Sec. 25 SW¼	2
4429	Desert Shrub	T.28S., R.9E., Sec. 35 NW¼	-
5437	Barren-Waste	T.28S., R.8E., Sec. 24 SE¼	-
5529	Barren-Waste	T.27S., R.9E., Sec. 3 NW¼	-
3172	Desert Shrub	T.28S., R.8E., Sec. 11 SW¼	-
4509	Desert Shrub	T.27S., R.8E., Sec. 30 SE¼	1
3366	Desert Shrub	T.27S., R.6E., Sec. 1 SE¼	2
3108	Desert Shrub	T.29S., R.8E., Sec. 5 NE¼	2
5019	Big Sage	T.29S., R.8E., Sec. 7 NE¼	2
3589	Grass	T.29S., R.7E., Sec. 13 NE¼	3
5337	Barren-Waste	T.29S., R.8E., Sec. 14 SE¼	-

TABLE 5-10 (page 2)

HENRY MOUNTAIN PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
2559	Desert Shrub	T.31S., R.13E., Sec. 13 SW$\frac{1}{4}$	-
2232	Desert Shrub	T.32S., R.13E., Sec. 10 NW$\frac{1}{4}$	-
2407	Desert Shrub	T.32S., R.12E., Sec. 25 SW$\frac{1}{4}$	1
221	Pinyon-Juniper	T.33S., R.11E., Sec. 13 SW$\frac{1}{4}$	1
4537	Mountain Brush	T.33S., R.11E., Sec. 13 SE$\frac{1}{4}$	12
2157	Desert Shrub	T.33S., R.12E., Sec. 21 SW$\frac{1}{4}$	1
2182	Desert Shrub	T.33S., R.12E., Sec. 28 SE$\frac{1}{4}$	-
1517	Desert Shrub	T.36S., R.11E., Sec. 20 SE$\frac{1}{4}$	1
1475	Desert Shrub	T.36S., R.11E., Sec. 27 NW$\frac{1}{4}$	1
1305	Desert Shrub	T.37S., R.10E., Sec. 8 NW$\frac{1}{4}$	2
5105	Barren-Waste	T.35S., R.10E., Sec. 27 NE$\frac{1}{4}$	-
4570	Desert Shrub	T.35S., R.9E., Sec. 27 NE$\frac{1}{4}$	7
78	Pinyon-Juniper	T.35S., R.9E., Sec. 17 NW$\frac{1}{4}$	20
3683	Desert Shrub	T.35S., R.9E., Sec. 5 NE$\frac{1}{4}$	1
5137	Barren-Waste	T.34S., R.10E., Sec. 20 NE$\frac{1}{4}$	-
3832	Desert Shrub	T.33S., R.9E., Sec. 33 NE$\frac{1}{4}$	1
325	Pinyon-Juniper	T.33S., R.10E., Sec. 29 NW$\frac{1}{4}$	-
1845	Desert Shrub	T.33S., R.10E., Sec. 25 NW$\frac{1}{4}$	-
479	Pinyon-Juniper	T.33S., R.8E., Sec. 22 SE$\frac{1}{4}$	5
3442	Grass	T.33S., R.8E., Sec. 11 NE$\frac{1}{4}$	13
357	Pinyon-Juniper	T.33S., R.9E., Sec. 4 SW$\frac{1}{4}$	1
374	Pinyon-Juniper	T.33S., R.9E., Sec. 10 NE$\frac{1}{4}$	-
375	Pinyon-Juniper	T.33S., R.9E., Sec. 10 SW$\frac{1}{4}$	-
3465	Grass	T.32S., R.10E., Sec. 30 NE$\frac{1}{4}$	1
5005	Big Sage	T.32S., R.10E., Sec. 28 SE$\frac{1}{4}$	-

TABLE 5-10 (page 3)

HENRY MOUNTAIN PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
1054	Pinyon-Juniper	T.31S., R.8E., Sec. 34 SE¼	1
3965	Desert Shrub	T.31S., R.7E., Sec. 25 SW¼	2
644	Pinyon-Juniper	T.32S., R.9E., Sec. 8 SW¼	-
626	Pinyon-Juniper	T.32S., R.9E., Sec. 3 NW¼	-
628	Pinyon-Juniper	T.32S., R.9E., Sec. 3 SW¼	-
5701	Coniferous Forest	T.32S., R.10E., Sec. 22 SW¼	-
4979	Desert Shrub	T.31S., R.9E., Sec. 22 NE¼	-
966	Pinyon-Juniper	T.31S., R.9E., Sec. 12 SE¼	3
4064	Desert Shrub	T.30S., R.9E., Sec. 34 NE¼	-
5204	Barren-Waste	T.30S., R.9E., Sec. 24 SW¼	-
4039	Desert Shrub	T.30S., R.9E., Sec. 21 NE¼	-
4236	Desert Shrub	T.29S., R.10E., Sec. 35 SW¼	-
3624	Grass	T.27S., R.10E., Sec. 13 NE¼	1
2536	Desert Shrub	T.31S., R.13E., Sec. 7 NW¼	2
2699	Desert Shrub	T.31S., R.12E., Sec. 24 SW¼	3

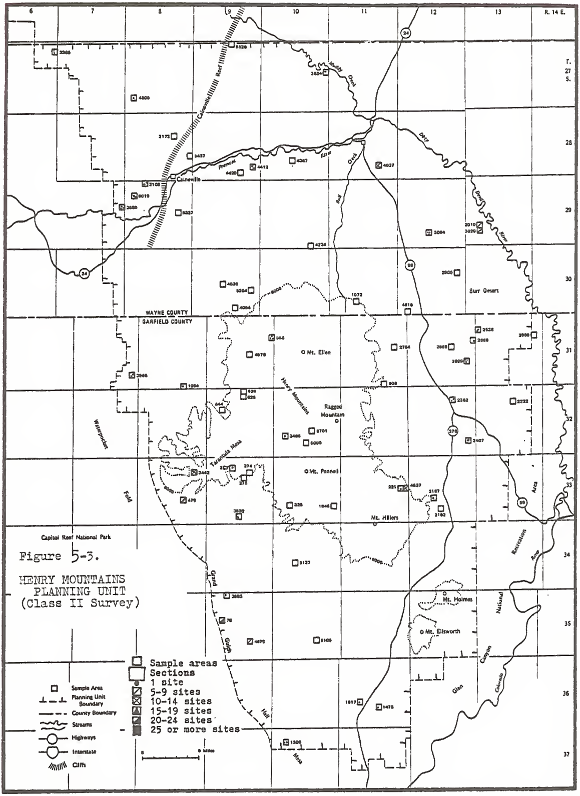


Figure 5-3. Henry Mountains Planning Unit Class II Survey.

Table 5-11

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Ga1332	HM 3442	6400	-	S-4	-	-	50m. x 50m.	
42Ga1333	HM 3442	6400	-	S-4	-	-	40m. x 40m.	
42Ga1334	HM 3442	6360	-	S-4	-	-	2m. x 2m.	
42Ga1335	HM 3442	6350	-	S-4	-	-	3m. x 3m.	
42Ga1338	HM 3442	6380	-	S-4	-	-	15m. x 15m.	
42Ga1339	HM 3442	6340	-	S-4	-	-	50m. x 50m.	
42Ga1340	HM 3442	6340	-	S-4	-	-	35m. x 35m.	
42Ga1341	HM 3442	6320	-	S-4	-	-	10m. x 10m.	
42Ga1343	HM 3442	6320	-	S-4	-	-	10m. x 10m.	
42Ga1344	HM 3442	6360	-	S-4	-	-	8m. x 8m.	
42Ga1345	HM 357	6500	-	S-4	-	-	20m. x 20m.	
42Ga1348	HM 2353	4800	-	S-4	-	-	40m. x 40m.	
42Ga1349	HM 2353	4800	-	S-4	-	-	25m. x 25m.	
42Ga1351	HM 78	5275	-	S-4	-	-	15m. x 10m.	
42Ga1352	HM 78	5275	-	S-4	-	-	30m. x 30m.	
42Ga1354	HM 78	5280	-	S-4	-	-	50m. x 50m.	
42Ga1355	HM 78	5280	-	S-4	-	-	300m.x300m.	
42Ga1356	HM 78	5280	-	S-4	-	-	100m.x100m.	
42Ga1357	HM 78	5280	-	S-4	-	-	5m. x 5m.	
42Ga1361	HM 479	5600	-	S-4	-	-	10m. x 10m.	
42Ga1362	HM 479	5600	-	S-4	-	-	15m. x 15m.	
42Ga1364	HM 479	5600	-	S-4	-	-	30m. x 30m.	
42Ga1366	HM 78	5275	-	S-4	-	-	5m. x 5m.	
42Ga1367	HM 78	5275	-	S-4	-	-	5m. x 5m.	
42Ga1368	HM 78	5275	-	S-4	-	-	5m. x 5m.	
42Ga1369	HM 78	5275	-	S-4	-	-	30m. x 30m.	
42Ga1371	HM 78	5275	-	S-4	-	-	30m. x 30m.	

Table 5-11 (page 2)

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lith. Scat. (cont.)								
42Ga1372	HM 78	5275	-	S-4	-	-	5m. x 5m.	
42Ga1373	HM 78	5275	Elko point	S-4	Archaic	8000-1400	15m. x 15m.	
42Ga1370	HM 78	5275	-	S-4	-	-	30m. x 30m.	
42Ga1374	HM 78	5275	-	S-4	-	-	Unrecorded	
42Ga1375	HM 4570	4960	-	S-4	-	-	30m. x 30m.	
42Ga1376	HM 4570	4960	-	S-4	-	-	15m. x 15m.	
42Ga1377	HM 4570	4960	-	S-4	-	-	5m. x 5m.	
42Ga1378	HM 4570	4960	-	S-4	-	-	5m. x 5m.	
42Ga1379	HM 4570	4960	-	S-4	-	-	100m.x100m.	
42Ga1380	HM 4570	5040	-	S-4	-	-	15m. x 15m.	
42Ga1381	HM 4570	4960	-	S-4	-	-	2m. x 2m.	Site disturbed by reservoir, canals, and roads
42Ga1382	HM 3683	5200	-	S-4	-	-	5m. x 5m.	
42Ga1383	HM 3832	5120	-	S-4	-	-	30m. x 30m.	
42Ga1384	HM 1305	4000	Elko side-notched pt.	S-4	Archaic/ Fremont	8000- 650	50m. x 50m.	
42Ga1386	HM 2407	5200	-	S-4	-	-	2m. x 2m.	
42Ga1387	HM 1475	4226	Black Rock concave & Fremont sd. notched	S-4	Archaic/ Fremont	8000- 650	300m.x300m.	
42Ga1388	HM 2157	5400	-	S-4	-	-	10m. x 10m.	
42Ga1389	HM 1517	4000	-	S-3	-	-	10m. x 30m.	
42Ga1392	HM 2699	4920	Elko corner notched pt.	S-4	Archaic	8000-1400	10m. x 3m.	
42Ga1393	HM 2699	4920	-	S-4	-	-	5m. x 5m.	

Table 5-11 (page 3)

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lith. Scat. (cont.)								
42Ga1394	HM 2699	4800	-	S-4	-	-	25m. x 10m.	
42Ga1396	HM 4537	6180	-	S-4	-	-	10m. x 10m.	
42Ga1402	HM 4537	6100	-	S-4	-	-	35m. x 20m.	
42Ga1405	HM 4537	6250	-	S-4	-	-	40m. x 15m.	
42Ga1406	HM 1054	5680	Rose Sprngs. point	S-4	Late Archaic Fremont	1500- 600	10m. x 40m.	
42Ga1407	HM 3965	5600	Bullcrk.pt.	S-4	Fremont	1300- 600	5m. x 5m.	
42Ga1408	HM 3965	5600	-	S-4	-	-	5m. x 5m.	
42Ga1409	HM 966	7980	-	S-4	-	-	70m. x 40m.	
42Ga1412	HM 3465	6800	-	S-4	-	-	30m. x 20m.	
42Ga1417	HM 221	6320	-	S-4	-	-	30m. x 30m.	
42Ga1418	HM 4537	6300	-	S-4	-	-	10m. x 10m.	
Kill/ Butchering								
42Ga1390	HM 2536	4940	Elko corner ntchd.,Rose Sprngs.Dsrt. Sd. ntchd. points	S-4	Late Archaic or Fremont	4500- 600	70m. x 70m.	
42Ga1398	HM 4537	6200	Elko eared point	S-4	Archaic	8000-1400	20m. x 20m.	
42Ga1399	HM 4537	6200	2 Elko cornered notched pts.	S-4	Archaic	8000-1400	15m. x 25m.	
42Ga1404	HM 4537	6200	Desert side notched pt.	S-3	Late Archaic Fremont	4500- 600	175m.x175m.	2 possible components

Table 5-11 (page 4)

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Kill/Butch. (cont.)								
42Ga1410	HM 966	7970	Gypsum pt.	S-4	Late Archaic	2700-1400	10m. x 5m.	
42Ga1411	HM 966	7980	-	S-4	-	-	10m. x 5m.	
Temporary Camp								
42Ga1336	HM 3442	6420	-	S-4	-	-	2m. x 2m.	Fire cracked rocks
42Ga1337	HM 3442	6350	-	S-4	-	-	40m. x 10m.	2 poss. components
42Ga1342	HM 3442	6300	-	S-4	-	-	15m. x 15m.	Fire ring w/ash
42Ga1350	HM 78	5275	-	S-4	-	-	10m. x 10m.	Ash observed
42Ga1353	HM 78	5280	-	S-4	-	-	30m. x 30m.	Sevrl. Fire pits
42Ga1358	HM 78	5300	-	S-4	-	-	10m. x 10m.	
42Ga1365	HM 479	5600	-	S-4	-	-	30m. x 30m.	Mano
42Ga1385	HM 1305	4000	-	S-4	-	-	15m. x 15m.	2 manos; 1 possible metate
42Ga1391	HM 2536	4800	-	S-4	-	-	25m. x 25m.	Fire cracked rock and ash
42Ga1403	HM 4537	6150	-	S-3	-	-	60m. x 40m.	Mano & poss. Metate
Rock Shelter								
42Ga1347	HM 2659	4560	-	S-4	-	-	15m. x 10m.	Poss. fire pit & metate
42Ga1359	HM 78	5250	Rose Sp.pt.	S-4	Late Archaic or Fremont	1500- 600	15m. x 15m.	Basin metate obs.
42Ga1360	HM 78	5240	-	S-4	-	-	15m. x 15m.	Charcoal,ash obs.
42Ga1363	HM 479	5600	Elko corner notched pt.	S-4	Archaic	8000-1400	20m. x 20m.	

Table 5-11 (page 5)

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Rock Shelter (cont.)								
42Ga1395	HM 4537	6000	Emery gray Snake Valley (?)	S-1	Fremont	1300- 600	35m. x 40m.	2 components; poss. stone masonry ground stone
42Ga1397	HM 4537	6120	Emery gray	S-3	Fremont	1300- 600	20m. x 5m.	Bone recovered
42Ga1400	HM 4537	6000	-	S-4	-	-	5m. x 2m.	2 stone masonry granaries
42Ga1401	HM 4537	6000	Emery gray	S-3	Fremont	1300- 600	2m. x 2m. (cist)	Pine nuts;vertical slabs;groundstone
Lithic Scatter								
42Wn1056	HM 3366	5600	-	S-4	-	-	50m. x 50m.	
42Wn1059	HM 3108	4940	-	S-4	-	-	10m. x 10m.	
42Wn1061	HM 5019	4960	-	S-4	-	-	10m. x 10m.	
42Wn1063	HM 3589	5360	-	S-4	-	-	7m. x 7m.	
42Wn1065	HM 3589	5440	-	S-4	-	-	15m. x 15m.	
42Wn1073	HM 4937	4600	-	S-4	-	-	15m. x 15m.	
42Wn1074	HM 4937	4430	-	S-4	-	-	5m. x 5m.	
42Wn1075	HM 3064	4700	-	S-3	-	-	20m. x 20m.	
42Wn1076	HM 3064	4670	-	S-4	-	-	Unrecorded	
42Wn1077	HM 3064	4620	-	S-3	-	-	20m. x 20m.	
42Wn1084	HM 3020	5100	-	S-3	-	-	Unrecorded	
42Wn1085	HM 3010	5120	-	S-3	-	-	10m. x 5m.	
42Wn1086	HM 3010	4980	-	S-4	-	-	5m. x 10m.	
42Wn1087	HM 3010	5080	-	S-4	-	-	5m. x 20m.	
42Wn1088	HM 3010	5040	-	S-4	-	-	10m. x 5m.	
42Wn1089	HM 3010	4960	-	S-3	-	-	20m. x 10m.	

Table 5-11 (page 6)

TABULAR DESCRIPTION

HENRY MOUNTAIN PLANNING UNIT (121 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lith. Scat. (cont.)								
42Wn1090	HM 3010	4920	-	S-2	-	-	25m. x 10m.	
42Wn1093	HM 4412	4660	-	S-4	-	-	4m. x 4m.	
Quarry								
42Wn1057	HM 3366	5600	-	S-4	-	-	400m.x400m.	Volcanic flow
42Wn1058	HM 4509	5200	-	S-4	-	-	1m. x 1m.	Chert outcrop
42Wn1060	HM 3108	4960	-	S-4	-	-	200m.x300m.	
42Wn1064	HM 3589	5440	-	S-4	-	-	800m.x200m.	
42Wn1066	HM 4937	4480	-	S-3	-	-	10m. x 10m.	
42Wn1067	HM 4937	4560	-	S-3	-	-	20m. x 20m.	
42Wn1068	HM 4937	5540	-	S-3	-	-	10m. x 10m.	
42Wn1069	HM 4937	4560	-	S-3	-	-	100m.x 50m.	
42Wn1070	HM 4937	4600	-	S-3	-	-	10m. x 15m.	
42Wn1071	HM 4937	4550	-	S-3	-	-	1m. x 1m.	
42Wn1072	HM 4937	5470	-	S-3	-	-	5m. x 5m.	
42Wn1078	HM 3020	5280	-	S-3	-	-	20m. x 10m.	
42Wn1079	HM 3020	5240	-	S-3	-	-	10m. x 10m.	
42Wn1080	HM 3020	5120	-	S-4	-	-	3m. x 2m.	
42Wn1081	HM 3020	5150	-	S-3	-	-	20m. x 10m.	
42Wn1082	HM 3020	5150	-	S-4	-	-	Unrecorded	
42Wn1083	HM 3020	5100	-	S-4	-	-	5m. x 5m.	
42Wn1091	HM 4937	4520	-	S-3	-	-	30m. x 20m.	
42Wn1092	HM 3624	4480	-	S-4	-	-	800m.x200m.	
42Wn1094	HM 4412	4640	-	S-3	-	-	100m.x200m.	
Extended Camp								
42Wn1062	HM 5019	4960	Sev.,Em.gr. sherds	S-3	Fremont	1300- 600	15m. x 15m.	3 metates; 2 stone circles; 2 manos

by the Richfield District of the Bureau of Land Management according to vegetation type, was carried out by AERC in June 1977. The survey consisted of the sixty-four quarter section sample areas described in Table 5-10.

One hundred twenty-one cultural resource sites were discovered on thirty-three sample areas during the RG-II research phase (see Figure 5-3). No sites were discovered in thirty-one of the sixty-four sample areas. Only seven areas had more than five sites each, with four of these having ten or more.

Area 78, on the boundary line of Capitol Reef National Park, was the most heavily utilized, with twenty sites reported (see Table 5-11). Of the twenty, fifteen are lithic scatters, three are temporary camps, and two are rockshelters. None was regarded as having special significance, however. The second most utilized sample area was number 3442, also near the western border of the planning unit on Tarantula Mesa. Of its thirteen sites, ten are lithic scatters, and three are temporary campsites. Sample area 4537 on the east slope of the Henry Mountains had eleven sites: three lithic scatters, three kill-butchering sites, one temporary campsite, two rockshelters, one cist, and one granary. The cist and the granary were both found within small rockshelters. Sample area 4937, near Hanksville, contained ten sites. Three are lithic scatters, and seven are quarries where stone was taken from the outcrops and worked at the site location. Sample areas 3010 and 3020 near the Dirty Devil River included six and seven sites, respectively. Six of the seven sites in area 3020 are quarry sites, with the remaining site and all of those in area 3010 being lithic scatters. The only other sample area with over five sites was area 4570 with seven. Area 4570 is also near the southwest boundary of the planning unit, close to Capitol Reef National Park; it contained only lithic scatter sites. The remaining sample areas average about one and a half sites each. There is a tendency for the sites to be more prevalent in the areas of the western half of the planning unit. The overall picture is one of limited activity by prehistoric cultures, except at specialty sites, such as quarries, or in favorable locations, such as sample area 78 (see Table 5-11 and Figure 5-3).

Sixty-three sites were reported from the pinyon-juniper woodland association (see Table 5-10). Nineteen were in juniper alone, and forty-four in a mixture of pinyon and juniper. These sixty-three sites include all thirty-three sites in the two most highly utilized sample areas, 78 and 3442, and most of the scattered sites in the west, as well as those in area 9537. The remaining sample areas are in desert shrub vegetation, primarily the black brush-Mormon tea association, which has forty sites. The others are in greasewood and salt bush areas. All of the quarry sites are in desert shrub.

Fifteen sites were discovered on Quaternary aeolian or alluvial material, primarily dunes and pediment gravels. One site was reported on Tertiary intrusive rock (42Wn1057). Forty-nine sites were found on Cretaceous materials (see Table 5-12). Fourteen of these are on the undivided Mesa Verde group, all in the Tarantula Mesa region. The other thirty-four, including all twenty from sample area 78, are on various members, mostly the sandstones of the Mancos shale. Of those, 42Ga1406 and 42Ga1409 were on Emery sandstone; ten each were on Ferron (42Ga1354, 1356, 1358, 1366, 1367, 1368, 1372, 1373; 42Wn1093, 1094), and Blue Gate sandstones (42Ga1350, 1351, 1352, 1353, 1355, 1359, 1360, 1374, 1383, 1412); three sites (42Wn1063, 1064, 1065) occurred on the Tununk shale member; and nine on the Masuk shale-sandstone member (42Ga1357, 1361, 1362, 1363, 1364, 1365, 1369, 1370, and 1371).

Fifty-three sites were reported on Jurassic materials. Two of these (42Ga1411, 42Wn1092) are on the undivided Morrison formation. Fourteen sites (42Ga1375, 1376, 1377, 1378, 1379, 1380, 1381, 1396, 1397, 1398, 1399, 1400, 1417, 1418) are on the Brushy Basin shale member, and

TABLE 5-12

GEOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Ga1332				X						
1333				X						
1334				X						
1335				X						
1336				X						
1337				X						
1338				X						
1339				X						
1340				X						
1341				X						
1342				X						
1343				X						
1344				X						
1345				X						
1347	X									
1348	X									
1349	X									
1350					X					
1351					X					
1352					X					
1353					X					
1354					X					
1355					X					
1356					X					
1357					X					
1358					X					
1359					X					
1360					X					
1361					X					
1362					X					
1363					X					
1364					X					
1365					X					
1366					X					
1367					X					
1368					X					
1369					X					

TABLE 5-12 (page 2)

GEOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAINS PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Ga1370					X					
1371					X					
1372					X					
1373					X					
1374					X					
1375								X		
1376								X		
1377								X		
1378								X		
1379								X		
1380								X		
1381								X		
1382										X
1383					X					
1384								X		
1385								X		
1386	X									
1387	X									
1388	X									
1389	X									
1390										X
1391										X
1392									X	
1393									X	
1394									X	
1395								X		
1396								X		
1397								X		
1398								X		
1399								X		
1400								X		
1401								X		
1402								X		
1403								X		
1404								X		
1405								X		
1406					X					
1407									X	

TABLE 5-12 (page 3)

GEOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAINS PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Ga1408									X	
1409					X					
1410									X	
1411							X			
1412					X					
1417								X		
1418								X		
42Wn1056	X									
1057		X								
1058	X									
1059									X	
1060									X	
1061								X		
1062									X	
1063					X					
1064					X					
1065					X					
1066									X	
1067									X	
1068									X	
1069									X	
1070									X	
1071									X	
1072									X	
1073									X	
1074									X	
1075									X	
1076	X									
1077	X									
1078	X									
1079	X									
1080	X									
1081	X									
1082									X	

TABLE 5-12 (page 4)

GEOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAINS PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Wn1083									X	
1084									X	
1085									X	
1086									X	
1087									X	
1088									X	
1089									X	
1090									X	
1091									X	
1092								X		
1093					X					
1094					X					
Sub total 121	15	1	0	14	34	0	1	24	29	3

the remaining nine (42Ga1384, 1385, 1395, 1401, 1402, 1403, 1414, 1405; 42Wn 1061) are on the Salt Wash sandstone member of the Morrison formation. These are mostly in sample areas 1305 and 4570 in the extreme southwest, and area 4537 on the south slope of the Henrys. The other twenty-nine sites associated with the Jurassic are in rocks of the San Rafael group. One is from the undivided San Rafael group (42Ga1410) and one from the Summerville formation (42Wn1062). Twenty-one sites, primarily from areas 4937, 3010, and 3020, were recorded on the Entrada sandstones of the San Rafael (42Ga1407, 1408; 42Wn1059, 1060, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1082, 1083, 1084, 1085, 1086, 1098, 1091). Six sites were on the Carmel formation (42Ga1392, 1393, 1394; 42Wn1088, 1089, 1090).

Two sites were reported from the Triassic Navajo sandstone (42Ga1382, 1391), and one from Wingate sandstone (42Ga1390). They are within area 2659 in the northeast, area 2536 in the east, and area 3683 in the southwest portion of the planning unit (see Table 5-12).

Nineteen sites were associated with alluvial soils, four were found with colluvial deposits, twenty-five occurred with aeolian soils, sixty-eight on residual soils, and five on bedrock (see Table 5-13).

Thirty-three sites were discovered on mesa tops. Half of these were on sample areas on Tarantula Mesa, and the remainder were from the southwest portion of the unit or from widely scattered areas. Twenty-four sites were located on drainage channels, while the remainder of the sites were located on diverse geomorphological features (see Table 5-13).

Thirty-nine sites were recorded between elevations of four and five thousand feet (1,220-1,424 m.), fifty-one sites between five and six thousand feet (1,524-1,829 m.), and twenty-eight between six and seven thousand feet (1,829-2,134 m.). Three sites (see Table 5-11) were found at elevations between seven and eight thousand feet (2,134-2,438 m.).

Seventy-six of the recorded one hundred twenty-one

TABLE 5-13

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Ga1332					Rs												
1333					Rs												
1334					Rs												
1335			Rs														
1336					Rs												
1337					Rs												
1338					Rs												
1339					Rs												
1340					Rs												
1341					Rs												
1342					Rs												
1343					Rs												
1344					Rs												
1345					Rs												
1347												Al					
1348													Ae				
1349													Ae				
1350			Rs														
1351									Rs								
1352			Rs														
1353			Rs														
1354														Rs			
1355														Rs			
1356														Rs			
1357			Bd														
1358																Cl	
1359												Al					
1360												Cl					
1361									Rs								
1362														Al			

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-13 (page 2)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Ga1363														Al			
1364					Rs												
1365					Rs												
1366			Rs														
1367			Rs														
1368														Bd			
1369					Rs												
1370			Rs														
1371					Rs												
1372					Rs												
1373					Rs												
1374					Rs												
1375					Rs												
1376			Al														
1377			Al														
1378			Al														
1379			Al														
1380					Rs												
1381			Al														
1382			Al														
1383			Al														
1384					Al												
1385					Al												
1386													Ae				
1387					Ae												
1388									Al								
1389													Ae				
1390									Bd								
1391			Al														
1392													Ae				
1393																Ae	

Al = alluvial
Ae = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

TABLE 5-13 (page 3)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Ga1394			Ae														
1395		Rs															
1396								Rs									
1397												Cl					
1398								Rs									
1399								Rs									
1400												Bd					
1401												Bd					
1402			Rs														
1403								Rs									
1404			Rs														
1405								Rs									
1406			Rs														
1407					Rs												
1408					Rs												
1409											Rs						
1410											Rs						
1411								Rs									
1412									Rs								
,																	
1417			Al														
1418			Al														
42Wn1056			Ae														
1057										Rs							
1058									Rs								
1059			Al														
1060									Rs								

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-13 (page 4)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Wn1061									Rs								
1062									Ae								
1063								Cl									
1064					Rs												
1065					Rs												
1066														Rs			
1067									Rs								
1068																Rs	
1069					Rs												
1070														Rs			
1071					Rs												
1072					Rs												
1073								Rs									
1074													Rs				
1075													Ae				
1076													Ae				
1077													Ae				
1078													Ae				
1079														Ae			
1080													Ae				
1081														Ae			
1082													Ae				
1083													Rs				
1084													Ae				
1085													Ae				
1086													Ae				
1087									Ae								
1088																Ae	
1089									Ae								
1090									Ae								

Al = alluvial
Ae = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

TABLE 5-13 (page 5)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HENRY MOUNTAIN PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Wn1091								Rs									
1092	Al																
1093					Rs												
1094								Rs									
Sub totals 121	1	1	24	0	33	0	0	10	13	1	2	6	16	10	0	4	0

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

sites were typed as lithic scatters. Quarry sites consisting of tool material outcrops and associated debitage accounted for twenty sites. Six kill-butchering sites and ten temporary camps were recorded, as well as one extended camp and eight rockshelter sites. Two of the rockshelter sites contained possible storage structures, one a post and mud cist (42Ga1410), and the other two stone masonry granaries (42Ga1400). No historic sites were found in the Henry Mountain Planning Unit (see Table 5-11).

Analysis of the diagnostic artifacts contained at these sites indicates cultural affiliation for seventeen sites; no affiliation could be determined for one hundred four sites. On the basis of diagnostic projectile points and ceramics, five sites were assigned to the Archaic, one to late Archaic, six to Archaic or Fremont, and five to Fremont (see Table 5-11).

All sites were evaluated according to the BLM Cultural Resource Evaluation System. Ninety-six sites were recorded at the lowest significance rating of S-4. Twenty-three sites were rated at the S-3 level. One site (42Wn1090), a lithic scatter with unidentifiable point fragments, was given a S-2 rating. One S-1 rating was assigned to a rockshelter with Fremont ceramics and ground stone artifacts (42Ga1395) situated in sample area 4537 (see Figure 5-3).

The correlations between site locations and available environments within those areas tested in the planning unit are striking; the sample areas with the greatest number of sites are in pinyon-juniper woodland except for those sample areas with large numbers of quarries. Quarries are obviously restricted to locations having lithic resources, irrespective of vegetation. Most of the sites within the planning unit are on sandstone rather than shale; this is probably because of variations in erosion patterns, vegetation, and water retention between these two kinds of surfaces. There does appear to be a definite relationship between site location and geomorphology, as over two-thirds of the sites are on topographic features which overlook lower areas. These include mesa tops, benches, hills, slopes, ridges, and alcoves (see Table 5-13). In spite of the large area involved in the survey, relatively few indications of intensive human activity were found. A greater site density occurs in the western half of the planning unit, with the exception of quarry sites associated with the Entrada and Carmel formations along the eastern periphery of the planning unit.

HUNTINGTON

An intensive field survey of an approximate one percent of the surface areas of the planning unit, stratified by the Moab District of the Bureau of Land Management according to vegetation type, was carried out by AERC in July 1977. The survey consisted of the ten quarter section sample areas described in Table 5-14.

Ten sample areas were surveyed for cultural resources in this planning unit; only three, 196, 317, and 629, were found to have sites. Area 196 contained one site, area 317, three sites, and 629, three sites (see Figure 5-4). Four of the seven sites are located in the pinyon-juniper ecosystem, while the remaining three are found in desert-shrub (rabbit brush, salt bush) areas. Three of the four sites found in the pinyon-juniper woodland were found in an area classified by the BLM as grassland (see Table 5-14).

As to the geologic locations of the sites, it was found that the one site in sample area 196 (42Em946) is on the Jurassic Carmel formation of the San Rafael group. The three sites in sample area 317 (42Em943, 944, 945) are on the Cretaceous Ferron sandstone member of the Mancos shale, while the remaining three sites located in sample area 629 (42Em940, 941, and 942) are on Quaternary alluvial or aeolian deposits (see Table 5-15).

