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Grass Mesa Locality Overview

by

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PREFACE

This report on the prehistory of the Grass Mesa Locality was prepared at the end of the first Dolores Archaeological Program field season and reflects the limited information available at that time. Additional fieldwork was carried out in the locality during the 1979 and 1980 field seasons allowing for a much more detailed treatment of the topic. Timothy A. Kohler has prepared an updated and expanded Grass Mesa Locality report which will be submitted as part of the 1980 report series.

ABSTRACT

The Grass Mesa Locality is a spatial division of the Escalante Sector located within Montezuma County in southwestern Colorado. Intensive archaeological investigations were performed in the locality in 1978 by the Dolores Archaeological Program (D.A.P.) to anticipate projected constuction activities proposed by the Bureau of Reclamation. Preliminary interpretation of survey and excavation data suggests that the locality has had a long history of human habitation beginning in the Archaic Period (5000 B.C.-A.D. 500). It is proposed that populations representing the Anasazi Tradition (A.D. 500-1300) residing in the Grass Mesa Locality were primarily horticulturalists cultivating the bottomlands along the river; however, because of the diversified habitats available within a short distance, the local populace may have relied to a greater degree on wild resources than was customary. The distribution of Anasazi habitation sites within the locality seems to correspond to a linear pattern, perhaps reflecting the distribution of potential croplands along the river. Grass Mesa Village (Site 5MT0023), the principal habitation in the locality, may have been a control point for foreign groups wishing to exploit highland resources to the north. From preliminary data, it is inferred that prehistoric population levels in the locality probably reached a maximum between A.D. 850-900; perhaps as many as 200 individuals resided at Grass Mesa Village and nearby habitations during the occupational climax. The formulation of more sophisticated interpretations awaits the completion of additional intensive studies.

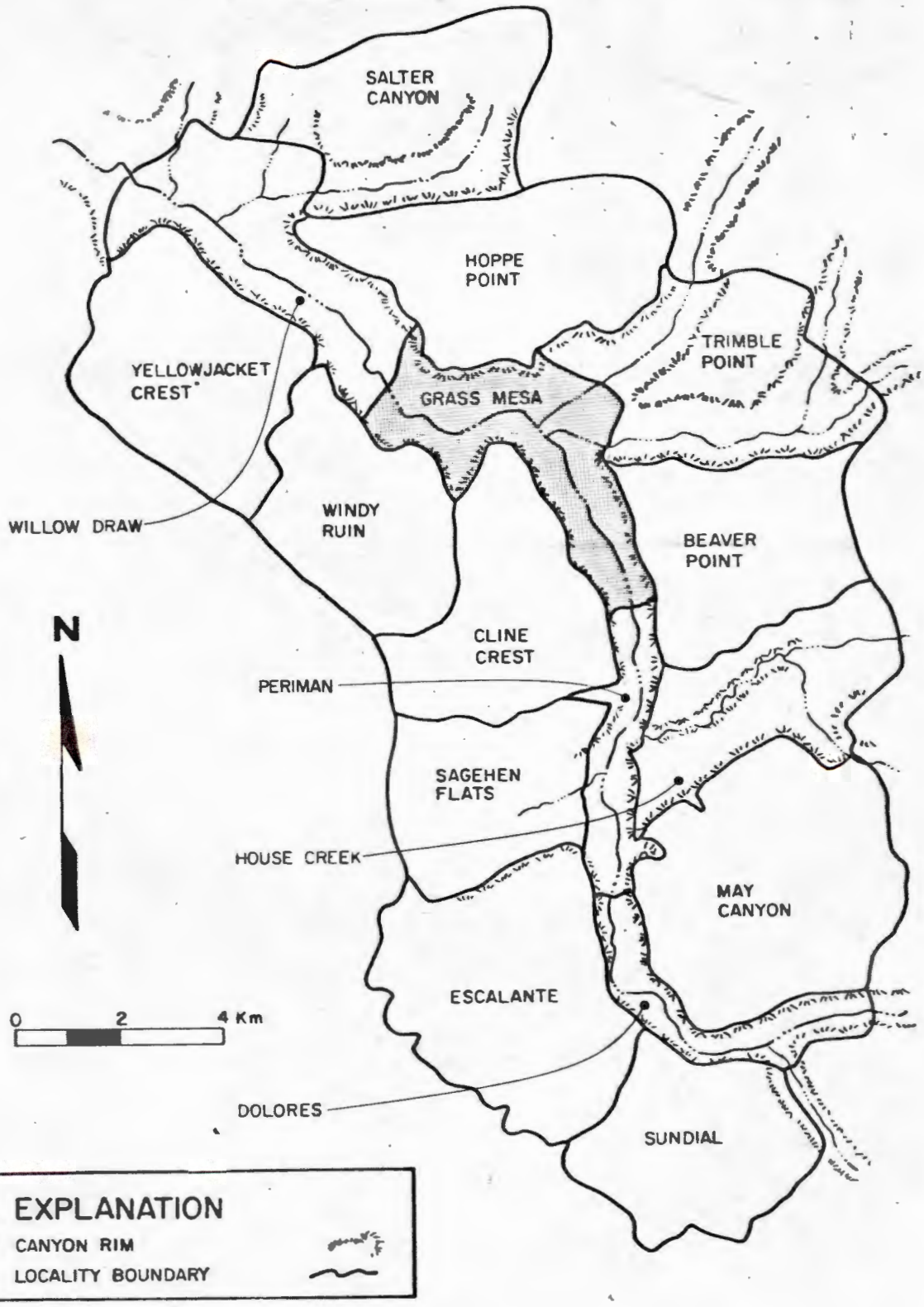
INTRODUCTION

The Grass Mesa Locality is one of 16 such spacial units defined in the Escalante Sector of the Yellowjacket District (Figure 10.1) (Kane [1]). Intensive D.A.P. investigations were performed in the locality in 1978 as this area incorporates the proposed McPhee Dam Site and cofferdam pool. As currently defined, the Grass Mesa Locality is an area of about 900 hectares centering on the confluence of Dry and Beaver Creek Canyons, and the Dolores River, located within Montezuma County in southwestern Colorado. The local landscape is characterized by deep, narrow canyons with steeply sloped walls rising to broad, rolling uplands. This canyon setting greatly influenced prehistoric occupation of the area and the resulting pattern of human adaptation is possibly unique within the Escalante Sector. Beginning with a sketch of the natural setting of the Grass Mesa area and an outline of its prehistory, this paper focuses on the local pattern of Anasazi settlement and the environmental constraints in part responsible for that pattern.

