Final Report
for
Archaeological Sampling Survey of Proposed Additions
to the Existing Grand Gulch Primitive Area
A-76-18

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# Table of Contents

INTRODUCTION. ........................................ 1

The Slickhorn Extension Area. .......................... 5

- Environmental Characteristics. .................... 5
- Quadrat Data ....................................... 7
- Canyon Data ....................................... 15
- Evaluation of the Proposed Slickhorn Unit Addition 20

Pine Canyon and Dripping Canyon Extension Areas .... 24

- Environmental Characteristics. .................... 24
- Quadrat Data ....................................... 26
- Canyon Data ....................................... 31
- Evaluation of Proposed Pine-Dripping Unit Addition 34

Sheiks and Coyote Flat Extension Areas. ............... 36

Western Sheiks Extension Area ......................... 37

- Environmental Characteristics. .................... 37
- Mesa Top Data ..................................... 38
- Canyon Data ....................................... 41
- Evaluation of Western Sheiks Extension Area .... 42

Eastern Sheiks Extension Area .......................... 44

- Environmental Characteristics. .................... 44
- Mesa Top Data ..................................... 45
- Canyon Data ....................................... 49
- Evaluation of the Eastern Sheiks Extension Area. 51

Kane Gulch Extension Area ............................... 52

- Environmental Characteristics. .................... 52
- Archaeological Characteristics .................... 53
- Canyon Data ....................................... 56
- Evaluation of the Kane Gulch Extension Area .... 57

Collins Spring-Steer Gulch Extensions .................. 60

Interpretive Summary

- Main Characteristics of Cedar Mesa Archaeology ... 63
- Archaeological Importance of the Proposed Addition 66
  Slickhorn ........................................... 67
  Pine-Dripping ..................................... 68
  Western Sheiks .................................... 69
  Eastern Sheiks .................................... 70
  Kane Extension .................................... 72
  Collins Spring-Steer Gulch. ......................... 73

References Cited. ..................................... 74
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slickhorn Quadrat Survey</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Hardscrabble Quadrat Survey</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Summary of Cedar Mesa Canyon</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Summary of Pine-Dripping Quadrats</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>Temporal Distribution of Sites</td>
<td>47</td>
</tr>
<tr>
<td>6</td>
<td>Upper Bullet Canyon Inventory Data</td>
<td>50</td>
</tr>
<tr>
<td>7a</td>
<td>Upper Grand Gulch Area</td>
<td>55</td>
</tr>
<tr>
<td>7b</td>
<td>Upper Grand Gulch Area</td>
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<td>8</td>
<td>Summary of Kane Gulch Extension Area</td>
<td>58</td>
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</table>
INTRODUCTION

The objective of this study is to assess the archaeological resources of proposed additions to the Grand Gulch Primitive Area, in terms of:

A. Their basic archaeological characteristics (e.g., cultural affiliation, dates, types of sites, etc.).

B. Their relationships to major environmental variables (e.g., mesatop pinyon-juniper woodland, sage parks, and blackbrush shrubland, and entrenched canyon environments).

C. Their scientific, educational, and recreational significance, both current and potential.

D. Their present condition, including effects of recent natural erosion and vandalism.

E. Their cultural and potential interpretive relationships to the archaeological resources of the existing Grand Gulch Primitive Area.

The Shieks Flat, Coyote Flat, Long Flat A and B and Kane Gulch extensions are characterized in this report and in tabular site summaries on the basis of work done in and immediately adjacent to these areas between 1969 and 1975 by the authors. The Dripping and Pine Canyon extensions, and the Slickhorn Extension, are characterized in this report on the basis of fieldwork conducted in the summer of 1976, which was
supported by this contract. Individual site forms and tabular summaries of site characteristics for these areas have already been submitted. It was intended that fieldwork be conducted in the small Collins Spring and Steer Gulch Extensions, but limitations on available time and funds made this work impossible without diverting personnel from the larger Slickhorn and Pine-Dripping areas. It was decided to concentrate on obtaining an adequate sample of the larger areas. Consequently, in this report, the Collins Spring and Steer Gulch Extensions are characterized on the basis of extrapolations from nearby and environmentally similar areas, including several small areas surveyed in 1976 by Museum of Northern Arizona and BYU archaeologists in conjunction with drillhole clearances (Sant 1976; Patterson 1976).

The fieldwork in the Pine-Dripping Extensions and in the Slickhorn Extensions was oriented by a two-part or stratified sampling design which covered approximately 10% of the study areas. The first part of this field study was the intensive survey of 400 meter square quadrats, scattered in a random pattern over the area. This was designed to give a reliable estimate of the number and main kinds of archaeological sites in at least the mesatop, or non-canyon, portion of the area. Because the canyons comprise a relatively small proportion of the total area in both study units, and the sites in them tend to be concentrated only in some portions
of the canyons, it was felt that the quadrat survey would not provide as much information as was desired about these canyon sites, since few of the random quadrats would probably fall in the canyons. Furthermore, the canyon sites are expected to receive more visitor impacts than the mesatop sites if the proposed extensions are added to the Primitive Area. Consequently, the canyons were studied in a different way, by teams systematically walking the canyon bottoms and lower ledges, and recording all sites encountered. As a result, a much higher proportion of the canyon environment than of the area as a whole was surveyed for sites.

The fieldwork for the Pine-Dripping and Slickhorn areas was carried out in July and August, 1976, under the direction of Dr. Lipe, assisted by Mr. Richard Ahlstrom. The size of the field party ranged from five to ten, with an average of six persons. In the Slickhorn unit, 23 quadrats were surveyed, and a total of 22 sites recorded. In addition, 37 km. of entrenched canyon was walked, yielding an additional 32 sites. In the Pine-Dripping units, 24 quadrats were surveyed and 55 sites found. In this area, 23.7 km. of canyon was walked and a total of 25 canyon sites recorded. In all, a total of 134 sites was recorded.

The survey data obtained in 1976, in conjunction with that already gathered as a result of the research activities of the Cedar Mesa Project, would support a great deal of analysis
directed toward the objectives listed above. Unfortunately, the scope and funding of this contract will permit no more than a superficial consideration of these possibilities in this report. A good deal of analysis of prehistoric land use patterns and environmental relationships has, of course, already been done as part of the work of the Cedar Mesa Project. It must be assumed here that those using this report are familiar with this previous work, reports of which have been submitted to the Bureau of Land Management District Office over the years (Lipe 1970; Lipe and Matson 1971a, 1971b, 1974, 1975; Matson and Lipe 1975, 1977; Keller et al., 1974; Agenbroad 1975; Salkin 1975). In addition, Lipe has addressed the questions of archaeological significance and management problems of cultural resources in the Cedar Mesa area in correspondence with the District Office (e.g., letters on "management recommendations for Grand Gulch Primitive Area", November, 1974, "comments on draft management plan", March, 1976) and in publication (Lipe 1975).

In the discussions that follow, a simple sequence of archaeological periods has been used. These periods, and the approximate dates we currently assign them, are as follows:

- Basketmaker II . . . . . . . . . . A.D. 100-450
- Basketmaker III . . . . . . . . . . A.D. 600-750
- Pueblo . . . . . . . . . . . . . . . . . A.D. 1050-1250

In the commonly used Pecos classification of periods of Anasazi
development, the Pueblo occupation spans late Pueblo II through middle Pueblo III. Recent analysis indicates that this approximately 200-year period can be further subdivided into perhaps as many as four phases. Although there are a few references to "late" or "terminal" Pueblo occupations in this report, a systematic subdivision of the Pueblo occupation was not attempted, because the sites inventoried in 1976 were dated only on the basis of surficial field inspection of sherd assemblages, and because the objectives of the study did not seem to warrant a more detailed treatment. The bases for defining and dating the various occupations of Cedar Mesa, as well as the gaps between them, are detailed in the reports listed above, and cannot be gone into here.

The Slickhorn Extension Area

Environmental Characteristics.

The Slickhorn Extension Area is located in the southwestern part of Cedar Mesa, and is drained by the Slickhorn Canyon system, which debouches into the San Juan River. The Slickhorn system is ramified into a number of tributaries, which are numbered in clockwise fashion 1 through 7 on Map 1. The southernmost part of the extension area is drained by an unnamed canyon that also runs into the San Juan; for convenience, this was labeled S-T8, even though it is not a tributary of Slickhorn. These canyon systems comprise a
relatively large portion of the study area. The Slickhorn system appears to be one of the best watered on Cedar Mesa; springs and seeps are abundant. From just above the Lake Powell Recreation Area boundary to the San Juan, both Slickhorn and T8 become very deeply entrenched—upwards of 1000-1200 feet deep. The floor of the main Slickhorn Canyon below about the T5 juncture is frequently ledgy and choked with large boulders. Patches of alluvium occur only in some of the tributaries and in the upper part of T8.

The mesatop into which these canyons are entrenched is relatively low-lying, and slopes gradually from about 6250 ft. at the eastern edge of the Extension area to below 5400 ft. at the westernmost part. Patches and ledges of bedrock are exposed in many places, and there are few areas of deep soil. Pinyon and juniper occur widely, but only in the eastern part of the area do they comprise a moderately dense woodland. In most areas they occur as a thin scattering of trees among predominantly shrub cover, and sometimes clustering into straggling groves. There are extensive areas of sage cover in the higher areas and deeper soils, interfingering with blackbrush on the lower areas or thinner soils. Often, blackbrush will be found growing on deflated areas of thin soil scattered with wind-exhumed caliche lumps, with sage confined to hummocks or dunes of sand that have been deposited, at least temporarily, by the prevailing southwesterly winds.
Quadrat Data.

The Slickhorn quadrat survey showed that the area enclosed within the proposed Extension had a site density of slightly less than one per quadrat, or about 6 per sq. km. This is in contrast to a mean site density of about 4.5 per quadrat or 28 per sq. km. estimated for Cedar Mesa as a whole on the basis of earlier Cedar Mesa Project studies. These figures are not precisely comparable, because the Cedar Mesa Project arbitrarily defined the lower mesa boundary at the 5600 ft. contour, and the Slickhorn Extension has a substantial amount of territory, particularly in its western reaches, below this elevation. It also is low in elevation as compared with the Bullet and Upper Grand Gulch drainages, and is about the same as the West Johns and Hardscrabble units. Since site densities on Cedar Mesa fall off rapidly with elevation, it is expectable that site densities in Slickhorn would be low. Furthermore, the Cedar Mesa Project data include some very small sites that probably would not have been recorded in the 1976 Slickhorn study. In general, in 1976 we did not assign site numbers to concentrations of less than a half dozen flakes, lithic scatters of extremely low density, or some isolated scatters of burned rock with no artifacts. Some of these would probably have been recorded in the earlier Cedar Mesa Project studies. If we use as a basis for calculation only those CMP sites to which a probable age could be assigned, the
nebulous sites are left out, and we have a figure of 3.6 sites per quadrat (22.5 per sq. km.) on the average for the mesa as a whole.