All sites but one (42Em946) are on alluvial soils, with three being found in a large plain surrounded by mountains and three within drainage channels. Site 42Em946

TABLE 5-14

HUNTINGTON PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
140	Pinyon-Juniper	T.19S., R.11E., Sec. 30 NE	-
213	Pinyon-Juniper	T.20S., R.11E., Sec. 10 SW¼	-
196	Pinyon-Juniper	T.20S., R.10E., Sec. 9 NE¼	1
317	Grasses	T.18S., R.10E., Sec. 34 NW¼	3
345	Grasses	T.19S., R.10E., Sec. 8 NW¼	-
337	Grasses	T.19S., R.11E., Sec. 6 SW¼	-
790	Sage	T.18S., R.8E., Sec. 8 SW¼	-
551	Desert Shrub	T.18S., R.9E., Sec. 30 NE¼	-
629	Desert Shrub	T.19S., R.10E., Sec. 10 SW¼	3
440	Barren-Waste	T.16S., R.8E., Sec. 28 SE¼	-

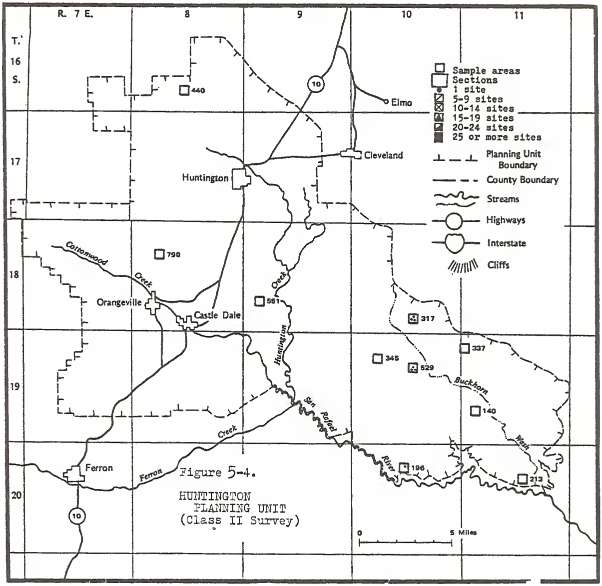


Figure 5-4. Huntington Planning Unit Class II Survey.

TABLE 5-15

GEOLOGIC/SITE RELATIONSHIPS

HUNTINGTON PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Em940	X									
941	X									
942	X									
943					X					
944					X					
945					X					
946									X	
Sub total 7	3	0	0	0	3	0	0	0	1	0

TABLE 5-16

GEOMORPHOLOGIC/SITE RELATIONSHIPS

HUNTINGTON PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em940																	Al
941																	Al
942																	Al
943			Al														
944			Al														
945			Al														
946										Rs							
Sub totals 7	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	3

Al = alluvial
Ac = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

Table 5-17

TABULAR DESCRIPTION

HUNTINGTON PLANNING UNIT (7 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Em940	HU 629	5620	-	S-4	-	-	10m. x 10m.	
42Em941	HU 629	5620	-	S-4	-	-	10m. x 10m.	
42Em942	HU 629	5620	-	S-4	-	-	25m. x 25m.	
42Em943	HU 317	5760	-	S-4	-	-	15m. x 15m.	
42Em944	HU 317	5760	-	S-4	-	-	15m. x 15m.	
42Em945	HU 317	5760	-	S-4	-	-	30m. x 30m.	
42Em946	HU 196	5900	-	S-4	-	-	40m. x 40m.	

is located upon residual soils on a terrace (see Table 5-16).

All of the cultural resource sites located in this planning unit during the RG-II survey are small to medium size lithic scatters, with no diagnostic artifacts observed. No cultural affiliation could be assigned to any of the seven sites. The survey indicates that this area was utilized on a limited basis by relatively few people.

All sites were evaluated according to the BLM Cultural Resource Evaluation System. All new sites were given a rating of S-4 (see Table 5-12).

LAST CHANCE

An intensive field survey of an approximate one percent of the surface area of this planning unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management, was carried out by AERC in August 1977. The survey consisted of the ten quarter section sample areas described on Table 5-18.

Culture resource sites were recorded in four of the ten sample areas with a total of eight new prehistoric sites recorded. Five of the eight are in sample area 180 (see Figure 5-5), one each in 674 and 711, and sample area 477 was recorded as one large lithic scatter (42Em955).

All of the sites are in sparse salt bush-rabbit brush desert shrub vegetation in the lower elevations of the area (see Table 5-18). One site is in Quaternary alluvial material (42Em936), and the rest are on Jurassic surfaces with six on Entrada sandstones (42Em949, 950, 951, 952, 953, 955), and one (42Em954) on the Carmel sandstone of the San Rafael group (see Table 5-19).

Five sites are on alluvial soils; one on a flat, two on desert pavement, and two in drainages. The remaining three sites are on residual soils, one on a rim, and two on ridges (see Table 5-20). All sites occur between the elevations of five and six thousand feet (1,524-1,829 m.), (see Table 5-21).

TABLE 5-18

LAST CHANCE PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
674	Desert Shrub	T.24S., R.6E., Sec. 31 SE¼	1
481	Desert Shrub	T.24S., R.7E., Sec. 35 SE¼	-
20	Desert Shrub	T.25S., R.7E., Sec. 13 SW¼	-
180	Desert Shrub	T.25S., R.7E., Sec. 19 NW¼	5
711	Desert Shrub	T.26S., R.7E., Sec. 3 NE¼	1
477	Grasses	T.24S., R.7E., Sec. 29 SE¼	1
775	Barren-Waste	T.24S., R.6E., Sec. 23 SW¼	-
981	Barren-Waste	T.25S., R.8E., Sec. 34 NE¼	-
731	Barren-Waste	T.26S., R.8E., Sec. 7 SE¼	-
47	Pinyon-Juniper	T.26S., R.8E., Sec. 11 NW¼	-

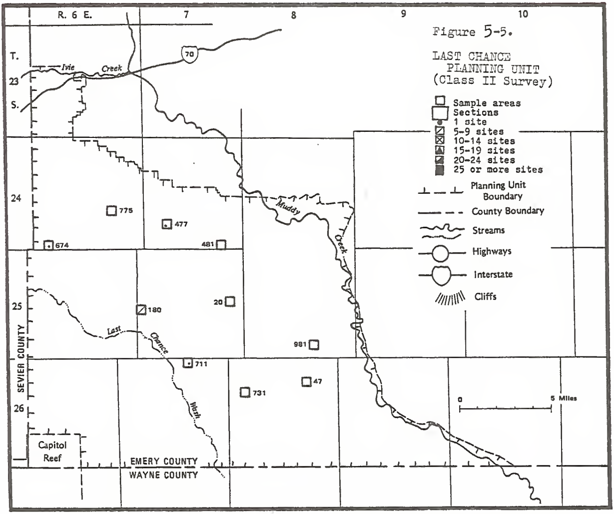


Figure 5-5. Last Chance Planning Unit Class II Survey.

TABLE 5-19

GEOLOGIC/SITE RELATIONSHIPS

LAST CHANCE PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Em949									X	
950									X	
951									X	
952									X	
953									X	
954									X	
955									X	
956	X									
Sub total 8	1	0	0	0	0	0	0	0	7	0

TABLE 5-20

GEOMORPHOLOGIC/SITE RELATIONSHIPS

LAST CHANCE PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em949						Al											
950						Al											
951			Al														
952	Rs																
953			Al														
954								Rs									
955																	Al
956								Rs									
Sub totals 8	1	0	2	0	0	2	0	2	0	0	0	0	0	0	0	0	1

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-21

TABULAR DESCRIPTION

LAST CHANCE PLANNING UNIT (8 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Em950	LC 180	5650	-	S-4	-	-	Unrecorded	
42Em952	LC 180	5700	-	S-4	-	-	400m.x100m.	
42Em953	LC 180	5640	-	S-4	-	-	20m. x 20m.	
42Em954	LC 711	5700	-	S-4	-	-	2m. x 2m.	
42Em955	LC 477	5540	-	S-4	-	-	400m.x400m.	
42Em956	LC 674	5960	Gypsum pt.	S-3	Late Archaic Fremont	1300- 600	500m.x 50m.	
Quarry								
42Em949	LC 180	5650	-	S-4	-	-	250m.x300m.	Chert & petrified wood source
42Em951	LC 180	5600	-	S-4	-	-	200m.x250m.	Chert source

The eight sites recorded represent undeterminable cultural use. Six are lithic scatters, and two are quarry sites. One lithic scatter (42Em958) was determined to be of either late Archaic or Fremont affiliation. Cultural association of the remaining seven sites is presently unknown. No historic sites were recorded as a result of the survey (see Table 5-21).

All sites were evaluated for significance, using the BLM Cultural Resource Evaluation System. Seven sites were given S-4 ratings, and one lithic scatter having diagnostic artifacts was rated as S-3 (see Table 5-21).

Due to the sparsity of the sites and the uniformity of the vegetation type, no correlations between habitat and site location can be made.

MUDDY

An intensive field survey of an approximate one percent of the surface area of this planning unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management was carried out by AERC in August 1977. The survey consisted of the twenty-two quarter section sample areas described in Table 5-22.

Fifty-one cultural resource sites were found in seven of the twenty-two sample areas, with the remaining fifteen areas having no sites. The sites were found in the following sample areas: 299 (6), 302 (2), 483 (21), 559 (13), 920 (2), 1138 (3), and 1563 (4). All but six of the sites were found in the southern half of the unit, and include site locations above and below the Coal Cliffs escarpment and in the San Rafael Swell (see Figure 5-6 and Table 5-23).

All of the sites were found either in the arid or pinyon-juniper ecozones. In the arid, a total of eleven sites were found. Three of these sites were found in association with salt bush and rabbit brush zones. The remaining forty sites were all found in the pinyon-juniper ecozones; eighteen were found in juniper alone, and twenty-two

TABLE 5-22

MUDDY PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
643	Desert Shrub	T.20S., R.8E., Sec. 10 SE¼	-
1401	Desert Shrub	T.20S., R.9E., Sec. 18 NE¼	-
1438	Desert Shrub	T.20S., R.9E., Sec. 21 SW¼	-
1445	Desert Shrub	T.20S., R.7E., Sec. 28 NW¼	-
734	Pinyon-Juniper	T.20S., R.10E., Sec. 30 SW¼	-
2101	Pinyon-Juniper	T.20S., R.11E., Sec. 7 SW¼	-
1563	Desert Shrub	T.21S., R.9E., Sec. 9 NW¼	4
807	Pinyon-Juniper	T.21S., R.9E., Sec. 11 NE¼	-
1612	Desert Shrub	T.21S., R.7E., Sec. 21 SW¼	-
920	Pinyon-Juniper	T.21S., R.8E., Sec. 32 NE¼	2
913	Desert Shrub	T.21S., R.9E., Sec. 29 SE¼	-
299	Pinyon-Juniper	T.22S., R.6E., Sec. 13 SW¼	6
302	Pinyon-Juniper	T.22S., R.7E., Sec. 17 SW¼	2
1051	Desert Shrub	T.22S., R.8E., Sec. 23 SW¼	-
483	Pinyon-Juniper	T.23S., R.7E., Sec. 8 NE¼	21
1138	Pinyon-Juniper	T.23S., R.7E., Sec. 17 SE¼	3
504	Pinyon-Juniper	T.23S., R.10E., Sec. 7 SW¼	-
559	Pinyon-Juniper	T.23S., R.9E., Sec. 22 SW¼	13
1871	Desert Shrub	T.23S., R.8E., Sec. 20 SE¼	-
1901	Desert Shrub	T.23S., R.8E., Sec. 30 SE¼	-
1932	Desert Shrub	T.23S., R.7E., Sec. 35 SE¼	-
1212	Desert Shrub	T.24S., R.7E., Sec. SE¼	-

in mixed pinyon-juniper.

On comparing the location of sites to the geology of the area, it was found that four sites were located on Quaternary alluvial deposits or slopes. Fifteen sites are of Cretaceous age. Of these sites, eight are located on the Ferron sandstone member of the Mancos shale formation, and seven in the Cedar Mountain formation. Nineteen sites are located on formations of Jurassic age. Fifteen were found on the Morrison formation, and four on the Carmel formation of the San Rafael group. The remaining thirteen sites are all of Triassic age, and were found on the Kayenta formation of the Glen Canyon group (see Table 5-24).

In relationship to geomorphic features, twenty-seven sites were located on alluvial deposits or soils. Of these, four are located on slopes, one on a mesa top, two in drainage channels, twelve on ridges, three on terraces, two in small alcoves, and two on hillocks. Only three sites were found on colluvial slopes or deposits, with one of these located on a small bench and two on slopes. Twenty-one of the sites were found on residual soils. Three of these sites were located on rims, four in drainage channels (with one on a small terrace in one of the channels), six on ridges, three on benches, three on slopes, and one on a saddle (see Table 5-25).

Between the elevations of five and six thousand feet (1,524-1,829 m.), nine sites were found (see Table 5-23). Twenty-nine of the sites were found between six and seven thousand feet (1,829-2,133 m.), and twelve sites were located from seven to eight thousand feet in elevation (2,133-2,438 m.).

Out of the fifty-one sites, a total of thirty-one were classified as lithic scatters. Seven sites were closely related to lithic scatters, and classified as quarries. Nine sites were temporary campsites, while only two sites were extended campsites. One single habitation (42Em889) and one historic site (42Em891) were also found.

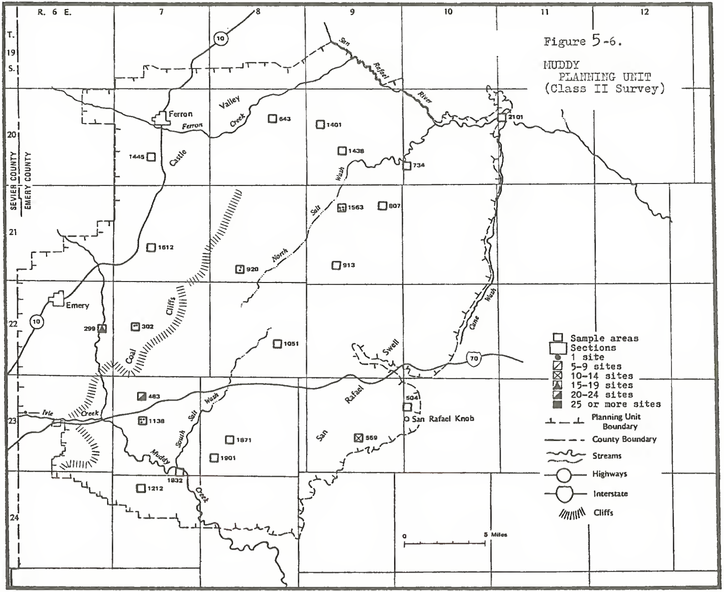


Figure 5-6. Muddy Planning Unit Class II Survey.

Table 5-23

TABULAR DESCRIPTION

MUDDY PLANNING UNIT (51 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Em897	M 920	5880	-	S-4	-	-	15m. x 15m.	
42Em902	M 483	6000	-	S-4	-	-	30m. x 30m.	
42Em903	M 483	6000	-	S-4	-	-	50m. x 50m.	
42Em904	M 483	6000	-	S-4	-	-	50m. x 50m.	
42Em905	M 483	6000	-	S-4	-	-	20m. x 20m.	
42Em906	M 483	6000	-	S-4	-	-	50m. x 50m.	
42Em907	M 483	6000	-	S-4	-	-	20m. x 30m.	
42Em908	M 483	6000	-	S-4	-	-	20m. x 20m.	
42Em909	M 483	6000	-	S-4	-	-	10m. x 10m.	
42Em910	M 483	6000	-	S-4	-	-	100m.x100m.	
42Em912	M 483	6000	-	S-4	-	-	10m. x 10m.	
42Em913	M 483	5080	-	S-4	-	-	15m. x 15m.	
42Em916	M 483	6000	-	S-4	-	-	10m. x 10m.	
42Em917	M 483	6000	-	S-4	-	-	30m. x 30m.	
42Em918	M 483	6000	-	S-4	-	-	50m. x 50m.	
42Em919	M 483	6000	-	S-4	-	-	50m. x 50m.	
42Em920	M 483	6000	-	S-4	-	-	20m. x 20m.	
42Em921	M 483	6000	-	S-4	-	-	10m. x 10m.	
42Em922	M 483	6000	-	S-4	-	-	15m. x 15m.	
42Em923	M 1138	5900	-	S-4	-	-	20m. x 20m.	
42Em925	M 1138	6000	-	S-4	-	-	15m. x 15m.	
42Em926	M 559	7040	-	S-4	-	-	20m. x 20m.	
42Em928	M 559	7040	Elko corner notched pt.	S-4	Archaic	8000-1400	25m. x 10m.	
42Em930	M 559	7120	-	S-4	-	-	10m. x 10m.	Collapsed alcove
42Em931	M 559	7000	-	S-4	-	-	100m.x 50m.	

Table 5-23 (page 2)

TABULAR DESCRIPTION

MUDDY PLANNING UNIT (51 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
L.scatter (cont.)								
42Em932	M 559	7000	-	S-4	-	-	30m. x 30m.	
42Em933	M 559	7000	-	S-4	-	-	50m. x 50m.	
42Em934	M 559	7000	-	S-4	-	-	50m. x 50m.	
42Em935	M 559	7000	-	S-4	-	-	75m. x 75m.	
42Em936	M 559	7000	-	S-4	-	-	30m. x 30m.	
42Em937	M 559	7000	-	S-4	-	-	50m. x 50m.	
Quarry								
42Em888	M 299	6180	-	S-4	-	-	Unrecorded	Chert source
42Em893	M 299	6250	Elko?	S-4	Archaic	8000-1400	Unrecorded	Chert source
42Em896	M 920	8800	-	S-2	-	-	75m. x 75m.	Chert source
42Em898	M 1563	5760	-	S-4	-	-	10m. x 10m.	Chert source
42Em899	M 1563	5730	-	S-4	-	-	50m. x 50m.	Chert source
42Em900	M 1563	5760	-	S-4	-	-	15m. x 15m.	Chert source
42Em901	M 1563	5758	-	S-4	-	-	200m.x200m.	Chert source
Temporary Camp								
42Em892	M 299	6240	Elko corner notched	S-4	Archaic	8000-1400	7m. x 7m.	Fire cracked rocks
42Em895	M 302	6500	-	S-4	-	-	15m. x 10m.	Fire pit
42Em911	M 483	6000	-	S-4	-	-	50m. x 50m.	2 fire pits-mano
42Em914	M 483	5600	-	S-4	-	-	?	
42Em915	M 483	6000	Emery gray sherd	S-4	Fremont	1300- 600	10m. x 10m.	Two components
42Em924	M 1138	5900	-	S-4	-	-	15m. x 15m.	

Table 5-23 (page 3)

TABULAR DESCRIPTION

MUDDY PLANNING UNIT (51 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
T. Camp (cont.)								
42Em927	M 559	7040	Elko corner & Fremont pts.-Sev., Emry. gray Emery sherds	S-4	Fremont	1300- 600	15m. x 5m.	
42Em929	M 559	6880	Frem. point	S-4	Fremont	1300- 600	100m.x 25m.	Metate, mano
42Em938	M 559	7010	Stemmed pt.	S-4	Fremont(?)	1300- 600	30m. x 30m.	
Extended Camp								
42Em890	M 299	6180	-	S-3	-	-	25m. x 25m.	2 components - 2 firepits w/ash
42Em894	M 302	6580	Emery gray-ware	S-2	Fremont	1300- 600	250m.x 45m.	5 components w/fire pits;some in overhangs
Single Habitation								
42Em889	M 299	6160	-	S-2	-	-	40m. x 15m.	Sq. stone structure mano
Historic								
42Em891	M 299	6220	Hist. trash	S-4	Anglo	1900-pres.	5m. x 5m.	Trash dump

Table 5-24

GEOLOGIC/SITE RELATIONSHIPS

MUDDY PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Em888					X					
889					X					
890					X					
891					X					
892					X					
893					X					
894					X					
895					X					
896	X									
897	X									
898									X	
899									X	
900									X	
901									X	
902							X			
903							X			
904								X		
905							X			
906							X			
907							X			
908							X			
909							X			
910								X		
911								X		
912								X		
913								X		
914								X		
915								X		
916								X		
917								X		
918								X		
919								X		
920								X		
921								X		
922								X		
923								X		
924	X									
925	X									

Table 5-24 (page 2)

GEOLOGIC/SITE RELATIONSHIPS

MUDDY PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Em926										X
927										X
928										X
930										X
931										X
932										X
933										X
934										X
935										X
936										X
937										X
938										X
Sub total 51	4	0	0	0	8	0	7	15	4	13

All but the historical site had lithic artifacts, and only four sites had ceramics.

Three sites were classified as Archaic according to projectile point typologies; five sites were placed in the Fremont cultural phase, though they showed some possible connections with the Kayenta Anasazi phase. Only one historic site was located. The remaining forty-two sites were all classified as unknown, being devoid of any cultural traits or identity (see Table 5-22).

All sites were evaluated for significance, using the BLM Cultural Resource Evaluation System. Of the fifty-one sites, forty-seven were given the lowest rating of S-4, one site was rated as S-3, and three sites (42Em889, 894, 896) were rated as S-2. No S-1 sites were recorded (see Table 5-23).

The fact that site locations correlate strongly with environmental factors has already been mentioned. This unit also conforms to many of the patterns which are seen in other planning units of the project. Seventy-eight percent of the sites were found within the pinyon-juniper ecozone. Also, the site locations are generally associated with geomorphic features, such as ridges, benches, terraces, saddles, rims, etc., which give a good commanding view of lower elevated land areas.

PRICE RIVER

An intensive field survey of approximately one percent of the surface area of the Price River Planning Unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management, was carried out by AERC in June 1977. The survey covered eighteen sample areas of 160 acres each (see Table 5-26).

In half of the eighteen sample areas, no cultural resource sites were recorded, while fifty-two sites were found in the remaining nine sample areas. Thirty of those sites are in only two sample areas (475 and 619) located in

TABLE 5-25

GEOMORPHOLOGIC/SITE RELATIONSHIPS

MUDDY PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em888	Rs																
889																Cl	
890																Cl	
891	Rs																
892			Rs														
893	Rs																
894			Rs														
895			Rs														
896										Rs							
897			Rs														
898								Rs									
899								Rs									
900								Rs									
901								Rs									
902								Al									
903																Rs	
904																Rs	
905																Rs	
906												Al					
907													Al				
908																Al	
909									Rs								
910					Al												
911			Al														
912																Al	
913								Al									
914			Al?														
915								Al									
916									Rs								
917									Rs								
918																Al	

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

TABLE 5-25 (page 2)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

MUDDY PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em919								Al									
920								Al									
921																Al	
922								Al									
923								Al									
924									Cl								
925													Al				
926			Al														
927										Al							
928										Al							
929										Al							
930												Al					
931											Re						
932								Rs									
933								Rs									
934								Al									
935								Al									
936								Al									
937								Al									
938								Al									
Sub totals 51	3	0	7	0	1	0	0	18	4	4	1	2	2	0	0	9	0

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

the far south of the planning unit (see Figure 5-7). No sites were found in either the grassland or the barren waste sample areas. Three sites were found in the sage sample area but two were in stands of juniper mixed with sage (see Table 5-26). One of those (42Cb93) is a historic site containing a corral, stone alignments, and a possible burial.

Eleven sites were discovered in three of the nine desert shrub sample areas. The other six areas yielded no sites. Of the eleven sites, eight are in area PR571 with six of those in stands of mixed pinyon and juniper. Therefore, even in ecozones which are predominantly composed of desert shrub, human activity has concentrated in the juniper habitats.

The remaining thirty-eight sites were discovered in the six pinyon-juniper sample areas. Only one area of the six had no sites, while two areas had fifteen sites each. Both of those two heavily utilized areas are in the higher, slightly damper Cedar Mountain featuring Cedar Mountain shale, residual and located soils on mesa and ridge tops. Of the total of fifty-two sites, forty-six had some relationship with pinyon-juniper vegetation; however, five of those were also related to sage or grassland habitats within the pinyon-juniper ecozone.

Three sites were found in Quaternary deposits, one each from alluvial and colluvial deposits and gravels. Forty-four sites are on Cretaceous geologic deposits, five of which come from undivided Mancos shale areas of the valley slopes north of the Price River. The remaining thirty-nine sites are all on Cedar Mountain shale in the southern portion of the unit. Five sites are located on Jurassic deposits, specifically the Brushy Basin shale of the Morrison formation (see Table 5-27).

Three of the sites are on alluvial soils, two on slopes and one on a plain. Of the four sites on colluvial deposits, one is on a drainage, one near a seep, and two are on mesa tops. Only one site was found on aeolian soils, again

TABLE 5-26

PRICE RIVER PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
172	Desert Shrub	T.15S., R.13E., Sec. 26 SW¼	-
259	Desert Shrub	T.16S., R.13E., Sec. 4 SE¼	1
187	Desert Shrub	T.15S., R.12E., Sec. 35 NE¼	-
571	Desert Shrub	T.17S., R.10E., Sec. 25 SE¼	8
316	Desert Shrub	T.16S., R.11E., Sec. 13 NW¼	2
242	Desert Shrub	T.16S., R.11E., Sec. 3 SW¼	-
393	Desert Shrub	T.16S., R.11E., Sec. 30 SE¼	-
83	Desert Shrub	T.16S., R.12E., Sec. 17 SW¼	-
124	Desert Shrub	T.15S., R.13E., Sec. 22 SE¼	-
475	Pinyon-Juniper	T.18S., R.10E., Sec. 11 SW¼	15
468	Pinyon-Juniper	T.18S., R.12E., Sec. 7 NE¼	-
224	Pinyon-Juniper	T.16S., R.12E., Sec. 26 NE¼	1
285	Pinyon-Juniper	T.17S., R.11E., Sec. 3 SW¼	4
619	Pinyon-Juniper	T.19S., R.11E., Sec. 1 NW¼	15
55	Pinyon-Juniper	T.13S., R.10E., Sec. 34 SW¼	3
149	Grasses	T.14S., R.11E., Sec. 18 NE¼	-
70	Sage	T.14S., R.13E., Sec. 31 SW¼	3
61	Barren-Waste	T.14S., R.13E., Sec. 3 SW¼	-

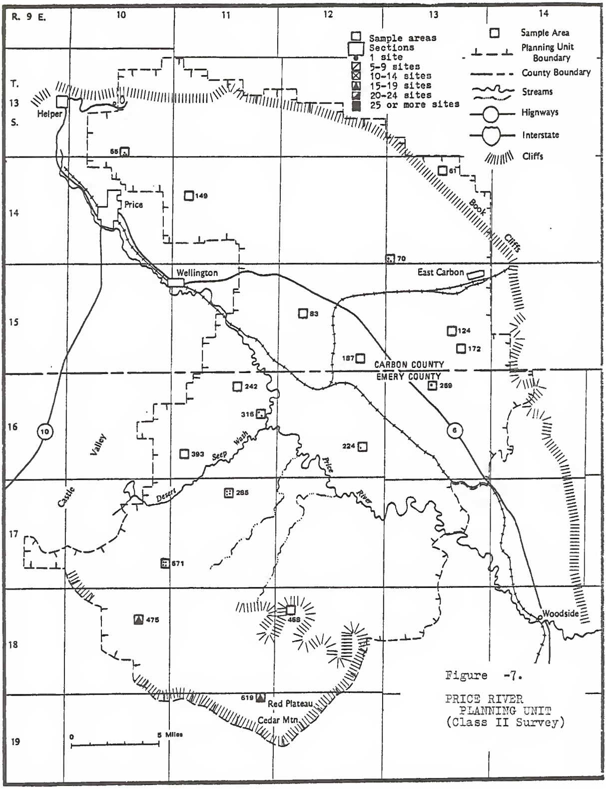


Figure 5-7. Price River Planning Unit Class II Survey.

on a mesa top. Forty sites were found on residual soils, falling on various landforms including rims (2), drainage channels (1), mesa tops (16), ridges (17), benches (2), terraces (1), and hillocks (1). The remaining four sites were found in alcoves and on bedrock (see Table 5-28).

Eighteen sites are between five and six thousand feet elevation (1,524-1,829 m.), nineteen between six and seven thousand feet (1,829-2,134 m.), and fifteen between seven and eight thousand feet (2,134-2,438 m.), (see Table 5-29).

The sites themselves represent a variety of human activities. Thirty-two are lithic scatters, three kill/butchering sites, one quarry site, nine temporary camps, one an extended camp, five rockshelters, and one historic ranch with corral (42Cb93). Lithics were observed at forty-nine sites and ceramics at five site locations.

On the basis of diagnostic artifacts, only eleven sites can be assigned cultural affiliations. Two are Archaic, two are late Archaic, two are late Archaic/Fremont, four are Fremont, and there is one historic Euro-American site. The association of the remaining forty-one sites cannot be established without further research (see Table 5-29).

All sites were evaluated by the BLM Cultural Resource Evaluation System. The majority of the sites (42) were given the lowest significance rating of S-4. Eight sites were rated at S-3, with only one site, a temporary camp with a possible structure (42Em820) rated as S-2. No S-1 ratings were given for any sites in the planning units (see Table 5-29).

Site locations correlate highly with certain environmental factors. Forty-six of the fifty-two sites are directly associated with pinyon-juniper. Forty-three are associated with mesa or ridge tops or other locations overlooking lower areas. Thirty-nine of the sites are located on Cedar Mountain shale. These relationships are not surprising as they are all inter-related. Pinyon-juniper is

TABLE 5-27

GEOLOGIC/SITE RELATIONSHIPS

PRICE RIVER PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS						JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group		
42Cb93					X					
94					X					
95					X					
96	X									
97					X					
98					X					
42Em807								X		
808							X			
809							X			
810								X		
811								X		
812							X			
813							X			
814							X			
815							X			
816							X			
817							X			
818							X			
819							X			
820							X			
821							X			
822	X									
823								X		
824							X			
825								X		
826							X			
827							X			
828							X			
829							X			
830							X			
831							X			
832							X			
833							X			
834							X			
835							X			
836							X			
837							X			

TABLE 5-27 (page 2)

GEOLOGIC/SITE RELATIONSHIPS

PRICE RIVER PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Em838							X			
839							X			
840							X			
841							X			
842							X			
843							X			
844							X			
845							X			
846							X			
847							X			
848							X			
849							X			
850							X			
851							X			
852	X									
Sub total 52	3	0	0	0	5	0	39	5	0	0

TABLE 5-28

GEOMORPHOLOGIC/SITE RELATIONSHIPS

PRICE RIVER PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Cb93			Rs														
94																Al	
95																	Al
96					Rs												
97	Rs																
98	Rs																
42Em807				Cl													
808					Rs												
809					Rs												
810					Rs												
811					Ae												
812					Rs												
813								Rs									
814					Rs												
815					Cl												
816					Cl												
817					Rs												
818					Rs												
819					Rs												
820					Rs												
821					Rs												
822					Rs												
823			Cl														
824					Rs												
825					Rs												
826								Rs									
827								Rs									
828								Rs									
829								Rs									
830								Rs									

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-28 (page 2)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

PRICE RIVER PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em831								Rs									
832								Rs									
833												Bd					
834								Rs									
835								Rs									
836												Bd					
837													Rs				
838								Rs									
839									Rs								
840												Bd					
841					Rs												
842								Rs									
843					Rs												
844								Rs									
845										Rs							
846									Rs								
847												Bd					
848								Rs									
849								Rs									
850								Rs									
851								Rs									
852																Al	
Sub totals 52	2	0	2	1	19	0	0	17	2	1	0	4	1	0	0	2	1

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

Table 5-29

TABULAR DESCRIPTION

PRICE RIVER PLANNING UNIT (52 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
<u>Lithic Scatter</u>								
42Cb94	PR 70	5750	-	S-4	-	-	15m. x 20m.	
42Cb95	PR 70	5800	-	S-4	-	-	30m. x 30m.	
42Cb96	PR 55	6100	-	S-4	-	-	30m. x 40m.	
42Cb98	PR 55	6000	-	S-4	-	-	15m. x 15m.	
<u>Kill/ Butchering</u>								
42Cb97	PR 55	6075	-	S-4	-	-	7m. x 7m.	
<u>Historic</u>								
42Cb93	PR 70	5750	Hist. trash	S-3	Anglo	Unknown	500m.x200m.	Animal burial (?) 3 comp.-ranch corral
<u>Lithic Scatter</u>								
42Em807	PR 619	7200	-	S-4	-	-	5m. x 5m.	
42Em808	PR 619	7380	-	S-4	-	-	5m. x 5m.	
42Em810	PR 619	7380	-	S-3	-	-	60m. x 20m.	
42Em811	PR 619	7380	Sd.ntchd.pt.	S-3	Late Archaic Fremont	1400-600	35m. x 10m.	
42Em812	PR 619	7380	Elko corner notched pt.	S-3	Archaic	8000-1400	45m. x 45m.	
42Em813	PR 619	7380	-	S-4	-	-	40m. x 40m.	
42Em814	PR 619	7380	-	S-4	-	-	10m. x 10m.	
42Em815	PR 619	7380	-	S-4	-	-	20m. x 20m.	
42Em816	PR 619	7390	-	S-4	-	-	15m. x 15m.	