Figure 10.1 The Grass Mesa Locality and its relationship to other localities in the Escalante Sector.

ESCALANTE SECTOR

LOCATION OF GRASS MESA LOCALITY



SETTING

In contrast to the open, rolling terrain of most of the project area, the Grass Mesa Locality is characterized by dramatic relief. Here the Dolores River meanders over a narrow flood plain, the valley floor of a v-shaped canyon more than 300 m deep (Figures 10.2 and 10.3). Along the steep convex side slopes, veneered with colluvium and talus, sculptured out-croppings of cross-bedded Entrada Sandstone form sweeping amphitheatres and vaulted cliffs. Near the rim, Morrison-Summerville mudstones outcrop in a discontinuous caprock of short vertical cliffs.

Stream flow from the southwest is restricted to a few deeply entrenched first and second order tributaries draining the mesa edge. This same pattern holds for the north and northeastern slopes locally; however, Salter, Dry Creek and Beaver Creek Canyons contribute significant seasonal flow from snow melt on the high plateau region known locally as the Glade.

The natural flow of the Dolores River itself is almost totally determined by surface runoff. Overall, the flow pattern is one of high spring discharge during snow melt, moderate summer discharge, and low discharge in the fall and winter; daily flow, however, can fluctuate erratically as weather conditions affect the rate of snow melt, or summer rainstorms cause flash flooding. The shallow groundwater system is interconnected with the surface flow system. Since the recharge and discharge is localized, it rises and falls with the flow of the river.

The alluvial flood plain is the only land in the canyon obviously suitable for cultivation, making a total available area of about 190 hectares within the boundaries of the locality. Although the river is

Figure 10.2 View of the Dolores Valley in the Grass Mesa Locality, looking south from LeMoc Shelter. Note v-shaped nature of canyon and heavily vegetated side slopes.

Figure 2: View of the Dolores Valley in the Grass Mesa Locality, looking south from LeMoc Shelter. Note v-shaped nature of canyon and heavily vegetated side slopes.

Figure 10.3 View of south side slope of Dolores Canyon from LeMoc Shelter. Note band of outcropping Entrada Sandstone on the canyon wall above the talus slope.

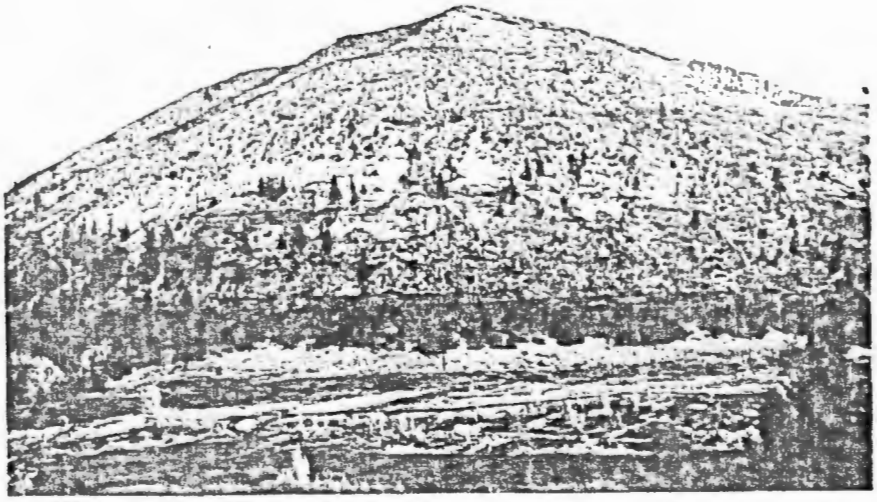


Figure 3: View of south side slope of Dolores Canyon from LeMoc Shelter. Note band of outcropping Entrada sandstone on the canyon wall above the talus slope.

presently contained in a meandering channel, a well developed terrace on the northeastern canyon slope suggests this entrenchment may be relatively recent. If uncontained, the river would seasonally flood the valley, renewing the supply of available minerals in the sediments and providing a supplemental source of moisture in the late summer months. Flooding could, as well, delay spring planting and later destroy fields of maturing plants.

The extreme relief of the Dolores River Valley in the vicinity of Grass Mesa has induced a pronounced altitude dependent zonation of plant communities. Five major vegetation zones occur on the northern slope of the canyon (Figure 10.4).

Along the flood plains are dense stands of Fremont cottonwood (*Populus deltoides*) and willow (*Salix* spp.), and open meadows with a variety of grasses and forbs. In sheltered areas along the southwestern slope immediately above the flood plain are stands of ponderosa pine (*Pinus ponderosa*). Stands occur as well in sheltered portions of Dry and Beaver Creek Canyons as do groves of quaking aspen (*Populus tremuloides*).