The Slickhorn site densities are most like those recorded by CMP for the Hardscrabble unit, one of the five drainages investigated as part of the study of the mesa as a whole. The Hardscrabble area, which actually is composed of the drainages of Polly's Canyon plus the unnamed Grand Gulch tributary just south of it, is the lowest in elevation of the five CMP study areas and is approximately the same in elevation as the Slickhorn Extension area, which lies just south of it. The unadjusted site density for Hardscrabble is 1.7 per quadrat (10 per sq. km.). If we drop out the sites lacking enough material to enable them to be assigned a probable date, we are left with a density of 1.4 sites per quadrat for Hardscrabble. Considering that the land lying around the heads of the upper Slickhorn tributaries has been excluded, whereas Hardscrabble includes entire watersheds, the two areas seem well matched.

The approximate number of sites in the proposed Slickhorn extension can be estimated from the quadrat survey data, because the quadrats were distributed in a random way throughout the area, and presumably provide a representative sample of it. The best estimate of the total number of sites will be the arithmetic mean number of sites per surveyed quadrat, times the total number of possible quadrats. In the Slickhorn
extension area, the survey located an average of about 1 site per quadrat, and the number of possible quadrats was 400; hence, the best estimate of total sites for the area is 400.

If we wish to assign confidence intervals to a mean estimate, the usual method is to use an estimate of the standard error. To do so, however, one makes the assumption that the sampling distribution is normal, which only follows if the population distribution is in fact approximately normal or if the sample is very large. Both experience and sampling experiments have shown that when such confidence intervals are calculated for data of the sort we have from Slickhorn, the estimates are usually one-sided, i.e., the lower confidence interval is about right, but the estimate of the higher interval is too low (Matson and Lipe 1975). The variance of the data from the Slickhorn survey is about 1.227; using this to calculate confidence intervals in the standard way (Cochran 1963), we obtain 80% confidence intervals of 285 and 514. Following our discussion above, we can be about 80% certain that there are at least 285 sites in the Slickhorn area, but we are on shakier ground—perhaps only 50% certain—that there are not more than 514 sites.

Binomial confidence intervals should be more appropriate for our situation, for they do not require any assumptions about population shape. Although there is no direct way for us to get binomial confidence intervals for Slickhorn, using our
survey data, we can get some indications. For instance, we can calculate the binomial confidence intervals for quadrats having a single site, those having two sites, and so forth, to obtain a total number of sites. Again, like the confidence intervals based on normal distributions, these estimates give us good lower bounds, but less reliable upper bounds. The reason is the same in both cases—we have good control over the most frequent size classes of quadrat, but have poor estimates of the rarer large size classes, e.g., those with four or more sites. Even a relatively minor fluctuation in the numbers of these "large" quadrats would change the estimated total significantly, so our estimates will be poor for the upper end.

Following Conover (1971) and using 95% binomial confidence intervals, we come up with a figure of 196 sites for the lower bound, and 684 for the upper. The latter figure is almost certainly too low. Note that these confidence intervals are asymmetrical around the mean, reflecting the characteristics of the raw data, while the ones based on normal distributions were symmetrical; the latter are almost certain to be in error.

Turning to the kinds and ages of sites found in the Slickhorn quadrat survey, the only evidence of Archaic occupation was a single thick, serrate-edged, indented-base point found in one "hot spot" at what was otherwise an extensive Basketmaker II base camp (S-70-2). There is no way to determine whether this
find represents an actual Archaic occupation or the work of a Basketmaker II "point-collector" who found the Archaic implement elsewhere. Suffice it to say that no definite Archaic site or component has been identified among the over 500 sites now systematically recorded in the Cedar Mesa area. A possible exception is the upper pictograph panel at the "Green Mask" site at the mouth of Sheik's Canyon near Grand Gulch, which may be done in an Archaic style (Polly Schaafsma, personal communication). Only a few other isolated points—probably less than 10—have been observed or recorded at other sites, and all in association with materials of other ages, as at S-70-2.

A glance at Table 1 will show that the sites recorded by the Slickhorn quadrat survey are overwhelmingly of Anasazi tradition, Basketmaker II age (probably dating between about A.D. 100-450), that there are no Basketmaker III sites, and only one Pueblo site (Pueblo II-III). This was expectable in terms of the general trends for the mesa demonstrated by the Cedar Mesa project. On the mesatops, Basketmaker III and Pueblo sites are concentrated in the higher, wetter parts of the mesa, and in association with the deeper soils, which usually are found on the divides between major drainages. In general, the gradient for Basketmaker III and Pueblo sites for Cedar Mesa trends from higher frequencies in the northeast to lower frequencies in the southwest. The implications
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*relatively large site
* dating assignment questionable
of this distribution are that the Basketmaker III and Pueblo sites were located to maximize rainfall farming.

The Basketmaker II sites, on the other hand, are much more uniformly distributed over the mesa, and are relatively abundant in the southwest as well as in the north and northeast. They have consistently been found to be associated with canyon rim areas. Although the Basketmaker II groups evidently were doing some farming on a regular basis, the settlement pattern suggests they had a more diversified subsistence pattern, and were locating their sites so as to obtain access to the resources of both the canyons and the mesa top. The Slickhorn data are in keeping with this trend.

The numbers of Basketmaker II sites per unit area in Slickhorn are about the same as in Hardscraboble, and only slightly lower than elsewhere on the mesa (the median for the five drainage CMP survey was 1.5 Basketmaker II sites per quadrat).

Hardscraboble shows (Table 2) the same emphasis on heavy Basketmaker II occupation as does Slickhorn, but has at least two probable Basketmaker III components and several Pueblo II-III components. In looking at both tables, it is apparent that the Basketmaker III and Pueblo sites are more likely to occur in the higher areas and in the divide or deep soil areas. As previously noted, because of the exclusion of much of the upper part of its drainage basin, Slickhorn has relatively more rimrock areas and fewer deep soil areas than does Hardscraboble. Consequently, it is not surprising
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*relatively large site

16 2 7 4 28
that the Slickhorn mesatop sites have relatively more Basketmaker II sites and fewer Basketmaker III and Pueblo II/III sites.

Another environmental correlation noted in Slickhorn as elsewhere is the association of mesatop sites of all kinds with pinyon-juniper cover. In general, sites are very rare in the open shrublands, whether sage or blackbrush covered. Big sage (Artemisia tridentata) is a good indicator of deep soil and more effective moisture, so it is expectable that Basketmaker III and Pueblo sites would be located near such flats or in pinyon-juniper woodlands where sage also occurs. Blackbrush, on the other hand, is an indicator of shallow soils and low effective moisture, and the later sites are unlikely to be found very near it (e.g., in the same quadrat).

The gap between Basketmaker III and late Pueblo II that has been noted elsewhere on the mesa is also present in the Slickhorn data. This hiatus in occupation lasted from about A.D. 700 to the late 1000's, a period of over 300 years. Why this should be so remains a puzzle (see discussion in Matson and Lipe 1977), but it is consistent with other lines of evidence suggesting that Cedar Mesa was marginal for Anasazi rainfall and floodwater farming.

Canyon Data.

The findings of the canyon surveys are in striking contrast to those of the quadrat survey, which predominantly sampled mesatop environments. In the canyons, the sites are
overwhelmingly of Pueblo II/III date. This also is in keeping with previously noted trends (cf. Lipe and Matson 1975) which show that the canyons, perhaps because of their superior water supplies, were much less sensitive to the northeast-southwest environmental gradient than was the mesatop. The presence of alluvial soils in some also must have provided an additional attraction for Pueblo occupation.

These points can be illustrated by reference to Table 3. In the first three columns, the Pueblo occupations of an upper portion of Grand Gulch, of upper North Road canyon, and of upper Polly's Canyon are compared. The Grand Gulch and North Road segments are in the environmentally favored north and northeast portions of the mesa, while Polly's is in the drier southwestern (Hardscrabble) area. There is a dropoff in site frequency and size, but not as great as for the mesatop. For example, the quadrat survey of Upper Grand Gulch yielded four to five times as many Pueblo sites per quadrat as did the Hardscrabble survey. The dropoff is even less when one compares these three canyons in terms of frequencies of sites, structures, etc., by unit area. Polly's Canyon occupies considerably less area per linear km., for example, than does Grand Gulch. The differences between Grand Gulch and North Road Canyon occupations are perhaps more than one might expect, based on the site densities of their respective mesatop surroundings. This difference is probably due to the fact that the section of Grand Gulch surveyed had almost
Table 3. Summary of Cedar Mesa Canyon Inventory Data.

<table>
<thead>
<tr>
<th>Site/Area Characteristics</th>
<th>Grand Gulch Pueblo</th>
<th>North Road Pueblo</th>
<th>Polly's Pueblo</th>
<th>Slickhorn Pueblo</th>
<th>Dripping-Cow Tank</th>
<th>Pine-Dripping Combined</th>
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Slickhorn Upper Tributaries. This includes T1, T2, T3, and T5, plus the upper part of T8, which is not actually tributary to Slickhorn, but is considered as a tributary here for comparative purposes. This set of canyons is physiographically comparable to the portions of Polly's and North Road that are also summarized here. T4, a short side branch, is considered part of the main canyon, and T7, a lower tributary, is also lumped with the main canyon in the second and fourth columns of the Slickhorn data.
continuous alluvial deposits, while North Road had few
canyon-bottom soils of any kind.

