This report presents the results of the Dolores Archaeological Program's initial (1978) field season. The Dolores Archaeological Program is funded by the Bureau of Reclamation as part of the Dolores Project Cultural Resources Mitigation Program, which is responsible for the mitigation of impacts to the cultural resources to be affected by the construction of a multipurpose water storage and distribution system on the Dolores River in Montezuma County, southwestern Colorado. The chapters in this report summarize the field work accomplished in 1978; present the program research design; outline the systems of terminology adapted and developed to describe spatial, temporal, and social units that occurred archaeologically in the area under study; and provide results obtained. Detailed descriptions of excavations at Sheep Skull Camp (Site 5MT2202), Sagehill Hamlet (Site 5MT2198), and Little House (Site 5MT2191) are also included. The time periods represented at these three sites range from the Archaic through Basketmaker III, Pueblo I, and Pueblo II. In addition, fieldwork and results of the magnetometer survey are presented. The report concludes with a chapter describing the methods and results of an archaeoastronomical reconnaissance.

**Editors:** WSF

**EJH**
Dolores Archaeological Program:
Field Investigations and Analysis - 1978

Prepared under the supervision of
Dr. David A. Breternitz, Principal Investigator
University of Colorado
Dolores Archaeological Program
Dolores, Colorado

The investigations covered by this report were
dataed by the Bureau of Reclamation, Upper
Colorado Region, Salt Lake City, Utah, under
Contract No. 8-07-40-S0562

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
Engineering and Research Center
Denver, Colorado

November 1983
As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

Mission of the Bureau of Reclamation

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.

The information contained in this report regarding commercial products or firms may not be used for advertising or promotional purposes and is not to be construed as an endorsement of any product or firm by the Bureau of Reclamation.
January 17, 1984

To Government Agencies and Interested Organizations and Individuals:

The enclosed publication entitled Dolores Archaeological Program: Field Investigations and Analysis--1978 is the first of a series which will report the findings of the Dolores Archaeological Program. We hope the report will be of interest not only to those conducting archaeological research within the American Southwest, but also to those involved in cultural resources management throughout the United States.

Sincerely yours,

Clifford I. Barrett
Regional Director

Enclosure
FOREWORD

This publication by the Bureau of Reclamation, U.S. Department of the Interior, is the first of a series that will report the findings of the Dolores Archaeological Program, including its excavation activities, and the preservation and analysis of newly discovered artifacts.

Early studies of the Dolores Project, a water supply and delivery project near Dolores, Colorado, found extensive archaeological resources which could be affected by construction.

In recognition of the unusual concentration of prehistoric Anasazi sites in southwestern Colorado, the Department of Interior supported passage of Public Law 96-301 in 1980. The law authorized an increase in program expenditures for archaeological research, from 1 percent to 4 percent of total project costs. The additional funds have provided for more comprehensive data collection, analysis, and documentation. Funds also will be used to construct the Anasazi Heritage Center to provide for public display and interpretation of the artifacts.

These publications discuss a portion of each year's activities. They are supplemented by more detailed contractor reports which will be readily available to the public through the Commerce Department's National Technical Information Service in Springfield, Virginia.

This archaeological research reflects Reclamation’s commitment to foster quality scientific study. Without the research, supported by Reclamation and conducted by the University of Colorado, an important opportunity to learn more of the Anasazi peoples and their culture would have been lost.

It is Reclamation policy that cultural resources should be preserved and interpreted for the best and widest scientific and public use. This publication is an example of our dedication to that ideal.

I recommend it to both the archaeological community and to the general public, particularly to those of us who now live and prosper on the lands once inhabited by the Anasazi.

Robert N. Broadbent

Commissioner, Bureau of Reclamation
PREFACE

This volume is the first publication to be issued by the Bureau of Reclamation Technical Publications Branch which presents the results of investigations by the University of Colorado Dolores Archaeological Program (DAP) under terms of Bureau of Reclamation Contract No. 8-07-40-S0562. A minimum of background and comments are necessary to place the present series of reports in perspective.

Basically, these reports were written in 1978-79. Since that time, terminology, field and laboratory procedures, and even philosophical orientations have been modified to accommodate the expanding data base, increased communication between field and analytical workers, and better integration of all aspects of the program with the refined Research Design. Thus, the program has evolved in many ways since the research and writing of these reports, but it is impractical and impossible to undertake the extensive rewriting and editing which would be necessary to totally update the reports to reflect the current state-of-the-art on DAP. Certain of these updates in thinking and procedure are presented in two other publications: (1) a series of four papers published in Contract Abstracts and CRM Archaeology, vol. 1, No. 2, Fall 1980; and (2) Dolores Archaeological Program Synthetic Report 1978-1980, which will be the second major DAP publication to be issued by the Bureau of Reclamation Technical Publications Branch.

More reports of the 1978 DAP effort were produced than are included in this volume. Reports which were not chosen for current publication include (1) site investigations begun in 1978 that were still in progress; i.e., further fieldwork and analysis was planned when other 1978 reports were submitted, and (2) administrative and laboratory procedure reports. These are basically historical documents of limited interest or which reflect the state-of-the-project at the time of writing where procedures have been subsequently modified, expanded, clarified, and coordinated with other operating sections of the DAP.

As a matter of historical reference, a short chronology of the early phases of the DAP will help to explain the conditions under which the data for the 1978 reports included herein were gathered and processed.

The contract between the Bureau of Reclamation and the University of Colorado was signed on 6 June 1978. Fieldwork was begun by two persons on 12 June 1978. Full-scale field investigations were initiated on 19 June 1978. Materials were brought in from the field and placed in temporary storage, to be moved at least twice before permanent laboratory facilities were available. The permanent laboratory facility was not operational until the first of September 1978, at which time the DAP was finally able to acquire the services of a Laboratory Supervisor. Analytical specialists began to arrive on the project during the summer, but the full complement of people was not on the project until the fall of 1978.

It is obvious that all elements of the 1978 reports reflect this "crisis operating mode" which permeated all aspects of the DAP during its first year of operation. These situations have been alleviated in subsequent years and reports of post-1978 work will reflect not only an accumulation of knowledge and better integration of the various field and analytical elements of DAP, but also a report writing and editorial consistency that was not possible in producing these reports.

David A. Breternitz
March 1982
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Chapter 1

INTRODUCTION TO
FIELD INVESTIGATIONS AND ANALYSIS
ABSTRACT

The University of Colorado began field operations as part of the Dolores Project Cultural Resources Mitigation Program in June 1978. The program is being funded by the Bureau of Reclamation as an integral part of the Dolores Project, a multipurpose water storage and distribution system being constructed on the Dolores River in southwestern Colorado. Preparation for the first field season included formulation of a general research design with five major problem domains (Economy and Adaptation, Paleodemography, Social Organization, Extraregional Relationships, and Cultural Process); design of a site typology and preliminary systems of spatial and temporal units; and development of a specific excavation design and excavation schedule for 1978. Intensive fieldwork began on 12 June and ended on 22 November. During this span, University of Colorado and Washington State University field crews conducted excavations at seven prehistoric sites; the occupational time span represented in this sample is about 4000 B.C. to A.D. 1200. In addition, another crew conducted specialized field studies including magnetometer survey and recovery of archaeomagnetic dating samples. In 1978 the program of field operations emphasized recovery of basic archaeological data for estimation of characteristics of prehistoric cultures in the Dolores Project area. Goals for the program in this direction included obtaining assessments of the temporal range of prehistoric remains, of variability in site types and distributions, and of the quality and quantity of portable artifacts. In 1979 and future years, field operations will be directed toward amassing additional data to refine and augment first-year constructs and toward the recovery of data that can be applied to specific questions outlined in the research design. During the fall of 1978, the data generated during the field season was employed to develop more rigorous project controls including a reversed site typology and systems of spatial and temporal units.
INTRODUCTION

The Dolores Project Cultural Resources Mitigation Program is a multi-institutional, multiyear research project funded by the U.S. Department of the Interior, Bureau of Reclamation. The goal of the program is to alleviate direct and indirect impacts on cultural resources in Montezuma and Dolores Counties, Colorado, resulting from construction and implementation of the Dolores Project, a multipurpose water storage and distribution system being constructed on the Dolores River. The prime contractor for the program, the University of Colorado, is responsible for directing and managing the program and conducting a major portion of the fieldwork and analysis. The University has engaged several subcontractors to conduct other facets of the program: Woodward-Clyde Consultants is designing and implementing the data management system; Washington State University is sharing responsibility for field operations and analysis; Western Audio Visual is preparing motion picture footage of the program; and Centuries Research, Incorporated, assumed responsibility for mitigation of historical resources.

During 1978 the University was to conduct field investigations in first-year construction impact areas as determined by the Bureau of Reclamation. Consideration of these guidelines led to the designation of priority zones for intensive investigations (usually excavation) of cultural sites. These priority zones are termed the 1978 study areas and reflect the projected locations of the damsite and initial borrow areas in the Bureau's construction plan. The 1978 study areas consist of two divisions, one each in the Sagehen Flats and Grass Mesa Localities. (See Spatial Systematics section for definitions of these terms.)

Necessary preparatory steps before initiating actual fieldwork were: (1) the formulation of a general research design for the program as a whole, (2) construction of preliminary control systems (temporal and spatial units and a site typology), and (3) creation of a sampling design and excavation schedule. Actual fieldwork was begun on 12 June and continued until 22 November. During most of this period, operations were conducted by five University of Colorado and Washington State University crews; four crews were responsible for site excavation and one crew carried out specialized field studies. These studies included magnetometer survey and recovery of archaeomagnetic dating samples. A summary of field activities is presented later in this chapter. Detailed discussions of specific site excavations and specialized field studies are included as other chapters of this volume. After the field season, project personnel were engaged in analysis and report preparation. The preliminary control systems were evaluated in light of the excavated data and more rigorous constructs formulated. These are presented later in this chapter.

GENERAL RESEARCH DESIGN

The general research design of the DAP (Dolores Archaeological Program) is focused on investigating prehistoric (Anasazi Tradition) communities in the Dolores area. The rationale for this study emphasis is twofold: first, archaeological surveys have revealed that the project area is rich in Anasazi remains representing all periods of occupation. (Other prehistoric traditions are not so well represented.) Second, the large areal expanse of the project allows study of Anasazi communities on a regional scale. Perhaps the most serious shortcoming of previous archaeological research done in the Montelores area (Montezuma and Dolores Counties, Colorado) is the lack of a regional perspective.

The study of regional variations, then, is a major aspect of the general research design. Quantitative analyses of intersite differences will allow estimates of the range of cultural diversity in the project area. Investigating the role of prehistoric environment and society as factors influencing cultural diversity will be a research objective. Culture change, or cultural process, is a second major research orientation. Since the project area contains sites representing the full spectrum of Anasazi prehistory and also includes remains of the Archaic predecessors to these Formative peoples, there is an excellent opportunity to conduct an in-depth study of temporal variation in local prehistoric cultures. Again, the emphasis will be not only on description, but also on identifying causal relationships.
 FIELD INVESTIGATIONS AND ANALYSIS—1978

On a larger scale, Anasazi communities in the project area will be studied as a local manifestation of the New World Formative Stage. Kent Flannery’s The early Mesoamerican village (1976a) is viewed as a suitable model for studying southwestern Formative cultures as well as those of Mesoamerica. Many of the basic concepts and study methods described by Flannery and his contributors will be applied to data generated by project operations, and their applicability tested. Adoption of these techniques and awareness of the cultural parameters for Formative Mesoamerica described in this work will allow cross-culture area comparisons.

The general research design incorporates a systems model of culture because of its suitability for studying both cultural dynamics and relationships with the environment. Archaeologists applying this model view prehistoric human behavior as articulations between numerous systems encompassing both cultural and noncultural components. The general strategy in this approach is to isolate the systems and system components necessary in developing a research design and to analyze their characteristics and mechanisms of interaction. The identification of systems that are fundamental and essential in the context of Anasazi communities was a critical step in conception of the project general research design. Eventually, four systems were selected; these were (1) economy and adaptation, (2) paleodemography, (3) social organization, and (4) extraregional relationships. Each of these topics was subsumed in the general research design as a major problem domain. In addition, cultural process is also regarded as a critical component of study and was added as a fifth major domain. A detailed presentation of the general research design for DAP can be found in chapter 2 of this volume. A short summary of each of the major problem domains follows.

Problem Domain 1: Economy and Adaptation

In order to fully investigate economic lifeways, program personnel will develop and investigate the implications of alternative man-resource interaction models. A key step in this process is the understanding and description of the role of human disturbance in modifying prehistoric ecosystems. Aspects of the problem to be considered include the identification of contemporaneous available resources for different areas and periods; analysis of procurement systems employed in obtaining these resources; and the investigation of processing techniques, consumption modes, and discard practices.

Problem Domain 2: Paleodemography

Research in this problem domain is primarily directed toward establishing parameters for the prehistoric population. Major areas of study include estimates of local and regional population levels, the establishment of population clines, the physical characteristics of prehistoric peoples in project study areas, and the distribution of sites and activities in the study areas. Other important research interests are mortuary practices, population age structures, and health.

Problem Domain 3: Social Organization

The research objectives in this problem domain are to reconstruct prehistoric behavior patterns (activities), where and when they were being performed, and the individuals or social groups responsible for carrying out these activities. The method will be first to establish criteria for identifying prehistoric groups and then to investigate group functions and articulations, including how task groups were organized, the degree of labor specialization, and how groups and individuals were integrated into the community. The analysis of Anasazi settlement systems (both intrasite and intersite relationships) is seen as an important research area in this domain and also in Problem Domain 1.

Problem Domain 4: Extraregional Relationships

Extraregional relationships and trade are other major aspects of culture being studied. The identification of introduced exotic materials and ideas in the project area and the recognition of local products and ideas in extraregional areas is basic and necessary to this research. Once these objectives have been accomplished, mechanisms of exchange can be investigated, and the political and economic relationships of local Anasazi groups to extraregional groups estimated.

Problem Domain 5: Cultural Process

To study cultural process in project study areas, it is first necessary to identify and describe temporal variability in the local prehistoric cultures. This requires fine temporal controls and the systematic application of dating techniques such as dendrochronology, archaeomagnetism, radiocarbon, and artifact seriation. After the nature of the variability is established, the next step in the analysis is the identification of general cultural mechanisms and processes that are reflected in this variability. Finally, the causal relationships necessitating these processes will be investigated. Change and process in Anasazi economies, demography, society, and extraregional relations will be investigated using this study method. Related research areas include the causes for the abandonment of the project area by the Anasazi peoples and the implications for modern inhabitants, and the introduction of domesticates into the project area, their changing role in the Anasazi economy, and inferences for the role of domesticates in human society in general.
FIELD INVESTIGATIONS — 1978

Field investigations of the Dolores Archaeological Program were begun in June 1978. These investigations can be generally classified as nonintensive operations or intensive investigations (excavations). Nonintensive operations include categories such as preliminary assessment of resources, archaeological survey, remote sensing programs, geologic and vegetation surveys, and detailed surface mapping and limited testing of prehistoric sites. Intensive investigations are at present limited to site-specific excavation. In 1978, several field programs classified as nonintensive operations were initiated; intensive investigations were conducted at seven prehistoric sites. All investigations in 1978 were initiated in Bureau of Reclamation primary impact areas.

Nonintensive Operations

Nonintensive field operations of four types were carried out in 1978: archaeological survey, preliminary assessments, a magnetometer survey testing program, and archaeoastronomy. These are summarized below.

Archaeological Survey

The 1978 archaeological surveys of DAP were carried out by a Young Adult Conservation Corps crew. The survey was classified as an inventory; that is, the goal was 100 percent identification and recording of sites in specified areas. The survey thus served to accomplish two goals of the program: first, the recording of cultural resources in project impact areas as required by law; and second, the formation of a sampling universe from which to select sites for further investigations. During the first year, the inventory survey was implemented in project primary impact areas; specifically, these were the damsite and cofferdam pool, main pool, Great Cut Dike, borrow areas A, B, and E, McPhee Recreation Area, and the proposed right-of-way of the Great Cut Dike-McPhee Dam access road. Survey operations in 1978 were thus carried out in the Grass Mesa, Periman, House Creek, Dolores, Escalante, Sagehen Flats, and Cline Crest Localities (Spatial Systematics section). A thorough report of survey operations, results, and interpretation has been prepared by Dykeman et al. (1981).

Preliminary Assessment

Goals of the preliminary assessment program in 1978 were to delineate study areas (or general locations) for first-year operations, to construct a preliminary site typology for classification of sites in the study area, and to design a sampling program for 1978 excavations. This program was implemented by a careful examination of existing archaeological survey records, assessment of Bureau of Reclamation construction schedules, and actual onsite evaluations in the field. An important factor in selection was the location of project primary impact areas. As a result, two tentative study areas were selected: (1) the Sagehen Flats study area, projected as the location of a construction borrow area; and (2) the Grass Mesa study area, which included the proposed McPhee Dam site (fig. 1.1). Both study areas are located north and west of the town of Dolores, Colorado. Detailed presentations of the environment and archaeology of these areas (subsequently termed localities) are included in later DAP reports.
excavation. Rather, investigations would be confined to the arbitrarily delimited study areas and a surrounding catchment area. During the field season, a literature search would be conducted for systems and terminology that might be adopted by the project.

For temporal controls, it was decided initially to use the Pecos Classification, a generalized scheme designed to categorize prehistoric cultures in the northern portion of the American Southwest, first implemented in 1927. The Pecos Classification is applicable only to the Anasazi Tradition. Cultural remains thought to represent other time spans would be assigned only general cultural affiliation. This preliminary temporal framework is presented in Table 1.1.

Further tasks to be accomplished before initiation of fieldwork were the development of a site typology and the formation of a sampling strategy based on the preliminary data. The process for developing a site typology consisted of reviewing records of the archaeological remains encountered in Dolores and Montezuma Counties and comparing these with site types described by Mesa Verde archaeologists (Rohn, 1977; Hayes, 1964). This comparison resulted in a list of site types expected to be encountered in the project study areas. The list was then organized according to three major divisions based on intensity of use by the prehistoric population and to subdivisions based on site function. Once the typology was established, sites in the study areas were classified according to the formalized criteria and according to the cultural periods established as part of the Pecos Classification. Sites included in this classification process were recorded during 1972 (Breternitz and Martin, 1973) and 1976 (Kane, 1977) archaeological reconnaissance of the project area. The 1972 survey was not a 100-percent coverage effort; hence, the site lists are probably incomplete. Table 1.2 presents the results of this classification effort.

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**Table 1.1 Preliminary temporal framework for DAP field operations**

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<td>Anasazi</td>
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<td>Pueblo I (PI)</td>
<td>A.D. 750-900</td>
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<td>A.D. 900-1100</td>
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<td>A.D. 1100-1300</td>
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<td>Athabascan-Shoshonean</td>
<td>A.D. 1300-present</td>
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<tr>
<td>EuroAmerican</td>
<td>A.D. 1776-present</td>
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</table>

*Adapted from Nickens (1977)

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**Table 1.2 Temporal occupations and type classifications of archaeological sites in the 1978 study areas (DAP)**

I. Grass Mesa study area; total sites — 5

A. Archaic Period
   1. Limited activity loci — 1 (suspected)
   2. Seasonal loci — 1 (suspected)
   3. Habitations — 0

B. Basketmaker III Period
   1. Limited activity loci — 0
   2. Seasonal loci — 0
   3. Habitations — 0

C. Pueblo I Period
   1. Limited activity loci — 1 (suspected)
   2. Seasonal loci — 0
   3. Habitations — 4

D. Pueblo II Period
   1. Limited activity loci — 0
   2. Seasonal loci — 1
   3. Habitations — 0

II. Sagehen Flats study area; total sites — 31

A. Archaic Period
   1. Limited activity loci* — 3
   2. Seasonal loci* — 4
   3. Habitations — 0

B. Basketmaker III — Pueblo I Period**
   1. Limited activity loci — 7
   2. Seasonal loci — 0
   3. Habitations — 15

C. Pueblo I Period
   1. Limited activity loci — 7
   2. Seasonal loci — 0
   3. Habitations — 6

D. Pueblo II Period
   1. Limited activity loci — 5
   2. Seasonal loci — 2
   3. Habitations — 2

*Seven sites in the Sagehen Flats Locality exhibited artifacts indicating a long span of occupation, but no structures. These were assumed to be seasonal camps or procurement/processing areas used during most periods. **Some sites in the study area yielded ceramic collections that indicated a transitional Basketmaker III-Pueblo I occupation. ¶It could not be determined from the survey record or surface evidence whether five small sites with Pueblo I artifacts were field houses or hamlets. These sites were tentatively placed in the habitation category.

**NOTE:** The total number of sites cited for each study area does not correspond to the total for the detailed breakdown because some sites were assigned more than one occupation.
The general strategy used to actually select sites for excavation was as follows. Initially, in a study of prehistoric communities, a representative sample of different site types according to cultural period should be excavated to firmly establish the characteristics of the data set. This inaugural effort serves to verify and fine tune the initial site typology and to yield a first estimate of architecture and material culture associated with site type units. Based on initial work, more selective intensive programs can be implemented in later field seasons. Such programs will be geared to gathering data necessary to address specific questions posed in the general research designs. For example, excavations might center on large refuse middens to recover human skeletal materials necessary to establish demographic characteristics of the prehistoric population; or habitation sites thought to represent a dispersed community cluster might be intensively sampled to investigate small-scale temporal changes within a local social group.

The first step in developing a specific sampling strategy is to prepare site catalogs for areas to be investigated during the next field season. The catalogs should consist of survey site records and notes made during field examinations organized by temporal period and site type. A sampling strategy tailored to the research objective is then used to select sites to be intensely investigated. For the DAP field program of 1978, the sampling criteria were as follows:

1. The sample was biased toward habitation, as these are central bases for communities and it was thought that more evidence of activities and the nature of prehistoric society could be gained.

2. There was an emphasis on attempting to investigate at least one site in every site type category identified for each cultural period. The rationale is to reconstruct the full range of prehistoric settlement and activity for each cultural period (at least for Anasazi periods).

3. Where there were two or more sites of the same type and time period in the catalog, a table of random numbers was employed to select the sample.

4. The sampling method incorporates flexibility when considering data requirements of the general research design. For example, it may be necessary to investigate the nature of a dispersed community cluster incorporating several habitation. In this case, rather than employing a random number table in selection of the sample, several neighboring habitation suspected to be members of the cluster would be chosen for excavation.

For this first season of fieldwork a pressing need, in addition to investigating community parameters, was the establishment of a local chronological system (phase scheme) with finer divisions than the Pecos Classification. To this end, it was decided that a site with potential for multiperiod occupations would be excavated in 1978. Otherwise, the original sampling design was adhered to. Since only seven sites were excavated in 1978, some catalog categories remain to be investigated in future years. The sites chosen to be excavated in 1978 were as follows:

1. Grass Mesa study area
   a. Site 5MT2151. A suspected Basketmaker III, Pueblo I-Pueblo II camp—chosen for excavation because it appeared to have potential for a long sequence of occupation.

2. Sagehen Flats study area
   a. Site 5MT2202. A seasonal camp or procurement locus with multiple occupations, including Archaic—selected to investigate the characteristics of limited activity sites.
   b. Site 5MT2198. A suspected Basketmaker III habitation—selected to gain information on the characteristics of the early Anasazi period.
   c. Site 5MT2193. A suspected Basketmaker III-Pueblo I habitation—selected as possible later analog of Site 5MT2198; may yield data that can be applied to establishing cultural sequence.
   d. Site 5MT2191. A suspected Pueblo I habitation or field house—selected because it appeared by nature of the surface evidence to be later than Site 5MT2193 and this could serve to extend the cultural sequence.
   e. Site 5MT4475. A suspected Pueblo I-Pueblo II village—selected “unique” resource. This site is the only large village so far recorded in the study area.
   f. Site 5MT2235. A suspected Pueblo II-Pueblo III hamlet or field house (also has possible Archaic component)—selected because it seemed to represent the latest occupation in the study areas.

Magnetometer Survey Testing Program
A third area of nonintensive study conducted during 1978 was a magnetometer survey testing program. The immediate objective of the program was to determine whether the magnetometer could be employed as an effective tool in detecting subsurface archaeological features. To this end, a magnetometer survey crew was active during the summer of 1978; actual magnetometer operations were conducted at 18 prehistoric sites. A summary of field procedures, including methodology and results, is reported in chapter 7, and results of the analysis are summarized in chapter 8 of this volume.
The preliminary results of this program are very promising. For example, a portion of the test was conducted at Dos Casas Hamlet (Site 5MT2193), a small Pueblo I (A.D. 750-900) habitation in the Sagehen Flats study area (Brisbin et al., 1981). Magnetometer survey of a 20-by-20-m grid, done while the site was in a preliminary phase of investigation, resulted in the identification of two magnetic anomalies. These were later tested by means of exploratory trenches and were determined to be pithouses. In this case the survey greatly aided the formulation of excavation strategies and scheduling at the site. The two pithouses represented an unusual orientation; one pit house was directly north of the other rather than in the more common east-west alignment. It would have taken much time and effort to reveal the true situation, a possible scenario that was avoided by using the magnetometer.

It thus appears that magnetometer survey operations will form a valuable part of future DAP nonintensive studies. An expanded magnetometer survey is planned for 1979 and future years. Ultimate objectives of the program are (1) survey of all suitable sites selected for intensive investigations, as an aid in management of the field program; (2) survey of selected sites as part of the preliminary operations, to obtain data useful in the selection of a site excavation sample; (3) survey of sites in secondary impact zones of the project and sites rejected for excavation, in order to map features; and (4) better articulation of magnetic anomalies with other surface evidence and with subsurface archaeological features.

Archaeoastronomy

As part of nonintensive field operations, Dr. Jack Eddy of the Astrophysics Department, University of Colorado, carried out observations relating to possible knowledge and use of astronomy in local Anasazi communities. Investigations were conducted at eight major prehistoric complexes: McPhee Village, Cline Crest Ruin, Little House Ruin, Emerson Ruin, Yellowjacket Springs Ruin, Goodman Point Ruin, Mud Springs Ruin, and Yucca House. The sample included some sites outside the limits of the project area in order to gain a regional perspective; all are in Montezuma County. While none of these sites exhibited general astronomical orientations, it appears that some interior features, specifically tri-wall structures and great kivas, may be oriented according to cardinal directions or astronomical phenomena. The most promising example is the tri-wall structure at Emerson Ruin. According to field observations, the structure is aligned on a major north-south axis and incorporates a bilateral symmetry in its construction. A great kiva at Goodman Point Ruin also exhibited a major north-south orientation. A comprehensive report summarizing archaeoastronomical studies is presented in chapter 9 of this volume.

Intensive Investigations

Intensive field investigations conducted by University of Colorado and Washington State University crews during 1978 consisted of excavations at seven prehistoric sites. The specific goals of the 1978 field program corresponded to the general strategy outlined for the preliminary assessment, that is, to gain a rough estimate of the characteristics and variability of the prehistoric remains in the project area. Information recovered during this first season was also used to judge the adequacy of the first year's sampling strategy (attempting to investigate the full spectrum of temporal periods and site types represented) in supplying data applicable to questions specified in the project research design. This determination will be a first step toward the formulation of specific question-oriented excavation sampling techniques to be applied in future field operations.

A second goal of first-year intensive operations was the recovery of data that could be used to design and refine the project systems of archaeological control units. These include the Dolores Archaeological Program Spatial and Formal Series and the Dolores Archaeological Program Site Typology (described later).

Detailed descriptions of site-specific intensive investigations and preliminary interpretations are the subjects of individual chapters in this volume. A brief summary of each site is presented below.

Sheep Skull Camp (Site 5MT2202)

Detailed operations at Site 5MT2202 are summarized in chapter 4 of this volume.

Spatial and temporal assignment. The site is located in the Sagehen Flats study area approximately 2.5 km west of the Dolores River and 7.1 km northwest of the town of Dolores. Three occupations, representing (tentatively) the Archaic Tradition and the Basketmaker III and Pueblo I periods, have been recognized. The site was probably occupied on a seasonal or sporadic basis during the period 2000 B.C. to A.D. 1000, based on a preliminary interpretation of the artifact assemblage.

Description. The site is a large, diffuse lithic and ceramic scatter situated on a prominent knoll north of the Sagehen Marsh. No cultural features or architecture were encountered at the site.

Interpretation. The nature of the artifact collection recovered from the site and its position in the local contemporary settlement milieu suggest that the site functioned as a hunting/gathering station or camp. People using Sheep Skull Camp as a base may have exploited the faunal and botanical resources of the nearby marshlands. During the Archaic, the site may have served as a seasonal and/or limited activity locus used by members of a local migratory group. Later, during the Basketmaker III through Pueblo II periods, Sheep Skull Camp was probably used as a procurement/processing area. The site may have been used by members of local agricultural communities during the first millennium A.D.
Sagehill Hamlet (Site 5MT2198)

Detailed operations performed at Site 5MT2198 are presented in chapter 5 of this volume.

Spatial and temporal assignment. Sagehill Hamlet, located in the Sagehen Flats study area, is approximately 3.7 km west of the Dolores River and 8.4 km northwest of the town of Dolores. Tree-ring analysis of construction wood recovered from the pithouse at the site and inferences from artifact analysis suggest Sagehill Hamlet was occupied in the last half of the seventh century, or approximately A.D. 660-690. This would place the occupation near the middle of the Basketmaker III period.

Description. The site is a small habitation situated on a low hillock north of the Sagehen Marsh. Cultural features include a pithouse and exterior use areas. The site is located in an area with good deposits of aeolian and alluvial soils that would have been suitable for horticulture.

Interpretation. The site functioned as the central base, or habitation, for one household unit; the inhabitants were probably practicing horticulture within a short distance of the site and also collecting wild resources. The site is believed to be an integral part of a local dispersed Anasazi farming community.

Dos Casas Hamlet (Site 5MT2193)

Detailed operations performed at Site 5MT2193 and preliminary analyses are summarized by Brisbin et al. (1981).

Spatial and temporal assignment. Dos Casas Hamlet is located in the Sagehen Flats study area approximately 3.4 km west of the Dolores River and 8 km northwest of the present town of Dolores. Two occupations have been identified at the site and both can be assigned to the early Pueblo I period. The first occupation is represented by a pithouse, later used as a refuse midden, and a row of surface rooms, later remodeled. Interpretation of tree-ring dates recovered from specimens of charred construction timbers at the site suggests this first occupation dates to the time span A.D. 750-770. Groups representing the second occupation built a new pithouse in the year A.D. 770 and also remodeled the arc of surface rooms to the north. The site was probably abandoned about 50 years after the initial construction effort.

Description. The site is situated on a low hillock north of the Sagehen Marsh. Architectural features include two pithouses (not contemporaneous), a five-room houseblock to the north of the pithouse area, and ancillary use areas. The site is located in an area containing suitable farming soils.

Interpretation. The site may have been used as a seasonal field house by a household group from the McPhee Village (described below). It is assumed that members of the household occupied Little House during the growing season and were performing activities associated with the maintenance of nearby agricultural fields.

Little House (Site 5MT2191)

The excavations at Little House are fully reported in chapter 6 of this volume.

Spatial and temporal assignment. Little House is located in the Sagehen Flats study area approximately 2.1 km west of the Dolores River and 7 km northwest of the modern town of Dolores. One occupation, representing a Pueblo I component, has been identified at the site. Materials amenable to tree-ring analysis were not encountered during excavation. Dating by time-sensitive ceramics suggests prehistoric use of the site in the ninth century A.D.

Description. Little House is situated on a low ridge line north of the Sagehen Marsh. Architectural remains investigated at the site include a small four-room houseblock and ancillary use areas to the south and southwest.

Interpretation. The site may have been used as a seasonal field house by a household group from the McPhee Village (described below). It is assumed that members of the household occupied Little House during the growing season and were performing activities associated with the maintenance of nearby agricultural fields.

McPhee Pueblo (Site 5MT4475)

Operations at McPhee Pueblo and results of preliminary laboratory analysis are reported by Brisbin (1980). Investigations during 1978 were confined to a small portion of the site, a major architectural unit of McPhee Village, described below.

Spatial and temporal assignment. McPhee Pueblo is located in the Sagehen Flats study area approximately 0.5 km west of the Dolores River and 6.2 km northwest of the modern town of Dolores. The site exhibits a lengthy occupational history spanning the late Pueblo I and early Pueblo II periods, or perhaps A.D. 850-975. It is suspected that evidence for even earlier occupations will be recovered in future investigations at McPhee. The site may have been settled during the early Pueblo I or even the late Basketmaker III period (about A.D. 700).

Description. McPhee Pueblo is situated on a low terrace west of the river in the Dolores River canyon. This position
allows easy access to riparian zones along the river, to alluvial soil deposits in the valley, and to aeolian soil areas and sagebrush/pinyon zones to the west. The pueblo consists of a horseshoe-shaped, double-row roomblock and an enclosed plaza area containing pitstructures; a trash midden is located to the south. The pueblo probably incorporates 40 to 50 rooms and 6 to 8 pitstructures. During 1978, nine rooms, one courtyard, and one pitstructure were investigated (actually, two pitstructures representing two elements were excavated, but they are superimposed units built in the same area).

Interpretation. The site is a major architectural component of McPhee Village, the abode of a centralized Anasazi community during the 9th and 10th centuries. During the period of maximum population, the pueblo was probably the home base for 10 to 15 households, or 50 to 75 individuals (based on a reconstruction of architectural units representing households, and assuming 5 to 7 persons constituted a household). The population at McPhee Pueblo is assumed to represent one-third to one-half of the total population at McPhee Village. McPhee served as the hub for many intracommunity economic, technical, and social activities. It is also speculated, based on the distributions of large Pueblo I villages in the project area (chapter 3 of this volume), that McPhee Village may have been one unit in a regional system and may have also served as a location for intercommunity social and ceremonial activities.

Marshview Hamlet (Site 5MT2235)

Investigations at Marshview Hamlet are presented in detail by Bussard (1980).

Spatial and temporal assignment. Marshview Hamlet is located in the Sagehen Flats study area, approximately 1.7 km west of the Dolores River and 6.6 km northwest of the town of Dolores. Three occupations have been identified; the first, which is tentative in nature, apparently dates to the Archaic Tradition, while the second and third date to the Pueblo III period. No architectural remains that could be assigned to the first occupation were identified, and no other discrete dating techniques could be applied. It can only be said, therefore, that an Archaic occupation is represented; finer temporal definition is impossible. Dating of the second and third occupations are based on tree-ring and archaeomagnetic analysis. These methods suggest the site was reoccupied about A.D. 1075. After a short period of use the site was abandoned again, but the area was reused sporadically as a camp or procurement locus until approximately A.D. 1200.

Description. Marshview Hamlet is situated on a low knoll north of the Sagehen Marsh. The Archaic occupation is represented only by scattered artifactual material. The second occupation is represented architecturally by a domestic pithouse, a large storage cist, and associated surface features. A hearth and use surface in the upper fill of the pithouse indicate continuing use after the abandonment of this structure.

Interpretation. Marshview Hamlet probably functioned as a procurement/processing area during the Archaic and may have been used by members of a local migratory group. Indications are that the site served as a small hamlet during the second occupation and the site is assumed to have been used by a single household. Ancillary evidence for the nature of the occupation during this period is the mass burial recovered from the floor of the pithouse, which was perhaps placed there after abandonment. Remains of three or four individuals were identified, which may represent the total population living at the hamlet at the close of the time of abandonment. Later, the site probably functioned as a seasonal locus or camp occupied by members of one household unit. The residents probably emphasized economic activities, which may have included exploitation of wild resources in the vicinity and limited horticulture. No local communities were based in the Sagehen Flats area during this period. A conjecture is that the camp was used by household units from communities to the south, perhaps those associated with the Escalante or Reservoir Ruins.

LeMoc Shelter (Site 5MT2151)

Investigations at and preliminary analysis of data from LeMoc Shelter are presented in detail by Hogan et al. (1979) in an in-house report; a complete report on the site excavations in 1978 and 1979 will be completed in 1980.

Spatial and temporal assignment. The site is located in the Grass Mesa study area, on the north canyon slope overlooking the Dolores River, about 13.2 km north of the town of Dolores. Three occupations, representing the Basketmaker III, Pueblo I, and Pueblo II periods, have been identified. Based on tree-ring analysis and dating of pottery types, it appears the site was used sporadically from about A.D. 700 to 1050.

Description and interpretation. The site's canyon slope location afforded easy access to the arable flood plain of the canyon and the upland resource areas to the north. An architectural and occupational summary of the site is as follows:

1. During the first occupation (late Basketmaker III, A.D. 700–750), the inhabitants built a pithouse and also a row of surface rooms in the back (north portion) of the shelter. It is inferred that the inhabitants were an Anasazi household farming the river bottomlands.

2. The site may have been abandoned for a short period but was reoccupied in the first part of the ninth century A.D. (Pueblo I period). Again, the shelter was probably
used by a single Anasazi household. The new occupants
built a second pithouse to the east of the original area
and probably reused the row of surface rooms.

3. The site was again abandoned before A.D. 900, but
was used as a seasonal camp in the 10th and 11th cen-
turies. The latest arrivals built rooms over and south of
the pithouses and perhaps reused the original Basket-
maker III rooms for a third time. Animal remains
recovered from the site suggest these people may have
been hunting elk and deer. Since the Dolores River val­
ley was abandoned as a farming province by A.D. 1000,
the camp may have been used by groups living per­
manently 15 to 20 km to the south.

Summary of Results

A review of the investigations completed during the 1978
field season confirms that the initial goal of obtaining
a broad data base ordered by site type and period was
achieved. In fact, the results exceeded the expectations in
that additional occupations were encountered that were
not anticipated at the start of operations. A summary of
the data base generated by 1978 excavations is as follows:

1. Archaic Tradition

Two occupations representing temporary camps or
perhaps resource procurement areas have been in­
vestigated (Sites 5MT2202 and 5MT2235).

2. Basketmaker III Period

Two occupations have been identified; both apparently
represent small, single household farmsteads or “ham­
lets.” One at Site 5MT2198 has been thoroughly in­
vestigated; the other at Site 5MT2151 will be exca­
vated in 1979.

3. Pueblo I Period

Six occupations have been identified; these are listed
below by site:

(a) and (b) Two early Pueblo I (A.D. 750-800) occu­
pations are recognized at Dos Casas Hamlet. These
represent two single household farmsteads or “ham­
lets.”

(c) LeMoc Shelter was apparently occupied by a
household in the early ninth century (A.D. 820-850).
During the occupation, the site served as a farm­
stead or “hamlet.”

(d) A Pueblo I occupation, dating to the late ninth
century (A.D. 850-900), has been identified at
McPhee Pueblo. Perhaps 8 to 10 households were
living at the pueblo during this time span.

(c) A Pueblo I occupation at Site 5MT2191 ap­
parently represents a field house (a site away from
the main village used as a base for agricultural ac­
tivities).

(f) Sheep Skull Camp (Site 5MT2202) was probably
used as a location for gathering and/or processing
wild foods or raw materials during the Pueblo I
period.

4. Pueblo II Period

Three occupations representing the Pueblo II period
were identified during 1978. These were a habitation
episode at McPhee Pueblo (Site 5MT4475), use of Site
5MT2202 as a gathering and processing location, and
use of Site 5MT2151 as a seasonal camp.

5. Pueblo III Period

Two occupations representing use of Site 5MT2235 as
first a hamlet and later a camp or processing area have
been identified.

The initial sampling strategy was judged adequate to
recover data that can be used to establish general
characteristics of prehistoric communities. However, it
was obvious that this approach resulted in gaps in the data
base that would have to be filled by designing more
specific, problem-oriented strategies.

The initial data base proved useful in formulating more
rigorous systems of controls. During the fall and spring of
1978-79, the preliminary constructs were discarded and
more detailed schemes developed which were tailored to
better fit the data from project investigations. These
systems are presented in the following sections.

SPATIAL SYSTEMATICS

The general research design of the Dolores Archaeological
Program emphasizes the definition and explanation of
regional relationships. To effectively investigate regional
aspects of the five major problem domains, a systematic
and well-conceived scheme of spatial study units is critical.
During the 1978 field season, arbitrary study units were
defined to serve as spatial controls. These were considered
inadequate for future investigations and the Dolores Ar­
chaeological Program Spatial Series was developed after
the initial fieldwork. Since the focal point of the research
design is the Anasazi community, the basic unit for this
spatial system must reflect the physical manifestation of
the community: the community cluster. Ideally, the divi­
sion in the spatial hierarchy should reflect cultural reality.
However, this may not be feasible when defining large
spatial units because of uncertainty in describing the
nature of intercommunity and long-distance Anasazi
relationships. It must be emphasized that the series in its present form is really a "model" based on ethnographic and archaeological analogies, inferences from excavation and survey data available from previous work in southwestern Colorado, and logic. As such, the construct serves to draw the researcher's attention to certain intrasite and intersite phenomena and to structure his inferences and notes in a standard way. The series is not primarily predicated on locally derived, inductive formulations. The current model will undergo periodic revision based on interpretations of excavation data. In the following presentation of the Dolores Archaeological Program Spatial Series, as utilized by program archaeologists, the intracommunity units are based on those presented by Flannery (1976b). Many of the intersite or intercommunity units have been derived from previous efforts to devise regional systematics in the area (Bullard, 1962; Lehmer, 1971; Gillespie, 1976). The DAP system is hierarchical in nature; that is, smaller units are always combined to form larger ones.

Intracommunity Units

Activity Area

An activity area is a physical locus where an identifiable single or main activity was performed. The activity area often represents a location where an individual member of a household carried out a task. However, it is possible that a number of individuals or a task group utilized the area either simultaneously or during different periods.

Activity areas may consist of groupings of features (permanent or semipermanent facilities and associated artifacts). Activity areas can also be defined minimally by a single feature (for example, a hearth or a metate bin) or artifact cluster (for example, a hammerstone and debitage). Spatially clustered activity areas can be grouped to form use areas (described below) and spatially isolated examples can be termed limited activity loci (discussed in the Site Typology section). The relationships among activity areas and other intrahousehold spatial units are illustrated in figure 1.2.

Use Area

A use area, a space used by a group for multiple activities, incorporates several or even numerous activity areas. The activity areas, facilities, and spatial relationships integral to a use area reflect the general purpose of the group in using that space (for example, the domestic functions of a household, storage, discard, integration, and ritual). Use areas may be enclosed spaces (surface rooms or pit structures), architecturally bounded open space, or unbounded, irregularly shaped areas. The house is a specific use area type and is an architecturally bounded space where the members of a household centralized their processing, maintenance, and other domestic activities. Houses usually incorporate a central hearth and recognizable storage and food processing facilities. Distinct male/female activity areas may be present. Within large, multiple household habitation units, specialized interhousehold use areas (such as middens, shared processing facilities, and integrative structures) are present. Spatially isolated use areas constitute the broad DAP Site Typology category termed "seasonal loci."

Household Clusters

The household cluster, which incorporates the space and facilities used by a household, can be considered as the property of or home base of this social unit. Household clusters usually consist of the house, surrounding outdoor use areas, and more distant activity or use areas (family burial plots and disposal areas, exterior storage pits, field houses and surrounding agricultural plots, traplines, and other hunting facilities used by individuals, etc.). The overriding concept is association with the same individual household (Winter, 1976:25). For analytical purposes, the household cluster is the material remnant of a household.

![Figure 1.2](https://example.com/figure1.2.png)

Figure 1.2 The relationship of intrahousehold spatial units in the DAP Spatial Series. Note that outlying activity areas are considered part of the household cluster.
A household cluster must contain a house, that is, the centralized living and working space of a household. Other clusters of use areas and features might have served as interhousehold task areas rather than functioning specifically as a locus for one household group.

**Interhousehold Cluster**

This unit is a spatially or otherwise related grouping of household clusters. By comparing architecture styles, artifact inventories, activity area locations, etc., related households may be identified. In large habitations (villages), such units might share the same roomblock and a patio area; these groupings can be termed courtyard groups (Flannery, 1976c:75). In the case of dispersed habitations, spatially related hamlets may exhibit sufficient similarities to be defined as an interhousehold group. This unit reflects social organization on a level intermediate between household and community.

**Habitation**

A habitation is defined as one or more household clusters and (if present) specialized use areas in a centralized location. Habitations represent the location where most community activities take place, and as such represent the home base of the community. Conceptually, the relationship between habitations and communities is similar to the one between houses and households. The habitation unit is normally only applied to nucleated communities (discussed subsequently) where central habitations (or villages) and satellite habitations (termed outlying barrios, Flannery (1976c:73), can be easily delimited. The definition of such units is more difficult in dispersed communities with isolated household clusters. In such cases, it may be possible to think in terms of a “habitation zone,” or core area, in which the isolated household clusters are located, or each individual household cluster can be termed a habitation.

**Community Cluster**

A community cluster, defined as the space, facilities, and architecture normally used by a community, is the material remnant of the community. Conceptually, community clusters are to communities as household clusters are to households. The community cluster normally consists of habitations or habitation zones plus outlying camps, and other seasonal loci and limited activity sites. (Relationships among household clusters, interhousehold groups, habitations, and community clusters are depicted in figs. 1.3 and 1.4.)

Community clusters are segregated into subtypes based on the degree of site dispersal exhibited within the cluster. The division is based upon the discussion of community types presented by Murdock (1949:79).

1. **Nucleated community clusters.** The type is characterized by a large central habitation with outlying use and activity areas (fig. 1.3). These clusters may contain satellite habitations or barrios within a few kilometers of the central locus. According to Murdock (1949:80), the communities using nucleated clusters employ a subsistence strategy compatible with a fixed residence. Agriculture, fishing, and hunting—under exceptional conditions (plentiful and nonmigratory game)—are cited as economies consistent with nucleated clusters. Communities occupying a concentrated cluster of dwellings near the center of an exploited territory are termed villages. An example of a nucleated community cluster is McPhee Village and its limited use outliers. The social group using these facilities was viable about A.D. 900.