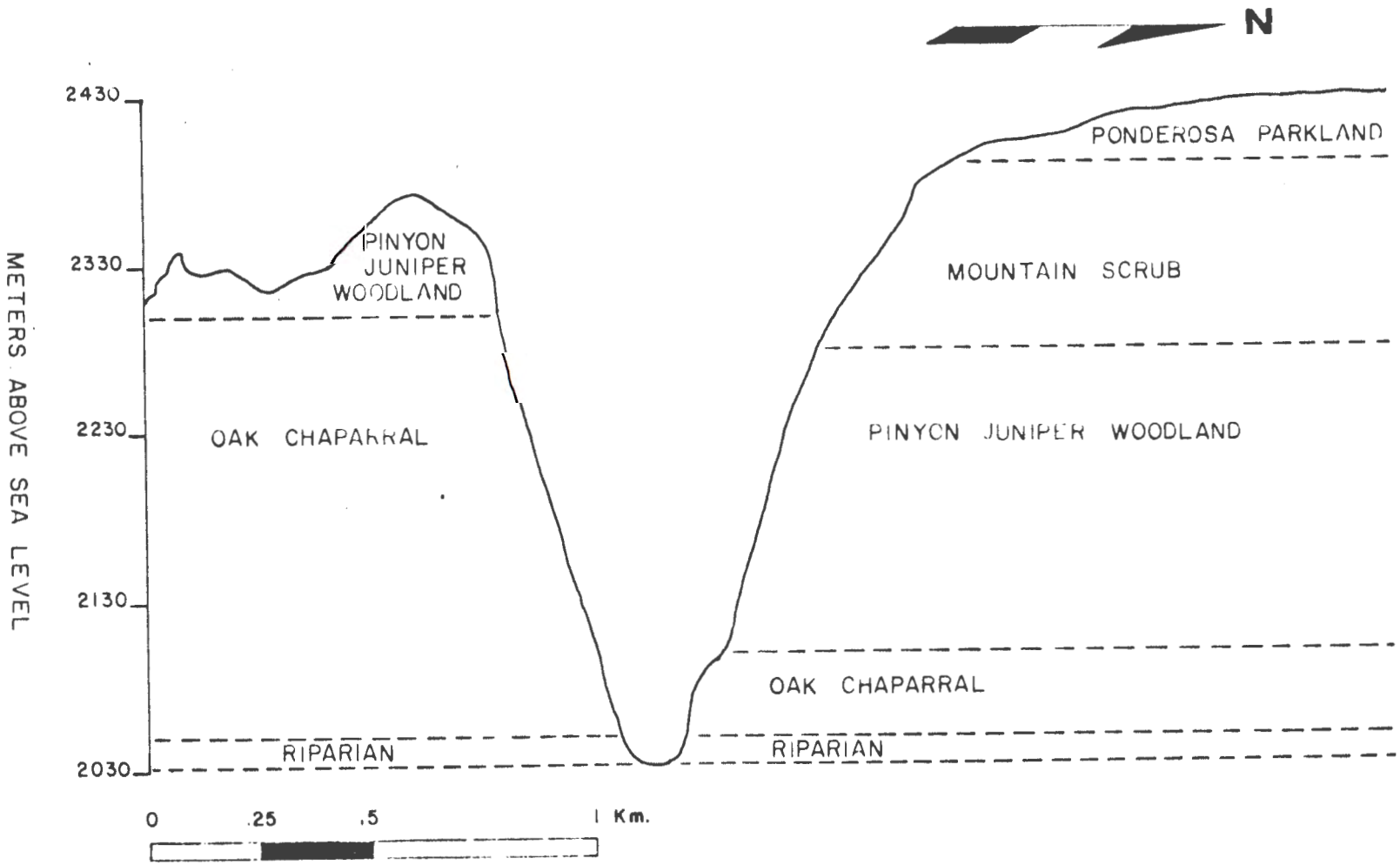
The river terrace and lower slopes of the canyon support thickets of Gambel oak (*Quercus gambelii*) interspersed with isolated ponderosa pines, pinyon pines (*Pinus edulis*), and rocky mountain juniper (*Juniperus scopulorum*). On the shaded side of the canyon, this oak chapparal dominates the entire hillside but gives way to pinyon-juniper woodland in the shallow rocky soils of the northeastern slope.

Interspersed with the pinyon and juniper are thickets of Gambel oak and serviceberry (*Amelanchier utahensis*) where the sediments are deepest. On the open talus broadleaf yucca (*Yucca baccata*), prickly pear cactus (*Opuntia* spp.), bunchgrass and small forbs are common.

Figure 10.4 Schematic profile of vegetation zones in the Grass Mesa Locality.

GRASS MESA LOCALITY

GENERALIZED VEGETATION PROFILE



PREHISTORIC SITE LOCATIONS IN
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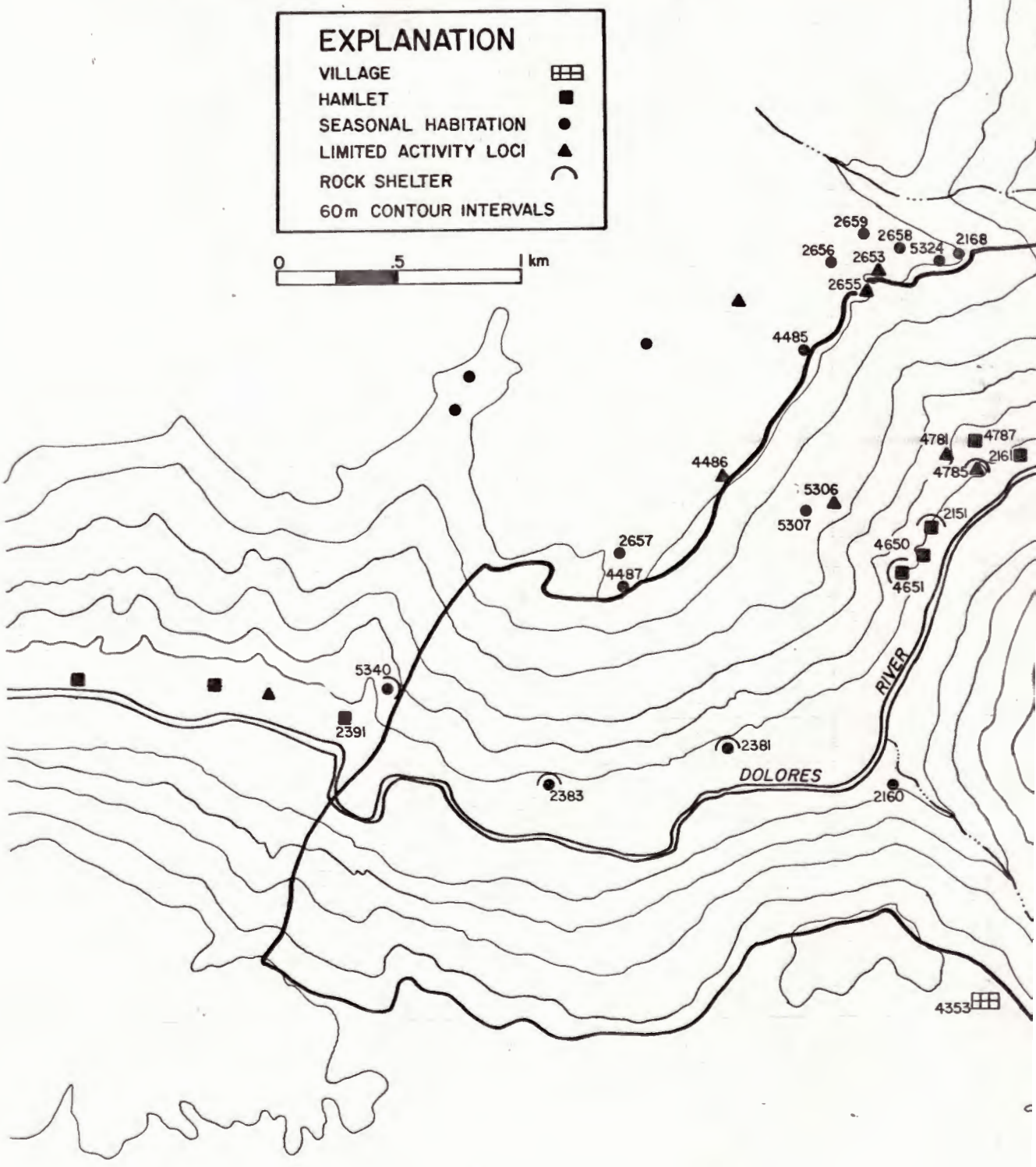