Looking at the Pueblo data from the Slickhorn canyon
survey, we see that in sites per km., Slickhorn falls below
even Polly's. This may be partly due to the fact that the
Polly's survey was more intensive, with all ledges being
systematically walked, instead of just the canyon floor and
lower ledges, as in Slickhorn. Consequently, some smaller
sites might have been missed in the latter canyon. Habitation
sites and sites with more than six structures should provide
a truer comparison, because these larger sites are unlikely
to have been missed by either survey. Here, Slickhorn appears
about the same as, or even slightly above, Polly's. In
structures per km., Slickhorn ranks between Polly's and North
Road, despite the fact that the Polly's survey was probably
more thorough. And in structures per site, Slickhorn is
ahead of even Grand Gulch. This latter measure, of course,
would also be affected negatively if some small sites had
been missed in Slickhorn. It is certainly unlikely that
enough small sites were missed to reduce this figure even
to the North Road level.

This pattern of statistics suggests that Slickhorn has
relatively few Pueblo sites, but that they tend to be
relatively large. This supports the subjective impression
formed in the field. It also fits with the impression that
the Pueblo occupation here is rather late; in general, Cedar
Mesa cliff dwellings appear to increase in size in the 1200's, although they never become really large. Several of the Slickhorn sites have more than 20 structures, and this puts them high on the list of a ranking by size of Cedar Mesa canyon pueblos.

Also worthy of note is the concentration of sites in the upper part of the drainage. The main Slickhorn Canyon has few sites, and below T5, appears quite barren, as do its lower tributaries. Tributaries 1, 2, and 3 have the greatest concentration of sites.

Having sketched in the quantitative outlines of Slickhorn archaeology and its environmental relationships, we can now turn to the questions of research, educational, and recreational potential and significance. One obvious research question that remains unanswered is how the Pueblo occupants of the canyons subsisted and why they were settling there. Several of the Slickhorn tributaries have alluvial soils (e.g., T1, T3, T8) which would probably have been attractive to farmers, but other occupied branches do not. The drainage's largest cliff ruin, S-T5-2, is in a canyon having almost no arable soils. One constant, however, does appear to be the association of the larger Pueblo sites with good springs. This suggests that the Pueblo occupation may have been concentrated in a time of drought. Furthermore, the peculiar construction of some of the sites suggests they may have been built in a
hurry or by groups that had been isolated from others long enough to develop differing architectural standards. The use of vertical log walls chinked with juniper bark, the lack of use of stone axes, the frequent reliance on dry masonry or jacal mudded only on one side, the late-appearing pottery, the apparent brief occupation of many sites, the presence of defensible structures, all give credence to a "last holdout" interpretation. These phenomena in combination produce a Pueblo III architectural and settlement complex that is unique for the Southwest and clearly requires much further study.

Evaluation of the Proposed Slickhorn Unit Addition.

Fortunately, the condition of the canyon sites is generally very good. The remoteness and ruggedness of the Slickhorn drainage spared this set of canyon sites the large-scale excavations of the 1890's and early 1900's that has affected the archaeological potential of many of the Grand Gulch sites now in the existing Primitive Area. These same factors have also protected these sites over the years from damage by both unintentional or casual vandals and experienced pothunters. Unfortunately, this situation is changing rapidly as the drainage is becoming better known and is increasingly being visited by hikers. When we visited site S-T5-2 for the first time in 1974 it was literally pristine. In 1976, fresh digging was evident in a number of places, and a substantial proportion of the few painted sherds that had
been on the surface had been picked up. At these cliff ruins, surface pottery can be of great value in dating the site without excavating it. Since many of these sites were only briefly occupied, such pottery usually is rare, and would never be abundant even from excavations. Consequently, the loss of surface sherds to casual collectors can be quite serious. At S-T1-3, one of the best-preserved late Pueblo sites we have ever seen has been seriously vandalized, probably within the last five years. A fully-roofed kiva, with an intact and functional ladder still in place, has been systematically cleaned out, and the trash near this structure badly dug over. At S-T3-7, a site with a unique vertical-log and dry masonry free-standing semi-pithouse (Pueblo III in date), visitors have made little piles of artifacts, the discards of surface collecting. At S-T8-5, a large and very interesting site with several unique features, there has been much digging, some of it since we first visited the site in 1972. In general, the canyon sites of the Slickhorn drainage are probably among the best preserved of the entire Southwest. But at the current rate of vandalism, they will not remain so long.

Another set of interesting and important research problems has to do with the disjunction between the Basketmaker dominated occupation of the mesatop and the Pueblo-dominated occupation of the canyons. At least some of the canyon Pueblos must have been farming on the mesa. Data from the similar Hardscrabble
situation suggests that Pueblo farming camps were located in the higher areas of better soil near the heads of the canyons. These areas were largely excluded from this survey, because at the time it was carried out, most such areas were not part of the proposed Slickhorn Extension. Subsequently, we understand, some canyonhead mesatop lands have been included in the proposal.

Only a few sites in the canyons were tentatively identified as Basketmaker, yet sites of this period are abundant on the surrounding mesas. The largest Basketmaker base camp the senior author has ever seen lies on the mesa near Slickhorn canyon.* It is probable that other canyon Basketmaker sites exist, but they are not as obvious as the Pueblo cliff ruins, and will take more intensive survey to find. Because the Slickhorn mesatop has evidence of substantial Basketmaker II occupation, and because the caves of the Slickhorn canyons were never dug over by the professional relic hunters of the early days, there remains the chance of finding undisturbed Basketmaker habitation or burial remains preserved in a dry shelter. Such a find would represent a rare and very great research resource.

The Basketmaker sites of the Slickhorn and Hardscrabble areas may hold the key to how the Basketmaker II people were using the lower areas of the mesa, and how their adaptation

*This site has never been formally recorded. It probably is not entirely included in the proposed Slickhorn Extension. Its location should be verified and the Extension modified slightly to include it. We had hoped to record it this summer, but there was not time.
differed from that of the later Basketmaker III and Pueblo peoples. Perhaps rainfall was more abundant at that time, so that no parts of Cedar Mesa were marginal to rainfall farmers. Perhaps these were winter hunting and gathering camps. Or perhaps only a few choice spots were used for farming, and these could be found in all parts of the mesa, with settlement pattern being dictated by accessibility to springs and to a variety of wild food resources. Survey data has delineated the settlement patterns and enabled us to define the problem. Excavation will probably be required for additional progress on these questions.

The mesatop sites of the Slickhorn area are currently subject to substantial vandalism in the form of surface collecting. Most of the larger sites we visited had off-road vehicle tracks that had been made within the past two or three years. Since many of these sites are almost entirely surface sites, collectors can seriously bias the artifact inventories that can be recovered from them. If any Archaic components exist in the area, for example, their discovery will probably depend on finding typologically distinctive points. If these have been picked up, this important determination will never be made or will be much more difficult. Off-road vehicles driving over the sites have also damaged some of the fragile slab structures that usually are the only recoverable features on Basketmaker sites. Fortunately, the incidence of digging seems
low in this area relative to the higher parts of the mesa, but this may be in part due to the shallowness of the sites.

The educational and recreational potential of the Slickhorn canyons and canyon sites should be obvious. The canyons are much less touched by the hand of recent man than are those of the existing Primitive Area, there is abundant drinking water and firewood, the scenery is at least as spectacular as that of Grand Gulch, and the archaeological sites are not only well-preserved but often unique in character. Inclusion of the surrounding mesatop in the Primitive Area is essential, even though its sites have less obvious appeal to the general public. These lands are needed to provide a buffer zone for the canyons, and to provide opportunities for research on the use of both canyon and mesa environments by the Anasazi. For both these reasons, the inclusion of additional land at the heads of T1, T2, and T3 is strongly supported.

Pine Canyon and Dripping Canyon Extension Areas

Environmental Characteristics.

Since these areas parallel and are adjacent to one another, they will be considered together in this discussion. The Pine-Dripping Extension is a strip of land about 13 km. (8.0 mi.) east-west by about 4 1/2 km. (2.8 mi.) north-south. It is just north of Grand Gulch, and lies across the middle
to upper portions of the Dripping and Step Canyon systems. These two canyons have Cow Tank and Pine Canyons, respectively, as major tributaries. The slope of the land in this area is down to the southwest; elevations in the Pine-Dripping Extension range from about 6500 ft. in the extreme northeast corner to about 5440 ft. in the extreme southwestern corner of the area. Vegetations ranges from a fairly heavy and continuous pinyon-juniper woodland with intermingled sage and small sage parks in some parts of the northeast to large stands of blackbrush or blackbrush and sage, and thin patches or scatters of pinyon-juniper in the southwest.

The canyons that cut through the area entrench only gradually and often are enclosed in broad, shallow basins or valleys comprised of broad benches and step-like low escarpments or ledges. Bedrock is frequently exposed over the area in stripped surfaces, shallow drainage channels, or ledges. Deep soils tend to occur in patches, largely in the eastern part of the area.

Pine-Dripping is rather difficult to compare with Slickhorn or with the five drainages (Upper Grand, Bullet, North Road, West Johns, and Hardscrabble) sampled as part of the Cedar Mesa Project, because it is an arbitrary slice across the middle portions of several drainages. The upland drainage-head areas are missing (as in Slickhorn Extension, but even more so here), and the lower downstream portions of the canyon systems and their adjacent mesatops are also poorly represented.
Pine-Dripping seems generally similar in elevation to Slickhorn. The former has slightly higher elevations at both the upper and lower ends of its elevation range, but both are similar in the middle range of elevations, and both appear to be slightly higher overall than Hardscrabble (compare, for example, the quartile points of the ranking by elevation of the quadrats from the three drainages as shown in Tables 1, 2, 4). It is our impression that Pine-Dripping has somewhat stronger development of pinyon-juniper woodland. Pinyon-juniper was impressionistically classed as dominant in 20 of 24 quadrats in Pine-Dripping, but only 13 of 23 in Slickhorn. This is probably related to greater effective moisture in Pine-Dripping; there does seem to be a slight increase in moisture as one moves north on the mesa, even if elevation is held constant. Furthermore, Pine-Dripping may be somewhat sheltered from the prevailing southwesterly winds by the nearby Red House Cliffs. The heavier pinyon-juniper growth might also be correlated with better soils, or both better soils and moisture. In the Cedar Mesa area juniper, at least, is often well established on deeper soils. Pinyon more often is on shallower soils.

Quadrat Data.

In the Pine-Dripping area, we surveyed 24 quadrats, and found a mean number of 2.29 sites per quadrat. Since there are about 335 possible quadrats in the area, our estimated total
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<th>Physiog.</th>
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*relatively large site

?dating assignment questionable
number of sites for the area is about 770. Since the population distribution appears to be less skewed in the Pine-Dripping area than in the Slickhorn extension, the standard confidence intervals, based on the assumption of a normal distribution, are probably closer to the mark. Calculation of the standard 80% confidence intervals gives us a lower estimate of about 600 sites and an upper one of about 937. Using 95% binomial confidence intervals as before, we calculate a lower bound of 463 and an upper bound of about 1000, which is almost certainly too low.