2. **Dispersed community clusters.** Dispersed clusters consist of dispersed household clusters, usually within a limited habitation zone, and outlying use and activity areas (fig. 1.4). Household clusters exhibit little or no tendency toward centralization. Communities using dispersed clusters are also characterized by fixed residence, but household groups live in isolated homesteads, as in the modern rural American Midwest.
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3. Band territories. Band territories are characterized by widely dispersed seasonal or temporary campsites and limited activity loci. Communities using this type of cluster have mobile residence patterns, because their subsistence strategies (gathering, hunting, or herding) necessitate place-to-place migration (Murdock, 1949:80). These types of communities are termed "bands." An example in the project area is the proposed North Marsh Band, an Archaic community located in the Sagehen Flats area, that was viable during the Archaic Tradition.

Intercommunity Units

Locality

Localities are units that are intended to reflect intercommunity social entities and resource procurement zones. In this sense they are subdivisions of the sector regarded as the maximum subsistence-settlement unit (discussed below). At present, little data regarding the nature of intercommunity relationships in the project area are available, and hence, spatial definitions based on the nature of these relationships are not possible. Some criteria that have potential applications are limits of central place systems that incorporate several community clusters, and spatial arrangements of intercommunity defensive or communicative facilities.

A more applicable criterion for establishing localities in current project study areas is environmental variability. Divisions based on environmental characteristics have social overtones, since they may represent prehistoric resource procurement zones or political territories. Environmental variables used in defining locality boundaries are drainage systems, topography, vegetation zones, soils, and bedrock geology.

Sixteen locality units have been defined in the Escalante Sector, the spatial unit including the study areas for 1978-79 mitigation efforts (fig. 1.5). Environmental characteristics were the primary criteria used in establishing the localities, although potential social implications were considered as well. Localities within the Escalante Sector were defined with potential use of the canyon resource zones in mind. The localities and their defining characteristics are presented below.

![Diagram of relationships among intracommunity units in the DAP Spatial Series (for dispersed community clusters).](image)

![Map of the Escalante Sector and incorporated localities. The locations of large Pueblo I Anasazi villages are indicated.](image)
1. Willow Draw, Locality No. 1

Area: 1310 ha

*Environmental characteristics:* The locality encompasses the lower portion of the Dolores River canyon in the Escalante Sector. The locality includes the bottomlands along the river and the north and south canyon slopes to the canyon rim. It encompasses a variety of vegetation zones, including a riparian community along the river course, pinyon-juniper woodlands and mountain scrub on exposed slopes, and pockets of forest with ponderosa, aspen, and Douglas fir in protected locations. Arable lands are found along the river course.

*Social characteristics:* Survey data indicate the locality may have been the abode of a farming community or communities during the Anasazi Tradition. Small hamlets are located on terraces with southern exposures, and prehistoric fields were presumably located in the bottomlands. The cultural pattern appears to be similar to that of the Grass Mesa Locality to the east, although no large habitation comparable to Grass Mesa Village has been identified. The data also indicate Archaic peoples used the locality, but the nature of this earlier occupation has not been established.

2. Salter Canyon, Locality No. 2

Area: 1520 ha

*Environmental characteristics:* The locality encompasses the major parts of Salter Canyon and Willow Draw plus a plateau area to the north that drains into Salter Canyon. Vegetation communities native to the area include pinyon-juniper woodland, mountain scrub, oak scrub, Douglas fir, aspen forest, and ponderosa parkland. The canyons are V-shaped and lack both a permanent stream and an established riparian zone. Hence, the locality lacks arable land because the plateau to the north that is otherwise suitable does not have an adequate growing season. Varied and plentiful wild resources are readily available, however. Among these are large game (elk and deer), small animals, wild plants, and firewood.

*Social characteristics:* The area is virtually unknown archaeologically. It is believed that the prehistoric use pattern here should be similar to the better-known Cline Crest Locality to the east. The area may have been used during the Archaic by peoples exploiting seasonal resources, and then by early Anasazi groups (A.D. 600-900) as a farming province.

3. Hoppe Point, Locality No. 3

Area: 1600 ha

*Environmental characteristics:* The locality is delimited by Salter, Dolores, and Dry Canyons. These drainages nearly circumscribe a highland plateau with elevations from 2375 to 2475 m. Most of the plateau is ponderosa parkland with Douglas fir; protected slopes exhibit stands of aspen-Douglas fir forest. The locality is unsuitable for agriculture because of an inadequate growing season. Wild plant and animal resources, however, are varied and plentiful.

*Social characteristics:* Archaeological survey data reveal that all sites within the locality are limited activity or seasonal loci; architectural remains are very limited. It is inferred, therefore, that the locality was exploited as a resource procurement zone. Both the Archaic and Anasazi Traditions appear to be represented in the survey record.

4. Yellowjacket Crest, Locality No. 7

Area: 1500 ha

*Environmental characteristics:* The locality encompasses a portion of the plateau highland south of the Dolores River canyon. The area includes the headwater drainages of Yellowjacket Canyon plus one minor tributary of the Dolores River. Elevations range from 2225 m at the southern boundary to over 2380 m at the northern crest. Vegetation is typically oak-mountain scrubland interspersed with small grass- and forb-covered meadows. Soils and ground water are suitable for agriculture.

*Social characteristics:* The area is virtually unknown archaeologically. It is believed that the prehistoric use pattern in this locality is similar to that of the Yellowjacket Crest and Cline Crest Localities. Windy Ruin, a large Pueblo I village, is located in the northeastern quadrant of the locality.

5. Windy Ruin, Locality No. 5

Area: 1150 ha

*Environmental characteristics:* The locality adjoins the Yellowjacket Crest Locality on the east side. The area includes the headwater drainages of Brimley Draw, a major tributary of Yellowjacket Canyon. Elevations, vegetation, and other natural features are similar to the Yellowjacket Crest and Cline Crest Localities.

*Social characteristics:* The area is virtually unknown archaeologically. It is believed that the prehistoric use pattern in this locality is similar to that of the Yellowjacket Crest and Cline Crest Localities. Windy Ruin, a large Pueblo I village, is located in the northeastern quadrant of the locality.

6. Grass Mesa, Locality No. 6

Area: 1360 ha

*Environmental characteristics:* The locality encompasses a portion of the Dolores River canyon upstream from the Willow Draw Locality. The limits include the bottomlands along the river and the north and south
slopes to the canyon rim. The locality exhibits a variety of vegetation zones, including a riverside riparian community, pinyon-juniper woodland, mountain scrub, and aspen-Douglas fir forest. The locality possesses a considerable amount of arable land along the river and outcrops of malleable stone for manufacture of tools.

Social characteristics: The locality has been the setting for a long history of prehistoric occupation. Characteristics of sites located near the rimrock on the northern periphery of the locality suggest an Archaic occupation. During the early Anasazi period (A.D. 600-900), the area played host to an intensive farming culture. These peoples built and maintained a large village center at Grass Mesa, a formidable headland on the east side of the valley. A post-Anasazi occupation is suspected, but not documented.

7. Trimble Point, Locality No. 7

Area: 1550 ha

Environmental Characteristics: The locality includes the lower portion of the Dry Canyon and Beaver Creek drainages and the highlands in between. The locality exhibits a variety of natural zones with stands of different vegetation. These include oak scrub, ponderosa woodland and parkland, and aspen-Douglas fir forest. A small amount of arable land is present along the Beaver Creek drainage, and outcrops of workable lithic raw materials are plentiful.

Social characteristics: The locality is not well known archaeologically. Present evidence indicates the area served as a seasonal resource procurement zone, since recorded sites do not possess permanent architecture.

8. Beaver Point, Locality No. 8

Area: 1180 ha

Environmental characteristics: The locality includes a portion of the highlands east of the Dolores River canyon. The area is bounded on the north, west, and south by Beaver Creek, Dolores, and House Creek Canyons, respectively. The eastern boundary corresponds to a vegetation change from mountain scrubland (oak, serviceberry, pinyon, and juniper), within the locality, to ponderosa woodland. Soils and elevations are suitable for cultivation.

Social characteristics: The locality is virtually unknown archaeologically, but it is presumed that the area was used primarily as a hunting and gathering province. It is possible that small farmsteads representing the Anasazi occupation are present as well. A survey will be required to gain a better estimate of prehistoric usage.

9. Cline Crest, Locality No. 9

Area: 1250 ha

Environmental Characteristics: The locality is defined as a plateau highland bounded by the Dolores River canyon on the east and north. The west boundary is formed by a major drainage between this locality and the Windy Ruin Locality. The southern boundary is somewhat arbitrary, but generally corresponds to the upper part of the Sagehen Flats drainage system. Vegetation zones common within the locality contains a high percentage of arable lands.

Social characteristics: The locality was used intensively by prehistoric peoples. It probably served as a hunting and gathering province during the Archaic and later became the home base for several farming communities. Local prehistoric society in the ninth century was probably dominated by Cline Crest Village, a large habitation located near the west limit of the locality. The area was virtually abandoned by Anasazi farmers by A.D. 950 and was used again by hunting and gathering groups. A later, post-Anasazi occupation is suspected, but not documented.

10. Sagehen Flats, Locality No. 10

Area: 1440 ha

Environmental characteristics: The locality is situated west of the Dolores River valley and encompasses the Sagehen Flats lowland and surrounding slopes. The locality is delimited on the east by the Dolores River valley, on the west by the divide between streams feeding Sagehen Flats and those draining into Yellowjacket Creek, and on the south by the escarpment formed by the House Creek Fault. The northern boundary corresponds to a somewhat arbitrary division between the northern and southern parts of the Sagehen Flats drainage system. Prehistoric vegetation zones in the locality were probably mostly pinyon-juniper-oak woodland and sagebrush scrubland. Sagehen Flats itself may have supported an intermittent bottomland community. The locality contains a large percentage of arable lands, except near the southern boundary, and easily accessible lithic raw materials along the House Creek Fault.

Social characteristics: The locality has a long history of intensive use by prehistoric peoples. The area was used initially by Archaic groups who probably centered their activities near the Sagehen Flats itself. The unit was used during the early portion of the Anasazi Tradition (Basketmaker III) as a homeland for several dispersed communities with households residing in isolated farmsteads. Beginning in the 800's the Anasazi moved
to other localities, but still used the area as an agricultural zone. After A.D. 950, the locality reverted to a hunting and gathering province.

11. Periman, Locality No. 11

Area: 650 ha

Environmental characteristics: The locality is defined as a section of the Dolores River canyon south of the Grass Mesa Locality. The east and west boundaries correspond to the rim of the canyon; the north boundary is formed by the appearance of outcrops of Entrada Sandstone slickrock and the southern boundary by the House Creek Fault. Vegetation within the locality is varied, consisting of riparian woodlands in the canyon bottom and pinyon-juniper-oak woodlands and mountain scrubland on the slopes. Ample arable lands are found on the canyon flood plain.

Social characteristics: Anasazi groups used the locality as a home base for agricultural practices during the Pueblo I period and for more limited activities during the Pueblo II and Pueblo III periods. Two large habitations (McPhee Village and Rio Vista Village) were centers of social activity during the Pueblo I period. A later, post-Anasazi occupation is suspected, but not documented.

12. House Creek, Locality No. 12

Area: 1360 ha

Environmental characteristics: The locality is defined as the lower portion of the House Creek Canyon. Northern and southern boundaries are formed by the limits of the canyon; the eastern boundary corresponds to the approximated change in vegetation zones between the pinyon-juniper-oak woodland within the locality and the ponderosa pine forest to the east. The west boundary is the mouth of the canyon. Vegetation in the locality is dominated by the pinyon-juniper-oak zone; riparian woodlands and shrublands and mountain scrublands are also present. Areas of arable soils with favorable slopes are located in the canyon bottom and on terraces to the north and south of the inner canyon.

Social characteristics: Evidence available from archaeological surveys indicates the locality was used prehistorically during the Archaic and Anasazi periods. No characteristics have been established for the former; however, it is suspected that the locality served as a hunting and gathering province. Sites representing the Anasazi Tradition have been classified as Basketmaker III, Pueblo I, and Pueblo II. Dispersed Basketmaker III farmsteads were replaced by a nucleated community centered at House Creek Village. This center was abandoned soon after A.D. 900; a remnant population lived in rock shelters along the inner canyon of House Creek. These people apparently also left about A.D. 1100. The presence of post-Anasazi Shoshonean groups is suspected, but not documented.

13. May Canyon, Locality No. 13

Area: 1550 ha

Environmental characteristics: The locality is defined as a plateau province east of the Dolores River canyon. The north, west, and south limits of the locality are demarcated by the canyon rims of House Creek and the Dolores River. The east boundary corresponds to a vegetation change from pinyon-juniper-oak woodland within the locality to ponderosa forest further to the east. Besides pinyon-juniper-oak woodland (the dominant type), a riparian zone is found along the May Canyon drainage within the locality. Ample arable lands are located on plateau tops.

Social characteristics: The locality is relatively unknown archaeologically, except near the western limit. Large areas within the locality are currently farmed and apparently were also used for agricultural purposes by the Anasazi. Several small Basketmaker III farmsteads and one large Pueblo I habitation (May Mesa Village) have been recorded within the area. May Mesa Village probably served as a center of prehistoric society in the locality in the ninth century A.D.

14. Dolores, Locality No. 14

Area: 1040 ha

Environmental characteristics: The locality encompasses a section of the Dolores River canyon south of the Periman Locality. The northeast and southwest boundaries are formed by the limits of the canyon system; the north boundary corresponds to the House Creek Fault. The eastern boundary is arbitrary and corresponds to the alinement of two minor side canyons east of the town of Dolores. Canyon bottomlands within the locality support riparian woodlands and meadows, while the canyon slopes feature pinyon-juniper-oak woodland. Arable lands are located in the canyon flood plain and on large benches located on the east canyon slope.

Social characteristics: The locality exhibits a long history of prehistoric occupation commencing with use by Archaic groups. No characteristics have been established for this early occupation; the area is believed to have served as a hunting and gathering domain. Anasazi sites assigned to the Basketmaker III, Pueblo I, and Pueblo II periods have been recorded, but no large villages or especially noteworthy sites have been identified. A post-Anasazi occupation is suspected, but has not been documented.
15. Escalante, Locality No. 15

Area: 1640 ha

**Environmental characteristics:** The locality is defined as a segment of plateau highlands southwest of the Dolores River canyon. The north boundary is formed by the House Creek Fault and the east boundary by the canyon rim. The western and southern boundaries were arbitrarily determined and generally follow elevation contours and major drainages. Most of the locality is currently in cultivation but was probably pinyon-juniper woodland and sagebrush scrubland during prehistoric times. Most of the plateau and terraces along drainages are suitable for agriculture.

**Social characteristics:** Anasazi and Archaic groups are known to have used the locality. No range of behavioral inferences for the Archaic occupation can be made from the present data. The Anasazi occupation is apparently continuous from Basketmaker III to Pueblo III. Escalante Ruin, commanding a superior vantage point near the rim of the Dolores River canyon, is believed to have functioned as a regional trading center about A.D. 1150.

16. Reservoir, Locality No. 16

Area: 1550 ha

**Environmental characteristics:** The locality is a segment of the plateau south of the Dolores River canyon. The north and northeast boundaries are formed by the rims of the Dolores River canyon and Lost Canyon.

The other limits are arbitrary and correspond to elevation contours and major drainages. Much of the locality is currently in cultivation. During the prehistoric period, pinyon-juniper woodland and sagebrush scrubland were probably the dominant vegetation types. Most of the plateau area and benches along drainages are suitable for agriculture.

**Social characteristics:** The locality exhibits a relatively intensive usage by prehistoric groups. Several small Basketmaker III and Pueblo habitations have been excavated, and a large Pueblo II-Pueblo III habitation (Reservoir Ruin) is located in the northwestern corner. One unique site, a Pueblo III tri-wall structure (a possible redistribution center controlled by local community leaders), has also been recorded.

**Sectors**

Sectors are composed of spatially related groups of localities. In a social sense, sectors are intended to be spatial divisions within which the inhabitants of the internal communities and localities experience a sense of cultural identity. No concrete social organization at this level is implied by employing this unit. The nature or even presence of macrolevel social units in Anasazi culture is speculative at best. The most promising evidence for intercommunity organization among these Pueblo peoples has been found in the Chaco region of northwestern New Mexico. Data produced during studies of Chacoan road networks (Morenon, 1974; Lyons and Hitchcock, 1977) suggest that a sophisticated system of regional communication, and perhaps polity, was centered in northwestern New Mexico about A.D. 1100. It is presently speculative whether analogies of this system existed in the project study areas and what physical manifestations they would exhibit.

Perhaps the best social analog for the sector is what Struver (1969) terms the "maximum subsistence-settlement unit," a societal unit which "includes all people integrated at one or more intervals in the functioning of a subsistence settlement system." Neighboring communities within a sector are expected to share many of the same behavior patterns and to react in a similar manner when confronted with phenomena requiring adjustments in the cultural system (droughts, influxes of foreign groups, technological innovations, etc.).

Environmental criteria can also be applied to define sectors. For this purpose environmental variables considered are large, inclusive categories such as physiographic divisions (plateaus, valleys, etc.), drainage systems, and vegetation zones. Depending on the available data, social and environmental criteria can be assigned differential priorities when evaluating individual areas.

The primary criterion used to define the Escalante Sector (the only such unit studied in 1978) was proximity to the Dolores River; that is, boundaries for the unit were established with access to the river ecosystems in mind. It is possible to walk into the main canyon within 1 to 2 hours from each archaeological site within the sector.

Phase sequences developed for project studies are to be applied at the sector level. Temporal variations are expected to conform to the same general pattern within sectors and to exhibit different patterns within districts (discussion follows). Field operations in 1978 were confined to the Escalante Sector, as initial construction activities planned by the Bureau of Reclamation were to be carried out in the Sageshen Flats, Peirman, and Grass Mesa Localities within the sector. In future years, operations will be expanded to other sectors in order to obtain the desired regional perspective. The locations of the Escalante and neighboring sectors are depicted in figure 1.6.

**Districts**

The term "district" has been previously employed by archaeologists working in southwest Colorado (Morris,
INTRODUCTION

These units have previously been established to correspond approximately with recognizable general differences in cultural patterns. For the purposes of this study, districts are considered as units composed of sectors, a concept similar to that employed by other archaeologists studying the Northern San Juan Culture Area. District communities shared the same general cultural patterns and are assumed to have shared a general sense of cultural identity. Districts do not reflect large divisions of Anasazi social or political organization. Most sectors investigated by DAP personnel during the duration of the project will be subdivisions of the Yellowjacket District. It is anticipated that comparative studies will be initiated using project data and information from studies done in other districts (for example, the Dolores, Western, and Mesa Verde Districts, fig. 1.7).

Region

On a larger scale, the Yellowjacket District is a subdivision of the Mesa Verde Region. For DAP purposes, the definition and boundaries of this unit correspond with those outlined by Breternitz et al. (1974). The regional boundaries roughly correspond with the area where Mesa Verde ceramic wares were being manufactured and used and where other general cultural traits were probably being shared as well.

In order to investigate several of the questions posed in the general research design (for example, those posed in Problem Domain 4: Extraregional Relationships), research into cultures removed from the Mesa Verde Region is important. Comparative data are potentially available from the Chaco Canyon and Kayenta areas to the south and southwest.

DOLORES ARCHAEOLOGICAL PROGRAM SITE TYPOLOGY

One result of the 1978 field season was a detailed Dolores Archaeological Program Site Typology based on sites expected or known in the project area. A system of site classification based on formal attributes is a necessary adjunct in describing settlement patterns and implementing sampling programs. The updated project system employs the same basic categories as were used in selecting the excavation sample for the 1978 field season: an initial division based on intensity of occupation, and subcategories based on visible characteristics and inferred function. A detailed presentation of the DAP Site Typology, or system of site classification, is presented below. Correlations among units of the typology and the DAP Spatial Series, and social groups utilizing the units, are depicted in table 1.3.

Limited Activity Loci

Limited activity loci, archaeological sites where a minimal range of activities took place, are similar to activity areas as defined for the DAP Spatial Series. However, limited activity loci are in isolated locations and separated from centralized areas of prehistoric activity. Limited activity
Table 1.3 Correlations between the DAP Formal and Spatial Series.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Spatial unit</th>
<th>Limited Activity Loci</th>
<th>Seasonal Loci</th>
<th>Habitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement Loci</td>
<td></td>
<td>Economic or technical</td>
<td>Social/ ceremonial</td>
<td>Comm.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Econ.</td>
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<tr>
<td>Social/ ceremonial</td>
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<td></td>
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</tr>
<tr>
<td>Limited Activity Loci</td>
<td></td>
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<tr>
<td>Social/ ceremonial</td>
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<td>Limited Activity Loci</td>
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<tr>
<td>Social/ ceremonial</td>
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</tr>
</tbody>
</table>

- **A** = use by one or more household individuals or intrahousehold task groups
- **B** = use by households as a group
- **X** = use by one or more interhousehold individuals or task groups
- **Y** = use by communities as a group
- **C** = use by one or more intercommunity individuals or task groups
- **Z** = use by intercommunity social units as a group

Loci are believed to have been integral settlement pattern components during both the Archaic and Anasazi Traditions, but individual sites may be difficult or impossible to date because they usually lack temporally diagnostic artifacts or features.

These sites were generally used for only a short time (from an hour or so up to a few days) and the use was often limited to a single economic season (hunting season, growing season, etc.). The activity or perhaps activities carried out at the site were probably performed by one, or at most, a few individuals. Limited activity loci can be subdivided based upon functional interpretations. (Note that in some cases it may be necessary to combine these subtypes at a single site; for example, a kill site/butchering station or a petroglyph panel/storage cist. However, as long as the activities performed at the site were limited and the occupation transitory in nature, it should be classified as a limited activity locus.)

### Economic or Technical Loci

Sites classified as economic or technical loci are isolated areas where resource use strategies (as defined in Problem...
Domain I) were implemented. In most cases activities performed at these sites can be viewed as one step in a behavioral chain integral to a subsistence subsystem (for example, tools, domestic food, wild food, shelter). Several discrete subtypes are recognized:

**Procurement loci.** This category is defined as areas where resources were procured. Further division can be made based on the object resource, as follows.

**Quarries:** Areas where mineral resources were procured, such as ceramic clay and temper sources, outcrops of cherts and quartzites suitable for manufacture of flaked stone tools, fossil shell beds where raw materials for ornaments could be collected, sandstone outcrops for building stone and tools, gravel deposits for cobbles, and limonite and hematite deposits for pigments.

**Kill sites:** Locations where animals were killed. Examples are snare locations, ambushes, and hunters' lookouts.

**Gathering stations:** Areas where vegetal resources were procured. These include fiber, firewood, and construction materials sources as well as areas where vegetal foodstuffs could be obtained.

**Agricultural sites:** These sites include prehistoric fields, terraces, and garden plots where domestic crops were grown.

**Water control sites:** These include modified springs, check dams, ditches, and enlarged potholes where water was obtained or controlled.

**Primary processing loci.** These are sites where a procured resource was preliminarily processed before being returned to the habitation or base camp. Processing sites can be divided into categories, depending on the broad class of resource (animal, vegetable, or mineral) being processed. Examples of processing loci are butchering stations, where game was cut up and divided, or areas where temper material for ceramic construction was graded and prepared before transport to the habitation. Sites can often be classified as joint procurement/processing loci.

**Secondary processing (manufacturing) loci.** These loci differ from processing areas in that the goal of the activity is the production of a finished product rather than preliminary modification of a recently procured resource. Examples are pottery kilns and chipping stations. Sites can be classified as joint primary processing/manufacturing loci; that is, sites where both steps were performed.

**Maintenance loci.** Maintenance was performed upon tools or gear at these locations. An example is a shelter with axe-sharpening grooves on a rock face.

**Storage loci.** At these locations, processed or unprocessed resources are stored before processing or consumption. An example is a masonry granary on a cliff face used to store maize.

**Consumption loci.** These are isolated locations at which consumption took place. An example would be a picnic spot. An isolated firepit used to roast meat consumed on the spot could be classified as a joint processing/consumption locus.

**Discard loci.** Discard loci are isolated locations used for disposal of unwanted, broken, or consumed items. These loci are often termed “middens” or “refuse deposits.”

**Social or Ceremonial Loci**

Sites classified as social or ceremonial loci are isolated areas where activities integral to the social systems of prehistoric communities (as defined in Problem Domain 3) were performed. Such locations often served to implement integrative mechanisms or to emphasize the roles of social groups. Some recognized site types are as follows: shrines, petroglyph and pictograph panels, sentry posts, signal fire locations (if used for warning or intracommunity communication), and cemeteries.

**Communications Loci**

Sites classified as communications loci are isolated locations where activities integral to intercommunity communications or exchange networks (as defined in Problem Domain 4) were performed. As such, they served to facilitate communication of ideas and materials among local and foreign communities. Some individual site types are trails and roads, signal fires (if used for intercommunity communication), and border markers.

**Seasonal Loci or Use Areas**

Seasonal areas or sites were occupied on a short-term basis, usually by small social groups. The occupation of these sites was typically seasonal and periodic in nature. “Seasonal,” as used here, is not limited to climatic seasons, but also may refer to economic seasons such as “growing season,” “harvest season,” or “deer season.” The span of occupation at seasonal areas ranges from a few days to several weeks, conceivably to a month or two. These sites were often utilized on a periodic schedule, such as three times a year or annually.

Activities performed at seasonal loci were diversified, but such sites would be established for a definite purpose, usually economic or social. The number and range of activities were less than performed at a habitation. In this sense, at least for the Anasazi period, seasonal sites are similar in concept to use areas (see discussion detailing the DAP Spatial Series), and in many cases can be considered
isolated examples of such spatial units. Seasonal sites may contain architecturally bounded spaces that are similar to houses at habitations and are considered as such. The distinction is that living rooms at seasonal sites were occupied for shorter periods and were generally used for fewer activities, and therefore generally can be expected to be architecturally less complex. A distinction can be made between seasonal camps or sites that contain no substantial domestic architecture and seasonal loci that incorporate living quarters (often called field houses).

Most commonly, the seasonal locus can be considered a central location where a household, or members of a household, performed activities that were more conveniently accomplished at certain times of the year at that place. Therefore, in many instances the seasonal locus can be considered a secondary habitation or centralized area of activity. Occupations at seasonal loci are often directed more toward a specific activity or activity set and are less intensive when compared to habitations.

Infrequently, seasonal loci might be used by task groups representing different households. This would be the case when the main activity performed is integral to overall community or intercommunity operations. Subdivisions of seasonal loci, based on functional criteria, are presented below.

**Economic or Technical Seasonal Loci**

These sites are locations where several economic or technical activities (as defined in Problem Domain 1) were performed. Generally speaking, the activity set is dominated by one particular activity, or several activities, in one behavior chain representing a subsistence subsystem.

However, other tasks (such as tool maintenance at a procurement camp or simple ceremonies at a field house) may be carried out. Because the occupation at such sites is more time- and labor-intensive than at limited activity loci, and because identifiable social units (task group or households) may be represented, research at such units supplies basic data to the study of prehistoric social organization. Recognized types of economic or technical seasonal loci are as follows.

**Procurement/processing seasonal loci.** These are seasonal sites that functioned as centers for procuring and processing natural resources. Individuals and groups could harvest the resource directly from the camp or could use a network of limited activity loci. Primary processing was then performed at the central camp. Such camps might be utilized by more than one Anasazi or Archaic household. In such cases, these camps are intended to be similar in concept to microband settlements as defined by MacNeish (1972). Examples of procurement areas are hunting camps and camps established for the gathering of pinyon nuts or *Opuntia* fruits.

Agricultural camps or field houses. These seasonal areas functioned as bases away from the habitation, where tasks associated with horticulture or agriculture were performed. Activities such as field preparation, planting, weeding, predator control, harvesting, initial processing, and temporary storage were either performed or based at these areas. Field houses are examples of such sites and are common in the later divisions of the Anasazi period. In the project area, field houses consist of small houses (usually one living room and several storage rooms) of jacaal or masonry-based construction and outlying features; no pit-structures are present.

**Reservoirs and irrigation systems.** Elaborate water control systems are classified as seasonal loci because of the large labor expenditure required to construct and repair such edifices. Routine use and maintenance may require only a small number of individuals for a short period.

**Social/Ceremonial Seasonal Loci**

Sites classified as social/ceremonial seasonal loci are locations where sets of activities integral to the social systems of local communities (as defined in Problem Domain 3) were performed. Other types of activities were carried out as well, but these were peripheral to one or more activity sets representing a part of a behavior chain functioning as part of the local social system. Subdivisions of social/ceremonial seasonal loci are as follows.

**Towers.** The functional implications of Anasazi towers have long been a controversy in Southwestern archaeology. Recent research by Winter (1976:210-215) near Hovenweep National Monument (about 40 km southwest of the Escalante Sector) suggests that towers in that area were multifunctional, serving as ceremonial rooms, grinding rooms, processing or manufacturing areas, and/or cooking or living areas. Winter (1976:210) concludes that towers may be an architectural rather than a functional classification.

Other proposed functional interpretations for towers include defense (Eastwood, 1893:360), storage and ceremonial use (Fewkes, 1919), and astronomical observation (Riley, 1948).

A preliminary assessment of those project area sites classified as towers is that an important function of these edifices was local communication. This inference is based on the topographic setting of individual tower sites and on their spatial distribution when considered as a group; that is, towers are situated at elevated, prominent locations with a commanding overview of the surrounding territory and seem to be distributed according to a pattern that is suitable for observation of the Dolores River canyon and for intertower communication. If these sites are part of a local communications system, it is logical to assume that
groups using the towers would be performing other activities as well, such as tool maintenance and domestic tasks.

**Forts**. These sites probably served as refuges when the community was threatened by other groups. They are manifested as walls or enclosures located on easily defended topographic features. Forts have not been identified in the Escalante Sector, although examples are known in the Yellowjacket District; for example, the site at the western end of Cannonball Mesa, reported in Fewkes (1919), and ruins on promontories described by Jackson (1877:423-429). These locations are 40 to 50 km southwest of the Escalante Sector.

Isolated kivas or great kivas. These sites were probably utilized by kin groups or village and intravillage groups for socioreligious activities. Because of the size of great kivas, it is supposed that the effort in constructing and maintaining them, and in conducting specified activities, involved a group of people larger than would normally live together on a day-to-day basis; that is, the presence of inter-household groups is implied by such structures.

**Communications Seasonal Loci**

Communications seasonal loci are locations where activities facilitating exchange of ideas and materials with extraregional groups (as defined in Problem Domain 4) were performed. Sites of this nature have not been recognized in the project area, nor are they reported in the archaeological literature available for the Yellowjacket District. Possible examples are travelers' huts and border checkpoints.

**Habitations**

Habitations are archaeological sites where a wide range of activities was performed. These sites were occupied continuously, or for a major portion of the year. Habitations in the DAP Typology are congruent to habitations as defined in the Spatial Systematics section. They consist of one or more household clusters in a centralized location; as such, substantial architectural remains such as rooms, pitstructures, and outside work areas are usually present. Habitations represent the locations where most community activities took place, and they represent the home base of the community. Divisions of this category (presented below) are based on architecture, number of social units, and function, rather than on function as the primary criterion, as was done with the other two major site categories.

**Base Camps**

Base camps are sites occupied by one or more household groups for a multiplicity of purposes. The intent in establishing this category is to allow for the study of Archaic sites as well as Anasazi types. Substantial domestic architecture is absent, although smaller facilities and features, such as hearths, ramadas, and brush screens, are standard accompaniments. Base camps were occupied by one or more households and served as central locations for endemic and outlying activities.

**Hamlet**

A hamlet is a small habitation containing one to three household clusters; it served as the home base for one to three households. A special case in this category is the unit hamlet, which consists of one household cluster. Hamlets contain permanent domestic architecture, such as roomblocks and/or pitstructures. Hamlets are the central abodes of small communities and may exist as isolated units in larger dispersed communities or neighborhoods.

**Large Hamlet**

Large hamlets are permanent habitations incorporating several household clusters (usually four to eight). A potentially important discriminator is the presence of an intracommunity integrative structure such as a "big" pithouse or kiva. Such structures are reported (Sender, 1975) for Pueblo III hamlets in the Mesa Verde District. It has not yet been established that such structures are present at earlier Basketmaker III-Pueblo I hamlets, the time span most frequently encountered in the project area.

**Village**

The village is a permanent habitation incorporating many household clusters (usually more than eight). Intracommunity and intercommunity integrative structures such as "big" pithouses or kivas and great kivas are often present. The village incorporates many architectural units such as pitstructures and large roomblocks. The architecture may be arranged in an orderly fashion according to a preconceived plan.

**Function Types**

Further subdivisions might be made based on functional criteria. The divisions described above are nonfunctional by definition and are based on the assumption that the types are functionally similar; that is, the sites were established as loci for general sets of subsistence and social activities. It is conceivable that hybrid types might exist that combine specialized activities and general domestic functions. For example, a trading post established by a foreign group or an observatory for ceremonial observation might be maintained by several permanent household groups as well as a cadre of specialists. Such sites might be identified by specialized architecture and site layouts. Escalante Ruin, a suspected Chaco culture trading site, is one example in the Escalante Sector.
TEMPORAL SYSTEMATICS AND THE DAP FORMAL SERIES

Regional relationships and cultural process are primary orientations of the general research design. Cultural process is also integrated into the research design as a major problem domain. A comprehensive and well-designed set of temporal controls is necessary to investigate variability in cultural phenomena. Spatial elements should be included in control systems so that cultural similarities and diversities can be described as multidimensional units. Development of such a rigorous multidimensional system, designated the DAP Formal Series, was a major goal during the initial year of DAP operations.

Because the prehistoric sequence in the first-year study area was relatively uncertain, temporal assignments of site occupations for preliminary investigations (refer to section on 1978 field investigations) were based on the widely applied Pecos Classification. This scheme of temporal classification consists of broad, flexible units for which one of the major sorting criteria are artifact types and architecture. Such a flexible system was well suited for initial temporal classification of sites in the project area. Survey data indicated that most sites would yield a suitable collection of artifactual materials. Occupational spans of sites excavated in 1978 are depicted in figure 1.8. As more intensive operations progressed through the summer and fall, it became apparent that the Pecos scheme was not a good reflector of cultural stability and change in the initial-year study area, and that it could not accommodate spatial variability; hence, a modified temporal system with more suitable units was needed. Such a system was formulated during the fall and winter of 1978-79.

Basic Formal Units

The Dolores Archaeological Program Formal Series is based upon units originally proposed by several well-known archaeologists (McKern, 1939; Kidder, 1962) and then combined by Willey and Phillips (1958:11-44) into a single integrated system. The units adopted by DAP personnel have stipulated spatial and temporal connotations; therefore, the system should be regarded as one consisting of archaeological units (Willey and Phillips, 1958:21) rather than merely temporal divisions. The system is hierarchical in nature: smaller units can always be combined to form larger entities. The basic units of the project scheme are defined as follows.

Element

The element is a single major building or remodeling episode within a community cluster and often reflects use histories within household clusters. The intent is to reflect periods of stability within prehistoric communities. For example, at Dos Casas Hamlet (Site 5MT2193 [Brisbin et al., 1981]), the inhabitants abandoned the original domicile and built a second one slightly to the north during the history of occupation. The period of time during which the people inhabited the early house (Pithouse I) is termed Element 1 and the time span during which the people were using the more northerly house is Element 2. The usual time span for an element is probably 25 ± 10 years during the Anasazi Tradition, reflecting the typical use period for a house. During other traditions, elements were probably more lengthy. Assemblages of elements in the same community are combined to form components, and sequences of elements in the same and closely related communities form subphases. (Fig. 1.9 depicts the relationships among these units of the DAP Formal Series.) The same element may be manifest at more than one site, since the element is designed to reflect changes within the community and prehistoric communities normally incorporated more than one site. Different element sequences are employed for different habitations, however. Elements are assigned sequential numbers beginning with the earliest occupation of a community cluster; the sequence is not interrupted for phase changes.

![Figure 1.8 Escalante Sector—Occupational span and gross functional classification of sites excavated in 1978.](image-url)
**INTRODUCTION**

Phases are not standardized as to the amount of space and time they occupy, but, in the DAP system, during the Anasazi Tradition they often approximate a sector in area and are of no more than 150 to 200 years in duration. The term “often” is emphasized, as the phase is a flexible unit; according to Willey and Phillips (1958:22):

A phase may be anything from a thin level in a site reflecting no more than a brief encampment to a prolonged occupation of a large number of sites distributed over a region of very elastic proportions.

A single element representing a single component, therefore, may be sufficient to define a phase.

**Local Sequence**

The definition of a local sequence is again extracted from Willey and Phillips (1958:25). For DAP purposes a local sequence is a chronological series of components within the geographical limits of a community cluster. A single component is sufficient to define a local sequence. A local sequence may crosscut phase boundaries and hence can be viewed as the manifestation of a tradition at a community cluster. Shifts between local sequences at community clusters often involve hiatuses in occupation at individual sites or changes in site types and functions.

**Sector Sequence**

A sector sequence is the manifestation of a tradition in a single sector and consists of sequences of phases. One phase in a sector is sufficient to define a phase sequence. The transition from one phase sequence to another within a sector involves drastic changes, including basic alterations in subsistence modes and material technologies and large-scale shifts in population parameters. The relationships among phases, sector sequences, subtraditions, and traditions are depicted in figure 1.10.
Subtradition

Subtraditions are divisions of traditions and consist of assemblages of phases. Subtraditions are used to delineate closely related phases and may crosscut sector and phase sequence boundaries. Subtraditions are limited spatially to a district or several sectors in the DAP system. The intent in using this unit is to provide for close cultural relationships in space.

Tradition

The term “tradition” is perhaps used in a broader sense here than by Willey and Phillips (1958:37). They view a tradition as “... a (primarily) temporal continuity represented by persistent configurations in single technologies or other systems of related forms.” In the DAP concept, traditions are subunits of “full cultural traditions” or “cultures” (Willey and Phillips, 1958:47-78; Willey, 1966:4); hence, they are neither primarily temporal in orientation nor restricted to a single or a few technologies or systems. Traditions are regarded as temporal and spatial divisions of cultures and thus would be considered as “subarea traditions,” employing the Willey and Phillips terminology. In a broad sense, traditions are viewed as local manifestations of stages (Willey and Phillips, 1958:64-78). In this sense they are primarily temporal in nature. Traditions consist of assemblages of phases, sector sequences, and subtraditions. One phase may be sufficient to define a tradition.

Criteria Employed in Definition

Archaeologists studying the Northern San Juan Culture Area have formulated temporal schemes for the Mesa Verde Region (for example, the Wetherill Mesa Phase Scheme [Hayes, 1964]) based on cultural characteristics. These formulations often employ artifact variability, particularly the evolution of ceramic types, as major determining criteria. The DAP has selected a different priority of defining criteria. It is believed that in many cases artifact variability may not accurately reflect differences in adaptive strategies and lifeways.

The characteristics used by project archaeologists are intersite, intrasite, and artifact patterns, with intersite patterns assigned the highest priority. The criteria are presented in detail below:

1. Variability in patterns at the intersite level, including:
   a. Form of community clusters, including total area, degree of nucleation evident in habitation units, and relationship among habitations and other site types.
   b. The site set employed by the community (an inventory of site types and frequencies of these types).
   c. Evidence for polity and intensiveness of foreign relations (are site types reflecting these areas present, what areas were inhabited, densities, etc.).

2. Variability in patterns at the intrasite level, including:
   a. The relationship among household clusters (spatial relationships, the presence or absence of integrative structures).
   b. The presence or absence of structures or facilities implying polity or formalized trade.
   c. The physical form of the household cluster (which spaces are used for domestic purposes, the form and amount of storage space, the types and frequencies of facilities present, etc.).

3. Variability in patterns at the artifact level, if the variability is evidence of adaptive or technological change, including:
   a. The types and amounts of raw materials procured.
   b. Architecture and construction modes.
   c. Types and frequencies of artifacts if such changes indicate change in technology or adaptation (for example, the introduction of new design elements on painted pottery might be regarded as a mere style preference, while a 75-percent increase in the mean size of storage jars would probably be more indicative of a change in technology).

These criteria are applied when defining individual units for four of the five levels in the formal hierarchy (that is, when defining individual subphases, phases, subtraditions, and traditions). As previously discussed, elements, the first level in the hierarchy, are defined by building episodes, and the other units in the system (components, local sequences, and sector sequences) are integrative constructs dependent on the prior definition of the basic units.

Magnitudes of cultural change are considered when defining units. For example, in defining a tradition, distinctive characteristics in all three major criteria and most subcategories must be present. For subtraditions, changes of definitive characteristics in two of the major categories, including intersite patterning, might suffice.

Phase definitions are based on distinct intersite patterning or on significant changes in the lower priority subcategories, while subphase definitions might involve lesser changes in the subcategories.

Application to the 1978 Study Area

Based on the data recovered from 1978 field operations and previous archaeological investigations in the Yellowjacket District, four prehistoric traditions, six phases, and
INTRODUCTION

The effective social unit was small. An extended family—man, wife or wives, children and children-in-law, some infants—numbering no more than 25 or 30 in all, would constitute a normal, year-round grouping. The pattern of life was a cyclic wandering, but it was not truly a nomadic one. The small groups moved regularly from place to place, from valley to upland, in search of the seasonal animal or plant resources which centuries of experience had taught them were to be had. Under such conditions, the material possessions were few, utilitarian and durable, or easily manufactured at need. The twin hallmarks of the Desert Culture were the basket and the flat milling stone. The orientation of the culture toward small seeds was well established by 7000 B.C., as these utensils testify. Supplementing vegetable foods, or perhaps of equal importance, was the hunt—virtually every animal of the desert fell prey to trap, snare and weapon.

The lifestyle and subsistence strategy described by Jennings would not necessitate complex intersite or intrasite patterns. The expected site set consists of a number of limited activity loci associated with hunting and gathering.
Table 1.4 Preliminary listing of suspected and identified traditions, phases, and elements in the 1978 study areas

<table>
<thead>
<tr>
<th>Tradition</th>
<th>Description</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Corners Paleoindian Tradition</td>
<td>(11,000?-7,000 B.P.) No phases or elements identified</td>
<td></td>
</tr>
<tr>
<td>Four Corners Desert Tradition</td>
<td>(5000 B.C.-A.D. 500?)</td>
<td></td>
</tr>
<tr>
<td>A. Great Cut Phase, Escalante and perhaps other sectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. North Marsh Community Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Sagehen Flats Locality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Marshview Hamlet (Site 5MT2235) Element 1 (dates conjectural)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sheep Skull Camp (Site 5MT2202)</td>
<td>No element specifically identified (dates conjectural)</td>
<td></td>
</tr>
<tr>
<td>II. Anasazi Tradition</td>
<td>(A.D. 450-1300)</td>
<td></td>
</tr>
<tr>
<td>A. Sagehen Phase</td>
<td>Escalante Sector, A.D. 650-850</td>
<td></td>
</tr>
<tr>
<td>1. Grass Mesa Locality</td>
<td></td>
<td></td>
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<tr>
<td>a. LeMoc Community Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. LeMoc Shelter (Site 5MT2151) Element 1 (A.D. 700-750)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. LeMoc Shelter (Site 5MT2151) Element 2 (A.D. 800-825)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sagehen Flats Locality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. West Sagehen Community Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Sagehill Hamlet (Site 5MT2198)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element 1 (A.D. 750-800)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Dos Casas Hamlet (Site 5MT2193) Element 1 (A.D. 770-800)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Dos Casas Hamlet (Site 5MT2193) Element 2 (A.D. 770-800)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. McPhee Phase</td>
<td>Escalante Sector, A.D. 850-975</td>
<td></td>
</tr>
<tr>
<td>1. Sagehen Flats Locality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. McPhee Community Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Little House (Site 5MT2191)</td>
<td>This site is assumed to be a field house used by the inhabitants of the McPhee Community. One element has been identified; however, the dates of use are uncertain. (A.D. 800-875)</td>
<td></td>
</tr>
<tr>
<td>2. McPhee Pueblo (Site 5MT4475) Element 1 (A.D. 870-900)</td>
<td></td>
<td></td>
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<tr>
<td>3. McPhee Pueblo (Site 5MT4475) Element 2 (A.D. 900-940)</td>
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<tr>
<td>4. McPhee Pueblo (Site 5MT4475) Element 3 (A.D. 940-975)</td>
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<td></td>
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<tr>
<td>C. Sundial Phase</td>
<td>Escalante Sector, A.D. 1050-1200</td>
<td></td>
</tr>
<tr>
<td>1. Sagehill Flats Locality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. North Periphery Community Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Marshview Hamlet (Site 5MT2235)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element 2 (A.D. 1075-1125)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Escalante Community (?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Marshview Hamlet (Site 5MT2235) Element 3 (A.D. 1125-1200)</td>
<td>A temporary hearth and a use area indicate a late seasonal occupation at this site; as the Escalante Ruin (Site 5MT2149) represents the nearest known prehistoric community at this time (Escalante was constructed in the 1130's, refer to Hallasi [1979]), this seasonal occupation has been assigned to that community.</td>
<td></td>
</tr>
</tbody>
</table>
practices, procurement camps, and base camps. Communities incorporating a seasonal round of restricted wandering into their settlement patterns are termed “bands” (Murdock, 1949:79), and this nomenclature has been adopted for project purposes. Hence, the proposed Archaic community that used Sheep Skull Camp and Marshview Hamlet is called the North Marsh Band.

During the last part of the Archaic Tradition, it is possible that the local peoples were experimenting with the raising of domestic plants introduced from the south, practices which may have resulted in a more sedentary existence. The nature of the Archaic-Anasazi transition is virtually unknown in the project area. The search for and the investigation of sites representing this transition will be assigned a higher priority in future operations.

The Anasazi Tradition

The Anasazi Tradition is well documented in the 1978 study area. Three phases, the Sagehen Phase, McPhee Phase, and Sundial Phase, and 12 elements have been defined in the Escalante Sector. Lifestyles are generally viewed as being similar to the Southwestern Tradition as described by Willey (1966:178-245). The Anasazi Tradition is the local manifestation of the Formative Stage.