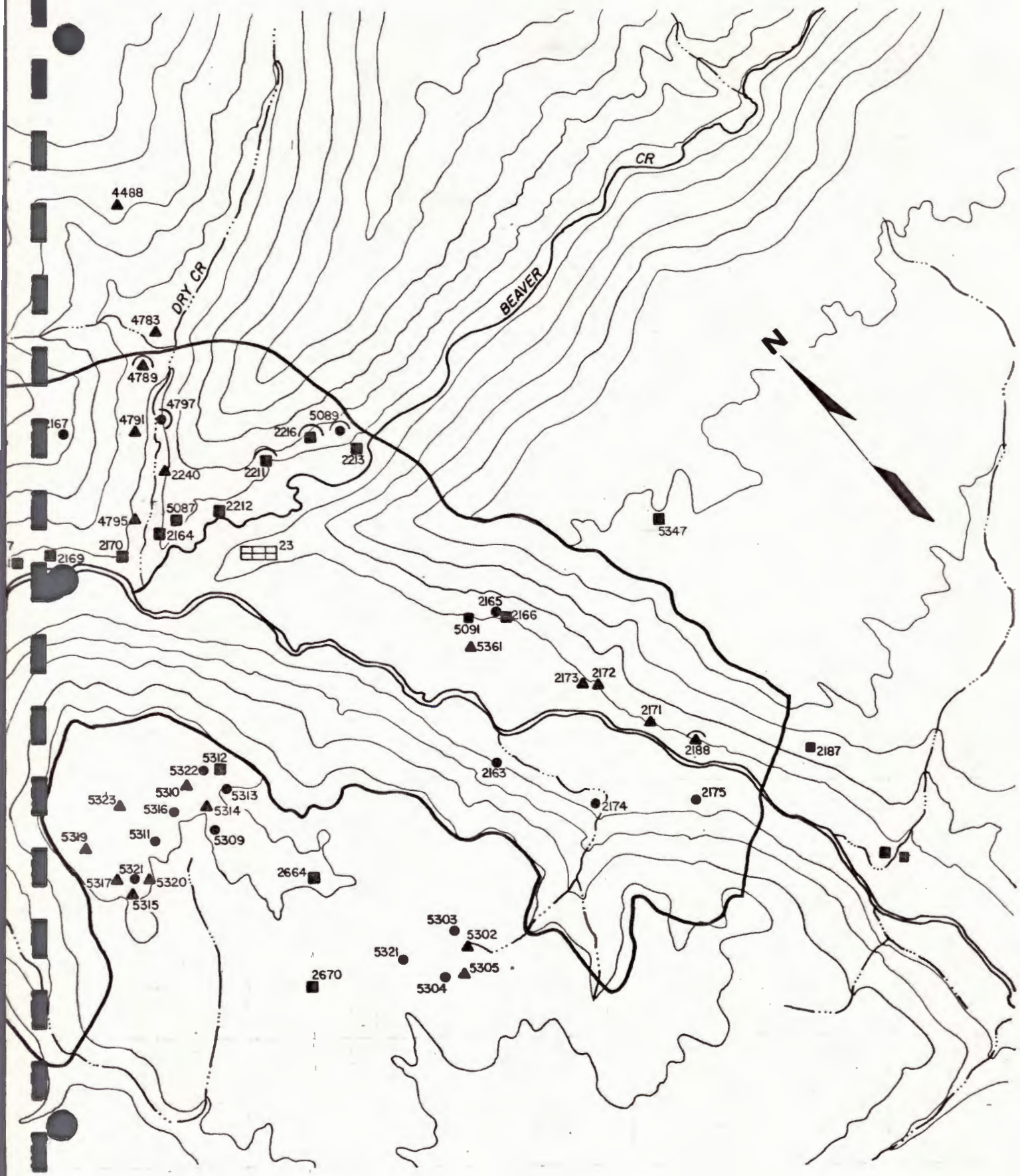
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The pinyon-juniper woodland is gradually supplanted on the upper slopes by a mountain shrub community dominated by Gambel oak, serviceberry, and mountain mahogany (Cercocarpus montanus). Ponderosa pine occurs more frequently near the rim of the canyon, becoming dominant on the plateau. Here groves of ponderosa and thickets of mountain shrubs are interspersed with broad highland meadows.

The diverse vegetation zones of the Grass Mesa Locality provides habitat for a variety of faunal species. The flood plain and canyon slopes support large rodent populations including deer mice (Peromyscus maniculatus), pinyon mice (Peromyscus truei), least chipmunk (Eutamias minimus), spotted ground squirrel (Spermophilus spilosoma), bushy-tailed woodrat (Neotoma cinerea), and rock squirrel (Spermophilus variegatus).

Along the river, striped skunk (Mephitis mephitis), beaver (Castor canadensis), muskrat (Ondatra zibethicus), and raccoon (Procyon lotor) are frequently seen. Porcupine (Erethizon dorsatum) and cottontail rabbit (Sylvilagus spp.) are present both along the river and in the hillside community.

Mule deer (Odocoileus hemionus) range over the entire locality throughout the year. American elk (Cervus canadensis) move seasonally along the larger canyons from the high country into the river valleys.

This array of herbivores supports an equally varied predator population including black bear (Ursus americanus), mountain lion (Felis concolor), coyote (Canis latrans), bobcat (Lynx rufus), and badger (Taxidea taxus).

The present natural setting of Grass Mesa, it should be emphasized, may not accurately reflect past environmental parameters. Although climatic conditions do not appear to have changed drastically since

Anasazi times, there have been fluctuations that may have subtly, but profoundly, affected prehistoric adaptation. Certainly historic use of the area has altered the ecosystem through farming, grazing, logging, and mining. Until an accurate reconstruction of the paleoenvironment is completed, though, present conditions must serve as a rough surrogate in assessing the nature of the area's aboriginal occupation.

PREHISTORY

Tentatively, man's first entry into the Grass Mesa area is believed to predate the Anasazi Tradition, although no Archaic artifacts have yet been found in the locality itself. Kane [2] reports several projectile points assignable to the Archaic Period (according to the temporal scheme developed for the Escalante Sector (Kane [1]), this would correspond to the Four Corners Desert Tradition, or 5000 B.C.-A.D. 500 were found in the House Creek area about 5 km south of Grass Mesa. These artifacts probably represent semi-nomadic hunters and gatherers exploiting the area sporadically during the warmer months of the year.