The survey data show that Hardscrabble, Slickhorn, and Pine-Dripping have very similar frequencies of Basketmaker II sites, at roughly 1 site per quadrat. There tends to be a slightly higher frequency of larger BMII sites in Hardscrabble, however. Our impression is that recent aeolian deposits and associated food grasses such as Indian rice-grass and stipa are more abundant in Hardscrabble than in the other two areas. This may be illusory, however, particularly the latter observation. Pine-Dripping, in particular, appears to have been more heavily grazed in recent years than the other two, especially Hardscrabble.

Site density as a whole for Pine-Dripping is about twice that for Slickhorn and approximately the same as that for Hardscrabble. This is due to the greater frequency of BMIII and Pueblo II/III sites (especially the latter) in Pine-Dripping.
and Hardscrabble. Most of the Pueblo sites in both are limited activity camps, rather than base camps or habitation sites, although there do appear to be a few of these in the surveys of both areas.

In making these comparisons, it should be kept in mind that the Pueblo data from Hardscrabble are from complete watersheds, while those from Pine-Dripping are from a transect through the middle portion of several drainages. If the entire Pine-Dripping watersheds were included, one would expect substantially greater frequencies of Pueblo sites to occur in the survey as the headwaters of the drainages were approached. Despite the frequency of quadrats with few Pueblo sites in the downstream portion of the area, survey of the upstream area would likely raise the mean number of sites per quadrat as well as increase the mean number of Pueblo sites per quadrat. If the northern area were examined at the same rate as the downstream area, the increase should be even more noticeable since the latter area is smaller than the unsurveyed upper drainage.

The low frequency of BMIII sites in Pine-Dripping is certainly related to the fact that such sites tend to be strongly associated with the mesa's best soils and most effective moisture, and these qualities are in short supply in Pine-Dripping. Superficially, the frequency of BMIII sites seems about what would be predicted from the environmental characteristics of the area. Further work in the Pine-Dripping
drainage might, however, help test the notion that Comb Wash exercised some type of "attraction" for BMIII sites. We might, for example, find environments in upper Pine-Dripping that matched the ones where BMIII sites regularly occur in the Upper Grand and Bullet areas to the east. If the frequency of BMIII sites in the selected Pine-Dripping areas were substantially less than predicted from the Upper Grand and Bullet data, we might interpret this as evidence that Comb Wash was the source of the BMIII settlement of Cedar Mesa.

Canyon Data.

Turning to the canyon data, it appears that the Step-Pine canyon system has higher frequencies of sites than does the Dripping-Cow Tanks system. Most of this difference can be accounted for by the presence in Step Canyon of a cluster of sites associated with a good patch of alluvium and a good domestic water supply.

The Pine-Dripping canyon system as a whole (within the Extension area, at least), has Pueblo sites per canyon km. in about the same frequency range as Slickhorn. A more thorough survey (walking all the ledges) might increase this frequency to the level of Polly's Canyon, but it is doubtful that it would go beyond. Physiographically, the Pine-Dripping surveys are probably fairly comparable to those conducted in Polly's and North Road. The head of entrenchment of the Pine-Dripping canyons fall within the survey area, and the
site search continued to the point of full, deep entrenchment, but not to the junction with a larger drainage such as Grand Gulch. This is also true for Polly's and North Road (the latter does not of course join Grand Gulch).

In Pueblo structures per site, the Pine-Dripping canyon system falls below Slickhorn, to which it compares in intensity of survey. Although it ranks higher than Polly's and North Road, as pointed out in the previous section, the survey of Pine-Dripping differed in intensity from that of Polly's and North Road. In the latter cases, more small sites having few or no structures are recorded. If Pine-Dripping were surveyed in a comparable fashion, the ratio of Pueblo structures per site would probably drop. The low figures for habitation sites per km. and sites with 6+ structures per km. (Table 3) also relate to the generally small size of Pine-Dripping sites. These figures are probably comparable across all the drainages being considered, and show Pine-Dripping at the lower end of the range. In general, the Pueblo statistics for Pine-Dripping seem most similar to those for Polly's. Pine-Dripping clearly differs from Slickhorn in lacking large sites. The generally drier character of Pine and Dripping Canyons may help account for this.

On all counts, the intensity of Pueblo occupation in the upper portion of Grand Gulch surpasses that of Pine-Dripping. As has already been pointed out in the discussion of Slickhorn,
if the comparisons were made in terms of sites, etc., per unit area, the Grand Gulch "lead" would probably be considerably less. Furthermore, the section of Grand Gulch on which we have statistics was partly selected for intensive survey because it did have numerous and large Pueblo sites.

Turning to the statistics for all sites (not just Pueblo) (Table 3), we see that Pine-Dripping is much more comparable to Slickhorn. We have not assembled comparable data for the other three drainages, but our impression is that this type of comparison would show Pine-Dripping to have relatively more intensive occupation with respect to Grand Gulch, Polly's, and North Road than it did in the Pueblo-only comparison. The reason for the boost in statistics for Pine-Dripping when all sites are considered is that a number of probable BMII sites were found in these canyons, and many of them had numbers of slab, mud, or hardpan cists. This is in strong contrast to Slickhorn, where few BMII sites were identified in the canyons. The more gradual entrenchment of the Pine-Dripping canyons, and their consequently shallower upper portions, may have been of importance here. BMII groups farming or collecting pinyon nuts, etc., on adjacent mesa tops may have found it easier to establish storage facilities in Pine-Dripping. A search of the upper-rim overhangs of entrenched Slickhorn canyons might, of course, locate similar mesatop oriented storage facilities.
Evaluation of Proposed Pine-Dripping Unit Addition.

A number of the Anasazi sites in the Pine-Dripping canyon system and some otherwise unoccupied sites have late 19th century or early 20th century historic remains, largely associated with the cattle industry. Some may relate to the Mormon Hole-in-the-Rock Trail. These will be of interest to historians or historical archaeologists. The remains range from corrals and trails to storage facilities to inscriptions to discarded tools, eating utensils, clothes, newspapers, and magazines. The most surprising historic find was approximately 20 sticks of dynamite cached in an Anasazi granary in Step Canyon.

We were quite impressed with the preservation of both the Anasazi and historic sites and remains. Cave wall inscriptions and evidences of old digging indicated that the notorious McLoyd and Graham had plied their relic-hunting trade in Step Canyon in the 1890's. The area evidently escaped the Wetherills, however. Evidence of early digging was found only at a few of the larger sites. Although a number of sites have sustained some disturbance from livestock, there is little evidence of human disturbance more recent than the 1890's. The general lack of recent campsites and litter indicate these canyons are receiving little hiking.

Our impressions of the condition of the mesatop sites was also that they were better preserved than sites in areas
to the east of Grand Gulch. There was some evidence of vandalism, particularly in the eastern part of the Pine-Dripping area, and near existing roads and jeep trails. In general, however, there was less evidence of off-road vehicle use and of visitation of sites by this means than we have become accustomed to seeing in the Slickhorn area and particularly in the Bullet, Upper Grand, and North Road areas.

The historic values in the area, both in relationship to the livestock industry and to the Mormon trail, which passes through the area, add some interesting possibilities, both for research and for public appreciation. Many of the historic remains are quite fragile in the sense that they can easily be carried away or displaced. How best to study or preserve these items will pose some interesting problems for those managing this area.

The strictly archaeological values of the Pine-Dripping area, while not as unusual or impressive as some of those in the Slickhorn area, do have both research and interpretive significance. These drainages are connected to the canyon of Grand Gulch, in the existing Primitive Area. The Anasazi occupation, we observed, is clearly related to that of the larger canyon. Tributaries such as the Pine and Dripping systems would have been avenues of travel and communications with the uplands, and must have been the loci of activities
such as farming or storage for segments of the same communities that were using nearby parts of the main canyon. Certainly the sites we observed would not themselves have constituted an entire community, although some may have been the residence of a nuclear or extended family.

The mesatop areas included in the Extension Area must also have been used by the same groups that were using Grand Gulch and its tributary canyon. Our work on Cedar Mesa has demonstrated that most of the Anasazi there were spending most of their time on the mesa rather than in the canyons. An understanding of the Anasazi occupation of the mesas surrounding Grand Gulch is essential for an understanding of the spectacular archaeological remains fortuitously preserved in the dry shelters of the Gulch. In the Pine-Dripping area, the proposed extension includes good examples of low to moderate-elevation mesatop environments, and of the sites associated with exploiting these environments. It would be logical also to include part of the higher areas at the heads of these drainages as well, but if competing land uses preclude this, examples of this kind of environment and sites can be added to the Primitive area in the Kane, Long, and Coyote extensions.

Sheiks and Coyote Flat Extension Areas

While the Sheiks and Coyote Flats Extension areas (hereafter referred to as the Sheiks area) were not surveyed during 1976
because of time and money limitations, much of this area had
previously been investigated as a part of the Hardscrabble
and Bullet drainage units, which were surveyed in 1972-74
by the Cedar Mesa Project. At this time, the entire Bullet
drainage was surveyed by means of random quadrats and canyon
inventory. Both quadrat and canyon inventory surveys were
also carried out in the Hardscrabble unit, but it was arbitrarily
bounded on the west by the 5600 ft. contour line, in keeping
with the way the edge of the mesa was defined by the Cedar
Mesa Project.

The proposed Sheiks Extension area naturally divides into
two parts, with the boundary being the western edge of Section 2
of Township 38S, Range 17E. The western portion overlaps with
the Hardscrabble unit of the earlier Cedar Mesa Project survey,
while the eastern portion overlaps with the Bullet unit.

**Western Sheiks Extension Area**

**Environmental Characteristics**

Examining the western section first, we find that it has
mesa top elevations ranging from 6160 ft. at the extreme eastern
edge to about 5400 ft. at the westernmost extremity. The area
is drained to the northwest by the medium-sized Polly's Canyon
system, and to the southwest by the twin heads of a small unnamed
canyon; all drainage is to Grand Gulch.