Distinctive Anasazi traits include the manufacture and use of ceramic artifacts and the presence of permanent settlements consisting of pitstructures and associated room-blocks and other features. Subsistence strategies emphasized food production or farming, and intensive methods such as irrigation were adopted later in the cultural sequence. Common cultigens were corn, beans, and squash; dogs and turkeys were animal domesticates. The society was organized by households living in distinct architectural divisions. During the early portion of the tradition (at least in the Escalante Sector), the people lived in dispersed communities, but an aggregative trend is evident in later periods. Besides ceramics, the general inventory included ground stone items (metates, manos, mortars, lapstones, polishing stones, hammerstones), flaked stone implements (projectile points, denticulates, drills), bone tools (awls, needles, flakers), basketry and ornaments (necklaces, pendants, bracelets). For the duration of the Anasazi Tradition, the local farmers were influenced—probably indirectly—by the Mesoamerican civilizations. Possible imports were new forms of cultigens, ornaments, and social and ceremonial concepts.

A more detailed discussion of identified phases is presented below. Note that settlement characteristics weigh heavily in the phase definitions. Settlement criteria are regarded as sensitive indicators of lifestyles and are currently more easily obtainable than technological or social parameters. A model of settlement hierarchies for each phase is presented in table 1.5.

Sagehen Phase. The Anasazi population during the Sagehen Phase was distributed in small hamlets located in favorable farming areas. Each hamlet was the primary domicile and center of activity for one household or, infrequently, two or three. In the Sagehen Flats Locality, the spacing between hamlets is more even than a randomly generated model, perhaps indicating interhabitation (chapter 3 of this volume).

Sagehen Phase settlement patterns incorporate a more limited site type set than do those of the later McPhee Phase. Limited activity loci and seasonal areas associated with hunting and gathering activities are well represented, but specialized farming or social sites are absent. Only one type of habitation, the hamlet, is present in the site set. The local Sagehen Phase peoples were apparently practicing a diverse-base subsistence strategy with emphasis on both hunting and gathering and horticulture. Farming practices are assumed to be of a simple nature because of the apparent lack of specialized sites. While there may have been interhousehold competition for lands with good agricultural potential, Sagehen societies were uncomplicated in organization. No trend toward centralization is evident. Local communities in the Escalante Sector consisted of dispersed habitation and can be classified as “neighborhoods,” rather than as nucleated settlements.

Within the habitation the center of activity was the subterranean pithouse, often subrectangular in outline with a
Table 1.5 Proposed settlement hierarchy according to phase, Escalante Sector, Anasazi Tradition

I. Sagehen Phase (A.D. 650-850)
   A. Limited Activity Loci
      observed: procurement/processing areas (component at Sheep Skull Camp is positive evidence for these types)
      expected: quarries, kill sites, horticultural plots, manufacturing and maintenance sites, petroglyph and pictograph panels, trails
   B. Seasonal Areas
      observed: none
      expected: procurement camps
   C. Habitations
      observed: hamlets (Element 1 at Sagehill Hamlet, Elements 1 and 2 at Dos Casas Hamlet, Elements 1 and 2 at LeMoc Shelter)
      expected: no additional types

II. McPhee Phase (A.D. 850-975)
   A. Limited Activity Loci
      observed: processing areas and gathering stations (component at Sheep Skull Camp)
      expected: quarries, kill sites, agricultural sites, water control sites, manufacturing sites, maintenance areas, shrines, petroglyph and pictograph panels, trails, boundary markers
   B. Seasonal Areas
      observed: field houses (Element 1 at Little House)
      expected: procurement camps
   C. Habitations
      observed: Large hamlets (Site 5MT2651, Site 5MT4628, others from survey data), villages (multiple elements at McPhee Pueblo, other surveyed sites such as Grass Mesa Village and May Mesa Village)
      expected: no additional types

III. Sundial Phase (A.D. 1050-1200)
   A. Limited Activity Loci
      observed: none
      expected: quarries, kill sites, gathering stations, processing areas, manufacturing sites, maintenance areas, shrines, petroglyph and pictograph panels, sentry posts, signal locations, trails, boundary markers
   B. Seasonal Areas
      observed: towers (from survey data), procurement camps (Element 3 at Marshview Hamlet, Element 3 at LeMoc Shelter)
      expected: field houses
   C. Habitations
      observed: hamlets (Element 2 at Marshview Hamlet, villages (multiple elements at Reservoir Ruin)
      expected: large hamlets, perhaps function-specific habitations
central hearth, an antechamber or ventilator system, and a four-post roof support pattern. A wingwall often divided the pithouse into north and south areas, the north area serving as a space for general activities and cooking and sleeping, while the south area was often reserved for food preparation (mealing) and storage.

Technology and material culture endemic to Sagehen Phase societies were similar to those described by other archaeologists for the late Basketmaker III-early Pueblo I periods (for example, Willey, 1966:202-207; Brew, 1946).

McPhee Phase. The McPhee Phase represents a demographic and organizational climax in the Escalante Sector. The population was distributed in nucleated villages or large hamlets rather than in dispersed hamlets. Thus, McPhee Phase communities are termed "nucleated communities" or "villages" rather than "bands" or "neighborhoods." Aggregation into large settlements was also accompanied by changes in intrasite patterns. Surface rooms were assigned a wider range of activities, and pitstructures probably assumed more of a ceremonial function.

The site set used by McPhee Phase communities was larger than that of the preceding period. In addition to a full range of site types associated with hunting and gathering activities, the inventory included specialized farming sites such as field houses and perhaps check dams and terraces. Agricultural practices were becoming more intensive, as is shown by the proliferation of agricultural site types and numbers. Recognized habitation types for the McPhee Phase are large hamlets and villages. Eight McPhee Phase residential clusters (villages) have been identified in the Escalante Sector, all located within easy access to the Dolores River. The larger McPhee Phase villages probably served as the permanent residence for a maximum of 40 to 50 households, or 200 to 350 individuals each. Intersite patterns show some conformities to a central place model, a correspondence which may indicate intercommunity competition or the possibility of interlocality social organizations. A trend toward a more nucleated settlement pattern may be related to increased reliance on intensive agricultural practices (Birkedal, 1976). Nucleation and a more complex settlement pattern may also imply a more complicated organizational structure in general.

Within the village habitation units, roomblocks were fronted by a plaza area incorporating pitstructures. Activity area and floor features located in the latter structures indicate more of an emphasis on ritual or at least multifunctional purposes. Formal architectural characteristics are different than in the preceding Sagehen Phase. Post-A.D. 900 pitstructures are round rather than subrectangular and do not have a wingwall. Very late (post-A.D. 925) McPhee Phase pitstructures may incorporate masonry walls. The general impression is that these round edifices can be classified as "kivas," as defined in southwestern archaeological literature (e.g., Martin and Plog, 1973:120-121; Gillespie, 1976:82-98). The DAP has not yet excavated any pitstructures assigned to the early part of the McPhee Phase; hence, their characteristics must remain unreported.

With this apparent basic change in the role of the pitstructure, Anasazi households used suites in surface roomblocks as domestic headquarters. The suites often consisted of a living room with a hearth and one or two connected storage rooms. Storage rooms were constructed of horizontal masonry coursing, perhaps to keep out rodents and other pests. Living rooms were often of less substantial construction. Other technological and social characteristics for this period probably approximate general descriptions given for late Pueblo I-early Pueblo II cultures (Willey, 1966:205-208; Hayes and Lancaster, 1975).

Sundial Phase. During the last part of the McPhee Phase there was a rapid population exodus from the Escalante Sector. The succeeding Sundial Phase is characterized by low population levels and the return to a simple settlement pattern. Procurement camps, hamlets, and towers representing this period have been recorded in the sector. Escalante Ruin and Reservoir Ruin, in the southern part of the sector, may represent specialized habitations serving limited functions. For example, Escalante Ruin has been inferred to be a trading post, perhaps representing an underlying unit of a larger trade network originating in the Chaco Canyon area in northwest New Mexico (Reed, 1979).

Economically, it appears that most of the Escalante Sector had reverted to a hunting and gathering province. Small settlements oriented toward limited farming were present in the southern portion (Sagehen Flats, Escalante, and Reservoir Localities). Socially, the Escalante Sector can probably be regarded as a frontier during the Sundial Phase. The presence of towers as a settlement type may indicate a warning system or communications network staffed by members of more southerly communities. Large habitations such as Escalante and Reservoir Ruins may have incorporated facilities and activities associated with the frontier (such as storage areas for trade items or special defensive features).

Lifeways were probably simple for the farming households living in the southern half of the sector. The pitstructure at Marshview Hamlet probably served as a domicile and may have been used on a seasonal basis. Lifeways at the larger hamlets or function-specific habitations in the southern part of the sector were more complicated. They are believed to have shared some similarities to those described for early Pueblo III societies by other authors (e.g., Willey [1966:208-209]; Swannack [1969]).
Shoshonean Athabascan Tradition

No phase or element assignments representing a local occupation by the Shoshonean or Athabascan peoples have been made. The 1978 field investigations did not reveal a post-Anasazi component at any of the investigated sites. However, the DAP survey crews recorded several sites with Shoshonean-style pottery fragments and projectile points. It thus appears that there was post-Anasazi use of the project area by Shoshonean peoples, and this is documented in early historic records of the area (e.g., Bolton, 1972). More definitive descriptions of post-Anasazi cultures will be based on future DAP fieldwork and analysis.

CONCLUSION

As part of the Dolores Project Cultural Resources Mitigation Program, archaeological field operations were executed in the period June-November 1978 by the University of Colorado. During this span field crews conducted nonintensive operations and intensive investigations: nonintensive operations included an inventory archaeological survey, preliminary assessment of recorded sites to aid in selection of an excavation sample, a magnetometer survey testing program, and archaeoastronomy. Intensive investigations included the excavation of seven prehistoric sites. This latter program revealed that the project area has probably been the scene of human activity for at least the last 5000 years. Both the Archaic Tradition (5500 B.C.-A.D. 500) and the Anasazi Tradition (A.D. 500-1300) are well represented in the present site universe.

The goals of the 1978 field program were the amassing of a general data base for application to the research design and the establishment of base parameters for the Anasazi occupation; both goals were realized. The data from 1978 investigations were used to design the Dolores Archaeological Program Spatial and Formal Series and Site Typology. These are basic classificatory systems which are vital in compiling raw data and presenting results of analyses in a standardized reporting format amendable to comparison.

The 1978 field operations program was also necessary as input for designing future operations. The 1979 field program will be greatly expanded when compared to 1978. Again, work scheduled to be performed can be classified as nonintensive operations or intensive investigations. Goals and directions in these research areas are summarized below.

Nonintensive Operations

Goal 1: Expansion of the archaeological data base

The following specific programs will be conducted to reach this goal:

a. Inventory survey. The University of Colorado will employ two survey crews in continuing the inventory survey of project area lands required by the Bureau of Reclamation. Goals for 1979 are to complete survey coverage of the proposed reservoir pool area and to do the bulk of the effort required in two proposed recreation areas.

b. Probability survey. Washington State University will employ one field crew to initiate a probability survey in parts of the Escalante Sector not designated for inventory survey. The probability survey will adopt a sampling strategy based on the selection of random 400 m² quadrants.

c. Magnetometer survey. The program will employ a magnetometer crew to record subsurface features at archaeological sites. Thirty-five sites have been scheduled for magnetometer investigation in 1979.

Since the feasibility of such operations was proved in 1978, goals of 1979 operations will be expanded; these include the evaluation of magnetometer data in predicting characteristics of pit structures (size, depth, and degree of burning) and in mapping large habitations.

d. Remote sensing. Mann and Associates of Albuquerque has been engaged to conduct an aerial mapping program of large sites in the project area. Seven sites will be included in the 1979 program. Specific objectives of these operations are accurate mapping of village site plans and evaluation of potential application of this technique.

Goal 2: Preliminary assessment of the project area data base and selection of a sample for intensive studies in 1979

Realization of this goal will involve the following processes:

a. Review of pertinent survey records.

b. Onsite evaluations.

c. Review of magnetometer survey results and additional testing if needed.

d. Classification of all sites according to the Dolores Archaeological Program Temporal and Formal Series.

e. Definition of a site universe and selection of a sample to be intensively investigated in 1979. The site selection process will be implemented by using a stratified random sampling design pursuant to the goals established for later intensive investigation.

Goal 3: Reconstruction of the prehistoric environment

A necessary preliminary step in investigating the problem domains specified in the general research design is to estimate the characteristics of the prehistoric environment.
Such a step is critical in assessing adaptive strategies employed by Anasazi cultures in the Escalante Sector. The methodology to be adopted in obtaining a first estimation specified the following procedures:

a. The characteristics of the present-day environment are established by conducting a literature search and then initiating field studies. The goal is an inventory of modern resources present in project study areas and maps of their distributions, if appropriate.

b. Post-abandonment processes resulting in the modern environment are studied by formulating and testing appropriate models.

c. A tentative model of prehistoric conditions is established based on the data generated by these procedures. This is tested and modified, if necessary, by comparison with the information recovered from excavation of prehistoric sites. To implement this design, the following specific programs will be undertaken in 1979:

1. Geology. A geologic studies subcrew will survey the Escalante Sector for geologic features, possible sources of raw materials for lithic and ceramic manufacture, and domestic water sources.

2. Climate. Four small weather stations will be established in the 1979 study area. These will be monitored daily. In addition, a crew from the Laboratory of Tree-Ring Research, University of Arizona, will undertake a climatic reconstruction study based on coring of living trees.

3. Vegetation and soil. An environmental studies crew will survey the Escalante Sector for vegetation and soil zones.

4. Fauna. A faunal studies crew will be collecting faunal samples in the Escalante Sector; regularly monitored trap lines will be established for this purpose.

5. Experimental agriculture. Experimental farming plots will be established and maintained by an environmental studies subcrew. Crops grown in the plots will include several varieties collected from modern Native American farming cultures to these items can be grown under local conditions.

Intensive Investigations

Intensive field investigations (excavation) in 1979 will be conducted within the limits of the Escalante Sector. Overall strategy for the operations is directed toward assembly of a general data base suitable for application to the two primary research orientations (regional and temporal relationships) and the five major problem domains. To investigate cultural relationships on a regional scale, excavation of selected sites will be done in four localities: Sagehen Flats, Grass Mesa, Periman, and House Creek. Because the analyses necessary to answer specific questions in the research design require a broad data base when considered in total, the 1979 excavation strategies will not emphasize collection of data in specific problem-domain areas, but rather the accumulation of a wide range of data. Exceptions to this general strategy may be made in future years in reference to data requirements for Problem Domains 2 (Paleodemography) and 4 (Extraregional Relationships). General and specific goals of the 1979 program of intensive operations are as outlined.

Goal 1: Augmentation of data base for Sagehen Flats Locality

Specific objectives are as follows:

a. Further investigation of the proposed North Marsh Band (Archaic Tradition). This objective will be implemented by further investigations at Marshview Hamlet (Site 5MT2235), magnetometer survey at Sheep Skull Camp (Site 5MT2202), excavation of Horse Bone Camp (Site 5MT2199), and magnetometer survey and other operations at Ridgeline Camp (Site 5MT2242).

b. Investigation of Archaic site(s) in north part of Sagehen Flats Locality. The objective is twofold: establishment of parameters for the Archaic community in this area, and recovery of data for comparison with the North Marsh Band. Specific operations include magnetometer survey, surface pickup, and testing at Site 5MT4640 and/or Sites 5MT4647 and 5MT4649.

c. Further investigation of the proposed West Sagehen Neighborhood (Sagehen Phase). Operations will include completion of efforts at Dos Casas Hamlet (Site 5MT2193) and excavation at Sites 5MT4512, 5MT4545, 5MT2194, 5MT4614, 5MT2844, 5MT2848, 5MT2853, and 5MT2236.

d. Initial investigation of the proposed Milhoan Neighborhood (Sagehen Phase). Operations will include excavation of Sites 5MT2858, 5MT4644, and 5MT2854.

e. Further investigations of the proposed McPhee Community (McPhee Phase). Operations will be confined to potential field houses in the western farming province of this community. Sites to be investigated include 5MT2192, 5MT2203, and 5MT2205.

Goal 2: Augmentation of data base for Periman Locality

Specific goals are: Investigation of relationship between Periman and Grass Mesa Localities (McPhee Phase). Operations will include excavation of Site 5MT4671.
Goal 3: Augmentation of data base for Grass Mesa Locality

Specific goals are as follows:

a. Identification of possible early community in locality. Operations include testing at Site 5MT4651.

b. Further investigations of proposed LeMoc Neighborhood (Sagehen Phase). Operations include completion of work at LeMoc Shelter (Site 5MT2151) and excavation of Site 5MT2161 or Site 5MT4650.

c. Further investigations of proposed Grass Mesa Community (McPhee Phase). Operations include excavations at Grass Mesa Village (Site 5MT23).

Goal 4: Augmentation of data base for House Creek Community (McPhee Phase)

Operations include excavations at House Creek Village (Site 5MT2320).
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Chapter 2

THE DOLORES ARCHAEOLOGICAL PROGRAM

RESEARCH DESIGN
ABSTRACT

The Bureau of Reclamation original Dolores Cultural Resources Mitigation Program Request for Proposals specified development and submission of a research design as a requisite for potential contractors. The University of Colorado submitted a preliminary research design as part of its formal mitigation proposal to the Bureau. This design underwent extensive revision in the fall of 1978 and spring of 1979. The document consists of five major elements or problem domains: (1) Economy and Adaptation, (2) Paleodemography, (3) Social Organization, (4) Extraregional Relationships, and (5) Cultural Process. Each problem domain is presented as a structure of inquiry to address the major generalized questions. The problem domains as a whole are logically consistent and incorporate specific methodological guidance developed by the project staff. Since the design is a structure of inquiry, it is not intended to answer all questions; rather, effort will be concentrated on those questions for which adequate data sets are available. The ultimate goals are to produce a reconstruction of synchronic prehistoric cultures and to develop and test a processual model using the research design as a methodological foundation.
CHAPTER 2
THE DOLORES ARCHAEOLOGICAL PROGRAM RESEARCH DESIGN

By Allen E. Kane, William D. Lipe, Ruthann Knudson, Timothy A. Kohler, Steven E. James, Patrick Hogan, and Lynne Sebastian

INTRODUCTION

This chapter is the result of approximately a year of effort devoted to elaborating and refining research strategies to be pursued in conjunction with the DAP (Dolores Archaeological Program). In the original proposal to the Bureau of Reclamation (spring, 1978), five problem domains were identified as the main elements of a research design. Each problem domain has evolved from relatively generalized questions, through a diagrammatic phase where the conceptual framework for research was developed, through a logical expression phase where the original questions were cast into a specific chronology of inquiries, to the present state in which each problem domain is expressed as an ordered series of specific questions for which viable analytical approaches using project data are available. The logic of each problem domain is consistent with that of all others and incorporates specific methodological guidance developed for this project.

This chapter consists of a discussion of general methodological considerations, followed by separate presentations of the five problem domains:

Domain 1: Economy and Adaptation
Domain 2: Paleodemography
Domain 3: Social Organization
Domain 4: Extraregional Relationships
Domain 5: Cultural Process

The main orientation of Domains 1 through 4 is to produce synchronic descriptions of the Anasazi culture and its antecedents for each of several past time periods (temporal units). The orientation of Domain 5 is to produce a diachronic description and explanations of culture, spanning several temporal units. Specific questions and strategies for Domain 5 are appropriately formulated at a later date when the synchronic descriptions from other domains begin to take form. Therefore, Domain 5 is expressed here as a relatively generalized logical construct; an implicit research activity in the coming year is to monitor the conceptual and analytical development of other domains and to advance Domain 5 to a higher level of specificity.

GENERAL METHODOLOGICAL CONSIDERATIONS

The Cultural Resources Mitigation Program of the Dolores Project provides unprecedented opportunities for enhancing public and scientific values through the large-scale interpretation of national heritage resources. The research design of the DAP recognizes the obligation to the public and to the scientific community to abide by a lucid, sound, replicable, and consistent set of methodological guidelines for the interpretation of data recovered in project operations. Important byproducts of this orientation are a thoroughly documented record of project investigations and a rich and diverse data base, both of which could be useful to future anthropological research in the Southwest.

General methodological considerations incorporated into this research design consist of a set of logical rules or research steps that structure the approach to each of the questions posed in each problem domain, along with some specific research activities for managing uncertainty and for improving the quality of inferences based on sample populations of data.

The set of logical rules is designed to lead each researcher through an identical process of library research, hypothesis formulation and testing, progressive inference (extrapolation, interpolation, or patterning), and summary. These rules apply to each question posed in the problem domains that follow.

1. Based on ethnographic, archaeological, and other scientific literature, identify models or logical constructs that may be used to describe the attribute or process under study. What are the relevant ways of organizing concepts? What are the data requirements of
these models? What criteria are suggested for identifying the relevant attributes or concepts in the archaeological record?

2. Within the Escalante Sector, which of these models or constructs may be useful for describing the process or attribute under study? What specifically are the criteria for identifying the relevant data or concepts in the archaeological record in this area?

3. Express these models as hypotheses, and define test implications. Generally, we are referring to multiple models or parametric models, and thus, sets or ranges of test implications.

4. Test the hypotheses on excavation data (in most cases—some hypotheses are uniquely regional and are tested in the following steps). Identify which sets of test implications are satisfied, note the variability, and refine the model accordingly.

5. Develop test implications that are appropriate to regional level analysis, and extrapolate to survey site data. Identify which sets of test implications are satisfied, and note the variability.

6. Based on probability sampling and statistical inference, extrapolate to the unsurveyed portion of the Escalante Sector, and note the level of uncertainty.

7. Synthesize the results of study at the excavation site, survey site, and regional levels, explicitly incorporating the uncertainty associated with each level of interpretation or inference. From this, produce a regional description of the attribute or process under study.

Researchers at the DAP recognize that many aspects of archaeological research, particularly those that inspire to regional interpretations, are attended by uncertainty. Some of this uncertainty is inherent in the nature of the work, and some is structural within the methodology (perception and inference). In order to manage uncertainty, we have incorporated into the research program specific activities to control or quantify variability, probability, and levels of confidence in our investigation. We recognize that we are dealing with incomplete data, and will propose studies to examine the recovery of information in excavation sites and survey sites. Sampling studies (discussed below) will also be proposed to enhance our understanding of the representativeness of data that we collect. Another inherent source of uncertainty is physical disturbance in the archaeological record. In addition to recording and accounting for disturbance in our field studies, we will propose studies to examine the causes and effects of disturbance in the sites we dig. Structural uncertainty (related to sequential inference and variability in the perception of archaeological remains) will be addressed explicitly. We hope to control perception by rigorously establishing criteria for identifying objects, assemblages, processes, and concepts in the archaeological record. We hope to control inference by the strict application of axioms of probability theory, and possibly through the use of Bayesian statistics. Wherever appropriate and relevant, objective or subjective expressions of the level of confidence or a probability distribution will be attached to observations and interpretations of data. To the extent possible, all analytical approaches will include assessments of variability and systematic treatment of uncertainty.

Many inferences will be based on the study of sample populations. We will propose a set of studies and experiments to increase the representativeness of sample populations to the sampling universe and to enhance the recovery of data important to the research design. Tentatively, we envision sampling studies or experiments to illuminate the study of occupation surfaces, surface recovery on survey sites, and regional site sampling. In addition, we have put into use a convention for probability sampling of all data on excavation sites, with the intent of providing a uniform basis for inference and extrapolation in the several problem domains.

PROBLEM DOMAIN 1: ECONOMY AND ADAPTATION

General Logic

Within each temporal unit, what were the available resources? Which ones were used by prehistoric peoples and how did they use (technically) each resource? How were these individual resource-use techniques combined to form subsistence systems and what were the basic social organizational attributes of these systems? The intent here is to describe the paleoenvironment and its prehistoric human usage, as well as to provide input to Problem Domains 2-5.

Question 1. What resources were available in the area, in each temporal unit?

a. Explicitly identify those natural resources considered to be of real or potential cultural significance within the DAP and outline the basis for that evaluation.

b. Which of these resources are now present within the project area, or were present there historically?

c. Which resources were used by indigenous people, according to ethnographic and/or ethnohistoric records?
d. What resources were present in the DAP within each temporal unit?

e. What were the absolute and relative abundances of these resources, and what was their spatial distribution?

f. Based on all of the above, what resources were culturally available to prehistoric DAP peoples?

Question 2. Within each temporal unit, which resources were used by prehistoric people?

a. What is the archaeological evidence for the composition of the used resource base?

b. What is the ethnographic, ethnohistoric, and regional archaeological (controlled for level of inference) evidence for modeling the used DAP resource base?

c. What then is the inferred composition of the DAP resource base within each temporal unit? What materials were used, in what quantities, and from which sources?

d. What proportion of the available resources were not used within any temporal unit? List these and offer alternative suggestions as to why these were not exploited.

Question 3. How were each of these resources used within each temporal unit?

a. Based on the list of used resources identified in Question 2, what archaeological contextual information is associated with each resource?

b. Reviewing comparable ethnographic, ethnohistoric, experimental, and regional archaeological descriptions of these identified resources,

(1) What perishable items are frequently associated with each resource?

(2) What are associated contexts, noting variations in such associations?

(3) What various activities or behaviors (as relate to resource procurement, processing, storage, distribution, consumption, discard) are associated with these resources and their contexts?

(4) Based on all this information, develop models of expected usage patterns and their predicted archaeological residues for various resources; i.e., explicitly define test implications of usage behavior models.

c. Given the archaeological data, models of expected resource-use activities, and test implications of those models, define adaptive techniques and strategies for all used resources for each temporal unit.

A basic paradigm for this can be presented in tabular form, understanding that it is a generalized view of resource use and that ultimately the answer to Question 3 must (insofar as is possible) be a species-by-species description of techniques and strategies.

<table>
<thead>
<tr>
<th>Tasks**</th>
<th>Biotic resources‡</th>
<th>Abiotic resources‡</th>
<th>Composite‡ resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procure-ment</td>
<td>Plant</td>
<td>Animal</td>
<td>Rock</td>
</tr>
<tr>
<td>Processing</td>
<td>Storage</td>
<td>Distribution</td>
<td>Consumption</td>
</tr>
</tbody>
</table>

*Filling out this chart is initially a listing of activities, not a discussion of their systemic organization.

**For some resource-use strategies it may not be appropriate to fill in each task cell; however, that should be explicitly thought out.

‡Many resources become combined with another to form a culturally significant product; e.g., corn and venison together form stew, a stone point with wooden shaft and sinew binding is a spear. Individual elements within each of these composite entities should have their individual life histories outlined in this table, with appropriate cross-references, and then the life history of composite items also should be displayed (though with most of the detail only referenced to elsewhere in the table).

As an aid in filling out this table, the following questions about plant uses are outlined. Be sure in answering these queries to specify whether data are known or inferred. These questions should first be answered for individual species, and then for plants as a general class.

(1) How were plants procured?

(a) Where did they come from?

(b) How are they available (considering the environmental constraints)? How much was used?

(c) What tools, facilities, and techniques were used to procure them?
(d) What seasonal patterns of plant procurement are evident?

(e) What is the minimum and maximum task group size appropriate for acquisition of this kind and quantity of plant resource?

(f) How many plants were discarded after procurement without any other use?

(2) How were plants processed?

(a) Where were they processed?

(b) What tools, facilities, and techniques were used to process them?

(c) Why were plants processed—for biochemical reasons, for toolmaking, or what else?

(d) What seasonal patterns of plant processing are present?

(e) What is the minimum and maximum task group size appropriate for processing this kind and quantity of plant resource?

(f) Of what was procured, how much was processed? How much of what was processed was discarded without further use?

(3) How were plants stored?

(a) Given the need for storage, what biochemical constraints operated to limit the kinds of items stored?

(b) Which plants were stored?

(c) Where were they stored, and what tools, facilities, and techniques were used to store them?

(d) What seasonal patterns of plant storage are evident?

(e) What is the minimum and maximum task group size appropriate for storing this kind and quantity of plant resource?

(f) Of what was procured, how much was stored? Of what was processed, how much was stored? How much of what was stored was discarded without further use?

(4) How were plants distributed?

(a) What were the constraints to distribution?

(b) Which products were distributed, and from where to where?

(c) What tools, facilities, and techniques were used to distribute these products?

(d) What seasonal patterns of plant distribution are present?

(e) What is the minimum and maximum task group size appropriate for distributing this kind and quantity of plant resource?

(f) Of what was procured, how much was distributed? How much of this was procured and/or stored? How much of what was distributed was lost without any other consumption?

(5) How were plants consumed?

(a) What plants were used in which consumptive mode (not including discard)?
   • food
   • building material
   • tools, facilities (including baskets)
   • clothing, including sandals
   • ceremonial purposes
   • medicinal purposes
   • fuel
   • trade, out of the system

(b) Where were plants consumed, again specifying consumptive mode?

(c) What tools, facilities, and techniques were used for plant consumption, specifying modes of the latter?

(d) What is the appropriate minimum and maximum social unit of consumption, specifying resources and consumptive mode?

(e) What seasonal patterns of consumption are evident?

(f) How much of the procured plants were consumed? Of what was consumed, how much had been processed, stored, and/or distributed?

(6) How were plants and plant products discarded?
RESEARCH DESIGN

(a) What were the modes of discard (e.g., loss, abandonment, reuse)?

(b) Where were things discarded?

(c) Why were some things discarded, others reused?

(d) For each reused item, describe how, where, and when it reenters the cultural system of use.

(e) What, if any, tools, facilities, and techniques were used in the process of plant discard?

(f) What seasonal patterns of plant discard are evident?

(g) What is the appropriate minimum and maximum social unit of discard?

(h) How much of the procured plants were discarded before processing? After processing, but before storage and/or distribution?

d. Given all the above task descriptions, how are these tasks organized and/or scheduled to form strategies of specific resource use? Describe in terms of worktime or energy investment in the entire strategy, as well as in its component tasks.

Question 4. Within each temporal unit, how are the tasks and strategies of resource exploitation organized to form a subsistence system to meet basic social and cultural needs?

Again, this question is best answered by displaying subsistence system components and subsystems in tabular form, then filling in specific cells of descriptive information to be able finally to characterize the entire dynamic system.

In this table, questions are best organized by rows, i.e., to define subsystems. For example, to define a food subsystem,

a. What natural resources are used as food, identifying (1) domestic and (2) nondomestic elements? Specify animal versus vegetable populations, including genera and/or species.

b. What environmental constraints (e.g., climate, soil chemistry) are there to food production (including both domestication and natural production)?

c. What needs of human individuals and social groups constrain the kinds or quantities of resources used as food?

d. What human activities are involved in the procurement, processing, storage, distribution, consumption, and discard of this food?

e. What seasonal or annual patterns of scheduling has the prehistoric human society developed to provide food for their needs?

Question 5. What were the basic social organizational attributes of the subsistence systems identified for each temporal unit?

a. What were the minimum and maximum number of people appropriate for each activity and task?

b. How were the people organized to perform these activities?

<table>
<thead>
<tr>
<th>Subsystems</th>
<th>Systemic components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Structure</td>
</tr>
<tr>
<td></td>
<td>Natural resources</td>
</tr>
<tr>
<td></td>
<td>Environmental constraints</td>
</tr>
<tr>
<td>Tools, facilities</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>Domestic</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
</tr>
<tr>
<td></td>
<td>Sociology</td>
</tr>
<tr>
<td></td>
<td>Ideotechnic</td>
</tr>
</tbody>
</table>
c. What was the functional division of labor appropriate for the described tasks and subsistence subsystems (by sex, age, and social status)?

d. What spatial considerations were involved in the social organization of individual and groups to operate these subsistence subsystems and their component tasks?

Note: Information from all of the above questions, including individual data elements and inferred systemic descriptions, serves as data in answering questions in Problem Domains 2, 3, 4, and 5.

PROBLEM DOMAIN 2: PALEODEMOGRAPHY

General Logic

How many people lived in the Escalante Sector in each temporal unit? How many people were associated with each household, with interhousehold groups, and with each site? What were the characteristics of this population (age, sex, health)? How were they distributed? How do these population estimates and distributions compare with the theoretical maximum limits to the number of people that might have lived in the area at different times?

The main tasks here are estimation of a vanished population in several past temporal units, and compilation of sufficient data (demographic and other) for use in a simulation of population growth and distribution. (Development of the simulation model is discussed in relation to Problem Domain 5—Cultural Process.) To estimate the prehistoric population, three kinds of estimation methods will be used:

- Habitation studies
- Resource-based studies (carrying capacity)
- Time-rate studies (rate of accumulation of archaeological evidence over time)

For each of these estimation methods, alternative approaches and models will be explored. Characteristic steps in the development of each alternative approach or model for a population estimation method are:

1. Based on a review of literature, selection of one or more ethnographic or other archaeological models of the process or attribute under study (e.g., household size, resource use, artifact discard, population growth).

2. Examination of excavation data based on established criteria for identifying or interpreting the archaeological evidence in relation to the concepts required by the models.

3. Extrapolation to survey data and unsurveyed portions of the Escalante Sector based on several alternative indicator attributes (e.g., site size and type, artifact distributions and densities, etc.), as well as on statistical methods.

4. Based on the above steps, estimation of total population at a site during a temporal unit. Concurrently, development and use of a technique to distribute this total population over the span of a temporal unit, to allow for an estimate of momentary population at any point during a temporal unit.

Ancillary to each approach to population estimation is the choice and refinement of methods to provide chronological controls to define occupation episodes that may be assigned to specific temporal units.

The characteristics of the population in each temporal unit will be estimated on the basis of human skeletal remains and statistical inference. Currently planned mitigation activities are not expected to yield a large number of skeletons. In the absence of sufficient direct evidence (human bones), a very conservative approach will be used for estimating demographic characteristics (such as age and sex composition, and health). Most of the interpretive demographic data developed on the basis of limited direct evidence will not be generalized beyond the hamlet or site level.

The studies of population distribution will rely on momentary population estimates and chronological controls for each occupation site. Optimally, for each occupation site encountered in the Escalante Sector, a time, spatial dimension, range of total population, and a level of confidence in the estimate will be developed. These data will be used as direct inputs to demographic simulations planned for Problem Domain 5.

Question 1. How many people lived in the Escalante Sector in each temporal unit?

No single estimation technique relying on incomplete data can produce a confident prehistoric population estimate. Therefore, three different approaches, each utilizing different kinds of data, will be pursued and the results compared to yield a synthetic and relatively high confidence "best estimate."

a. Habitation approach. Based on ethnographic and archaeological models of household size and household/site size correlation and variability, estimate the maximum cumulative population by multiplying the number of households from each temporal unit at a site by a range of household sizes. A variation of this is to estimate the habitation area and multiply this by a ratio of habitation area to population. Then, distribute...
this cumulative population over the temporal unit (using a range of assumptions and chronological evidence) to develop the ability to estimate momentary population at any time interval in the temporal unit. Specific questions pertinent to this approach are:

(1) From the literature (ethnography and archaeology):

(a) What are the criteria for identifying a household in the archaeological record?

(b) What correlations are suggested between the spatial dimensions of architecture, activity loci, associated features, and household size? What correlations are suggested between site size and number of households? How do these relationships vary?

(c) What are the criteria for identifying temporal units at occupation sites? What correlations are suggested between surface features of sites and the depth, complexity, and chronology of underlying deposits? How do these relationships vary?

(2) What test implications can be developed to identify households and household sizes on the basis of the above models? What implications can be developed to identify or predict evidence of temporality on the basis of the above models?

(3) Based on excavation data and probabilistic estimation methods, how many households from each temporal unit occur at excavation sites? Are these household number estimates consistent with the models from (1) above?

(4) Based on excavation data and probabilistic estimation methods, what are the surface indicators of occupation during each of several temporal units? Using surface observations from survey sites, what are the temporal units likely to have been spanned by occupations at each site?

(5) Using site size/household number correlations (or other defendable relationships) developed from steps (1) through (3) above, extrapolate to survey sites to yield an estimate of the number of households at each survey site (occupation sites only) by temporal unit.

(6) How do the locations of sites surveyed to date compare with an idealized probabilistic sample of site locations for the Escalante Sector? The research purpose of this examination is to place a momentary confidence interval about the extrapolation of household numbers and temporal units from excavated to survey sites, and to provide the basis for further extrapolation to unsurveyed areas.

(7) Based on probabilistic estimation techniques and explicit treatment of uncertainty, how many sites of what size and temporal unit are likely to have been occupied in unsurveyed portions of the Escalante Sector?

(8) Based on household size estimates (from the literature and excavation data); on household number estimates from excavated sites, survey sites and unsurveyed areas; and on explicit expressions of uncertainty associated with each level of estimation-extrapolation, how many people are thought to have lived in the Escalante Sector in each temporal unit? At each site?

b. Resource-based studies. Based on ethnographic and other archaeological models of subsistence systems and their variability, and on environmental data from the area, estimate the theoretical maximum number of people that could have been sustained by the resources available in the Escalante Sector. Alternative approaches to this could include multiple-resource models, indicator (single resource) models, decision-based models, or others. Based on excavation data, develop estimates of resource use at sites; extrapolate these estimates to survey sites and unsurveyed areas to produce a regional resource-use estimate. Compare resource use to resource availability, and compare this ratio to ethnographic and archaeological models to yield a resource use based population estimate for each temporal unit. More specific questions pertaining to this approach have yet to be elaborated, depending on the choice of models. The following attempts a more specific logical context within which an orderly sequence of steps can be postulated and adapted to fit the chosen model or models.

Conceptually, a three-element model construct is needed. For the hunter-gatherer cultural period a non-domesticated-foraging resource-use model will be developed. For sedentary cultural periods, separate models for domesticated and nondomesticated resource use will be developed, and then combined. The hunter-gatherer-only and the sedentary-nondomesticated resource models will be used primarily for bounding purposes. The main effort will focus on developing a resource-use model centered around agricultural crop yields. Overall, such a model seeks to estimate total possible agricultural yields, identify agricultural resource use at sites, estimate limits to agricultural resource use at sites, examine these limits in relation to total possible production limits in the Escalante Sector, and infer from this proportion a maximum population in each temporal unit.
Controlling conditions in such a model are likely to be: soil nutrients, and their rate of depletion under agriculture, available technology (clearing, tilling, etc.), and available moisture. Specifications of these conditions will come from the literature and from Problem Domain 1 studies. Subject to these conditions, a land suitability model and map will be developed. Probable components of the suitability model are: fertility, friability, cover, moisture content (depth, water retention, warmth, drainage, slope, aspect), and seasonal constraints. Products of the model will be descriptions of crop type, yields, and soil depletion rates at specific locations. Crop yield data from experimental gardens will provide a basis for comparison and adjustment of model components and products.

The products of such a model can be used to generate site-specific test implications of resource-use hypotheses involving presence/absence or increasing/decreasing utilization of domesticated food resources in each temporal unit. Gross crop yield and soil depletion estimates can be used to describe theoretical maximum population ranges that could have been sustained by domesticated resources in each temporal unit. These values may be adjusted to account for non-domesticated food resource use and then further adjusted by the subsequent development and application of models that are based on decision rules (agricultural site preference) or food production and processing technology limits. Construction of these models would rely heavily on ethnographic analogies and implementation of the models would require examination and statistical manipulation of excavation and survey data. The adjusted maximum population estimates would then be disaggregated to the site level (if possible), and reaggregated over sites within each temporal unit to produce sector-wide synchronic population estimates.

c. Time-rate studies. Using a combination of ethnographic and archaeological models and additional experimental/simulation efforts to postulate the rate of deposition and/or discard of various kinds of archaeological evidence on different kinds of surfaces, develop a model of accumulation of evidence over time in relation to human effort and population size. Based on excavation data (samples), estimate the total quantities of selected diagnostic archaeological evidence deposited in excavated sites in the E"calante Sector in each temporal unit. Compare the quantity of evidence likely to have been deposited to the human effort likely to have been required to deposit that quantity to infer a level of human activity associated with occupation at each site in each temporal unit. Divide or proportion the level of activity by the length of the associated temporal unit to infer a population size at each site for each temporal unit. Concurrently, seek out a correlation between visible attributes of survey sites (e.g., surface artifacts, architecture, features) and quantities of deposited artifacts. Identify the temporal units during which each survey site was likely to have been occupied. Apply the model developed in excavated sites to survey sites in order to estimate population size in each temporal unit. Based on a comparison with a regional sampling construct, estimate the total population in the E"calante Sector in each temporal unit. Utilizing the deposition/discard-rate model, develop a statistical formula for estimating momentary population at the site and sector level.

A special case of the time-rate study is the survivorship model, based on human burial data. Conceptually, age, sex, and fertility observations from excavated human skeletons are systematically compiled until a skeletal population of sufficient size (i.e., more than 100, to several hundred) is assembled and described for a given temporal unit. Life tables and a beginning population estimate (from other sources) are then prepared and used as inputs to a simple arithmetic survivorship model which over the short run can provide momentary population estimates within a temporal unit. In a diachronic application (more appropriately the subject matter of Problem Domain 5), assumptions regarding migration are incorporated into the model along with other constraints that influence mortality and fertility. It is unlikely that a sufficient number of skeletons will be excavated in the near term; without a large number of skeletons, construction of such a model would not be merited. No specific research design along these lines will be proposed until enough data are accumulated to permit an explicit treatment of variability and uncertainty in the human bone record.

Question 2. How many people were associated with each household, with interhousehold groups, and with each site?

a. What does the ethnographic/archaeological literature suggest are the criteria for identifying households (from Question 1a. (1)(a)). Interhousehold groups?

b. What does the literature suggest are the indicators of household size? What are the criteria for identifying these indicators in the archaeological record (from Question 1a. (1)(b) and (2))?

c. Based on excavation data and the above models, how many people were associated with each excavated household and each excavated interhousehold use area? How many people were associated with each site (from Question 1a. (7))? What are the associated uncertainties in these estimates?

d. Based on statistical examination of these excavation-based estimates, what are the measures of central
tendency and variability for household size and interhousehold group size? These interpretations are to be organized by site and temporal unit.

**Question 3. What were the characteristics of the population in each temporal unit?**

Like the survivorship model discussed earlier under Question 1c, studies of demographic characteristics generally require a large body of skeletal data to achieve acceptable levels of significance. Until a sufficient body of data is accumulated, approaches to this question will be limited to the systematic compilation of data from excavated human remains, and general comparisons of these data with other skeletal populations from the Northern San Juan Culture Area. Early studies of age and sex will simply record these attributes for individuals until a statistically manageable sample is accumulated. Health studies will initially be limited to an examination of oral pathology (frequency, type: antemortem tooth loss, caries, and periodontal abscess), based on the assumption that these observations may be presumed to indicate the health of the entire organism. These observations may then be compared with characteristics of other skeletal populations from the area to make some general inferential statements about human health in the Escalante Sector. If and when a large skeletal population is excavated, a more detailed and rigorous research design for specifying demographic characteristics will be proposed.

**Question 4. How was the prehistoric population distributed?**

Inputs to this question are derived wholly from the answers to Question 1. The main purpose of responding to this question is to generate a systematic set of data for studying variation in distribution, in Problem Domain 5. The pertinent subquestions are:

- a. What are the locations of human occupation in each temporal unit? Which locations were permanently occupied? Which ones were seasonally occupied?
- b. How many people occupied each location?
- c. What are the approximate dates of each occupation?
- d. What does the literature suggest are limits to site size and proximity in relation to site type and temporality? How do Escalante Sector sites compare to these limits in each temporal unit? What is the variability?
- e. From the literature, what are the available models to describe site distributions by size and type for formative cultures? For earlier periods? What models are available to describe human distributions (density per household, per square kilometer, distribution with respect to natural resources, etc.)? Do any of these models seem to be consistent with observed distributions in the Escalante Sector? If so, what is the nature of the variance between expected and observed distributions?

**Question 5. What are the implications of the products of this problem domain to other problem domains?**

This is a methodological problem, but should be formally addressed to maintain consistency between analyses of different domains. Many of the questions that are the main subject matter of Problem Domain 2 (such as household size, site size, distribution of people with respect to available resources, etc.) are influential in developing assumptions for other problem domains, prominently Problem Domain 3—Social Organization. Since the overall approach proposed here has been to generate multiple models and compare results to yield “best estimates,” the variability among intermediate analytical results from this domain merits examination in relation to the strength and validity of assumptions that may be developed out of these data for use in other research areas. The techniques to be used to respond to this question will vary with the degree of consistency or inconsistency of intermediate results from alternative models used in this problem domain. Initially, variance among analytical results will be examined statistically toward the specification of error and confidence limits. If extreme or antithetical inconsistencies occur (such as a carrying capacity based population estimate that is lower than the habitation-based estimate), then restructuring of this or other problem domains may be indicated.

**PROBLEM DOMAIN 3: SOCIAL ORGANIZATION**

Because of the broad range of information encompassed by this problem domain, we have chosen to divide it into four aspects or subdomains: social, economic, political, and ideological/ceremonial. Settlement patterning, originally a component of this study area, is no longer considered a separate area of inquiry, but rather as a type of evidence on which the subdomains of this problem domain and other problem domains draw. The divisions listed above were derived largely out of convenience; however, the separation follows traditional lines of anthropological inquiry. We fully recognize that these divisions are artificial and probably do not parallel cognized divisions of the culture under study.

Essentially, research in each subdomain will pursue independent, though not unrelated, lines of evidence. Subdomain 1, social organization, has as its major focus the identification of groups—those units that structure the society's social relations. We are assuming here that the
Anasazi culture was a kin-based society. The structure identified in this subdomain, therefore, is expected to serve, as does the kinships system, as the basis of organization for all of the society's activities.

The subdomains addressing the economic and political aspects of social organization, on the other hand, are functional divisions. The units participating in these types of activities, therefore, can be expected to be subsets of the social groupings identified by subdomain 1. Similarly, subdomain 4 must ultimately be related to these groups. This division, however, is neither a structural nor a functional one. Rather, ideology, as reflected in the archaeological record through ceremonialism, is seen as a pervading mechanism for social integration, sanction of authority, and possibly, for the organization of certain economic pursuits.

Because the four subdomains generally pursue distinct lines of evidence, research in each subdomain can be pursued concurrently. Subdomain 3, political organization, though, is based largely on the analysis of patterns derived from more primary data by the other three subdomains. Consequently, the full range of research into this aspect of social organization must await some preliminary work in the other areas. Similarly, certain questions in other subdomains cannot be completed until there is input from research in other problem domains. Notably, questions relating to group size in subdomain 1 and to the means of production in subdomain 2 are dependent upon prior work in problem domains 2 and 1, respectively.