Evidence for settlement during the Basketmaker II period (terminal Great Cut Phase, 1000 B.C.-A.D. 500) is equally tenuous. Two sites on the mesa top near the canyon rim have no associated ceramic material and exhibit other characteristics of Basketmaker II sites. Although the limited data available from these sites precludes any real assessment of settlement and subsistence, the scarcity of sites representing this period suggests there was no intensive use of the vicinity before about A.D. 450.

The most intensive occupation of the locality occurred during the Sagehen and McPhee phases (A.D. 650-975) of the Anasazi Tradition. Preliminary survey records lump these periods, a policy necessarily adopted here with the caveat that some changes in the cultural system probably occurred between A.D. 450-900 that are consequently masked. With the exception of Grass Mesa Village (Site 5MT0023), a large McPhee Phase settlement on a point at the mouth of Beaver Creek Canyon, the habitation sites of the early part of this period are small hamlets spaced more or

less evenly along the northeastern bank of the river. On the flood plain, and on the upper hill slopes and mesa top to the northeast are a number of apparently contemporary sherd and lithic scatters marking limited activity loci. After A.D. 900 there appear to have been no permanent settlements in the locality, with the possible exception of Grass Mesa Village. Six limited activity sites have yielded ceramics assignable to the late McPhee Phase (A.D. 850-975), and research at the LeMoc Shelter (Site 5MT2151) suggests the actual site density may be greater than this evidence suggests. No McPhee Phase ceramics were found in the surface collection at LeMoc, yet excavation uncovered a sizable early Pueblo II component. Even these relatively extensive deposits, however, represent only a sporadic seasonal use of the canyon. And by A.D. 1050-1100, the Anasazi had apparently abandoned the area entirely.

Although there is no direct evidence for post-Anasazi prehistoric utilization of the Grass Mesa Locality, the area was probably utilized occasionally by mobile Ute Tribe groups during the Shoshonean Tradition (A.D. 1400-1900). The migration of the Utes into southwestern Colorado remains undated, but it probably occurred after the Anasazi abandonment of the Mesa Verde region. Earliest historic reference to the Utes by the Spanish place them in the area by A.D. 1600.

Largely on the basis of linguistic data, the arrival of Athabascan speakers, Navajo and Apache, in the Southwest (the Athabascan Tradition) is placed at about A.D. 1500, but the Navajo do not appear to have moved into southwestern Colorado until sometime in the early nineteenth century. Since the generally accepted territory of the Navajo lies south of the San Juan River, however, it is unlikely they habitually utilized the Grass Mesa area.

It is evident from the preceding outline that only for the Sagehen and McPhee phases is enough information currently available to speculate on the influences the local environment may have had on the pattern of Anasazi settlement in the vicinity of Grass Mesa.

SUBSISTENCE

Toll [3:156], in an overview of prehistoric adaptations to the deep canyons of the Dolores River, stresses the diversity of biotic resources created by the closely spaced micro-environments within the river valley. He argues that because of the diversity of resources present in the eco-zones of the canyon, and its limited agricultural potential, a more mixed subsistence strategy than is typical of the Anasazi would be favored (i.e., a modified Archaic-style subsistence pattern). As will be documented more fully in the LeMoc Shelter report (Hogan [4]), the aboriginal settlers in the Grass Mesa vicinity did draw freely from the variety of wild plant and animal resources available to them.

The high plateau country to the northeast of the locality (the Glade) appears to have been particularly important in the overall pattern of resource exploitation. A number of lithic scatters, tentatively assignable to the Sagehen Phase, suggest big game hunting and possibly the quarrying of lithic raw material were important activities. Mature ponderosa may also have been cut for building timber but the intensity of this exploitation cannot be determined. The Glade is a unique resource zone that was easily accessible to prehistoric peoples of the Escalante Sector and areas further removed. Logical avenues of approach to this area are through the Grass Mesa Locality; if the local inhabitants controlled access to the Glade district by foraging parties from other, more distant habitations, perhaps to the point of trading these upland resources, then a pattern of local specializations in resource procurement and processing may have developed that would have a significant impact on the social environment. It is noteworthy in this respect, that the largest habitation in the

locality, Grass Mesa Village, is located on a prominence that commands the best avenues of approach.

Despite what preliminarily seems atypical emphasis on wild resources, there is little doubt the Anasazi in the vicinity of Grass Mesa were full-scale agriculturalists. All habitation sites are located immediately adjacent to the river flood plain and, while only about one fifth of the available land is suitable for planting, this is more than sufficient to support the estimated population during the maximum exploitation period.

Using Kirkby's estimates of prehistoric maize yields in Oaxaca, Mexico (Flannery [5]) a rough estimate of maize yields for the Basketmaker III-Pueblo II periods of 0.4 metric tons per hectare was calculated; for the 200 ha of arable land in the locality, the annual yield would be 80 metric tons. Flannery [5:93,106] estimates that a Mesoamerican Formative family of two adults and three children consumed one metric ton of maize annually. Assuming that these figures approximate Anasazi parameters, some 80 households, roughly 400 people, could be supported in the 6 km strip of bottomland within the present boundaries of the Grass Mesa Locality.

Direct precipitation would not be critical to successful farming of the river bottom since the river effectively concentrates precipitation from a large catchment area. Whether this water is available to agricultural fields, though, depends on the river's channel configuration. If the channel is shallow, the river would overflow during each high water period inundating major portions of the flood plain. For successful farming, the overflow must be sufficient to saturate the ground yet not so forceful that seeds or plants would be washed away. If more deeply entrenched, river water would still be consistently available to crops

through subsurface movement as long as the water table remained within reach of their roots.

Temperature, rather than moisture, appears to have been critical in the success or failure of harvests in the area of Grass Mesa. Climatic data for Yellowjacket, Colorado (14 km west of Grass Mesa at about the same elevation--2010 m) suggest the locality has an average of about 124 frost-free days under the current climatic regime; the range of variation in the period 1964-1975 was 98 days minimum to 142 days maximum (U.S. Weather Bureau Climatic Summaries [6]). Hack's [7] figures indicate that Hopi maize requires 130 frost-free days to mature.

Even with multiple plantings, one early in the spring and a second after the danger of frost was past, crop failure would be frequent. Toll's [3] mixed subsistence strategy under these circumstances would be a necessity--a necessity, that is, if the present climate accurately reflects past conditions. Paleoenvironmental reconstruction and alluvial studies will clearly be critical to the final evaluations of the prehistoric agricultural potential of the locality.