Pinyon-juniper woodland is widespread in the area, but the
stands are generally quite sparse and open, becoming more so
with decreasing elevation. There are many open sandy areas dominated by blackbrush or blackbrush and sage; blackbrush increases in frequency at lower elevations and in wind-deflated sandy areas. The abundant exposures of bedrock often have sparse fringes of pinyon.

The area slopes to the southwest, giving it maximum exposure to the prevailing southwesterly winds and to the afternoon sun. The Hardscrabble unit was the driest area studied in the Cedar Mesa Project surveys. Since the overlapping Western Sheiks area extends both west of and lower than the Hardscrabble unit, the former can be expected to be slightly drier.

**Mesa Top Data**

Most of the quadrats of the 1972-74 Cedar Mesa Project survey of the Hardscrabble unit fell in mesa top locations; the data they yielded can be used to characterize the mesa or non-canyon environments of the overlapping Western Sheiks area. Nine of the 14 Hardscrabble quadrats fall in or within 500 meters of the Western Sheiks area. (These nine quadrats were numbers 2-5, 7, 9-11, and 13). The average number of sites found in the nine quadrats was 2.3; the average number of sites per quadrat in the full Hardscrabble sample was 2.0. This difference is not large enough to be significant.

Because the Western Sheiks area extends west of the Hardscrabble unit into a slightly lower and drier environment,
the actual number of sites per unit area should be slightly lower for the former than for the latter. Since the survey data we have for Hardscrabble is not a true representative sample of the Western Sheiks area, it is technically not legitimate to use the Hardscrabble data to calculate an estimate of the number of sites in Western Sheiks. Since the two areas overlap extensively, however, and are well-matched environmentally, site density figures drawn from the Hardscrabble data can probably provide us with a good guess at site numbers in Western Sheiks. Using the Hardscrabble figure of two sites per 400-meter quadrat, and observing that the Western Sheiks area is large enough to contain about 104 such quadrats, we obtain an estimate of about 208 sites for the area. As noted above, this may be a bit too high. Given the limitations on the data, it would be inappropriate to calculate confidence intervals.

Since the Hardscrabble and Western Sheiks areas are so well-matched environmentally, we will use the full 14-quadrat Hardscrabble sample as the base for extrapolations into the Western Sheiks area, rather than depending on just the nine quadrats that actually fell in or adjacent to this latter area. The larger sample is less likely to be subject to chance fluctuations in site types and numbers than is the smaller one.

Reviewing the Hardscrabble site data (Table 2) we see that Basketmaker II sites are the most common, with a mean of 1.1
per quadrat. Because Western Sheiks is a bit lower than Hardscrabble overall, the actual mean for Basketmaker II sites in this area should fall between that of Hardscrabble and Slickhorn, or about 1.1 to .9 per 400 meter quadrat. As in the other areas that have been studied on Cedar Mesa, the larger Basketmaker II "habitation" or "base camp" sites in Hardscrabble/Western Sheiks are located near canyon rim areas.

Two Basketmaker III sites were found in Hardscrabble, while none were in Slickhorn. This is probably due to the existence of deep soil divide areas which are located in both the Hardscrabble drainage and (in a very small way) in the Extension area. Thus there are probably Basketmaker III sites in this Extension, although only a small number.

Pueblo II/III sites are also found in Hardscrabble in greater numbers than Slickhorn. This should be true of the Extension area as well although perhaps to a slightly lesser extent. As mentioned before, the larger "habitation" sites are concentrated in the divide areas, which are better represented in this section than in Slickhorn. The non-habitation sites are also more common in this area than in Slickhorn, probably a reflection of the general south to north trend of increasing Pueblo occupation.

While there is likely to be more Pueblo and Basketmaker III occupation in this part of Sheiks Extension area than in Slickhorn,
it is an area still dominated by Basketmaker II sites. We would expect not more than one out of every three quadrats to have a Pueblo site, and only one out of every seven to have a Basketmaker III site, but one out of every two quadrats should have at least one Basketmaker II site. These figures differ from the mean numbers per quadrat because the sites are not uniformly distributed. Hence, even though the area has a mean of about one Basketmaker II site per quadrat, the sites are more concentrated in some parts of the area than in others. Quadrats in the favored areas are likely to have more than one site, while chances are that quadrats falling in the unfavored areas will not have any.

Canyon Data

The main canyon draining this area—Polly's or Hardscrabble—was fully surveyed from its head to the junction with Grand Gulch as part of the Cedar Mesa Project (Lipe and Matson 1975). Approximately a third of Polly's Canyon actually falls in the Western Sheiks area. There is also a smaller canyon to the south, the two heads of which are in the Western Sheiks area; this canyon drainage was not surveyed. It is known that a good spring does exist in the southern of these two canyon heads. Since the terminal Pueblo occupation of the canyons is tied closely to the location of water sources, this leads us to expect that there would be some evidence of Pueblo occupation in this canyon.

-41-
Polly's Canyon has been discussed during previous comparisons (Table 3), so a brief review is all that is in order here. In the full 14 km. of Polly's Canyon, there are 20 Pueblo sites, seven of them habitation sites. This gives a figure of 1.4 sites per linear km., higher than that of Slickhorn and Pine-Dripping, and 1.9 structures per site, lower than the above. These differences, as cautioned previously, may be due in part to the more intensive survey carried out during the Cedar Mesa Project.

In general there is a much higher density of Pueblo sites in Polly's canyon than on the mesa top, and a lower density of Basketmaker II and III sites. Still, as elsewhere, with the possible exception of the terminal Pueblo occupation, the evidence indicates that most Pueblo people lived on the mesa top.

Evaluation of Western Sheiks Extension Area

The value of the Pueblo canyon sites is probably greatest as an example of the most common kinds of Pueblo canyon sites on Cedar Mesa, those near the heads of canyons, rather than in deep, alluvium-filled canyons. These sites, while not large, are impressive and more representative of the regional use of canyons than are those in Grand Gulch. Since Polly's has been used in the past as a way into Grand Gulch it could be made part of a route exposing the visitor to the full range
of canyon sites and environments as part of the Grand Gulch experience.

The condition of these sites is definitely inferior to that of those in Slickhorn, although superior to those in Grand Gulch. Polly's has been used as a way into Grand Gulch in the past, and thus these sites have been exposed to many visitors, with the usual consequences. The fact that few of these sites are spectacular may have saved them from worse depredations. Still it is inevitable that if nothing is done, in the course of the next few years they will be severely damaged.

The mesa top, as mentioned before in the Slickhorn Extension discussion, is mainly of value because of the intensive Basketmaker II habitation. This is not well understood, nor is the late Pueblo III canyon occupation. The mesa top sites, here as in Slickhorn, show increasing evidence of visitors, often by way of all-terrain vehicles with the probable consequences detailed in that discussion.

In general, this part of the extension has values to the Grand Gulch area in that it adds to the area a sample of more typical canyon Pueblo sites, as well as of the Basketmaker II occupation. However, this part of the extension does not have much deep soil divide area, the type of environment where the bulk of Cedar Mesa Pueblo habitation occurred.
Eastern Sheiks Extension Area

The eastern and northern portion of the Sheiks Extension Area, combined with the Coyote Flat Extension (hereafter referred to together as the Eastern Sheiks Extension) overlap both with the Bullet drainage unit of the 1972-74 Cedar Mesa Project survey and with the 1969-70 intensive survey done in the western part of the area between the Sheiks and Coyote drainages. Of the 21 quadrats surveyed in the Bullet unit by the Cedar Mesa Project, eight are in or adjacent to the proposed Eastern Sheiks Extension (quadrats 4, 9, 12, 15, 18-20, and 22). In addition, 62 sites from the 1969-70 Sheiks-Coyote survey fall in the Extension area. Data from these two surveys show similar trends. The Sheiks-Coyote survey, however, was an intensive examination of approximately three square miles of mesatop, while the later Bullet unit survey was based on quadrats distributed randomly over a much larger area. Consequently, the Sheiks-Coyote data show considerably less environmental and archaeological variability than do the Bullet quadrat data.

Environmental Characteristics

The Eastern Sheiks Extension area stands in contrast to the Western Extension in that its pinyon-juniper woodland is both denser and more extensive. Blackbrush is non-existent, and sage is common, both as an understory in some portions of the woodland, and as the dominant vegetation in open parks in some of the deeper soil areas. Because of its higher
elevations, the Eastern Sheiks area is better watered than is the Western. The former also has large areas of deep soil on the divides between drainages. Areas of slickrock and recent eolian deflation are correspondingly reduced.

**Mesa Top Data**

The 1969-70 Sheiks-Coyote survey overlaps the Eastern Sheiks Extension proportionately more than does the 1972-74 Bullet quadrat survey. The quadrat survey data have, however, been more fully analyzed, and represent a range of environmental types more comparable to those of the Eastern Sheiks Extension. Consequently, the full data (all 21 quadrats) from the earlier Bullet unit survey will be relied upon below in estimating the characteristics of the Eastern Sheiks area.

The site density in the Bullet drainage area, and presumably in the Eastern Sheiks Extension, is much higher than in the other areas that have been discussed. The full Bullet sample from the Bullet unit has a density of 6 sites per 400 meter quadrat, while the eight quadrats that fall in the Eastern Sheiks Extension show a nearly identical density of 5.4 per quadrat. These figures contrast dramatically with the densities of 1.7, 1.0, and 2.3 per quadrat for the Hardscrabble, Slickhorn, and Pine-Dripping areas, respectively. Because the Slickhorn and Pine-Dripping surveys did not use quite as inclusive a definition of "site" as did the earlier Bullet and Hardscrabble surveys, the two sets of figures are
not precisely comparable. It is clear, however, that the Bullet densities are several times those of Hardscrabble and Slickhorn and probably at least twice that of Pine-Dripping.

Applying the overall Bullet site density figure of six per quadrat to the Eastern Sheiks Extension, we calculate a total of about 1040 sites for this area (there are about 173 possible quadrats). Because of the extrapolated nature of this estimate, derivation of confidence intervals for Eastern Sheiks would not be appropriate.

The Bullet drainage (Table 5) shows a pattern of Basketmaker II site distribution similar to that found elsewhere (Matson and Lipe 1977). The larger, more extensive sites are concentrated near canyon rims. The overall density of Basketmaker II sites in Bullet, while greater than in Hardscrabble and Slickhorn, is of the same general range. For instance, while the median number of BMII sites is larger for Bullet, the upper quartile figure is the same as for Hardscrabble. This demonstrates the fact discussed earlier, that while Basketmaker II sites are concentrated in rim areas they are not very sensitive to current environmental trends on Cedar Mesa.