**Problem Domain 3, Subdomain 1: Social Organization**

Service (1962:17) divides the structure of social organization into groups, the small social units into which societies are divided, and statuses, "named social positions which are assigned conventional attributes and roles that regulate or influence the conduct of interpersonal relations." Thus defined, a status network is highly emic and would appear largely unrecoverable archaeologically. But it is important to keep in mind that status networks "regulate and influence" interpersonal relations through sets of rules of conduct. Such sets of rules should produce patterned behaviors, at least some of which should have archaeologically recoverable material correlates.

Generally speaking, however, it is the groups aspect of social structure which will be more readily and completely identifiable archaeologically. Service further divides groups into those which are residential and those which are "a nonresidential association that has some corporate functions or purposes" (Service, 1962:13), the latter of which he terms "sodalities."

If we turn from this brief sketch of the structure of human social organization to a consideration of its function, we might accept the following as a working definition. Social organization comprises those aspects of culture which serve as:

... the extrasomatic means of articulating individuals one with another into cohesive groups capable of efficiently maintaining themselves and of manipulating technology (Binford, 1962:219).

This maintenance of the group involves both biological continuance and such social factors as socialization and enculturation of children. As for effectiveness, White (1959:103) describes the effectiveness of a social unit as arising from the group's size and its solidarity, "... the strength and intensity of the ties, the social relations, between the individuals who compose the group." These two competing forces, inversely related to each other, ultimately determine the nature of a society's social organization. The size of social groups, the degree of integration of the groups, and the changes in these two factors through time are potentially informative about the effectiveness of social units and about the response of social units to various stresses.

The three major areas of concern in this subdomain, therefore, are the delimitation of groups, both residential and nonresidential; the identification of archaeologically recoverable information about the status network; and the study of group solidarity or integration.

The identification of groups at all hierarchical levels—from the socioeconomic household to the largest ethnically self-conscious entity—should be the central concern of the social organization subdomain. Architectural evidence should be especially important at the household, household cluster, and village levels of social groupings. Stylistic evidence would be equally important at these levels and supremely important at the locality, sector, and district levels. Settlement pattern data would be critically important to any understanding of the relationship between various hierarchical levels of residential groups and perhaps to the definition of nonresidential associations as well.

The network of statuses in a society would, as noted above, be much more difficult to recover archaeologically. Such macrolevel status positions as men versus women or various age-grades may well show evidence of differential rules of behavior in terms of division of labor, styles of personal adornment, mortuary treatment, etc., but the microlevels are less given to material correlates. An example of a possible line of evidence which might be productive in studies of finer status distinctions would be differential distribution of animal carcass parts which might imply specific rules of food sharing tied to specific kin relationships, but such inferences would be tenuous at best.

Unlike boundaries of groups and the named positions of the status network, both of which are discrete units having
direct material culture correlates, the integration of social
groups is a relative attribute which must be inferred from
less direct material evidence. There is no one best material
culture measure of increased or decreased intensity of
social relations; the most suitable measure will vary with
the nature of the available data and with the exact ques­
tions about integration which are being asked. Some
measures of integration which have been used include
degree of sharing of stylistic elements, standardization in
the manufacturing or construction techniques, and physi­
proximity or access to specific physical facilities.

Though strongly inferential, the evidence for degree of in­
tegration is probably more direct than the evidence for
means of integration. An increase of group integration was
undoubtedly one of the latent functions of many groups
and activities in Anasazi life, but these groups and ac­
tivities had manifest functions (most of them involving
other problem domains or subdomains) which would have
been perceived as the primary or sole functions of the
groups or activities in question. And more important,
those manifest functions would have left most or all of the
recoverable material culture remains. Only by analogy
with manifest and latent functions of ethnographically
known groups and activities can we approach the question
of means of integration.

The three major areas of concern identified above—social
groups, the status network, and the integration of social
units—may be used to structure sets of specific questions
to be pursued within the DAP Research Design. This list of
questions should not by any means be considered ex­
hautive; rather it should be considered as setting out
general lines of inquiry and suggesting a number of poten­tially fruitful specific problem areas.

Question 1. What social groups can be defined within the
study area?

a. What residential groups can be identified?
   (1) Can residential groups smaller than the site as a
   whole be identified?
   (2) Can residential groups intermediate in size be­
tween presumable domestic socioeconomic units and
   the site as a whole be defined?
   (3) Is there more than one hierarchical level of in­
termediate groups?
   (4) Are the numbers and types of hierarchical levels
   the same at all sites of comparable size and time? If
   not, is there a patterned difference in numbers of
   levels at various locations within the project area?
   (5) What can be determined about the relationship
   of larger residential groups to smaller groups in
   general and to specific smaller groups (or sets of
   groups) in particular?
   (6) What can be determined about the relationship
   between residential groups at the same hierarchical
   level?

b. What nonresidential groups can be identified?
   (1) Can any evidence be adduced of ethnic self­
   awareness roughly corresponding to locality, sector,
district, region, or other spatial divisions used in this
   project?
   (2) Is there evidence for a hierarchy of nonresiden­
tial associations, with members, for example, from
   several hamlets or villages or even from several
   larger spatial units such as localities or sectors?
   (3) Within villages or hamlets, is there evidence for
   nonresidential associations which crosscut residential
   boundaries?

Question 2. Is there archaeologically recoverable evi­
dence of what Service (1962) terms the status
network?

a. What can be determined about the roles of status
   positions?
   (1) What can be determined about such macrolevel
   status positions as man, woman, immature indi­
   vidual, mature individual, old person, etc.?
   (2) Can anything be determined about microlevel
   statuses?

Question 3. What information about group integration can
be recovered archaeologically?

a. What degree of integration can be postulated for
   residential and nonresidential groups in the project
   area?
   (1) What material remains can be considered indi­
   cative of degree of group integration?
   (2) How can degree of integration be measured?
   (3) Are there apparent differences in degree of in­
tegration between groups at different hierarchical
   levels? At the same level within the same site? At the
   same hierarchical level in different geographical
   locations?

b. What evidence is there of means by which group in­
tegration was maintained and increased?
(1) Do the means of integration appear to have been specific to particular hierarchical levels?
(2) Do the means of integration appear to have varied geographically?

**Problem Domain 3, Subdomain 2: Economic Social Organization**

Economic social organization comprises the social relations of production, distribution, and consumption. Although closely allied with Problem Domain 1, subdomain 2 is distinct in emphasizing the interplay of information and materials that move goods through the society rather than the technological factors related to that flow. In general, the goal of research is to identify the units of production, distribution, and consumption for each major class of material goods, and to relate those units to the social groupings that organize the Anasazi culture.

Unlike the other subdomains of social organization, this subdomain will derive its basic data from the lowest order of the spatial hierarchy, the activity locus. Initially, the objective is to reconstruct which activities were performed and where they were habitually carried out. Secondly, the number of participants and the status of those performing the task must be inferred. Finally, each task group and each locus of activity must be tied to the spatial correlates of the social groupings identified in subdomain 1.

An additional concern is how to best classify material goods for analysis. Precisely, what constitutes a "major class of material goods" will clearly vary with the specific study, but in general, the focus in classification will be on the process of consumption. Were the materials consumed as food, fuel, building materials, or as the raw materials for a particular industry? Further division of these categories might then be made based upon the character of the materials themselves. Other distinctions that might prove useful are between perishable and durable goods, materials available locally and those that are exotic, materials that are perennially available and those cyclically available, and between goods produced for consumption and those for exchange.

At the level of the activity locus, primary evidence will be those attributes of artifacts related to function, and those that denote some particular social status. Proximity to a particular resource and botanical and zoological remains will also be considered as evidence. Analysis at higher spatial divisions will probably be more synthetic, with a greater reliance on contextual association, differential distribution, and variability. It is anticipated that this will involve a variable battery of statistical tests, locational analysis techniques, and simulation models. The goal is to move from the reconstruction of particular activity patterns to the systems of organization that regulate production, distribution, and consumption at every level of society.

**Question 4. How was production of each major class of material goods organized?**

a. Where did production take place?
b. Did manufacture or procurement involve more than one stage? Was each stage done at a different location?
c. How many personnel were involved at each stage of production?
d. What statuses of groups were involved in production?
e. How much time was required for the task?
f. How are the activity loci distributed within each level of the spatial hierarchy?
   (1) Are they equally or differentially distributed?
   (2) Are they restricted to some level?

**Question 5. What were the patterns of consumption for each major class of material goods?**

a. Where were the materials consumed?
b. By whom were the materials utilized?
c. Were the probable units of consumption different from those involved in their production?
d. Were certain goods utilized only by groups of a certain status?
e. Were durable goods reutilized?
f. With what levels of the spatial hierarchy are the units of consumption associated?

**Question 6. How was each major class of material goods distributed?**

a. Between which levels of the spatial hierarchy were goods distributed?
b. What was the direction of flow?
c. How many distributional steps were involved?
d. What groups and statuses were involved in the distribution? Were these different from the units of production and/or consumption?

e. By what mechanisms were goods distributed?

f. Was stockpiling or storage involved?

g. Were the materials equally accessible to all members of the society?

h. Were materials distributed as raw resources or as finished products?

Question 7. Given the patterns of production, consumption, and distribution derived from Questions 4-6, what was the system of economic social organization?

a. What groups comprise the basic units of production? Of consumption?

b. What, if any, were the mechanisms for resource distribution? What classes of goods were distributed?

c. Is there any evidence for differential access to any resources?

(1) Which groups were involved?

(2) Which resources?

d. Is there any evidence for economic specialization?

(1) What specialties?

(2) At what levels did specialization occur?

e. Were there any scheduling conflicts in procuring resources?

(1) What resources?

(2) How was the conflict resolved?

Problem Domain 3, Subdomain 3: Political Organization

Political organization refers to the presence and activities of a central authority or leadership operating within the community social structure. Leadership may constitute a formal group with its own internal structure and conventions or may exist informally as part of the status network of the community.

Specific lines of inquiry that might be applied to specific research in the area of political organization are as follows:

Model formulation. Modern Pueblo ethnographies and works on social organization of Anasazi and prehistoric southwestern cultures should be consulted. As modern Pueblo political organization probably does not parallel leadership structure in early Anasazi periods, other works dealing with formative cultures should also be considered.

Archaeological evidence. At the regional level, the applicability of geographic models such as central place, nodes and networks, and nearest neighbor should be evaluated in determining whether the regional data base has spatial order. Evidence of ordering might be used to infer political organization; description of such regional organizations can be in the form of a "best fit" model generated through evaluation and reformulation of ethnographic archaeological models. Hence, rigorous settlement pattern studies and a regional sampling design are critical in conducting research into regional political systems. The researcher should be aware of possible site types and architectural edifices associated with regional political groups or activities such as boundary markers, towers, regional communications networks, and redistribution centers.

At the community and intracommunity levels, recognition and description of status networks are critical aspects of political or leadership research. Status groups in the archaeological record can perhaps most easily be defined by the evaluation of the quantity and quality of material culture associated with individuals, households and interhousehold groups; estimations of domestic and other social space may be a profitable course of evidence as well. High status groups or political groups within the community may occupy dominant or centralized locations within the community cluster. The researcher should also be aware of possible specialized structures and features that may be associated with political activities. Leaders may have possession of unique artifacts, which may have served as symbols of their authority.

Question 8. What political organization existed prehistorically in the project study area?

a. Did communities in the project study area incorporate a formal political structure or did political authority operate informally as part of other social groups; i.e., did Anasazi communities have a political organization as such? (This question is closely allied with the problem of group identification as set forth in subdomain 1. The presence of political groups in Anasazi communities may be used to infer the social level reached by southwestern cultures.)

b. What was the role of status networks in these communities; what were possible political functions of such groups? (The question is again closely related to subdomain 1. Ascribed and possibly achieved high status
positions may have political or leadership characteristics or ascribed high status may be the result of membership in a leadership group.)

Question 9. At what levels did political organizations operate within Anasazi society?
   a. Did political groups operate at the interhousehold level within communities?
   b. Did Anasazi societies have a community leader(s) or headman?
   c. Were there regional political systems or spheres of influence? Where and what activities did such groups oversee? Did political groups identify and maintain territories and boundaries?

Question 10. What functions were performed by existing political organizations and what activities and social groups did they oversee? What activities were organic to political groups? (The question is related to areas of study described in subdomains 1, 2, and 4.)
   a. What economic activities and groups were overseen by a political hierarchy?
   b. What social activities and conduct were sanctioned by the political leadership? Did the leaders of the community enforce mores and conventions?
   c. What was the relationship between political groups and information flow within and between communities? Did community leaders oversee communications with foreign communities; were trade relations governed by leadership groups (tie in with Problem Domain 4)?
   d. Were ceremonial activities and groups overseen by political groups? Were ceremonial activities performed to further political ends?

Problem Domain 3, Subdomain 4: Ideology and Ceremony

The ideology of the peoples in the cultures under study is approachable in the archaeological record only through its material manifestations. Most of these manifestations are traditionally called ceremonial by archaeologists—probably a fair appellation, but rather uninformative, since in modern Pueblo societies religion pervades all aspects of life. The operation of religion has been divided into three categories by Rappaport (1971): ultimate sacred propositions, ritual, and religious experience. The ultimate sacred propositions, or dogma, as well as the religious experiences by the performance of ritual are difficult to define archaeologically. However, ritual is the socially enacted aspect of religion, and a behavior set which leaves archaeological traces.

How can we define these ritual or ceremonial aspects of culture in the Escalante Sector? One attractive approach is to identify patterns of religious behavior documented among modern Southwestern Indian groups, particularly the Pueblo peoples who are generally believed to be the living descendents of the Anasazi. Indeed, analogy with these groups suggests a long list of materials and facilities also thought to be present prehistorically in the Escalante Sector. Minimally, this list includes structures such as kivas, great kivas, and perhaps small rooms in surface structures serving as meeting places for sodalities (Dozier, 1965: 45-46). Hill (1970:23) and Smith (1952:154-65) have suggested lists of test implications for identifying kivas. Other facilities and features which can be identified as being of at least partly ritual function include plazas, pictographs, petroglyphs, sipapus, tri-wall structures, and both human and animal burials. Individual artifacts which by ethnographic analogy might be assumed to have ritual significance include quartz pebbles (lightning stones), "killed" ceramic vessels, kiva jars, grave goods, Corn-Mother Goddesses, figurines, fetishes, remains of exotic animals such as parrots, medicine bundle collections, pipes, and evidence for religious experience inducing materials such as Datura.

Question 11. Which of the groups identified in subdomain 1 can be associated with ritual functions?

Using ethnographic analogy it appears that there may be several hierarchical levels for community ritual: the household level, the lineage/clan level, the sodality level, the moiety level (in the Eastern Pueblos), and the community-wide level. The study of the consistency of ceremonial activities horizontally on any of these hierarchical levels will be of use in identifying groups and group composition.

Question 12. What are the functions of the kiva and great kiva structures? What is their distribution across the natural and cultural landscape during each phase in the Escalante Sector?

Ford (1972) has suggested that the periodic rituals of modern Pueblos serve as regulatory mechanisms to cope with erratic and unpredictable variations in the environment affecting food supply on very local levels. If true, one would expect to see evidence for the growth of such regulatory activities concomitant with the rise of agriculture as a major food source in environments where agriculture is a marginal activity.

Question 13. What role did certain sites (such as Grass Mesa, which presumably served a ceremonial role vis-a-vis the sites in the surrounding area) play in the ceremonial integration of the
locality? Can localities be differentiated from each other synchronically on the basis of different styles of ceremonial activity in each? Or do all participate in a larger, common pattern? What role do the other site types in each locality play in the ceremonial activity of the locality?

Question 14. What environmental variables correspond to the area of ceremonial influence of each of the major sites?

In a sector where the localities are environmentally distinct from each other, a certain economic specialization might be anticipated. If these localities also correspond to units of ceremonial identity, it might be suggested that one function of the community structures is interlocality movement of materials.

Question 15. What is the relationship between political leadership and ceremonial leadership?

It is generally agreed that one frequent path to the increasing centralization of power seen in "Big Man" and chiefdom-level societies is the personification of both kinds of power in one individual. Did this happen in the Escalante Sector? If not, why not?

PROBLEM DOMAIN 4: EXTRAREGIONAL RELATIONSHIPS

General Logic

Given that nearly all human societies, whether based on hunting and gathering economies or complex industrial technologies, have a culturally structured way of interaction with "foreigners," how is this operational in the study area? Given both the area's neighbors and a broader sphere of Mesoamerican influence, with whom did the Dolores people interact? By what mechanisms (e.g., political domination, population migration, economic interchange (perhaps including spouse exchange)) did they interact, and how intensively? How were these interactions integrated into broader areawide social, economic, political, and/or ideological systems in any one temporal unit? Why was one mechanism used rather than another, one group dealt with more extensively than another?

There is an initial problem of defining the sociopolitical units of interaction here. Because the interactions within the Dolores Project area, particularly within the Escalante Sector, are dealt with in Problem Domain 3, analysis will focus on the interactions external to the Escalante Sector, with neighbors or distant social entities who are foreign to Escalante.

In order to define the presence of "foreign" or "exotic" data within the project area, assuming that data reflect patterns of foreign interaction that can be delineated on the basis of archaeological information, the ethnographic and social science literature must first be searched to develop hypothetical models of such interaction mechanisms. Test implications of each of these models—the artifactual and contextual data and patterning that are associated with each mechanism—should then be outlined from the literature. Finally, the Dolores data should be searched to define the presence or absence of similar data—to test the presence or absence of evidence of similar mechanisms operative in the Dolores data, within any one temporal unit. So that the relationship of Dolores people to external communities can be understood, the archaeological records from those communities also need to be searched for data that are of Dolores origin—foreign to those foreigners—and then both the external and internal information used as the ultimate basis for evaluating the mechanisms of Dolores interactions. Finally, the systemic organization of these mechanisms within the Dolores sociopolitical structure needs to be evaluated, and the intensities of interaction with any one neighbor, or distant contact, in order to fully understand extraregional interactions of the Dolores communities.

Question 1. Based on the definition of exotic items and expectations of Dolores assemblages, what specific items or features found in the project data may be identified as "exotic?" What items reflect exotic "ideas" applied to local materials?

Question 2. Based on the literature (especially ethnographic, or other social sciences), what mechanisms for extraregional relationships can be used as models for investigating the project area relationships with neighbors and distant contacts?

a. War, political domination?

b. Population migration in or out of the region, resulting in continuities of relationships?

c. Economic exchange, which may or may not include exchange of spouses?

d. Diffusion of ideas?

Question 3. For each of these models, outline specific ar- tifactual/architectural/contextual data that would be expected to be left as archaeological residues if the modeled mechanism had been used by the archaeological population.

a. What is a general definition of "exotic" materials?

b. Given the models of Southwestern ethnography and archaeology, what specific "exotics" could be expected to occur in the project area archaeological data?
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- ceramic assemblage (materials, designs, technologies)
- lithic assemblage (materials, designs, technologies)
- bone tools, unworked bone remains
- vegetal tools, unworked vegetal remains
- architectural techniques
- architectural layouts

Question 4. Based on the definition of exotic items, and modeled expectations and/or experience with the occurrence of these in general southwestern cultures (past and present), identify items of project area origin that occur in neighboring assemblages of the same temporal unit. Identify items of indigenous manufacture but which conform to Dolores ideas in extraregional assemblages. Identify these in Mesoamerican assemblages if possible.

Question 5. Given the occurrence of exotic items and ideas in the Dolores data, and Dolores-originated items and ideas in extraregional contexts, which of the hypothetical models of interaction mechanisms is most applicable to the Dolores population?

Question 6. Given the mechanisms of extraregional interaction used by Dolores people within any one temporal unit, how were these mechanisms integrated within the social, economic, political, and ideological systems at Dolores?

a. How were the various mechanisms used in varying degree with different populations?
b. Did extraregional interactions provide significant input to the economic organization of the Dolores people?
c. Did extraregional interactions provide significant input to the social organization of the Dolores people, e.g., by providing broader kinship networks?
d. Did extraregional interactions result in significant political interaction of Dolores and other groups?

Given that these questions can be answered, the question becomes one of why such patterns developed and were used. These “why” questions must in turn be based on models of interacting mechanisms and their benefits/costs, and an application of those models to the Dolores data. This is more a function of Problem Domain 5, cultural variation over time, since mechanisms are probably used for their adaptive value and can hence be best judged in a diachronic view of adaptation.

**PROBLEM DOMAIN 5: CULTURAL PROCESS**

**General Logic**

Given the diachronic framework of assigned cultural periods and calendar dates for the Dolores archaeological data, what patterns of diachronic archaeological variation/identity occur at Dolores? How does this time-sensitive patterning reflect cultural process, including both change and stability? Based on extant scientific models of cultural process (based on environmental, demographic, and inter- and intra-group social systems), and developing further models of the archaeological manifestations that might be expected for these various models, how can we best explain why the Dolores cultural systems developed or were maintained over time? Given our identification of periods of change in the cultural systems reflected in the archaeological record, how can we best explain these at Dolores? Based on the Dolores analysis, what general implications can be drawn for explaining how and why human domestication of food resources has developed.

**Question 1.** How do the project area data, in the bivariant framework of both calendar dates (from dendrochronology, archaeomagnetism, radiocarbon and artifact seriation) and assigned periods (e.g., Basketmaker II, Escalante Sector phase scheme) vary over time?

a. Identify both variability or difference and sameness or stability in attributes over time.
b. Look at specific attributes (Rouse's [1960] time-sensitive "modes") such as ceramic paint type, attribute clusters (as they define ceramic types, for instance, of project paint styles), and inferred behavioral systems (e.g., maize domestication).
c. Look at all four problem domains. Identifying what you are looking at is in large measure a strategic function of the test implications of your hypothetical models of cultural process (see Question 3).

**Question 2.** What patterns of cultural stability and change can be inferred to have occurred in the project area? (This is a what/how question, not a why.)
a. Did changes in economic strategy occur?

b. Were there changes in settlement pattern? In inferred demographic and social structural patterns?

c. In extraregional interactions?

d. In the interaction of all these inferred cultural patterns?

Question 3. Why did these patterns occur in the project area's prehistory?

a. Identify hypothetical models explaining cultural variability, based on the literature. Offer multiple models, looking at various aspects of ecology, demography, social organization, and foreign intervention.

b. Develop test indications of the expected archaeological manifestations of the theoretical explanatory models.

c. Array the project area archaeological data and inferences against 3b, to identify most appropriate theoretical explanations of the Dolores variations; if none fit, suggest why not.

d. Look at stability and change in explaining adaptive strategies and human-environment interactions.

e. Propose and conduct additional studies to further explain or qualify the results of 3c.

Question 4. Based on analysis of the Dolores data, what can be inferred about the role of domestication in general human cultural systems?

a. Why were domesticates introduced and accepted in the project area?

b. What shifts or accommodations to other cultural systems were made in response to the introduction of domesticates?

c. What was the long-term effect of domesticates on Anasazi culture?

d. What conclusions can be drawn on the role of domesticates in cultural evolution based on the project material?

Question 5. How can population movement, growth, and decline within the Escalante Sector be accounted for?

a. What environmental factors might be involved?

(1) What data from ethnographic/historical records might apply to this situation?

(2) What evidence is there for environmental variability during the prehistoric period (drought, soil exhaustion, temperature variability, epidemics in human and resource populations, resource depletion)? What techniques can be employed to estimate variability? (Tentatively, a simulation of population growth and decline may be useful. Also, specific studies directed at explaining why the Anasazi moved out of the area are contemplated.)

b. What social factors might be involved?

(1) What are applications from the ethnographic/historical records?

(2) Is there evidence for cultural stress (violence, defensive mechanisms, changing subsistence strategies)?
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Chapter 3

THE SAGEHEN FLATS ARCHAEOLOGICAL LOCALITY
ABSTRACT

The Sagehen Flats Locality is a spatial division of the Escalante Sector located in southwest Colorado about 6 km northwest of the town of Dolores. Containing primarily lowland areas west of the Dolores River, the locality has been the scene of human habitation for thousands of years. The first well-documented occupation dates to the Great Cut Phase of the Archaic Tradition, or from 2000 B.C. to A.D. 500. During this period the prehistoric inhabitants utilized seasonal sites situated along the perimeter of the Sagehen Marsh and subsisted primarily on wild foods. During the subsequent Anasazi Tradition (A.D. 600-1200), the locality served as the home territory of several farming communities whose members lived first in dispersed farmsteads and then in aggregated villages. A prehistoric population maximum in the locality occurred about A.D. 875. A rapid decline then followed and the area was virtually abandoned by the Anasazi as a setting for permanent settlement by A.D. 975. The locality was reoccupied during the Shoshonean-Athabascan Tradition (A.D. 1500-1800) and served as a hunting and gathering province. Modern Euro-American settlement began in the area in the late 1800's.
CHAPTER 3
THE SAGEHEN FLATS ARCHAEOLOGICAL LOCALITY

By Allen E. Kane

INTRODUCTION

The Sagehen Flats Locality is one of 16 such divisions currently identified in the Escalante Sector of the Yellowjacket District. The locality incorporates the flat lowland area west of the former townsite of McPhee known as Sagehen Flats, a fringe area of low loess-covered hills, and the Dolores River valley to the east. The total area included within the locality is about 1050 ha (fig. 3.1). As originally conceived, the boundaries of the Sagehen Flats Locality were drawn to reflect two phenomena: first, a lowland resources area including the river bottoms and the marshy area known as Sagehen Flats and its fringes, and second, the extent of the local maximum subsistence-settlement unit during the McPhee Phase. This latter area would correspond to the extent of social and perhaps ceremonial influence exerted by McPhee Village during its population maximum. The present boundaries of the locality may undergo modification as more is learned about local settlement patterns and cultural processes. This chapter is a presentation of the natural setting and prehistory of the locality, followed by a discussion of the prehistoric settlement system in terms of economy and society.

NATURAL SETTING

In a topographic sense, the Sagehen Flats Locality presents a marked contrast to the canyon and plateau terrain common in nearby areas. The locality is typified by low, flat bottomlands and wetlands surrounded by rolling hills; low cliffs are found along the Dolores River valley. The Sagehen Flats area itself is probably the result of prehistoric geological processes. Specifically, the flats area represents the southern extremity of the downthrust northern block along the House Creek Fault (Crandall, 1977). Elevations in the locality range from 2075 m in the eastern portion along the Dolores River to 2135 m on the crests of the low hills surrounding the Sagehen “marsh.” Vertical relief in the locality is most extreme along the cliffs bordering the Dolores River valley and along the House Creek Fault, but even in these areas it is moderate when compared to other localities in the Escalante Sector. The height of the cliff zone to the north of McPhee Village is approximately 40 m from the bottom of the talus slope to the top of the canyon rimrock.

Surface soils in the locality were formed during the Tertiary and Quaternary Periods, while exposed bedrocks are of the Jurassic and Cretaceous Periods. A north-south
The geological cross section of the locality is presented as figure 3.2. The southern boundary of the study area is formed by the uplift of the House Creek Fault with the upthrown southern block lifted 100 m over the northern block (Crandall, 1977:26). Exposed strata in the southern block include (from bottom to top) the Morrison-Summmerville Formation (230 m thick, Jurassic Period); Burro Canyon Formation (20 m thick, Cretaceous Period); and the Dakota Formation (30 m thick, Cretaceous Period). From 3 to 6 m of Quaternary/Recent age cobbles and gravels cover the Dakota Formation (Crandall, 1977:35). The fault zone itself consists of crushed and brecciated debris of Mancos Shale and may exceed 200 m in thickness. To the north of the fault, the bedrock units comprising the bedrock stratigraphy consist of Dakota Sandstone, Mancos Shale, and aeolian and alluvial/residual clay soils. Dakota Sandstone outcrops occur in cliffs along the river valley and in eroded areas north of the Sagehen Marsh. The Mancos Shales are exposed on eroded hillocks north of the marsh and along the fault line. Aeolian and colluvial soils cover most of the rolling hillocks and ridges to the north of the marsh. The aeolian deposits seem to be quite similar to the Mesa Verde loess (described by Arrhenius and Bonatti, 1965) and may have derived from the same source. Residual clay soils are found in the western extremity of the locality in the vicinity of the Great Cut. Quaternary alluvial soils are located in the Dolores River valley in the eastern part of the locality, both on Pleistocene age terraces along the sides of the canyon and in the valley bottomlands.

The ground water system in the Sagehen Flats Locality is unconfined flow (Arrhenius and Bonatti, 1965:26). The recharge-discharge regime is localized and interconnected with Main Canal No. 2 of the Montezuma Valley Irrigation Company system, the Sagehen Marsh, and the Dolores River.

Lands suitable for cultivation are located on the margins of the Sagehen Marsh, on the hills and ridges in the northern upland portion of the locality, and in the river valley. The total area available for cultivation is about 600 ha; 215 ha of this total (35.8 percent) is river terrace or bottomlands and 385 ha (64.2 percent) is an area with aeolian or alluvial soils west of the river valley. At present, there are no data bearing on prehistoric preferences for either of these potential agricultural zones. Settlement pattern analysis indicates that both zones were being used as farming areas during the Sagehen (A.D. 650-850) and McPhee (A.D. 850-975) Phases of the Anasazi Tradition.

The locality is part of a larger climatic province classified as a cold, middle-latitude, semi-arid type according to Koppen (Trewartha, 1954:225). The area is characterized by a bimodal pattern of precipitation, most of which results from summer thunderstorms or winter snows. July, August, and October are the wettest months; May, June, and November the driest (based on National Weather Service records from stations in Montezuma County for the years 1964-75). Climatic data for four weather stations within a 50-km radius of the Sagehen Flats Locality are presented in Table 3.1. A significant conclusion to be drawn from the data is that local elevation has a major effect on prehistoric preferences for either of these potential agricultural zones.

Table 3.1 Climatic data from the National Weather Service stations in the vicinity of the Sagehen Flats Locality

<table>
<thead>
<tr>
<th>Station</th>
<th>El. (m)</th>
<th>Latitude</th>
<th>Annual precip. (mm)</th>
<th>July mean temp. (°C)</th>
<th>Jan. mean temp. (°C)</th>
<th>Consecutive frost-free days (mean)</th>
<th>Frost-free days, standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolores²</td>
<td>2118</td>
<td>37°28'N</td>
<td>460.5</td>
<td>19.7*</td>
<td>-3.1*</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Yellowjacket¹</td>
<td>2090</td>
<td>37°33'N</td>
<td>376.4</td>
<td>21.2</td>
<td>-4.2</td>
<td>124</td>
<td>17.92</td>
</tr>
<tr>
<td>Cortez¹</td>
<td>1882</td>
<td>37°21'N</td>
<td>308.9</td>
<td>22.2</td>
<td>-2.8</td>
<td>128</td>
<td>12.42</td>
</tr>
<tr>
<td>Hovenweep¹</td>
<td>1646</td>
<td>37°23'N</td>
<td>288.8</td>
<td>24.6</td>
<td>-3.7</td>
<td>147</td>
<td>17.42</td>
</tr>
</tbody>
</table>

*For period 1908-1928.
**Not available.
¹The Dolores station is located 6.4 km southwest of the locality.
²The Yellowjacket station is located 13.7 km west of the locality.
³The Cortez station is located 17.8 km south of the locality.
⁴The Hovenweep station is located 47.7 km southwest of the locality.
climatic variables; for example, groups farming in the Yellowjacket and Dolores areas would benefit from greater precipitation because of relative elevations, but their crops would be subject to lower annual temperatures and a shorter growing season. Modern vegetation cover is illustrated in figures 3.3 and 3.4.

Figure 3.3 Modern vegetation types and topography in Sagehen Flats Locality. Sagehen Marsh is in foreground.

Figure 3.4 Modern land use and topography in Sagehen Flats Locality. McPhee Village is in right center.

Growing season is considered to be a particularly critical environmental variable affecting Anasazi farming practices in the project area. Hack (1942:20) has described Hopi maize cultivation in his comprehensive ethnographic treatment of these people and their environment. On the average, a period of 130 days separates the main Hopi planting period in the spring and the harvest in September. Generally, the planting occurs after the last spring freeze, while the harvest often occurs after the first freeze in the autumn. Most of the Hopi Reservation in northeastern Arizona has a frost-free period of 120 to 150 days (Hack, 1942:8), which in most years would be ample time for the growing of a mature crop. Extrapolations from the regional weather data available indicate the Sagehen Flats Locality probably averages about 120 to 125 frost-free days plus or minus about 20 days. Thus, the usual frost-free period is 100 to 145 days, significantly shorter than that of the Hopi lands. It is assumed that the local Anasazi farmers were probably employing methods suited to the Sagehen environment, such as the use of more hardy strains of maize or the planting of several strains as a buffer against microclimatic fluctuations. Still, it appears that crop failures may have been frequent and that a small climatic shift toward cold temperatures may have rendered the locality unsuitable for agriculture.

The Sagehen Flats Locality is characterized by disturbed, transitional vegetation zones. Approximately 90 percent of the river valley itself is now under cultivation or has been farmed in the recent past. In addition, a major portion of this part of the locality was the site of a timber processing town, McPhee (Baker and Smith, 1978), in the 1930’s and 1940’s. Hence, there are very few areas containing undisturbed vegetation in the river valley. Some strips along the river channel in the northern portion of the locality may contain vegetation stands that come close to replicating prehistoric conditions.

The flats and upland areas west of the river also have a history of recent disturbance. Perhaps 50 percent of the locality north of Road X (or an elevation greater than 2120 m) is currently cultivated; the remainder is apparently undisturbed. Common vegetation zones in this area are pinyon-juniper woodland, oak scrubland, and sagebrush scrubland. South of Road X (elevations less than 2120 m) the vegetation cover is typically rabbitbrush (*Chrysothamnus nauseosus*), snakeweed (*Gutierrezia sarothrae*), and big sagebrush (*Artemisia tridentata*) scrubland in the eastern portion of the area and sage scrubland and pinyon-juniper woodland in the western portion. Many of the plant communities contain a high percentage of weedy species which are indicative of the modern disturbance of the Sagehen Flats area. The flats have probably been used for cultivation or pasturage on a more or less regular basis since the early 1900’s.

In the center of the flats is a marshy area with a fair expanse of open water. The fringes of the marsh support a luxurious growth of wetlands vegetation including cattail (*Typha latifolia*), willow (*Salix* sp.) and bulrush (*Scirpus acutus*). The area would have provided a rich resource base for prehistoric groups practicing foraging if it were a marsh then, but it is questionable whether the wetlands were a permanent phenomenon. Analysis of core samples collected from the marsh by Petersen indicates that the marsh is transitory in nature, and that the area has experienced several prolonged periods of desiccation in the past. The present robust condition of the marsh may be the result of ground water flow from the Main Canal No. 2 of the Montezuma Valley Irrigation Company system. The

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1 Dr. Kenneth Lee Petersen, Dept. of Anthropology, Washington State University, Pullman, personal communication.
modern marsh, therefore, may not reflect prehistoric conditions. During prehistoric periods, the wetland area may have been intermittent in nature and probably smaller in area, or nonexistent.

A partial listing of exploitable plants probably available to the prehistoric inhabitants of the Sagehen Flats Locality is presented below. The plants are included in the vegetation community in which they are most commonly found (table 3.2).

Table 3.2 Economic plants identified in the Sagehen Flats Locality

1. Riparian community (in bottomlands along Dolores River, eastern portion of locality).
   - Fremont cottonwood (*Populus fremontii*)
   - Box elder (*Acer negundo*)
   - Willow (*Salix* sp.)
   - chokecherry (*Prunus virginiana*)
   - Hackberry (*Celtis reticulata*)
   - Wild rose (*Rosa woodsii*)

2. Wetlands community (along fringes of marsh, west central part of locality).
   - Bulrush (*Scirpus acutus*)
   - Cattail (*Typha latifolia*)
   - Reed (*Phragmites communis*)

3. Big sagebrush community (in disturbed area, Sagehen Flats, on higher exposed slopes).
   - Big sagebrush (*Artemisia tridentata*)
   - Rabbitbrush (*Chrysothamnus nauseosus*)
   - Sunflower (*Helianthus petiolaris*), in disturbed habitats
   - Indian ricegrass (*Oryzopsis hymenoides*)

4. Pinyon-juniper woodland/oak scrub (on shelter or north slopes, oak scrub at higher elevations. Many of the plants listed are found in cliff zones or on comparatively open talus slopes).
   - Pinyon pine (*Pinus edulis*)
   - Juniper (*Juniperus osteosperma*)
   - Gambel oak (*Quercus gambelii*)
   - Serviceberry (*Amelanchier utahensis*)
   - Gooseberry (*Ribes cynosbat*)
   - Currant (*Ribes aureum*)
   - Broad-leaved yerca (*Yucca baccata*)
   - Pricklypear (*Opuntia* sp.)
   - Sego lily (*Calochortus nuttallii*)
   - Wild onion (*Allium* sp.)
   - Peppergrass (*Lepidium campestre*)
   - Squawbrush (*Rhus trilobata*)

Besides economic plants, the various vegetation communities of the Sagehen Flats Locality also support many animals which would have been useful to prehistoric peoples. The riparian and marsh communities are good habitat for such mammal species as muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), and raccoon (*Procyon lotor*). Avifauna, including many duck and goose species, passerines, herons, and cranes, are also common to these wetland environments. The prehistoric inhabitants may also have exploited animal resources living in the river or marsh pool, such as native fish (a fish vertebra was recovered from McPhee Pueblo) and crawfish (*Cambarus affinis*).

The evidence for the presence of exploitable avifauna is more indirect. Certainly, the name "Sagehen Flats" is suggestive, but sagehens or grouse were not observed in the locality during 1978. Preliminary analyses of faunal remains from Little House and McPhee Pueblo have resulted in the identification of grouse and turkey. The grouse remains have not yet been identified to species because of lack of comparative material and it is unclear whether the turkey remains represent domestic or wild forms. In the latter case, however, it appears that the remains may be those of wild individuals as domesticated forms were probably introduced into the Four Corners area after the main Anasazi occupation in the Escalante Sector.

The Sagehen Flats Locality has been characterized by highly disturbed conditions since the appearance of modern Euro-American settlers. Therefore, it is difficult to describe the prehistoric environment available to the Anasazi at the time they moved into the area. The Sagehen Flats area itself, in the center of the locality and Dolores River flood plain, appears to have been particularly affected by modern modifications. The previous description

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*Steven D. Emshie, Center for Western Studies, Flagstaff, Arizona, personal communication.*
is meant only to serve as a rough estimate of prehistoric conditions. A more thorough reconstruction awaits the implementation of more thorough testing and sampling programs.

**PREHISTORY**

The first clear evidence for human presence in the Sagehen Flats Locality apparently dates to the Archaic Tradition (the Great Cut Phase in the chronological scheme developed for project researchers). However, there are a few indications that prehistoric peoples may have been acquainted with the area even earlier. One such indication of an earlier occupation is an isolated base fragment of a Plano-type projectile point recovered from the northwestern portion of the locality.¹

The nature and extent, if any, of the Plano occupation is presently conjectural. More evidence is available for the succeeding local manifestations of the Archaic and Anasazi Traditions. Separate discussions of the cultural periods within these traditions follow.

**The Great Cut Phase**

(2000 B.C.—A.D. 500)

Archaeological survey crews have recorded 13 sites in the locality that have been assigned a Great Cut Phase occupation (fig. 3.5). They are assumed to represent occupations by the theoretical North Marsh Band, the local late Archaic community. The sites have been placed in a functional category based on visible characteristics; six are classified as seasonal camps and four are limited activity loci. One of the seasonal camps, Sheep Skull Camp (Site 5MT2202), was investigated by intensive excavation techniques during the 1978 field season. Unfortunately, no features were discovered during excavation, probably due to destruction of the original surface of the site by erosion. (For a presentation of the archaeology of Site 5MT2202, refer to chapter 4 of this volume). An Archaic component is also present at Marshview Hamlet (Site 5MT2235, [Busvard, 1980]), but has not yet been investigated. Thus, very little is known regarding the Archaic occupation in the locality except site location. A pressing need before further investigation of the Great Cut Phase is the establishment of a chronology, perhaps based upon projectile point typologies or radiocarbon dating of suitable remains.

**The Sagehen Phase**

(A.D. 650-850)

To date, no sites have been recorded in the locality that might yield information on the transition between the Archaic and Anasazi Traditions. The earliest known Anasazi site in the locality is Sagehen Hamlet which dates to the last half of the seventh century A.D. and, hence, is well into the Anasazi period. The potential for evaluating the nature of the transition based on evidence from the Sagehen Flats Locality does not appear promising at present and awaits further research.

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¹Douglas Dykeman, DAP, Dolores, Colorado, personal communication.
represents habitations used by the West Sagehen Neighborhood, a Sagehen Phase dispersed community. This community apparently consisted of small family groups living in isolated farmsteads and practicing a mixed horticulture and hunting and gathering subsistence strategy.

Tree-ring dates from construction wood recovered from McPhee Pueblo indicate the two major elements at this large habitation occurred during the last two decades of the ninth century A.D. and between A.D. 900 and 940. (For more detailed narratives of Site 5MT2191 and McPhee Pueblo, refer to chapter 6 of this volume and Brisbin [1980].) Again, the population appears to have been relying on farming as a primary subsistence strategy backed up by hunting and gathering.

The Sundial Phase

(A.D. 1050-1200)

During the 10th century A.D., population levels in the locality were in rapid decline. Only a sparse population was present during the period succeeding the McPhee Phase, the Sundial Phase (late Pueblo II-early Pueblo III, A.D. 1050-1200). Seven sites assigned to the Sundial Phase have been recorded in the locality. The summary by type is: small hamlets - 2, towers (?) - 3, limited activity loci - 2 (fig. 3.8). Marshview Hamlet (Site 5MT2235), a small habitation, was excavated during the 1978 season to recover data regarding this cultural period. This site was occupied by a household unit of the North Peripheral
RESOURCES, ADAPTATIONS, AND SETTLEMENT PATTERNS

The Sagehen Flats Locality exhibits a rich variety of natural resources which probably would also have been available to the prehistoric inhabitants. The locality contains a variety of plant communities and ecosystems, including marshlands, riparian communities, cliff zones, and woodlands. The variety and productivity of this area may have allowed prehistoric populations to support themselves primarily on local resources. The woodlands in the area north of Sagehen Flats would have provided ample firewood and construction material for houses. Lenses of cherts and other materials suitable for manufacture of flaked stone tools are found in the Burro Canyon and Morrison-Summerville Formations which outcrop along the House Creek Fault. Dakota Sandstone, an excellent raw material for masonry blocks and ground stone tools, is also plentiful in the locality.

The most important resource for a subsistence strategy based on horticulture or agriculture, as practiced by the Anasazi, is arable land and soils. Approximately 600 ha of arable land are available for farming in the locality, 215 ha located in the river valley itself and 385 ha in the Sagehen Flats vicinity and in the peripheral upland area.

Kirkby (1973) has presented figures on prehistoric maize yields in Mesoamerica based on data from the Tehuacan Valley. Her work is not directly applicable to the American Southwest because of the utilization of different races of maize and other cultural factors. The maize collection from the DAP's 1978 field season did not contain enough cobs to establish the physical characteristics of the local population. Estimated yields based on extrapolations from other analyses of this sort from southwest Colorado (Valdez, 1978; Cutler and Meyer, 1965) are 0.3+ metric tons annually per hectare for the Sagehen Phase and 0.4 metric tons per hectare for the McPhee Phase. Assuming one crop per year, the potential total annual harvest yield for the Sagehen Flats Locality was 210 metric tons of maize during the Sagehen Phase and 240 tons during the McPhee Phase. According to Flannery's (1972:93) estimates for the Mesoamerican Formative, these yields would be sufficient to support between 210 and 240 households, a much higher figure than is currently estimated for any prehistoric occupation in the locality. Of course, such figures assume that environmental factors permitting a harvest were present. Among limiting factors affecting local agricultural productivity are soil fertility, effective moisture, and growing season. One or more of these factors may have affected Anasazi farming productivity and methods during their occupation of the locality.
FIELD INVESTIGATIONS AND ANALYSIS—1978

From the general literature pertaining to prehistoric southwestern cultures, it is assumed that the local Archaic-Anasazi populations were pursuing varying subsistence strategies, and that these are reflected by settlement patterns and material remains. Culture is a systemic phenomenon and reacts with changes in the environmental system, which is often unstable. A discussion of settlement pattern/subsistence strategy relationships follows for such cultural periods defined in the Sagehen Locality as part of the Anasazi Tradition. In addition, the nature of Archaic adaptations are also presented, since they influenced later Anasazi patterns.

The Great Cut Phase

A small, probably seasonal population of Archaic peoples was present in the locality, based on analysis of archaeological survey data. These early groups were probably performing a variety of economic and social activities in the local area. Their lifestyle is believed to have been a rather simple one (chapter 1) and was oriented around the seasonal exploitation of truly wild, and/or encouraged wild, resources. These peoples probably lived in small social groups or bands which were very mobile within a defined territory, harvesting plants and animals when they were available in local areas. The North Marsh Band is the formal project appellation assigned to the Archaic group that occupied the Sagehen Flats and northern upland portions of the locality.

An examination of the characteristics of the Archaic sites in the Sagehen Flats Locality reveals the utilization of a simple settlement system. Only two site types are recognizable from the record—seasonal camps and limited activity loci. The criteria for this division are site size, quantity of material remains, and topographical aspect. Large sites with a fair quantity of artifacts and a good view over the surrounding terrain are interpreted as camps, and are assumed to be components of a seasonal round. Small sites with limited artifacts located in diverse topographical situations are assumed to be limited activity loci.

As components of a seasonal round where the population arrives in a certain area at a certain time to harvest available resources, seasonal camps would be located in close proximity to such resources. One of the more obvious areas that might be expected to yield exploitable plants and game is the bottomland in Sagehen Flats, currently a marsh with a variety of economic plant types and good cover for game. The environmental characteristics of the flats may have been different during the prehistoric period; the bottomland is a natural drainage basin.

A scrutiny of Great Cut Phase camp locations (fig. 3.5) suggests that they are clustered in the perimeter around the flats. To lend rigor to this impression, a simple test was devised. First, the distances from known Great Cut Phase camps to the marsh were calculated and an average taken (table 3.3); this value is 603 m.