SETTLEMENT PATTERN

The locality, hypothesized as the maximum settlement-subsistence unit for the McPhee Phase in the Escalante Sector (Kane [8]), is defined by a number of small hamlets and field houses clustered about a large village which serves to integrate the community. For most of the sector localities these site clusters tend to approximate a polygonal central place model (Kane [1]). The pattern is clearly linear, however, in the vicinity of Grass Mesa (Figure 10.5). Upriver and downriver from Grass Mesa Village small hamlets are spaced roughly 500 m apart; assuming equal allotment of farmland, 10 to 20 ha would be available to each household abiding at these hamlets. Grass Mesa Village predictably commands a proportionately greater area of the flood plain. Of the four prehistoric hamlets currently recorded within the locality boundaries, the nearest are clustered between 1 and 2 km downstream of this large settlement. The exact relationship among the small riverside hamlets and Grass Mesa Village is at the moment conjectural; finer temporal controls to establish momentary population figures and additional excavation data to estimate social distance are critical research needs in the locality.

In addition to its significance as the primary subsistence zone of the Anasazi households, the river valley was the path of least resistance for the flow of information, people, and materials. It is therefore likely that the degree of influence exerted by the community center at Grass Mesa Village was a function of linear distance along the river. Correspondingly, the canyon relief would tend to reduce the influence of mesa top villages on the river hamlets. Under these conditions it is

Figure 10.5 The locations of archaeological sites in the Grass Mesa Locality.

suspected that Grass Mesa served to integrate a much larger community than the preliminary boundaries suggest. The Grass Mesa Locality, in this broader sense, appears to exhibit a modification of typical sector social organization in the same way as the subsistence pattern represents a modification of the typical Anasazi economy; these modifications can be viewed as specialized adaptation to the unique deep canyon environment of the locality.

POPULATION DYNAMICS

Prehistoric occupation of the Grass Mesa Locality probably was a long-term phenomenon; evidence from other localities in the Escalante Sector indicates that a fairly substantial Archaic population was viable in the Dolores area. While there is no direct evidence for specific Archaic utilization of the Grass Mesa Locality, it is a near certainty that early hunters and gatherers did exploit this territory. Population parameters for this early period are unknown and await future investigation.

Population levels and flux for the Anasazi Tradition are very difficult to estimate as well. Temporal indicators in present survey collections are insufficient to determine momentary populations. If settlement patterns for the locality are similar to those of the Sagehen Flats area (and, of course some variation among localities is anticipated), then a general reconstruction is possible. The four hamlets downstream from Grass Mesa Village may represent a Sagehen Phase (A.D. 650-850) occupation. Excavation data from LeMoc Shelter (one of the downstream sites) indicate that this sandstone alcove did function as a hamlet during the last portion of this period. The Sagehen Phase occupation, then, would consist of perhaps five to six households at these four habitations plus those at the Grass Mesa site, which probably exhibited continuous expansion during this period. Ten to 12 households with 60-70 individuals is a rough estimate of the maximum momentary population during the Sagehen Phase (perhaps at A.D. 850).

During the succeding McPhee Phase it is assumed, from comparison with the Sagehen Flats model, that most of the population in the locality

was concentrated at Grass Mesa Village. Interpretation of data recovered from LeMoc Shelter indicates that this site no longer functioned as a habitation after A.D. 850; instead, the rock shelter was apparently used as a seasonal camp during the McPhee Phase. This evidence, then, tends to support the notion of a general trend toward centralization in this period. Preliminary examination of ceramic collections from Grass Mesa Village indicates that a population climax was reached there between A.D. 850-900. The nature of the occupation at the settlement after A.D. 900 is unknown; the absence of any index ceramics is not viewed as an indicator, as surface collections from McPhee Village also were lacking in type sherds assignable to the tenth century A.D. Based on a total habitation area and comparison with McPhee, the maximum momentary population at Grass Mesa Village during the McPhee Phase is estimated at 25-30 households or 90-180 individuals. This figure represents the highest population level for the Anasazi Tradition; it is well below the theoretical carrying capacity (400 persons) for the locality estimated previously based on potential maize yields.

To date virtually nothing is known about the Sundial Phase (A.D. 1050-1150) or later Anasazi occupations in the locality. No habitations representing these periods have been recorded and the evidence for other types of use is very slight. These potential late occupations were obviously of a nonintensive nature and may have been limited to seasonal foraging expeditions.

CONCLUSIONS

In conclusion, very little intensive work has been done in the Grass Mesa Locality; surveys are incomplete and only one site has been excavated. The preliminary interpretations offered herein are intended only to place some of the more obvious features of the area within the larger perspectives of regional relationships and the D.A.P. research design.

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INTRODUCTION

The Grass Mesa Locality is one of 16 such spacial units defined in the Escalante Sector of the Yellowjacket District (Figure 10.1) (Kane [1]). Intensive D.A.P. investigations were performed in the locality in 1978 as this area incorporates the proposed McPhee Dam Site and cofferdam pool. As currently defined, the Grass Mesa Locality is an area of about 900 hectares centering on the confluence of Dry and Beaver Creek Canyons, and the Dolores River, located within Montezuma County in southwestern Colorado. The local landscape is characterized by deep, narrow canyons with steeply sloped walls rising to broad, rolling uplands. This canyon setting greatly influenced prehistoric occupation of the area and the resulting pattern of human adaptation is possibly unique within the Escalante Sector. Beginning with a sketch of the natural setting of the Grass Mesa area and an outline of its prehistory, this paper focuses on the local pattern of Anasazi settlement and the environmental constraints in part responsible for that pattern.

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Figure 10.3 View of south side slope of Dolores Canyon from LeMoc Shelter. Note band of outcropping Entrada Sandstone on the canyon wall above the talus slope.

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Figure 10.4 Schematic profile of vegetation zones in the Grass Mesa Locality.

The pinyon-juniper woodland is gradually supplanted on the upper slopes by a mountain shrub community dominated by Gambel oak, serviceberry, and mountain mahogany (Cercocarpus montanus). Ponderosa pine occurs more frequently near the rim of the canyon, becoming dominant on the plateau. Here groves of ponderosa and thickets of mountain shrubs are interspersed with broad highland meadows.

The diverse vegetation zones of the Grass Mesa Locality provides habitat for a variety of faunal species. The flood plain and canyon slopes support large rodent populations including deer mice (Peromyscus maniculatus), pinyon mice (Peromyscus truei), least chipmunk (Eutamias minimus), spotted ground squirrel (Spermophilus spilosoma), bushy-tailed woodrat (Neotoma cinerea), and rock squirrel (Spermophilus variegatus).