Table 5-29 (page 2)

TABULAR DESCRIPTION

PRICE RIVER PLANNING UNIT (52 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Sctr (cont.)								
42Em817	PR 619	7400	-	S-4	-	-	10m. x 10m.	
42Em819	PR 619	7400	-	S-4	-	-	20m. x 20m.	
42Em821	PR 619	7100	Eastgate pt.	S-4	Late Archaic	4500-1400	10m. x 10m.	
42Em822	PR 571	5800	-	S-4	-	-	15m. x 15m.	
42Em823	PR 571	5720	-	S-4	-	-	40m. x 40m.	
42Em824	PR 571	5800	-	S-4	-	-	15m. x 20m.	
42Em825	PR 571	5800	-	S-4	-	-	10m. x 10m.	
42Em826	PR 571	5920	-	S-4	-	-	10m. x 10m.	
42Em827	PR 571	5920	Elko corner notched pt.	S-4	Archaic	8000-1400	6m. x 6m.	
42Em828	PR 571	6000	-	S-4	-	-	40m. x 10m.	
42Em830	PR 475	6140	-	S-4	-	-	20m. x100m.	
42Em837	PR 475	6080	-	S-4	-	-	5m. x 15m.	
42Em838	PR 475	6100	-	S-4	-	-	40m. x 10m.	
42Em843	PR 475	6180	-	S-4	-	-	10m. x 5m.	
42Em844	PR 475	6060	-	S-4	-	-	5m. x 5m.	
42Em846	PR 316	5360	-	S-4	-	-	5m. x 5m.	
42Em848	PR 285	5600	-	S-4	-	-	10m. x 10m.	
42Em850	PR 285	5560	-	S-4	-	-	5m. x 5m.	
42Em851	PR 285	5560	-	S-4	-	-	-	
Kill/ Butchering								
42Em831	PR 475	6180	-	S-4	-	-	10m. x 10m.	
42Em842	PR 475	6190	-	S-4	-	-	10m. x 15m.	

Table 5-29 (page 3)

TABULAR DESCRIPTION

PRICE RIVER PLANNING UNIT (52 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Quarry								
42Em829	PR 571	5840	-	S-4	-	-	10m. x 8m.	
Temporary Camp								
42Em809	PR 619	7320	-	S-3 (?)	-	-	.5m. x .5m.	
42Em820	PR 619	7100	L. Arch. pt.	S-2 (?)	Late Archaic	2700-1400	20m. x 15m.	Possible structure
42Em832	PR 475	6200	4 Emery gray sherds	S-3	Fremont	400-1300	60m. x 25m.	
42Em834	PR 475	6200	-	S-4	-	-	30m. x 20m.	
42Em835	PR 475	6120	2 Emery gray sherds	S-4	Fremont	400-1300	60m. x 40m.	Possible Quarry site tool
42Em839	PR 475	6100	-	S-4	-	-	5m. x 5m.	
42Em841	PR 475	6170	3 Emery gray sherds	S-4	Fremont	400-1300	10m. x 5m.	
42Em845	PR 224	5760	Sherds N.C.	S-4	-	-	15m. x 5m.	Site had ceramics, but none collected
42Em849	PR 285	5600	-	S-4	-	-	30m. x 20m.	
Extended Camp								
42Em818	PR 619	7400	Gypsum pt.?	S-4	Late Archaic Fremont	2500 B.C. 500 A.D.	10m. x 10m.	

Table 5-29 (page 4)

TABULAR DESCRIPTION

PRICE RIVER PLANNING UNIT (52 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Rock Shelter								
42Em833	PR 475	6160	-	S-4	-	-	5m. x 3m.	
42Em836	PR 475	6130	-	S-4	-	-	5m. x 5m.	
42Em840	PR 475	6100	-	S-4	-	-	5m. x 2m.	
42Em847	PR 316	5388	2 Emery gray sherds	S-3	Fremont	400-1200	5m. x 5m.	Has been pothunted
42Em852	PR 259	5400	-	S-3	-	-	10m. x 10m.	

found at higher elevations, which in the northern part of the unit are primarily associated with the Cedar Mountain shale formation. The occurrence of sites on higher landforms within the unit is probably related to increased water availability and more game. It should be pointed out, however, that the higher elevations in this planning unit remain below the 8,000 foot elevation (2,438 m.).

RANGE CREEK

An intensive field survey of approximately one percent surface area of this planning unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management, was carried out by AERC in August 1977. The survey consisted of the twenty-nine quarter section sample areas described in Table 5-30.

Of the twenty-nine sample areas, only five had any cultural resource sites. These five sample areas are all located in the eastern portion of the planning unit and in close proximity to the Green River (see Figure 5-8). All of the sites were found in the pinyon-juniper ecozone with five of the eight in the juniper vegetation community and the remaining three in mixed pinyon-juniper woodland (see Table 5-30).

Six of the sites are located on the Tertiary Green River formation in the oil shale bearing Parachute Creek member. The other two sites are found in the Tuscher formation of the Mesa Verde group of Cretaceous age (see Table 5-31).

Two sites were found in association with alluvial fill, one under a rim along a drainage channel and one on a drainage channel only. Three, all petroglyphs, were found on colluvial slopes and on cliff faces at the bottom of a canyon. Two sites were on residual soils on mesa tops; one of the two was located on the rim of the mesa proper. The last site was located on bedrock adjacent to a drainage channel on the face of an escarpment (see Table 5-32).

TABLE 5-30

RANGE CREEK PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
76	Desert Shrub	T.17S., R.14E., Sec. 11 All	-
96	Desert Shrub	T.17S., R.14E., Sec. 15 NE¼	-
107	Desert Shrub	T.17S., R.13E., Sec. 24 NW¼	-
118	Desert Shrub	T.17S., R.13E., Sec. 24 SW¼	-
299	Sage	T.12S., R.17E., Sec. 15 NE¼	1
1437	Sage	T.13S., R.14E., Sec. 3 NE¼	-
1561	Sage	T.13S., R.15E., Sec. 21 SE¼	-
524	Sage	T.13S., R.15E., Sec. 35 SE¼	-
1646	Sage	T.13S., R.16E., Sec. 35 SE¼	-
1656	Sage	T.14S., R.16E., Sec. 1 NW¼	-
1031	Sage	T.15S., R.16E., Sec. 6 SW¼	-
667	Sage	T.15S., R.17E., Sec. 32 NE¼	-
1894	Sage	T.16S., R.16E., Sec. 6 SE¼	-
980	Sage	T.18S., R.16E., Sec. 34 SE¼	1
1046	Fir	T.12S., R.14E., Sec. 17 NW¼	-
521	Fir	T.13S., R.14E., Sec. 34 SW¼	-
1128	Pinyon-Juniper	T.12S., R.12E., Sec. 12 NW¼	-
1035	Pinyon-Juniper	T.12S., R.14E., Sec. 8 W¼	-
1285	Pinyon-Juniper	T.12S., R.14E., Sec. 21, NE¼	-
1253	Pinyon-Juniper	T.12S., R.16E., Sec. 13 NW¼	-
1419	Pinyon-Juniper	T.12S., R.16E., Sec. 36 NW¼	-
522	Pinyon-Juniper	T.13S., R.15E., Sec. 34 SE¼	-
505	Pinyon-Juniper	T.13S., R.17E., Sec. 29 SE¼	-
1743	Pinyon-Juniper	T.14S., R.16S., Sec. 35 SW¼	2

TABLE 5-30 (page 2)

RANGE CREEK PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
614	Pinyon-Juniper	T.15S., R.16E., Sec. 1 NW¼	3
1938	Pinyon-Juniper	T.16S., R.15E., Sec. 9 SW¼	-
2048	Pinyon-Juniper	T.16S., R.16E., Sec. 19 SW¼	-
2222	Pinyon-Juniper	T.17S., R.17E., Sec. 18 NE¼	-
2287	Pinyon-Juniper	T.17S., R.16E., Sec. 20 SW¼	1

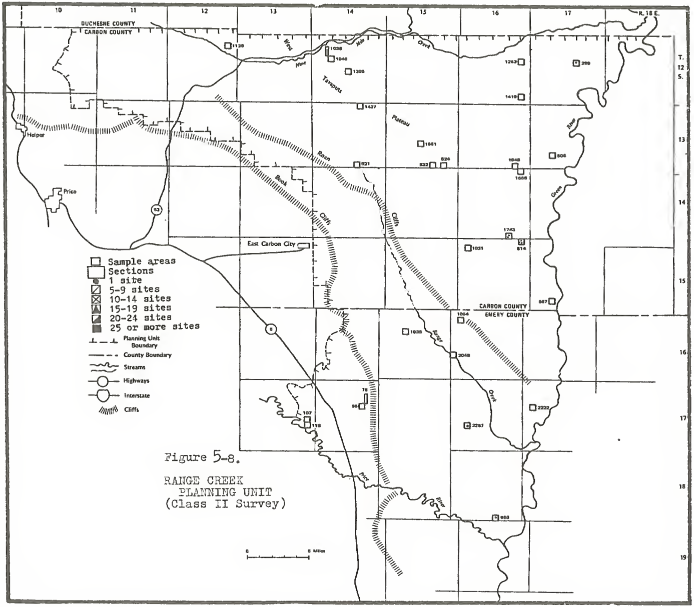


Figure 5-8. Range Creek Planning Unit Class II Survey.

TABLE 5-31

GEOLOGIC/SITE RELATIONSHIPS

RANGE CREEK PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Cb101		X								
102		X								
103		X								
104		X								
105		X								
106		X								
42Em947				X						
948				X						
Sub total 8	0	6	0	2	0	0	0	0	0	0

TABLE 5-32

GEOMORPHOLOGIC/SITE RELATIONSHIPS

RANGE CREEK PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Cb101		Cl															
102			Al														
103		Cl															
104		Cl															
105		Bd															
106					Rs												
42Em947					Rs												
948	Al																
Sub totals 8	1	4	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

Table 5-33

TABULAR DESCRIPTION

RANGE CREEK PLANNING UNIT (8 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Temporary Camp								
42Cb102	RC 1743	5300	Desert side-ntchd.pt. Emery gray	S-3	Fremont	1200-700	50m. x 20m.	
42Cb106	RC 299	6140	-	S-3	Fremont	-	200m.x150m.	
Granary								
42Cb105	RC 614	5200	-	S-2	-	-	2.5m.x3m. (Granary)	Jacal structure associated pictographs
Rock Art								
42Cb101	RC 1743	5300	-	S-4	-	-	.35m.x.19m. (pictograph)	Red pictograph
42Cb103	RC 614	5060	-	S-3	-	-	10m. x 5m. (panel)	Mt. sheep, snake petroglyphs
42Cb104	RC 614	5060	-	S-3	-	-	10m. long	Anthropomorph & zig zag petroglyphs
Lithic Scatter								
42Em947	RC 980	5920	-	S-4	-	-	15m. x 15m.	
Rock Shelter Habitation								
42Em948	RC 2287	5400	-	S-4	-	-	10m. x 10m.	Circular slab wall structure

Seven of the eight sites are in the five to six thousand foot (1,424-1,829 m.) elevations and the other is between the six and seven thousand foot (1,829-2,134 m.) elevations (see Table 5-33).

The eight sites represent a limited range of human activity and occupation; only one lithic scatter was located in the planning unit (42Em947). This is in contrast to the high percentage of lithic scatters found in other planning units. Two sites are temporary camps, one is a single habitation in a rockshelter, three are petroglyphs, and one is a small granary. Two of the three petroglyphs were sketched.

At six of the eight sites a cultural identification could not be made. Both of the temporary campsites were classified as Fremont based on ceramic evidence (see Table 5-33).

All sites were evaluated for significance using the BLM Cultural Resource Evaluation System. Three sites were rated as S-4, four were given S-3 ratings, and one, 42Cb105, was rated as S-2 (see Table 5-33).

As in other planning units there appears to be a relationship between sites, vegetation and geomorphology. All sites in this unit are found in pinyon-juniper woodland and seven of the eight are in geomorphic locations overlooking lower elevations. The lack of sites in the western part of the unit is puzzling. Causes have not as yet been determined.

SUMMERVILLE

An intensive field survey of approximately one percent surface area of this planning unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management, was carried out by AERC in June 1977. The survey covered fifteen sample areas of 160 acres each (see Table 5-34).

Nineteen cultural resource sites were found in eight of the fifteen sample areas with no sites discovered in the remaining seven areas. One site was found in sample area 40a, a saltbush-rabbit brush vegetation area. This was one of the two temporary campsites located in the survey of the planning unit. Two sites were recorded in area 17a, grassland; however, one of the two sites is in a stand of juniper within the grassy habitat.

Six sites were discovered in two of the desert shrub sample areas, 457 and 744. Five of those six sites were lithic scatters, the sixth was a quarry. Also five of these six sites were in juniper stands within the desert shrub areas. The remaining ten sites were also found in pinyon-juniper areas. Only one of the five pinyon-juniper sample areas had no sites (see Table 5-34).

Six sites were found associated with Cretaceous formations, four in the Buckhorn Conglomerate member of the Cedar Mountain shale, one in Mancos shale, and one in the Blackhawk formation of the Mesa Verde group. Eleven sites were in Jurassic deposits, four in the Bushy Basin shales of the Morrison formation and seven in various formations of the San Rafael group. These latter include four in the Carmel (42Em800, 801, 803, 804), one in the Curtis (42Em799), and two in the Entrada (42Em789, 802). Two sites (42Em790, 805) were recorded on Triassic deposits with both on the Navajo sandstone (see Table 5-35).

Eleven of the twenty sites are on alluvial soils, three on drainage channels, one on a playa, three on ridges, two on benches, and two on slopes. Five sites are located on colluvial materials, one on a rim, two on ridges, one on a bench, and one on a slope. One site was found in a saddle on aeolian soil, while the remaining two sites were found on residual soils, one on a slope and one on a ridge (see Table 5-36).

Elevations of sites (see Table 5-37) varied between the four and six thousand foot elevations with seven sites falling between four and five thousand feet (1,200-1,524 m.) and twelve sites between five and six thousand feet (1,524-1,829 m.).

TABLE 5-34

SUMMERVILLE PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
40b	Pinyon-Juniper	T.18S., R.13E., Sec. 25 NE$\frac{1}{4}$	4
339	Pinyon-Juniper	T.20S., R.13E., Sec. 9 SW$\frac{1}{4}$	2
24	Pinyon-Juniper	T.18S., R.14E., Sec. 19 NW$\frac{1}{4}$	3
196	Pinyon-Juniper	T.19S., R.14E., Sec. 19 SW$\frac{1}{4}$	-
58	Pinyon-Juniper	T.18S., R.12E., Sec. 36 NE$\frac{1}{4}$	1
17	Grass	T.19S., R.13E., Sec. 23 NW$\frac{1}{4}$	2
457	Desert Shrub	T.20S., R.14E., Sec. 25 NE$\frac{1}{4}$	5
584	Desert Shrub	T.21S., R.14E., Sec. 1 SW$\frac{1}{4}$	-
744	Desert Shrub	T.21S., R.15E., Sec. 31 SW$\frac{1}{4}$	1
244	Desert Shrub	T.19S., R.15E., Sec. 22 SW$\frac{1}{4}$	-
522	Desert Shrub	T.20S., R.15E., Sec. 35 NW$\frac{1}{4}$	-
364	Desert Shrub	T.20S., R.14E., Sec. 10 SW$\frac{1}{4}$	-
241	Desert Shrub	T.19S., R.14E., Sec. 24 SE$\frac{1}{4}$	-
104	Desert Shrub	T.18S., R.14E., Sec. 27 SW$\frac{1}{4}$	-
40a	Barren-Waste	T.19S., R.16E., Sec. 9 SW$\frac{1}{4}$	1

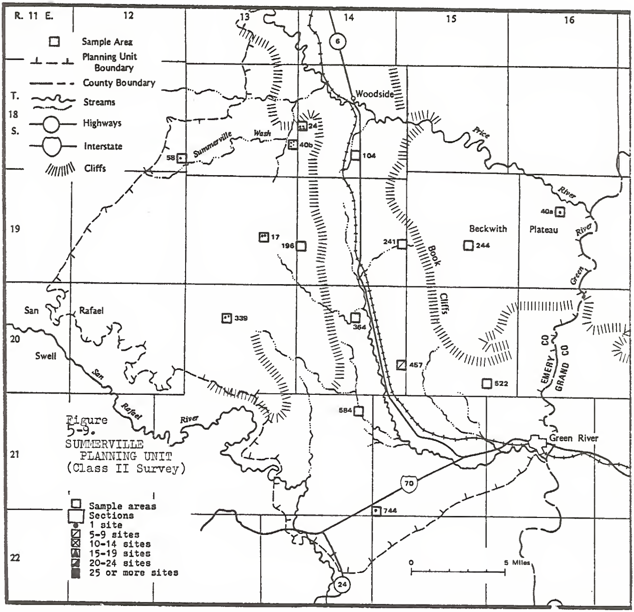


Figure 5-9. Summerville Planning Unit Class II Survey.

TABLE 5-35

GEOLOGIC/SITE RELATIONSHIPS

SUMMERVILLE PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Em787								X		
788				X						
789									X	
790										X
791								X		
792								X		
793								X		
795							X			
796							X			
797							X			
798							X			
799									X	
800									X	
801									X	
802									X	
803									X	
804									X	
805										X
806					X					
Sub total 19	0	0	0	1	1	0	4	4	7	2

TABLE 5-36

GEOMORPHOLOGIC/SITE RELATIONSHIPS

SUMMERVILLE PLANNING UNIT

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em787																Rs	
788									Ae								
789									Al								
790			Al														
791								Cl									
792																Cl	
793								Cl									
795																Al	
796			Al														
797																Al	
798								Al									
799								Rs									
800			Al														
801									Al								
802								Al									
803								Al									
804									Cl								
805	Cl																
806							Al										
Sub totals 19	1	0	3	0	0	0	1	6	4	0	0	0	0	0	0	4	0

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

Table 5-37

TABULAR DESCRIPTION

SUMMERVILLE PLANNING UNIT (19 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Em787	S 40b	5020	-	S-3	-	-	10m. x 15m.	
42Em789	S 457	4640	Cottonwood trianglr.pt.	S-3	Late Arch. Fremont	4500- 600	10m. x 10m.	
42Em791	S 40b	5050	-	S-3	-	-	7m. x 10m.	
42Em796	S 24	5048	-	S-4	-	-	2m. x 2m.	
42Em798	S 17	5380	-	S-4	-	-	10m. x 5m.	
42Em800	S 457	4680	-	S-3	-	-	15m. x 15m.	
42Em801	S 457	4680	-	S-3	-	-	20m. x 20m.	
42Em803	S 457	4760	-	S-3	-	-	10m. x 10m.	
42Em805	S 339	5480	-	S-3	-	-	5m. x 5m.	
42Em806	S 744	4450	-	S-4	-	-	50m. x 50m.	
Quarry Site								
42Em792	S 40b	5080	-	S-3	-	-	10m. x 10m.	
42Em793	S 40b	5040	-	S-4	-	-	3m. x 5m.	
42Em795	S 24	5080	-	S-4	-	-	60m. x 20m.	
42Em799	S 17	5300	-	S-4	-	-	10m. x 10m.	
42Em802	S 457	4640	-	S-4	-	-	Not recrded.	
Kill Butchering								
42Em790	S 339	5420	Elko Corner Notched pt.	S-3	Archaic	8000-1400	10m. x 10m.	
42Em797	S 24	5120	-	S-3	-	-	20m. x 10m.	

Table 5-37 (page 2)

TABULAR DESCRIPTION

SUMMERVILLE PLANNING UNIT (19 sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Kill Butchering 42Em804	S 58	5560	-	S-3	-	-	2m. x 2m.	
Temporary Camp 42Em788	S 40a	4290	Expanding stem(E.gate)	S-4	Late Archaic Fremont	4500 - 600	80m. x 50m.	

The sites themselves are of four types, none representing permanent habitations. Ten are lithic scatters, five are quarries, three are kill/butchering, and one is a temporary campsite. Lack of more permanent sites is not surprising given the extreme aridity of the region.

Sixteen sites are of unknown cultural association. Two sites, one a temporary camp and one a lithic scatter, were considered as late Archaic or Fremont while one kill/butchering site can be considered Archaic. No historic sites were recorded in the planning unit (see Table 5-37).

All sites were evaluated according to the BLM Cultural Resource Evaluation System (see Part A of this chapter for a discussion of CRES ratings). Eight sites were rated at S-4 and eleven at S-3; no sites were assigned the ratings of S-2 or S-1 (see Table 5-37).

WATTIS

An intensive field survey of an approximate one percent of the surface area of the Wattis Planning Unit, stratified according to vegetation type by the Moab District of the Bureau of Land Management, was carried out by AERC in August 1977. The survey consisted of the eight quarter section sample areas described in Table 5-38.

Out of eight sample areas in the planning unit, only one sample area, 378, had a cultural resource site (see Figure 5-10). The site (42Cb107) is a historic Euro-American garbage dump containing glass, metal, tin cans and wire. It is located on the Masuk member of the Cretaceous Mancos shale in a drainage channel on an alluvial slope in a mixed pinyon-juniper stand at an elevation between six and seven thousand feet (1,829-3,234 m.). No collection was made but the site was recorded and assigned the rating of S-4 on the BLM Cultural Resource Evaluation System.

The lack of extensive prehistoric activity in the planning unit as indicated by the results of the Class II survey is at present a matter of conjecture. The presence

TABLE 5-38

WATTIS PLANNING UNIT

Sample Area	B.L.M. Vegetation Type	Legal Description	No. of Sites Located
707	Pinyon-Juniper	T.12S., R.10E., Sec. 19 SW¼	-
71	Pinyon-Juniper	T.13S., R.9E., Sec. 15 SE¼	-
80	Sage	T.13S., R.8E., Sec. 24 NW¼	-
378	Pinyon-Juniper	T.13S., R.9E., Sec. 29 SE¼	1
486	Sage	T.15S., R.9E., Sec. 6 NE¼	-
193	Pinyon-Juniper	T.15S., R.9E., Sec. 10 NW¼	-
489	Sage	T.15S., R.9E., Sec. 18 SE¼	-
319	Grasses	T.16S., R.8E., Sec. 13 NE¼	-

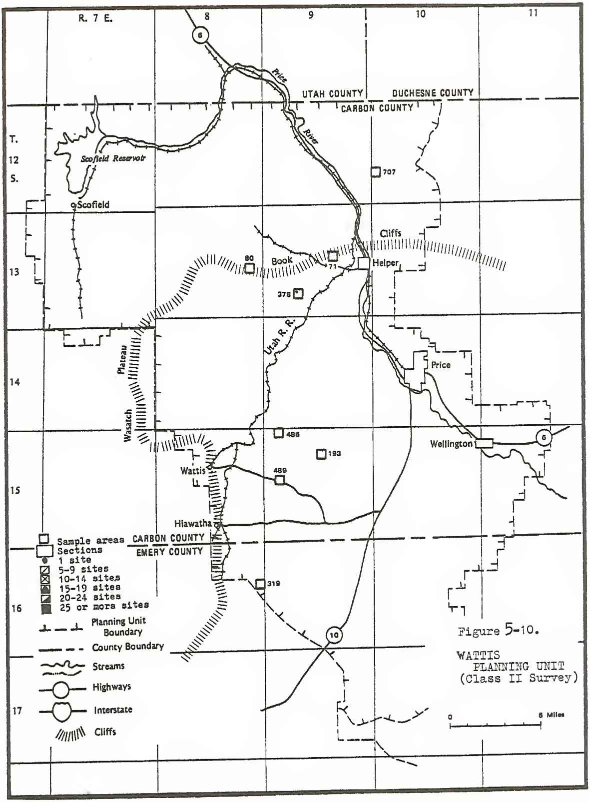


Figure 5-10. Wattis Planning Unit Class II Survey.

TABLE 5-39

TABULAR DESCRIPTION

WATTIS PLANNING UNIT (1 site)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	CRES Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Historic								
42Cb107	W 378	6360	Historic Trash	S-4	Historic	1920-1930	5m. x 5m.	

TABLE 5-40

GEOLOGIC/SITE RELATIONSHIPS

WATTIS PLANNING UNIT

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Cb107					X					
Sub total 1	0	0	0	0	1	0	0	0	0	0

TABLE 5-41

GEOMORPHOLOGIC/SITE RELATIONSHIPS

WATTIS PLANNING UNIT

Permanent Site Number		Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Cb107				Al														
Sub totals	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Al = alluvial
Ae = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

in Wattis of pinyon-juniper woodlands, which correlate with prehistoric activity zones in other planning units permits the reasonable assumption that more sites should have been found in this planning unit. Possible explanations for this hiatus could involve the nature of the sampling procedures or may be due to some presently unknown environmental or ecological factors. It can be stated that the area was at best minimally utilized by prehistoric people. Similar results have been obtained in the Class I and II surveys conducted in the U.S. Forest Service Northern Sample Stratum which is located just west of the Wattis Planning Unit.

FOREST CENTRAL SAMPLING STRATUM (U.S.F.S.)

An intensive field survey of an approximate one percent of the surface area of the Forest Central Sampling Stratum, stratified by the Forest Service Regional Office in Ogden, Utah was carried out by AERC in July and August 1977. The survey consisted of the thirty-eight quarter section sample areas described in Table 5-42. The sample was stratified toward the eastern area of the sampling stratum where greatest impacts from the coal industry are expected to occur.

A total of forty cultural sites was discovered in thirteen of the thirty-eight sample areas with site density tending to increase toward the southern end of the sampling stratum. Over half of the total sites were located in sample areas 21, 29, 31, and 32 (see Figure 5-11).

Twenty-four of the forty sites were associated with the pinyon-juniper ecozone. One site was associated with the juniper vegetational community of this ecozone. Seven were in the mixed pinyon-juniper community and the remaining sixteen sites of the pinyon-juniper ecozone were found in a pinyon community. The other sixteen sites found in the Forest Central Sampling Stratum were located in the Montane ecozone. Ten of these sites were associated with the ponderosa pine community; five sites were at slightly higher average elevations and were found in the mixed aspen, spruce, and yellow pine community, while only one site was found in a high spruce habitat. Four of the sites located in the Montane ecozone were discovered in small sage habitats, while one was located in a mountain meadow community.

Only one site was found in Quaternary alluvial material (42Sp70) and one in Tertiary Flagstaff limestone (42Em887). The remaining thirty-eight sites are in Cretaceous geologic deposits. Of these, twenty-four are in the Mesa Verde group and fourteen were located in the North Horn formation (see Table 5-43). A further breakdown of the sites found in the Mesa Verde group shows that ten are in the Price River formation, nine are in the Castlegate sandstone formation, and five are in the Blackhawk formation.

From a geomorphic standpoint, ten sites were located on alluvial slopes or surfaces. Of these, one was further described as being located on a rim, three on ridges, three on terraces, and three in drainages. Two sites lie on aeolian deposits; both of these are situated on mesa tops. One site rests on a bedrock rim. The remaining twenty-seven sites are all found on residual materials; one was discovered on a bedrock outcropping, four on mesa or plateau rims, one in a drainage channel, four on ridges, six on terraces, one in a saddle near a seep, eight in alcoves, and two on hilltops (see Table 5-44).

On a larger geomorphic scale, it can be noted that in almost every case, sample areas containing sites are located in the higher elevations and on level surfaces at the base of steep slopes. Those sample areas without sites tend to be steep throughout. Elevations of the sites range from seven to ten thousand feet (2,133-3,048 m.). Eight of the sites are located at elevations ranging from seven to eight thousand feet (2,133-2,438 m.). Twenty-six sites, or over sixty percent of the total number, lie between the elevations of eight and nine thousand feet (2,438-2,743 m.). Five are between the nine thousand and ten thousand foot level (2,743-3,048 m.), and one site is located at over ten

TABLE 5-42

FOREST CENTRAL SAMPLING STRATUM

Sample Area	General Vegetation Type	Legal Description	No. of Sites Located
1	Alpine	T.16S., R.6E., Sec. 11 SE$\frac{1}{4}$	1
2	Alpine	T.16S., R.6E., Sec. 24 NE$\frac{1}{4}$	-
3	Alpine	T.16S., R.7E., Sec. 7 NW$\frac{1}{4}$	-
4	Montane	T.16S., R.8E., Sec. 20 SW$\frac{1}{4}$	-
5	Alpine	T.17S., R.5E., Sec. 20 SE$\frac{1}{4}$	-
6	Montane	T.17S., R.6E., Sec. 1 NE$\frac{1}{4}$	-
7	Alpine	T.17S., R.6E., Sec. 4 NW$\frac{1}{4}$	-
8	Montane	T.17S., R.6E., Sec. 7 SW$\frac{1}{4}$	-
9	Pinyon-Juniper	T.17S., R.6E., Sec. 14 SE$\frac{1}{4}$	-
10	Montane	T.17S., R.7E., Sec. 9 NE$\frac{1}{4}$	-
11	Montane	T.17S., R.7E., Sec. 10 NW$\frac{1}{4}$	-
12	Alpine	T.17S., R.7E., Sec. 14 SW$\frac{1}{4}$	1
13	Montane	T.17S., R.7E., Sec. 24 SE$\frac{1}{4}$	-
14	Montane	T.17S., R.7E., Sec. 26 NE$\frac{1}{4}$	2
15	Montane	T.17S., R.7E., Sec. 27 NW$\frac{1}{4}$	-
16	Alpine	T.18S., R.4E., Sec. 24 SW$\frac{1}{4}$	-
17	Pinyon-Juniper	T.18S., R.5E., Sec. 12 SE$\frac{1}{4}$	2
18	Alpine	T.18S., R.5E., Sec. 17 NE$\frac{1}{4}$	-
19	Alpine	T.18S., R.5E., Sec. 28 NW$\frac{1}{4}$	-
20	Montane	T.18S., R.5E., Sec. 34 SW$\frac{1}{4}$	2
21	Montane	T.18S., R.6E., Sec. 13 SE$\frac{1}{4}$	6
22	Montane	T.18S., R.6E., Sec. 23 NE$\frac{1}{4}$	-
23	Montane	T.18S., R.6E., Sec. 25 NW$\frac{1}{4}$	1
24	Pinyon-Juniper	T.18S., R.6E., Sec. 29 SW$\frac{1}{4}$	-

TABLE 5-42 (page 2)

FOREST CENTRAL SAMPLING STRATUM

Sample Area	General Vegetation Type	Legal Description	No. of Sites Located
25	Montane	T.18S., R.7E., Sec. 30 SE¼	1
26	Alpine	T.19S., R.4E., Sec. 13 NE¼	3
27	Alpine	T.19S., R.4E., Sec. 15 NW¼	-
28	Pinyon-Juniper	T.19S., R.6E., Sec. 7 SW¼	4
29	Montane	T.19S., R.6E., Sec. 11 SE¼	7
30	Pinyon-Juniper	T.19S., R.6E., Sec. 33 NE¼	-
31	Montane	T.19S., R.7E., Sec. 4 NW¼	5
32	Montane	T.19S., R.7E., Sec. 6 SW¼	5
33	Alpine	T.20S., R.4E., Sec. 9 SE¼	-
34	Montane	T.20S., R.4E., Sec. 23 NE¼	-
35	Alpine	T.20S., R.4E., Sec. 36 NW¼	-
36	Alpine	T.20S., R.5E., Sec. 2 SW¼	-
37	Montane	T.21S., R.4E., Sec. 1 SE¼	-
38	Alpine	T.17S., R.7E., Sec. 19 NE¼	-

thousand feet (3,048 m.), (see Table 5-45).

The forty sites found in this sampling stratum represent a variety of human activities mostly of a temporary or seasonal nature. Twenty-two of the sites are lithic scatters, eleven are rockshelters, three are hunting sites, one is a temporary camp and one an extended camp.

Thirty-eight sites contained lithics, four recorded ceramics, six had wood and vegetable materials, and two contained bone.

Twenty-eight of the forty sites could not be assigned a cultural affiliation due to the absence of diagnostic artifacts. Five sites were assigned to the Archaic cultural phase, while seven sites were defined as having an affiliation with the Fremont cultural phase. Of the seven Fremont sites, three shared artifacts which may also be classified into the late Archaic subphase. All of these sites, however, were assigned to the Fremont culture phase due to the presence of Fremont ceramics found on the sites.

Sites were all evaluated according to the U.S. Forest Service Cultural Significance Scale and given significance ratings ranging from I through III. Almost 75% (29) of the sites were assigned the rating of S-III. Nine were given S-II ratings, and two rockshelter sites (42Em880 and 42Em885) were assigned S-I designations (see Table 5-45) and should probably be given National Register status in the future.