<table>
<thead>
<tr>
<th>Site</th>
<th>Distance (m)</th>
<th>Direction (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5MT2199</td>
<td>360</td>
<td>170</td>
</tr>
<tr>
<td>5MT2202</td>
<td>260</td>
<td>180</td>
</tr>
<tr>
<td>5MT2242</td>
<td>300</td>
<td>190</td>
</tr>
<tr>
<td>5MT2220</td>
<td>1400</td>
<td>240</td>
</tr>
<tr>
<td>5MT2243</td>
<td>400</td>
<td>260</td>
</tr>
<tr>
<td>5MT2244</td>
<td>900</td>
<td>30</td>
</tr>
</tbody>
</table>

Average distance from marsh: 603 m;
Standard deviation: 455 m

Next, 25 random locations within the locality were designated, using a table of random units, and the average distance from these locations to the marsh calculated. The average for random locations was 905 m (standard deviation of 592 m). Thus, there is good evidence for clustering of Archaic camps around the marsh, which implies exploitation of wetland resources by the local peoples. It also should be noted that eight additional camps within 2 km of the marsh have been recorded outside of the locality boundaries.

The Sagehen Phase

By A.D. 650, social groups in the Sagehen Flats Locality had apparently abandoned the traditional hunting and gathering lifestyles and were depending on horticulture for a major portion of their foodstuffs. Local Sagehen Phase subsistence patterns and material cultures are seen as being similar to the general pattern observed for Basketmaker III and Early Pueblo I cultures (chapter 1, this volume). The typical simple settlement pattern, containing two site types, hamlets and limited activity loci, is present.

An examination of the map depicting West Sagehen Neighborhood habitations for this period (fig. 3.6) gives the impression of somewhat even spacing of hamlets over the loess-covered hillocks and colluvial flats north of the central marsh area. For these early farmers, arable land was probably the most critical criterion for site location. A review of site locations and inventory form descriptions for specific sites reveals that all Sagehen Phase hamlets in the locality are located in arable soil areas (arable soil areas in this case being defined as at least 0.25 ha of soils judged to be of adequate depth for cultivation and of aeolian or colluvial derivation).

The habitation sites, therefore, are clustered on the arable land areas for the locality (57.1 percent of the total area). To test the impression of uniform spacing of hamlets in the
locality, spatial distributions were analyzed using the nearest neighbor statistic. As originally described by Clark and Evans (1954), the nearest neighbor statistic is a measure of spacing; the statistic itself expresses departure from a random condition. A formula, \( R = \frac{\bar{d}A}{\bar{d}E} \), is used to calculate deviation from randomness. In the formula, \( R \) is the ratio of the mean distance observed (\( \bar{d}A \)) to the mean distance expected (\( \bar{d}E \)). The factor \( \bar{d}E \) is derived from the Poisson distribution and is determined by site density in the area to be tested. Mean expected distance is calculated using the formula, \( \bar{d}E = \frac{1}{2\sqrt{\rho}} \), where \( \rho \) is the site density.

For the test, a 100-ha area with high habitation density was chosen. This study area is located in the western portion of the locality north of the Sagehen Marsh and represents part of the area occupied by the West Sagehen Neighborhood (fig. 3.6). For this analysis it was assumed that all hamlets in the study area were effectively contemporaneous, or were members of the same momentary population (see section on population parameters). This assumption is probably erroneous in a real sense, but not in a social context. In other words, even though many of the hamlets may have been unoccupied at one time, they may have been treated as viable entities and their social territories respected by other local settlers. The area contains 13 sites that have been classified as Sagehen Phase hamlets; the average distance (\( \bar{d}A \)) to the nearest neighbor is 0.1767 km. The site density in the study area is 13/km\(^2\); therefore, \( \bar{d}E = \frac{1}{2\sqrt{\rho}} = 0.1387 \). The nearest neighbor statistic, \( R \), is then calculated to be 0.1767/0.1387, or 1.273. To interpret this figure it is noted that an "\( R \)" of 1 indicates a randomly distributed population, results of between 0 and 1 indicates clustering, and those between 1 and 2.149 indicate even spacing. The nearest neighbor statistic for the hamlets in the study area therefore indicates some movement toward even spacing. A possible interpretation of this phenomenon is competition among households for farmland. The Sagehen Phase settlement pattern might be similar to that described for the Late Formative cultures of the East Texcoco region described by Earle:

Village locations were strongly influenced by the dominance of the Lower Piedmont, especially above 2300 m. Sites are "clustered" in this zone relative to the area as a whole, yet within the zone, they become regularly spaced by competition (1976:206).

In other words, Earle observed that on a large scale, sites were clustered in areas containing important resources (in the case of the Sagehen Flats Locality, arable lands), but within these areas the sites tended to be regularly spaced.

The McPhee Phase

Early in the ninth century A.D., a significant shift in settlement patterns was demonstrated within the Sagehen Flats Locality. The many small farmsteads distributed evenly over the arable flats and uplands were abandoned. The local population moved to larger hamlets and villages containing as many as 20 households. This trend toward centralization marks the beginning of a new cultural period, the McPhee Phase (A.D. 850-975). A comparison of the site descriptions for the McPhee and Sagehen Phases reveals that more site types (four vs. two) have been identified for the McPhee Phase occupation. This greater variety is believed to reflect a more complex economic and social system during this period. Rather than practicing a simple horticultural/hunting and gathering economy with farming plots adjacent to the farmstead, the McPhee population had adopted a central habitation/field house system where large agricultural fields are located up to 3 or 4 km away from the main living area. Thus, the field houses and most of the limited activity loci so far identified in the Sagehen Flats Locality (fig. 3.7) are believed to have been utilized by peoples living at McPhee Village.

On a larger scale, it is a possibility that McPhee Village and the other McPhee Phase sites in the Sagehen Flats Locality form a component of a larger sector-wide settlement pattern. Such a conceptual model would include McPhee Village, House Creek Village, and May Mesa Village (fig. 3.9) as central nodes in this larger system. These three large habitations form a triangular distribution with approximately equal distances between the apexes. By applying Thiessen polygon construction, tentative territories

![Figure 3.9 McPhee Phase villages in the Escalante Sector. Thiessen polygons are employed to approximate village territories.](image-url)
for each village can be estimated. The distribution of large hamlets around McPhee can be regarded as components in a polygonal network surrounding McPhee (fig. 3.10). Such patterns may be integral parts of central place systems (Losch, 1954; Johnson, 1972; Haggett, 1966; Haggett et al., 1977). Note that there are no western or southwestern components of the polygon system. Since the central place model for the Escalante Sector is confined to the margins of the Dolores River valley, the settlements may not be "packed" in this direction (i.e., the area 4 to 5 km west and southwest of McPhee Village may represent a frontier area that had not reached the population level necessary for a central place pattern).

The Sundial Phase

As is generally the case for the Escalante Sector, population levels in the Sagehen Flats Locality declined drastically in the period A.D. 900-950. By A.D. 950, the locality was virtually abandoned, except perhaps for seasonal visits by hunting and gathering parties.

Archaeological survey and excavation indicate a resumption of prehistoric activity and perhaps an attempt at resettlement in the period A.D. 1050-1200. This interval has been designated the Sundial Phase and is represented by seven sites within the boundaries of the locality (fig. 3.8). Two small Sundial Phase habitations are located in areas characterized by easy access to arable land and potentially resource-rich ecological zones. (Site 5MT2223 is situated on an upland hillock close to a cliff zone and the riparian areas in the Dolores River valley; site 5MT2235 is situated on the top of a low ridge just north of the Sagehen Marsh.)

It seems a reasonable conclusion that the small social groups at these hamlets (habitation units of the North Peripheral Neighborhood) were practicing horticulture on small plots within a short distance of the dwelling and were also exploiting nearby wild resources.

The so-called Sundial Phase "towers" (Site 5MT2206, Site 5MT2230, and Site 5MT2241) present a more difficult interpretive problem. These towers consist of mounds of block sandstone rubble, often in the form of a ring. The masonry rings are approximately 6 to 8 m in diameter and the interiors of the towers measure about 4 to 5 m across. These edifices are always located on prominent points or ridge tops with a commanding view of the surrounding terrain. Their function must remain conjectural for the present, although their salient location is notable. Intuitively, the locations of these sites appear to form a regular pattern, and therefore, may be construed as a network. It is not a reasonable presumption that these structures were built and used primarily by the inhabitants of the coeval local hamlets, since such activities would be outside the scope of loosely organized dispersed groups. Rather, it is more logical that these sites were maintained and used by prehistoric communities based outside the locality and perhaps outside the sector as well. It may be that the use of these towers is related to the communities inhabiting Escalante Ruin and/or Reservoir Village, both located approximately 4 to 5 km southeast of the locality. Both apparently were important centers of prehistoric activity during the Sundial Phase. By A.D. 1200, the Anasazi were no longer maintaining settlements in the locality or practicing any intensive activities. The area may have been used during the 13th century as a hunting and gathering province and visited at infrequent intervals; however, evidence for these activities is slight. After the abandonment of the Four Corners area by the Anasazi, the locality was used by Shoshonean and Athabascan peoples until the arrival of Euro-American settlers.

POPULATION PARAMETERS

The Sagehen Flats Locality was the setting for a long-term prehistoric occupation, perhaps extending from 6000 B.C. until the advent of modern Euro-American settlement. During this long period, prehistoric populations used different subsistence strategies and the number of people living in the Sagehen Flats area was subject to wide fluctuation. The locality achieved a maximum level of exploitation and population during the Sagehen and McPhee phases of the Anasazi Tradition.

To better quantify this statement and to obtain figures for interlocality comparisons, population and density estimates for the locality according to cultural period have been calculated; these estimates are summarized in table 3.4.

These figures have been obtained by estimating the number of households present in the locality contemporaneously
Table 3.4 Prehistoric population estimates for the Sagehen Flats Locality

<table>
<thead>
<tr>
<th>Period</th>
<th>Time span</th>
<th>Total population</th>
<th>Density (individuals/km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paleoindian Tradition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6000 B.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Archaic Tradition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Cut Phase</td>
<td>1000 B.C.-A.D. 500</td>
<td>15-50 (seasonal)</td>
<td>1.7-5.6</td>
</tr>
<tr>
<td><strong>Anasazi Tradition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sagehen Phase</td>
<td>A.D. 650-850</td>
<td>60-75</td>
<td>6.7-8.3</td>
</tr>
<tr>
<td>McPhee Phase</td>
<td>A.D. 850-975</td>
<td>110-150</td>
<td>12.2-16.7</td>
</tr>
<tr>
<td>Sundial Phase</td>
<td>A.D. 1050-1200</td>
<td>5-10</td>
<td>0.6-1.1</td>
</tr>
<tr>
<td><strong>Shoshonean-Athabascan Tradition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaver Point Phase</td>
<td>A.D. 1400-1800</td>
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</tr>
</tbody>
</table>

Finally, a last problem area to be considered in obtaining preliminary population estimates is the concept of "momentary population" (Tolstoy and Fish, 1973; Marcus, 1976). Assignments of locality sites to phases are based primarily on lithic and ceramic assemblages and architecture. Within the Yellowjacket District, such criteria can often be used to temporally place an Anasazi site within a 50- to 100-year period, but no finer definition is possible. Within the Sagehen Flats Locality, Archaic sites at present cannot be placed in a time span finer than a few thousand years, and, while the criteria are more exacting for the Anasazi Tradition, there are ambiguities here as well. A case in point is the relationship between Sagehill and Dos Casas Hamlets. Both were assigned to the Sagehen Phase (A.D. 650-850) on the basis of survey data, but no finer temporal distinctions could be made. In fact, excavations yielded tree-ring dates and other evidence indicating that approximately 100 years separate the occupations at the two sites. Thus, even though sites may be assigned to the same cultural period on the basis of survey collections, an estimate of the momentary or truly contemporaneous population for the period may be more difficult to make.

There are major difficulties in obtaining population figures for any prehistoric occupation. In addition to the above-mentioned major problems, approximately 10 percent of the locality has not been archaeologically surveyed; thus, allowances for unsurveyed areas are incorporated into the estimates. Rough parameters can be estimated for the Sagehen Flats Locality on the basis of the available data. These are presented below according to phase, and are tabulated in table 3.4.

The Great Cut Phase
Six sites assumed to be seasonal Archaic camps are present in the Sagehen Flats Locality; perhaps one or two others.
might be recorded during future survey operations. The problem with computing population estimates for this period is twofold: (1) material evidence for reconstructing household clusters is lacking and the social complement of such clusters is unknown; and (2) there is no present method for establishing momentary populations. The sites in question are lithic scatters averaging perhaps 1 ha in area. If the assumption is made that each camp was used seasonally by one to three households, then the maximum temporary population in the locality would be on the order of 100 individuals. This seems excessive considering the size of the locality and the available resources. A more realistic estimate based on a conservative approach (a momentary population of three households occupying two of the six camps) is 15 to 50 individuals. This, of necessity, is a very subjective analysis. It is hoped that the recovery of more data during future field operations will allow a more rigorous approach.

The Sagehen Phase

There is less difficulty in recognizing household clusters representing the Sagehen Phase. However, the problem of estimating momentary populations remains. Thirty-three small hamlets are identified in the locality during this period. The great majority (90 percent) are probably unit hamlets containing one household cluster, but perhaps three (10 percent) contain two or three household clusters. For the period as a whole, then, approximately 38 households were present in the area. However, this does not address momentary population levels. Based on excavation data, it appears that the average span of occupation at a Sagehen Phase hamlet was somewhat less than 50 years; therefore, only one-third to one-quarter of the hamlets were probably contemporaneous. An accurate estimate of the maximum momentary population is probably 55 to 70 individuals representing 9 to 12 households. Assuming three additional hamlets will be identified when the remainder of the locality is archaeologically surveyed, the momentary population living in the locality during the Sagehen Phase probably averaged 60 to 75 individuals.

The McPhee Phase

Population estimates for this phase are probably more accurate than for the previous two examples. There is no difficulty in recognizing and estimating household clusters and, since only two habitations have been recorded in the locality, momentary population is also not a problem. The large hamlet, Site 5MT2318, is assumed to be socially related and therefore contemporaneous with McPhee Village. McPhee Village is estimated to contain 20 to 25 household clusters; however, probably a maximum of 15 to 20 clusters were occupied at one time (Plog, 1974). Site 5MT2322 contains four or five household clusters or three or four coeval clusters. On this basis, the maximum momentary population for the McPhee Phase is 110 to 150 individuals representing 18 to 24 households. It is assumed that no additional McPhee habitations would be discovered by future survey operations in the locality.

The Sundial Phase

Only two hamlets representing the Sundial Phase have been identified in the locality. It is assumed they are contemporaneous and that no other habitations will be recorded during anticipated future surveys. The maximum momentary population is estimated at 12 individuals representing two households.

POPULATION DYNAMICS

Prehistoric population levels in the locality were low during the Archaic Tradition and began to rise with the beginning of the Sagehen Phase of the Anasazi Tradition (fig. 3.11). A population climax was reached during the McPhee Phase (perhaps A.D. 875-900). At this point in the program it is impossible to estimate the factors which may have contributed to this phenomenon. Possible relevant variables are continued immigration into the area and little migration to other areas, favorable climate, improved subsistence methods and cultigens resulting in larger harvests, and improved social mechanisms able to better cope with more and larger groups. A rapid decline and probable exodus from the locality as part of a sector-wide phenomenon took place soon after the beginning of the 10th century A.D. By A.D. 1000, the locality was virtually deserted, but a small-scale and localized resettlement effort is featured in the ensuing Sundial Phase. By A.D. 1200, this effort had failed and the locality received only seasonal visits until the advent of Euro-American settlement.

It is notable that at no time during the Anasazi Tradition did the population levels, apparently, approach the potential annual maize harvest as calculated earlier. Indeed, the maximum number of contemporaneous households in the locality (24 households during the McPhee Phase) is less than 15 percent of the carrying capacity of the locality.
using the figures for potential maize yields, a statistic that is not expected to change significantly with the addition of future survey data. Such figures have bearing on the possible causes for the abandonment of the locality. A severe environmental change would be necessary to reduce the potential maize yields to an extent whereby a carrying-capacity overload would be a factor in the cultural collapse. A lowering of annual temperature resulting in a reduction in the length of the growing season has been mentioned in this respect. Social factors may have been a major force in the decline of the Anasazi culture in the locality and offer a promising avenue for future research.
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Chapter 4

EXCAVATIONS AT SHEEP SKULL CAMP
(SITE 5MT2202), A MULTIPLE-OCCUPATION SITE
ABSTRACT

Sheep Skull Camp (Site 5MT2202) is a prehistoric limited activity locus located in the Sagehen Flats Locality, Escalante Sector, southwestern Colorado. The site is located on a hilltop overlooking the Sagehen Marsh to the south. For purposes of intensive investigation, the site was divided into three sampling strata based on distribution of surface artifacts. Sixty-five test squares were then selected, via a stratified random sampling design, and excavated. Backhoe tests, a magnetometer survey, and blading were also conducted at the site after preliminary investigations had been completed. Results of this extensive subsurface sampling were largely negative, although one rock-outlined hearth was encountered approximately 10 to 15 cm below surface (by the blading program) and artifacts were found in loose surficial deposits in some of the test pits. There appears little likelihood that significant undisturbed subsurface deposits exist at the site.

On the basis of the differential distribution of surface artifactual material, three areas of prehistoric activity were defined, and an analysis of artifact composition suggests some differences in activities among the three areas. In general, the site appears to have functioned primarily as a resource procurement and processing locus, rather than as a habitation or storage site.
CHAPTER 4

EXCAVATIONS AT SHEEP SKULL CAMP
(SITE 5MT2202), A MULTIPLE-OCCUPATION SITE

By Sarah H. Schlanger

INTRODUCTION

Sheep Skull Camp (Site 5MT2202) in the Sagehen Flats Locality of the Escalante Sector, Montezuma County, southwestern Colorado, lies on a small knoll overlooking a marsh to the south, and rolling, loess-covered agricultural lands to the north. A surface scatter of flaked lithic debitage, tools, nonflaked lithic fragments, and sherds covered the entire top of the knoll and extended part way down the sides, especially on the south, where the slope is the longest and most gradual. The site measures 270 by 130 m (with the long axis approximately north-south) and covers an area of approximately 3.5 ha. Sheep Skull Camp is at an elevation of 2109 m in the SW1/4 of the NW1/4 of sec. 36, T38N, R16W, according to the USGS Trimble Point 7.5 Minute Series 1965 Topographic Map; its Universal Transverse Mercator coordinates are 714,429 mE, 4,154,102 mN; zone 12.

Initial survey reports described Site 5MT2202 as a possible small hamlet of Basketmaker III-Pueblo I age. The site was reclassified in 1978 as a probable multiple-component limited activity or seasonal site when a field check revealed several probable Archaic point fragments, an abundance of lithic remains, and no evidence of habitation or storage structures. Sheep Skull Camp was selected for excavation as part of the DAP (Dolores Archaeological Program) because it offered an opportunity to study a limited activity site which appeared to have been used during the Archaic occupation of the locality as well as during later periods.

Mapping, surface collection, and excavation were carried out at Site 5MT2202 between 11 July 1978 and 2 August 1978, under the supervision of Sarah Schlanger, Washington State University. A total of 443 person-days was expended in these operations with 418 in excavation only. Members of the YCC (Youth Conservation Corp) contributed 425 person-days; University of Colorado personnel, 1.5 person-days; and Washington State University employees, the remainder.

ENVIRONMENTAL SETTING

Sheep Skull camp is located on a knoll consisting of a localized outcrop of Mancos Shale overlain by a thin mixed deposit of decomposing shale and reddish-brown aeolian sediments. The latter are probably related to the Mesa Verde loess described by Arrhenius and Bonatti (1965). On the upper slopes of the knoll, especially on the eastern side, the bedrock is exposed or is covered only by a shallow layer of decomposed shale. This unit of shale and reddish-brown sediment becomes thicker on the slopes of the knoll. The thickness of this unit is unknown; excavations on the lower slopes reached a depth of 0.55 m, well below cultural material, without coming to the bottom of the deposit.

The vegetation on the knoll is dominated by pinyon pine (Pinus edulis), including both mature and juvenile trees, with a sage (Artemisia tridentata) understory. The presence of the pinyon and larger shrubs served to distinguish this knoll from others in the immediate vicinity. Other members of the floral assemblage include serviceberry (Amelanchier utahensis), cliff fendlerbush (Fendlera rupeicola), broadleaf yucca (Yucca baccata), pricklypear cactus (Opuntia sp.), Indian paintbrush (Castilleja chromosa), snakeweed (Gutierrezia sarothrae), and grasses. The sparser plant cover on the slopes of the knoll is dominated by snakeweed and Utah thistle (Cirsium utahensis), and might be due to soil disturbances or to poor soil quality resulting from downslope erosion of the Mancos Shale.

Pinyon pine, broadleaf yucca, cactus, and, to a lesser extent, serviceberry and cliff fendlerbush all provide edible fruits or nuts. The pinyon, yucca, and cactus would probably have been the most important food resources for aboriginal populations if these resources were present during the prehistoric occupation of the knoll.

Other resources, both floral and faunal, which might have been available to prehistoric users of Sheep Skull Camp,
are found in and around the marsh, south and east of the knoll, and in a drainage lying north of the site. The marsh exists because an alluvial fan at its north end prevents water from draining into the Dolores River, some 12 m lower in elevation. Fed by drainage from the upland areas of Sagehen Flats to the north, east, and west of the site, the marsh appears to be augmented at present by diversions from Main Canal No. 2, an irrigation ditch which runs along the southern margin of the marsh westward to the Great Cut, about 1.5 km away.

It is not clear whether a permanent marsh was present before late 19th-century canal building made water more regularly available. Research is underway to test for the existence of the marsh prehistorically. The marsh is too high to have been flooded in recent millennia by the Dolores, and it is not known whether runoff from the uplands would have been sufficient to maintain year-round standing water. It seems likely that in the past the marsh existed only intermittently, or was subject to greater fluctuations than at present. Cores taken at the marsh in August 1978 indicate that the marsh has been dry at times in the past, although the dates for these events are not known. The possibility that the marsh habitat was intermittent must be kept in mind, therefore, when evaluating the potential of the marsh to provide economic resources for prehistoric inhabitants of the area.

Resources thought to be important prehistorically, which are present in the marsh today, include three species of sedge (Carex spp.), American bulrush (Scirpus americanus), and cattail (Typha latifolia). Squawbush (Rhus aromatica ssp. trilobata), chokecherry (Prunus virginiana), serviceberry (Amelanchier utahensis), squash-apple (Peraphyllum ramossissimum), sego lily (Calochortus nuttallii), foxtail barley (Hordeum jubatum), and wild onion (Allium acuminatum) all grow on the slopes on the southern border of the marsh. The marsh also attracts waterfowl and probably large and small game, including mule deer (Odocoileus hemionus) and American elk (Cervus canadensis).

Additional resources may have been available prehistorically in the well-entrenched arroyo approximately 175 m north of the site. The arroyo appears to hold some soil moisture even during midsummer; vegetation there is quite dense and includes sedges and rushes as well as a good growth of grasses. The arroyo appears to be a favored location for large game; deer were flushed out of it several times during the investigations at Site 5MT2202. The attractiveness of this location might have been enhanced by the recent construction of a stock tank at the head of the arroyo, and the presence of game resources may be a response to this alteration.

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1 Dr. Kenneth L. Petersen, Dept. of Anthropology, Washington State University, Pullman, personal communication.
This environmental setting presents physiographic material in direct association with Sheep Skull Camp. The Sagehen Flats Locality report (Greenwald, 1981) presents more detailed information concerning geology, climate, raw material resources, and the like in the area.

SOCIAL SETTING

Based on analysis of the materials recovered in surface collection and excavation of this site, it seems likely that Sheep Skull Camp was a limited activity locus (Kane, 1979). Activities at the site were probably associated with tool manufacture and food processing related to the exploitation of the nonagricultural resources available at the site and in the immediate area. The site appears to have been used by both Archaic and Anasazi groups. It is not clear whether the activities carried out at this site differed significantly during its several periods of occupation, but certainly the overall settlement system in which the site functioned must have changed.

Time-sensitive projectile points and ceramics document the multicomponent nature of this site. Four probable Archaic—Great Cut Phase points, three probable Basketmaker II points (probably older than those associated with the Sagehen Phase), and two Pueblo style points (contemporary with or later than the Sagehen Phase) were collected. Thirty sherds were also found at the site, of which three were Sagehen, or Basketmaker III-Pueblo I, ceramics. The remainder are probably associated with the McPhee Phase occupation of the area. Those sites near Site 5MT2202 which are broadly contemporaneous with or later than the Sagehen Phase were collected. For the McPhee Phase, there are no known habitation sites within 1 km of Site 5MT2202. Site 5MT4475, McPhee Pueblo (Briska, 1981), located 550 m to the west on the first small knoll in that direction, is an Archaic site that might have used Sheep Skull Camp as a seasonal camp or limited activity locus used by the North Marsh Band, a Great Cut Phase (late Archaic Tradition) community (Kane, 1979).

The nearest habitation site of the Sagehen Phase occupation, Site 5MT4512 (Wilshusen, 1981a), lies 400 m to the north. Eight other Sagehen Phase sites, four of which probably also represent small hamlets (Site 5MT4545 [Brisbin, 1981], Site 5MT4614 [Yarnell, 1981a]; Sites 5MT4546 and 5MT4514, and four which may be nonhabitation sites (5MT2199, 5MT4525, 5MT4524, and 5MT2201) lie within 500 m of Site 5MT2202 [Greenwald, 1981]). A total of 22 Sagehen Phase sites are located within 1 km of Site 5MT2202; this is approximately 50 percent of the sites presently recorded in the Sagehen Flats Locality. There are only 11 probable limited activity sites of the same general surficial appearance as Site 5MT2202 (abundant flaked lithics, some nonflaked lithics, a light sherd scatter, and no evidence of architectural remains) located in comparable settings in the Sagehen Flats Locality; inhabitants from a number of habitation sites probably shared in the use of these limited activity loci.

The nearest possible Great Cut Phase site is Site 5MT2199 (Brown, 1981), located 550 m to the west on the first small knoll in that direction. Site 5MT2246, another possible Great Cut “campsite,” lies 1.45 km to the southeast, across the present marsh. Other sites assigned to the Great Cut Phase and located close to Site 5MT2202 include Site 5MT2201, located 200 m to the east on the closest knoll in that direction (this site is identified as a McPhee Phase site in initial survey reports); Site 5MT4673, found 800 m to the north; and Site 5MT2843, located 900 m north of Site 5MT2202. (See Sagehen Flats Locality report [Greenwald, 1981] for locations of sites with suspected Archaic components in the vicinity.) Sites 5MT2199 (Brown, 1981), 5MT2246, and 5MT2201 are located in environmental situations similar to that occupied by Site 5MT2202 and have access to many of the same resources. These sites might have been functionally identical to Site 5MT2202. The occupation of one or another might have been dictated by conditions prevailing at any given time. Site 5MT2202 might also represent a limited activity station connected with sites located in the uplands on the northern edge of Sagehen Flats or with sites even further away. Although the evidence from Site 5MT2202 indicates that a wide range of activities was not carried out there, whether any of the other Archaic sites in the Sagehen Locality have better evidence of being “base camps” is not known. Sheep Skull Camp has been tentatively designated as a seasonal camp or limited activity locus used by the North Marsh Band, a Great Cut Phase (late Archaic Tradition) community (Kane, 1979).

For the McPhee Phase, there are no known habitation sites within 1 km of Site 5MT2202. Site 5MT4475, McPhee Pueblo (Briska, 1980), the nearest habitation of this phase, is located 2.1 km to the northeast. Two suspected McPhee Phase field houses, Site 5MT2191, Little House (chapter 6, this volume), and Site 5MT2192, Pheasant View Hamlet (Yarnell, 1981b) are located within 500 m of the site. It is inferred that economic task groups representing the McPhee Community (residing permanently at McPhee Village and, at times during the growing season, at Site 5MT2192 and Site 5MT2191) might have used Sheep Skull Camp as a limited activity locus. Sites 5MT2191 and 5MT2202 are similarly situated with respect to the marsh. At present, the most productive part of the marsh is closer to Site 5MT2191 than to Site 5MT2202. Seasonal residents of Site 5MT2191 might have used Sheep Skull Camp while exploiting pinyon, yucca, and cactus, which might not have been available at their site. Site 5MT2202 may have served as a base for hunting operations. Because Site 5MT2192 is located 1.1 km north of the marsh, its residents were more likely than those of Site 5MT2191 to have used Sheep Skull Camp for exploiting marsh resources. Pinyon, yucca, cactus, and possibly game animals were probably more available or more easily exploitable from Site 5MT2202.

The single Sundial Phase habitation in the Sagehen Flats Locality, Site 5MT2235 (Wilshusen, 1981b), lies 800 m northeast of Site 5MT2202. As was the case with Site 5MT2191, Site 5MT2235 is located as close to marsh resources as Site 5MT2202.
SURFACE COLLECTION

The initial survey records for Sheep Skull Camp report that "the major portion of the site lies on the lower border of a knoll (northeast quadrant of the site) where ceramics and lithics are scattered in a 19.8-m radius. As observed on the survey form for Site SMT2202, "Artifacts were found on top of the hill, but in no heavy concentration." Reexamination of this site prior to its selection for excavation indicated that lithic artifacts occurred over the entire top of the knoll, as suggested by the survey crew, and extended down the southern slope of the knoll as well. No concentration of artifacts corresponding to that reported by the survey team was located on the lower border of the knoll. The survey crew, however, might have collected the materials in the concentration; 12 sherds and 16 lithic artifacts were collected by the survey crew.

The surface materials located at Site SMT2202 covered approximately 3.5 ha. Because the site was so large and the surface scatter was relatively diffuse and apparently uniform, a multistage investigative strategy was adopted. During the first stage, the surface of the knoll and of part of the southern slope was gridded off and all artifacts found within the grid units were collected. A systematic survey of the lower southern slope recovered other artifacts; these lay outside the formal grid and were assigned extrapolated grid locations. The second stage of the work consisted of dividing the site into two horizontal strata and excavating randomly selected 1- by 2-m units within those strata. Following these preliminary investigations, backhoe trenches, a magnetometer survey, and a blading program completed the subsurface testing.

The surface collections at this site contain the bulk of the information recovered; very little additional material or information was gained in subsequent excavations. A good deal of time was expended in subsurface excavation, however, in an attempt to gain information about the Archaic occupation. Sites of this period are rare, not only in the project area, but in the Southwest in general. The discussion of surface artifacts is included with that of the total artifact distributions later in this report.

An area of 2408 m² covering the top of the knoll and part of the southern slope was gridded and completely collected. A north-south baseline (164 m) and an east-west baseline (100 m) were established, and stakes placed at 8-m intervals along them. Grid stakes were positioned by measuring distances from the baseline stakes or, eventually, from stakes close to the baseline, using 30-m tapes. The northwest corner stake in each 8-m unit served as the grid reference point. These units were subdivided into 16-m² quadrants for collection so that each 8-m unit had a northwest, northeast, southwest, and southeast provenience unit.

A total of 172 such 8-m units were collected, resulting in 688 possible provenience units. Not all units, however, contained artifacts. All flaked lithic, nonflaked lithic, and ceramic pieces visible on the surface of the units were collected. In addition, the number of sandstone fragments per 16 m² quadrat was counted and recorded. These fragments were originally thought to represent rubble from hearths or other structural features, but the generally small size of the fragments and the absence of any stone large enough to have served for building material led to the conclusion that the sandstone was the eroded lag remnant of a stratum which had at one time overlain the Mancos Shale now exposed at the knoll.

Although the knoll's southern slope was not gridded, that area was found to contain a number of bifacially worked flaked and nonflaked lithic artifacts which were also collected. The enlarged site collection area totaled 1104 quadrants, each 16 m² in size, because the artifacts were recorded on a hypothetical extension of the original grid. This extension area, from the southern edge of the established grid down to the access road and extending about 200 m east to west, was systematically surveyed by a crew of three YCC workers walking back and forth across the area searching for artifacts (including debitage). Items thus located were plotted on the extended grid system with the aid of a transit.

EXCAVATION METHODS AND OBJECTIVES

Excavation units were drawn from two horizontal strata (fig. 4.3). Stratum 2 covered an area 90 by 48 m in the north-central portion of the site and was defined by those contiguous 8-m units within which the 16-m² collection units contained an average of three or more flaked lithic artifacts. Outliers, or those single grid units that were separated from the central area, but which still possessed more than three flaked lithic artifacts, were not included in the stratum. Units in the central section of the site that had fewer than three flaked lithic artifacts, but which were surrounded by units with greater than this number, were included in Stratum 2 as well. Stratum 1 covered the remainder of the site area.

Stratum 2 was inadvertently redefined in the field to include a 4-m-wide strip north of the original stratum boundary, and to exclude a 4-m strip along the southern boundary of the original stratum. Although this error resulted in a stratum which no longer corresponded with the definition, 29 of the 35 units excavated in Stratum 2 were located within the boundaries of the original stratum, representing a sampling rate of 2.4 percent. The redefined Stratum 2 excavation sample contained thirty-five 1- by 2-m units, representing a sampling rate of 2.9 percent. Stratum 1 was sampled at a rate of 0.2 percent and contained thirty 1- by 2-m units.
Sampling the entire site with 2- by 2-m units at a 25-percent rate, as suggested in the original version of the research design, would have required the excavation of 2036 units. Excavating the area of heaviest concentration, represented by Stratum 2, would have required the excavation of 152 (2- by 2-m) units at this rate. Excavation of the 35 units in Stratum 2 and the 30 units in Stratum 1 represented a compromise between the research design and the time constraints imposed by the contract, and was felt to be sufficient to provide a reliable sample of the site. Altogether, 130 m² were tested, using shovels and both ¼- and ½-inch screens, in arbitrary 15-cm excavation levels. Units were generally excavated to a depth of 30 cm, except in those cases in which bedrock was encountered prior to a depth of 30 cm or when artifacts had been recovered from the 15- to 30-cm level. In these latter cases, excavation continued for another 10 cm, or until it was concluded that sterile deposits had been reached.

Backhoe tests were also conducted at the site after the excavation units had been completed. Three tests were located in Stratum 2 and one in the north section of the site where several pieces of nonflaked lithic and ceramic materials were recovered (fig. 4.3). No artifacts were recovered in these tests and no features were found. These tests covered a total of 464 m² and reflect the negative evidence provided by the regular sampling program: that there is no substantial subsurface component at Sheep Skull Camp, or at least none which is amenable to location via sampling techniques.

A magnetometer survey of an 800-m² block on the central section of the knoll (fig. 4.3), conducted after test excavations were concluded, revealed four anomalies of possible cultural origin. All four anomalies were small, ranging from 1.5 to 6 m², and were interpreted as possible loci of burned or decayed material. In general, the surveyed area did not appear to contain buried architectural features, hearths, or activity areas, and the cultural association of the four anomalies located was termed "dubious" by Huggins. 2

Blading operations were subsequently undertaken in the area covered by the magnetometer survey. No cultural evidence was found at the four targeted loci, but the extensive blading did reveal the presence of a stone-lined hearth, the only definite feature recorded for the entire site. This hearth was located on the southern margin of the magnetometer survey block and might not have been included in the survey proper.

CULTURAL REMAINS LOCATED AT SITE 5MT2202

Excavation Results

Excavations at the site yielded a total of 116 items, comprising approximately 8 percent of the total assemblage of 1530 artifacts (table 4.1). Most of the recovered materials (107 items, or 92 percent), were located in an arbitrary level extending from present ground surface to a depth of 15 cm. In most areas this level consisted primarily of loose, uncompacted surficial deposits. Time-sensitive artifacts recovered include four Late Pueblo Gray Body Sherds (type undifferentiated) and a possible Basketmaker, (pre- or early Sagehen Phase) projectile point.

The remaining nine artifacts collected during excavation—eight pieces of debitage and a fragment of an unshaped mano—were found 15 to 30 cm below present ground surface. No time-sensitive artifacts were recovered from depths greater than 15 cm below present ground surface.

All artifacts encountered in excavation came from the randomly selected excavation units.

2 Robert Huggins, University of Nebraska, Magnetometry Consultant to the DAP, personal communication.
Table 4.1 Artifacts recovered during excavation of Site 5MT2202

<table>
<thead>
<tr>
<th>Type</th>
<th>Number excavated</th>
<th>Percentage of excavated assemblage</th>
<th>Percentage of total assemblage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debitage</td>
<td>90</td>
<td>77.6</td>
<td>86.1</td>
</tr>
<tr>
<td>Cores</td>
<td>2</td>
<td>1.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Utilized flakes</td>
<td>4</td>
<td>3.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Bifaces (includes untypable projectile points)</td>
<td>6</td>
<td>5.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Typable projectile points</td>
<td>1</td>
<td>0.8</td>
<td>0.4</td>
</tr>
<tr>
<td>Manos</td>
<td>8</td>
<td>6.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Unique stones</td>
<td>1</td>
<td>0.8</td>
<td>—</td>
</tr>
<tr>
<td>Late Pueblo Gray Body Sherds</td>
<td>4</td>
<td>3.4</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>116</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Artifact Assemblage

The artifact assemblage from the excavations is generally similar to the overall artifact assemblage at the site. Flaked lithic debitage is the most numerous material category collected; the percentage of debitage in the excavations (77.6 percent) is just slightly less than that for the total assemblage (86.1 percent). Higher proportions of cores, utilized flakes, bifaces, typable projectile points, and manos were located in the excavations than in the total collection, but the small sample of material recovered in excavation makes interpretation of the disparity difficult. The small sample size may make the differences meaningless.

Features

The grading activities at the site, conducted in the fall of 1979, revealed the presence of a stone-lined hearth (fig. 4.3) which was the only feature recorded at this site. The hearth, excavated into sterile deposits, was lined with 19 large (approximately 10 to 15 cm in length) sandstone blocks and several smaller stones. One of the large sandstone pieces was identified as a mano. The hearth was nearly circular, measuring 72 cm east to west by 74 cm north to south, and was 16 cm deep. Heath fill consisted of a soft, dark, charcoal-flecked deposit with several large (approximately 10 cm in length) stones mixed in with the sediment. A sample was taken for radiocarbon dating, but proved too small to yield a date. Exact depth below surface for this feature is unknown, but is estimated at 5 to 10 cm.

Depositional Characteristics of the Site

Three strata were distinguished in profile across the knoll (fig. 4.4). Unit 1, the uppermost stratum, consists of a mixture of decomposed shale and a reddish material which may be related to the aeolian deposits known as Mesa Verde loess (Arrhenius and Bonatti, 1965). On the top of the knoll this upper unit is underlain by Unit 2, which is composed primarily of decomposed, powdery shale, with smaller amounts of intrusive material. There is no clear boundary between these two units. The second unit is underlain by shale parent material, represented in some areas by a layer of shale fragments overlying a pure, powdery shale deposit, and in others by the pure deposit alone. This "bedrock" level was reached at depths of 10 to 20 cm below the present ground surface on the top of the knoll.

On the slopes of the knoll the deposits are composed primarily of the reddish material—found in small quantities mixed with the shale at the top of the knoll—and a small amount of decomposed shale. This deposit may be derived from the top of the knoll as colluvium. Bedrock was not reached in the test excavations (maximum depth = 55 cm) on the slopes of the knoll.

The subsurface artifacts found at this site were confined to the loose, unconsolidated, uppermost few centimeters. It is suggested that these artifacts were incorporated into the upper 15 cm of deposit largely by surface trampling. Rodent activity, which affects the site at present, might have been responsible for transferring some of these artifacts to below the surface as well, but no rodent activity was noted in the profiles of the excavated units. Eight of the nine artifacts recovered at depths greater than 15 cm came from units which were described as colluvial. The test pits yielding these artifacts were located on the slopes of the knoll where colluvial deposition is thought to have taken place. One artifact, a piece of debitage, was recovered at a depth of 15 to 19 cm in a unit described as powdery shale. This artifact is also thought to have been buried through surface trampling or rodent activity. The presence of the buried hearth within the uppermost, unconsolidated unit, indicates some post-occupational deposition; the exact amount of deposition above the hearth is unknown.

The knoll on which this site is located seems to have been a favored spot for the sheep which were grazed in the area. Seven partially articulated sheep skeletons were found on the surface of the knoll—mute testimony to historic site disturbance.

Composition of Entire Site Assemblage

Preliminary analyses of the flaked lithic debitage and tools, nonflaked lithic items, ceramic materials, and faunal remains recovered at Site 5MT2202 during survey and excavation have been completed and make up the data base for the following descriptions.
Figure 4.4 Stratigraphic profile of Site 5MT2202.
Flaked Lithic Assemblage

The flaked lithic assemblage (table 4.2) is composed primarily of flaked lithic debitage. Over 90 percent of the lithics recovered were classified as debitage, with approximately 85 percent of the identified debitage exhibiting striking platforms. Over 70 percent of the debitage consists of relatively fine-grained materials, including very fine and microscopic sources. The flakes are generally quite small; mean weight for the debitage is 2.3 g. Fewer than 30 percent of the flakes retain any cortex on their surface.

Table 4.2 Composition of flaked lithic assemblage at Site 5MT2202

<table>
<thead>
<tr>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debitage</td>
<td>1318</td>
</tr>
<tr>
<td>With cortex</td>
<td>361</td>
</tr>
<tr>
<td>With platform</td>
<td>1138</td>
</tr>
<tr>
<td>Grain size</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>46</td>
</tr>
<tr>
<td>Finely granular</td>
<td>324</td>
</tr>
<tr>
<td>Very fine</td>
<td>748</td>
</tr>
<tr>
<td>Microgranular</td>
<td>200</td>
</tr>
<tr>
<td>Tools</td>
<td>138</td>
</tr>
<tr>
<td>Grain size</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>6</td>
</tr>
<tr>
<td>Finely granular</td>
<td>9</td>
</tr>
<tr>
<td>Very fine</td>
<td>60</td>
</tr>
<tr>
<td>Microgranular</td>
<td>63</td>
</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Utilized flakes</td>
<td>24</td>
</tr>
<tr>
<td>Cores</td>
<td>9</td>
</tr>
<tr>
<td>Chopper-scrapers</td>
<td>35</td>
</tr>
<tr>
<td>Thick scrapers</td>
<td>2</td>
</tr>
<tr>
<td>Thin scrapers</td>
<td>5</td>
</tr>
<tr>
<td>Bifaces</td>
<td>10</td>
</tr>
<tr>
<td>Projectile points</td>
<td>28</td>
</tr>
<tr>
<td>Specialized forms</td>
<td>12</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>13</td>
</tr>
</tbody>
</table>

Nonflaked Lithic Assemblage

Nonflaked lithic tools account for approximately 4 percent of the total artifact assemblage (table 4.3). The majority of the tools recovered were fragmentary, but analysis indicates that most of the tools were unmodified nodules of medium-grained stone. An unmodified nodule is an analytic classification referring to rocks which were apparently used "as is"—the rock or lump of stone was not modified prior to use. Close to 70 percent of the tools were classified as manos; a small number of metate fragments, hammerstones, unhafted and hafted implements were also recovered. Over 90 percent of the materials classified as manos were either unmodified nodules or had been only slightly shaped prior to use. Only one mano in the collection exhibited the flat grinding planes and triangular cross section which typically result from use on a trough or slab metate. Further discussion of the lithic materials collected at Site 5MT2202 is presented in appendix 4-1.

Table 4.3 Composition of nonflaked lithic assemblage at Site 5MT2202

<table>
<thead>
<tr>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonflaked lithics</td>
<td>56</td>
</tr>
<tr>
<td>Completeness</td>
<td></td>
</tr>
<tr>
<td>Indeterminate</td>
<td>1</td>
</tr>
<tr>
<td>Fragment</td>
<td>36</td>
</tr>
<tr>
<td>Complete</td>
<td>19</td>
</tr>
<tr>
<td>Grain size</td>
<td></td>
</tr>
<tr>
<td>Coarse</td>
<td>42</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
</tr>
<tr>
<td>Nongranular</td>
<td>1</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>1</td>
</tr>
<tr>
<td>Production stage</td>
<td></td>
</tr>
<tr>
<td>Original nodule</td>
<td>44</td>
</tr>
<tr>
<td>Minimally shaped</td>
<td>11</td>
</tr>
<tr>
<td>Well-shaped</td>
<td>1</td>
</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
</tr>
<tr>
<td>Unhafted implement</td>
<td>2</td>
</tr>
<tr>
<td>Hammerstone</td>
<td>5</td>
</tr>
<tr>
<td>Mano</td>
<td>39</td>
</tr>
<tr>
<td>Metate</td>
<td>5</td>
</tr>
<tr>
<td>Hafted implement</td>
<td>1</td>
</tr>
</tbody>
</table>
Ceramics

Ceramics are poorly represented at this site (table 4.4). The sample of 18 sherds collected during the 1978 fieldwork is augmented by a grab sample of 12 sherds collected and analyzed in 1972. The grab sample data appear only in table 4.4, and are not included in subsequent tables and totals because their exact proveniences are unknown.

Painted sherds are relatively rare in both collections; all sherds appear to belong to the Mesa Verde Cultural Category. Sherd types primarily date to A.D. 900 or later, though three sherds from the 1972 collections are identified as types dating before A.D. 900.

Of the 30 sherds recovered from the survey and excavation activities, 6.7 percent represent bowl forms and 93.3 percent represent jar forms, possibly indicating storage or other specialized use at Site 5MT2202. Further discussion of the ceramic assemblage at Site 5MT2202 is presented in appendix 4-2.

Faunal Material

Faunal materials constitute the most poorly represented artifact class at the site. Only four specimens were recovered: one eggshell fragment, one fragment from *Sylvilagus* sp., and two unspecified mammal bone fragments. The species were located in the upper 15 cm of deposit at the site and probably were not contemporaneous with human occupation. There were too few faunal remains recovered from Site 5MT2202 for any interpretation.