Along the river, striped skunk (Mephitis mephitis), beaver (Castor canadensis), muskrat (Ondatra zibethicus), and raccoon (Procyon lotor) are frequently seen. Porcupine (Erethizon dorsatum) and cottontail rabbit (Sylvilagus spp.) are present both along the river and in the hillside community.

Mule deer (Odocoileus hemionus) range over the entire locality throughout the year. American elk (Cervus canadensis) move seasonally along the larger canyons from the high country into the river valleys.

This array of herbivores supports an equally varied predator population including black bear (Ursus americanus), mountain lion (Felis concolor), coyote (Canis latrans), bobcat (Lynx rufus), and badger (Taxidea taxus).

The present natural setting of Grass Mesa, it should be emphasized, may not accurately reflect past environmental parameters. Although climatic conditions do not appear to have changed drastically since

Anasazi times, there have been fluctuations that may have subtly, but profoundly, affected prehistoric adaptation. Certainly historic use of the area has altered the ecosystem through farming, grazing, logging, and mining. Until an accurate reconstruction of the paleoenvironment is completed, though, present conditions must serve as a rough surrogate in assessing the nature of the area's aboriginal occupation.

PREHISTORY

Tentatively, man's first entry into the Grass Mesa area is believed to predate the Anasazi Tradition, although no Archaic artifacts have yet been found in the locality itself. Kane [2] reports several projectile points assignable to the Archaic Period (according to the temporal scheme developed for the Escalante Sector (Kane [1]), this would correspond to the Four Corners Desert Tradition, or 5000 B.C.-A.D. 500) were found in the House Creek area about 5 km south of Grass Mesa. These artifacts probably represent semi-nomadic hunters and gatherers exploiting the area sporadically during the warmer months of the year.

Evidence for settlement during the Basketmaker II period (terminal Great Cut Phase, 1000 B.C.-A.D. 500) is equally tenuous. Two sites on the mesa top near the canyon rim have no associated ceramic material and exhibit other characteristics of Basketmaker II sites. Although the limited data available from these sites precludes any real assessment of settlement and subsistence, the scarcity of sites representing this period suggests there was no intensive use of the vicinity before about A.D. 450.

The most intensive occupation of the locality occurred during the Sagehen and McPhee phases (A.D. 650-975) of the Anasazi Tradition. Preliminary survey records lump these periods, a policy necessarily adopted here with the caveat that some changes in the cultural system probably occurred between A.D. 450-900 that are consequently masked. With the exception of Grass Mesa Village (Site 5MT0023), a large McPhee Phase settlement on a point at the mouth of Beaver Creek Canyon, the habitation sites of the early part of this period are small hamlets spaced more or

less evenly along the northeastern bank of the river. On the flood plain, and on the upper hill slopes and mesa top to the northeast are a number of apparently contemporary sherd and lithic scatters marking limited activity loci. After A.D. 900 there appear to have been no permanent settlements in the locality, with the possible exception of Grass Mesa Village. Six limited activity sites have yielded ceramics assignable to the late McPhee Phase (A.D. 850-975), and research at the LeMoc Shelter (Site 5MT2151) suggests the actual site density may be greater than this evidence suggests. No McPhee Phase ceramics were found in the surface collection at LeMoc, yet excavation uncovered a sizable early Pueblo II component. Even these relatively extensive deposits, however, represent only a sporadic seasonal use of the canyon, and by A.D. 1050-1100, the Anasazi had apparently abandoned the area entirely.

Although there is no direct evidence for post-Anasazi prehistoric utilization of the Grass Mesa Locality, the area was probably utilized occasionally by mobile Ute Tribe groups during the Shoshonean Tradition (A.D. 1400-1900). The migration of the Utes into southwestern Colorado remains undated, but it probably occurred after the Anasazi abandonment of the Mesa Verde region. Earliest historic reference to the Utes by the Spanish place them in the area by A.D. 1600.

Largely on the basis of linguistic data, the arrival of Athabascan speakers, Navajo and Apache, in the Southwest (the Athabascan Tradition) is placed at about A.D. 1500, but the Navajo do not appear to have moved into southwestern Colorado until sometime in the early nineteenth century. Since the generally accepted territory of the Navajo lies south of the San Juan River, however, it is unlikely they habitually utilized the Grass Mesa area.

It is evident from the preceding outline that only for the Sagehen and McPhee phases is enough information currently available to speculate on the influences the local environment may have had on the pattern of Anasazi settlement in the vicinity of Grass Mesa.

SUBSISTENCE

Toll [3:156], in an overview of prehistoric adaptations to the deep canyons of the Dolores River, stresses the diversity of biotic resources created by the closely spaced micro-environments within the river valley. He argues that because of the diversity of resources present in the eco-zones of the canyon, and its limited agricultural potential, a more mixed subsistence strategy than is typical of the Anasazi would be favored (i.e., a modified Archaic-style subsistence pattern). As will be documented more fully in the LeMoc Shelter report (Hogan [4]), the aboriginal settlers in the Grass Mesa vicinity did draw freely from the variety of wild plant and animal resources available to them.

The high plateau country to the northeast of the locality (the Glade) appears to have been particularly important in the overall pattern of resource exploitation. A number of lithic scatters, tentatively assignable to the Sagehen Phase, suggest big game hunting and possibly the quarrying of lithic raw material were important activities. Mature ponderosa may also have been cut for building timber but the intensity of this exploitation cannot be determined. The Glade is a unique resource zone that was easily accessible to prehistoric peoples of the Escalante Sector and areas further removed. Logical avenues of approach to this area are through the Grass Mesa Locality; if the local inhabitants controlled access to the Glade district by foraging parties from other, more distant habitations, perhaps to the point of trading these upland resources, then a pattern of local specializations in resource procurement and processing may have developed that would have a significant impact on the social environment. It is noteworthy in this respect, that the largest habitation in the

locality, Grass Mesa Village, is located on a prominence that commands the best avenues of approach.

Despite what preliminarily seems atypical emphasis on wild resources, there is little doubt the Anasazi in the vicinity of Grass Mesa were full-scale agriculturalists. All habitation sites are located immediately adjacent to the river flood plain and, while only about one fifth of the available land is suitable for planting, this is more than sufficient to support the estimated population during the maximum exploitation period.