On none of the previous proposed extensions are Basketmaker III sites found in any frequency; while they are not really abundant on Bullet, they do occur (Table 5). As can be seen at least one of every four quadrats would be expected to have a Basketmaker III site present. One Basketmaker III
Table 5. Temporal distribution of sites in rim-canyon vs. divide areas and overall, Bullet drainage area, 21 quadrats. (Sites that could not be assigned a probable temporal category were not included in statistics.)

<table>
<thead>
<tr>
<th>Type of Statistic</th>
<th>Temporal Period</th>
<th>Basketmaker II (Interquartiles)</th>
<th>Basketmaker III</th>
<th>Pueblo II-III</th>
<th>All Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medians of rim-canyon quadrats, ranked by numbers of sites</td>
<td>2 - 3</td>
<td>0</td>
<td>1 - 2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Medians of divide quadrats, ranked by numbers of sites</td>
<td>(2.5)</td>
<td>(0 - 1)</td>
<td>(1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medians of rim-canyon quadrats, ranked by numbers of artifacts</td>
<td>306</td>
<td>0</td>
<td>465</td>
<td>868</td>
<td></td>
</tr>
<tr>
<td>Medians of divide quadrats ranked by numbers of artifacts</td>
<td>116</td>
<td>311</td>
<td>1076</td>
<td>1310</td>
<td></td>
</tr>
<tr>
<td>Medians of quadrats overall Bullet N = 21</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Interquartiles, sites overall Bullet N = 21</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>2 - 4</td>
<td>4 - 8</td>
<td></td>
</tr>
</tbody>
</table>
site in the extension area (GG 70-187) was partially excavated by Lipe in 1970. As is shown on Table 5, Basketmaker III sites are concentrated in divide areas, and are essentially absent in rim areas. The median expected number of Basketmaker III artifacts in the rim area is 0 and about 311 in the divide areas. As also indicated previously, divide areas in lower and drier areas (such as Hardscrabble and Slickhorn) do not have nearly the same frequencies of Basketmaker III materials as the better watered areas to the north and south.

The same trend can be observed among the Pueblo II/III material in which the divide areas in Bullet show a median of 4 Pueblo sites per 400 meter quadrat (Table 5). While the rim areas have less Pueblo material than the divide areas they still have substantially more than any extension area discussed above. Further, the size of sites is much larger with a number of the largest typical Pueblo site type, the Prudden unit, known to occur in the extension area. This cluster of structures, consisting of a central pithouse (kiva) with surface masonry or jacal structures to the northwest and trash to the southeast, is far more typical for Pueblo II/III habitation than the much more visible canyon dwellings.

The concentration of Pueblo sites in the northern half of Cedar Mesa in deep soil divide areas or next to sagebrush flats is in accord with local dry farming practices which suggest similar agricultural practices were occurring at this
time. While the Bullet drainage statistics may provide slightly estimate of site numbers for the Eastern Sheiks Extension, the general picture is certainly correct and the contrast with areas previously discussed will certainly hold up.

Canyon Data

The only canyon drainage of any extent in the Eastern Sheiks Extension is Upper Bullet. This had been previously surveyed as part of the Cedar Mesa Project in the same extensive manner as Hardscrabble (Polly's). If figures are calculated for this part of the canyon as for the others (Tables 3 and 6) one finds a very high density of habitation sites and sites per linear km. While the number of structures per site appears to be lower than those of the canyons surveyed in 1976, as we have previously indicated, this is probably an artifact of the differences in survey technique. The very high number of structures per km. (8.9 and 9.6) suggests that this is indeed the case.

The upper part of Bullet, then, has a very high density of Pueblo sites, with most measurements roughly equal to or slightly lower than the figures for Grand Gulch. An exception is the number of large (more than 6 structures) Pueblo sites per linear km. This class of sites occurs with much lower frequency in upper Bullet.

While lower Bullet, now in the Grand Gulch Primitive Area, has moderate amounts of alluvium, upper Bullet does not, which
Table 6. Upper Bullet Canyon Inventory Data.

<table>
<thead>
<tr>
<th>Site/Area Characteristics</th>
<th>Pueblo</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Canyon km. surveyed</td>
<td>12.7</td>
<td>12.7</td>
</tr>
<tr>
<td>Sites</td>
<td>44</td>
<td>68</td>
</tr>
<tr>
<td>Structures</td>
<td>113</td>
<td>122</td>
</tr>
<tr>
<td>Habitation sites</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>Sites with 6+ structures</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Structures per site</td>
<td>2.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Sites per km.</td>
<td>3.5</td>
<td>5.4</td>
</tr>
<tr>
<td>Structures per km.</td>
<td>8.9</td>
<td>9.6</td>
</tr>
<tr>
<td>Habitation sites per km.</td>
<td>1.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Sites with 6+ structures per km.</td>
<td>0.39</td>
<td>0.39</td>
</tr>
</tbody>
</table>
suggests that many if not most of the Pueblo inhabitants were obtaining their livelihood from the mesa tops. There are several areas of good springs in upper Bullet. That these are also areas of dense Pueblo occupation supports the general relationship between locations of water sources and Pueblo sites.

Evaluation of the Eastern Sheiks Extension Area

The upper Bullet canyon Pueblo sites are an important resource whose archaeological and recreational potential is very high. The relationship between resources and location of upper canyon Pueblo sites is as yet unclear and upper Bullet with its dense occupation is very important to this question. Like Hardscrabble (Polly's) it would be desirable to incorporate this area into the primitive area in that it would acquaint the visitor with the full range of Pueblo canyon exploitation. The sites are, of course, much denser and more spectacular than those of Polly's. Unfortunately, Bullet canyon in the recent past has been a favorite route to Grand Gulch and virtually all sites in Bullet have suffered accordingly. Of the canyon systems discussed, with the exception of Grand Gulch, Bullet has had the most serious damage done to it. The fragility of these sites has already been discussed and all too often Bullet sites demonstrate this point.

The mesa top has its highest importance in adding areas of deep soil divide where the abundant Pueblo and relatively
scarce Basketmaker III sites occur. Protection of these usually vandalized sites is important to conserve these resources. The addition of this area would give a much needed balance to the range of Pueblo sites found in the Grand Gulch Primitive Area. After all it seems very clear, that with the possible exception of terminal Pueblo III times, the great majority of Pueblo people both farmed and lived on the mesa top, concentrating their larger sites, at least, in the deep soil areas.

Kane Gulch Extension Area

Environmental Characteristics

The proposed Kane Gulch Extension, combined with Long Flat Extensions A and B (all these are hereafter referred to as the Kane Gulch Extension) forms an irregular north-south trending strip that is the most northeasterly of the areas considered in this report. It is also the highest, with mesa-top elevations ranging from about 6400 to 6720 ft. As previously indicated, on Cedar Mesa, effective moisture increases from southwest to northeast, as well as with increasing elevation. On both counts, the Kane Extension is favored relative to the other areas we have been discussing. Soil depth and soil cover also tend to increase as one approaches the main divide of the mesa; Kane Gulch is the closest to this divide of any of the proposed extensions. In general, the pinyon-juniper woodland of the Kane Extension has larger trees and forms a denser ground cover than is the case for the more southerly and
westerly areas that have been discussed. The Kane Extension also includes several areas dominated by sage and grasses.

Archaeological Characteristics

The 1972-74 Cedar Mesa Project survey sampled the Upper Grand Gulch drainage unit, which overlaps with and is a generally good environmental match for the Kane Extension. Of the nine quadrats that were surveyed in the Upper Grand unit, three (Nos. 2, 4, and 7) actually fall within the proposed Kane Extension. Site density for the Upper Grand unit was about 4.4 sites per 400 meter quadrat, or somewhat below the figure for Bullet. This is surprising, considering that Upper Grand is a better watered area than is Bullet. Part of the difference is accounted for by the fact that Basketmaker II sites are slightly less abundant in Upper Grand. There are also physiographic differences between the two drainages that may account for other differences. Upper Grand is a long, narrow, watershed with a somewhat greater proportion of canyon than Bullet. The former area also appears to have had some rather extensive open sage-dominated areas that have only recently begun to be invaded by juniper and pinyon. Although open sage areas may have been good agricultural locations, they typically lack sites. Two of the nine Upper Grand quadrats fell in such areas, while none of the Bullet quadrats was entirely in a sage park.

Applying the Upper Grand site density figures to the Kane Extension, we obtain an estimated number of about 317 sites
The Upper Grand survey found that Basketmaker II sites, although somewhat less numerous than in the Bullet area, were nevertheless present in the same general range of frequency as found in all the other areas of Cedar Mesa that have been surveyed. For example, even though Slickhorn-Hardscrabble are considerably drier today than Upper Grand-Kane Extension, these two portions of the mesa have approximately the same frequencies of Basketmaker II sites. Types and sizes of sites are also comparable.

There are great contrasts, however, between these two areas in their Basketmaker III statistics. In fact, Upper Grand (and presumably Kane Extension) contrasts with all the other areas that have been surveyed in terms of its concentration of BMIII sites. This occupation, while still not dense, is far greater here than elsewhere. As shown in Table 7, one out of four quadrats would have three or more Basketmaker III sites on it, more than was found in all of Slickhorn's 23 quadrats! These include large pithouse sites complete with antechambers and outside storage cists. At least two such sites are known to exist in the Extension area. The increased occurrence of Basketmaker III sites is in line with their association with the better-watered deep soil areas which reach a peak in this area. The Basketmaker III occupation is thus several times as dense as any other proposed addition to the Primitive Area.
Table 7a. Upper Grand Gulch Area, Cedar Mesa Project
Summary Statistics (9 400 meter Quadrats).

<table>
<thead>
<tr>
<th>Basketmaker II</th>
<th>Basketmaker III</th>
<th>Pueblo II/III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med. CI IR</td>
<td>Med. CI IR</td>
<td>Med. CI IR</td>
<td></td>
</tr>
<tr>
<td>1 0-2 0-2</td>
<td>0 0-3 0-3</td>
<td>2 1-3 1-3</td>
<td>4 1-7 1-7</td>
</tr>
</tbody>
</table>

Med., Median number of sites. CI, 98% Confidence Intervals
IR, Interquartile Range.