<table>
<thead>
<tr>
<th>Type</th>
<th>1972 Collection</th>
<th>1978 Collection</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Chapin Gray</td>
<td>1</td>
<td>8.3</td>
<td>0</td>
</tr>
<tr>
<td>Mancos Corrugated</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>Late Pueblo Gray</td>
<td>1</td>
<td>8.3</td>
<td>11</td>
</tr>
<tr>
<td>Corrugated Body Sherds</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
</tr>
<tr>
<td>Cortez Black-on-white</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>Early Pueblo White</td>
<td>1</td>
<td>8.3</td>
<td>0</td>
</tr>
<tr>
<td>Late Pueblo White</td>
<td>1</td>
<td>8.3</td>
<td>2</td>
</tr>
<tr>
<td>Early Pueblo Red</td>
<td>1</td>
<td>8.3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>12</strong></td>
<td><strong>40.0</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

Artifact Spatial Patterning

Three weakly expressed clusters of surface artifacts, visible in distribution plots of flaked lithic tools, ceramics, and nonflaked lithic tools, were used to define analytic subareas at the site (fig. 4.5). These clusters were not discerned during field operations and had no bearing on the collection or excavations employed at Site 5MT2202. The three subareas, designated Subareas 1, 2, and 3, correspond in general to the overall morphology of the knoll.

Subarea 1

Subarea 1 is located on the northernmost part of the knoll which extends to the north as a relatively narrow finger or ridge. The subarea is the smallest of the three and covers 960 m², approximately 7 percent of the total site area. Close to 8 percent of the total artifact collection came from Subarea 1.

Subarea 2

Subarea 2, the largest of the three subareas, is centrally located on the highest and widest part of the knoll; areal coverage is 8750 m², or 67 percent of the site. Approximately 80 percent of the total site artifact collection was found in Subarea 2.

Subarea 3

Subarea 3 is located in the southern section of the site and is primarily confined to the upper portion of the gentle slope leading down to the marsh southeast of the site. This subarea covers about 3400 m², or 26 percent of the site, and contained approximately 12 percent of the total number of artifacts recovered.

Steven D. Emelie, Center for Western Studies, Flagstaff, Arizona, personal communication.
Figure 4.5 Surface distributions of flaked lithic tools, ceramics, and nonflaked lithic tools at Site 5MT2202.
Table 4.5 Composition of subarea assemblages compared to total site assemblage, Site 5MT2202

<table>
<thead>
<tr>
<th>Type</th>
<th>Subarea 1</th>
<th>Subarea 2</th>
<th>Subarea 3</th>
<th>Total site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Debitage</td>
<td>104</td>
<td>87.4</td>
<td>1093</td>
<td>89.9</td>
</tr>
<tr>
<td>Flaked lithic tools</td>
<td>10</td>
<td>8.4</td>
<td>92</td>
<td>7.4</td>
</tr>
<tr>
<td>Utilized flakes</td>
<td>0</td>
<td>0.0</td>
<td>15</td>
<td>1.2</td>
</tr>
<tr>
<td>Chopper-scrapers</td>
<td>4</td>
<td>3.4</td>
<td>27</td>
<td>2.2</td>
</tr>
<tr>
<td>Projectile points</td>
<td>2</td>
<td>1.7</td>
<td>12</td>
<td>1.0</td>
</tr>
<tr>
<td>Nonflaked lithic tools</td>
<td>3</td>
<td>2.5</td>
<td>33</td>
<td>2.7</td>
</tr>
<tr>
<td>Manos</td>
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<td>0.8</td>
<td>22</td>
<td>1.8</td>
</tr>
<tr>
<td>Metates</td>
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<td>0.0</td>
<td>4</td>
<td>0.3</td>
</tr>
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<td>Ceramics</td>
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<td>12</td>
<td>0.8</td>
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</tbody>
</table>

Subareal Artifact Composition and Frequency

In general, the composition of collections in the subareas is similar to that of the undifferentiated total site collection (table 4.5). The collections from Subareas 1 and 2, in particular, are almost identical in composition to the overall site collection. Subarea 3 differs from the other two and from the overall collection in the proportions of debitage and of tools of all material types. The proportion of debitage from Subarea 3 is slightly over 20 percent below that in the other areas, and, except for chopper-scrapers, proportions of major flaked lithic tool types are consistently higher. Similar differences occur when the percentage of a particular type from a subarea assemblage is compared with the proportion of overall site area which the subarea occupies (table 4.6). For most classes of artifacts the proportion of the class found in a particular subarea is approximately equal to the areal proportion of the subarea, indicating fairly even distribution for the class over the entire site. Flaked lithic debitage, chopper-scrapers, projectile points, and manos are not evenly distributed. Debitage and chopper-scrapers are relatively scarce in Subarea 3, while projectile points and manos appear to be concentrated in this subarea.

DISCUSSION

Chronology

Although the deposits at Sheep Skull Camp were non-stratified and the sample collected from hearth fill contained too little material for radiocarbon dating, the ceramics and some flaked lithic tools collected indicate that the site was used during the late Archaic period (probably during the Great Cut Phase) and the Sagehen and McPhee Phases. Given this time span, the lack of stratified deposits suggests that use of this site was probably sporadic and that individual occupations were probably brief. This same lack of stratified deposits makes it very difficult to assign a date to most of the materials collected at the site, including the debitage, most classes of flaked lithic tools, and many of the nonflaked lithic tools.

Identification of lithic material types represented in the debitage collection and a study of sources for these materials would aid in the evaluation of the possibility of temporal differences in intensity of site use. Preliminary analysis indicates that the typologically “early” projectile points at Site 5MT2202 often were made from a distinctive set of materials not available locally, including silicified wood, obsidian, fine-grained quartzite, and chert. Typologically “later” projectile point types appear to be made primarily from locally available materials, including a fine-grained quartzite and chert. Cherts (both local and nonlocal) and fine-grained quartzite are the most abundant lithic materials at Sheep Skull Camp, and it may be possible to differentiate debitage and tools deposited at different times during site use on the basis of material type.

Table 4.6 Proportions of artifacts compared to areal proportions of subareas at Site 5MT2202

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent of total site area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Debitage</td>
<td>7.3</td>
</tr>
<tr>
<td>Flaked lithic tools</td>
<td>7.2</td>
</tr>
<tr>
<td>Utilized flakes</td>
<td>0.0</td>
</tr>
<tr>
<td>Chopper-scrapers</td>
<td>11.4</td>
</tr>
<tr>
<td>Projectile points</td>
<td>7.1</td>
</tr>
<tr>
<td>Nonflaked lithic tools</td>
<td>5.4</td>
</tr>
<tr>
<td>Manos</td>
<td>2.6</td>
</tr>
<tr>
<td>Metates</td>
<td>0.0</td>
</tr>
<tr>
<td>Ceramics</td>
<td>11.1</td>
</tr>
</tbody>
</table>
Ecological Adaptation

A number of features of the site setting and archaeological assemblage suggest that activities at Sheep Skull Camp were directed toward procurement of wild resources, with an emphasis on game resources. The site apparently functioned primarily as a hunting and butchering station; no evidence for permanent habitation of the knoll was recorded.

Sheep Skull Camp affords a good view of the cultivable uplands to the north and the present-day marsh to the south and provides easy access to these areas. The knoll upon which the site is located is uncultivable, with only a thin upper layer of unconsolidated sediment overlying a Mancos Shale bedrock. Although the uppermost sediments could certainly support a variety of surface structures, the knoll is unsuitable for the subterranean pithouse constructions characteristic of the Puebloan occupation in the project area.

The prehistoric vegetation of the knoll might also have provided some shade and shelter. The exact composition of this vegetation is unknown, but the differences in substrata between the knoll and surrounding areas indicate that plant cover on the knoll was likely to have been different than that supported on the local flats and swales. At present, areas with exposed bedrock and generally shallow sediment cover support yucca, pinyon, juniper, and the larger shrubs, including fendlerbush and serviceberry, while areas of greater sediment depth support a dense cover of sagebrush, other small shrubs, and grasses.

There is no archaeological evidence for construction of any facilities at Sheep Skull Camp other than the single hearth located during blading operations. The results of the surface and subsurface testing, including the magnetometer survey, indicate that other hearths or larger structures were not likely present at this site. The presence of insubstantial structures, such as brush windbreaks and lean-tos, would be difficult to detect at this site, although their use at Sheep Skull Camp cannot be ruled out entirely.

The artifact assemblage is dominated by flaked lithic tools—primarily projectile points, chopper-scraper forms, bifaces, and utilized flakes—and flaked lithic debitage. The low average weight of the debitage suggests that repair and/or finishing of tools were more common at Sheep Skull Camp than complete lithic tool manufacture from flake or core through finished item. The small number of cores recovered from Site 5MT2202 supports the inference that early steps in tool manufacture took place elsewhere. Partially used or exhausted cores and other byproducts of tool manufacture might not have been discarded at the site, however, and their absence is not conclusive proof of an emphasis on repair or reworking.

Manos also constitute an important part of the artifact assemblage at Sheep Skull Camp. The presence of these tools suggests that some vegetal processing of various wild plant materials might have occurred on the knoll. The manos could also have served in some capacity in the production of lithic artifacts. The relative scarcity of hammerstones indicates that some of the manos might have functioned as hammerstones, but intensive analysis of these tools is necessary to evaluate these conjectures.

The absence of architecture, the low number of items of presumably domestic function, including ceramics and large metates, and the dominance of flaked lithic tools and debitage suggest that the site might have been used as some sort of staging area for hunting activities. Assuming the marsh resources were available, these activities probably concentrated on the marsh to the south. Hunters might have gathered there to survey the marsh prior to the hunt and retreated there again following the hunt for butchering. The length of stay at the site probably varied from a few hours to a few days. The cores and percussors used in flaked lithic tool manufacture and the specialized tools used for making and repairing arrowshafts, foreshafts, and other parts of the hunting kit would generally have been taken along when the hunters left the knoll. Some collection and processing of vegetal materials might have been carried out on the knoll.

Paleodemography

Because Site 5MT2202 was not a permanent habitation locus, and because the length of the various occupations cannot be determined, population estimates are impossible. It is probable that the site was used by small hunting and/or gathering parties during all periods of human occupation in the project area.

Activity Areas

The three subareas of the site were defined on the basis of spatial separation and not on the basis of artifact content. The slight differences in the artifact assemblages of these subareas suggest slightly different activities.

The average weight of the debitage in Subareas 1 and 3 is higher than that in Subarea 2 by about 1.5 to 2 g, suggesting that more lithic tool repair or production—particularly the later stages of lithic tool production—was taking place in the center of the site. This apparent difference might, however, be the result of the relatively low sample size of about 100 in both Subareas 1 and 3; Subarea 2 has a sample size of over 1000.

The higher proportion of projectile points recovered in Subarea 3 is seen as a function of distance to the marsh.
Subarea 3 might have been a convenient place for butchering activities, being far enough from the marsh to keep game disturbance to a minimum.

Trade
The identification of lithic sources is as yet incomplete. Although nonlocal lithic materials are represented in the collection, no data are currently available with which to evaluate the question of trade in lithic materials versus collection of these materials at their source areas by occupants of the sites. No nonlocal ceramics are present in the site collections.

Culture Changes
The lack of structures at the site indicate that Sheep Skull Camp remained a hunting and gathering locus throughout its long history. It is certainly possible, however, that changes in activity occurred that have not been detected by the studies to date.

SUMMARY
Sheep Skull Camp was probably a locus of hunting and gathering activities throughout the aboriginal occupation of the project area. Visits to this site were likely to have been both infrequent and fairly short term, based on the observation that the site’s history spanned several thousand years; yet the number of artifacts deposited at the site is small and there are no architectural remains. Most probably the site was used by inhabitants of nearby habitations during the Anasazi occupation of Sagehen Flats Locality and by Archaic groups possibly operating out of a base camp in the area. Both the Puebloan and the Archaic uses of the site appear to have been directed toward the exploitation of faunal resources, and perhaps, to a lesser extent, plant resources. Although some tools were undoubtedly made at this site, the majority of the lithic remains probably resulted from repair and replacement of tools damaged during the hunt, lost during use of the site, or intentionally discarded at the site.
APPENDIX 4-1

DATA AND SUMMARY STATEMENTS,
LITHIC MATERIALS FROM SITE 5MT2202

By Thomas H. Hruby

The data presented in tables 4.7, 4.8, and 4.9 represent part of the lithic reductive-technology analysis completed for Site 5MT2202. From a 12-attribute FLT (Flaked Lithic Tool) analysis system, 4 attributes were selected to illustrate general technological, functional, and raw-material variability. A traditional morphological-use classification, a ranked estimation of production technology input for dorsal and ventral surfaces, and a grain-size evaluation are included. Six variables are included from the FLD (Flaked Lithic Debitage) analysis system: grain-size ranking, classification of items with cortex, items which retain a striking platform, obsidian items, mean weight, and total number of debitage items. The NFLT (Non-flaked Lithic Tool) analysis system is represented by four variables: traditional morphological-use item classification, production-input evaluation, indication of item completeness, and raw-material grain-size evaluation. The complete lithic-analysis systems are described elsewhere in DAP publications (Phagan, 1981).

During 1980, DAP lithic-laboratory personnel have repeatedly reviewed the utility and reliability of the lithic-analysis systems. In this review, a number of analysis variables have been modified, particularly the item morphological-use variables on both the FLT and NFLT systems. Analytical perspectives change as information accumulates and as models of tool production and use improve. To minimize the effects of this analytical modification on interpretation, the observed values of these variables have been regrouped into larger categories within which analytic consistency is reliable.

For comparative purposes, the tables also include data for a grouping of temporally and functionally similar DAP sites and for all DAP Anasazi sites analyzed prior to the 1980 field season. These latter “Anasazi group” data have been generated from computer files which have not undergone complete editing, and final figures may differ slightly from those presented. Comparisons and interpretations presented here, particularly those of an inter-site nature, are based on a qualitative assessment of lithic profile variation, since significance has not been statistically established.

Site 5MT2202 is a large limited activity/seasonal camp utilized at differing intensities during the Great Cut Phase and the Cline Subphase of the McPhee Phase. Two sites, Site 5MT2199 and Site 5MT2242, have a similar temporal/functional matrix and are grouped together for comparative purposes.

Site 5MT2202 and the other two limited/seasonal camps are different from the group of Anasazi sites in several ways. The relatively high percentage of chopper-scraper planes, bifaces, and projectile points indicates that tools generally associated with hunting activities are well-represented at the site. The grain size ranking for Site 5MT2202 has a high quantity of microscopic raw materials, indicating that high quality materials were selected for use on this site. The above observations are consistent with other sites with dominant Archaic components, and suggest a high curation technological model. The high values in the technological input variables also support this hypothesis. Figure 4.6 shows a sample of the projectile points recovered at Site 5MT2202.

The FLD table is more difficult to interpret because all three groups appear to be significantly different (table 4.8). Site 5MT2202 has a low percentage of microscopic materials, which indicates that high input tools generally associated with microscopic materials, were not produced at the site. The above observation also suggests a high curation technological model for Archaic peoples. The low mean weight of flakes at the Archaic sites and the relatively high percentage of flakes with platforms for Site 5MT2202 suggest that the later stages of tool manufacture/resharpening are well-represented at the site; these observations indicate a certain amount of tool production took place at the site.

The NFLT analysis (table 4.9) suggests that some food processing occurred at the site. Manos are well-
Table 4.7 Lithic analysis data summary for Site 5MT2202, flaked lithic tools

<table>
<thead>
<tr>
<th>Subarea 1 (N=10)</th>
<th>Subarea 2 (N=92)</th>
<th>Subarea 3 (N=36)</th>
<th>5MT2202 Total (N=138)</th>
<th>5MT2199 Total (N=251)</th>
<th>Anasazi group (N=7048)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>8.7</td>
<td>1</td>
<td>2.8</td>
<td>9</td>
</tr>
<tr>
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<td>8.7</td>
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<td>10.0</td>
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<td><strong>Thinning stage: Ventral</strong></td>
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<td>0.4</td>
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<tr>
<td>Nonfacial item</td>
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<td>2.2</td>
<td>2</td>
<td>5.6</td>
<td>4</td>
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<td>Unthinned item, w/cortex</td>
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<td>4.3</td>
<td>1</td>
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<td>5</td>
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<td>8.7</td>
<td>1</td>
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<td>37</td>
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96
Table 4.8 Lithic analysis data summary for Site 5MT2202, flaked lithic debitage

<table>
<thead>
<tr>
<th>Subarea 1 (N=104)</th>
<th>Subarea 2 (N=1093)</th>
<th>Subarea 3 (N=121)</th>
<th>5MT2202 Total (N=1318)</th>
<th>5MT2199 5MT2242 Total (N=6445)</th>
<th>Anasazi group (N=66095)</th>
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</thead>
<tbody>
<tr>
<td>Grain size</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Medium (coarse)</td>
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<td>4 3.3</td>
<td>46 3.5</td>
<td>71 1.1</td>
<td>3.2</td>
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<tr>
<td>Fine</td>
<td>45 43.3 235 21.5</td>
<td>44 36.4</td>
<td>324 24.7</td>
<td>358 5.6</td>
<td>21.4</td>
</tr>
<tr>
<td>Very fine (detrital)</td>
<td>21 20.2 661 60.5</td>
<td>66 54.5</td>
<td>748 56.5</td>
<td>3476 53.9</td>
<td>51.6</td>
</tr>
<tr>
<td>Microscopic (nongranular)</td>
<td>21 20.2 172 15.7</td>
<td>7 5.8</td>
<td>200 15.3</td>
<td>2540 39.4</td>
<td>23.7</td>
</tr>
<tr>
<td>Items with cortex</td>
<td>20 19.2 293 26.8</td>
<td>48 39.7</td>
<td>361 27.4</td>
<td>513 8.0</td>
<td>25.9</td>
</tr>
<tr>
<td>Items with platform</td>
<td>62 59.6 981 89.8</td>
<td>95 78.5</td>
<td>1138 86.3</td>
<td>2663 41.3</td>
<td>38.8</td>
</tr>
<tr>
<td>Obsidian items</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Mean weight (grams)</td>
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<td>2.33</td>
<td>1.35</td>
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Table 4.9 Lithic analysis data summary for Site 5MT2202, nonflaked lithic tools

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<th>Subarea 2 (N=33)</th>
<th>Subarea 3 (N=20)</th>
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<th>Anasazi group (N=4318)</th>
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</thead>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>142 60.7</td>
<td>9.2</td>
<td></td>
</tr>
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<td>Generalized, unhafted</td>
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<td>3 1.3</td>
<td>24.0</td>
<td></td>
</tr>
<tr>
<td>Hammerstones</td>
<td>4 12.1 1 5.0</td>
<td>5 8.9</td>
<td>9.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>manos</td>
<td>1 33.3 22 66.7</td>
<td>16 80.0</td>
<td>39 69.6</td>
<td>44 18.8</td>
<td>33.5</td>
</tr>
<tr>
<td>Slab metates</td>
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<td>1 1.8</td>
<td>36 15.4</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Trough metates</td>
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<td>2.6</td>
<td>9.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unspecified &amp; frag. metates</td>
<td>3 9.1 1 5.0</td>
<td>4 7.1</td>
<td>1 0.4</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>Generalized, hafted</td>
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<td>1 1.8</td>
<td>24 10.3</td>
<td>21.1</td>
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<tr>
<td>Miscellaneous specialized</td>
<td>2 0.8</td>
<td>2.0</td>
<td>4.0</td>
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<td>Indeterminate</td>
<td>2 66.7 25 75.8</td>
<td>17 85.0</td>
<td>44 78.6</td>
<td>36 15.4</td>
<td>53.5</td>
</tr>
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<td></td>
<td>141 66.8</td>
<td>8.4</td>
<td></td>
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<td>Minimally shaped</td>
<td>1 33.3 7 21.2</td>
<td>3 15.0</td>
<td>11 19.6</td>
<td>13 5.6</td>
<td>16.7</td>
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<td>1.8</td>
<td>24 10.3</td>
<td>21.1</td>
<td></td>
</tr>
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<td>Highly stylized</td>
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<td>Item completeness</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
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<td>1 1.8</td>
<td>140 59.8</td>
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<td>Small fragment</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial implement</td>
<td>3 100.0 22 66.7</td>
<td>11 55.0</td>
<td>36 64.3</td>
<td>74 31.6</td>
<td>43.6</td>
</tr>
<tr>
<td>Complete (+ or -) implement</td>
<td>11 33.3 8 40.0</td>
<td>19 33.9</td>
<td>20 8.5</td>
<td>50.8</td>
<td></td>
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<tr>
<td>Grain size</td>
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<tr>
<td>Indeterminate</td>
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<td>1 5.0</td>
<td>42 75.0</td>
<td>4 1.7</td>
<td>16.5</td>
</tr>
<tr>
<td>Coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>8 24.2 15 75.0</td>
<td>12 21.4</td>
<td>215 91.9</td>
<td>39.4</td>
<td></td>
</tr>
<tr>
<td>Fine</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nongranular</td>
<td>1 3.0</td>
<td>1 1.8</td>
<td>14 6.0</td>
<td>34.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>
represented at Site 5MT2202 while other tool types are poorly represented. The high percentage of manos suggests that food processing was probably a highly specialized activity at the site. The high percentage of manos is consistent with other special activity sites. Site 5MT2242 shows the above profile because of the large number of indeterminates—these represent small fragments of very thin grinding stone slabs.

Site 5MT2202 is similar to other limited activity/seasonal sites in the DAP area. These limited activity sites are representative of a number of occupations over a long period, but the intensity of occupation at any particular time is difficult to evaluate; the intensity of Anasazi utilization of Site 5MT2202 was probably not very great. When working with Site 5MT2202, it is important to consider that most of the materials are inseparable on the basis of technology or raw materials and that the site should be interpreted as consisting of mixed assemblages. The site appears to be dominated by Archaic assemblages that reflect hunting activities and manufacturing of finished tools.

Figure 4.6 Projectile points recovered from Site 5MT2202.
APPENDIX 4-2

DATA AND SUMMARY STATEMENTS, CERAMIC MATERIALS FROM SITE 5MT2202

By William A. Lucius and Eric Blieman

Ceramic artifacts from Site 5MT2202 were analyzed by members of the DAP Additive Analysis Laboratory. Descriptions of inventory analysis procedures and structure, and of the resulting data interpretability are available in Lucius (1981). Familiarity with the inventory analysis program will aid in the understanding of the data and interpretations provided below.

Description of the total ceramic assemblage from the site is presented in table 4.10. This assemblage includes both DAP collections and the ceramics collected during site survey in 1972. Sherds are grouped by "culture categories and wares" (Lucius, 1978). All sherds from 5MT2202 were assigned to wares of the Mesa Verde Culture Category and reflect a local (Mesa Verde region) manufacturing tradition and exchange system. Pottery types within each ware are listed sequentially from early to late, and grouped types (e.g., Late Pueblo Gray) are listed last and include sherds not assignable to specific types.

Relative weights of the temporally diagnostic types in table 4.10 have been used to construct figure 4.7. Each type is presented as a percentage of the total typable sherds of the ware. The relative contribution of each ware to the site total is listed in parentheses to the left of the figure. Temporal spans for the diagnostic types are based on Breternitz et al. (1974) with some adjustments based on dating results from within the DAP. This presentation illustrates the intensity of occupation as well as the temporal range of occupation, and it can be compared with similar figures prepared for other DAP sites.

Ceramic types in figure 4.7 indicate a date range of about A.D. 600 to 1050. However, only three sherds in the collection suggest a pre-A.D. 900 association, and the presence of Cortez Black-on-white, Mancos Corrugated, and Corrugated Body Sherds argue for a primary site use in the A.D. 900-1000 range. Of the few (only 30) sherds recovered at the site, 87 percent were found on the modern ground surface (table 4.11), and none could be associated with reconstructable vessels. It is unlikely that the deposition of these ceramics resulted from any intensive use of the site.

Of the sherds recovered by survey and excavation, 25 percent (by weight) contain tempering materials that are not the local crushed igneous rock. These other tempers are believed to have been in use to the west and south of the project area, but they still originate within the Mesa Verde region.
Table 4.10 Summary of descriptive frequencies of ceramics at Site 5MT2202*

<table>
<thead>
<tr>
<th>Ware</th>
<th>Traditional type</th>
<th>Bowl</th>
<th>Jar</th>
<th>Other</th>
<th>Total</th>
<th>Rims</th>
<th>Modified</th>
<th>By weight</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>g</td>
</tr>
<tr>
<td>Mesa Verde Gray</td>
<td>Chapin Gray</td>
<td>1</td>
<td>3.6</td>
<td>1</td>
<td>3.3</td>
<td>1</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Mancos Corrugated</td>
<td>1</td>
<td>3.6</td>
<td>1</td>
<td>3.3</td>
<td>1</td>
<td>50</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Late Pueblo</td>
<td>19</td>
<td>67.8</td>
<td>19</td>
<td>63.3</td>
<td>152</td>
<td>70.0</td>
<td>152</td>
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<tr>
<td></td>
<td>Corrugated</td>
<td>3</td>
<td>10.7</td>
<td>3</td>
<td>10.0</td>
<td>19</td>
<td>8.8</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Body Sherds</td>
<td>2</td>
<td>5.6</td>
<td>3</td>
<td>8.8</td>
<td>1</td>
<td>2.3</td>
<td>1</td>
</tr>
<tr>
<td>Mesa Verde White</td>
<td>Cortez Black-on-white</td>
<td>1</td>
<td>3.6</td>
<td>1</td>
<td>3.3</td>
<td>9</td>
<td>4.1</td>
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<tr>
<td></td>
<td>Early Pueblo</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>3.3</td>
<td>5</td>
<td>2.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Late Pueblo</td>
<td>3</td>
<td>10.7</td>
<td>3</td>
<td>10.0</td>
<td>19</td>
<td>8.8</td>
<td>19</td>
</tr>
<tr>
<td>Mesa Verde Red</td>
<td>Early Pueblo</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>3.3</td>
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<td>1.4</td>
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<tr>
<td>Total</td>
<td></td>
<td>2</td>
<td>28</td>
<td>30</td>
<td>2</td>
<td>217</td>
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*Survey collection added

Table 4.11 Ceramic assemblage for Site 5MT2202, by provenience

<table>
<thead>
<tr>
<th>Ware</th>
<th>Surface collection</th>
<th>Excavation of Subarea 2 (N=4) %</th>
<th>Total #</th>
<th>Site %</th>
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<tr>
<td></td>
<td>Subarea 1 (N=2) %</td>
<td>Subarea 2 (N=8) %</td>
<td>Subarea 3 (N=4) %</td>
<td></td>
</tr>
<tr>
<td>Mesa Verde Gray Ware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mancos Corrugated</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Late Pueblo Gray</td>
<td>100</td>
<td>38</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Corrugated Body Sherds</td>
<td>—</td>
<td>38</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Mesa Verde White Ware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cortez Black-on-white</td>
<td>—</td>
<td>—</td>
<td>25</td>
<td>—</td>
</tr>
<tr>
<td>Late Pueblo White</td>
<td>—</td>
<td>25</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Vessel forms</td>
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</tr>
<tr>
<td>Jars</td>
<td>100</td>
<td>100</td>
<td>100</td>
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100
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Wilshusen, Richard

Yarnell, Richard W.
Chapter 5

EXCAVATION AT SAGEHILL HAMLET
(SITE 5MT2198), A BASKETMAKER III-PUEBLO I
HABITATION SITE
Sagehill Hamlet (Site 5MT2198), a small Anasazi habitation located approximately 8 km (5 mi) northwest of Dolores, Colorado, was excavated during the summer of 1978 as part of the Dolores Project Cultural Resources Mitigation Program. Field operations were conducted during the months of August and September; a University of Colorado crew excavated and recorded a small pithouse and associated surface features. Site 5MT2198 was probably the domicile and home base of a single household group practicing limited agriculture and foraging in the Escalante Sector. Because of the scant nature of the material collection and the lack of any major architectural remodeling, it is assumed that the site was inhabited for a relatively short time span. While Site 5MT2198 is clearly associated with the Sagehen Phase (A.D. 600-850), more precise dating of the site is problematic: tree-ring dates indicate that pithouse construction probably occurred during the last half of the seventh century A.D., while ceramic analysis suggests that the occupation occurred during the eighth century, terminating by A.D. 775.
INTRODUCTION

Sagehill Hamlet is a small habitation situated on a low prominence north of the Sagehen Marsh (fig. 5.1). In the systems of spatial and temporal units employed by DAP (Dolores Archaeological Program) archaeologists (chapter 1 of this volume), the site is located in the Sagehen Flats Locality, Escalante Sector, and incorporates one component of the Sagehen Phase (A.D. 600-850). Surface indications of the site included a rather sparse concentration of ceramic fragments and lithic debris over the top and south slope of the small knoll or prominence. The artifact scatter at the site measures approximately 50 m north to south by 45 m east to west, or a surface area of 0.23 ha. Sagehill Hamlet is located in the NW¼ of the NW¼ of sec. 35, T38N, R16W. The Universal Transverse Mercator grid coordinates for this location are 713,780 mE, 4,145,240 mN, zone 12; a basic map reference to the area is the USGS (U.S. Geological Survey), 7.5' Trimble Point Quadrangle (1965).
The original survey report (Breternitz and Martin, 1973) described Site 5MT2198 as an oval area along a ridge spur containing rock rubble, shrub, and flakes; no functional interpretations were included. The artifact collection from survey operations indicated a Basketmaker III and/or Pueblo I occupation. The site was reexamined during June of 1978 and was tentatively designated as a Sagehen Phase small hamlet. It was later selected for excavation as one unit of a sample designed to yield data on Sagehen Phase communities in the Sagehen Flats Locality.

Investigations at Sagehill Hamlet were supervised by Nancy J. Hewitt, CU (University of Colorado) archaeologist; the excavations were conducted by one CU field crew during the period 1 August through 10 October 1978. Environmental data and dating samples were recovered by environmental studies program and dating-remote sensing program personnel. A total of 234 person-days was expended excavating the site, all by CU personnel.

ENVIRONMENTAL SETTING

Situated on the crest and south side of a low knoll in the west Sagehen Flats Locality, the site overlooks a small drainage basin approximately 100 to 150 m to the southeast. To the east and west of the knoll are narrow tributaries which empty into the basin. Although the native red loess soils on and adjacent to the site are deep and well-drained and apparently suitable for farming, perhaps the basin area would have provided better conditions for cultivation due to the presence of additional ground moisture from the drainages.

About 1 km southeast of the site is a large marsh. Core tests carried out by Ken Petersen, Washington State University, as part of a regional pollen study, have revealed that this marsh has been in existence intermittently for at least the last 2000 years, but the exact periods when the marsh was active cannot be reconstructed. If the marsh area was active during the Sagehen Phase, it would have provided the aboriginal inhabitants of Site 5MT2198 with valuable, easily accessible resources such as domestic water, waterfowl, and various wild plants for consumption and other economic activities. Seeps located in shallow canyons approximately 2 km to the north and northeast may have provided domestic water periodically. However, the most dependable permanent water source would probably have been the Dolores River, 3.4 km due east.

At an elevation of 2120 m, Sagehill Hamlet is located in the Upper Sonoran vegetation zone, although the flora in the immediate site vicinity is typical of a disturbed area (fig. 5.2). Discussions with local ranchers confirm that this land had been cleared and farmed quite recently. As a result of this disturbance the local ecosystem is currently in a transitional stage.

Plant species now growing in the immediate site vicinity include big sagebrush (Artemisia tridentata), squawbush (Rhus aromatica), Indian ricegrass (Oryzopsis hymenoides), birdbeak (Cordylanthus sp.), and lupine (Lupinus spp.). South and north of the site (approximately 300 m) are a few low hills with remnant stands of pinyon (Pinus edulis) and juniper (Juniperus osteosperma). Since this area had been cleared for agriculture historically, it is entirely possible that the climax pygmy pinyon-juniper forest endemic to the area covered a larger area prehistorically. Fremont cottonwoods (Populus fremontii) grow in the washes adjacent to the site area.

Within a 5-km radius of the site, numerous exploitable plant resources may have been available for the prehistoric residents. These include pads and fruit from pricklypear cactus (Opuntia spp.); fruit, fiber, and soap from yucca (Yucca baccata); and fruit and wood from pinyon, juniper, squawbush, serviceberry (Amelanchier utahensis), and chokecherry (Prunus virginiana). Bulbs from sego lily (Calochortus nuttallii) and onion (Allium spp.) and seeds from sunflowers (Helianthus spp.), Indian ricegrass, and other grasses are readily available.

The microclimate of Site 5MT2198 is similar to that of other low elevation areas in the Escalante Sector. The general pattern is one of low humidity, wide diurnal temperature changes, mild summers, and cold dry winters. An average annual precipitation of 455 mm is recorded at the Dolores National Weather Service station, approximately 8 km southeast of the site. This amount is attained during two wet seasons, one in the winter months and one in late summer. With an average of 126 frost-free days (recorded at the National Weather Service station in Yellow Jacket, Colorado, 13 km west of Site 5MT2198), this site and its vicinity, therefore, seem to have a sufficient growing season for certain varieties of maize (Carter and Anderson, 1945). Cold air drainage in the low areas within
Animal species observed near the site are limited to Nuttall's cottontail (Sylvilagus nuttalli), coyote (Canis latrans), mule deer (Odocoileus hemionus), and rattlesnakes (Crotalus sp.). Avifauna observed during the field season included bald eagle (Haliaeetus leucocephalus), red-tailed hawk (Buteo jamaicensis), Cooper's hawk (Accipiter cooperii), sparrow hawk (Falco sparverius), turkey vulture (Cathartes aura), raven (Corvus corax), scrub jay (Aphelocoma coerulescens), mourning dove (Zenaida macroura), night hawk (Chordeiles spp.), red-shafted flicker (Colaptes auratus cafer), and numerous passerines.

SOCIAL SETTING
Within a 1-km radius of Sagehill Hamlet are 21 sites which exhibit characteristics of the Sagehen Phase and hence are considered archaeologically contemporaneous (although the nature of momentary populations in the area must be further researched). Surface evidence indicates that 18 close neighbors are similar in form and layout to Site 5MT2198 and are probably unit or double unit hamlets. The closest contemporary habitations to the site are Site 5MT4679, located 120 m to the northwest; Site 5MT2194, located 190 m to the east; and Site 5MT2200, located 40 m to the southwest. The clustering of Sagehen Phase habitations in the vicinity of Sagehill Hamlet implies that there were probably close social ties and local cooperation among farmsteads. These hamlets comprise the home residences of what is inferred to have been the West Sagehen Neighborhood, a dispersed farming community based in the area north of the Sagehen Marsh between A.D. 650 and 800 (chapter 3, this volume).

Three limited activity sites assigned Sagehen Phase components are located within 1 km of Sagehill Hamlet. These include Site 5MT2199, located 550 m southeast; Site 5MT2202, located 900 m southeast; and Site 5MT4525, located 900 m east. It is impossible to state that the inhabitants of Sagehill Hamlet actually frequented these locations; however, it seems likely that local peoples used a network of limited activity sites to acquire raw materials and for other purposes. This hypothetical network probably included sites within 1 km of Sagehill Hamlet as well as more distant outliers.

In summary, Sagehill Hamlet is regarded as one habitation unit of the postulated Sagehen Phase West Sagehen Neighborhood, a dispersed local community. The group abiding at Site 5MT2198 probably maintained close social relations with other nearby households. Sagehill Hamlet is one node in the local Sagehen Phase settlement network which included small hamlets and limited activity loci.

EXCAVATION METHODS AND OBJECTIVES
Surface indications of prehistoric occupation at Site 5MT2198 were scant. Sherds, flakes, and a few fragments of ground stone tools were sparsely scattered over a 50- by 45-m area on the top and south side of the knoll. Depressions suggesting subsurface structures were nonexistent, and evidence of other architectural features was likewise absent. Excavation objectives were to discover and record architectural features present at the site (if any), recover a representative sample of the material culture, and reconstruct the types and extent of activities carried out by the prehistoric inhabitants.

Investigation of the site was initiated by laying out a grid system of 2- by 2-m squares over the extent of the artifact scatter. All cultural material on the surface within the grid was collected in 4- by 4-m units. Then, by applying standard random sampling procedures developed before the field season began, fifty-two 2- by 2-m squares were chosen for excavation. Vegetation within the gridded area was removed and excavation of the random squares was begun by stripping away the 15 to 20 cm of unconsolidated upper plow zone to reach the prehistoric occupation surface. This method resulted in the exposure of a large stained area representing pithouse fill. Once this structure was identified, the random-squares design was abandoned and stripping continued until the entire pithouse outline was exposed. This stripping technique also resulted in uncovering ancillary features such as outlying fire hearths and postholes. Seventy-three 2- by 2-m squares were ultimately excavated in this manner (figs. 5.3 and 5.4).

Excavation of the pithouse was initiated by digging two test trenches into the fill of the structure. Test Trench 1 was sunk into the antechamber-ventilator area and Test
Bulk soil samples were collected from nearly every grid square, from fire hearths, postholes, floor cists, floors, pithouse fill, corn concentrations, and from a stratigraphic control column in the fill of the pithouse at 20-cm intervals.

Pollen samples were collected from the floor of the main chamber in each 2- by 2-m excavation square, and under large artifacts associated with cultural surfaces. Samples were also taken from each quadrant on the floor of the pithouse ventilator, from the bottom of fire hearths, and from a stratigraphic control column in the pithouse fill at 20-cm intervals. (Refer to app. 5-1 for the results of the pollen analysis for this site.)

Lithic materials recovered in situ off the floor of the pithouse were collected for amino acid testing.

Since artifactual material was extremely sparse throughout the site and in the fill of the pithouse, only the lower fill in the pithouse was screened. However, very little material was recovered by this technique, again due to the paucity of artifacts.

Whenever possible, charred wood remains were collected and treated for dendrochronological analysis. If the wood was in a fragmented condition, the charred material was collected for radiocarbon dating. Ideally, both types of samples as well as botanical samples were collected from the same log.

Archaeomagnetic samples were taken from the central hearth in the pithouse and from one of the outside fireplaces. A summary of these samples is included in appendix 5-2.

**CULTURAL UNITS**

Architectural remains at Sagehill Hamlet consist of a single pithouse and three types of surface features: fireplaces and hearths, postholes, and amorphous concentrations of corn kernels. The surface features have been used to define two use areas (fig. 5.5).

**Pithouse I**

Pithouse I, a small, deep, nearly circular structure, was the major architectural feature investigated at Site 5MT2198. Photographs and plan and profile maps of Pithouse I are included as figures 5.6 through 5.11. Table 5.1 presents point-located artifacts from Pithouse I.

**Dimensions:**
- North-south diameter: 3.85 m
- East-west diameter: 4.05 m
- South room length: 3.56 m
- South room width: 1.11 m
Floor area (main chamber north of wingwalls) 11.06 m²
Floor area (main chamber south of wingwalls) 3.40 m²
Floor area (antechamber) 8.36 m²
Total roofed area (without antechamber) 14.46 m²
Total roofed area (including antechamber) 22.82 m²
Depth of structure (floor level to modern ground surface) 2.35 m
Reconstructed roof height (from floor) 2.70 m

Period and Span of Occupation

The site was occupied during the Sagehen Phase (late Basketmaker III-Early Pueblo I). Dendrochronological data indicate the pithouse was built between the years A.D. 660 and 700, while ceramic evidence suggests occupation sometime between A.D. 700 and 775. The pithouse was probably occupied for a relatively short time span by a single generation, perhaps less than 30 years.

Shape

This structure is a deep circular pithouse with squared corners and slightly undercut walls. No bench was encountered.

Orientation

The main (northwest-southeast) axis of the pithouse (a line passing through the centers of the ventilator tunnel, deflector, hearth, and sipapu) is oriented 18° west of magnetic north. Therefore, the front of the pithouse, the antechamber end, faces south-southeast. This orientation is typical for Basketmaker III pithouses in the eastern Anasazi area (Birkedal, 1976:39).

Walls

The walls of the pithouse are cut into the native sterile soil. They are fairly vertical at the top but undercut slightly at the bottom. The upper portions of the walls were fairly eroded and there is no evidence of plaster. At approximately 1.3 m below present ground surface, the native soil changes from a hardpacked and clay-like consistency to sandy and loose. To alleviate any potential degradation of the lower walls, the inhabitants coated the walls with a thin wash of the clay soil.
Figure 5.7 Sagehill Hamlet (Site 5MT2198), Pithouse I, plan view.

Figure 5.8 Pithouse 1, Site 5MT2198, north-south architectural profile.

Figure 5.9 Pithouse 1, Site 5MT2198, east-west architectural profiles.
Surfaces

Floor I of the main chamber consists of a relatively level layer of "puddled adobe" laid over the native coarse yellow sand. Although the floor appears to have been laid down as a single unit, it varies in thickness from 2.0 to 3.5 cm. The floor is thickest around the hearth and thins out in the area south of the wingwall. It is basically gray, probably due to ash trodden into the floor during the prehistoric occupation. The walls and floor meet in a nearly perpendicular fashion, except for a slight rise in the floor to meet the east wall. Rodent activity and erosion was minimal, leaving the floor in good condition for excavation and recording.

Hearth

Located slightly south of center along the northwest-southeast axis of the pithouse is a fairly large circular hearth (fig. 5.10). This hearth measures 66 cm in diameter and has a depth of 16 cm. The south border was lined with three upright sandstone slabs. Two of these slabs were concealed by an adobe collar, 4 cm high and 13 cm wide; the collar did not extend around the rest of the hearth rim. In cross section the hearth is basin shaped with a fairly flat bottom and steep concave walls, except for the north wall, which is stepped. Except for the three stone slabs on the south end, the sides and bottom of the pit consisted of unlined but fire-hardened and slightly fire-reddened native earth.

There were numerous layers of fill in the hearth, most of them consisting of ash and charcoal. About 5 cm from the bottom of the pit was a 2- to 3-cm layer of sterile red claylike soil. Originally, it appeared as though this layer was deposited naturally during a period of nonuse, but further investigation showed that this layer was restricted to the middle of the basin and did not extend out to the sides of the basin. Therefore, it seems that this soil may have been purposely deposited into the hearth for unknown reasons.

This layer of red soil corresponds with the step or ledge in the north border of the hearth.

An archaeomagnetic sample (No. 2) was obtained from the hearth. While analysis yielded four possible dates for this feature, the earliest date, A.D. 700 ± 75, is not inconsistent with the other dating evidence for this site (see app. 5-2).

Deflector

A single upright, roughly rectangular slab of unshaped sandstone served as a deflector. This slab measures 20 cm in height, 41 cm in width, and 8 cm in thickness. This deflector is situated between the two wingwalls but 65 cm south of the wingwall line and 18 cm north of the ventilator tunnel.

Sipapu

In line with the ventilator tunnel, deflector, and hearth is a small unlined cylindrical hole which has vertical sides and is 12 cm deep and 10 by 12 cm in diameter. Because of its size and location, it is postulated that this feature functioned as a sipapu. Clean yellow sand constituted the contents of the hole.

Postholes

Four relatively large cylindrical postholes form a square pattern on the floor of the main chamber. They are set out from the walls of the pithouse 15 to 30 cm. The postholes range in size from 24 to 30 cm in diameter and 22 to 53 cm in depth. The two southern postholes are in the area just behind the wingwalls (the south end). Two other smaller postholes abut against the north sides of the wingwalls, and are half-moon shaped. Apparently the posts originally placed in these postholes were cut in half vertically before placement. Since these holes are not in line with the four
Table 5.1 Point-located artifacts, Pithouse 1, Site 5MT2198

<table>
<thead>
<tr>
<th>Provenience</th>
<th>Artifact</th>
<th>Point location No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pithouse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main chamber (north of wingwalls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor, sq 024030</td>
<td>1 shaped stone slab</td>
<td>1</td>
</tr>
<tr>
<td>Floor, sq 024030</td>
<td>1 flake‡</td>
<td>2</td>
</tr>
<tr>
<td>Floor, sq 024030</td>
<td>7 flaked lithic debitage</td>
<td>3</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 flaked lithic debitage</td>
<td>4</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 flaked lithic debitage</td>
<td>5</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 flaked lithic debitage</td>
<td>6</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 core</td>
<td>7</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 thick biface</td>
<td>8</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 flaked lithic debitage</td>
<td>9</td>
</tr>
<tr>
<td>Floor, sq 024032</td>
<td>1 sherd</td>
<td>10</td>
</tr>
<tr>
<td>Floor, sq 024028</td>
<td>1 flaked lithic debitage</td>
<td>11</td>
</tr>
<tr>
<td>Floor, sq 024028</td>
<td>1 sherd</td>
<td>12</td>
</tr>
<tr>
<td>Floor, sq 026032</td>
<td>charred beam fragment</td>
<td>13</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 anvil</td>
<td>14</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>2 flaked lithic debitage, and</td>
<td>15</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 utilized flake</td>
<td></td>
</tr>
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<td>1 flaked lithic debitage</td>
<td>16</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flake‡</td>
<td>17</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 polishing/pecking stone</td>
<td>18</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 mano</td>
<td>19</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>20</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>21</td>
</tr>
<tr>
<td>Floor, sq 024030</td>
<td>1 mano</td>
<td>35</td>
</tr>
<tr>
<td>Main chamber (south of wingwalls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>22</td>
</tr>
<tr>
<td>Floor, sq 026032</td>
<td>1 flaked lithic debitage</td>
<td>23</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage‡</td>
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</tr>
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<td>2 flaked lithic debitage</td>
<td>25</td>
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<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>26</td>
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<tr>
<td>Floor, sq 026032</td>
<td>1 mano</td>
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</tr>
<tr>
<td>Floor, sq 026032</td>
<td>1 flaked lithic debitage</td>
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</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>29</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 flaked lithic debitage</td>
<td>30</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 round sandstone cobble*</td>
<td>31</td>
</tr>
<tr>
<td>Floor, sq 026030</td>
<td>1 mano</td>
<td>32</td>
</tr>
<tr>
<td>Floor, sq 026032</td>
<td>1 flaked lithic debitage</td>
<td>33</td>
</tr>
<tr>
<td>Floor, sq 026032</td>
<td>1 flaked lithic debitage</td>
<td>34</td>
</tr>
</tbody>
</table>

‡Not available for analysis
*Function indeterminate
larger postholes and are set further in toward the center of the chamber, it is assumed that these were for secondary support posts. The easternmost of these holes measures 19 by 10 cm and 15 cm in depth. The western posthole measures 20 by 11 cm and 21 cm in depth.

A seventh posthole lies 5 cm east of the northwesternmost of the major postholes. Measuring 10 by 20 cm in cross section and 20 cm in depth, it is slightly smaller than the major support holes. Its size and location seem to indicate that it was for a secondary support post which either replaced or provided additional strength to the adjacent post. This posthole and the southeast main support posthole were reinforced at the bottom with flat pieces of sandstone.