Using Kirkby's estimates of prehistoric maize yields in Oaxaca, Mexico (Flannery [5]) a rough estimate of maize yields for the Basketmaker III-Pueblo II periods of 0.4 metric tons per hectare was calculated; for the 200 ha of arable land in the locality, the annual yield would be 80 metric tons. Flannery [5:93,106] estimates that a Mesoamerican Formative family of two adults and three children consumed one metric ton of maize annually. Assuming that these figures approximate Anasazi parameters, some 80 households, roughly 400 people, could be supported in the 6 km strip of bottomland within the present boundaries of the Grass Mesa Locality.

Direct precipitation would not be critical to successful farming of the river bottom since the river effectively concentrates precipitation from a large catchment area. Whether this water is available to agricultural fields, though, depends on the river's channel configuration. If the channel is shallow, the river would overflow during each high water period inundating major portions of the flood plain. For successful farming, the overflow must be sufficient to saturate the ground yet not so forceful that seeds or plants would be washed away. If more deeply entrenched, river water would still be consistently available to crops

through subsurface movement as long as the water table remained within reach of their roots.

Temperature, rather than moisture, appears to have been critical in the success or failure of harvests in the area of Grass Mesa. Climatic data for Yellowjacket, Colorado (14 km west of Grass Mesa at about the same elevation--2010 m) suggest the locality has an average of about 124 frost-free days under the current climatic regime; the range of variation in the period 1964-1975 was 98 days minimum to 142 days maximum (U.S. Weather Bureau Climatic Summaries [6]). Hack's [7] figures indicate that Hopi maize requires 130 frost-free days to mature.

Even with multiple plantings, one early in the spring and a second after the danger of frost was past, crop failure would be frequent. Toll's [3] mixed subsistence strategy under these circumstances would be a necessity--a necessity, that is, if the present climate accurately reflects past conditions. Paleoenvironmental reconstruction and alluvial studies will clearly be critical to the final evaluations of the prehistoric agricultural potential of the locality.

SETTLEMENT PATTERN

The locality, hypothesized as the maximum settlement-subsistence unit for the McPhee Phase in the Escalante Sector (Kane [8]), is defined by a number of small hamlets and field houses clustered about a large village which serves to integrate the community. For most of the sector localities these site clusters tend to approximate a polygonal central place model (Kane [1]). The pattern is clearly linear, however, in the vicinity of Grass Mesa (Figure 10.5). Upriver and downriver from Grass Mesa Village small hamlets are spaced roughly 500 m apart; assuming equal allotment of farmland, 10 to 20 ha would be available to each household abiding at these hamlets. Grass Mesa Village predictably commands a proportionately greater area of the flood plain. Of the four prehistoric hamlets currently recorded within the locality boundaries, the nearest are clustered between 1 and 2 km downstream of this large settlement. The exact relationship among the small riverside hamlets and Grass Mesa Village is at the moment conjectural; finer temporal controls to establish momentary population figures and additional excavation data to estimate social distance are critical research needs in the locality.

In addition to its significance as the primary subsistence zone of the Anasazi households, the river valley was the path of least resistance for the flow of information, people, and materials. It is therefore likely that the degree of influence exerted by the community center at Grass Mesa Village was a function of linear distance along the river. Correspondingly, the canyon relief would tend to reduce the influence of mesa top villages on the river hamlets. Under these conditions it is

Figure 10.5 The locations of archaeological sites in the Grass Mesa Locality.

suspected that Grass Mesa served to integrate a much larger community than the preliminary boundaries suggest. The Grass Mesa Locality, in this broader sense, appears to exhibit a modification of typical sector social organization in the same way as the subsistence pattern represents a modification of the typical Anasazi economy; these modifications can be viewed as specialized adaptation to the unique deep canyon environment of the locality.

POPULATION DYNAMICS

Prehistoric occupation of the Grass Mesa Locality probably was a long-term phenomenon; evidence from other localities in the Escalante Sector indicates that a fairly substantial Archaic population was viable in the Dolores area. While there is no direct evidence for specific Archaic utilization of the Grass Mesa Locality, it is a near certainty that early hunters and gatherers did exploit this territory. Population parameters for this early period are unknown and await future investigation.

Population levels and flux for the Anasazi Tradition are very difficult to estimate as well. Temporal indicators in present survey collections are insufficient to determine momentary populations. If settlement patterns for the locality are similar to those of the Sagehen Flats area (and, of course some variation among localities is anticipated), then a general reconstruction is possible. The four hamlets downstream from Grass Mesa Village may represent a Sagehen Phase (A.D. 650-850) occupation. Excavation data from LeMoc Shelter (one of the downstream sites) indicate that this sandstone alcove did function as a hamlet during the last portion of this period. The Sagehen Phase occupation, then, would consist of perhaps five to six households at these four habitations plus those at the Grass Mesa site, which probably exhibited continuous expansion during this period. Ten to 12 households with 60-70 individuals is a rough estimate of the maximum momentary population during the Sagehen Phase (perhaps at A.D. 850).

During the succeding McPhee Phase it is assumed, from comparison with the Sagehen Flats model, that most of the population in the locality

was concentrated at Grass Mesa Village. Interpretation of data recovered from LeMoc Shelter indicates that this site no longer functioned as a habitation after A.D. 850; instead, the rock shelter was apparently used as a seasonal camp during the McPhee Phase. This evidence, then, tends to support the notion of a general trend toward centralization in this period. Preliminary examination of ceramic collections from Grass Mesa Village indicates that a population climax was reached there between A.D. 850-900. The nature of the occupation at the settlement after A.D. 900 is unknown; the absence of any index ceramics is not viewed as an indicator, as surface collections from McPhee Village also were lacking in type sherds assignable to the tenth century A.D. Based on a total habitation area and comparison with McPhee, the maximum momentary population at Grass Mesa Village during the McPhee Phase is estimated at 25-30 households or 90-180 individuals. This figure represents the highest population level for the Anasazi Tradition; it is well below the theoretical carrying capacity (400 persons) for the locality estimated previously, based on potential maize yields.

To date virtually nothing is known about the Sundial Phase (A.D. 1050-1150) or later Anasazi occupations in the locality. No habitations representing these periods have been recorded and the evidence for other types of use is very slight. These potential late occupations were obviously of a nonintensive nature and may have been limited to seasonal foraging expeditions.

CONCLUSIONS

In conclusion, very little intensive work has been done in the Grass Mesa Locality; surveys are incomplete and only one site has been excavated. The preliminary interpretations offered herein are intended only to place some of the more obvious features of the area within the larger perspectives of regional relationships and the D.A.P. research design.

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