There appears to be some correlations between site location and environmental features in this sampling stratum. As is evidenced in other planning units and sampling stratum, there is an association between site location and the pinyon-juniper ecozone. Over half of the sites are located in pinyon-juniper including the upper elevation units of the ecosystem. There is also a tendency for sites to be located so as to afford a view of lower elevations. Another tendency probably characteristic of site locations in the Forest Central sampling stratum is the definite pattern of avoidance of the Tertiary Flagstaff limestone formation in favor of the

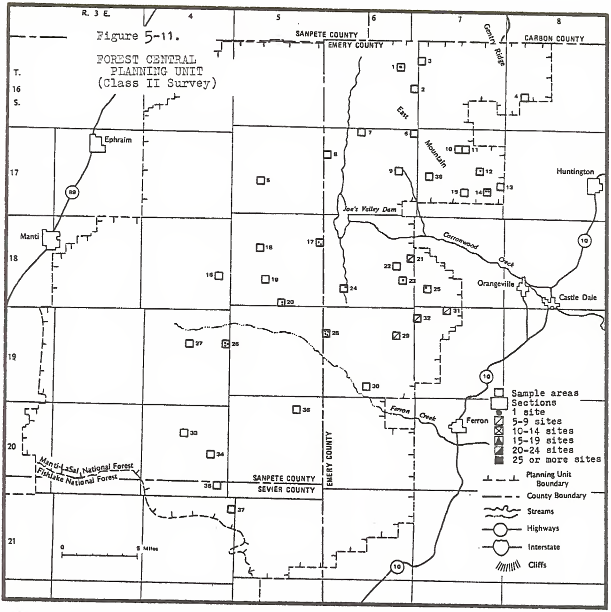


Figure 5-11. Forest Central Planning Unit Class II Survey.

TABLE 5-43

GEOLOGIC/SITE RELATIONSHIPS

FOREST CENTRAL SAMPLING STRATUM

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
42Em853				X						
854			X							
855			X							
856			X							
857				X						
858				X						
859				X						
860				X						
861				X						
862				X						
864			X							
865			X							
866			X							
867			X							
868				X						
869				X						
870				X						
871				X						
872				X						
873			X							
875				X						
876				X						
877				X						
878				X						
879				X						
880				X						
881				X						
882				X						
883				X						
884				X						
885				X						
886				X						
887		X								

TABLE 5-43 (page 2)

GEOLOGIC/SITE RELATIONSHIPS

FOREST CENTRAL SAMPLING STRATUM

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS					JURASSIC		TRIASSIC
			North Horn Formation	Mesa Verde Group	Mancos Shale	Dakota Sandstone	Cedar Mountain Formation	Morrison Formation	San Rafael Group	
45Sp66			X							
67			X							
68			X							
69			X							
70	X									
71			X							
72			X							
Sub total 40	1	1	14	24	0	0	0	0	0	0

TABLE 5-44

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST CENTRAL SAMPLING STRATUM

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em853	Rs																
854	Rs																
855	Rs																
856				Rs													
857								Rs									
858												Rs					
859												Rs					
860		Rs															
861	Rs																
862	Bd																
864										Al							
865								Al									
866										Al							
867	Al																
868					Ae												
869					Ae												
870												Rs					
871												Rs					
872												Rs					
873			Al														
875								Rs									
876								Rs									
877														Rs			
878										Rs							
879										Rs							
880										Rs							
881			Al														
882												Rs					
883										Rs							
884												Rs					
885												Rs					

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-44 (page 2)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST CENTRAL SAMPLING STRATUM

Permanent Site Number		Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Em886											Rs							
887											Al							
42Sp66				Rs														
67										Rs								
68															Rs			
69				Al														
70											Rs							
71									Al									
72									Al									
Sub totals	40	6	1	4	1	2	0	0	6	1	9	0	8	0	2	0	0	0

Al = alluvial
Ac = aeolian
Bd = bedrock

Cl = colluvial
Rs = residual

Table 5-45

FOREST CENTRAL SAMPLING STRATUM (40 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Em853	FC 14	8900	-	S-III	-	-	40m. X 40m.	
42Em856	FC 1	10400	-	S-III	-	-	40m. X 20m.	
42Em857	FC 21	8200	-	S-III	-	-	20m. X 10m.	
42Em861	FC 21	7825	-	S-III	-	-	10m. X 3m.	
42Em865	FC 28	8000	-	S-III	-	-	30m. X 30m.	
42Em866	FC 28	7950	-	S-III	-	-	3m. X 3m.	
42Em868	FC 31	8640	-	S-III	-	-	5m. X 5m.	
42Em869	FC 31	8640	Elko side notch	S-III	Archaic	6000-500	6m. X 6m.	
42Em873	FC 25	8676	East gate expanding stem	S-II	Late Archaic and Fremont	2500-1500	8m. X 8m.	
42Em875	FC 29	8400	Elko eared, stemmed pt.	S-II	Archaic	6000-500	50m. X 50m.	
42Em876	FC 29	8400	1 Emery gray sherd	S-III	Fremont	700-1200	20m. X 20m.	
42Em877	FC 29	8450	-	S-III	-	-	15m. X 15m.	
42Em878	FC 29	8376	-	S-III	-	-	5m. X 5m.	
42Em879	FC 29	8376	-	S-III	Archaic	6000-500	10m. X 10m.	
42Em881	FC 29	8326	-	S-III	-	-	7m. X 7m.	
42Em883	FC 32	8400	-	S-III	-	-	30m. X 30m.	
42Em886	FC 32	8380	-	S-III	-	-	5m. X 5m.	
42Em887	FC 23	8351	-	S-III	-	-	15m. X 15m.	

Table 5-45 (page 2)

FOREST CENTRAL SAMPLING STRATUM (40 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Hunting								
42Em854	FC-14	9000	-	S-III	-	-	15m. X 15m.	
42Em855	FC 12	9050	-	S-III	-	-	7m. X 7m.	
42Em864	FC 28	8000	-	S-III	-	-	5m. X 5m.	
Kill/Butcher								
42Em867	FC 28	7930	-	S-III	-	-	28m. X 28m.	
Rock Shelter								
42Em858	FC 21	8050	-	S-III	-	-	5m. X 3m.	
42Em859	FC 21	8075	1 Elko side and 1 East Gate expanding stem	S-II	Late Archaic and Fremont	2500-1200	15m. X 20m.	
42Em860	FC 21	7850	-	S-III	-	-	4m. X 3m.	
42Em862	FC 21	7750	-	S-II	-	-	10m. X 10m.	
42Em870	FC 31	8600	-	S-II	-	-	10m. X 8m.	
42Em871	FC 31	8250	-	S-II	-	-	8m. X 3m.	
42Em872	FC 31	8325	-	S-III	-	-	8m. X 3m.	
42Em880	FC 29	8276	5 Emery and 3 Black/White sherds	S-I	Fremont	700-1200	50m. X 20m.	
42Em882	FC 32	8350	3Emery and 1 Sevier sherd	S-II	Fremont	700-1200	22m. X 8m.	
42Em884	FC 32	8350	-	S-II	-	-	8m. X 2m.	

Table 5-45 (page 3)

FOREST CENTRAL SAMPLING STRATUM (40 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Rock Shelter (cont.)								
42Em885	FC 32	8350	Side notch projectile point	S-I	Late Archaic or Fremont	2500-1200	10m. X 4m.	
Lithic Scatter								
42Sp66	FC 26	9400	-	S-III	-	-	10m. X 10m.	
42Sp67	FC 26	9350	-	S-III	-	-	20m. X 10m.	
42Sp68	FC 26	9200	-	S-III	-	-	20m. X 20m.	
42Sp71	FC 20	7960	-	S-III	-	-	5m. X 5m.	
Quarry								
42Sp70	FC 17	7541	Elko corner	S-III	Archaic	6000-500	15m. X 15m.	
Temporary Camp								
42Sp69	FC 17	7541	Elko corner	S-III	Archaic	6000-1200	12m. X 12m.	
Extended Camp								
42Sp72	FC 20	8020	Emery Gray sherd	S-II	Fremont	700-1200	18m. X 8m.	

Cretaceous geologic formations.

FOREST NORTH SAMPLING STRATUM (U.S.F.S.)

An intensive field survey of an approximate one percent of the surface area of the Forest North Sampling Stratum, stratified by the Forest Service Regional Office in Ogden, Utah, was carried out by AERC in July 1977. The survey consisted of the nineteen quarter section sample areas described in Table 5-46. The sample was not selected completely through random methods, but was stratified toward that eastern area of the Wasatch Plateau where the greatest impacts are expected from coal mining operations to occur.

Only two cultural resource sites were located in the entire nineteen sample areas. Both were found in sample area 2 located in Bear Canyon, west of Scofield Reservoir (see Figure 5-12). These sites are situated on small sagebrush flats in the Montane ecozone composed of ponderosa, yellow pine, quaking aspen, and blue spruce. Both sites are in the Cretaceous Blackhawk formation of the Mesa Verde group and lie on residual soils. One is located on a bench and the other on a small ridge within the canyon proper. They are at an elevation of 7,800 feet (2,377 m.), (see Tables 5-7 and 5-9). One of the sites is a small lithic scatter with few artifacts. The other is a small temporary campsite probably utilizing Bear Creek as a fresh water source. Lithic collections were made at both sites but no diagnostic artifacts were found, so cultural affiliation could not be determined. Both sites were given the lowest level of site significance rating used by the U.S. Forest Service (see Table 5-49), (see Part A of this chapter for a discussion of AERC Forest Ratings).

The lack of sites in the remaining eighteen sample areas may possibly be due to the environmental factors such as vegetation, altitude, and slope degree. In the forest, ground cover is extensive and sites, if present, are extremely difficult to see during the reconnaissance. The generally

TABLE 5-46

FOREST NORTH SAMPLING STRATUM

Sample Area	General Vegetation Type	Legal Description	No. of Sites Located
1	Montane	T.12S., R.6E., Sec. 9 NE¼	-
2	Montane	T.12S., R.6E., Sec. 12 NW¼	2
3	Montane	T.12S., R.6E., Sec. 20 SW¼	-
4	Montane	T.12S., R.6E., Sec. 28 SE¼	-
5	Montane	T.12S., R.6E., Sec. 35 NE¼	-
6	Alpine	T.13S., R.6E., Sec. 15 NW¼	-
7	Alpine	T.13S., R.6E., Sec. 23 SW¼	-
8	Alpine	T.14S., R.7E., Sec. 16 SE¼	-
9	Alpine	T.14S., R.7E., Sec. 18 NE¼	-
10	Montane	T.14S., R.7E., Sec. 26 NW¼	-
11	Alpine	T.14S., R.7E., Sec. 28 SW¼	-
12	Alpine	T.14S., R.7E., Sec. 32 SE¼	-
13	Montane	T.14S., R.7E., Sec. 35 NE¼	-
14	Alpine	T.14S., R.6E., Sec. 24 NW¼	-
15	Alpine	T.15S., R.6E., Sec. 25 SW¼	-
16	Alpine	T.15S., R.7E., Sec. 12 SE¼	-
17	Montane	T.15S., R.7E., Sec. 17 NE¼	-
18	Montane	T.15S., R.7E., Sec. 21 NW¼	-
19	Alpine	T.15S., R.7E., Sec. 28 SW¼	-

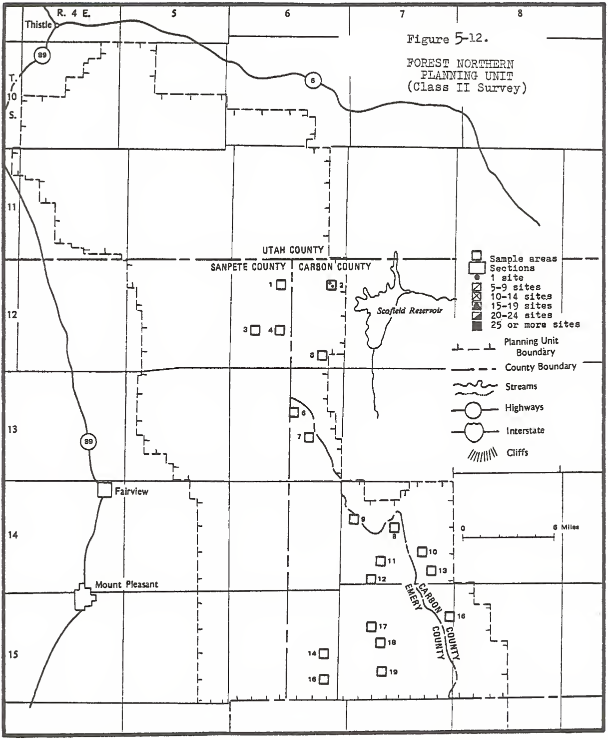


Figure 5-12. Forest Northern Planning Unit Class II Survey.

TABLE 5-47

GEOLOGIC/SITE RELATIONSHIPS

FOREST NORTH SAMPLING STRATUM

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Cb99				X						
100				X						
Sub total 2	0	0	0	2	0	0	0	0	0	0

TABLE 5-48

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST NORTH SAMPLING STRATUM

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Cb99			Rs														
100			Rs														
Sub total 2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

Table 5-49

TABULAR DESCRIPTION

FOREST NORTH SAMPLING STRATUM (2 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Lithic Scatter								
42Cb99	FN 2	7800	-	S-III	-	-	15m. x 5m.	Site has been overgrazed
Temporary Camp								
42Cb100	FN 2	7800	-	S-III	-	-	45m. x 45m.	

marginal level of activity at high altitudes may also be a contributor to the lack of sites in the area. Both sites were found in the only sample area having an average elevation lower than 8,000 feet (2,438 m.). Eight of the remaining sample areas lie between eight and nine thousand feet (2,438-2,743 m.) in elevation. Ten sample areas are between nine and ten thousand feet (2,743-3,048 m.).

Although vegetation and elevation are potential factors in restricting their prehistoric use, they are not by themselves adequate explanations for lack of sites. Several sites in the Forest Central Sampling Stratum, only a few miles south of the Forest Northern Sampling Stratum, have been recorded in similar vegetation ecozones and at elevations over ten thousand feet (3,048 m.). Another factor in this sampling stratum which may have negatively affected prehistoric activity is probably slope degree. Most sites recorded in the Wasatch Plateau region are found on either fairly level plateau surfaces or at the base of escarpments in moderately level valleys or canyons. In this sampling stratum all of the sample areas with the exception of the canyon floor area are devoid of level surfaces or lowland areas of moderate slope. In fact, the average slope in seventeen of the nineteen sample areas is greater than 1,000 feet (305 m.) in local relief. Only two areas have moderately steep slopes which range from 500 to 1,000 feet (150-305 m.) in relief.

It appears that the lack of significant human activity in prehistoric times in this sampling stratum can be partially explained by the compounded environmental factors of vegetation, elevation, and slope. This assumption can be further verified by the paucity of already known sites within the sample stratum and by the similar findings in the Wattis Planning Unit which joins this stratum on the east.

FOREST SOUTH SAMPLING STRATUM (U.S.F.S.)

An intensive field survey of an approximate one percent of the surface area of the Forest South Sampling

Stratum, stratified by the Forest Service Regional Office in Ogden, Utah, was carried out by AERC in May and June 1977. The survey consisted of the twenty-seven quarter section sample areas described in Table 5-50.

A total of forty-one cultural resource sites were located in nine of the twenty-seven sample areas; the remaining eighteen areas had no sites. Out of the forty-one sites, eighteen of the sites were located in FS-27 on the extreme eastern boundary of the National Forest in the southern portion of the sampling stratum (see Figure 5-13).

Thirty-one of the sites are associated with the pinyon-juniper ecozone; only one site is associated with juniper and sagebrush. Twenty-five sites are found in mixed pinyon-juniper with five of these in association with sagebrush and/or ponderosa pine niches. Five sites are in pinyon pine with three of these being associated with sagebrush and/or grassland. Of the remaining ten sites, five are in mountain brush, four in mixed ponderosa and mountain brush with aspen and/or live oak, and one in the Douglas-fir, aspen vegetational community.

Twenty-seven sites were found on geologic deposits of Cretaceous age. Of these, three were found on the Price River formation (42Sv1026, 1030, 1031), and two on the Blackhawk formation of the Mesa Verde group (42Sv1032, 1033). Twenty-two sites were found on Mancos shale, one on Ferron sandstone (42Sv1010), and twenty-one on Tununk shale.

Of the remaining fourteen sites, two were on Tertiary extrusives (42Sv995, 997), and twelve on Quaternary deposits, seven of those on colluvial materials (42Sv1000, 1001, 1002, 1003, 1004, 1005, 1006), one on a landslide (42Sv999), and four on basaltic flows (42Sv993, 994, 996, 998), (see Tables 5-51 and 5-52).

Other geomorphic relationships to sites show that twenty-six of the sites are on residual soils. Of these, four are on rims, seven are associated with drainage channels, two are on the rims of mesas or plateaus, one on a playa, six

TABLE 5-50

FOREST SOUTH SAMPLING STRATUM

Sample Area	General Vegetation Type	Legal Description	No. of Sites Located
1	S F D A*	T.21S., R.3E., Sec. 14 NW¼	-
2	S F D A*	T.21S., R.4E., Sec. 8 SW¼	-
3	Mountain Meadow	T.21S., R.5E., Sec. 17 SE¼	2
4	Mountain Meadow	T.22S., R.4E., Sec. 2 NE¼	1
5	Mountain Meadow	T.22S., R.4E., Sec. 8 NW¼	-
6	S F D A*	T.22S., R.4E., Sec. 34 SW¼	-
7	Pinyon-Juniper/Big Sage	T.23S., R.3E., Sec. 1 SE¼	-
8	Ponderosa Pine	T.23S., R.4E., Sec. 10 NE¼	-
9	Mountain Brush	T.23S., R.4E., Sec. 15 NW¼	2
10	S F D A*	T.24S., R.3E., Sec. 9 SW¼	-
11	S F D A*	T.24S., R.3E., Sec. 16 SE¼	-
12	S F D A*	T.24S., R.3E., Sec. 19 NE¼	-
13	S F D A*	T.24S., R.3E., Sec. 31 NW¼	-
14	Mountain Brush	T.24S., R.4E., Sec. 14 SW¼	1
15	Big Sage	T.24S., R.4E., Sec. 33 SE¼	-
16	Pinyon-Juniper	T.24S., R.4E., Sec. 25 NE¼	4
17	S F D A*	T.25S., R.3E., Sec. 3 NW¼	-
18	Mountain Meadow	T.25S., R.3E., Sec. 17 SW¼	-
19	Mountain Brush	T.25S., R.3E., Sec. 32 SE¼	-
20	Pinyon-Juniper	T.25S., R.4E., Sec. 12 NE¼	2
21	Big Sage	T.25S., R.4E., Sec. 13 NW¼	5
22	S F D A*	T.25S., R.4E., Sec. 29 SW¼	-
23	Big Sage	T.25S., R.4E., Sec. 39 SE¼	-
24	Big Sage	T.25S., R.4E., Sec. 32 NE¼	6

TABLE 5-50

FOREST SOUTH SAMPLING STRATUM

Sample Area	General Vegetation Type	Legal Description	No. of Sites Located
25	S F D A*	T.26S., R.4E., Sec. 6 NW$\frac{1}{4}$	-
26	Big Sage	T.26S., R.4E., Sec. 7 SW$\frac{1}{4}$	-
27	Pinyon-Juniper	T.26S., R.5E., Sec. 19 SE$\frac{1}{4}$	18

*Spruce, Fir, Douglas-Fir, Aspen Association (after Hackman 1973)

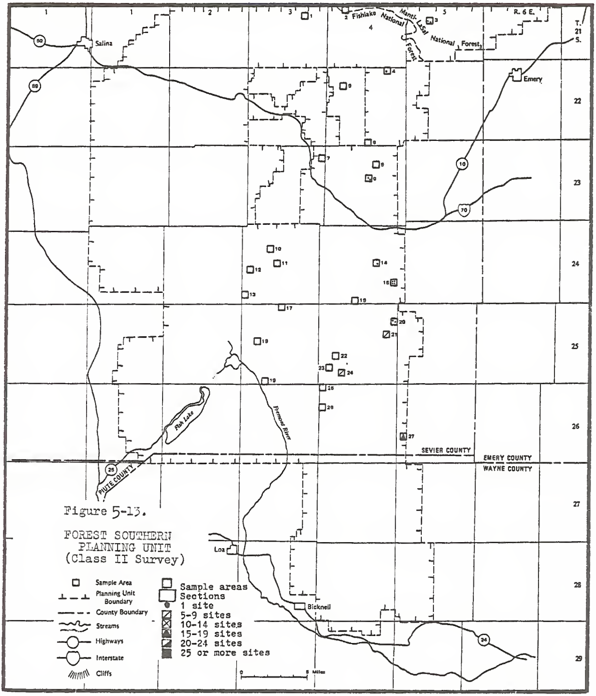


Figure 5-13. Forest Southern Planning Unit Class II Survey.

on ridges, one on a bench, one on a terrace, and four in small saddles.

Nine sites were found on colluvial slopes or deposits, with one occurring on a ridge, and two on terraces. The remaining six sites were located on alluvial deposits; two of these were found on ridges, one on a bench, one a terrace, and two on hills (see Table 5-52).

It appears significant that almost every site was found relatively near the eastern boundary of the sampling stratum. This boundary follows rather closely that somewhat abrupt zone between the montane and desert environments of the region, and is marked by an important change in elevation. Sites have a definite tendency to be along rims, escarpments, or the tops of slopes. In fact, thirty-four of the forty-one sites occur on ridges, benches, terraces, rims, or saddles.

Twenty-one of the sites are between seven and eight thousand feet in elevation (2,133-2,438 m.). Sixteen sites are between eight and nine thousand feet (2,438-2,743 m.), and only four sites are at elevations greater than nine thousand feet (see Table 5-53).

Of the forty-one sites, eighteen were lithic scatters, five were hunting sites, three were kill/butchering sites, six were temporary camps, eight were extended camps, and one was a historic campsite. It is important to note that fourteen of the temporary or extended campsites, are in sample area 27.

Twenty sites were identified as to cultural affiliation with twenty culturally unidentified. Of the twenty-one identified sites, one was historic; seven indicated Archaic period use, two of which were found to be in the late subphase of the Archaic and possibly associated with the Fremont culture. Thirteen sites were identified as Fremont based upon lithic and ceramic evidence (see Table 5-53).

All sites were evaluated according to the Forest Service Site Significance Ratings. Thirty-five of the sites were assigned the lowest significance rating of S-III while the remaining six were rated as S-II sites. No S-I sites were

TABLE 5-51

GEOLOGIC/SITE RELATIONSHIPS

FOREST SOUTH SAMPLING STRATUM

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS: North Horn Formation	CRETACEOUS: Mesa Verde Group	CRETACEOUS: Mancos Shale	CRETACEOUS: Dakota Sandstone	CRETACEOUS: Cedar Mountain Formation	JURASSIC: Morrison Formation	JURASSIC: San Rafael Group	TRIASSIC
42Sv993	X									
994	X									
995		X								
996	X									
997		X								
998	X									
999	X									
1000	X									
1001	X									
1002	X									
1003	X									
1004	X									
1005	X									
1006	X									
1007					X					
1008					X					
1009					X					
1010					X					
1011					X					
1012					X					
1013					X					
1014					X					
1015					X					
1016					X					
1017					X					
1018					X					
1019					X					
1020					X					
1021					X					
1022					X					
1023					X					
1024					X					
1025					X					
1026					X					
1027					X					
1028					X					
1029				X						
1030				X						

TABLE 5-51 (page 2)

GEOLOGIC/SITE RELATIONSHIPS

FOREST SOUTH SAMPLING STRATUM

Permanent Site Number	QUATERNARY	TERTIARY	CRETACEOUS North Horn Formation	CRETACEOUS Mesa Verde Group	CRETACEOUS Mancos Shale	CRETACEOUS Dakota Sandstone	CRETACEOUS Cedar Mountain Formation	JURASSIC Morrison Formation	JURASSIC San Rafael Group	TRIASSIC
42Sv1031				X						
1032				X						
1033				X						
Sub totals 41	12	2	0	5	22	0	0	0	0	0

TABLE 5-52

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST SOUTH SAMPLING STRATUM

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Sv993								Cl									
994																	
995																Cl	
996																Cl	
997																Cl	
998																Cl	
999								Al								Cl	
1000									Al								
1001										Al							
1002														Al			
1003														Al			
1004										Rs							
1005								Rs									
1006							Rs										
1007														Cl			
1008										Cl							
1009										Cl							
1010								Al									
1011								Rs									
1012								Rs									
1013			Rs														
1014			Rs														
1015											Rs						
1016			Rs														
1017								Rs									
1018											Rs						
1019								Rs									
1020											Rs						
1021											Rs						
1022																Rs	
1023																Rs	

Al = alluvial
Ac = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

TABLE 5-52 (page 2)

GEOMORPHOLOGIC/SITE RELATIONSHIPS

FOREST SOUTH SAMPLING STRATUM

Permanent Site Number	Rim	Face	Drainage	Seep	Mesa top	Desert Pavement	Playa	Ridge	Bench	Terrace	Saddle	Alcove	Hillock	Hill	Cove	Slope	Plain
42Sv1024								Rs									
1025			Rs														
1026	Rs																
1027			Rs														
1028																Rs	
1029	Rs																
1030			Rs														
1031			Rs														
1032	Rs																
1033	Rs																
Sub totals 41	4	0	7	0	0	0	1	9	1	4	4	0	0	3	0	8	0

Al = alluvial
Ae = aeolian
Bd = bedrock
Cl = colluvial
Rs = residual

Table 5-53

FOREST SOUTH SAMPLING STRATUM (41 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
<u>Lithic Scatter</u>								
42Sv994	FS 24	8960	-	S-II	-	-	25m. X 25m.	
42Sv995	FS 24	9050	-	S-II	-	-	5m. X 5m.	
42Sv996	FS 24	9000	-	S-II	-	-	160m. X 50m.	
42Sv997	FS 24	9010	-	S-III	-	-	5m. X 5m.	
42Sv1001	FS 21	8000	Gypsum and Rose spring corner notch	S-III	Late Archaic and F emont	2500-1200	5m. X 5m.	
42Sv1002	FS 21	8010	-	S-III	-	-	12m. X 5m.	
42Sv1003	FS 21	8080	-	S-III	-	-	16m. X 5m.	
42Sv1004	FS 21	8240	-	S-III	-	-	50m. X 10m.	
42Sv1005	FS 20	8260	-	S-III	-	-	15m. X 15m.	
42Sv1006	FS 20	7880	-	S-III	-	-	150m. X 20m.	
42Sv1008	FS 16	7880	-	S-III	-	-	30m. X 20m.	
42Sv1009	FS 16	7920	Elko side notch	S-III	Archaic	6000-500	6m. X 15m.	
42Sv1010	FS 16	8360	-	S-III	-	-	20m. X 20m.	
42Sv1027	FS 27	7200	-	S-III	-	-	10m. X 10m.	
42Sv1030	FS 3	8360	-	S-III	-	-	5m. X 5m.	
42Sv1031	FS 4	8240	-	S-III	-	-	30m. X 30m.	
42Sv1032	FS 9	8220	-	S-III	-	-	50m. X 50m.	
42Sv1033	FS 9	8240	-	S-III	-	-	5m. X 5m.	
<u>Hunting</u>								
42Sv1007	FS 16	7920	Elko side notch	S-III	Archaic	6000-500	5m. X 2m.	

Table 5-53 (page 2)

FOREST SOUTH SAMPLING STRATUM (41 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Hunting (cont.)								
42Sv1013	FS 27	7240	Basal notch point	S-III	Late Archaic and Fremont	2500-1200	60m. X 80m.	
42Sv1014	FS 27	7280	Elko side notch	S-III	Archaic	6000-500	200m.X200m.	
42Sv1023	FS 27	7220	-	S-III	-	-	30m. X 10m.	
42Sv1028	FS 27	7000	-	S-III	-	-	10m. X 10m.	
Kill/Butcher								
42Sv998	FS 24	8950	4 Elko side notches	S-II	Archaic	6000-500	20m. X 20m.	
42Sv999	FS 14	8560	Pinto & Side notches	S-III	Archaic	6000-500	20m. X 20m.	
42Sv1022	FS 27	7280	-	S-III	-	-	100m.X100m.	
Temporary Camp								
42Sv1000	FS 21	8019	-	S-III	-	-	20m. X 15m.	
42Sv1016	FS 27	7280	2 Emery gray, 1 Elko side & 1 Gypsum notches	S-III	Fremont	700-1200	40m. X 30m.	
42Sv1019	FS 27	7160	3 Emery and 1 Sevier sherd	S-III	Fremont	700-1200	15m. X 15m.	
42Sv1024	FS 27	7160	4 Emery sherds	S-III	Fremont	700-1200	20m. X 20m.	

Table 5-53 (page 3)

FOREST SOUTH SAMPLING STRATUM (41 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
42Sv1026	FS 27	7160	5 Emery sherds	S-III	Fremont	700-1200	40m. X 20m.	
42Sv1029	FS 3	8480	2 Sevier and 1 Emery sherds	S-III	Fremont	700-1200	15m. X 15m.	
Extended Camp								
42Sv1011	FS 27	7040	2 Emery Gray sherds	S-III	Fremont	700-1200	20m. X 20m.	
42Sv1012	FS 27	7120	1 Emery Gray sherd	S-III	Fremont	700-1200	15m. X 15m.	
42Sv1015	FS 27	7320	2 Emery Gray sherds	S-II	Fremont	700-1200	80m. X 80m.	
42Sv1017	FS 27	7260	5 Emery Gray sherds	S-III	Fremont	700-1200	30m. X 70m.	
42Sv1018	FS 27	7160	2 Emery Gray sherds	S-III	Fremont	700-1200	30m. X 30m.	
42Sv1020	FS 27	7200	1 Emery and 1 Sevier Black/Gray sherd	S-III	Fremont	700-1200	20m. X 20m.	
42Sv1021	FS 27	7200	1 Sevier and 3 Emery sherds	S-III	Fremont	700-1200	25m. X 25m.	
42Sv1025	FS 27	8120	5 Emery and 1 misc. sherd	S-II	Fremont	700-1200	200m.X200m.	

Table 5-53 (page 4)

FOREST SOUTH SAMPLING STRATUM (41 Sites)

Site Type and Number	Sample Area	Elevation (ft.)	Diagnostic Artifacts	USFS Rating	Cultural Affiliation	Temporal Range	Site Size	Comments
Historic								
42Sv993	FS 24	9300	-	S-III	Historic	1850 - present	1m. X .5m.	

located in the sample stratum (see Table 5-53).

Site locations in this sampling stratum also correlate highly with certain environmental factors observed in other sample units. Thirty-one of the forty-one sites are associated with pinyon-juniper woodlands. Only one site was found in the spruce, Douglas-fir forest.

Part C: Correlations Between Cultures, Site Types, and Environments

Computer coding of the environmental and cultural variables of the Class II survey data was developed through the use of the Statistical Package for the Social Sciences (SPSS) Crosstabs program. The following discussion is based upon the data derived from the program and is intended to relate the field survey information to the broader questions of culture history, environmental parameters for site location, cultural assignation of site types, as well as cultural resource significance of the site types. Temporal and spatial distribution of the sites are also discussed.

Throughout the cultural resources survey for the Central Coal Project, attempts have been made to relate sites with their natural environment as well as with cultural groups. The Tables 5-54, 56, 58, 60, 63, and 65 provided below summarize by planning unit the association of sites with vegetation, geomorphology, elevation, and geology, as well as the number of sites of each site type. Other tables (5-55, 57, 59, 61, 62, and 64) show relationships on the basis of site type rather than by planning unit.

The correlation between number of sites and vegetation type are shown in Tables 5-54 and 5-55. The strong degree of association between sites and the pinyon-juniper ecosystem is subdivided into three zones, i.e., juniper, pinyon-juniper, and pinyon. Furthermore, all but two of the sites recorded as being in big sage are actually in small sage areas within the larger pinyon-juniper ecosystem (the other two sites are actually in the ponderosa zone). Adding all of the sites associated with this ecosystem together, they make up over sixty-nine percent of all of the sites discovered in the survey. Moreover, they include most (ninety-four percent) of the temporary and extended camps and habitation sites discovered. The importance of the sites associated with desert shrub, on the other hand, is lessened by the fact that ninety-four percent of them are lithic scatters or quarries with only six percent being camps or habitation sites. The higher elevation vegetation zones were predominantly of nonintensive, short duration use during prehistoric times.

The relationships between sites and geomorphic location is only slightly less strong than that between sites and vegetation. However, as noted in Tables 5-56 and 5-57, there is still a high association between sites and geomorphic features which overlook lower areas. About sixty-seven percent of the sites, for example, are either on plateau or mesa tops, ridges, rims, benches, terraces, saddles, hills, or faces. Some of the sites recorded as being in drainages should possibly also be included with one of these features because a drainage cannot exist in isolation. This relationship is further strengthened by the fact that eighty-five percent of the camp and habitation sites are in those geomorphic locations.

The relationship between cultural sites and elevation is harder to define (see Tables 5-58 and 5-59). About seventy-three percent of the sites are located between five and eight thousand feet (1524-2438 m.) and they include eighty-six percent of the camp and habitation sites. The elevation distribution of sites is somewhat determined by the elevations given in each planning unit sample area, but seems to indicate a preference for middle elevations within the total range. This also corresponds to the pinyon-juniper ecosystem discussed above.