Roof

The posthole pattern on the floor of the main chamber indicates that the inhabitants used a typical four-main-support-post construction to support the roof. It is assumed that four main beams were then strung between the support posts and a superstructure consisting of secondary beams, matting, and earth was used to complete the roof. The two other support posts located against the north side of the wingwall may have been used to support auxiliary beams. As the pithouse lacks a bench, it is assumed that the leaner poles were placed against the main beams and anchored in a shelf area around the perimeter of the main chamber. This shelf was probably constructed on or near the prehistoric ground surface and was destroyed by erosion.

Floor Cist

A single shallow cist is located 80 cm northeast of the hearth. Kidney shaped, this feature measures 47 cm east to west, 33 cm north to south, and is 21 cm deep. The fill of the cist was the same as the lower fill of the pithouse, indicating it was probably empty at the time of abandonment. This cist is basin shaped in profile and unlined.

Wingwalls

Two wingwalls form a partition across the southeast portion of the main chamber (fig. 5.11). These walls appear to be constructed of a material different from the local native soil; the construction is of a reddish-gray clay with flecks of charcoal. These walls abut against the walls of the pithouse and extend into the middle of the main chamber, arching slightly to the north. The interior ends are rounded and there is a 20-cm space between them. The wingwalls appear to have been built in sections, one stacked on top of the other, to reach their total heights. The west wingwall is 116 cm long and 75 cm high, and the east wingwall is 115 cm long and 73 cm high; both walls may have been higher at one time. Average thickness of the wingwalls is 12 cm. There is no evidence that the wingwalls had been plastered. However, they may have been smoothed by hand, since there are fingerprints on the south side of the west wingwall (fig. 5.12).

Metate Rest

In the western portion of the south room (the part of the pithouse south of the wingwalls) was a double alinement of stones. The alinements consist of a total of five unworked fragments of sandstone resting on the floor of the main chamber. A mano (Point Location 32) was incorporated into the easternmost alinement. It is inferred that a metate rested on these stones, a placement which would have elevated and angled the metate to a workable position. Processing areas containing metates, metate rests, and manos are commonly found in the western portions of the south rooms of Basketmaker III and Pueblo I pithouses (Birkedal, 1976; Farmer, 1977).

Floor Artifacts

Forty-two artifacts and a segment of a burned beam were found in direct association with the floor of the main chamber (fig. 5.7, table 5.1). Twenty-eight of these artifacts were flakes which tended to be clustered around the south end of the hearth and just north of the northeastern main support posthole. One core was also found in the latter location. An anvil and a composite polishing/pecking stone were found in the northwest quadrant of the chamber. One mano and a round sandstone cobble (function indeterminate) were found in the area south of the west wingwall near the metate rest, and a broken, shaped stone slab and a mano were located near the sipapu. The remaining two artifacts were pottery sherds.
Antechamber

The antechamber measures 3.39 m east to west and 2.96 m north to south; the floor was probably located about 40 cm below the prehistoric ground surface.

The actual antechamber is situated south of the main chamber; its central axis is 22° west of north.

In plan the antechamber is roughly oval. In profile this chamber is basin shaped and very shallow, having a maximum depth of 42 cm below the original occupation surface. This is an atypical form, as most Basketmaker III antechambers are deeper in relation to the main chamber and have steep vertical sides (Bullard, 1962: 141).

Walls. No evidence of the walls of the antechamber remains; they probably were destroyed by modern disturbance due to cultivation. It is assumed that the walls consisted of a wooden framework plastered with mud, since adobe fragments were recovered in this area.

Floor. The floor of the antechamber is rough, uneven, and of unprepared native earth. This surface is 108 cm above the floor of the main chamber.

Ramp entry to main chamber. At the north end of the antechamber is a ramp that slopes down into the main chamber. The front edge of the ramp is 88 cm above the floor of that structure. If this was an entry ramp, a long vertical stretch would have been necessary for getting in and out of the pithouse. Perhaps there was a step to alleviate the problem, and it was removed later when the ventilator system was installed. This feature shows no sign of having been plastered or prepared in any way.

Postholes. Three relatively large postholes present in the antechamber floor are probably associated with its construction. A fourth posthole, which would have completed a square pattern, may have been destroyed when the ventilator shaft was constructed. These postholes range from 15 to 20 cm in diameter, and 19 to 39 cm in depth. The northeast posthole contained remnants of a partially burned post. None of the postholes were lined.

The original ground surface adjacent to the basin-shaped surface of the antechamber shows no evidence of side pole sockets which may have supported leaner poles for the walls and roof. If they were present, they probably have eroded away.

Ventilator

The east side of the antechamber was remodeled to accommodate a shaft that functioned as the vertical portion of the ventilation system; a horizontal tunnel connects this feature to the main chamber.

At floor level, the ventilator shaft measures 2.13 m east to west by 1.91 m north to south. The length of the tunnel from the north portal to the back of the ventilator shaft is 2.70 m.

Walls. The walls of the shaft are cut into the native sterile soil and show no evidence of having been plastered. They are undercut, resulting in a bell-shape effect.

Floor. No hardpacked or prepared surface that could be identified as a floor was found at the bottom of the ventilator shaft. There was a layer of clean yellow sand and fragments of yellow sandstone on a surface thought to be a floor, but later determined to be part of the natural deposits present at the site. This surface was 165 cm below present ground surface, but 11 cm below the floor level of the main chamber, and 8 cm below the floor level of the tunnel. Since this surface is a natural phenomenon, the actual bottom of the ventilator shaft may have been level with the floor of the tunnel.

Tunnel. Connecting the ventilator shaft with the main chamber is a rounded tunnel. On each side of the north end of the tunnel is a small adobe lip that extends out into the main chamber. The tunnel is slightly funnel shaped in that it is wider at the south end, narrowing toward the north end. On the north end, the tunnel opening is 43 cm high and 50 cm wide. The south end opening is 43 cm high and 56 cm across. Total length of the tunnel is 113 cm. Figure 5.13 depicts the pithouse deflector and horizontal ventilator tunnel.

Figure 5.13 Pithouse 1. Site 5MT2198: detail of deflector slab and horizontal portion of ventilator system.

Pithouse Fill

The general characteristics of the pithouse fill indicate that the structure lay open to aeolian and waterborne sedimentation and to decay for a short period before the remnants of the roof burned. The fire must have been minimal.
because the walls and floor show no signs of burning and only one fragment of a charred beam was found on the floor of the main chamber. The burning was concentrated in the ventilator shaft and antechamber area; more charcoal and numerous fragments of charred beams were recovered from these features. After the fire the forces of nature continued to fill the depression formed by the pithouse until the ground surface above the pithouse became indistinguishable from the surrounding area.

The character of the pithouse fill reflects the nature of the depositional history. The topmost fill layer consisted of 10 to 15 cm of loose, dry, reddish-brown soil, which was essentially the plow layer resulting from modern cultivation. Only flecks of charcoal in this layer gave a clue to the structure below. Beneath this topsoil layer, extending to the floor of the pithouse, was a fairly homogeneous fill. Clearly post-occupational, this soil was dark reddish-brown, compact, and contained pieces of charcoal and very little cultural debris. The upper 50 cm of this fill was blocky, angular, and slightly darker than lower deposits, probably due to certain soil formation processes. The middle portion of this fill was characterized by numerous thin varve layers, probably reflecting periods when water accumulated in the depression. Although there were small chunks of burned adobe throughout the fill, there was not a distinct layer of roof fall. A few unburned, unshaped sandstone slabs were found in the lower fill. These may have been lying on the roof when it decayed and fell in.

Artifactual remains were scarce throughout the post-occupational deposits and consisted mainly of small sherds and flaked stone debris. A broken metate was recovered from the fill of the ventilator shaft.

**Use Area I**

Use Area I is an unbounded surface locus of prehistoric activity located north of the pithouse. Surviving internal features consist of a posthole and several pockets of charred corn kernels (fig. 5.14).

**Dimensions (approx.)**
- Length (E-W): 6 m
- Width (N-S): 8 m
- Surface area: 48 m²
- Depth of activity surface: Not reconstructable

**Period and Span of Occupation**

The occupation of Use Area I is inferred to correspond to that of the central dwelling or pithouse.

**Shape**

The use area probably did not correspond to a regular size or shape and was not bounded by architectural configurations.

**Walls**

No walls were incorporated into the use area.

**Surfaces**

No surfaces were encountered during excavations. It is believed that a surface probably existed during the prehistoric occupation, but that it was destroyed by modern cultivation.

**Postholes**

Located 6.9 m north of the north wall of the pithouse is a solitary isolated posthole measuring 13 to 14 cm in diameter and 7 cm in depth. No other postholes were located that might indicate the former presence of a ramada or other structure. Such evidence may have been destroyed by plowing or other agricultural practices.

**Pockets of Corn**

In close spatial association with the posthole are numerous ill-defined pockets of charred corn kernels and cob fragments and charcoal-stained areas. These features may represent the former presence of a storage facility, possibly incorporating jadal construction, since fragments of burned adobe were also recovered in these areas.

Figure 5.14 Sagehill Hamlet (Site 5MT2198), Use Area 1, plan view.
Surface Artifacts

Two manos were found in a disturbed context just south of the posthole (table 5.2). A conjecture is that these artifacts were originally on a prehistoric use surface that has been destroyed through modern farming practices. An inference is that the manos are the remnants of a food-resource processing locus in Use Area 1.

Table 5.2 Site 5MT2198, Use Area 1, point-located artifacts

<table>
<thead>
<tr>
<th>Point location No.</th>
<th>Artifact</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mano</td>
<td>southern edge of use area</td>
</tr>
<tr>
<td>2</td>
<td>mano</td>
<td>southern edge of use area</td>
</tr>
</tbody>
</table>

Dimensions (approx.)
Length (E-W) 6 m
Width (N-S) 6 m
Surface area 36 m²
Depth of activity surface Not reconstructable

Shape

The bounds of the use area probably did not correspond to a regular size or shape; no architectural boundaries were defined during the excavation process.

Surfaces

No activity surfaces were encountered during excavations. It is assumed that use surfaces existed during the occupation of the site, but that they have been destroyed by modern agricultural practices.

Hearth

Located 4.3 m east of the main chamber of Pithouse 1 is a small hearth (fig. 5.16). This feature is a shallow oval, basin shaped in cross section and unlined. The hearth measures 63 cm along the north to south axis and 74 cm east to west; the center of the basin is 6 cm deep. Examination of the sides and bottom of the feature revealed very little oxidation of the native soil. Therefore, the hearth probably was not used for a prolonged period or for processes entailing intense burning. The fill of the hearth contained pulverized flecks of charcoal mixed with post-occupational wind- and water-deposited materials. Because of the unsuitability of the materials preserved, archaeomagnetic or radiocarbon samples were not collected from the hearth. Since this is the most prominent feature in Use Area 2, it is assumed that most activities in Use Area 2 were performed in the vicinity of the hearth.
Postholes

Located near the center of the use area are two postholes. Posthole 1 is approximately 16 cm in diameter and 10 cm deep; it is 70 cm southwest of the hearth. Posthole 2 is approximately 11 cm in diameter and is 5 cm deep; it is situated 3.82 m east of the hearth. Possible functions of these postholes in association with the use of the hearth are conjectural. One hypothesis is that these features were part of a ramada or windbreak that was used to shelter the area during periods of use. It is notable that the prevailing winds in the area are from the southwest, and a structure anchored on these postholes would shield the hearth from winds in this direction. Another possibility is that the postholes were used to support a structure directly associated with food processing or other activities (such as a meat drying rack or other drying apparatus).

Artifacts

Any prehistoric surfaces and artifact associations originally present in Use Area 2 have been destroyed by modern farming practices. Several artifacts were recovered from Stratum 2, the plow zone (a mano and a flake, table 5.3), and Stratum 1, the unconsolidated upper plow zone (several flakes, a uniface, and a broken cobble). It could not be ascertained whether these artifacts might be associated with the destroyed surface. The nature of the modern agricultural practices in the site area were not intensive enough to greatly affect the lateral displacement of artifacts.

Table 5.3 Site 5MT2198, Use Area 2, point-located artifacts

<table>
<thead>
<tr>
<th>Point location No.</th>
<th>Artifact</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mano</td>
<td>northwest quadrant of use area</td>
</tr>
<tr>
<td>2</td>
<td>flake</td>
<td>above hearth</td>
</tr>
</tbody>
</table>

Other Structural Remains

One other ancillary feature was investigated at Sagehill Hamlet that was not part of a use area or structure; this is described below.

Fireplace

This rock-lined feature is located 4 m east-southeast of Pithouse 1 (fig. 5.17). The fireplace is 63 cm in diameter and measures 7 cm in depth. Although the sides of the pit are outlined with unshaped fragments of sandstone, this lining is conspicuously absent from the bottom and one-half of the south side of the pit. An archaeomagnetic sample (No. 1), obtained from the bottom of the fireplace, yielded a date of 650 ± 50 years (app. 5-2). Like the hearth in Use Area 2, this feature probably functioned as the central focus of a seasonal or specialized activity area of the inhabitants of the site.

Figure 5.17 Site 5MT2198, fireplace in isolated context. Feature has been sectioned to record stratigraphy.

DATING SAMPLES

Sixteen tree-ring samples, 19 radiocarbon samples, and 2 archaeomagnetic samples (app. 5-2) were recovered from Site 5MT2198. No radiocarbon samples were submitted for analysis. The results from the tree-ring samples are available at this time and the three dates obtained are summarized in table 5.4. While the tree-ring and archaeomagnetic dates suggest that the pitstructure was constructed during the last half of the seventh century A.D., the ceramic assemblage at the site (discussed in the following section) suggests a slightly later occupation.

Table 5.4 Tree-ring dates from Site 5MT2198

<table>
<thead>
<tr>
<th>Provenience</th>
<th>Lab. No.</th>
<th>Field No.</th>
<th>Species</th>
<th>Inside</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pithouse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antechamber</td>
<td></td>
<td>Upper fill</td>
<td>DAR-56 3</td>
<td>Juniper 0581fp¹ 0655vv²</td>
<td></td>
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<tr>
<td>Main chamber</td>
<td></td>
<td>Upper fill</td>
<td>DAR-57 9</td>
<td>Juniper 0496fp 0550vv</td>
<td></td>
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<tr>
<td>Antechamber</td>
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<td>Upper fill</td>
<td>DAR-58 8</td>
<td>Juniper 0528fp² 0634vv³</td>
<td></td>
</tr>
</tbody>
</table>

¹fp - the curvature of the inside ring indicates that it is far from the pith
²p - pith ring present
³vv - there is no way of estimating how far the last ring is from the true outside
PORTABLE ARTIFACTS

Results of preliminary laboratory analysis performed on the artifact assemblage recovered from Sagehill Hamlet are presented below according to material categories.

Lithics

This category includes both flaked and nonflaked tools and debris. Totals and field proveniences of these artifacts are summarized in appendix 5-3.

A total of 52 flaked stone tools and 351 debitage items are included in the artifact assemblage from Sagehill Hamlet. Flaked tools are limited to cores (used and unused), unifaces and bifaces, specialized forms, and utilized flakes (figs. 5.18, 5.19, and 5.20). The assemblage contains a single corner-notched, expanding-stem projectile point. Clusters of flaked tools and debitage on the floor of the main chamber, Pithouse I (fig. 5.7), possibly represent activity areas where flint knapping was carried out. Raw materials used by the inhabitants of Sagehill Hamlet for making flaked stone tools included quartzites, siltstones, felsites, rhyolites, slate, and various cherts.

Most of the 55 nonflaked stone artifacts in the assemblage from Sagehill Hamlet are utilitarian objects such as manos and metates. Other tools in the collection from the site include hammerstones, pecking stones, and an anvil, all probably employed for a variety of purposes. The anvil was discovered in situ approximately 25 cm north of the central fireplace, Pithouse 1. Such a placement is typical for Anasazi pithouses investigated in the Four Corners Area (Brinbin et al., 1981; Farmer, 1977), and probably represents the standard location of a manufacturing area. Several shaped sandstone slabs are also represented in the artifact inventory; these may represent cist or jar covers. Raw materials used in the manufacture of nonflaked lithic tools were primarily sandstones; some quartzites, diorites, siltstones, and basalts were also represented. Typical nonflaked stone artifacts recovered from Sagehill Hamlet are depicted in figures 5.21 to 5.23.

Ceramics

Over 500 sherds were recovered from both the excavations and the initial survey collections at Site 5MT2198. Of these, only 16 could be classified to type, including Chapin Gray, Chapin Black-on-white, and Piedra Black-on-white. The remainder of the sherds are classified with grouped types, and include gray wares, white wares, and red wares. Crushed igneous rock is the predominant temper type (84 percent by weight), and there are no sherds that are identified as trade wares from beyond the Mesa Verde region. The only vessel from the site that could be reconstructed was a small portion of a gray ware jar.
Figure 5.21 Site 5MT2198, nonflaked lithic tools: anvil (recovered from floor of Pithouse 1 north of hearth).

Figure 5.22 Site 5MT2198, nonflaked lithic tools. Left: from east end of south room, Pithouse 1. Upper center: from west corner of south room, Pithouse 1. Right: from floor of Pithouse 1. Lower center: from plow zone west of Pithouse 1.

Figure 5.23 Site 5MT2198, nonflaked lithic tools. Left: polishing/pecking stone, Point Location 18, floor of Pithouse 1 (see fig. 5.7). Right: round sandstone cobble (function indeterminate) from west end, south room of Pithouse 1.

The types recovered span the time range of about A.D. 575-900 (Breternitz et al., 1974). Piedra Black-on-white and the red wares appear in the project area at about A.D. 750, but Moccasin Gray, a type that appears at about A.D. 775 and is abundant by A.D. 800, is totally absent. Thus, ceramic data suggest occupation of the site during the early A.D. 700's and abandonment before A.D. 775.

Vessel forms present at the site are what would be expected from a small habitation. Jar fragments account for 90 percent of the total sherd weight, while bowls account for 8 percent and other forms (especially seed jars) account for the remaining 2 percent. The greatest use of ceramics was for cooking and storage.

**Vegetal Remains**

Charred corncobs and kernels are the only vegetal food items represented in the material inventory recovered from Site 5MT2198. Other vegetal remains include charred juniper and sagebrush wood and phragmites, a reed-like plant that grows in marshy environments. Proveniences of vegetal remains are summarized in table 5.5.

In addition to conducting dendrochronological analysis on suitable specimens, Laboratory of Tree-Ring Research personnel also identified to species the specimens of structural wood sent to their laboratory. Of a total of 16 individual pieces sent to the Tree-Ring Laboratory, 11 specimens, or 68.7 percent, were juniper (*Juniperus osteosperma*); 1, or 6.2 percent, was pinyon pine (*Pinus edulis*); 1, or 6.2 percent, was cottonwood (*Populus* sp.); and 3, or 18.7 percent, were unidentified soft wood. The results of this identification indicate that the people of the hamlet were relying primarily on juniper as construction wood. This tree was probably easily obtainable within a short distance from the site. More surprising is the presence of cottonwood and other softwoods. If the prehistoric environment was similar to the modern one, then the inhabitants of Site 5MT2198 would probably have had to transport nonconiferous wood from the Dolores River bottomlands, a distance of 3.2 km. (A few cottonwoods are presently growing in the drainages north of the Sagehen Marsh; however, if they were available in the local area during prehistoric times, this potential source was probably quickly exhausted.) This would have entailed a significant expenditure of energy. Perhaps softwood was preferred for special elements of house construction.

**Bone**

One worked bone artifact was recovered from Site 5MT2198. This is a jackrabbit tibia awl recovered from the ventilator shaft of the pithouse (fig. 5.24). The smallness of the collection makes impossible any conclusions regarding the nature of the worked bone inventory or manufacturing industry of the household group inhabiting this site.
Table 5.5 Site 5MT2198, vegetal remains

<table>
<thead>
<tr>
<th>Level</th>
<th>Cobs</th>
<th>Kernels</th>
<th>Phragmites</th>
<th>Juniper*</th>
<th>Nonidentifiable wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antechamber/ventilator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper fill</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Main Chamber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fireplace</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancillary Features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posthole C</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Pockets of charred corn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Trench 2</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

*tentative identification
‡numerous

ARCHITECTURAL AND CERAMIC REMAINS—1978

**Preliminary Interpretations**

**Chronology**

Architectural and ceramic remains indicate that Site 5MT2198 was occupied during the Sagehen Phase (Late Basketmaker III period). The three dates of tree-ring specimens confirm this association. The general paucity of artifacts and lack of a trash mound suggest that the site was occupied for a short period of time. The remodeling of the antechamber into a ventilation system is not interpreted as evidence of a second component. Assigning a more precise date to this occupation is difficult. The three tree-ring dates suggest that the pithouse was constructed during the last half of the seventh century A.D. In agreement with this, an archaeomagnetic sample from the fireplace in Use Area 2 yielded a date of A.D. 650 ± 50 years. On the other hand, the presence of red ware and Piedra Black-on-white sherds suggests that the site's occupation occurred somewhat later—during the eighth century A.D.—terminating by A.D. 775.

**Economic Activities**

This single pit dwelling and associated surface features probably represent a farmstead occupied by a nuclear family (Birkedal, 1976:459). That the occupants were farmers is certain, due to the abundance of charred corn recovered near the pithouse. Their fields were probably close by, perhaps in the basin directly south of the hamlet and on the low hills within 100 m of the site. That the inhabitants of the hamlet were restricted to a very local area for their farming activities is supported by the nearness of other similar habitation units of the West Sagehen Neighborhood. Although it can be speculated that these farmers grew other crops and utilized wild plants as well, positive evidence for these activities is lacking from the material collections recovered from the site.

**Paleodemography**

It is postulated that Sagehill Hamlet was the residence of one household unit incorporated into the dispersed community designated the West Sagehen Neighborhood. Although no reliable figures are available concerning population estimates for Formative stage or Anasazi Tradition households, Parsons (1971), Blanton (1972), and Winter (1972) all assume a mean figure of five individuals per household unit based on their research involving Mesoamerican villages. Both Birkedal (1976) and Flannery (1976a:23) believe that American Formative stage households (for the Anasazi Tradition, Mesa Verde Region, and
the Mesoamerican Formative Period, respectively) consisted of nuclear families. This social unit can be described as a parent pair, their children, and possibly 1 or 2 close relatives, or 2 to 3 individuals at a minimum, and 8 to 10 individuals maximum, or a mean of 5 to 6 persons.

One popular approach to estimating prehistoric site populations is to infer the number of occupants based on the available habitation area (for example, Narroll, 1962; LeBlanc, 1971; Casselberry, 1974; or Clarke, 1974). Based on the total roofed area for Pithouse 1, population estimates have been calculated for Sagehill Hamlet based on the methods of Narroll (the population of a settlement unit can be calculated as one-tenth the floor area measured in square meters) and Casselberry (the population of a multifamily dwelling can be estimated as one-sixth the total floor area of the dwelling as measured in square meters). These population estimates are shown in table 5.6.

### Table 5.6 Site 5MT2198, population estimates based on habitation area

<table>
<thead>
<tr>
<th>Floor area</th>
<th>Estimated No. of occupants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Narroll</td>
</tr>
<tr>
<td>With antechamber</td>
<td>22.82</td>
</tr>
<tr>
<td>Without antechamber</td>
<td>14.46</td>
</tr>
</tbody>
</table>

Population estimates for the site obtained by using the Narroll formula appear unreasonably low, while those using Casselberry's method seem more plausible. Birkedal (1976:437) also reports more success by applying Casselberry's techniques. The early occupation had access to more roofed floor area, since an antechamber was incorporated in the design of the pithouse. Later occupants had less space when the antechamber area was remodeled into a ventilator system; perhaps some activities that were originally performed in the antechamber were relocated in Use Area 1 to the north of the pithouse.

In summary, it is inferred that Sagehill Hamlet served as the residence of one household unit that was integrated into the West Sagehen Neighborhood. Based on estimates of available floor area, it appears that Site 5MT2198 was occupied by a small family unit of two to four individuals.

### Social Activities

It can reasonably be assumed from artifactual and structural remains at the site that activities were basically restricted to those involving subsistence, e.g., farming, food processing, tool production, etc., and social functions relating to these activities. There is no evidence that would indicate any specialized use of the site in the economic, social, or ceremonial realms. That some religious or ceremonial activities occurred at the hamlet is evidenced by the sipapu in the pithouse; the extent of these activities remains conjectural.

Specific activity areas within the pithouse can summarily be assigned on the basis of floor artifacts. The abundance of flakes around the hearth, flakes and cores in the northeast corner, and a cluster of stone tools and flakes near the west wall of the structure point to tool-producing activities in these areas. Food preparation probably took place in the south room (the area south of the wingwall) since manos and a metate rest were recovered from that area. The anvil recovered just northwest of the central hearth may represent a specialized tool manufacturing locus in this area.

Outside activities probably centered around the hearth to the east and the fireplace to the southeast of the pithouse, and around Use Area 1 to the north. Actual evidence for specific activities around the hearth and fireplace is lacking. Perhaps they represent the centers of seasonal activity areas, since during the winter they would be exposed to the elements and unusable during heavy snows. They would have been somewhat protected by construction of a ramada; the postholes located to the west and southwest of the hearth in Use Area 2 may be evidence for such a structure. Storage and/or food processing activities may have been carried out in Use Area 1 north of the pithouse since an abundance of charred corn and two manos were recovered from this location. However, as a result of destruction from modern cultivation, any conclusions regarding prehistoric structures and activities in this area must remain mostly conjectural.

Because of the array of architectural remains present at Site 5MT2198, it has been concluded that one family or household occupied the habitation. The total cultural remains at Site 5MT2198 can therefore be said to represent a household cluster. A household cluster, according to Flannery, "consists of the house and all the surrounding storage pits, burials, middens and features that can be reliably associated with the same household" (1976b:5). The household cluster, therefore, is a cluster of architectural and artifactual remains used by a social unit, the household. In this case the remains recorded at Site 5MT2198 can be used to estimate the facilities and portable artifacts present at a Sagehen Phase household cluster and the activities performed by the household members using that household cluster. At Sagehill Hamlet the household cluster consists of a (pith)house, a storage and use area (possibly with surface rooms and pits) to the north of the house, and other use/activity areas with hearths and possible brush screens or ramadas to the east of the house. Activities performed at the household cluster include flaked stone tool manufacture (represented by the core anddebitage concentrations on the house floor), other tool
manufacture (represented by the anvil), food processing (corn and/or seed grinding as represented by the manos and metate rest), and food storage (represented by the pockets of corn and numerous storage jar fragments recovered from Use Area I north of the house). This household cluster will be compared to those recorded at other Sagehen Phase hamlets to establish parameters for the prehistoric occupation during this time period.

Trade

There is nothing in the cultural materials inventory recovered from Site 5MT2198 that would indicate that the prehistoric inhabitants of the hamlet traded with their more distant neighbors. The extent of trade and cooperation among the very close hamlets in the vicinity is unknown.

Cultural Process

Although all evidence indicates that Sagehill Hamlet was occupied for a short time, one extensive remodeling episode did occur in that interval. The original shallow antechamber was undoubtedly abandoned when the inhabitants elected to replace it with a ventilator. This shift of ventilating systems appears to be a general trend in Anasazi architecture toward the end of the Basketmaker III Period (Bullard, 1962; Brew, 1946).

CONCLUSION

In summation it can be concluded that Site 5MT2198 was a small habitation occupied by a single family intent on making a living by local farming and by foraging for other resources available in the Escalante Sector. This household unit was part of what is considered to have been the larger West Sagehen Neighborhood, a dispersed community inhabiting the area north of the Sagehen Marsh during the seventh and eighth centuries A.D. The Sagehill residents occupied the site for a short time, then abandoned their home for unknown reasons, perhaps only moving a short distance to another knoll in the Sagehen Locality. Future excavations in the Sagehen Flats Locality will help to elucidate the local movements and other cultural patterns of the prehistoric peoples living in small hamlets during the Sagehen Phase.
Appendix 5-1

POLLEN REPORT FOR SITE 5MT2198

By Linda Scott

SITe 5MT2198
(SAGEHILL HAMLET)

Pollen samples were collected at various sites to obtain information concerning the prehistoric environment and potential economic resources used by the prehistoric peoples. Discussion of the methodology involved and intersite comparisons are presented in the Pollen Administrative Report (Scott, 1981). Not all the pollen recovered is discussed in detail in that report, but mention is made of the various types and the entire pollen record is graphically represented.

The first sample diagramed from this site, pollen sample 7, represents the uppermost layer of a stratigraphic column taken from the pit structure (table 5.7). This sample was taken from 0 to 20 cm below the present ground surface. Sample 7 contains slightly less arboreal pollen than does the modern pollen sample from Site 5MT4512, another Sagehen Phase site located about 760 m east of Site 5MT2198. The difference between the two samples is primarily that the sample from Site 5MT4512 contains more Pinus pollen. In most respects, however, sample 7 reflects the same pollen rain exhibited in the modern sample from Site 5MT4512.

All of the archaeological pollen samples from this site were taken from Surface 1 in Pit structure 1. Pollen sample 13 was taken from contact with the floor in the northwest quadrant of this pit structure. Pollen sample 15 was taken from beneath a lap anvil in the same quadrant of the same pit structure. The pollen composition of these two samples is similar and appears to represent primarily ambient or background pollen from this pit structure. A small amount of Cleome (1 percent) was noted in the floor-contact sample, while the sample taken from under the lap anvil contains 5 percent Cleome, 1 percent Opuntia, and 1 percent Umbelliferae pollen. This lap anvil is located slightly to the

<table>
<thead>
<tr>
<th>Pollen sample No.</th>
<th>Field provenience No.</th>
<th>Provenience and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>84</td>
<td>0 to 20 cm below present ground surface, SW quad, against wall</td>
</tr>
<tr>
<td>13</td>
<td>83</td>
<td>NW quad, Surface 1</td>
</tr>
<tr>
<td>15</td>
<td>114</td>
<td>Under lap anvil, NW of hearth, Surface 1</td>
</tr>
<tr>
<td>19</td>
<td>114</td>
<td>SW quad, in front of wingwall, Surface 1, Sq. 030026</td>
</tr>
<tr>
<td>20</td>
<td>126</td>
<td>SW quad, behind west wingwall, Surface 1, Sq. 030028</td>
</tr>
<tr>
<td>21</td>
<td>114</td>
<td>SE edge of main hearth</td>
</tr>
<tr>
<td>22</td>
<td>124</td>
<td>Under mano behind distal end of east wingwall, Surface 1</td>
</tr>
<tr>
<td>24</td>
<td>115</td>
<td>SE quad, corner where east wingwall meets wall of structure, Surface 1, Sq. 032026, no pollen</td>
</tr>
<tr>
<td>28</td>
<td>132</td>
<td>Under mano, behind west wingwall, Surface 1</td>
</tr>
<tr>
<td>29</td>
<td>127</td>
<td>Below rim of main hearth, SE corner, 5 cm N of slab, no pollen</td>
</tr>
<tr>
<td>31</td>
<td>127</td>
<td>Below main hearth, SW corner, 4 cm NE of slab, no pollen</td>
</tr>
</tbody>
</table>
northwest of the hearth. It might be that the increased amount of economic pollen relates to activities around the hearth, rather than specifically to this lap anvil.

Pollen sample 19 was taken from inside the main chamber just in front of the west wingwall. Sample 24, taken from near the east wingwall where the wingwall joins the main chamber, did not yield sufficient pollen for analysis. Pollen sample 20 represents the area behind the west wingwall. The primary differences between the two samples analyzed are that sample 20 has slightly more *Artemisia*, and that *Cleome* pollen (2 percent) was found only in sample 19. Neither of these samples contain any evidence of *Zea* pollen. The pollen record suggests that these two areas sampled were probably not connected with food-processing activities or vegetable storage.

Pollen samples 28 and 22 were taken from beneath mano fragments behind the wingwalls. These samples contain arboreal pollen frequencies similar to one another, and in fact, they have pollen records similar to samples 13 and 19. Both mano fragments contain evidence of *Opuntia* pollen (1 percent), and one contains evidence of *Cleome* pollen (12 percent) while the other contains a small amount of *Zea* pollen (1 percent). The *Cleome* pollen in sample 22 indicates that the mano sampled was probably used to grind *Cleome* seeds.

Three pollen samples were taken in association with the hearth in this pitstructure. Pollen sample 21 was taken from the south edge of the hearth and was the only sample to contain sufficient pollen for analysis. Samples 29 and 31, taken from below the rim of the hearth and from below the hearth, respectively, contained insufficient pollen for analysis. Pollen sample 21 contains an arboreal pollen frequency similar to those from the rest of the samples from this pitstructure (22 percent). The unique components of this pollen sample include a trace of *Opuntia* pollen and 5 percent Umbelliferae pollen.

The pollen evidence indicates that the prehistoric environment at or near this site offered the following vegetation types for exploitation by the inhabitants of the site: *Juniperus, Pinus, Quercus*, short-spined *Compositae, Artemisia*, high-spined *Compositae, Chenopodiaceae, Cleome, Ephedra nevadensis-type and *Ephedra torreyana-type, Eriogonum, Gramineae, Opuntia, Rosaceae*, and Umbelliferae. *Zea* was the only cultigen noted in the pollen samples from this site. The archaeological pollen samples at this site establish a fairly uniform record of background pollen in this pitstructure. The variations in pollen content in these samples appear in the ones taken from under the mano fragments, which contain evidence of *Opuntia, Cleome, and Zea* pollen. The relatively small frequencies for these pollen types make it difficult to ascertain whether this pollen should be attributed to ambient pollen in the area or to grinding activities of the mano. The limited occurrence of these economic pollen types in this pitstructure suggests that their occurrence in samples associated with features and artifacts is probably related to food preparation activities.

The hearth sample also contains evidence of *Opuntia, Zea*, and Umbelliferae pollen. The association of these pollen types with the mano fragments and hearth appear to indicate not only the use of *Cleome, Opuntia, Umbelliferae, and Zea* as food items, but also their preparation for consumption at these specific locations in the pitstructure.
Appendix 5-2

ARCHAEO MAGNETIC RESULTS FOR SITE 5MT2198

By J. Holly Hathaway and Jeffrey L. Eighmy

INTRODUCTION

Archaeomagnetic dating is a relatively recent chronometric method which has important implications for the archaeologist. Utilization of this method will not only refine estimates of ancient chronology, but also enable archaeologists to assign dates in the absence of other dating methods (e.g., dendrochronology and carbon-14). Care should be taken in reporting results, because in a young science, methodology needs a thorough discussion, and good communication should speed the diffusion of any significant technical or methodological advances. Archaeomagnetic methods are continually being refined in attempts to increase the variety of datable features, to tighten temporal control, and to further understand the nature of magnetic change. For a more complete discussion of laboratory and field methods refer to Hathaway and Eighmy (1981).

SAMPLING AND METHODS

Two samples were collected on Site 5MT2198 during the 1978 field season. The site is located at 37°31' north latitude and 251°42' east longitude in the Sagehen Flats area of DAP. The site consists of a small hamlet, probably occupied during the Sagehen Phase (A.D. 600-850).

Sample 1 was collected from a slab-lined fireplace located in an exterior area southeast of the main living structure. Sample 2 was collected from the central hearth in Pitstructure 1. No other features suitable for archaeomagnetic analysis were recovered on this site.

Twelve specimens were collected for each of the samples from Site 5MT2198. Each specimen (an estimated volume of 3.4 cm³) was encased in a 2.5-cm plaster cube (15.6 cm³). The orientation of each specimen was maintained by leveling the cube and measuring the magnetic declination of

Table 5.8 Archaeomagnetic results from Site 5MT2198

<table>
<thead>
<tr>
<th>Archaeomagnetic designation</th>
<th>5MT2198-1</th>
<th>5MT2198-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature and provenience</td>
<td>Fireplace Sq. 034032, Level 1</td>
<td>Hearth Pitstructure I, Surface 1</td>
</tr>
<tr>
<td>Specimens used in final analysis/total collected</td>
<td>7/12</td>
<td>9/12</td>
</tr>
<tr>
<td>DeGauss level</td>
<td>180 oersted</td>
<td>150 oersted</td>
</tr>
<tr>
<td>Mean inclination</td>
<td>64.49</td>
<td>59.44</td>
</tr>
<tr>
<td>Mean declination</td>
<td>5.43</td>
<td>1.81</td>
</tr>
<tr>
<td>Mean intensity</td>
<td>$0.165272 \times 10^{-4}$</td>
<td>$0.125983 \times 10^{-4}$</td>
</tr>
<tr>
<td>Mean sample vector</td>
<td>6.99</td>
<td>8.94</td>
</tr>
<tr>
<td>Precision parameter (k)</td>
<td>449.66</td>
<td>139.90</td>
</tr>
<tr>
<td>Alpha 95</td>
<td>2.85</td>
<td>4.37</td>
</tr>
<tr>
<td>Paleolatitude</td>
<td>80.29</td>
<td>86.91 N.</td>
</tr>
<tr>
<td>Paleolongitude</td>
<td>274.21</td>
<td>277.91 E.</td>
</tr>
<tr>
<td>Error along great circle (EP)</td>
<td>3.66</td>
<td>4.92</td>
</tr>
<tr>
<td>Error perpendicular to great circle (EM)</td>
<td>4.57</td>
<td>6.56</td>
</tr>
</tbody>
</table>
one cube side. To control for current local magnetic declination, North Star was sighted on 2 September 1978. The average observed magnetic declination was 13.5°, ½° different than the USGS 1965 geological map, and in substantial agreement with expected values calculated from the National Oceanic and Atmospheric Administration Map “Magnetic Declination in the United States-Epoch 1975.0.0.”

LABORATORY RESULTS

Results from samples 1 and 2 are reported in table 5.8. Individual magnetic directions are plotted for each sample in figure 5.25 using the declination and inclination method. Five outliers were identified from sample 1, and three from sample 2. Outliers were identified in the following manner: the sample was rerun with relatively extreme specimens excluded and a new mean and the angular deviation calculated. The excluded specimens were defined as outliers of the new mean (smaller sample) if they fell beyond two standard deviations. It is considered a strong possibility that these outliers are not part of the same population and that the new sample is a better representation of the true direction created by the ancient firing.

Three tests were used to determine sample reliability. Alpha 95 is defined as the radius of a circle centered on the observed mean direction within which the true mean will fall 95 percent of the time. Small values indicate tighter clustering about the mean. The precision parameter is estimated by Fisherian statistics, and values increase geometrically with internal consistency. The mean sample vector indicates internal consistency as the value approaches the number of specimens used for determination of the mean. Error along the great circle and perpendicular to the great circle are functions of the alpha 95 which has an oval distribution when plotted, with a short axis (EP) which runs along the great circle between the collecting site and paleopole. The long axis is perpendicular to the short axis; both are centered on the paleopole.

The demagnetized and cleaned results of samples 1 and 2 were then plotted on the Southwest master curve (fig. 5.26). Sample 1 appears to fall close to the A.D. 650 portion of the curve with a large error range (+ 50 years). A modern interpretation is also possible, also with a ± 50-year error range. The paleopole plot of sample 2 is somewhat problematic due to its wide range of error, and dates reported should be used in conjunction with the archaeological record to determine the most feasible interpretation. Possible archaeomagnetic interpretations include: A.D. 700, A.D. 1075, A.D. 1340, and A.D. 1440; all with a ± 75-year range of error.

![Figure 5.25 Site 5MT2198, archaeomagnetic specimen plots, samples 1 and 2.](image)

![Figure 5.26 Site 5MT2198, Southwest master curve. Solid portion is based on DuBois (1975). Dashed portion is based primarily on Wolfman (1979). Modern portion is calculated from USGS magnetic declination and inclination maps for the United States—Epoch and from Svendsen (1962).](image)
Appendix 5-3
DATA AND SUMMARY STATEMENTS,
LITHIC MATERIALS FROM SITE 5MT2198

By Carl J. Phagan and Thomas H. Hruby

The data presented in tables 5.9, 5.10, and 5.11 represent part of the lithic reductive-technology analysis completed for Site 5MT2198. From a 12-attribute FLT (Flaked Lithic Tool) analysis system, 4 attributes were selected to illustrate general technological, functional, and raw-material variability. A traditional morphological-use classification, a ranked estimation of production technology input for dorsal and ventral surfaces, and a grain-size evaluation are included. Six variables are included from the FLD (Flaked Lithic Debitage) analysis system: grain-size ranking, classification of items with cortex, items which retain a striking platform, obsidian items, mean weight, and total number of debitage items. The NFLT (Non flaked Lithic Tool) analysis system is represented by four variables: traditional morphological-use item classification, production-input evaluation, indication of item completeness, and raw-material grain-size evaluation. The complete lithic-analysis systems are described elsewhere in DAP publications (Phagan, 1981).

During 1980, DAP lithic-laboratory personnel have repeatedly reviewed the utility and reliability of the lithic-analysis systems. In this review, a number of analysis variables have been modified, particularly the item morphological-use variables on both the FLT and NFLT systems. Analytical perspectives change as information accumulates and as models of tool production and use improve. In order to minimize the effects of this analytical modification on interpretation, the observed values of these variables have been regrouped into larger categories within which analytic consistency is reliable.

For comparative purposes, the tables also include data for a grouping of temporally and functionally similar DAP sites and for all DAP Anasazi sites analyzed prior to the 1980 field season. These latter “Anasazi group” data have been generated from computer files which have not undergone complete editing, and final figures may differ slightly from those presented. Comparisons and interpretations presented here, particularly those of an intersite nature, are based on a qualitative assessment of lithic profile variation, since significance has not been statistically established.

Site 5MT2198 is a small unit hamlet placed within the Sagehill Subphase of the Sagehen Phase. Four sites, Site 5MT2194, Site 5MT2858, Site 5MT4545, and Site 5MT4614, have a similar temporal/functional matrix and have been grouped together for comparable purposes.

Site 5MT2198 has an unusually large percentage of cores and is underrepresented in utilized flakes when compared with the Anasazi group and the group of similar temporal/functional sites. Site 5MT2198 also has a comparatively low percentage of items with high technological input—the exception to this is the specialized forms which have high technological input values. The above evidence along with the relatively low number of other high input items (bifaces, scrapers, and projectile points) indicates that Site 5MT2198 had a very specialized flaked tool industry—probably related to specialized household tasks. Supporting this conclusion are the dorsal and ventral technological evaluations which suggest that a relatively large amount of energy input was being given to the traditionally low-input items. Also supporting the specialized nature of the flaked lithic assemblage is the percentage of flaked tools to total flaked lithic items. Both the Anasazi group and the group of unit hamlets have 9.8 tools per 100 flaked lithic items; Site 5MT2198 has 12.9 tools per 100 items. This percentage is quite high for an Anasazi site. The above discussion suggests that Site 5MT2198 might be functionally specialized with respect to other Anasazi sites. It is also possible that the differences might reflect collection-mode or abandonment-mode problems.

The FLD profile may also indicate a specialized primary production situation. The profile for the lithic debitage indicates a selection for raw materials in the fine to very fine grain sizes. In the two groups used for comparative purposes, microscopic raw materials were highly selected. The large flake size, high cortex count, and very high platform
Table 5.9 Lithic analysis data summary for Site 5MT2198, flaked lithic tools

<table>
<thead>
<tr>
<th>Surface collection (N=3)</th>
<th>Pit-structure 1 (N=24)</th>
<th>Use excavated (N=21)</th>
<th>Pit-structure fill (N=19)</th>
<th>Pit-structure floor (N=3)</th>
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<td>221 25.8</td>
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Table 5.10 Lithic analysis data summary for Site 5MT2198, flaked lithic debitage

|                | Surface collection (N=12) | Pit-structure 1 (N=195) | Use Area 1 (N=12) | Other excavated units (N=132) | Pit-structure fill (N=137) | Pit-structure floor (N=29) | 5MT2198 Total (N=351) | 5MT2194 | 5MT2858 | 5MT4545 | 5MT4614 | Total (N=132) | Total group (N=66,095) | Anasazi group | % | % | % | % | % | % | % |
|----------------|--------------------------|-------------------------|-------------------|-------------------------------|---------------------------|---------------------------|------------------------|----------------|----------|----------|----------|----------|----------------|-------------------------|----------------|---|---|---|---|---|---|---|
| **Grain size** |                          |                         |                   |                               |                           |                           |                       |                |          |          |          |          |                |                           |                |   |   |   |   |   |   |   |
| Medium (coarse)| 2                        | 1.0                     | 2                 | 16.6                          | 4                         | 3.0                       | 2                      | 1.5             | 8         | 2.3      | 235       | 2.9       | 3.2           |                          |                |   |   |   |   |   |   |   |
| Fine           | 7                         | 58.3                    | 124               | 63.6                          | 71                        | 55.8                      | 81                     | 59.1            | 21        | 72.4     | 209       | 49.5      | 21.4          |                          |                |   |   |   |   |   |   |   |
| Very fine (detrital) | 5                        | 41.7                    | 57                | 29.2                          | 2                        | 16.6                      | 50                     | 37.9            | 48        | 35.0     | 114       | 32.5      | 51.6          |                          |                |   |   |   |   |   |   |   |
| Microscopic (nongranular) | 12                        | 6.1                     | 1                 | 8.3                           | 7                         | 5.3                       | 6                      | 4.4             | 3         | 10.3     | 20        | 5.7       | 23.7          |                          |                |   |   |   |   |   |   |   |
| Items with cortex | 5                        | 41.7                    | 76                | 38.9                          | 6                        | 50.0                      | 52                     | 39.4            | 55        | 40.1     | 10        | 34.5      | 25.9          |                          |                |   |   |   |   |   |   |   |
| Items with platform | 3                        | 12.5                    | 150               | 76.9                          | 5                        | 41.6                      | 92                     | 69.7            | 111       | 81.0     | 21        | 72.4     | 38.8          |                          |                |   |   |   |   |   |   |   |
| Obsidian items | 6                         | 00.1                    |                   |                               |                           |                           |                       |                 | 6         | 00.1     | 18        |          |               |                          |                |   |   |   |   |   |   |   |
| Mean weight (grams) | 9.92                     | 9.47                    |                   | 23.1                          | 10.3                      | 7.45                      | 10.78                  | 8.65            | 7.93      |          |          |          |              |                          |                |   |   |   |   |   |   |   |
| Total debitage | 12                       | 195                     | 12                | 132                           | 137                       | 29                        | 351                   | 8239           | 66,095    |          |          |          |              |                          |                |   |   |   |   |   |   |   |
Table 5.11 Lithic analysis data summary for Site 5MT2198, nonflaked lithic tools

<table>
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<tr>
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<th>Use Area 1</th>
<th>Other excavated units</th>
<th>Pit-structure fill</th>
<th>Pit-structure floor</th>
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<th>5MT2194 SMT2858 SMT4565 SMT4614 Total</th>
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Production evaluation

| Indeterminate     | 2 66.7         | 2 50.0   | 4 19.0                 | 8 14.5            | 34 6.0           | 8.4           |                             |               |
| Nodule            | 1 33.3         | 1 25.0   | 4 9.5                  | 10 76.0           | 6 75.0           | 32 58.2       | 53.5                        |               |
| Minimally shaped  | 2 2.9          | 5 23.8   | 2 15.4                 | 7 12.7            | 90 15.7          | 16.7          | 16.7                        |               |
| Well-shaped       | 5 11.7         | 3 14.3   | 1 7.7                  | 2 25.0            | 8 14.5           | 63 11.0       | 21.1                        |               |
| Highly stylized   |                |          |                        |                   |                   |               |                             |               |

Item completeness

| Indeterminate     | 2 66.7         | 2 50.0   | 4 19.0                 | 8 14.5            | 34 6.0           | 8.4           |                             |               |
| Small fragment    | 1 33.3         | 1 25.0   | 4 9.5                  | 10 76.0           | 6 75.0           | 32 58.2       | 53.5                        |               |
| Partial implement | 2 66.7         | 2 50.0   | 4 19.0                 | 8 14.5            | 34 6.0           | 8.4           |                             |               |
| Complete (±) implement | 1 33.3  | 1 25.0   | 4 19.0                 | 8 14.5            | 34 6.0           | 8.4           |                             |               |

Grain size

| Indeterminate     | 1 33.3         | 3 5.9    | 1 25.0                 | 2 9.5             | 7 12.7           | 72 12.6       | 8.1                         |               |
| Coarse            | 2 66.7         | 11 47.0  | 1 25.0                 | 7 33.3            | 37.5             | 21 38.2       | 16.5                        |               |
| Medium            | 10 35.3        | 6 28.6   | 4 30.8                 | 4 50.3            | 17 30.9          | 207 36.2      | 39.4                        |               |
| Fine              | 3 11.8         | 5 23.8   | 1 7.7                  | 9 16.4            | 183 31.9         | 34.5          |                             |               |
| Nongranular       |                | 1 4.8    | 1 7.7                  | 1 12.5            | 9 16.4           | 183 31.9      | 34.5                        |               |
counts indicate a fairly specialized production situation—probably reflecting primary production of low-input items. The paucity of debitage items, 351 pieces, suggests that the high-input tools were carried onto the site.