Table 7b. Upper Grand Gulch Area, Cedar Mesa Project
Summary Statistics (Quadrats actually within the
Kane Extension Area).

<table>
<thead>
<tr>
<th>Quadrat No.</th>
<th>Elev.</th>
<th>Vegetation</th>
<th>BMII</th>
<th>BMIII</th>
<th>P II/III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6650</td>
<td>p-j</td>
<td>0</td>
<td>3*</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>6600</td>
<td>p-j</td>
<td>1</td>
<td>3*</td>
<td>2*</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>6560</td>
<td>p-j, cliffside</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

* relatively large
As with the Basketmaker III sites, Pueblo II-III sites on Cedar Mesa generally increase in size and in frequency as one goes up in elevation and into deep soil divide areas. While the Upper Grand summary statistics for Pueblo sites appear to be very similar to Bullet, there is almost certainly a higher density of the larger Pueblo II-III habitation sites (Prudden units) in this area than in Bullet. In fact the largest mesa top Pueblo site collected during the Cedar Mesa Project (UGG-4-3) is found with this extension area. The Upper Grand area, then, shows a high concentration of "large" mesa top Pueblo sites, probably considerably higher than the other proposed extension areas.

Canyon Data

Within the Kane Gulch Extension Area two portions of canyons exist: a 4.4 km. portion of Upper Grand Gulch and a much smaller portion of Kane Gulch. The portion of Upper Grand Gulch was completely surveyed during the Cedar Mesa Project; the small part of Kane was not examined at all. Both canyon sections are intermediate -- above the deepest entrenchment but well below the canyon heads. Alluvium does exist in portions of Upper Grand but not to any extent in Kane. In parts of both canyon systems, unique botanical environments exist, with plants that generally are found at higher elevations, such as Douglas fir and aspen, present.

The section of Upper Grand that falls within the extension area, although only a few kilometers long, has an intensive
archaeological occupation. The summary figures (Table 8) compare well with Grand Gulch (of which it is a part). While the average site size is relatively low (1.6 structures per Pueblo site), the site density is higher than any canyon system surveyed during 1976 (4.3 per Pueblo site and 5.7 per site when all sites are considered). The number of structures per linear km. is second only to Grand Gulch and Bullet. While the canyon section under consideration is short, the number of habitation sites and the number of sites with six or more structures are both very high. So except in the category of very large sites, this section of Upper Grand Gulch compares well with Lower Grand Gulch.

The canyon situation, however, is quite different from Lower Grand Gulch with broad alluvial patches being relatively rare and with access to the mesa top being relatively easy. We are uncertain whether the sites found in this section should be considered to be mainly oriented toward arable canyon soil, or mesa top soil, or both. We suspect the second alternative, however.

Evaluation of the Kane Gulch Extension Area.

The canyon sites in this area are similar to Pine-Dripping in that the amount of destruction is not as great as associated with main Grand Gulch and Bullet despite evidence of visitors in the area. On the other hand, the state of preservation is inferior to that in Slickhorn. There is evidence of historic
Table 8. Summary of Kane Gulch Extension Canyon Data (Upper Grand Gulch, Cl3 - C20).

<table>
<thead>
<tr>
<th>Site/Area Characteristics</th>
<th>Pueblo</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Canyon km. surveyed</td>
<td>4.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Sites</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>Structures</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>Habitation sites</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Sites with 6+ structures</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Structures per site</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Sites per km.</td>
<td>4.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Structures per km.</td>
<td>7.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Habitation sites per km.</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Sites with 6+ structures per km.</td>
<td>.45</td>
<td>.45</td>
</tr>
</tbody>
</table>
use of this area, but much of it appears to be relatively old and Upper Grand is much less subject to disturbance than Bullet since it is little used as an access to Lower Grand Gulch. The scientific values are obvious and the recreational values are similar to those expressed above for Bullet. These sites are not under the same pressure as those in Bullet, but still are being damaged. The value of showing canyon sites in a more "typical" setting either in Upper Bullet or Upper Grand Gulch is obvious and either could serve this purpose.

The mesa top has a similar relationship to the existing Grand Gulch Primitive Area as does Eastern Sheiks. That is, the addition of well-watered, deep soil areas where the great majority of Pueblo and Basketmaker III peoples lived would give a much better balance to the area than now exists. In this case (Kane Unit), however, the density of large (Prudden unit) Pueblo sites is greater than that of Bullet. Furthermore, the density of Basketmaker III sites is probably several times that of the Bullet area. On the other hand, the actual amount of area with this sort of occupation is much less in the proposed Kane Gulch Extension than in the total area found in the Eastern Sheiks Extension.

Unfortunately, the condition of the mesatop Pueblo sites in the Upper Grand Gulch area is probably the worst that we have seen on Cedar Mesa. The density of large Pueblo sites appears to be well known to vandals and virtually all the large Pueblo
sites have had, at a minimum, portions of the trash potted. This area, then, is under pressure not only from casual visitors, but from systematic vandals. It is likely that these observations apply to the whole Kane Extension area as well.

The scientific value of this area may be greatest for the problem of interrelations between Pueblo sites and for settlement pattern studies for the Basketmaker III sites. Elsewhere the mesa top Pueblo habitation sites appear to be spaced much farther apart, and Basketmaker III sites are too rare to be studied in detail.

Collins Spring-Steer Gulch Extensions

These small, nearly contiguous areas were not systematically surveyed by the 1976 expedition, or earlier by the Cedar Mesa Project. The authors have, however, visited the area around Collins Spring and are subjectively familiar with it. Two small contract projects have also been recently completed not far to the north and west of Collins Spring (Sant 1976; Patterson 1976).

The proposed Collins Spring-Steer Gulch Extensions lie between about 5000 and 5340 ft., and are thus the lowest areas treated in this report. They also are the most westerly, and are characterized by thin, relatively unstabilized eolian deposits, numerous patches of exposed bedrock, and blackbrush-rabbitbrush-ephedra vegetation with only scattered pinyon or juniper trees. All these characteristics indicate that open
Pueblo or Basketmaker III sites are very unlikely to occur. Lithic sites, probably of Basketmaker II age, can be expected, but their frequencies would probably be at the lower end of the Cedar Mesa range for such sites. We would expect somewhat less than one site per 400 meter quadrat, or probably something under 25 sites for the combined Collins-Steer Gulch extensions.

Such data as we have for the area confirm these expectations. The senior author has noted sparse but extensive chipping debris around the head of Collins Spring Canyon, and Sant (1976) notes a similar type of site on a sandy ridge about a mile north of Collins Spring. Patterson, who walked several seismograph lines north and west of Collins Spring, observed a small amount of lithic material, but did not note any concentrations that she could designate a site (Patterson 1976).

Although these proposed extensions are very small, they would have value in helping to determine the environmental characteristics associated with a drop-off in frequency of Basketmaker II sites. We have noted the rather uniform frequency of such sites on Cedar Mesa, but our data are largely confined to elevation ranges from about 5400 to 6800 ft. Observations in the lowland areas south of Cedar Mesa suggest that there is a substantial dropoff in overall abundance of lithic sites, and certainly in the frequency of BMII base camp sites, by ca. 4500 ft. elevation. Additional survey between this elevation and 5400 ft.,
and in a variety of physiographic/vegetational situations, is needed to tie down the point at which decrease in frequency accelerates with decreasing elevation. Such information is potentially very important in reconstructing the nature of Basketmaker II adaptations. Since we also know that there was Pueblo occupation in nearby areas of Collins Spring Canyon and Grand Gulch, any evidence of Pueblo use of the adjacent low-lying mesa top would also be important. It is of course also possible that the relatively featureless lithic scatters such as observed by Lipe and by Sant might be remains of Pueblo, as well as Basketmaker II, activities. This is a more widespread problem, but areas such as the Collins Spring-Steer Gulch extensions have some potential to contribute data.

Because of their proximity to the much-used Collins Spring trail into Grand Gulch, the Collins Spring-Steer Gulch extension has undoubtedly experienced much surface collecting. The probable shallow and extensively scattered nature of the sites makes it unlikely they will have been much damaged by digging or by displacement of lithic debris by collectors, but the removal of projectile points is a serious problem. These often diagnostic artifacts provide one of the few ways in which "flake scatters" can sometimes be assigned to one or more temporal periods. Hence, surface collecting for points complicates the problem noted above, that of categorizing simple lithic sites.
Interpretive Summary

Main Characteristics of Cedar Mesa Archaeology.

Although much remains to be learned about the fascinating history of the Anasazi Indians in the Grand Gulch-Cedar Mesa area, archaeological survey and excavations undertaken since 1969 have revealed the main outlines of the prehistoric occupation of the area.

There is little evidence of man's use of this area until about the time of Christ, when Anasazi people of the Basketmaker II cultural period settled here. Their economy appears to have been based on farming, supplemented in a substantial way by hunting and gathering, and they had not yet begun to make pottery. Their principal habitation sites, which are primarily on the mesa top, can better be characterized as base camps rather than as villages. They did, however, occasionally construct shallow pithouses, but located them singly rather than in clusters. There are also numerous small sites that probably represent temporary camps associated with seasonal economic activities. Natural alcove shelters in the canyons were used as well, primarily for storage and for burial of the dead. Pictographs were also often painted on the walls of these shelters. It is quite possible that the Basketmaker II people were following a seasonal round of movement rather than occupying a single settlement throughout the year.

The Basketmaker II sites are abundant throughout the Cedar Mesa area, and show roughly similar frequencies in all
parts of the mesa, and over an elevational range of 5400 to 6800 ft. The site frequencies presumably drop off above and below these elevations, but our surveys have not extended enough outside this range to be able to document this variation. It is clear, however, that the Basketmaker II settlement pattern is less "sensitive" to environmental variation on Cedar Mesa than are the later occupations. This suggests either that the Basketmaker II people were less sensitive to variations in effective moisture because they placed less reliance on rainfall farming, or that the climate was more favorable in the early centuries A.D. The former explanation would seem to be favored by the fact that the Basketmaker II base camps are consistently located in thin soil areas near the canyon rims, rather than in the deeper soil areas on the mesa's divides. This pattern is suggestive of a mixed hunting-gathering-farming economy, with the main sites located to maximize access to a diversity of resources, in this case to the resources of both the canyons and mesa tops.