In observing the relationship between sites and

Vegetation \ Planning Unit	TOTAL	Book Mountain	Forest	Henry Mountain	Huntington	Last Chance	Muddy	Price River	Range Creek	Summerville	Wattis	Forest Central	Forest North	Forest South
Desert Shrub	99	13		58	3	8	11	5		1				
Big Sage*	15		4										2	9
Grass	1									1				
Juniper	74	11	3	19			18	6	5	6	5	1		
Pinyon-Juniper	175	2	18	44	4		22	41	3	11	3	7		20
Pinyon	18											16		2
Mt. Brush	5													5
Ponderosa	14											10		4
SFDFA**	7											6		1
Mt. Meadow	0													

* All are small habitats in other zones: 13 in the Pinyon-Juniper zone, and 2 in the Ponderosa subzone of the SFDFA.

** SFDFA: Spruce, Fir, Douglas Fir, Aspen Association (after Hackman 1973).

Table 5-54. Correlation between number of sites and vegetation types by planning unit. Vegetation totals reflect actual site-vegetation associations and are not identified with B. L. M. designated vegetation zones provided on other planning unit tables.

Vegetation Zones / Site Type	Lithic Scatter	Hunting	Kill/Butchering	Quarry	Temp. Camp	Ext. Camp	Single Hab.	Multiple Hab.	Rock Art	Burial	Ceremonial	Rock shelter	Cabin	Other
Arid														
Greasewood	7													
Salt Brush	41			5	1		1					2	1	1
Black Brush	38	1		15	1									
Shad Scale														
Arid Trans.														
Big Sage	1			1										
Wavey Leaf Oak														
Pinyon-Juniper	1				1					1	1			
Juniper	44		1	6	9	1	1					3		
Pinyon-Juniper	94	6	8	6	26	12	4					8		2
Pinyon	12	2	1		1	1						3		
Mountain Brush	5	1	2											
Montane														
Ponderosa-Scrub	8	1										5		
Douglas Fir					1									
Yellow Pine	6				1									
Alpine														
High Spruce	1													
Mt. Meadows														
Sub-Tuntra														
TOTALS	258	11	12	33	41	14	6			1	1	21	1	3

Table 5-55. Correlation between number of sites and vegetation zones by site type.

Geomorphology \ Planning Unit	TOTAL	Book Mountain	Forest	Henry Mountain	Huntington	Last Chance	Muddy	Price River	Range Creek	Summerville	Wattis	Forest Central	Forest North	Forest South
Ridge	80	4	4	10		2	18	17		6		6		13
Drainage	68	8	4	24	3	2	7	2	1	3	1	4	2	7
Plateau/Mesa	66	1	8	33			1	19	2			2		
Bench	29	4		13			4	2		4		1		1
Slope or Deposit	29		2	4			9	2		4				8
Terrace	26	4	2	1	1		4	1				9		4
Rim	22	3		1		1	3	2	1	1		6		4
Hillock-Dune	21	2		16			2	1						
Alcove	20			6			2	4				8		
Hill	16		1	10								2		3
Saddle	11		4	2			1							4
Face	6			1					4			1		
Plain	5				3	1		1						
Seep	2							1				1		
Desert Pavemnt.	2					2								
Playa	2									1				1

Table 5-56. Correlation between compounded site numbers and geomorphic feature by planning unit.

Geomorphology / Site Type	Lithic Scatter	Hunting	Kill/Butchering	Quarry	Temp. Camp	Ext. Camp	S. Hab.	Petro.	Rock Shelter	Granary/Cist	Misc. Hist. Sites
Ridge	51	3	5	5	11	4					
Drainage	44	3	2	3	9	2	1				
Plateau/Mesa	48			4	9	2	2				
Bench	17	1		3	3	1	1				1
Slope Alluvial	21		1	1	1	1	1				
Terrace	16	1		4	5				1		1
Rim	11	2	2	2	2				1		1
Hillock Dune	21			4							
Alcove	4				1				17		
Hill	14	1		6							
Saddle	7		2			4					
Face							1	1		2	
Plain											1
Seep	2										
Desert Pavement	1			1							
Playa	1										

Table 5-57. Correlation between compounded site numbers and geomorphic features by site type.

Elevation \ Planning Unit	TOTAL	Book Mountain	Forest	Henry Mountain	Huntington	Last Chance	Muddy	Price River	Range Creek	Summerville	Wattis	Forest Central	Forest North	Forest South
(1218-1523 m.) 4-5000'	66	20		39						7				
(1523-1828 m.) 5-6000'	116	4		51	7	8	9	18	7	12				
(1828-2133 m.) 6-7000'	93	2	13	28			29	19	1		1			
(2133-2438 m.) 7-8000'	73		12	3			12	15				8	2	21
(2438-2743 m.) 8-9000'	43						1					26		16
(2743-3048 m.) 9-10,000'	9											5		4
(3048 + m.) 10,000' +	1											1		

Table 5-58. Correlation between number of sites and elevation by planning unit.

Elevation \ Site Type	Lithic Scatter	Hunting	Kill-Butcher	Quarry	Temporary Camp	Extended Camp	Single Habitation	Petroglyph	Burial	Rock Shelter	Granary/Cist	Corral	Historic Dump	Cabin
(1208-1523 m.) 4-5000'	42	1	1	8	5		1							1
(1523-1828 m.) 5-6000'	87		3	19	13	1	3	3	1	2	1	1		1
(1828-2133 m.) 6-7000'	51	4	2	5	19	2	1			3	2		2	
(2133-2438 m.) 7-8000'	35	6	2	1	10	10	1			2				
(2438-2743 m.) 8-9000'	26	2	2		2	1				8				
(2743-3048 m.) 9-10,000'	5				1									
(3048 + m.) 10,000' +	1													

Table 5-59. Correlation between number of sites and elevation by site types.

the geological formation on which they are found (see Tables 5-60 and 5-61), it is difficult to detect any significant relationships. One possibility, however, might be some preference for Cedar Mountain Shale and its associated Buckhorn Conglomerate. Fifty-one sites were found on this formation, mostly in the Cedar Mountain area of the Price River Planning Unit. Although thirty-one of those sites are lithic scatters, there were eleven temporary camps and one extended camp. Whether they are there because of the geology or because of the pinyon-juniper vegetation or some other factor is difficult to ascertain fully. A second possible relationship could be between sites and Entrada sandstone. Of interest here is that forty-four percent of the sites in this formation are quarries and the remainder are lithic scatters. Other possible associations are between sites and the members of the Mancos shale and the Morrison formations.

Rainfall, both annual and summer, is listed in Table 5-62 and is cross-tabulated with site types. In general, sites occur within the range of 6 to 20 inches (150 to 600 mm.) of annual rainfall or 5 to 10 inches (120 to 250 mm.) summer rainfall, with no clear association of any site type with specific rainfall annuals.

Table 5-63 gives a distribution of site types by planning unit. The Price River and Henry Mountains Units have the widest range of site types. While many sites had been previously recorded from the Henry Mountains Unit, only eleven had been reported for Price River. The addition of fifty-two new sites in the Price River Unit is a major contribution of this survey and points to a region where further cultural resource surveys are urgently needed.

We also note from Table 5-63 that those planning units along the northern zone of the study area (with the exception of Nine Mile Canyon) have very few sites of any type. This is in contrast to the apparent relative abundance of sites in an east-west belt extending across the middle of the study area in environments which, if anything, are less hospitable than those to the north.

Table 5-64 relates site type to culture for the sites discovered in the survey. Due to lack of adequate diagnostic artifacts, only about twenty-two percent of the sites can be culturally identified. It is probable, however, that many other sites, especially the camp and habitation sites, could be identified at some future date through testing and excavation. Table 5-64 indicates that major site activity involved the Early Archaic through the Fremont cultures. For the most part, these sites consist of lithic scatters, hunting, and temporary camp sites. The spatial distribution of these culturally identifiable sites is demonstrated on Table 5-65. This display shows that Forest South had the greatest number of culturally identifiable sites followed by the Henry Mountains, Forest Central, Muddy, and Price River Planning Units. Table 5-65 further indicates that the Fremont was the single most easily identified culture which was probably a result of ceramic artifact associations on those sites. Another 63 sites could be either Fremont or Archaic because of the general association of both Elko and Gypsum series projectile points with both culture stages. Early, Middle, and late Archaic are equally represented by five sites and five isolated finds.

The cultural history of the CCP as indicated by the Class II survey data differs only in minor respects with the general outline of cultural history presented in Chapter 3. No Paleo Indian use of the area was documented by the survey, although Paleo Indian sites and isolated projectile points do occur in the general CCP area (see Figure 5-14). The initial utilization as determined by the survey data was during the Archaic period (24 sites). The Black Knoll subphase, as delineated by Schroedl (1976), dating from roughly 8300 to 6200 B.P., was represented by two lithic scatter sites, 42Ga1387 and 42Gr749 (see Figures 5-18F and 5-15A). With the exception of one definite Middle Archaic quarry site

Geology \ Site Type	Lithic Scatter	Hunting	Kill/Butchering	Quarry	Temporary Camp	Extended Camp	Single Habitation	Petroglyph	Burial	Rock Shelter	Granary/Cist	Corral	Historic Dump	Cabin
QUATERNARY														
Alluvial & Aeolian	31			5	2									1
Gravels	2				1		1							
Colluvial	7				1									
Landslide	2		2		4	7								
Basalt	2		1		1									
TERTIARY														
Green River					2			3			1			
Flagstaff L.	1													
Intrusives & Ext.	3			1										
CRETACEOUS														
North Horn	8	3	1		1	1								
Mesa Verde Group	16			1	2		1							1
Tuscher	1						1							
Price River	8				1					4				
Castlegate	4									6				
Blackhawk	7				1					1				
Mancos Shale	9		1				1					1		
Masuk	10			1	2	1	1						1	
Emery	2				1									
Blue Gate	7				3					2				
Ferron	14			4	2	2	1						1	
Tunuck	5	2		1		1								
Dakota S.	6													
Cedar Mt.	30		2	3	9	1				4				
JURASSIC														
Morrison	15	1		2	3									
Brushy Basin	14		2							1	1			
Salt Wash S.	4		2		2		1			1				
San Rafael G.	1		2											
Summerville	1			2		1								
Curtis	1													
Entrada	24			11	1									
Carmel	14			2										
TRIASSIC														
Navajo	1				1									
Kayenta	10				3									
Wingate		1												

Table 5-60. Correlation between number of sites and geological features.

Geology \ Planning Unit	TOTAL	Book Mountain	Forest	Henry Mountain	Huntington	Last Chance	Muddy	Price River	Range Creek	Summerville	Wattis	Forest Central	Forest North	Forest South
QUATERNARY														
Alluvium & Aeolian	35	2	11	12	3	1	4	1				1		
Gravels	3			2				1						
Colluvial	10		1	1				1						7
Landslide	1													1
Glacial														
Basalt	4													4
TERTIARY														
Green River	6								6					
Flagstaff Limestone	1											1		
Intrusion & Ext.	3			1										2
CRETACEOUS														
North Horn	14											14		
Mesa Verde	18	4		14										
Tuscher	2								2					
Price River	13											10		3
Castlegate	10	1										9		
Blackhawk	10									1		5	2	2
Mancos Shale	15	9						5		1				
Masuk	15		5	9							1			
Emery	3		1	2										
Blue Gate	11		1	10										
Ferron	22			10	3		8							1
Tununk	24			3										21
Dakota Sandstone	7	7												
Cedar Mountain	51			1			7	39		4				
JURASSIC														
Morrison	20	3		2			15							
Brushy Basin	22			13				5		4				
Salt Wash	9			9										
San Rafael G.	1			1										
Summerville	4		3	1										
Curtis	1									1				
Entrada	32		3	21		6				2				
Carmel	16			6	1	1	4			4				
TRIASSIC														
Navajo	5			3						2				
Kayenta	13						13							
Wingate														

Table 5-61. Correlation between site types and geological features by planning unit.

Site Type	TOTAL	Lithic Scatter	Hunting	Kill/Butchering	Quarry	Temporary Camp	Extended Camp	Single Hab.	Multiple Hab.	Rock Art	Burial	Ceremonial	Rock Shelter	Mine	Cabin	Sawmill	Kiln	Other
Annual Rainfall																		
0-5.9" (0-150mm)																		
6-10.9" (150-300mm)	255	175	2	4	30	26	5	3					7		1			2
11-15.9" (300-450mm)	93	51	5	5	2	11	8	3				1	6					1
16-20.9" (450-600mm)	42	25	4	3		2							8					
21-25.9" (600-750mm)	7	3			1	2	1											
26-30.9" (750-900mm)																		
31" + (900-1500mm)	4	4																
Summer Rainfall																		
0-5.9" (0-150mm)	295	198	2	7	32	28	5	5				1	13		1			3
6-10.9" (150-300mm)	106	60	9	5	1	13	9	1					8					
11-15.9" (300-450mm)																		

Table 5-62. Correlation between number of sites and precipitation zones by site type.

Site Type / Planning Unit	Book Mountain	Forest	Henry Mountain	Huntington	Last Chance	Muddy	Price River	Range Creek	Summerville	Wattis	Forest Central	Forest North	Forest South
Lithic Scatter	21	14	76	7	6	31	32	1	10		22	1	18
Hunting			0								3		5
Kill-butchering	1		6				3		3		1		3
Quarry	1	4	20		2	7	1		5		1		
Temp. Camp	1	5	10			9	9	2	1		1	1	6
Ext. Camp		1	1			2	1				1		8
S. Hab.	1	1	0			1		1					
Ceremonial			0										
Petroglyph								3					
Burial							0						
Rock Shelter			8				5				11		
Granary/Cist			0					1					
His. Misc. Sites	1					1	1			1			1

Table 5-63. Correlation between number of sites and site type by planning unit.

Cultural Affiliation \ Site Type	Lithic Scatter	Hunting	Kill/Butchering	Quarry	Temporary Camp	Extended Camp	Single Hab.	Multiple Hab.	Rock Art	Burial	Ceremonial	Rock Shelter	Mine	Cabin	Sawmill	Kiln	Other
Unknown	229	6	5	29	23	2	4	-	-	-	1	8	-	-	-	-	1
Paleo Indian																	
Archaic	10/	5/	4/	1/	3/							1/					
Early	/2																
Middle				/1													
Late	2/6		1/	/1	/1	/1						3/					
Fremont	3/4		1/	/1	/1							1/					
Parowan																	
Sevier					1/1	/1											
San Rafael	/1				/8	/10	/1					1/7					
Anasazi - PI																	
BMII																	
San Juan																	
Kayenta												/1					
Numic	/2				/1												
Euro American historic	/1				/1		/1							/1			/1

Note: Probable/Known sites

Table 5-64. Correlation between number of sites and cultures by site type.

Planning Unit	General Archaic		Early Archaic		Middle Archaic		Late Archaic		Late Archaic Fremont		Fremont		Paiute Shoshone		Euro American	
	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate	Site Assoc.	Isolate
Book Mountain			1Δ												2**	
Forest											1*		1Δ1*			
Henry Mountain	5Δ							1Δ	6Δ		1Δ 4*					
Huntington																
Last Chance									1Δ							
Muddy	3Δ										3Δ 3*				1**	
Price River	2Δ			1Δ		1Δ			4Δ		4*				1**	
Summerville	1Δ								2Δ	1Δ						
Range Creek											1Δ 2*					
Wattis															1**	
Forest Central	5Δ			1Δ					3Δ		4*					1**
Forest North										1Δ						
Forest South	5Δ	0		1Δ					2Δ	1Δ	1Δ13*				1**	
Totals	21Δ	0	1Δ	3Δ	0	1Δ	0	1Δ	18Δ	3Δ	6Δ31*	0	1Δ1*	0	6**	1**
TOTALS	21 Δ		4Δ		1 Δ		1Δ		21Δ		6Δ 31*		2Δ 1*		7**	

Δ Projectile points
* Ceramic lots
** Bottle glass

Table 5-65. Correlation of diagnostic artifacts by planning unit. (Each number relates to occurrences of artifacts and not actual artifact counts. Isolate represents isolated artifacts not found in association with cultural sites.)

(42Sp70), (see Figure 5-20H), the remainder are of late Archaic affiliation (15 sites). Archaic sites are generally those of a temporary nature, including lithic scatters, quarries, temporary camps, and hunting/kill butchery sites.

Fremont sites in the survey area (see Figure 6-5) show slight shifts toward more intensive site use, although sites of a temporary nature continue to be utilized (see Table 5-64). The San Rafael variant of the Fremont accounted for 28 sites; no Uinta or Parowan variant sites were recorded. Anasazi utilization of the CCP area was minimal; the one occurrence of Kayenta Anasazi was at a rockshelter (42Ga1401) in the Henry Mountains Planning Unit, and the assignation was on the basis of one sherd of Kayenta white ware, possibly a trade sherd, found in an otherwise Fremont association.

Numic-affiliated sites (see Table 5-64) were classified by the association of diagnostic Shoshonean pottery or projectile points (see Figure 5-25G). These sites were quite rare, with only three sites so assigned.

Historic EuroAmerican utilization was also sparse, with only five sites showing historic use. It should be noted that the historic lithic scatter (see Table 5-64) is a result of the computer coding system; a historic cabin (42Gr764) was found in association with a prehistoric lithic scatter.

In summary, prehistoric utilization began with the early Archaic and continued through the Fremont and Shoshonean prehistoric periods. The large number of sites of unknown affiliation make statements about the density and intensity of use during any specific period difficult.

Exploitation of plant, animal, and mineral resources was the primary cultural activity documented by the survey. Horticultural village activity, known to have taken place in the survey area, was not represented in the Class II survey data.

Part D: Artifact Inventory and Analyses

PROJECTILE POINTS

Figures 5-14A and 5-14B show the obverse and reverse faces of a large corner notch point. This point resembles the Elko Corner Notch type, but is larger than normal. A similar specimen is shown in Wilson and Smith (1976:Figure 16m). Figures 5-14C and 5-14D are the obverse and reverse faces of a Cumberland Gap point found in the project area by an amateur collector. These points were found in association with the specimen described above. Cumberland points are generally limited to the eastern United States, Tennessee and Ohio in particular (Wormington 1964:81). Figure 5-14E is a bi-point resembling Cascade points described by Butler (1961). Similar points were recovered from Hogup Cave (Aikens 1970:41).

Figures 5-15A, B, C, D, F, G, H, and I are all variants of the Pinto square and sloping shouldered types. Although Pinto points frequently have concave bases (Holmer in Jennings et al, n.d. a), an examination of the original type site specimens (Wormington 1964:166) reveals that the concave base is not a necessary condition. The specimen in Figure 5-15E cannot be confidently classified, although similarities to the Gypsum point are evident. Figure 5-15J shows a nondiagnostic specimen which is similar to a point described by Marwitt (1968:Figure 52K) recovered from a Sevier Culture site.

Figures 5-16A, C, D, E, G, and K show specimens which exhibit shallow corner and side notching and are probably best classified in the Elko series (see Jennings 1957:119). Figure 5-16I shows an Elko Corner Notch point (Hester and Heizer 1973:Figure 3b). Figure 5-16J is an Elko Side Notch (Jennings 1957:104). Figure 5-16H is most likely a Pinto point (Wormington 1964:166) as is the specimen shown in Figure 5-16F. Figure 5-16B is nondiagnostic.

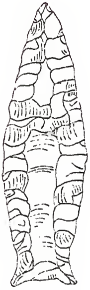
Figures 5-17A, D, and G show Gypsum point specimens. Figure 5-17B probably demonstrates an incomplete Gypsum point

(42Em677)

A

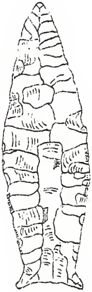
(42Em677)

B



(42Em677)

C



(42Em677)

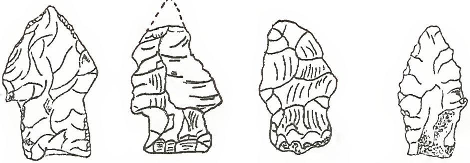
D

(AERC 10/X1)

E

(ACTUAL SIZE)

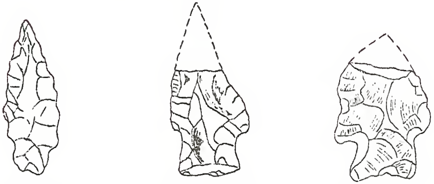
Figure 5-14.



(42Ga749) (03K/X-14) (42Em896) (42Sv999)

A B C D

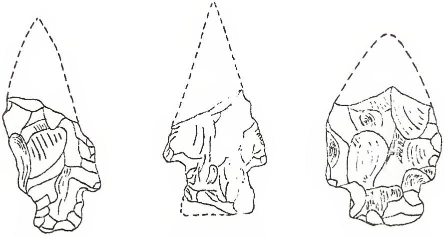
(ACTUAL SIZE)



(42Sv1029) (42Ga1404) (03E/X1)

E F G

Figure 5-15.



(03J/X1) (42Sv1024) (03K/X1)

H I J

(Jennings 1957:112). Figures 5-17C, E, and F are also difficult to classify because they do not appear to be completed specimens. Figures 5-17H and I are probably Gypsum points (Jennings 1957:112).

The specimens shown in Figure 5-18 are all variants of the Elko point series. Specimens 5-18A, B, D, E, F, and G are Elko Side Notch and specimens 5-18C and H are Elko Corner Notch points (Jennings 1957:104, 118, 119).

Figures 5-19A, D, and F also show examples of Elko Corner Notch points. Figures 5-19B, C, and E demonstrate specimens which are too fragmentary to be confidently classified but are tentatively assigned to the Elko series.

Figures 5-20A, B, C, D, F, G, and H show examples of Elko Corner Notch points while Figure 5-20E portrays a point which is probably an Elko Corner Notch.

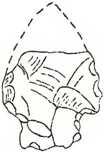
Figures 5-21A through I show examples of Elko Eared points (Aikens 1970:38, Jennings 1957:122, 124). Figure 5-21J is an example of a point frequently classified as an Elko Split Stem. However, Elko Split Stem points have many similarities to certain varieties of Pinto points (see Hester and Heizer 1973:Figure 2i).

Figure 5-22A demonstrates a specimen resembling the Northern (Bitterroot) Side Notch (Aikens 1970:37). Figure 5-22B shows an example of the newly defined Sudden Side Notch type (Holmer in Jennings et al, n.d. a).

Figure 5-23A is a specimen which is too incomplete for confident classification, but probably is a Pinto variant. A specimen resembling a Pinto variant from the Great Basin (Hester and Heizer 1973:Figure 2h) is shown in Figure 5-23B. Figure 5-23C shows a specimen which is too incomplete for classification, while Figure 5-23D resembles Elko Split Stem (or Pinto) without the basal notch (Jennings 1957:125). Figure 5-23E superficially resembles the Sandia point, but lacks basal grinding. The specimen shown in Figure 5-23F most closely resembles the Agate Basin points (Wormington 1964:142) and has basal grinding.

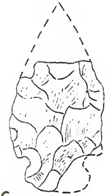
(ACTUAL SIZE)

Figure 5-16.

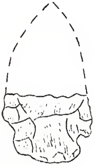


A (42Em898)

B (42Sv998)

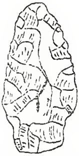


C (03C/X1)



D (03A/X6)

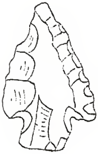
E (42Em849)



F (42Sv1016)

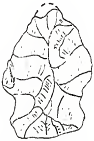
G (42Sv1018)

H (42Sv998)



I (42Em841)

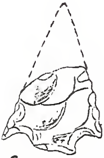
J (42Sv1009)



K (03A/X5)

A
(42Ga1410)

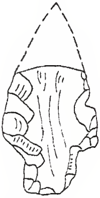
B
(03C/X22



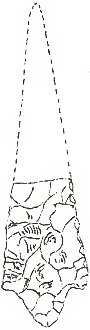
C
(42Ga1346)

D
(03A/X10)

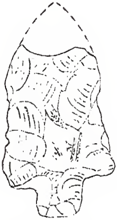
E
(03C/X21)



F
(42Em818)



G
(42Em956)



H
(42Em938)

I
(03C/X36)

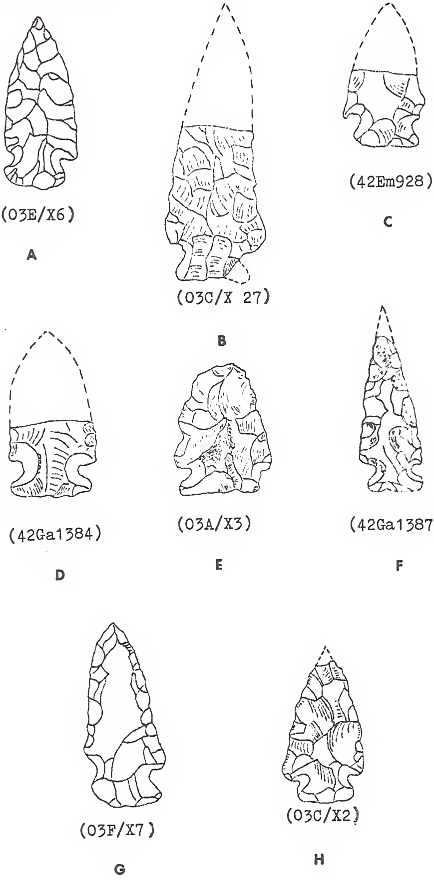
(ACTUAL SIZE)

Figure 5-17.

Figure 5-23G shows an example of an Elko Corner Notch (Jennings 1957:115), while Figure 5-23H portrays an unusual specimen for which there are no known comparable examples. Multiple notching is very rare; two specimens with double side notches were reported from Danger Cave (Jennings 1957:128). Figure 5-23I shows a specimen which resembles several examples from Danger Cave (Jennings 1957: 113). Figure 5-23J is a Cottonwood Triangular point (Hester and Heizer 1973:Figure 2j), while Figure 5-23K most closely resembles the Elko Split Stem (Pinto) without the basal notch (Jennings 1957:123). The lack of flaking may indicate that the point was not completed.

Figure 5-24 includes nine arrowpoints. All specimens except for 5-24B closely resemble Rose Spring points, a type defined for the Great Basin (Hester and Heizer 1973:Figure 4; Aikens 1970:37). The specimen shown in Figure 5-24B most likely is an Eastgate Expanding Stem point (Hester and Heizer 1973:Figure 4). Similar points are found also at Fremont and Sevier culture dwelling sites and at occupation sites in northeastern Utah (Leach 1966:Figure 19; Taylor 1954:Figure 15; Wormington 1955:Figure 32; Gunnerson 1957:Figures 9 and 14; and Marwitt 1968:Figure 52).

Figures 5-25A through D are also examples of Rose Springs points. Figure 5-25E shows an example of a newly defined type, the Bull Creek point, found at Fremont culture sites and Kayenta associated sites in south and central Utah (Lister and Lister 1961; Jennings et al, n.d. c; Aikens 1967; Taylor 1957:Figure 32d). The point shown in Figure 5-25F is nondiagnostic. Figure 5-25G is a Desert Side Notch point (Hester and Heizer 1973:Figure 5). The specimens shown in Figures 5-25H, I, and J are side notch points which are possibly variants of the Desert Side Notch type but are also found in Fremont, Sevier, and unnamed plains-derived culture sites (Schroedl and Hogan 1975:Figure 10; Marwitt 1968:Figure 52; Ambler 1966:Figure 40).



(ACTUAL SIZE)

Figure 5-18.

(ACTUAL SIZE)

Figure 5-19.

(42Ga1363)

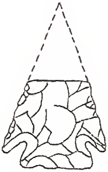
A

(42Em821)

B

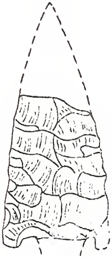
(42Em880)

C



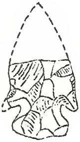
(42Em790)

D



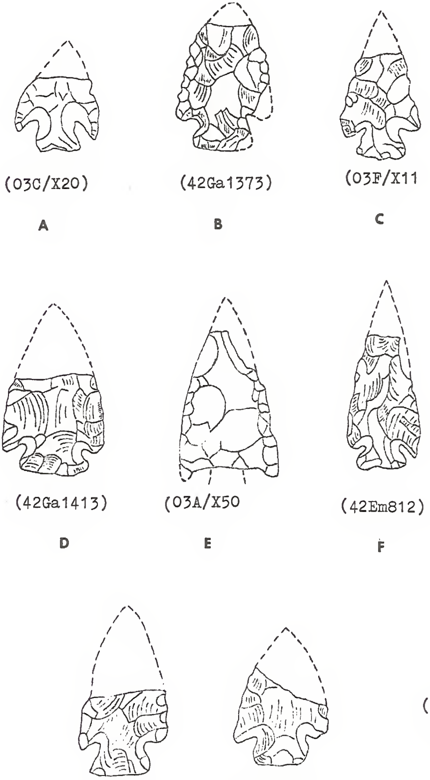
(42Ga1390)

E



(42Ga1399)

F



(03C/X20) A

(42Ga1373) B

(03F/X11 C

(42Ga1413) D

(03A/X50 E

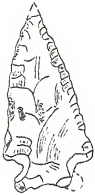
(42Em812) F

(42Em827) G

(42Sp70) H

(ACTUAL SIZE)

Figure 5-20.

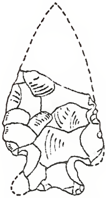


(03K/X8)

A

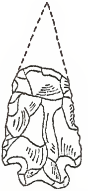
(42Em880)

B



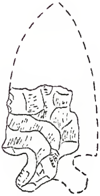
(42Ga1314)

C



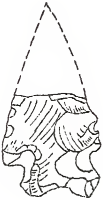
(42Em1398)

D



(03A/X2)

E



(42Cb110)

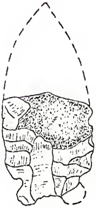
F

(03K/X12

G

(AERC 10/X2)

H



(03F/X9)

I

(42Em879)

J

(ACTUAL SIZE)

Figure 5-21.

(ACTUAL SIZE)

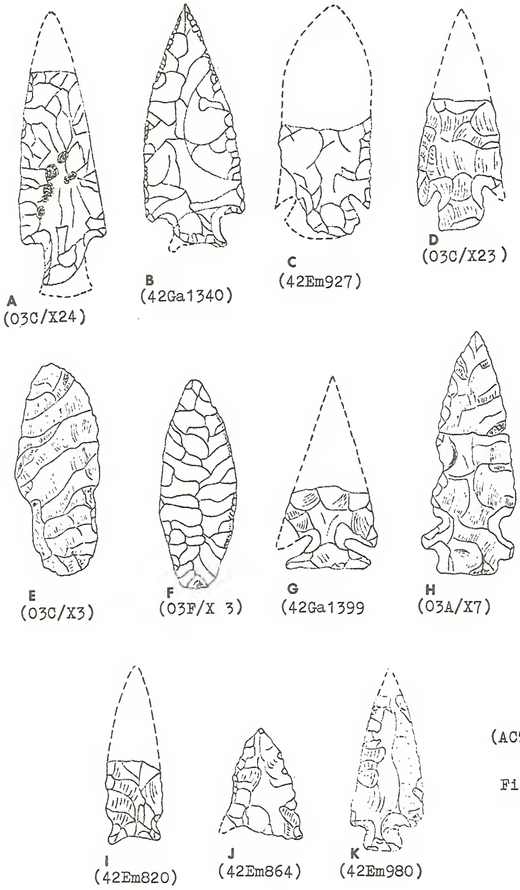
Figure 5-22.

(42Sv1007)

A

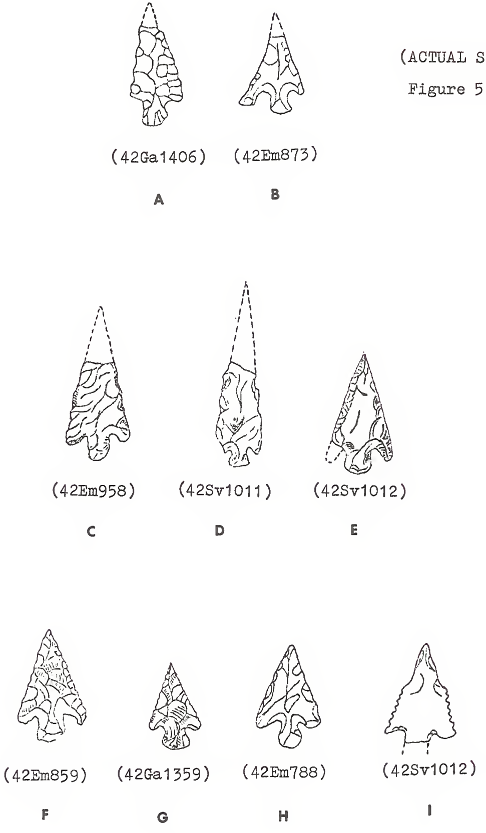
(42Em859)

B



(ACTUAL SIZE)

Figure 5-23.



(ACTUAL SIZE)

Figure 5-24.

(42Em929)

A

(42Sv1018)

B

(42Ga1390)

C

(42Em910)

D

(42Em888)

E

(03L/X2)

F

(ACTUAL SIZE)

Figure 5-25.

(42Ga1390)

G

(42Em885)

H

(42Cb102)

I

(42Ga1404)

J

MISCELLANEOUS LITHIC ARTIFACTS

Figure 5-26 shows nine miscellaneous artifacts. Figures 5-26B and F are probable projectile points while Figure 5-26C and H are hafted drills. Figures 5-26A, D, E, G, and I show examples of nondiagnostic artifacts.

Figures 5-27A, B, and C are fragmentary biface tools of uncertain use. The tools in Figures 5-27A and B are probable knives, while 5-27B is probably a knife preform.

Figures 5-28A through D show examples of biface blanks, while Figure 5-29A is a biface preform and Figure 5-29B a biface blank.

Figures 5-30A, B, and C along with Figure 5-31A are biface preforms. Figures 5-31B and C show examples of scrapers.

Figures 5-32A and B show examples of biface preforms.

Figures 5-33A, B, and C demonstrate specimens which are probably either projectile points or knife tips. The tools in Figures 5-33D, E, and F are examples of knives.

Figures 5-34A, C, and D are also examples of knives. The specimens shown in Figures 5-34B, E, F, G, and H are biface preforms.

Figure 5-35A is a perforator. Figures 5-35B, D, F, G, H, and I are knives. Figures 5-35C, E, and J are examples of biface preforms.

LITHIC ARTIFACT DISCUSSION

The projectile point typologies utilized to classify the points observed during the survey generally followed the existing classification system. However, recent analyses of Archaic projectile points from Sudden Shelter (Holmer in Jennings et al, n.d. a) and Cowboy Cave (Holmer in Jennings et al, n.d. b) have resulted in the combination of several previously separate point types and the identification of several new point types. Since Sudden Shelter is within the boundaries of the project area and Cowboy Cave is located just

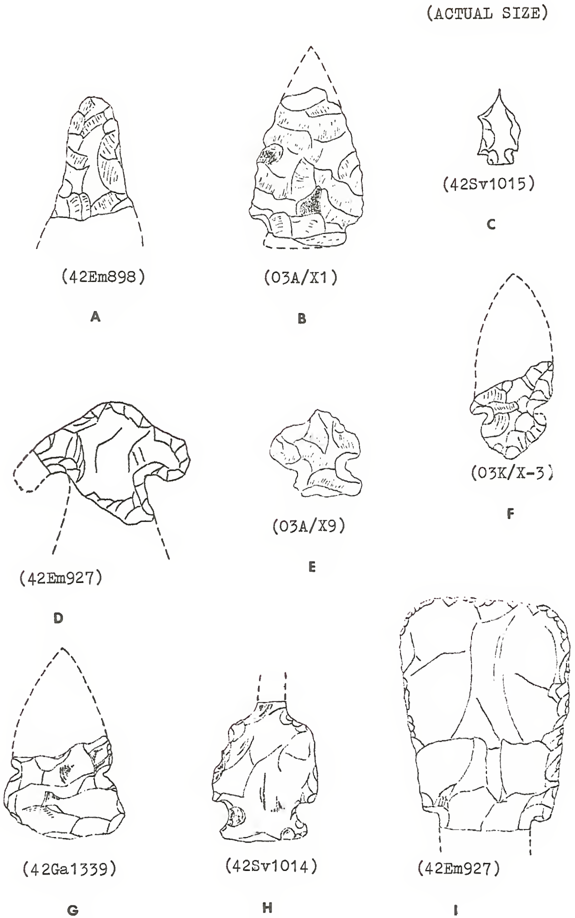
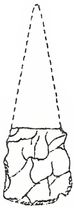

(ACTUAL SIZE)
(42Em898)
A
(03A/X1)
B
(42Sv1015)
C
(42Em927)
D
(03A/X9)
E
(03K/X-3)
F
(42Ga1339)
G
(42Sv1014)
H
(42Em927)
I

Figure 5-26.

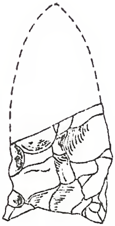
(ACTUAL SIZE)

Figure 5-27.



(42Ga745)

A



(42Ga1387)

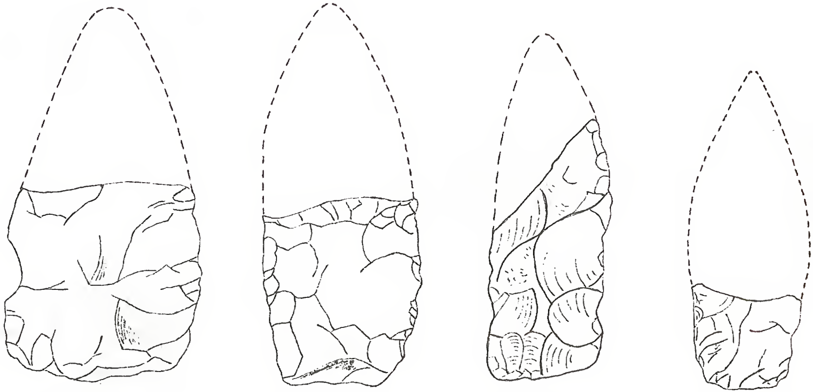
B

(42Em893)

C

(ACTUAL SIZE)

Figure 5-28.



(42Ga1346) A

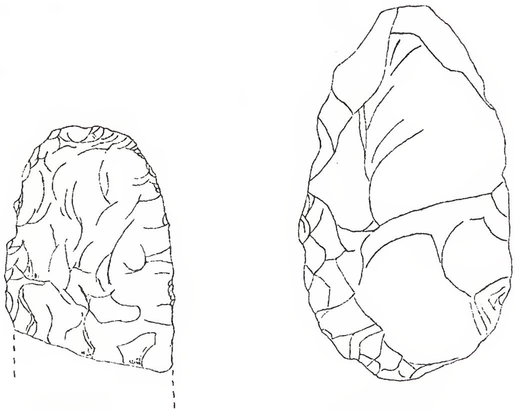
(42Em927) B

(42Em923) C

(42Sv1007) D

(ACTUAL SIZE)

Figure 5-29.



(42Em952)

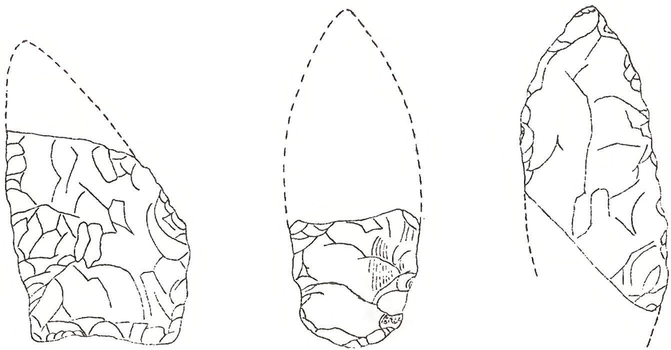
A

(42Sv1027)

B

(ACTUAL SIZE)

Figure 5-30.

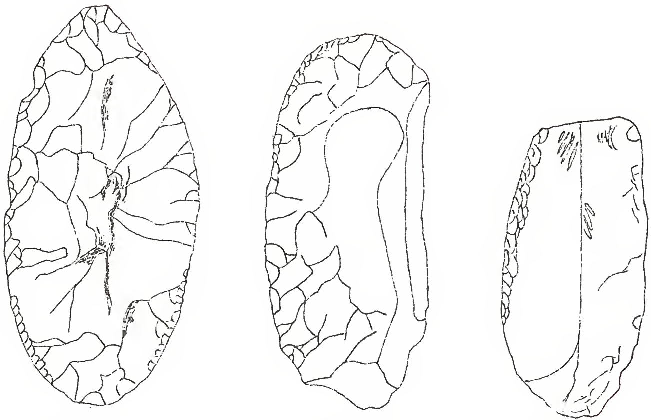


(42Em915) A

(42Sv1028) B

(42Em927) C

(ACTUAL SIZE)



(03K/X4) A

(42Sv1045) B

(03F/X1) C

Figure 5-31.

(ACTUAL SIZE)

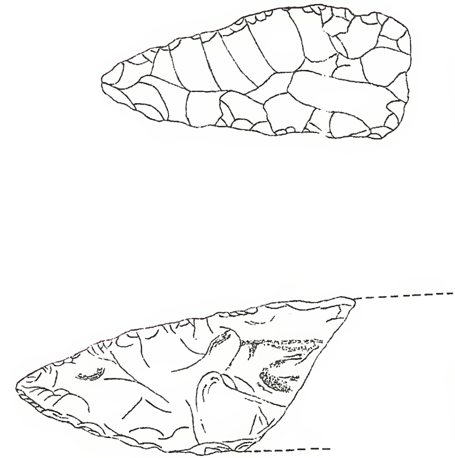


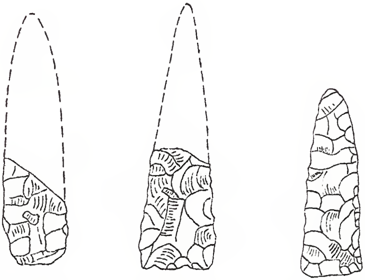
Figure 5-32.

(ACTUAL SIZE)

Figure 5-33.

(42Sv1007) (42Em864) (42Em859)

A B C

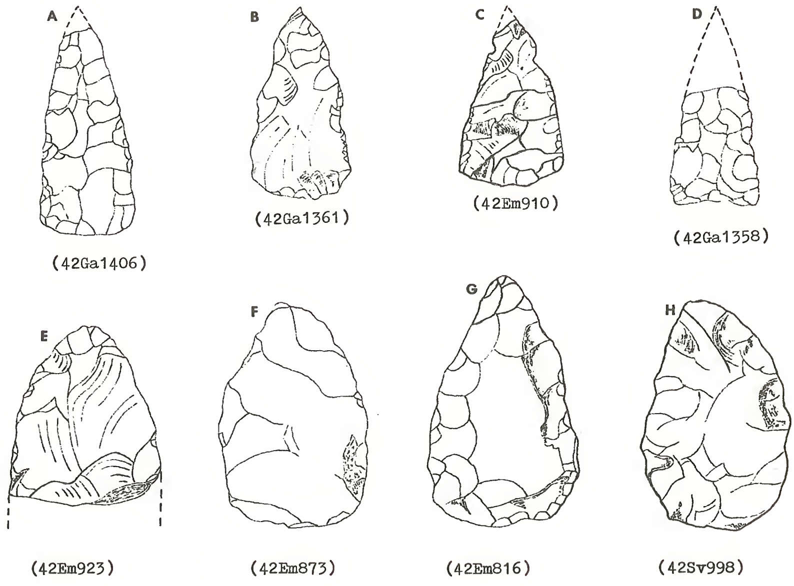


(42Em827) (42Em812) (42Ga1407)

D E F

(ACTUAL SIZE)

Figure 5-34.



(ACTUAL SIZE)

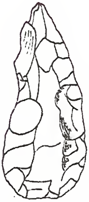
Figure 5-35.

(42Em918)

A

(03C/X4)

B



(03F/X1)

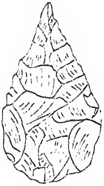
C

(42Sv1028)

D

(42Em905)

E



(42Sv1023)

F

(42Wn1062)

G

(42Em927)

H

(42Ga1368)

I

(42Em927)

J

outside the boundaries, the data from these two sites are pertinent.

Pinto Points

The Pinto point type has several varieties, the common denominator among the varieties being a wide stem. The blades on all varieties are generally triangular with straight or slightly convex blade edges, but blade length is highly variable. The stem sides may be straight or concave and the stem base may be straight or indented (Hester and Heizer 1973:Figure 2; Wormington 1964:166). According to Holmer, the Pinto points from Sudden Shelter are of the variety which has a straight sided stem with an indented base. A discriminant analysis performed by Holmer (Jennings et al, n.d. a) revealed also that the Elko Split Stem variety does not belong in the Elko Series, but in actuality is a Pinto point variety.

Although Pinto points from the Great Basin generally date from ca. 3000 B.C. to ca. 500 B.C. (Hester and Heizer 1973:31), the Pinto points from Sudden Shelter are considerably earlier. The Pinto points from Sudden Shelter were recovered from the earliest strata dated between ca. 6300 B.C. and ca. 4400 B.C. (Holmer in Jennings et al, n.d. a).

Northern Side Notch Points

The Northern Side Notch point has a wide distribution covering the Great Basin and most of Utah. Holmer (in Jennings et al, n.d. a) did a discriminant analysis to compare the Northern Side Notch type with the Bitterroot point type and discovered that he could not statistically distinguish between the two types. Holmer integrated the Bitterrot point type into the Northern type. As defined by Holmer (in Jennings et al, n.d. a), the Northern Side Notch type is characterized by a triangular blade with slightly convex edges, horizontal notches relatively high on the blade, while the proximal stem is slightly smaller than the medial blade above the notches. The base is normally concave although some examples have straight bases.

Northern Side Notch points were recovered from both Sudden Shelter and Cowboy Cave. At Sudden Shelter the Northern type was present for a short period between ca. 4450 B.C. and ca. 4700 B.C. (Holmer in Jennings et al, n.d. a). At Cowboy Cave, the Northern type was recovered from strata dating between ca. 4600 B.C. and ca. 5600 B.C. (Holmer in Jennings et al, n.d. b).

Sudden Side Notch Point

The Sudden Side Notch point type newly defined by Holmer (in Jennings et al, n.d. a), is described as follows: Triangular blade forms with slightly convex edges--the side notches are horizontal and high on the blade. The base is slightly convex and the blade edge both above and below the notches forms a smooth arc broken only by the side notches. Sudden Side Notch points were recovered from strata at Sudden Shelter dated between ca. 4500 B.C. and ca. 2700 B.C. (Holmer in Jennings et al, n.d. a). No Sudden Side Notch points were recovered from Cowboy Cave.

Elko Series Points

The Elko Series points have previously been subdivided into four varieties: side notched, corner notched, eared, and split stem. As was already discussed, the Elko Split Stem is more likely a Pinto variety.

The Elko Corner Notch point has a triangular blade with straight or slightly convex edges. The corner notches form tangs and an expanding stem. The stem is generally narrower than the blade and the stem base ranges from slightly convex to slightly concave.

The Elko Side Notch point is similar to the corner notched variety except that the stem width is roughly the same as the blade width. The distal notch angle is nearly horizontal so that tangs are rarely present.

The Elko Eared point is similar to either of the above Elko types with the addition of a shallow basal indentation or a narrow basal notch.

Elko series points were recovered from Sudden Shelter. Elko Side and Corner Notch varieties were found, but no Elko Eared specimens were recovered. Holmer subjected both of the recovered Elko varieties to analysis to determine whether or not the two varieties were really autonomous. A scattergram plotting of the edge angles did not show any clustering so Holmer concluded that there is a continuum of notch edge angles between the side notch and corner notch extremes (Holmer in Jennings et al, n.d. a).

The Elko series in the Great Basin dates from between 2000 B.C. and 1000 A.D. (Hester and Heizer 1973:31). In central and eastern Utah, however, the Elko series has a greater time depth. At Sudden Shelter, Elko points were recovered from strata dating between ca. 5900 B.C. and ca. 3900 B.C. and between ca. 2900 B.C. and ca. 2200 B.C. (Jennings et al, n.d. a). At Cowboy Cave, however, the Elko series points were recovered from strata dating between ca. 5600 B.C. and ca. 450 A.D. spanning the entire time range for the cultural deposits (Jennings et al, n.d. b). Elko points have also been recovered from numerous Fremont sites in Utah which further extends the time range of the Elko series in eastern Utah past 1000 A.D. (Leach 1966:Figure 21; Schroedl and Hogan 1975:Figure 10; Wormington 1955:Figure 33, Lindsay and Lund 1976:Figure 15). The Elko series points in Utah obviously have little value as temporal or cultural indicators.

Gypsum Points

Gypsum points are characterized by triangular blades with convex edges and wide corner notches which give the point a shouldered appearance. The stem generally tapers to a convex base. At Sudden Shelter, Gypsum points were recovered from the uppermost cultural stratum dating between ca. 2700 B.C. and ca. 1450 B.C. (Jennings et al, n.d. a).

At Cowboy Cave, Gypsum points were recovered from strata dated between ca. 4500 B.C. and ca. 450 A.D. (Jennings et al, n.d. b). Points closely resembling the Gypsum type have also been recovered from several Fremont sites (Aikens 1967: Figure 24; Lindsay and Lund 1976:Figure 15; Wilson and Smith 1976:Figure 16; and Wormington 1955:Figure 33).

Arrow Points

The Rose Spring arrow point is a small corner notched or stemmed point type which is found all over the Great Basin and eastern Utah. The Rose Spring type appears at about 400 A.D. in both the Great Basin (Hester and Heizer 1973:31) and at Cowboy Cave (Jennings et al, n.d. b). It is also common in Fremont, Sevier, and unnamed plains culture sites in Utah.

The Desert Side Notch point is characterized by a small basal notch. It appeared in the Great Basin around 1000 A.D. but was never very common east of the Wasatch Mountains.

Small side notch points are commonly found in Sevier, Fremont, and unnamed plains culture sites (Aikens 1967:Figure 24; Ambler 1966:Figure 40; Marwitt 1968:Figure 52; Schroedl and Hogan 1975:Figure 10; Taylor 1957:Figure 25; and Wormington 1955:Figure 32).

Very little work has been done with the post-Archaic point types of Utah. Although Rose Springs and side notched points are commonly found at horticultural sites all over Utah, the Bull Creek point type has a limited distribution. The Bull Creek point is a long, narrow triangular form with a concave base which varies from a shallow to a deep indentation, the latter resulting in pronounced ears. Bull Creek points have been found in association with Kayenta Anasazi sites along the Glen Canyon drainages, at Coombs Village (Lister and Lister 1961), along the Bull Creek drainage (Weder in Jennings et al, n.d. c), and at several sites between the San Rafael Swell and the Wasatch Plateau

(Aikens 1967:Figure 24; Taylor 1957:Figure 34; Wilson and Smith 1976:Figure 16).

Ceramics

A total of 159 sherds were recovered from 33 sites, the majority being typed as Snake Valley gray (46.5%) followed by Emery gray (45.9%). The remaining 7.6% include four Shoshonean fragments from sites 42Sv1050 and 42Cb106, three Ivie Creek black-on-white sherds from 42Em880, two Uintah gray sherds from 42Cb102, and one sherd each of Tusayan corrugated (42Cb106), Sosi black-on-white (42Sv1025) and Snake Valley black-on-gray (42Sv1020). Madsen (1977), Colton (1955), and Colton and Hargrave (1937) were used as references during the identification of ceramic types.

SNAKE VALLEY GRAY AND BLACK-ON-GRAY

Seventy-four sherds of Snake Valley gray and one black-on-gray sherd were collected from a total of 23 sites, most of which (65%) also contained Emery gray sherds as represented in the collection. The Sosi and Ivie Creek sherds were picked up on sites which contained both Snake Valley gray and Emery gray ware.

EMERY GRAY

Seventy-three Emery gray sherds were recovered from a total of 23 sites. The range in temper, size, and appearance was found to vary greatly among these specimens. A minority contained large, dark gray basaltic temper particles which contrasted with the sherd's lighter core color and paste texture. The majority of Emery gray sherds had medium to light gray basalt tempers which had less contrast with their cores, but were generally easily distinguishable from the gray quartzitic tempers of the Snake Valley gray type. The darker basalt tempered sherds probably fall within the Sevier gray range of variation and if recovered from west of the Wasatch Mountains on sites where a predominance of Sevier gray is found, they would probably be typed as a lighter variation of the Sevier gray.

KAYENTA CERAMICS

The intrusive Tusayan corrugated and Sosi sherds are intrusive from the Southwest and temporally range from A.D. 900 through 1300. The Tusayan corrugated fragment was recovered from an association with a Shoshonean gray sherd.

Chapter 6

SYNTHESES OF CLASS I AND CLASS II DATA

The purpose of this chapter is to combine the cultural and environmental information gathered from the archives and records during the Class I research with similar data compiled during the RG-II field research period.

A variety of environmental and site type correlations are provided for an aggregate of 2,152 historic and prehistoric sites in Part A.

Part B follows with a discussion of site type distributions within each planning unit. Overall trends in site distribution throughout the project area are also provided.

The correlation of Class I and Class II into an overview of site density in the study area is presented in Part C.

A general statement concerning temporal-spatial change in the project area as identified by the RG-I and RG-II research phases is developed in Part D. This discussion utilizes site distribution maps to show apparent cultural activity patterns for the specific cultures that have inhabited this general locality.

In Part E, sample areas which were devoid of cultural materials or sites are coordinated with those sample areas where known sites exist. This correlation provides an additional basis for understanding the presence and absence of human activity in specific localities.

Part A: Environmental and Site Type Correlations

Combining results from the Class I literature search (RG-I) and Class II field survey (RG-II) surveys provides interesting information which must be used with great care. The combined information should not be used for inferential/predictive purposes, because the Class I information cannot be assumed to be the result of random sampling. The Class I data was gathered through biased sampling and intensive survey projects. These projects involved both construction-related archeological surveys, in which nonrandom factors dictated the survey location, and occasional archeological field trips, where students were taken to specific localities in order to teach survey and recording methods. Therefore, general site prediction can only be based on the information gathered during the RG-II random sample survey.

The type of surveys reflected in the RG-I data appears to demonstrate a strong research and reporting bias in favor of higher order site types, i.e., camps and habitation sites. This is because of the common tendency to conduct nonintensive surveys in a nonrandom fashion and in the most "likely" areas where camps and habitation sites can be found. Also amateur collectors tend to report camp and habitation sites, and ignore low order lithic scatters, hunting sites, etc. Therefore, a summary of the total Class I and Class II data is presented with the expectation that as further systematic random surveys add to the data base, the biases will be cancelled out and the accrued information will be cancelled out and the accrued information will then be more useful for predictive purposes.

Combining data from both the Class I and Class II surveys allows for a complete synthesis of all known sites with regard to environmental factors. The relationship between site-types and vegetation, geology, geomorphology, elevation, and rainfall are discussed for the aggregate 2,152 sites.

VEGETATION

Some 396 sites, or 18 percent of the total, are in the arid, desert shrub ecozone. They are divided rather evenly between the four desert shrub sub-zones: greasewood, salt brush, shadscale, and black brush-Mormon tea. The first three sub-zones have a variety of site types; approximately half are camp and habitation sites (128). The fourth sub-zone in contrast to the other three, has primarily lithic scatters and quarries, with very few (10) camp and habitation sites.

The big sage ecozone has almost exactly the same number of sites as the desert shrub ecozone, with 410 sites (19%). Similarly, approximately half are camp and habitation sites, and most of the rest are lithic scatters. Temporary camps are the most significant in numbers with 140 examples (32%).

The pinyon-juniper ecozone has 48 percent of all known sites in the project area. These 1,035 sites represent the entire range of site types, and include 52 percent of all the temporary camps, 53 percent of all the extended camps, and 27 percent of all the single and multiple habitation sites in the CCP area. This ecozone also includes 64 percent of all the lithic scatters. Within this concentration of sites in the pinyon-juniper ecozone, there is a further concentration in the mixed pinyon-juniper sub-zone. In fact, only some 17 percent of the pinyon-juniper sites are in juniper or pinyon sub-zone .

The remaining three ecozones have few sites. There are 41 sites (2% of the total) in the mountain brush ecozone, 64 sites (3%) in the montane ecozone, and only 4 sites (00.1%) in the alpine, mountain meadow zone. These are mostly lithic scatters, although most site types are represented in mountain brush. Temporary camps are common to the three zones, while rockshelters are most abundant, with a total of 11, all found in the montane zone.

A summary by site type indicates that lithic scatters are distributed among the ecozones, with some 16 percent in desert shrub, 12 percent in big sage, 63 percent in pinyon-juniper, and the rest in the other zones. Hunting sites are most important in the pinyon-juniper zone, with 75 percent of these sites in that zone. Kill-butchering sites also concentrate in the pinyon-juniper zone, with over 83 percent of them in that zone. Quarry sites, on the other hand are 48 percent in desert shrub, 18 percent in big sage, and 34 percent in pinyon-juniper.

Temporary campsites are associated with the ecozones in the following way: 32 percent in big sage, some 14 percent in desert shrub, and 52 percent in pinyon-juniper. Extended camps are 31 percent in desert shrub, 14 percent in big sage, and 53 percent in pinyon-juniper. Single habitation sites are 37 percent in desert shrub, 30 percent in big sage, and 30 percent in pinyon-juniper. Multiple habitation sites are 41 percent in desert shrub, 35 percent in big sage, and 23 percent in pinyon-juniper. Rockshelters are 16 percent in desert shrub, 29 percent in big sage, 46 percent in pinyon-juniper, and the rest in higher elevation ecozones.

Another finding demonstrating the heavy utilization of the pinyon-juniper ecozone is that 59 percent of the petroglyphs are in pinyon-juniper ecozones while only 21 percent were recorded in big sage zones, and 19 percent in desert shrub.

The above figures do not reflect 222 previously recorded sites which lack vegetational data.

GEOLOGY

A total of 329 sites (15% of the total) are on alluvial or aeolian materials of Quaternary age. Of those, 52 percent are camp or habitation sites, including 62 temporary camps, 44 multiple habitation sites, 31 single habitation sites, 18 extended camps, and 15 rock shelters.

Another 35 percent (116 sites) are lithic scatters.

There are 89 sites (4% of the total) on Quaternary gravels, mostly pediment gravels. Of these, 45 percent are camp and habitation sites, and 37 percent are lithic scatters. Although there is not a large percentage of the total sites associated with other Quaternary formations, slightly over half are camp or habitation sites, indicating that Quaternary materials in general are relatively favorable for containing high intensity use sites.

The next formation with a significant number of sites, is the Parachute Creek member of the Tertiary Green River formation. It has 101 sites (4.7%), of which 38 are petroglyphs (37%), and 32 are camps or habitations (32%).

Materials of Cretaceous age provide locations for a high proportion of sites within the CCP area. There are 99 sites in the North Horn formation; however, only 68 are lithic scatters, and only 19 (19%) are camps or habitations. There are 66 sites in the Price River formation. They also include a preponderance of lithic scatters (59%). Both of these formations primarily occur at higher elevations where permanent, prehistoric habitations are rarely found.

Various members of the Mancos Shale formation were significantly utilized. The Masuk formation only has 49 sites, but 55 percent are camps and habitation sites. In contrast, the more favorable Emery sandstone has 214 sites, 73 percent of which are camp and habitation sites (including 135 temporary camps). Only 24 percent are lithic scatters. The Blue Gate sandstone has fewer sites, only 122, of which 47 percent are camps and habitations. The Ferron sandstone, which comes next in age, has the most sites of all, 234, but a smaller percentage are camps and habitations when compared with the Emery sandstone (55%). The lower Tununk shale has only 54 sites, but significantly, 43 percent are camps and habitations. Thus, next to Quaternary deposits, the Cretaceous formations are most productive of sites. Since

Cretaceous formations also contain extensive coal resources, future coal development in those formations has a high potential for adversely affecting valuable cultural resources.

The Cedar Mountain formation is transitional between the Cretaceous and Jurassic ages. It has 42 sites, some 2 percent of the total. About 55 percent are lithic scatters, and one-third are camp and habitation sites.

Of the formations of Jurassic age, both the Morrison and Entrada contain a significant number of sites. There are 119 sites in the Morrison formation. Of those, 47 percent are camp and habitation sites. The Entrada sandstone has 68 sites, with only 26 percent camps and habitations, but with 25 percent quarries.

Other older formations, including Navajo sandstone and the Kayenta formation, have about one-third of their relatively few sites as camp and habitation sites, an equal number having lithic scatters, and about one-fourth containing petroglyphs, with the remainder consisting of miscellaneous types.

Major relationships summarized according to site type include the fact that 20.7 percent of the lithic scatters are in Quaternary materials, and 27.8 percent are in the Mancos shale. About 44 percent of the hunting sites are in Quaternary deposits, 17.6 percent in the North Horn formation, and only 5.9 percent in Mancos shale. Kill-butchering sites have a similar distribution pattern. Over 26 percent of the quarries are in Quaternary material, with 24 percent in Entrada sandstone, and the rest widely scattered.

Temporary camps are primarily found in Quaternary materials (17.8%), and Mancos shale (59%). A different distribution occurs for extended camps, with 43 percent in Quaternary deposits, and 33 percent in Mancos shale. Single habitations are 35 percent in Quaternary, and 34 percent in Mancos shale formations. Multiple habitation sites are half in Quaternary and 24 percent in Mancos shale. There is also a significant concentration in Entrada sandstone, which contains 7.6 percent of all multiple habitation sites.

GEOMORPHIC FEATURES

The two most important land-form locations are ridges and drainage channels. A total of 28.5 percent of all sites are on ridges. Of those, 53 percent are camp and habitation sites, with 37 percent of this figure including temporary camps. These camp sites are 46 percent of all temporary camps reported to date. Lithic scatters make up 39 percent of ridgetop sites. A significant number of all kill-butchering (31%), quarry (22%), hunting sites (18%), and burials (37.5%), are also on ridges.

A total of 22.3 percent of all sites are associated with drainage channels. Just over half of those are camp and habitation sites, including 27 percent of all temporary camps, 39 percent of all extended camps, 26 percent of all multiple habitations, and 21 percent of all rockshelters. Drainages are also significant locations for petroglyphs (21%), and hunting sites (24%), as well as having their share of lithic scatters (32%).

The next most important geomorphic locations involve mesa and plateau tops, which contain 8.5 percent of the total sites. Of those, 63 percent are lithic scatters, and 32 percent are camp and habitation sites. Mesa tops are closely followed by hill locations, which have 8.4 percent of the total. These are 58 percent lithic scatters, and 27 percent camps and habitations. Twenty-one percent of all quarries are also on, or associated with, hilltop locations. The faces of steep slopes and escarpments contain 7.8 percent of the total sites. These include half of all the petroglyph sites in the CCP, as well as 27 percent of all rockshelters. Of these sites, 42 percent are camps and habitation sites.

Other geomorphic locations include benches and terraces. Terraces have 5.4 percent of all sites, a third of which are lithic scatters, and 46 percent of which are camps and habitations. Benches are next in importance, with 5.2 percent of all sites, 47 percent of which are lithic scatters, and 31 percent of which are camps and habitations.

No other geomorphic location has as many as 5 percent of the total sites, although hillocks, with 3.9 percent, appear to be important as living locations, with 41 percent of their sites as camps and habitations. Rims, with 3.8 percent of the total, are significant for hunting and kill-butchering sites, with 17.6 percent and 18.8 percent respectively.

Alcoves have 1.8 percent of the total sites, and almost 68 percent of those are habitation sites, mostly rockshelters. Saddles have 1.3 percent of the total, one-third of which are temporary or extended camps. Desert pavement follows, with 0.8 percent of all sites, and then seeps, with 0.5 percent of all sites. About half of the sites in these two categories are habitation or camp sites. About 1.3 percent of all sites occur in other miscellaneous geomorphic locations. These sites are 83 percent lithic scatters.

A summary by site types indicates that lithic scatters are most prominent in drainages (18%), mesa tops (13%), ridges (28.5%), and hills (12%), with a few examples in each of the other landform features. Hunting sites are most common on rims (17.6%), in drainages (23.5%), on ridges (17.6%), and on hills (11.8%). Kill-butchering sites are 18.8 percent on rims, and equal percentage in drainages, 31.3 percent on ridges, and 12.5 percent in saddles. Quarries occur mostly in drainages (13.2%), ridges (22%), terraces (12%), and on hills (20.6%).

Continuing with camps and habitation sites, it can be noted that 27 percent of all temporary camps are associated with drainages, and 46 percent are on ridges, with the rest in a variety of locations. Almost 39 percent of the extended camps are on drainages, 18 percent on ridges, and 12 percent on hillocks. Single habitations occur most frequently on drainages (15.7%), on ridges (29.4%), on hillocks (10.8%), and on hills 11.8%). Multiple habitations are found on drainages (25.6%), mesa tops (9.8%), on ridges (30.5%), and hills (9.8%). Rockshelters are predominantly located on escarpments (27%), drainages (20.9%), ridges (12.2%), and in alcoves (12.8%).

Other site types include petroglyphs, of which 50 percent are on escarpment or rim faces; 21 percent are associated with drainages, and most of the rest on benches (7.3%), and terraces (9.1%). A total of 37.5 percent of all burials are in drainages, and a like number on ridges, with 6.3 percent on benches, hillocks, and hills respectively. Other site types are too few from which to make generalizations.

RAINFALL

Correlations between site type and annual rainfall provide the following information: Lithic scatters occur in areas with as little as 6 inches (152 mm.) of rain to as much as 33 inches (838 mm.). They are concentrated, however, between 6 and 16 inches (152 to 406 mm.). Hunting sites occur more frequently at wetter locations, mostly from 12 inches (304 mm.), or 35 percent of this site types, to 18 inches (457 mm.) and at some high altitude locations to 30 inches (762 mm.). Kill-butchering sites have similar distribution.