After what may have been a brief period of abandonment of the mesa, the area was reoccupied about A.D. 600, during the succeeding Anasazi period, Basketmaker III. The settlement pattern of this occupation was quite different from that of the preceding period. Sites tend strongly to be located in association with the deeper soils on the divide areas, and to be confined to the better-watered northeastern part of Cedar Mesa. The canyons continued to be used to some extent,
apparently in ways similar to the preceding period. The Basketmaker III occupation was terminated sometime in the early 700's A.D., initiating a period of several hundred years of virtual abandonment by the Anasazi people. The characteristics of the Basketmaker III occupation suggest that farming had at this time become more important to the Anasazi of this area, and that they were locating their sites so as to maximize access to the best areas of arable soil. Cedar Mesa appears to have become marginal for Anasazi farmers at this time, and regional evidence suggests that population was centered somewhat to the east. It may well be that the Basketmaker III occupation of Cedar Mesa stems from Comb Wash, where alluvial soils and floodwater farming may have permitted a somewhat more stable agricultural adaptation.

By about A.D. 1050, or late in the Pueblo II period, small Anasazi sites become abundant on Cedar Mesa again, and this Pueblo occupation continues through the mid-Pueblo III period, or until about A.D. 1250 or 1260. Abandonment occurred again about this time, and the area was never again occupied by the Anasazi. The Pueblo settlement pattern resembled the earlier Basketmaker III one, in that sites are concentrated in the better watered areas, and tend to associate with the deeper soils on the divides. Sites are much more numerous than in the Basketmaker III period, and there was more use of the central and southern parts of the mesa. The canyons were also heavily used by the Puebloans, and the spectacular and well-
preserved cliff dwellings of Grand Gulch and other canyons date to this time.

Archaeological Importance of the Proposed Additions.

The Grand Gulch Primitive Area was established to provide protection for the significant archaeological resources of this canyon system, and to permit the public to enjoy these resources in a scenic and relatively unaltered environment. Recent management plans for the Grand Gulch Primitive area propose several expansions; for purposes of discussion, these can best be grouped as follows:

1. Slickhorn
2. Pine and Dripping Canyons
3. Western Sheiks
4. Eastern Sheiks (including Coyote Flat)
5. Kane Gulch (including Long Flat)
6. Collins Springs and Steer Gulch

This report has presented estimates of the archaeological characteristics of these areas, as well as an evaluation of the archaeological resources. In general, we can conclude that expansion of the Grand Gulch Primitive Area will be beneficial to archaeological research and interpretation. The existing primitive area includes a number of visually impressive, predominantly Pueblo, sites, but it does not provide a good representation of the full range of archaeology to be found in this area. Our researches over the years have amply
documented that the Grand Gulch sites were part of a settlement system that included the mesa top and smaller canyons as well. In fact, most of the Anasazi occupants of this area spent most of their time in these latter types of locale, particularly the mesa top settings. The proposed expansions of the Primitive Area will include a number of sections of mesa top as well as several smaller canyons; the expanded Primitive Area would therefore contain a much more typical range of Anasazi sites and environments than was originally the case. Furthermore, it is estimated that expansions proposed here would add roughly 2750 sites to the Primitive Area.

Moving to the several proposed expansion areas, we can briefly summarize our results for each.

1. **Slickhorn.** The relatively low-lying mesa top portion of the proposed expansion is dominated by Basketmaker II sites, including some large base camps. The sites show considerable evidence of recent surface-collecting activity. In the entrenched canyons, Pueblo cliff dwellings predominate. Adjectives such as unique, spectacular, well-preserved, and archaeologically significant can all be applied to some of these sites. There appears to have been a late Pueblo occupation here with some very interesting, possibly unique features. These sites complement and extend the range of variation represented by the Grand Gulch cliff dwellings. Although there has been some recent vandalism, the Slickhorn sites are in general better
preserved than the ones in Grand Gulch. It is not only logical but essential that this outstanding archaeological area be added to the existing Primitive Area.

2. **Pine-Dripping.** On the mesa top, Basketmaker II sites are found throughout the proposed extension, but Pueblo sites are largely confined to the higher portions. Basketmaker III sites occur, but are very rare. The addition of an area lying west of Grand Gulch offers some opportunities for studying east-to-west variation in the Basketmaker III and Pueblo occupations of Cedar Mesa. This has importance for testing the hypothesis that Cedar Mesa was settled from areas to its east, such as Comb Wash.

Although there is some evidence of recent collecting and digging in the Pine-Dripping upland area, the area seems to be suffering less impact than are the lands to the east of Grand Gulch. This correlates with the generally lower frequency of access roads and traces of off-road-vehicle use west of the Gulch. The Pine-Dripping canyon systems, down to the edge of the existing Primitive area, are relatively narrow and shallow, and are representative of the smaller canyon systems of the area. Their sites are neither especially large or numerous, but they are quite well-preserved, much better so than in many other parts of the Cedar Mesa area. There are also some very interesting historic cowboy camps that are of value for recording and interpreting the history of the cattle industry in this area.
3. **Western Sheiks.** The upland portion of this extension area resembles that of Slickhorn and the lower part of Pine-Dripping. Extrapolation of data from earlier surveys in this area indicates that Pueblo sites are likely to be more abundant in Western Sheiks, however, and that a few Basketmaker III sites are likely to occur.

Surveys of the canyons in this area indicate that small Pueblo sites are to be found there. The proposed extension is important in this respect because it includes the heads of several canyons whose lower portions already are included in the Primitive Area. These canyon head areas have often been found to contain concentrations of small Pueblo sites. This is probably because springs often occur near the canyon heads and because the upper portions of canyons also offer easy access to the mesa top as well as the advantages of canyon resources such as springs and natural shelters. Such small canyons and canyon head locations, although undoubtedly important in the overall Pueblo settlement pattern in the Cedar Mesa region, are very poorly represented in the existing Primitive Area.

The condition of sites in this area can be described as "average" or "intermediate." The mesa top sites are not as free of indications of vandalism as those in Pine-Dripping, but they are in better shape than those in Eastern Sheiks or the Kane Extension. The sites in Polly's Canyon are not as well preserved as those in Slickhorn or Pine-Dripping, probably
because Polly's is a frequently-used route into Grand Gulch, but their condition is better than that of comparable small sites in the main part of Grand Gulch.

4. **Eastern Sheiks.** This area is higher, better watered, and has more deep soil areas than the units previously discussed. On the mesa top, site densities are also much greater, presumably as a result. The increase is not so large in frequencies of Basketmaker II sites, but Basketmaker III and particularly Pueblo sites are dramatically more abundant. This is an area of Pueblo habitation sites as well as camps or special activity sites. The typical Pueblo habitation site on the mesa top is a small "unit pueblo" consisting of a kiva, a few habitation and storage rooms, and a small trash disposal area.

Analysis of data from the overlapping Bullet Canyon drainage indicates that the 150-175 years of Pueblo occupation in this area can be subdivided into at least four temporal subdivisions. This offers the prospect of studying in some detail the processes of Pueblo settlement and abandonment of the area. Since the Grand Gulch Primitive Area was set up largely to protect and make available to the public the Pueblo cliff-dwellings, it is important to add some areas of mesa top that were important for the Pueblo occupation of the region as a whole. The Eastern Sheiks Extension is such an area.

The canyon archaeological resources of the Eastern Sheiks Extension lie primarily in portions of upper Bullet Canyon that
will be added to the Primitive Area. Lower Bullet, already included in the Primitive Area, is a large canyon with many of the characteristics of Grand Gulch, both environmentally and archaeologically. Surveys done as part of the Cedar Mesa Project indicate that the portions of Upper Bullet that fall in the proposed Extension are rich in small Pueblo cliff dwellings of the sort that are really more typical of the region as a whole than are the somewhat larger sites of main Grand Gulch and lower Bullet. Since the upper canyon sites are also likely to have been oriented to mesa-top farming, they are probably closely related to the mesa top sites previously discussed.

The condition of sites in the Eastern Sheiks Extension is not as good as in the more southerly and westerly areas of the mesa. Because the mesa top Pueblo and Basketmaker III sites are larger and have more depth, they have more often been the target of diggers as well as surface collectors. The abundance of access roads in the area and the lack of regulation of off-road vehicle use appears to correlate with increased "wear and tear" on the sites.

The canyon sites sustained some damage in the nineteenth and early twentieth century when some were excavated by parties collecting specimens for museums or for sale. The popularity of Bullet as an access route to Grand Gulch also appears to have led to increased visitation to many of the sites, and to a higher frequency of recent vandalism that was observed in less-visited canyons such as Pine and Dripping.
5. **Kane Extension.** This is a relatively small area, but it is important for the same reasons that Eastern Sheiks is. It adds to the Primitive Area some prime Basketmaker III and Pueblo farming territory, and at the same time, adds a number of typical mesa-top sites of these periods. Evidence from earlier surveys suggests that the Kane Extension is likely to be the best area of those discussed here for studying and interpreting Basketmaker III and Pueblo habitation sites. The addition of the upper end of Grand Gulch will also add a number of well-preserved small to medium-sized Pueblo cliff dwellings to the Primitive Area inventory.

The canyon sites in the proposed extension are in better condition than for the main part of Grand Gulch, probably because the former area was not so accessible to the pack trains of the early collecting expeditions, and because recent hiking traffic has usually entered Grand Gulch through Kane rather than through Upper Grand proper. Unfortunately, this degree of relative preservation does not extend to the mesa top sites in this area. Judging by our observations on earlier surveys, the Kane Extension and surrounding area has been the hardest hit of any of the areas discussed in this report. Informed and systematic pothunting, as well as casual vandalism, has been at work, and it is unlikely that any of the Basketmaker III or Pueblo habitation sites has entirely escaped such damage.
6. **Collins Spring--Steer Gulch.** These two small areas are very low-lying and undoubtedly have very low site densities, primarily of lithic sites. In conjunction with other low dry areas of this sort, the Collins Spring--Steer Gulch Extension has promise of helping define the lower elevational limits of the Basketmaker II occupation. The sites in this extension area are likely to be thin, extensive lithic scatters. They are not likely to be subject to digging, but are vulnerable to surface collecting, which removes the few diagnostic artifacts they are likely to contain and makes assessing their temporal position and cultural function much more difficult.
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1977 Final Report for Archaeological Sampling Survey of Proposed Additions to the Existing Grand Gulch Primitive Area. Submitted to the Bureau of Land Management, Moab District, San Juan County, Utah, Contract No. YA-512-CT6-200

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