There is a clustering of most site types, including quarries, temporary and extended camps, and single and multiple habitations in the 8 to 16 inch (203 to 406 mm.) rainfall regions. The 8 to 10 inch area (203 to 254 mm.) seems especially significant, containing over 53 percent of all sites in the CCP area.

Summer rainfall ranges from 3 to 10 inches (76 to 254 mm.) throughout the region. Sixty-four percent of all sites are in the 4 to 5 inch (101 to 127 mm.) range, and almost 91 percent of all sites are in the 3 to 6 inch area

(76 to 152 mm.). Lithic scatters, hunting sites, and kill-butchering sites extend into the wetter, higher elevations.

The above summary of the relationships between site type and environmental factors has not considered the relative amount of area involved within each environmental region. Obviously there are not many sites in geologic formations which occupy only small areas. Further evaluation requires more extensive cultural and environmental data.

Part B: Site Type Distribution by Planning Unit

The purpose of this section is to examine the distribution of Class I and II archeological site types among the planning units of the project area. (Site type units outnumber actual archeological sites, which may include evidence of more than one activity or cultural function.)

Table 6-1 shows by row the site type density and relative percentages of site types in each planning unit. For example, in the top row, pertaining to the Book Mountain Planning Unit, the site type density is 0.96, and 32.9% of its site types are lithic scatters, etc. In each vertical column, these statistics are grouped according to site type density and site type. In the column under lithic scatter, for example, 32.9% of the site types in the Book Mountain Planning Unit are lithic scatters, 31.4% in the Forest Planning Unit, and so on.

To see how site type density and site type percentage in each case vary in relation to each other, correlation coefficients between column sets were calculated. The more statistically significant results are shown in Figure 6-1. What this means in the case of a positive correlation is that as one variable increases or decreases, so does the other. Where the correlation is negative, one variable increases as the other decreases. The significance level expresses the probability of these correlations occurring by chance.

The findings shown in Figure 6-1 are reflected in the planning units as follows:

BOOK MOUNTAIN PLANNING UNIT

Of the archeological site types in the project area, 3% are in the Book Mountain Planning Unit (73 site types), ranking it seventh in number of site types among the thirteen

Table 6-1 Site-type statistics	Density (site-types/ 10,000 acres)	Lithic Scatter	Hunting	Kill/ Butchering	Quarry	Temporary Camp	Extended Camp	Single Habitation	Multiple Habitation	Petroglyph	Burial	Ceremonial	Rock Shelter	* Totals
Book Mountain	0.96	24 site-types 32.9%	1 1.4%	0 0%	1 1.4%	2 2.7%	0 0%	5 6.8%	8 11.0%	13 17.8%	0 0%	0 0%	11 15.1%	73
Forest	40.72	106 31.4%	0 0%	2 0.6%	9 2.7%	177 52.4%	9 2.7%	11 3.3%	17 5.0%	1 0.3%	1 0.3%	0 0%	3 0.9%	338
Henry Mountains	5.01	167 32.7%	1 0.2%	6 1.2%	30 5.9%	90 17.6%	38 7.4%	49 9.6%	44 8.6%	19 3.7%	7 1.4%	0 0%	28 5.5%	511
Huntington	2.05	15 45.5%	0 0%	0 0%	1 3.0%	3 9.1%	1 3.0%	2 6.1%	5 15.2%	4 12.1%	0 0%	0 0%	0 0%	33
Last Chance	2.50	13 31.7%	0 0%	0 0%	3 7.3%	3 7.3%	0 0%	7 17.1%	4 9.8%	2 4.9%	0 0%	0 0%	6 14.6%	41
Muddy	9.78	83 23.6%	0 0%	0 0%	20 5.7%	112 31.9%	15 4.3%	15 4.3%	20 5.7%	28 8.0%	3 0.9%	2 0.6%	42 12.0%	351
Price River	2.31	32 47.8%	0 0%	3 4.5%	1 1.5%	10 14.9%	1 1.5%	1 1.5%	4 6.0%	3 4.5%	1 1.5%	0 0%	5 7.5%	67
Range Creek	3.94	18 10.0%	0 0%	0 0%	0 0%	15 8.3%	1 0.6%	17 9.4%	8 4.4%	54 30.0%	1 0.6%	1 0.6%	39 21.7%	180
Summerville	1.66	10 25.6%	0 0%	3 7.7%	7 17.9%	3 7.7%	0 0%	2 5.1%	1 2.6%	8 20.5%	0 0%	0 0%	2 5.1%	39
Wattis	3.72	5 11.1%	0 0%	0 0%	0 0%	1 2.2%	0 0%	0 0%	27 60.0%	1 2.2%	0 0%	0 0%	0 0%	45
Forest Central	2.94	54 52.4%	3 2.9%	1 1.0%	2 1.9%	3 2.9%	2 1.9%	5 4.9%	4 3.9%	5 4.9%	0 0%	0 0%	19 18.4%	103
Forest North	1.72	9 29.0%	1 3.2%	0 0%	1 3.2%	7 22.6%	0 0%	0 0%	2 6.5%	0 0%	0 0%	0 0%	0 0%	31
Forest South	16.24	289 70.7%	8 2.0%	7 1.7%	6 1.5%	39 9.5%	13 3.2%	14 3.4%	10 2.4%	3 0.7%	1 0.2%	2 0.5%	9 2.2%	409
Overall numbers and percentages of site-types		825 37.1%	14 0.6%	22 1.0%	81 3.6%	465 20.9%	80 3.6%	128 5.8%	154 6.9%	141 6.3%	14 0.6%	5 0.2%	164 7.4%	2221

*Totals in this column include the additional site-types of the remaining site-type categories (all historical) whose numbers were too few to be meaningfully included in the correlations between column-sets.

Table 6-1. Site-type statistics

1. A positive correlation exists (.806) for site density and temporary camps.

   t = 4.52 Significance level - .1%

2. A positive correlation exists (.693) for kill-butchering site types and quarries.

   t = 3.19 Significance level - 1%

3. A positive correlation exists (.560) for petroglyph site types and rock shelters.

   t = 2.24 Significance level = 5%

4. A positive correlation exists (.549) for single habitations and rock shelters.

   t = 2.18 Significance level = 5%

5. A negative correlation exists (-.417) for lithic scatters and petroglyph site types.

   t = 1.52 Significance level - 20%

6. A negative correlation exists (-.415) for lithic scatters and multiple habitations.

   t = 1.51 Significance level - 20%

Note: In standard fashion, the correlation coefficient (r) between column-sets was calculated according to the formula

$$r = \frac{N\Sigma XY-(\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2-(\Sigma X)^2}\sqrt{N\Sigma Y^2-(\Sigma Y)^2}}.$$

Here, in the comparison between column-sets, X represents the values of one column-set, Y represents the values of the other column-set, and N equals the number of individual values in a column set.

The designation t refers to the t distribution in statistics. This value was calculated by the formula

$$t = r\,\frac{\sqrt{N-2}}{\sqrt{1-r^2}}$$

, where r is the correlation coefficient and N is again the number of individual values in a column-set.

The significance level was determined from a table of the t distribution shown as Table III in Statistical Tables for Biological, Agricultural, and Medical Research by Fisher & Yates.

Figure 6-1. Significant statistical correlations between sets of variables pertaining to site type density and various cases of site type percentages.

planning units. Still lower is the relative site type density, ranking thirteenth.

Along with its relatively low site type density, the Book Mountain Planning Unit is distinguished by relatively few temporary camps, only 2.7% as compared to 20.9% overall. Also, there are no extended camps (4% overall), an unusually high percentage of petroglyph site types (17.8% versus 6.3% overall), and a higher-than-average percentage of rockshelters (15.1% versus 7.4% overall).

FOREST PLANNING UNIT

Fifteen percent of the archeological site types in the total project area (338 site types) are in the Forest Planning Unit. It ranks fourth overall in number of site types; but in site type density, it ranks first. These facts are of special interest because the Forest Planning Unit is the smallest of the thirteen units.

Characteristic of the Forest Planning Unit, in addition to its relatively high site type density, is an unusually high percentage of temporary camps (52.4% versus 20.9% overall), relatively few petroglyph site types (.3% versus 6.3% overall), and a low percentage of rockshelters (.9% versus 7.4% overall).

HENRY MOUNTAINS PLANNING UNIT

With 23% of the archeological site types in the project area (511 site types), the Henry Mountains Planning Unit has more site types than any other unit. Relatively large in size, however, it ranks fourth in relative site density.

Except for slightly high percentages of quarries (5.9% versus 3.6% overall), extended camps (7.4% versus 3.6% overall), and single habitations (9.6% versus 5.8% overall), the percentages of site types in this planning unit are similar to those of the overall project.

HUNTINGTON PLANNING UNIT

The Huntington Planning Unit is next to the lowest unit in number of archeological site types, with only 1% of the total (33 site types). In relative site type density, it ranks somewhat higher at tenth.

Even with so few site types, so that only a slight change in numbers markedly alters their percentages, the proportion of site types in the Huntington Planning Unit is generally like that for the total project. The only exception of possible significance is the low percentage of temporary camps (9.1% versus 20.9% overall).

LAST CHANCE PLANNING UNIT

Also near the bottom in number of archeological site types (tenth overall) is the Last Chance Planning Unit, with 2% of the total for the project area (41 site types). Relative site type density is also low, ranking eighth. For the proportion of site types, there is no significant difference between the Last Chance Planning Unit and the project area as a whole.

MUDDY PLANNING UNIT

The Muddy Planning Unit has 16% of the archeological site types in the project area (351 site types). It ranks third overall in number of site types and also in site type density. There are no significant differences in the proportion of site types in the Muddy Planning Unit and in the project area as a whole.

PRICE RIVER PLANNING UNIT

Only 3% of the archeological site types in the survey area are in the Price River Planning Unit (67 site types). In number of site types it ranks eighth overall, and in site type density it ranks ninth.

Generally, there is parity in the proportion of site types in the Price River Planning Unit and in the project area overall, although in the planning unit, the percentage of kill-butchering site types is high (4.5% versus 7% overall), and the percentage of single habitations is low (1.5% versus 5.8% overall). The significance of these differences is lessened, however, not only by the few sites in the Price River Unit, but also by the few sites of each type.

RANGE CREEK PLANNING UNIT

The Range Creek Planning Unit, with 8% of the total number of archeological site types in the project area (180 site types), ranks fifth in number of sites as well as in site type density.

Characteristics of the proportion of site types of the Range Creek Planning Unit include low percentages of lithic scatters (10% versus 37.1% overall), temporary camps (8.3% versus 20.9% overall), and extended camps (.6% versus 3.6% overall). Also, there are high percentages of single habitations (9.4% versus 5.8% overall), petroglyph site types (30% versus 6.3% overall), and rockshelters (21.7% versus 7.4% overall). There are, in fact, more petroglyph site types (38% of the total) and rockshelters (24% of the total) in the Range Creek Planning Unit than in any other unit.

SUMMERVILLE PLANNING UNIT

Of the total archeological site types in the project area, 2% are in the Summerville Planning Unit (39 site types). It ranks eleventh in number of site types and twelfth in site type density.

Distinctive percentages of site types characterizing the Summerville Planning Unit include a high kill-butchering percentage (7.7% versus 1% overall) and a low multiple habitation percentage (2.6% versus 6.9% overall). These differences, however, probably stem from so few site types in the planning unit. Possibly of greater significance (in accord with larger numbers of site types for the control unit in some cases, and high percentages of site types for the project area in others), is a high percentage of quarries (17.9% versus 3.6% overall), and petroglyph site types (20.5% versus 6.3% overall), and a low percentage of temporary camps (7.7% versus 20.9% overall). Also, there are no extended camps while the overall percentage among planning units is 3.6%.

WATTIS PLANNING UNIT

The Wattis Planning Unit ranks ninth in number of site types but sixth in site type density. Only 2% of the archeological site types in the project area are in this planning unit (45 site types).

Differences between the proportion of site types at the unit level and for the project overall are widespread, and probably stem from so few site types in the planning unit. Comparatively low are lithic scatters (11.1% versus 37.1% overall), temporary camps (2.2% versus 20.9% overall), and petroglyph site types (2.2% versus 6.3% overall). Also, there are no extended camps (as compared with 3.6% overall), no single habitations (contrasting with 5.8% overall), and no rockshelters (against 7.4% overall). Comparatively numerous are Historic Period multiple habitations (60% versus 6.9% overall), and historic mines (19% against .7% overall, approximately). About fifty-six percent of the mines in the project area are in the Wattis Planning Unit.

FOREST CENTRAL SAMPLING STRATUM

Five percent of the archeological site types in the project area are in the Forest Central Sampling Stratum (103 site types), giving it an overall ranking of sixth in number of site types. In relative site type density, it ranks seventh.

The Forest Central distribution of site types is distinguished by a relative lack of temporary camps (2.9% versus 20.9% overall), and a high percentage of rockshelters (18.4% versus 7.4% overall).

FOREST NORTH SAMPLING STRATUM

Of the archeological site types in the project area, 1% are in the Forest North Sampling Stratum (31 site types). It is the unit with the fewest site types, and ranks eleventh in site type density.

The Forest North proportion of site types is characterized by a relatively large percentage of historic mines (9% versus .7% overall, approximately). Despite the relatively few archeological site types in this sampling stratum, its mines constitute about 19% of the total for the project area, and its cabins amount to about 36% of the total.

FOREST SOUTH SAMPLING STRATUM

About 18% of the archeological site types in the project area are in the Forest South Unit (409 site types), ranking it second overall both in number of site types and in site type density.

Unusually abundant in the Forest South Planning Unit are lithic scatters (70.7% versus 37.1% overall). Also, the majority of the hunting site types in the project area (57% of the total) are in the Forest South Sampling Stratum, as well as a disproportionate percentage of the kill-butchering site types (32% of the total). Low in relative frequency in the Forest South Planning Unit are quarries (1.5% versus 3.6% overall), temporary camps (9.5% versus 20.9% overall), single habitations (3.4% versus 5.8% overall), multiple habitations (2.4% versus 6.9% overall), petroglyph site types (.7% versus 6.3% overall), and rockshelters (2.2% versus 7.4% overall).

From a statistical correlation between sets of variables pertaining to site type density and various cases of site type percentage, a number of general trends have been noted as summarized in Figure 6-1. The validity of these trends, however, rests on (1) the effectiveness of the sampling technique for field research; (2) the establishment of valid site categories; (3) the thoroughness of the survey; (4) data analysis proficiency; and (5) the number of site types in each planning unit (where more site types are involved, site type percentages are more reliable). Points 1 through 4 were the responsibility of both previous and AERC researchers, and during this project, every effort has been made to satisfy these requirements. But still, much of the data has been gathered from Class I research, making the validity of the above mentioned trends difficult to evaluate. Thus, they remain only within the realm of possibility and should be treated with caution.

One other point deserves mentioning. A high positive or negative correlation does not mean a cause and effect relationship between variables. This is not to say, however, that such is never the case, but often it is necessary to look further for causality. It is within this realm that geography can be important as an enveloping framework for approaching explanation.

Part C: Correlation of Research Data on Site Density

The research results of the Class I and Class II surveys can be combined in the form of tables for evaluating known site density in the study area. Table 5-1 demonstrates the site densities in each planning unit related to the Class II sites found in the surveyed sample areas. A basic comparison can be made in each planning unit between the total number of sites known prior to this investigation (Class I data) and the intensive survey results (Class II data).

A basic correlation of Class I data by site density according to the total acreage of each planning unit is shown in Table 6-2. This table indicates that the Forest (BLM) and Forest South (USFS) planning units are in gross acreage estimates of higher site density than the other units. These results of Table 6-2 are partially comparable with the density results shown in Table 5-1 for the Henry Mountain, Muddy, Wattis, and Forest North (USFS) Planning Units. The comparability of these units on both tables suggests that the known cultural resource potential of each unit (Class I data) is similar to the site potential suggested by the sample area results. The disparity in results between Tables 5-1 and 6-2 for the Forest (BLM), Last Chance, Range Creek, and Forest South (USFS) Units indicates that the site potential shown in the sample survey is lower than the previously known cultural resource potential (Class I data) of these units. This means that the past, non-sampling survey techniques carried out in these units indicate more density potential per acre than was identified in the sample survey. Conversely, the lower densities shown in Table 6-2 suggest that the previous archeological research (Class I data) in the Book Mountain, Huntington, Price River, Summerville, and Forest Central (USFS) Units indicates a higher potential for cultural resources was demonstrated during the sample survey. The

Planning Unit	Total Acres	Total Sites (Class I)	% of Sites per Acre	Site Totals per 10,000 Acres	Density Ratings
Book Mtn.	964,000	40	.004	.4	L
Forest	124,000	306	.246	24.6	VH
Henry Mtn.	1,294,000	373	.028	2.8	ML
Huntington	233,000	25	.010	1.0	L
Last Chance	185,000	41	.022	2.2	ML
Muddy	464,000	289	.062	6.2	MH
Price River	367,000	14	.003	.3	L
Range Creek	576,000	149	.025	2.5	ML
Summerville	316,000	18	.005	.5	L
Wattis	439,000	40	.009	.9	L
Forest Central	328,000	61	.018	1.8	L
Forest North	550,000	28	.005	.5	L
Forest South	268,000	363	.135	13.5	VH

Key:
L = 0 to 2 sites (low)
ML = 2.01 to 4 sites (moderately low)
M = 4.01 to 6 sites (medium)
MH = 6.01 to 8 sites (moderately high)
H = 8.01 to 10 sites (high)
VH = 10.01 to N (very high)

Table 6-2. Site densities of Class I sites to total acreage in each planning unit sample area survey in these five units (see Table 5-1) suggests that a higher site density exists than has been identified by non-sample research projects. This statement must be viewed with caution, however, since the sample area locations on the Forest Central, Forest North, and Forest South (USFS) Units were biased during the selection process to include surfaces related to known coal zones and were situated in the eastern portion of each sampling unit.

In summary, it is apparent that a discrepancy exists between the data recovered by the stratified random sample of the CCP Class II survey and that recorded by previous subjective archeological research efforts. It can be argued, using the data as an example, that a sampling technique utilizing non-cultural parameters (e.g. vegetation zones or coal resources) for definition of random survey units will provide as much or more data on cultural resource potential in any given area than will non-random subjective surveys. With this basic correlation in mind, the relationship between the Class I and Class II data in Tables 5-1 and 6-2 can be more readily interpreted.

Visual representations of site densities and vegetation zones are presented in Figures 6-2 and 6-3. Site densities shown in Figure 6-2 extend across planning unit boundaries to demonstrate density comparability throughout the study area. Four ratings have been utilized including localities having a heavy density rating of over 50 sites per township/range as shown in the center of the study area. Two areas of heavy density are shown, one southeast of the present community of Hanksville in the Bull Creek locality, and the other in the Muddy, Last Chance, and Middle Desert Wash drainages.

Localities having a moderate site density of between 10 to 50 sites per township/range are also shown and each relates to specific drainage complexes.

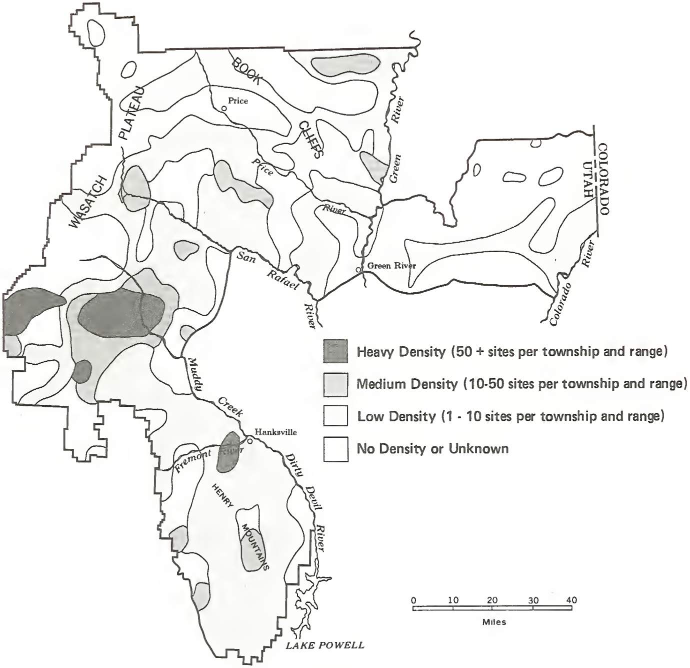


FIG. 6-2

Class I and Class II archaeological site densities in the project area.

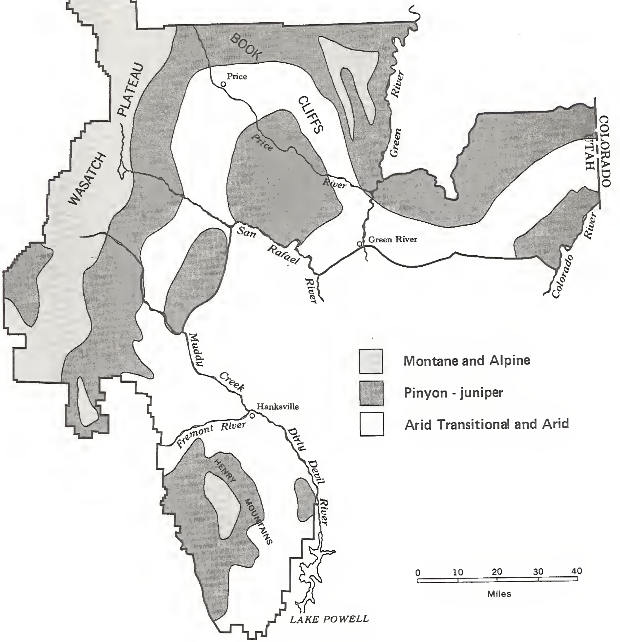


FIG. 6-3

General vegetation zones in the project area

The low site density localities, which include from one to ten sites per township/range, are broad in area, and generally tend to tie together the smaller areas which have heavier densities.

The general vegetation zones found in the CCP area are shown in Figure 6-3. These vegetation zones are basically identical with AERC ecozones (arid, arid transitional, pinyon-juniper, mountain transitional, and montane). The BLM vegetation types for barren and grass fall within the arid ecozone while sage and brush/scrub are in the arid transitional. AERC's mountain transitional ecozone equates with the BLM mountain scrub while the montane and conifer zones are relatively similar.

Figure 6-3 shows a large pinyon-juniper zone that extends from the Book Mountain Unit northwest through Range Creek and west across the Price River and Huntington Units. The pinyon-juniper zone extends south along the eastern slopes of the Wasatch and is also found in the Henry Mountain Planning Unit. The National Forest lands along the western periphery of the study area are dominated by the conifer or montane ecozone which generally grades into the lower pinyon-juniper ecozone through the mountain brush transitional zone. The higher elevation alpine ecozones are not demonstrated on the sensitivity map. The center of the study area is dominated by both the arid and arid transitional ecozones which gradually grade upwards into the pinyon-juniper zone. Diverse vegetation subzones such as big sage, shadscale-rabbit brush, or salt brush-rabbit brush, are not represented on the map, nor are habitats and communities of isolated dissimilar vegetation types which owe their peculiar existence to combinations of environmental variables, e.g., soil, drainage, and exposure.

Part D: Correlations by Culture

On the basis of correlated RG-I and RG-II data, some general cultural assessments for the project area can be made. Figure 6-4 presents the results of the Class I and Class II surveys by demonstrating the general location of all sites without regard to cultural affiliation. Figure 6-5, however, plots the known Paleo Indian sites and isolated finds. Of immediate notice is their scarcity, being associated with the western portion of the area and with the major drainages.

Overlapping the Paleo Indian use of the area and representing a general hunting/gathering mode of subsistence, the Archaic period sites (see Figure 6-6) show a wider distribution that still can be characterized as basically oriented to major drainages. However, it is also possible to see a tendency of those sites to fall near higher contour intervals away from the drainages, perhaps indicating that resources associated with increased rainfall and vegetation at the middle range elevations were being utilized. Archaic sites ranging from 8300 to 1500 B.P. (before present) are represented in the area.

The horticultural Fremont (see Figure 6-7) intensified the same pattern developed during the Archaic habitation in the Central Coal Project area between ca. 1500 and 700 B.P. Horticulture and exploitation of riverinemarsh resources influenced Fremont concentrations along drainages, especially at the headwaters. Figure 6-7 demonstrates that site density is strongly concentrated in the western and southern portions of the area with decreasing occupation east of the Green River in the Book Mountain Planning Unit.

Late prehistoric or protohistoric use of the area (see Figure 6-8) can be compared with the Paleo Indian site density shown on Figure 6-5. Sites are sparse and are apparently concentrated west of the Green River. A general

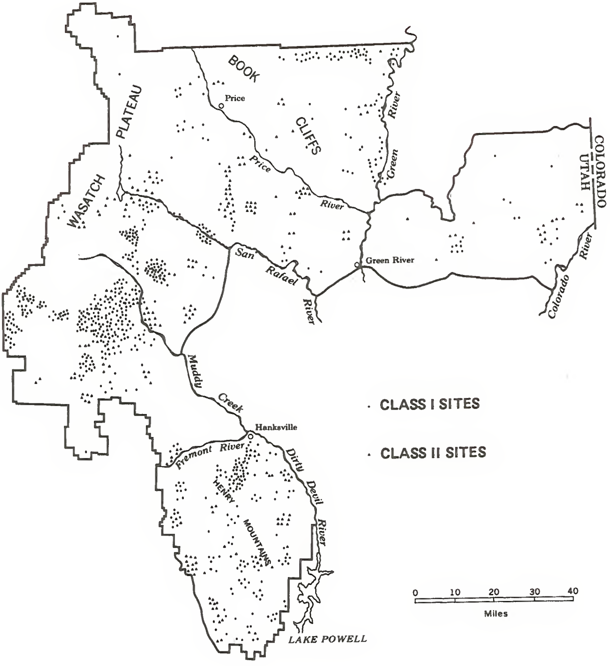


FIG. 6-4
Project area map showing major topographic features and all site locations

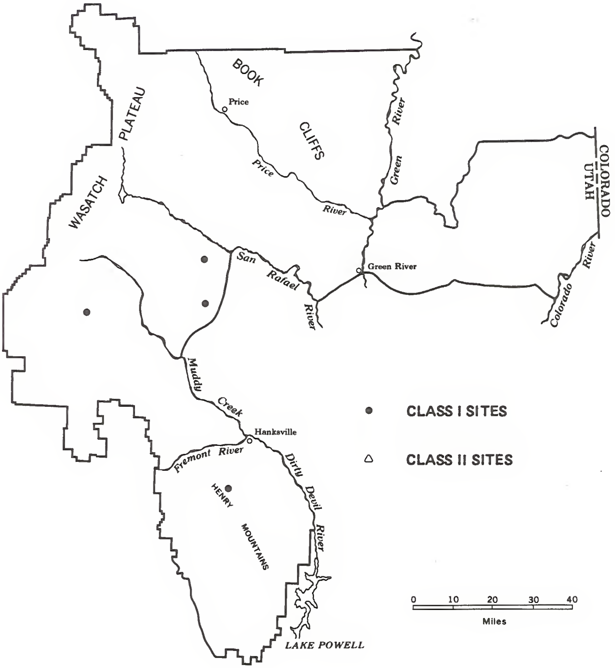


FIG. 6-5
Project area map showing major topographic features and Paleo Indian site locations

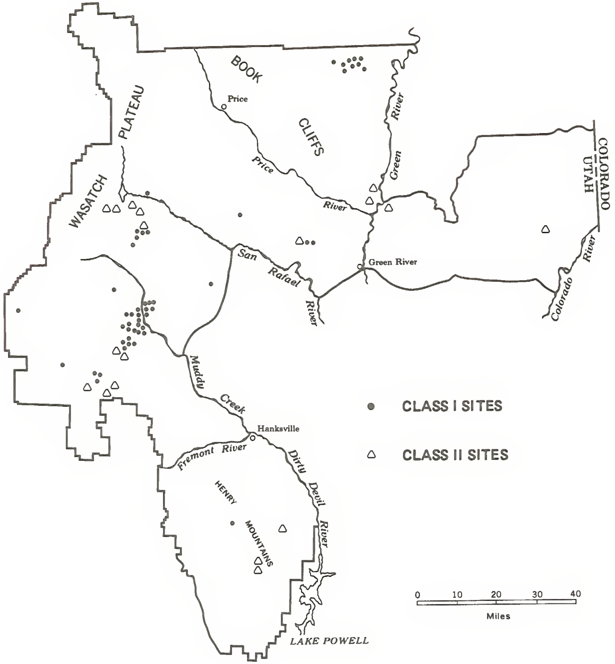


FIG. 6-6
Project area map showing major topographic features and Archaic site locations

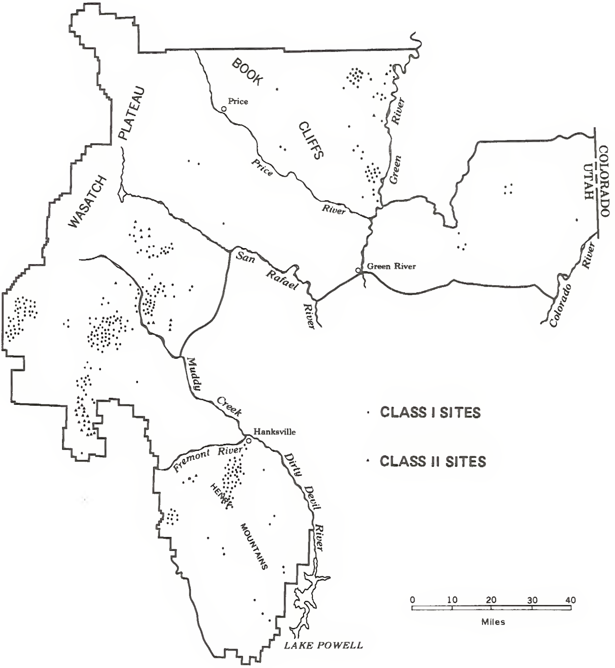


FIG. 6-7

Project area map showing major topographic features and Fremont site locations

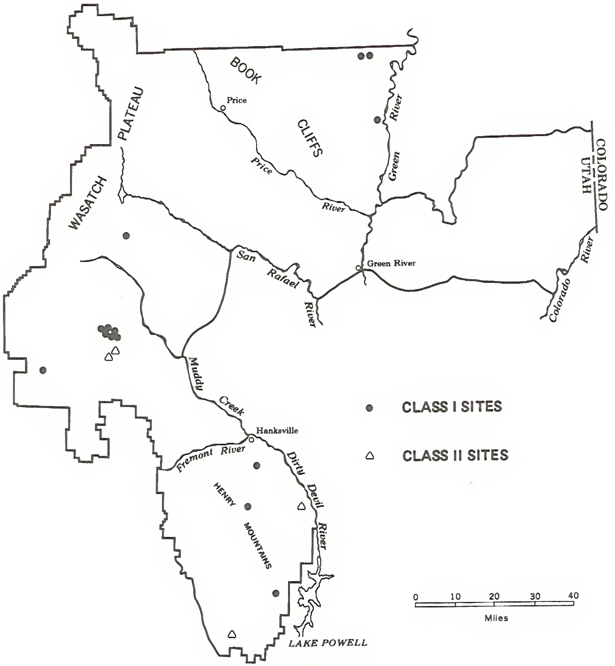


FIG. 6-8

Project area map showing major topographic features and protohistoric site locations

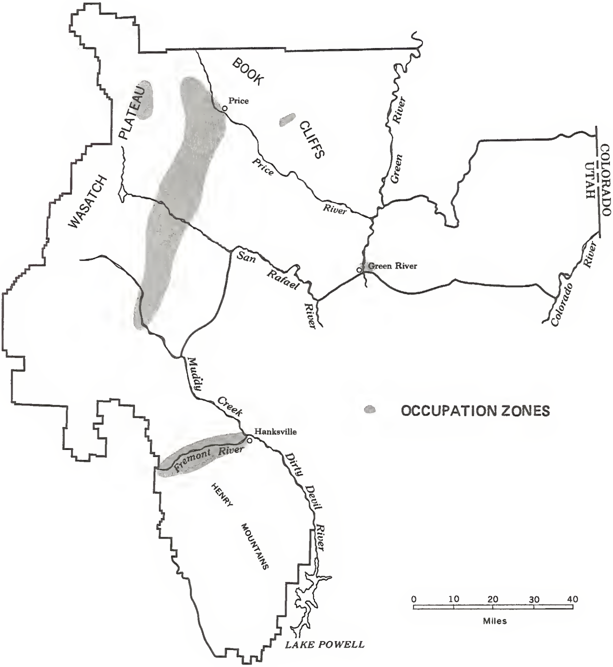


FIG. 6-9

Historic occupation zones in the project area.

association with major drainages can be determined from the map. These sites are attributed to Shoshonean activity which dated from ca. 650 B.P. to Historic contact. Figure 6-9 demonstrates the primary zones of historic concentration in the area. These zones are comparable with the localities on Figure 6-4 which demonstrate the heaviest prehistoric activity.

In summary, several statements can be made on the human occupation of the project area. Aboriginal activity appears to have concentrated on major drainages and the middle range elevations within the area, with increasing utilization through time of related environments until the termination of the Fremont period. The preponderance of prehistoric sites appears to be concentrated along the western tributaries of the Green River; occupation east of the Green River has traditionally been light. A different habitation pattern appears to be reflected in the site densities around the Henry Mountains in the southern portion of the Central Coal Project. This pattern apparently has additional cultural affinities with Anasazi culture zones to the south and southeast.

Part E: Sample Area Coordination

In contrast to most previous cultural resource surveys, an evaluation was made not only of sample areas where sites were found, but also of sample areas devoid of sites. This is significant because two-thirds of the sample areas in the CCP had no sites. All of the 311 sample areas, each having 160 acres, were evaluated according to the environmental characteristics: vegetation, distance to water, slope, elevation, geological formations, and rainfall. Then the sample areas without sites were compared with the sample areas with sites on a planning unit basis as well as in aggregate. A summary of those results follows.

Each sample area was given the predominate vegetation type. Only 31% of the sample areas classified as desert shrub had any sites and almost two-thirds of those were in the Henry Mountains Planning Unit. That unit was the only one with greater than 50% of its desert shrub sample areas having sites.

For the entire Central Coal Project area, some 49% of the sample areas classified as pinyon-juniper had sites. However, if the planning units of the north, i.e., Book Mountain, Range Creek, Wattis, and Forest North, which apparently have very few sites, were excluded, the nine remaining planning units would show 68% of the sample areas classified as pinyon-juniper with sites. Thirty-nine percent of all sample areas in the project were pinyon-juniper and they contained 70% of all sites discovered.

Passing on to other vegetation zones, it is noted that 15% of the sample areas in mountain brush had sites, as did 36% of the areas in the ponderosa zone, and 11% of those in the spruce, fir, Douglas-fir, aspen zone. No sites were discovered in sample areas classified as mountain meadow or big sage. As noted elsewhere, all sites found in sage were in sage habitats, within pinyon-juniper or ponderosa ecozones.

The distance in kilometers was measured from the center of each sample area to the nearest water source. Most such water sources were intermittent streams. Fifty-eight percent of the sample areas with sites had their center within one-fourth kilometer of a water source and 76% were within one-half kilometer. On the other hand, only 36% of the sample areas without sites were within one-fourth kilometer and 59% within one-half kilometer. All sample areas had some type of water source within four kilometers of their center.

The slope of each sample area was derived from the USGS map quads by finding the elevation range of each sample area. Sample areas with a vertical difference of less than 200 feet (61 m.) were considered flat and those with a range of 200 to 500 feet (61-152 m.) were designated as having a gentle slope. Areas with a range of 500 to 1000 feet (152-305 m.) had a moderate slope. Those with a range of over 1000 feet (305 m.) were called steep.

Seventy-two percent of all sample areas with sites were evaluated as either flat or gentle-sloped, and only 4.7% were steep. This compares with 19% of the areas without sites which were classified as steep and only 50% as gently-sloped or flat. This does indicate an avoidance of areas with high relief in favor of gentler slopes. A subjective evaluation based on map observation is that those sites in sample areas classified as moderate or steep tend to be on near-level areas at the top or the bottom of steep cliffs. A Chi-square test for significant differences between the two samples (those with and without sites) allowed for the rejection of an hypothesis of no difference at the =.001 level. This demonstrates a significant difference at a probability level greater than 99.9% (see Figure 6-10).

Differences in elevation category between the two groups of sample areas were also evaluated. Fifty-nine percent of the sample areas with sites were between 4,000

SLOPE TYPE

Flat	O	38	49	87
	E	29.4677	57.5322	
Gentle	O	38	54	92
	E	31.1613	60.8387	
Moderate	O	24	63	87
	E	29.4677	57.5322	
Steep	O	5	39	44
	E	14.9032	29.0968	
		105	205	310

Ho=no difference

Ha=difference

α=.001

RR=X^2 - 16.27

df=(r-1)(k-1)=3

$$X^2 = \sum \frac{(O-E)^2}{E}$$

X^2=17.49086

Reject Ho

Figure 6-10 Chi-Square Test for sample area differences related to slope.

and 6,000 feet (1220-1829 m.), with the largest number, 44% situated between 5,000 and 6,000 feet (1524-1829 m.). Only 16% of the areas with sites were above 8,000 feet (2438 m.) while 32% of the areas without sites were in that category. Twenty-six percent of the areas without sites were between 5,000 and 6,000 feet (1524-1829 m.). A Chi-square test for differences between the two groups allows for the rejection of an hypothesis of no differences at the =.01 level. This indicates a significant difference at a probability level greater than 99% (see Figure 6-11).

Differences between sample areas with and without sites as they relate to geologic formation are difficult to evaluate. The 312 sample areas categorized are within 38 formations or groups. Areas with sites were found in 27 formations and areas without sites in 33. Too few sample areas fall into most of the formation categories for proper analysis, and the differences could be the result of random chance in the sample. Nonetheless, the major differences are noted below. The largest difference occurs in the Tertiary Parachute Creek member of the Green River formation. Twenty-eight sample areas are situated in this formation, and only three had sites. The significance of this fact is largely negated, however, by the fact that all 28 areas are in the site-scarce Book Mountain and Range Creek Planning Units. Other formations, where the number of areas without sites exceeds those with sites, include the high elevation Flagstaff limestone and Blackhawk formations in the Wasatch Plateau with ratios of 8=1 and 16=4, respectively. Other such formations and their "sample areas without sites to sample areas with" ratios are: Wasatch formation (5=0), undifferentiated Mancos shale (18=6), Masuk member (9=3), Emery sandstone (3=1), Blue Gate sandstone (10=2), and Tununk shale (10=1).

Other geologic formations had some tendency to favor site location. The formations, along with their "sample area with" ratios are: Alluvial and aeolian deposits (8=13),

ELEVATION				
4-5000	O	21	27	48
	E	16.0994	31-9006	
5-6000	O	43	55	98
	E	32.8696	65.1304	
6-7000	O	17	34	51
	E	17.1056	33.8944	
7-8000	O	10	29	39
	E	13.0807	25.9192	
8-9000	O	14	36	50
	E	16.7702	33.2298	
9000+	O	3	33	36
	E	12.0745	23.9255	
		108	214	322

Ho=no difference
Ha=difference
$\alpha = .01$
df=5

RR=X^2 15.09
$$X^2 = \sum \frac{(O-E)^2}{E}$$
X^2=18.99
Reject Ho

Figure 6-11 Chi-Square Test for sample area differences related to elevation

Mesa Verde formation (3=5), Dakota sandstone (0=2), Morrison formation (4=11), Entrada sandstone (3=7), Cedar Mountain formation (2=8), and Ferron sandstone (4=4).

Average rainfall figures of each sample for both summer and annual precipitation were obtained from the Normal Annual Precipitation Map of Utah for 1931 through 1960. Comparisons were made between rainfall characteristics for sample areas with sites and those without. A series of Kolmogorov-Smirnov two-sample tests were performed. They indicate that for the project area as a whole, there is a significant difference between the two groups. The difference, however, is that drier sample areas have the greatest probability of having sites! Next, the high elevation planning units were excluded from the analysis with the result that there is no significant difference (=.10 or less) between sample areas with sites and sample areas without. Therefore, the conclusion is that the rainfall data gleaned from the map are highly correlated with elevation, and that high elevation areas with the greatest rainfall have less probability of sites, while rainfall differences at lower elevations are not great enough to be statistically significant.

There are, then, some significant environmental differences between sample areas which have cultural resource sites and those which do not. A decided preference exists for site location in the juniper, mixed pinyon-juniper, and pinyon zones of the pinyon-juniper ecozone, and a secondary preference for desert shrub areas. These vegetation zones also tend to correlate with lower and middle altitudinal zones and gentle slopes within the project boundaries. They provide shelter, warmer winter temperatures, habitat for game, vegetative resources, and soils for incipient agriculture. The case of geology is less clear, although there is some apparent preference for formations which either weather into usable soils or for formations which provide rockshelters or materials for tool making. On the basis of present evidence, however, it must be admitted that elevation and climate are probably more important than geologic formation as site location factors.

Chapter 7

RECOMMENDATIONS FOR FUTURE RESEARCH

Part A: Cultural Data Gaps

As a result of the survey and analysis procedures of the Central Coal Project, several major data gaps have become apparent. The first is manifested by a total lack of new information concerning Fremont or Kayenta Anasazi horticultural activity in the area. Despite the known occurrence of multiple habitation sites as demonstrated from the RG-1 phase of analysis, no prehistoric village sites were recorded during the Class II survey which covered about 49,000 acres in thirteen planning units. Large multiple habitation sites exist in the CCP area and include the Turner-Look site in the Book Mountain Planning Unit (Wormington 1955), and the Bull Creek sites in the Henry Mountain Planning Unit (Jennings 1976, 1977).

The contributing factor to this data gap is probably the broad ecological sampling stratum developed by the BLM and USFS to define vegetation zones and plot sample areas. The use of vegetation zones for plotting survey areas appears to be appropriate for sampling occasional use sites, such as temporary camps, quarry sites, rock shelter camps, and chipping areas. However, the permanent horticultural villages situated by the Anasazi and Fremont peoples to favorably exploit riverine-marsh resources were not adequately sampled by the survey.

The prehistoric and historic use of the semipermanent and permanent stream banks and their immediate terraces cannot be adequately evaluated through broad sampling designs based on general vegetation types. It is suggested that a riverine-terrace sampling stratum be included in future sampling procedures. Proper recognition of the riverine-terrace ecozone as a sampling stratum will permit more accurate representation of the cultural resources of central Utah.

Our experience shows that Euro-American cultural resources tend to occur in the same ecozones as were utilized by prehistoric horticulturalists. As a result, many multiple habitation sites have either been destroyed, buried under alluvium, or are now situated in private land and inaccessible to public land sample surveys.

Another problem attendant to the project has been the lack of Paleo Indian artifacts and sites recovered during the Class II survey. Isolated Paleo Indian artifacts have occasionally been found in the area (see Chapter 3). Lack of further documentation is an indication of the scarcity of these artifacts on the earth's surface and is not a reflection of the sampling procedure.

A major data gap exists as a result of the biased approaches primarily used in research projects in the area. The recovery of 52 sites in the Price River Planning Unit, when compared to the five previously recorded sites, indicates that little substantive work has been done in that locality. Site density calculations demonstrate that the Price River Planning Unit ranks second among these thirteen planning units in site density per acre (see Table 5-1 and Chapters 5 and 6 for discussion); yet prior to this survey, the cultural resources of this planning unit were virtually unknown. Further survey is warranted in the Price River Planning Unit in order for archeologists to obtain a viable understanding of the cultural resources of that locality. The Class I and Class II data strongly indicate that numerous smaller localities throughout the project area have been completely neglected by archeologists.

A pressing problem emphasized by the RG-1 team lies in the virtual lack of any state-wide systematic record system and companion field work file for historic sites other than towns and mine sites. The occurrence of farmsteads, ranches, sheep herding camps, cowboy camps, and transient historic activity in the Central Coal Project area requires a broad data base against which to evaluate the entire range of prehistoric and historic cultural resources. The existing data base is extremely limited. Although field recognition and recording of specific historic features was performed during the Class I survey, the lack of an organized record system continually hindered evaluation of historic sites and decreased the effectiveness of the survey.

Part B: AERC Recommendations for Future Research

Four separate levels of future research in the project area could be successfully pursued by cultural resource specialists. These levels can be identified as follows: (1) systematic sample surveys; (2) habitat selected surveys; (3) intensive surface evaluations; and (4) environmental-specific research.

SYSTEMATIC SAMPLE SURVEY

Each quadrant of the project area could be successfully studied through systematic sample surveys. In the northern planning units (Wattis, Forest North Sampling Stratum, Price River, and Range Creek), studies can be conducted to better document the nature of human activity and to more completely understand the apparent sparseness of prehistoric human activity in this locality. The eastern portion of the project area, i.e., Book Mountain and Summerville Planning Units can be researched to ascertain those specific environments where the most intensive prehistoric activities occurred. Research in the western quadrant, specifically the Huntington, Muddy, Forest, and Last Chance Planning Units can successfully provide an understanding of those lower elevation vegetation zones, terrain forms, and geological features which were most conducive to intensive utilization in the past. The southern portion of the area, i.e., the Henry Mountain Planning Unit, can be more accurately understood through the initiation of a series of sample surveys. Research around the Henry

Mountains could result in greater information on prehistoric demography. Such investigations will also provide additional depth on the economic and social contacts that existed between the Fremont and Anasazi peoples within this cultural buffer zone.

HABITAT RELATED SURVEYS

Specific floral habitats, i.e., lucustrian and riverine-marsh vegetation communities may have been more heavily utilized by prehistoric cultures than were the general ecozones within which these habitats are situated. A specialized sampling procedure for researching such habitats at the low, medium, and high elevation ecozones can be developed. Such an orientation would possibly provide an understanding of resource exploitation in the higher elevations that cannot adequately be documented in the general sample survey. In addition, needed information can be obtained on Fremont and Archaic habitation and their utilization of low elevation lucustrian and riverine-marsh habitats.

INTENSIVE SURFACE EVALUATIONS

Intensive surface evaluations of the Old Spanish Trail corridor should be initiated. AERC research in the vicinity strongly suggests that the corridor was intensively utilized throughout prehistory as an access route between the Green River and the Wasatch Plateau. The trail's protohistoric and historic use are only partially documented; no definite information presently exists establishing its importance in antiquity.

Intensive reconnaissance should be conducted in Price River and Range Creek Planning Units. Locating the prehistoric route that links the Price River with the Green River via Minnie Maud Creek in Nine Mile Canyon could prove to be of great archeological interest. In addition, the prehistoric and protohistoric record in the Cedar Mountain locality has only been initially identified in this report.

More research in that locality would be valuable.

Specific Pleistocene surfaces and river channels still exist in the project area which have received little or no surface modification since prehistoric times. These localities should be subjected to intensive searches for evidences of Paleo Indian activity. Undoubtedly, Paleo Indian camp sites exist in the area and can be identified through careful planning and rigorous field work.

ENVIRONMENTAL-SPECIFIC RESEARCH

The Central Coal Project has identified specific environmental features, e.g., geologic formations, elevations, vegetation ecozones, geomorphic features, where human activity and habitation patterns have been either dense and intensive or quite sparse and scattered. During the preparations of this report, AERC has resisted the temptation to speculate concerning the trends shown by the data. The data base that has been acquired, however, provides a rich source from which to develop specific theories regarding prehistoric and historic land use and occupation. Research designs can now be established which document or discount some of the basic concepts which could be advanced through the findings of this report. Projects should be implemented which can increase the understanding on such subjects as why the intensity of activity in the Mesa Verde group and just how important the distance from site to water source really was for annual versus seasonal occupations. It is our assessment, upon the completion of this project, that a small portion of a brilliantly hued tapestry has been revealed, richly depicting man's past activity, growth, and the intensity of his struggle in east central Utah. The astute researcher has the unparalleled opportunity of rolling out the remainder of the carpet.

Chapter 8
ADVERSE IMPACT POTENTIAL IN THE STUDY AREA

General correlations between coal development phase, cultural site type, and geomorphic location type furnish the archeologist, land administrator, and industrialist a means for assessing interrelationships between these variables. A summary of the correlations demonstrated in Chapter 3, Volume III of the original report provides the following information:

1. Terraces, residual and alluvial soils, benches, plateau-mesa tops, and ridge lines appear to have the greatest potential for containing cultural resources and also exhibit the greatest potential for receiving significant disturbance during coal development and exploration phases;

2. access road construction, the development of transportation and communication systems, and the development of service areas for coal mines provide the greatest potential for impacting cultural resources and for disturbing land forms;

3. long-term, spatially concentrated projects probably cause the greatest degree of direct (project related) and indirect impact on cultural resources; and

4. short-term, spatially dispersed projects, e.g., engineering survey parties, access road construction, drilling operations, and construction of transportation-communication systems, have the highest potential for causing disturbance to the greatest diversity of land forms.

Chapter 3, Volume III of the original report provides a series of correlations showing known cultural resource locations with reference to known coal resource locations in each of the thirteen planning units. These correlations aid the developer and land administrator in ascertaining the degree of adverse impact potential that exists in any given locality. Certain planning units, e.g., Huntington, Price River, Summerville, and Forest North, presently demonstrate little or no relationship between cultural resource density and coal zone, hence coal development in these units poses perhaps only a marginal threat to the cultural resource base. Future archeological surveys conducted in conjunction with coal development in these units can be better directed toward finding archeological sites and thus insuring cultural resource preservation. Using these maps, archeologists can also be aided in developing explicit hypotheses formulated to advance our understanding of the prehistoric and historic land use patterns in localities where prehistoric human activity was evidently a rarity.

The Book Mountain, Range Creek, and Wattis Planning Units demonstrate some correlation between cultural resource density and coal resource location. The maps in Volume III indicate that site densities in these units may be directly correlated with rims, drainages, and potential access routes connecting the more arid lowlands with the higher elevations. Many of the sites demonstrated in these units date from the historic period and are directly associated with earlier coal mining locations. Additional archeological field research is needed in these coal zones to determine if prehistoric activity was highly concentrated within key geological and geomorphic features or if human activity has traditionally been sparse until the advent of the coal miner in the nineteenth century.

The remaining six units (Forest, Henry Mountain, Last Chance, Muddy, Forest Central, and Forest South) all demonstrate a high cultural site density in association with coal zones (see Figures 3-7, 8, 9, 10, 13, 14, 15, 16, 25, 26, 29, and 30 in Volume III of the original report). The results of the Class I and Class II surveys conducted for this report show that coal development in any of these units has the potential for causing extensive disturbance to valuable cultural resources if avoidance and the methods of premitigation and mitigation are not utilized (for a discussion on adverse impact and archeological methods, see Chapters 2 and 5 of Volume III). Certainly energy resources in these high density localities should be developed; however, all energy exploration and developmental projects must be carefully coordinated with cultural resource exploration to insure maximum preservation of sites and cultural materials. Because of the great number of sites in these areas, adequate survey, testing, and salvage sampling and research designs must be developed in order to obtain the maximum amount of cultural information given the limitations of time, personnel, and budget. Avoidance cannot always be used to insure preservation. Governmental archeologists and archeologists working as consultants or under federal contract in these units are obligated to structure their research designs so that every field opportunity is used to increase the data base. With the forewarning that development of coal resources in these units means certain destruction for inadequately researched cultural resources, archeologists must begin to coordinate responsible research designs which can effectively aid energy resource explansion and also permit detailed understanding of the prehistoric and historic development of the area.

The development of the coal mining industry in the study area will probably be centered upon four separate coal zones which include parts of the Henry Mountain Field southwest of Hanksville, segments of the Wasatch Plateau Field in the northern periphery of the study area, subsurfaces in the Emery and Salina Canyon Fields, and the Sego Field associated with the Book Cliffs locality. These four localities appear to be particularly susceptible to development since all have proven

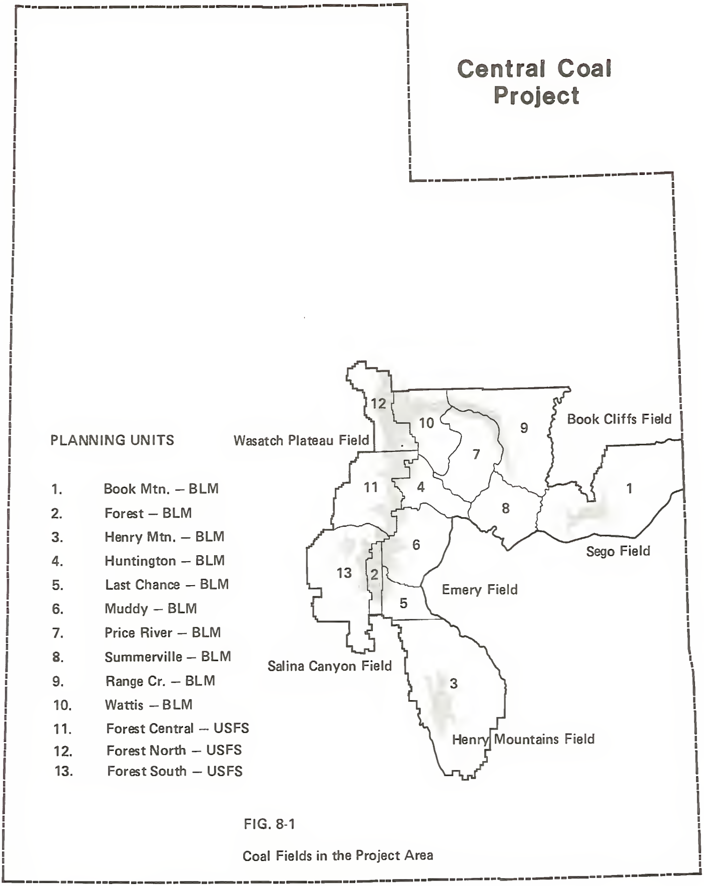


FIG. 8-1

Coal Fields in the Project Area

coal resources, are in easy access to populated areas, and have good potential for the development of the necessary transportation-communication systems important for the movement of coal and personnel. In addition, all three localities have good access to water resources. Only one field, the Henry Mountain Coal Field, is positioned in such a way as to threaten the scenic resources of a national park just outside the project area (cf Figure 3-2).

Access routes for the movement of coal out of each locality are presently in use and are direct--thus having the potential for keeping development costs within a reasonable cost-profit margin. Access out of the Henry Mountain Field to the Fremont River Valley will require extensive development, although unpaved roads already exist. Access from the Salina Canyon presently exists with Interstate 70 and its branch roads in the vicinity. The Emery Field presently has inadequate access to paved highways and railroad systems, and extensive development would be required for the movement of coal out of the Paradise Lake-Last Chance Wash locality. The Wasatch Plateau Field has been actively mined for some time and the basic road and railroad systems for coal movement already exist in the region. The Sego Field northeast of Green River, Utah, could be connected to the existing road and railroad lines in that locality.

These four development zones can all be evaluated for the potentials that could exist with future development for causing adverse impacts on the known cultural resources identified in this project. In addition, the vegetation zones and geological formations associated with these localities and their potential access routes can be identified. Using the various site density-environmental variables identified in this volume, a basic projection of the cultural resource potential in each locality can be defined and thus the adverse impact susceptibility quotient for the potential impact of future development on unknown cultural resources can be postulated.

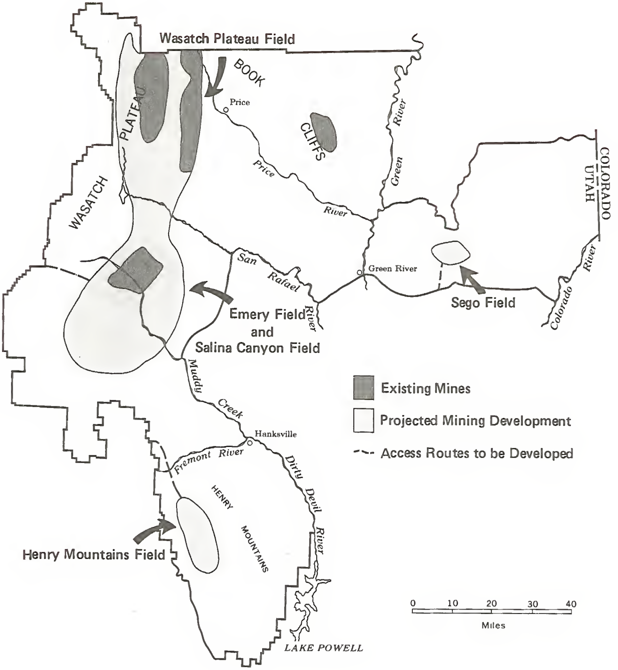


FIG. 8-2

Projected development in the project area

Coal development in the Salina Canyon and Paradise Lake localities of the Emery Coal Field (see Figures 8-1, 8-2) and the development of an adequate transportation route to Interstate 70 and hence to either Salina or Price, Utah, present the highest potential for causing adverse effect on cultural resources. Figure 6-2 shows that heavy cultural site densities exist in the developmental locality and in the Salina Canyon. The Last Chance and Paradise Lake locality is mostly situated in the pinyon-juniper ecozone and its primary geological formations include the Quaternary, Mancos Shale, and San Rafael Group. Information developed in Chapter 6 shows that the pinyon-juniper ecozone and the Quaternary, Mancos Shale, and the Entrada-Carmel Formations of the San Rafael Group have a high potential for containing significant numbers of archeological sites. Therefore, the known heavy site density in this locality will probably be further increased on certain surfaces after an intensive surface reconnaissance of the entire locality has been conducted. In addition, the moderate site density along the Muddy and Ferron Creek drainages can be expected to be increased and even extended along the entire drainages into the San Rafael, since these drainages were probably important access corridors.

The development of coal resources in the Tarantula Mesa locality of the Henry Mountain Field presents some potential for disturbing cultural resources in that area. Figure 6-2 shows that the locality contains moderate, low, and unknown cultural site densities. Three major factors, the high incidence of pinyon-juniper, the amount of Quaternary alluvium, and the importance of the locality and its drainages along a north-south corridor connecting prehistoric Kayenta and Fremont cultures, suggest that the site density ratings will be increased to moderately heavy and heavy (over 50 sites per township and range) with the conclusion of an extensive reconnaissance over the entire locality and its access route which extends north to the Fremont River Valley.

Cultural resource disturbance caused by future initiation of coal development in the Wasatch Coal Field in the Forest North and Wattis Planning Units, is difficult to ascertain at the present. Data previously provided in this report shows that the known low cultural resource density for the region is distributed along valley floors. The diversity of the vegetation zones and the geological formations in the locality suggest a greater incidence of sites in the lower valleys than has been documented. The intensive reconnaissance of the entire region would probably yield significant numbers of sites along the drainages in the elevations below the 7,500 foot level, and only scattered sites on higher elevation terrain surfaces between the major drainages.

Future development of the Sego Field near Green River will pose some danger of impact on cultural resources situated below the Book Cliffs in this locality. Cultural resource sites in the planning unit (see Figure 6-2) are of low density; however, the density in important drainages and along the rim can be expected to increase with the initiation of additional intensive research projects. The lower elevations between the Book Cliffs on the north and the Colorado River to the south and southeast probably formed an important area for cultural movement during prehistoric times between the Fremont peoples of central Utah and western Colorado, and the San Juan and Kayenta Anasazi peoples to the south.

GLOSSARY

Aeolian Deposit - An accumulation of organic or inorganic material deposited by wind action.

Alcove - A niche or arched opening in a cliff that can function as a shelter.

Alluvial (Alluvium) Deposit - An accumulation of organic or inorganic material deposited by water action on or at the base of a slope.

Artifact - A single, portable man-made or man-altered object, usually culturally diagnostic.

Bedrock - Solid rock surface exposed by erosion and/or removal of all upper strata.

Bench - An elevated flatland (very large terrace) of ground or rock, with a steep slope at the back.

Burial - Cemetery or disturbed interment in a shallow hold or in a rock cleft.

Ceremonial Site - A site exhibiting multiple dwelling structures of religious function characterized by religious art and/or kivas.

Cist - Storage pit in the ground usually lined with rock slabs.

Colluvial (Colluvium) Deposit - Rock detritus accumulated on or at the base of a slope.

Cove - Flatland within a "U" shaped hill or cliff formation.

Cultural Resources - Physical remains of human activity over fifty years old.

Desert Pavement - Hardpan floor of desert.

Direct impact, or project impact refers to those project-related activities, e.g., bulldozing, trenching, drilling, digging, surveying, and vehicle movements, which, without mitigation of related cultural materials, can result in the destruction of resources within the immediate project locality. Artifact collection and site disturbance by engineers, construction and administrative personnel, and inadequate archeological methodology used to mitigate potential impact, can all be considered as direct impact if cultural materials and data are lost. Direct Impact can almost always be mitigated through avoidance, testing, and/or excavation, because it is project-related, specifically located, and usually identifiable prior to project initiation.

Drainage Channel - Seasonal wash or river bed.

Extended Camp - A non-architectural site of varying size, exhibiting hearths or fire pits; ceramics; lithic and grinding tools, especially non-transportable metates.

Historic Site - A site exhibiting artifacts that postdate the first Mormon settlements in Utah in 1847.

Hunting Site - A location characterized by projectile points or point fragments only.

Indirect Impact pertains to site and artifact disruption by amateurs who may or may not be affiliated with a developmental project. Planned or random exploration, collection, and vandalism of cultural resources by amateur collectors, which would not normally be adversely affected by a development, falls within this category. Indirect impact is generally related to surface disruption, but can involve both surface and subsurface destruction. Indirect Impact of cultural resources can only be partially mitigated, since affected resources are not always located within a developmental zone. Archeologists consulting with developmental organizations generally lack the time, flexibility, and finances to adequately locate, evaluate, record, and preserve all the cultural resources existing adjacent to, but outside the potential construction zones. Hence, indirect impact becomes most difficult to control.

Kill-butchering Site - A location with points or point fragments and knives, choppers and/or scrapers.

A location characterized by the predominance of butchering tools, including knives, choppers, utilized flakes and/or scrapers.

Lithic Scatter Site - Characterized by the presence of flaked tools, chips, cores, or flakes only.

Multiple Habitation - Multiple structures that would accommodate more than one family.

Petroglyph - Figures, symbols, or scenes pecked or etched in rock.

Pictograph - Figures, symbols, or scenes painted on rock.

Plateau or Mesa Top - A raised flat or level summit.

Playa - Flat desert floor area that does not drain; a dry lake bed.

Prehistoric Site - A site dating from any time prior to contact with Europeans or their descendants.

Primary Disturbance, pertains to location and intensity of impact rather than to type. Primary impact involves a specific locus of destruction where energy has been concentrated to destroy surface, and/or subsurface cultural deposits. Primary disturbance can be initiated by man or by natural agencies, such as erosion, flash flood, and fire.

Protohistoric Site - A site exhibiting both prehistoric artifact types and European artifact types acquired through trade.

Quarry Site - A lithic mine showing presence of hammerstones, flakes, cores, and unfinished tools.

Residual Soil - Residue from extensive erosion action.

Ridge - Line along the top of a range of hills between the sloping sides.

Rim - The outer edge of a ridge, ledge, or plateau.

Rock Shelter - A small or large rock overhang used as a protective dwelling; characterized by the presence of artifacts and smoke-blackened rock overhang.

Saddle - The extended depression of a ridge between two higher points along the ridge.

Seep - An area of subsurface drainage from porous soil, rocks, or cracks.

Secondary Disturbance relates strictly to surface disruption caused by man, e.g., collection, and by natural agency, e.g., slope-wash erosion. Secondary disturbance does not include an area or areas of concentrated destruction, but is rather the result of diffused impact over a site's surface.

Single Habitation - Small structure such as a pithouse that would accommodate a single family.

Site - Locus of human activity identified by a minimum of four flakes within a five meter radius, from documents, or by archaeological techniques.

Storage Shelter - Usually a small uninhabitable shelter with basketry or pottery, grinding tools and food remnants.

Surround - An enclosure or barricade for capturing game animals.

Temporary Camp - A small site exhibiting no architecture; characterized by a hearth or fire pit, lithic and small grinding tools, and ceramics.

Terrace - A flat narrow shelf of ground or rock extending along a slope; especially a former shoreline of a river or lake.

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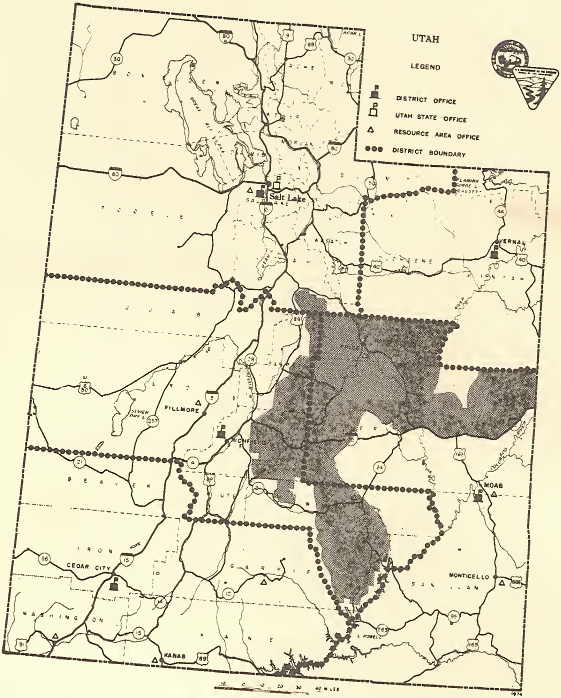

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