The proportion of flaked lithic tools to nonflaked lithic tools is very low. In Site 5MT2198 only 48.6 percent of the tools are flaked lithic tools; in the two groups used for comparative purposes the flaked lithic tools account for approximately 60 percent of the tools. The nonflaked lithics also suggest the specialized character of Site 5MT2198. The nonflaked lithic tools on Anasazi sites are usually dominated by manos and metates. Site 5MT2198 follows this pattern but has a greater percentage of manos and metates than the other unit hamlets of the Sagehill Subphase. Generalized nonflaked lithic tools are more abundant in the Anasazi group and the unit hamlet group, while specialized nonflaked lithics are twice as abundant in Site 5MT2198.

The above information suggests that Site 5MT2198, a unit hamlet currently placed in the Sagehill Subphase, is a highly specialized site in terms of the lithic materials. Both the FLT and NFLT systems indicate that food processing was a very important activity at the site. The flaked lithics are more difficult to evaluate but appear to represent an industry more related to specialized domestic activities than hunting activities.
Appendix 5-4

DATA AND SUMMARY STATEMENTS,
CERAMIC MATERIALS FROM SITE 5MT2198

By William A. Lucius and Eric Blinman

Analysis of ceramic artifacts from Site 5MT2198 was carried out by members of the DAP Additive Analysis Laboratory. Structure and procedures of this inventory analysis are described in Lucius (1981) and familiarity with this program will aid in the understanding of the data and interpretations below.

Ceramic data for the site as a whole are presented in table 5.12. These data include materials collected at the time the site was recorded in 1972. Sherds are grouped by “culture categories and wares” (Lucius, 1978). Apart from two indeterminant white ware sherds, all ceramics could be assigned to wares of the Mesa Verde Culture Category. These reflect a local (Mesa Verde region) manufacturing tradition and exchange system. Pottery types within each ware are listed sequentially from early to late, and grouped types (e.g., Early Pueblo Gray) are listed last and include sherds not assignable to specific types. The two indeterminate sherds have attributes that are not consistent with the expected attributes of either the Mesa Verde or adjacent culture categories. A breakdown of sherd frequencies within smaller spatial units of the site is presented in table 5.13.

The ceramic profile presented in figure 5.27 is based on relative weights of the typable sherds of each ware for the entire site. Relative contributions of each ware to the site total are listed in parentheses to the left of the figure. Date ranges for the types are based on those published in Breternitz et al. (1974), with some adjustments based on dating results from within the DAP. Intensity of occupation as

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### Table 5.13 Site 5MT2198, ceramic data from selected proveniences

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<th>Surface</th>
<th>Pitzone</th>
<th>Plowzone over hearth</th>
<th>Plowzone over isolated fireplace</th>
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<td>286</td>
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Includes 1972 survey collection

*Trace
Figure 5.27 Diagnostic type occurrences for ceramics, Site 5MT2198.

well as temporal span are illustrated by the figure, and it can be compared with similar figures that have been prepared for other DAP sites.

An extremely cautious estimate of occupation span for the site would be A.D. 600-900. However, the absence of Moccasin Gray (present as early as A.D. 775 and common after A.D. 800), argues for termination of site occupation at or before A.D. 775. Both Piedra Black-on-white sherds and red wares are also present, and their introduction into the project area is currently believed to postdate A.D. 750. If this assumption is correct, then the ceramic dating (site occupation lasting into the A.D. 750-775 time range) is in conflict with dating inferences based on tree-ring samples and architecture. These inferences place the date of pithouse construction after A.D. 655 but probably before A.D. 700, and there is no evidence that use of the pithouse was unusually protracted or that there were two sequential occupations at the site. It may be that this site represents an early introduction of both red wares and Piedra Black-on-white into the project area, sometime between A.D. 700 and 750.

Although all classifiable sherds are attributable to the Mesa Verde region, 14 percent were tempered with materials believed to have been used outside of the immediate project area. Most of these were tempered with a multolith sand, probably originating somewhere to the west.
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Scott, Linda J.

Svendsen, K. L.

Winter, Marcus C.

Wolfman, Daniel
Chapter 6

EXCAVATION AT LITTLE HOUSE

(SITE 5MT2191) A PUEBLO I-PUEBLO II FIELD HOUSE
ABSTRACT

Little House (Site 5MT2191) is a small Pueblo I-Pueblo II Anasazi seasonal habitation or agricultural field house located approximately 8 km (5 mi) northwest of Dolores, Colorado. The site was excavated during the summer of 1978 as part of the Dolores Project Cultural Resources Mitigation Program. Field operations were conducted during the months of July and August. A crew consisting of University of Colorado and Youth Conservation Corps personnel investigated the small surface structure comprising four small rooms and associated features. On the basis of ceramic analysis, Little House has been assigned to the early part of the McPhee Phase (A.D. 850-970). Site 5MT2191 was probably the seasonal abode for a small household or intrahousehold group practicing small-scale agriculture in the immediate site vicinity. It is inferred that the site was occupied only during the growing and harvest season (May-September). The lack of any major remodeling episodes and the small size of the material collection suggest that the site was in use for a short period of time, perhaps no more than a single generation.
CHAPTER 6
EXCAVATIONS AT LITTLE HOUSE (SITE 5MT2191), A PUEBLO I-PUEBLO II FIELD HOUSE
By Nancy J. Hewitt

INTRODUCTION

Little House is a small seasonal habitation or field house situated on a north-south trending ridgeline north of the Sagehen Marsh. In the hierarchy of spatial and temporal units employed by DAP (Dolores Archaeological Program) archaeologists (see chapter 2, this volume), the site is located in the Sagehen Flats Locality, Escalante Sector (fig. 6.1) and represents one component of the McPhee Phase (A.D. 850-970), Anasazi Tradition. More specifically, Little House is located in the SE 3/4 of the NW 1/4 of sec. 35, T38N, R16W. The Universal Transverse Mercator coordinates for the site location are 714,910 mE, 4,154,240 mN, zone 12. A basic reference map for the area is the Trimble Point Quadrangle, Colorado, USGS 7.5' series (1965) (topographic).

Surface indications of prehistoric occupation of the site consisted of a small area of sandstone fragments and a relatively sparse scatter of ceramic sherds and lithic debris strewn over the center portion of the ridgeline. The entire artifact scatter measured approximately 40 m north to south by 30 m east to west, with a surface area of 0.12 ha.

The original survey record (Breternitz and Martin, 1973) describes Little House as a ceramic and lithic concentration with no evidence of a structure; no preliminary functional interpretations were included. Analysis of the artifacts collected during survey operations indicated that the site was probably occupied during the Pueblo I and early Pueblo II periods. In June 1978, the site was evaluated for possible inclusion in that year's DAP excavation schedule and was tentatively designated as a Sagehen or McPhee Phase site. Little House was later selected for excavation; subsequent investigations led to the site being reassigned as an early McPhee Phase field house.

Operations at the site were supervised by Nancy J. Hewitt, University of Colorado archaeologist. The excavations were conducted by one University of Colorado field crew and one Youth Conservation Corps field crew during the period 10 July-16 August 1978. Average crew size was six people. Environmental data and archaeomagnetic dates were recovered by the Environmental Studies Program and dating-remote sensing program personnel, respectively. A total of 157 person-days was expended on intensive investigations at the site.

ENVIRONMENTAL SETTING

Little House is situated on the crest and south slope of a low ridge north of the Sagehen Marsh (fig. 6.1). Narrow drainages to the east and west of the site empty into the

![Figure 6.1 Little House (Site 5MT2191) topographic map.](image-url)
marsh basin. The site commands an excellent view of surrounding slopes, the marsh, and its environment.

At an elevation of 2104 m, Little House is located in the Upper Sonoran vegetation zone, although the flora in the immediate site vicinity exhibit certain characteristics of a disturbed environment. The dominant present vegetation cover at the site is big sagebrush (Artemisia tridentata), lupine (Lupinus spp.), birdbeak (Cordylanthus spp.), and thistle (Cirsium spp.); various grasses are also abundant. Squawbush (Rhus aromatica spp. trilobata) is present in the drainages near the site. Remnant stands of pinyon (Pinus edulis) and juniper (Juniperus osteosperma) are found on higher knolls to the south. Since this area has been cleared for cultivation historically, it is postulated that the pinyon and juniper stands might have been more extensive during the prehistoric occupation of the area. Within a 5-km radius of the site, various exploitable plant resources may have been available to the prehistoric occupants. Broadleaf yucca (Yucca baccata) would have yielded fruit, pods, soap, and fiber. Fruit and pods would also have been available from pricklypear (Opuntia spp.). Various grasses, especially Indian ricegrass (Oryzopsis hymenoides), would have provided important seed resources. Bulbs could have been harvested from wild onions (Allium spp.) and sego lily (Calochortus nuttallii). Serviceberry (Amelanchier utahensis), squawbush, chokecherry (Prunus virginiana), and squaw-apple (Peraphyllum ramosissimum) would have provided fruits. In good years the very important pinyon nut would have been locally abundant.

Animal species observed near the site during excavation operations include Nuttall's cottontail (Sylvilagus nuttali) and mule deer (Odocoileus hemionus). Avifauna include raven (Corvus corax), mourning dove (Zenaida macroura), turkey vulture (Cathartes aura), and unidentified song birds and hawks.

Domestic water might have been available from two sources. The closest would have been the Sagehen Marsh, located approximately 0.5 km south of the site. However, core tests carried out by program personnel conducting regional pollen studies indicate that the marsh has been in existence only intermittently (Petersen, 1979). At this point, it is conjectural whether the marsh area was active when Little House was occupied. The other potential domestic water source is the Dolores River. Obtaining water from the river would have required a fairly long (4.2 km round trip), but not difficult, trek.

The microclimate of Site 5MT2191 is similar to that of other low elevation areas within the Escalante Sector. The typical pattern is one of low humidity, wide diurnal temperature fluctuations, mild summers, and cold dry winters. At the Dolores Weather Station, located approximately 7.5 km southeast of the site, the average annual precipitation is 455 mm. This amount is attained primarily during two wet seasons—one during the winter months and the other in late summer. The site vicinity is thought to have an average growing season of 120 to 130 days, based on data compiled at the National Weather Service Station at Yellowjacket, Colorado, 13.5 km west of the site. The site area, therefore, appears to have an adequate frost-free period for the maturation of certain varieties of maize (Carter, 1945:88-89). Cold air drainage into the marsh basin area might have affected prehistoric cultivation and its distribution.

The red loess soils in the site vicinity are quite suitable for agricultural purposes. Testing revealed that the soil depths on the site itself range from 0.6 to 1.2 m, which is adequate for cultivation.

**SOCIAL SETTING**

Within a 1-km radius of Little House are four sites assigned McPhee Phase components and therefore considered to have been contemporaneous (fig. 6.2). Three of these sites are classified as limited activity loci while the fourth is classified as a field house. The limited activity loci are Site 5MT2201, 300 m to the southwest; Sheep Skull Camp, Site 5MT2202 (chapter 4, this volume), 420 m to the west; and Horse Bone Camp, Site 5MT2199 (Brown, 1981), 930 m to the west. Although it is impossible to tell at this time whether these sites were used by the occupants of Little House, it seems likely that they were all used by members of the same community.

![Figure 6.2 Little House (Site 5MT2191), location of selected contemporaneous sites.](image-url)
The other site within 1 km is Casa Roca, Site 5MT2203 (Brisbin, 1981), located 580 m northwest. This site has also been classified as a McPhee Phase field house. It is inferred that Casa Roca was also used on a seasonal basis by members of a local community, albeit by a different household than the one that occupied Little House.

The nearest contemporary habitation sites are McPhee Pueblo, Site 5MT4475 (Brisbin, 1980), located 1.65 km to the east and Crestview Hamlet, Site 5MT2651, located 1.75 km to the north (chapter 3, this volume). Due to its location, it is believed that Little House represents an outlying area used by inhabitants of either McPhee Village or Crestview Hamlet. Specifically, Little House probably functioned as a centralized location where individuals from a household from one of the local communities could carry out agricultural activities during the season from planting to harvest.

**EXCAVATION PROCEDURES**

Surface indications at Little House consisted of a sparse scatter of sherds, flaked stone, ground stone, and building rubble. The area of artifact concentration measured about 30 m north to south and 25 m east to west over the top and south slope of the knoll. The building rubble was confined to a 10- by 8-m area in the north portion of the site. It was assumed that this concentration of sandstone fragments represented a surface structure. No depressions which might indicate pitstructures were observed. Excavation objectives were to (1) discover and record any architectural features, (2) recover a representative sample of the material culture, and (3) reconstruct the types and extent of activities performed by the prehistoric occupants of the site.

Investigation was initiated by establishment of a grid system of 2- by 2-m squares over the extent of the artifact scatter. By applying standard sampling procedures developed prior to the field season, 16 such squares were randomly chosen for excavation. After the vegetation had been removed within the gridded area, excavation was begun on the random squares. All of these units were excavated in 15-cm levels until sterile soil or cultural phenomena were encountered. This resulted in the exposure of masonry walls in the area of rubble concentration. Once these indicators of architecture were encountered, the random square design was abandoned and efforts were concentrated on defining the total extent of the structures. When all the masonry walls had been exposed and the limits of all rooms defined, a small test pit was excavated in the fill of each room to determine the character and depth of the deposits and to determine the location of the floors. Since there were no cultural strata in the room deposits and since they appeared to be post-occupational in nature, these deposits were removed as a single excavation unit. Usually the fill was less than 25 cm deep. In Room 1, 5 cm above the floor, was an intermittent layer of roof fall which was removed as a separate provenience unit.

The random squares and two test trenches failed to reveal any other features or structures. To settle the issue of whether a pitstructure was present at the site, another long test trench was dug to the south of the roomblock, using a backhoe. This trench extended 9 m southeast of the main room (Room 1) and exposed a cluster of ancillary features (later designated as Occupation/Activity Area 2): a refuse pit, a storage cist, and a fireplace; no pitstructure was uncovered. Once these smaller cultural features were defined, the fill was removed by hand. In the case of small features, one-half of the fill was removed first to expose a vertical profile and the fill was collected for flotation. Additional testing of peripheral areas was done by surface scraping with a mechanized blade and by subsurface probing with a posthole digger. The total extent of the area sampled at Little House and the locations of test trenches and blading are depicted in figure 6.3.

**EXPLANATION**

| Artifacts were collected according to both artificial and cultural provenience units. For random units and for peripheral area testing, collection units were standardized levels. For excavation of structures and features, the collection units corresponded with cultural phenomena (e.g., floors in rooms and strata in features). A small sample (about 1 percent) of the deposits from the cultural units |}

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Figure 6.3 Little House (Site 5MT2191), site sampling plan.
was screened in order to recover some of the smaller cultural materials which are difficult to recover using other excavation techniques.

Bulk soil samples for flotation processing were collected from grid squares, hearths, pits, cists, and room floors. Pollen samples (app. 6-1) were taken from surfaces in rooms and use areas according to a quadrant sampling design and from under artifacts discovered in situ on these surfaces. Pollen samples were also taken from cists, pits, and hearths.

Dating materials recovered from the site include three radiocarbon samples obtained from hearths and charred vegetal material and two archaeomagnetic samples (app. 6-2). None of the charred wood specimens discovered during excavation was suitable for dendrochronological analysis.

**CULTURAL UNITS**

Architectural remains at Little House consist of a roomblock containing one living room and three probable storage rooms, several smaller features within the rooms, and clusters of features outside the roomblock which have been used to define two nonstructural cultural units. One of these latter units (termed occupation/activity areas) is located just west of and adjacent to the living room (Room 1). The other is situated approximately 4 m southeast of the roomblock (figs. 6.4-6.7).

**Room 1**

Dimensions:
- Length (north-south diameter) 2.80 m (average)
- Width (east-west diameter) 3.28 m (average)

Floor (less area of bins) 8.51 m²
Total roofed area (including bins) 9.08 m²
Depth of structure (modern ground surface to floor) 30 cm
Reconstructed roof height Not reconstructable

Figure 6.4 Little House (Site 5MT2191). spatial relationships of major cultural units.

Figure 6.5 Little House (Site 5MT2191). general site profile (northeast-southwest).
Figure 6.6 Little House (Site 5MT2191), general site profile (southeast-northwest).

Figure 6.7 Little House (Site 5MT2191), view to the southeast of room block area. Note tested grid squares in background.

Room 1 is a small, nearly square structure with base walls of unshaped rubble masonry. Interior features include a central hearth and two bins formed by an upright slab partition wall (figs. 6.8-6.10, and table 6.1).

**Period and Span of Occupation**

Room 1 is attributed to the McPhee Phase. The span of occupation is believed to correspond to the occupation of the site in general. Based on depositional characteristics and on the lack of a midden or of major remodeling episodes, occupation is assumed to have been brief. Ceramic analysis indicates that the room was occupied during the ninth century A.D.

**Shape**

This structure is a nearly square room with a floor excavated about 15 cm below the original ground surface.

**Orientation**

The main (northwest-southeast) axis of the room is oriented 30° west of magnetic north, an orientation which corresponds with typical Anasazi construction practices.

**Walls**

The existing wall remnants of Room 1 are constructed of crude coursed masonry. Construction materials consist of unworked sandstone fragments bonded with a local soil mortar. All of the walls are a single stone thick and range between one and four courses in height. Since only very small amounts of building rubble were found in the
shaped pit with a flat bottom and fairly steep sloping sides. The sides and bottom are composed of fire-hardened and slightly fire-reddened native earth. An archaeomagnetic sample (No. 2) obtained from the hearth did not provide a reliable date for this feature (app. 6-2). The fill of the feature consisted mainly of ash and small pieces of charcoal interspersed with concentrations of coarse yellow sand. Covering the entire hearth, and thereby concealing it, was a layer of native red soil which was level with the room floor.

Storage Bins

At the north end of the room the upright slab wall partitions off the corners of the room, forming a storage bin in each corner. Both bins are triangular in outline and their floors are level with the floor of the rest of the room. Corn cobs, kernels, and ceramic fragments were recovered from both bins; a mano was found on the bottom of the northwest bin (Point Location 7, fig. 6.8).

Floor Artifacts

Seven artifacts (table 6.1) were recovered in situ from the floor of Room 1, including the mano recovered from the floor of the northwest storage bin (fig. 6.8). Another mano was found at floor level on the native soil which covered the central hearth. An obsidian projectile point was located a few centimeters southwest of the hearth and a core was found 45 cm northeast of the hearth. Near the center of the room was a large shaped sandstone slab, possibly a door cover. In the southwest corner of the room was a slab metate. A broken trough metate was leaning against the south wall.

Table 6.1 Little House (Site 5MT2191), Room 1, point-located floor artifacts

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<th>Point location No.*</th>
<th>Description</th>
<th>Location</th>
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<tr>
<td>1</td>
<td>obsidian projectile point</td>
<td>southwest quadrant</td>
</tr>
<tr>
<td>2</td>
<td>core</td>
<td>northeast quadrant</td>
</tr>
<tr>
<td>3</td>
<td>mano</td>
<td>southeast quadrant</td>
</tr>
<tr>
<td>4</td>
<td>metate</td>
<td>leaning against south wall</td>
</tr>
<tr>
<td>5</td>
<td>shaped sandstone slab</td>
<td>northwest quadrant</td>
</tr>
<tr>
<td>6</td>
<td>slab metate</td>
<td>southwest quadrant</td>
</tr>
<tr>
<td>7</td>
<td>mano</td>
<td>northwest corner bin</td>
</tr>
</tbody>
</table>

*See figure 6.8
Figure 6.9 Little House (Site 5MT2191), Room 1, architectural profiles.

Figure 6.10 Little House (Site 5MT2191), Room 1, view from the north. Note doorslab in center of room, bins in northwest and northeast corners, and metate against south wall.

Figure 6.11 Little House (Site 5MT2191), Room 1, view of central hearth. The feature has been sectioned to reveal the nature of cultural and postoccupational deposits.
Room 2

Dimensions:
- Length (north-south diameter): 1.80 m (average)
- Width (east-west diameter): 2.85 m (average)
- Floor area: 5.70 m²
- Total roofed area: 5.70 m²
- Depth of structure: 27 cm
- Reconstructed roof height: Not reconstructable

Room 2 is a small, nearly square structure and is the westernmost room of the roomblock. It is inferred that the walls of Room 2 were constructed of adobe or jacal with a sandstone base. Due to its size and lack of interior features, it is believed that this room functioned as a storage facility (figs. 6.12 and 6.13, and table 6.2).

Figure 6.12 Little House (Site 5MT2191), Room 2, view from the north.

Period and Span of Occupation

Room 2 is presumed to have been occupied at the same time as Room 1 and as Little House in general. The room was occupied seasonally for a brief period during the ninth century A.D.

Orientation

The main (northwest-southeast) axis of this room is oriented 25° west of north and corresponds to the usual pattern of Anasazi construction.

Walls

The south and west wall remnants are a single stone high and are constructed of unshaped, upright sandstone fragments. The east wall remnant, a common wall for Room 2 and Room 4, is two courses high and constructed of unshaped fragments of sandstone. Three sandstone fragments are all that remain of the north wall. All walls are a single stone thick. Due to the lack of stone building materials in the fill inside and outside the structure, it is assumed that the walls above the first few stone courses were constructed of perishable materials—perhaps adobe or jacal.

Figure 6.13 Little House (Site 5MT2191), Room 2, plan view.

Floor

The floor of Room 2 is approximately level with the prehistoric ground surface. It consists of fairly hard-packed, but otherwise unprepared, native soil.

Table 6.2 Little House (Site 5MT2191), Room 2, point-located floor artifacts

<table>
<thead>
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<th>Point location No.</th>
<th>Provenience</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>southwest corner of room</td>
<td>metate fragment</td>
</tr>
<tr>
<td>2</td>
<td>outside room, closest to north wall</td>
<td>mano</td>
</tr>
</tbody>
</table>

*See figure 6.13
Floor Artifacts

A metate fragment was recovered from the southwest corner of the room and a mano was found at floor level just outside the north wall of Room 2 (fig. 6.13).

Features

No floor or wall features were discovered in Room 2.

Roof

No remains of a roofing structure for Room 2 were found during excavation.

Room 3

Dimensions:

- Length (east-west diameter) 2.87 m (average)
- Width (north-south diameter) 2.15 m (average)
- Floor area 6.05 m²
- Total roofed area 6.05 m²
- Depth of structure 40-45 cm
- (modern ground surface to floor)
- Reconstructed roof height Not reconstructable

Room 3 is the northeasternmost unit in the roomblock at Little House. The room is basically square in outline and is similar in construction techniques to Room 2. This structure probably functioned primarily as a storage facility (fig. 6.14).

Period and Span of Occupation

Room 3 is believed to have had the same occupational history as the other units in the roomblock and as Little House in general. The room was used on a seasonal basis for a brief period during the ninth century A.D.

Shape

Original shape of this room is not certain since the east and south walls are virtually nonexistent, but it was probably square like the other three rooms.

Orientation

The main (northwest-southeast) axis of the room is 33° west of magnetic north.

Walls

The west wall remnant, shared by Rooms 3 and 4, consists of crude coursed masonry formed by unshaped sandstone fragments laid a single course high. The north wall remnant consists of a single row of unshaped, upright sandstone slabs. The south wall remnant is defined by three unshaped sandstone fragments at the southwest corner of the room and two unshaped sandstone fragments at the southeast corner of the room. A single stone is all that remains of the east wall. All walls are a single stone thick. It is inferred that these architectural remnants represent the bases of more substantial structures which have not withstood erosional forces. Because of the scarcity of stone building materials in the fill, it is assumed that the upper portions of the walls were constructed of adobe or jacal. The original height of these walls could not be reconstructed.

Floor

There was no definite hard-packed surface in Room 3 that could be defined as a floor, but sterile soil was encountered 30 cm below the original ground surface. The walls of the structure were footed on the original ground surface but the inside of the room had been excavated down 25 to 30 cm below the base of the walls.

Roof

No roof construction materials were encountered in the fill of Room 3, so it is not possible to reconstruct the roof type for this structure. Roof height above the bottom of the room could not be reconstructed from the available evidence.
Floor

The floor of this structure consisted of unprepared, use-compacted native soil. This surface is approximately at the same level as the aboriginal ground surface.

Intrusive Hearth

In the fill of Room 4, 10 cm above the floor, was an intrusive hearth. Nearly circular, with vertical walls and a shallow basin-shaped bottom, this feature was unlined and showed no sign of fire reddening or fire hardening. Around the northeast edge of the feature were two fragments of sandstone and a mano fragment. Recovered from the fill of the hearth were fragments of charred corn cobs, corn kernels, and a bean. Due to its location in the fill of the room, this feature probably represents a temporary post-main-occupation use of the complex.

Floor Artifacts

Two artifacts, both mano fragments, were recovered in situ from the floor of the room (table 6.3). One was located in the northeast quadrant, the other in the southeast quadrant (fig. 6.15).

Postholes

Two small postholes, each about 20 cm in diameter, are located near the northwest limit of the room and might have originally supported poles for a roof or a wattle-anddaub wall (fig. 6.15).

Occupation/Activity Area 1

Dimensions:

<table>
<thead>
<tr>
<th>Surface</th>
<th>Length (east-west)</th>
<th>Width (north-south)</th>
<th>Area</th>
<th>Depth (modern ground surface to Surface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface 1</td>
<td>1 m</td>
<td>2 m</td>
<td>2 m²</td>
<td>23 cm</td>
</tr>
<tr>
<td>Surface 2</td>
<td>3.40 m</td>
<td>3.05 m</td>
<td>10.4 m²</td>
<td>20 cm</td>
</tr>
<tr>
<td>Surface 3</td>
<td>2.0 m</td>
<td>3.05 m</td>
<td>5.8 m²</td>
<td>(approx.) 15 cm</td>
</tr>
</tbody>
</table>

Occupation/Activity Area 1 is located adjacent to Room 1 on the west side. The west wall of Room 1 and the south wall of Room 2 served to enclose the north and east sides of the occupation area. The other two sides are open, but are well defined by the limits of hard-packed surfaces. This unit probably functioned as a locus of processing and maintenance activities for the site (figs. 6.17-6.19).

Figure 6.17 Little House (Site 5MT2191), plan view of Surface 2, Occupation/Activity Area 1.

Figure 6.18 Little House (Site 5MT2191), plan view of Surface 3, Occupation/Activity Area 1.
Large Shallow Pit

Original impressions were that in the middle of Room 3 there was a basin-shaped pit containing small stone rubble, charcoal, and various artifacts, including a mano and several cores and pieces of debitage. However, further observation and excavation revealed that this pit extended to the north and west walls of the room and to the east and south where the sparse remnants of those walls remain. Therefore, it seems the occupants of the complex excavated this room to about 30 cm below the prehistoric ground surface just as they did with Room 1.

Floor Artifacts

No artifacts were recovered in situ from the surface of Room 3.

Room 4

Dimensions:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (east-west diameter)</td>
<td>2.80 m (average)</td>
</tr>
<tr>
<td>Width (north-south diameter)</td>
<td>2.02 m (average)</td>
</tr>
<tr>
<td>Floor area</td>
<td>5.70 m²</td>
</tr>
<tr>
<td>Total roofed area</td>
<td>5.70 m²</td>
</tr>
<tr>
<td>Floor depth (modern ground surface to floor)</td>
<td>10-15 cm</td>
</tr>
</tbody>
</table>

Room 4 (figs. 6.15 and 6.16, table 6.3) is the center back room of the major structural complex at Little House. With walls probably constructed of jacal or adobe with sandstone rubble bases, this room apparently served the same function as Rooms 2 and 3; that is, these three rooms probably served as storage facilities for the inhabitants of the site.

Shape

This structure is roughly square even though the north wall is missing.

Orientation

The main (northwest-southeast) axis of this room is 35° west of magnetic north.

Walls

The existing walls are of crude coursed masonry incorporating unshaped sandstone fragments. The west wall, a common wall with Room 2, is two courses high. The other two walls are a single course high and all walls are one stone thick. Two postholes near the northern limit of the room may be all that remain of the fourth wall which was possibly constructed of wattle and daub.

Figure 6.15 Little House (Site 5MT2191), Room 4, plan view.

Figure 6.16 Little House (Site 5MT2191), Room 4, view from the north.

Table 6.3 Little House (Site 5MT2191) Room 4, point-located floor artifacts

<table>
<thead>
<tr>
<th>Point location No.*</th>
<th>Provenience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>east center portion of room</td>
<td>mano fragment</td>
</tr>
<tr>
<td>2</td>
<td>south center portion of room</td>
<td>mano fragment</td>
</tr>
</tbody>
</table>

*See figure 6.15
Large Shallow Pit

Original impressions were that in the middle of Room 3 there was a basin-shaped pit containing small stone rubble, charcoal, and various artifacts, including a mano and several cores and pieces of debitage. However, further observation and excavation revealed that this pit extended to the north and west walls of the room and to the east and south where the sparse remnants of those walls remain. Therefore, it seems the occupants of the complex excavated this room to about 30 cm below the prehistoric ground surface just as they did with Room 1.

Floor Artifacts

No artifacts were recovered in situ from the surface of Room 3.

Room 4

Dimensions:
- Length (east-west diameter) 2.80 m (average)
- Width (north-south diameter) 2.02 m (average)
- Floor area 5.70 m²
- Total roofed area 5.70 m²
- Floor depth (modern ground surface to floor) 10-15 cm

Room 4 (figs. 6.15 and 6.16, table 6.3) is the center back room of the major structural complex at Little House. With walls probably constructed of jacal or adobe with sandstone rubble bases, this room apparently served the same function as Rooms 2 and 3; that is, these three rooms probably served as storage facilities for the inhabitants of the site.

Shape

This structure is roughly square even though the north wall is missing.

Orientation

The main (northwest-southeast) axis of this room is 35° west of magnetic north.

Walls

The existing walls are of crude coursed masonry incorporating unshaped sandstone fragments. The west wall, a common wall with Room 2, is two courses high. The other two walls are a single course high and all walls are one stone thick. Two postholes near the northern limit of the room may be all that remain of the fourth wall which was possibly constructed of wattle and daub.

Table 6.3 Little House (Site 5MT2191) Room 4, point-located floor artifacts

<table>
<thead>
<tr>
<th>Point location No.*</th>
<th>Provenience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>east center portion of room</td>
<td>mano fragment</td>
</tr>
<tr>
<td>2</td>
<td>south center portion of room</td>
<td>mano fragment</td>
</tr>
</tbody>
</table>

*See figure 6.15
Orientation

The main axis (northwest-southeast) of the occupation/activity area is 26° west of north.

Walls

The south wall of Room 2 and the west wall of Room 1 define the north and east limits of this unit. Descriptions of these walls are included in the individual discussions of these units.

Floor

Three occupation surfaces were identified in Occupation/Activity Area 1, each separated by 3 to 5 cm of fill. Surface 3 was the most recent and therefore in the best condition, with definite limits. Surface 2 covered nearly the same area as Surface 3 but was not as well defined. The first occupation surface was patchy and difficult to define; only small portions of it could be found near the walls of Room 1 and Room 2. All three surfaces were of unprepared use-compacted soil which was a mixture of native soil and cultural debris.

Storage Bin

Dimensions:

<table>
<thead>
<tr>
<th></th>
<th>Length (east-west)</th>
<th>Width (north-south)</th>
<th>Depth (top of rock wall to bottom of bin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit 1</td>
<td>100 cm</td>
<td>80 cm</td>
<td>20 cm</td>
</tr>
<tr>
<td>Pit 2</td>
<td>110 cm</td>
<td>95 cm</td>
<td>35 cm (max.)</td>
</tr>
</tbody>
</table>

Two pits were found in association with Surface 2 (fig. 6.17). Pit 1, the larger of the two, is located in the northwest corner of the occupation/activity area. In shape it is rather square at the north end, then narrows and becomes circular at the south end. It is possible that this feature was originally two pits that were later connected. In the charcoal-flecked fill of this pit were a bone weaving tool (fig. 6.23), three pieces of debitage, and 12 Mesa Verde sherds: 10 gray ware, 1 red ware, and 1 white ware. Although most of this pit was clearly associated with Surface 2, a shaped sandstone slab associated with Surface 3 covered the northern portion of the pit. Therefore, part of the pit may have been used during the last occupation of this nonstructural unit. The function of the pit is unknown; it may have been used for storage.

Postholes

Two small postholes were found on Surface 3 near the west wall of Room 1 (fig. 6.18): Posthole 1 has a diameter of 6 cm and a depth of 5 cm, and Posthole 2 a diameter of 6 cm and a depth of 6 cm. Two other small postholes were found in association with Surface 2 and are located near the middle of the occupation/activity area (fig. 6.17). The diameter of Posthole 3 is 8 cm and its depth is 18 cm; Posthole 4 has a diameter of 11 cm and a depth of 28 cm.

The location of the first two postholes suggests an east-west orientation; the latter two, a north-south orientation. Although there is no conclusive evidence, it is postulated that the holes held posts which supported a ramada, sun shade, or drying rack.
storage. Both pits were dug into native soil and were unlined.

**Floor Artifacts**

Five artifacts were found in situ on Surface 3 (fig. 6.18) and three on Surface 2 (fig. 6.17) of Occupation/Activity Area 1. On the western edge of Surface 3 was a large shaped sandstone slab which covered part of Pit 1, a feature associated with Surface 2. A bone awl, a second piece of worked bone (fig. 6.23), and a cluster of sherds were located in the northern half of the occupation/activity area, and two manos were found in the central portion. Two of the floor artifacts associated with Surface 2 were clusters of ceramic sherds, the third was a single large sherd (tables 6.4 and 6.5).

### Table 6.4 Little House (Site 5MT2191), Surface 2, Occupation/Activity Area 1, point-located floor artifacts

<table>
<thead>
<tr>
<th>Point location No.*</th>
<th>Provenience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>near center of area</td>
<td>ceramic cluster</td>
</tr>
<tr>
<td>2</td>
<td>northwest quadrant</td>
<td>ceramic cluster</td>
</tr>
<tr>
<td>3</td>
<td>northwest quadrant</td>
<td>sherd</td>
</tr>
</tbody>
</table>

*See figure 6.17

### Table 6.5 Little House (Site 5MT2191), Surface 3, Occupation/Activity Area 1, point-located floor artifacts

<table>
<thead>
<tr>
<th>Point location No.*</th>
<th>Provenience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>northeast quadrant</td>
<td>sherd cluster</td>
</tr>
<tr>
<td>2</td>
<td>northwest quadrant</td>
<td>mano</td>
</tr>
<tr>
<td>3</td>
<td>northwest quadrant</td>
<td>shaped sandstone slab</td>
</tr>
<tr>
<td>4</td>
<td>northwest quadrant</td>
<td>bone awl, worked long bone fragment</td>
</tr>
<tr>
<td>5</td>
<td>southeast quadrant</td>
<td>mano fragment</td>
</tr>
</tbody>
</table>

*See figure 6.18

**Post-abandonment Processes**

Due to the nature of the fill in the rooms and in Occupation/Activity Area 1, it appears that this area lay open to aeolian sedimentation and decay after abandonment. There is no evidence to indicate that any of the structures burned.

In general, the topmost layer (upper fill) consisted of 10 to 15 cm of loose, dry reddish-brown soil; this was essentially the plow zone. A few artifacts and small flecks of charcoal were found in this layer. In Room 1, between this stratum and the floor, was a 25- to 35-cm layer (lower fill) of compact reddish-brown soil containing sherds, manos, metate fragments, flakes, small pieces of charred wood, and stone rubble. Above the floor were patchy areas of hard-packed, reddish soil, possibly roof fall. Although more artifacts were found in the fill of this room than in others, they may have originally been on the roof of the structure and have fallen into the room when it collapsed, rather than being deposited there as the result of slope wash or of deliberate action by other prehistoric groups after abandonment.

Beneath the plow zone (upper fill) in Room 3 was a 25- to 30-cm lower fill of reddish-brown soil containing flecks and some concentrations of charcoal, stone rubble, patches of grayish soil (adobe melt?) and several flaked and non-flaked lithic tools (app. 6-4). This fill also appears to be the result of natural forces as opposed to deliberate cultural deposition.

In Room 4, beneath the plow zone stratum (upper fill), was a 15-cm layer of reddish-brown, fairly compact soil containing flecks of charcoal, a few artifacts, and patches of grayish soil (adobe melt?). In this lower fill (downward from 15 cm below present ground surface) were the intrusive firepit and a few associated artifacts: two projectile points, a broken mano, and a few ceramic sherds. This probably represents a brief, temporary use of this room after the main occupation of the site.

Between the plow zone and the occupation surfaces of Room 2 and Occupation/Activity Area 1 was a 5- to 10-cm lower fill of a compact reddish-brown soil containing small flecks of charcoal.

**Occupation/Activity Area 2**

**Dimensions (approx.):**
- Length (east-west): 5 m
- Width (north-south): 4 m
- Area: 20 m²

Occupation/Activity Area 2 has no definite boundaries but is probably rectangular; it is located approximately 4 m southeast of the roomblock at Little House (figs. 6.3 and 6.5). This locus of activity does not incorporate any rooms or other major architectural features and is therefore assumed to represent a primarily outdoor use area. Included in the area are a refuse pit, a storage cist, and a fireplace (fig. 6.20); these are described below. The occupation/activity area was not bounded, nor was a prepared use-compacted surface in evidence. The limits of the area have been arbitrarily defined by estimating the extent of intensive activity around the cluster of features. Based on the nature of the features and the associated artifactual assemblage, it is inferred that Occupation/Activity Area 2 served as a locus for processing vegetal resources.
Refuse Pit

Dimensions:
North-south diameter  2.70 m
East-west diameter  3.60 m
Depth  25-55 cm

Located just south of the firepit and the storage cist in Occupation/Activity Area 2 is a roughly oval pit. Cut into native soil, the pit is unlined, with steep sloping sides and an uneven bottom. The east and west portions of the pit are deeper than the center, almost like small pits themselves. The fill throughout the feature was dark gray, charcoal-stained soil which contained an abundance of pottery sherds; charred vegetal remains, including yucca, corn and beans; ground and flaked stone tools, including projectile points; and nonhuman bone. These remains are interpreted to indicate that this feature served as a refuse pit.

Storage Cist

Dimensions:
North-south diameter  94 cm
East-west diameter  94 cm (at bottom)
Depth  55 cm

Located approximately 10 cm northeast of the trash pit is another small cist, or pit (fig. 6.21). This pit is roughly oval at the top and circular at the bottom. Cut into native soil, it has unlined, nearly vertical sides and a flat bottom lined with sandstone slabs. The fill of this feature was charcoal stained and fairly compact; it contained ceramic sherds, flakes, and charred plant materials. The character of the fill indicates deliberate cultural deposition; therefore, it is assumed that this feature was ultimately used as a trash depository. However, the stone-lined bottom and carefully carved sides indicate that its original purpose was probably for something other than trash. The stone lining would have prevented rodent burrowing, and plaster on the sides would have similarly limited rodent activity (although there is no evidence of plaster). Therefore, it is postulated that this feature was originally constructed as a storage facility.

Fireplace

Dimensions:
North-south diameter  50 cm
East-west diameter  70 cm
Depth  10 cm

Adjacent to the north edge of the refuse pit is a stone-lined fireplace (fig. 6.22). Roughly oval, this feature consists of seven unshaped sandstone fragments and one pecked piece of sandstone. These stones, charcoal-stained and burned, are not in a basin or pit but are lying on sterile soil. Between the stones was a dark charcoal-stained soil containing a few sherds and charred twigs. An archaeomagnetic sample (No. 1) was obtained from this feature (app. 6-2).
Other Features

Several small ancillary features were discovered and excavated at Little House. These could not be associated with any inferred activity loci at the site and are therefore discussed separately. It is likely that these features were associated with supplemental activity, although their cultural origin might be questioned.

Fireplace

Located approximately 6 m south of Occupation/Activity Area 2 is an isolated fireplace (fig. 6.3). Roughly oval-shaped, this feature consists of a shallow basin with a large unshaped sandstone slab which lines the bottom. Its dimensions are 65 cm east to west, and 40 cm north to south, with a depth of 6 cm. In the basin were 5 to 6 cm of very dark, charcoal-stained soil devoid of artifacts. This feature is located 35 cm below present ground surface and does not appear to be associated with any other features. Its cultural affiliation with the rest of the site is unclear.

Pits

Located 6.2 m south of the roomblock are two irregular pits filled with charcoal-stained soil (fig. 6.3). Pit 1, the westernmost pit, contained burned sandstone fragments and charred sagebrush; no artifacts were associated with this feature. The pit is unlined, has steep sides, and tapers to a width of 20 cm at the bottom. The top diameter is 50 cm north to south by 45 cm east to west; maximum depth is 40 cm. Pit 2 is a shallow basin-shaped feature containing charcoal-stained soil, a few sherds, and burned rocks. Cut into native soil and unlined, this pit has a north-south diameter of 40 cm, an east-west diameter of 40 cm and a depth of 8 cm. The purpose of both pits is unknown, and they may be of a noncultural origin (e.g., rodent burrows).

MATERIAL CULTURE

Of the various categories of portable artifacts recovered, only preliminary analysis of nonhuman bone, lithic, and vegetal collections are complete at this writing; a general description of ceramic types is also available.

Nonhuman Bone

Sixty-seven nonhuman faunal specimens, representing six biological orders, were recovered during the excavation of Little House. Totals and proveniences are summarized in table 6.6. Only three of the bones had been worked—an awl, a weaving tool, and an unidentified tool (fig. 6.23). The relatively small size of the faunal assemblage at the site permits few interpretations. Several of the species represented may have been used for food by the prehistoric inhabitants, including cottontail rabbit, mule deer, sage grouse, raven, and domesticated dog. Others, such as the pocket gopher and Gunnison’s prairie dog, may also be intrusive.

Ceramics

The ceramic assemblage represented in the artifact collection includes three wares and five temporally diagnostic types. These are as follows:

Gray Ware: Chapin Gray, Moccasin Gray, and numerous gray ware body sherds (Early Pueblo Gray).

White Ware: Chapin Black-on-white, Piedra Black-on-white, and numerous white ware body sherds (Early Pueblo White).

Red Ware: Bluff Black-on-red and numerous red ware body sherds (Early Pueblo Red).

No definable trade ceramics were identified in the assemblage.

The recovered collection can be used to estimate the approximate age of the main occupation of the site. According to Breternitz et al. (1974), Moccasin Gray was

Figure 6.23 Little House (Site 5MT2191), worked bone artifacts. Left: awl manufactured from split mule deer metapodial, recovered from Surface 3, Occupation/Activity Area 1. Center: worked long bone fragment from unidentified mammal, recovered from Surface 3, Occupation/Activity Area 1. Right: weaving tool fragment recovered from Subsurface Pit 1, Surface 2, Occupation/Activity Area 1.
Table 6.6 Little House (Site 5MT2191), recovered assemblage of faunal materials

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Sciuridae</th>
<th>Prairie dog</th>
<th>Pocket gopher</th>
<th>Lagomorpha</th>
<th>Artiodactyla</th>
<th>Carnivora</th>
<th>Galliformes</th>
<th>Passeriformes</th>
<th>Mammal, unidentifiable</th>
<th>Unidentifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Room 4</td>
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<tr>
<td>Occupational/Activity</td>
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<td>Fill between Surface 3 and Surface 2</td>
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<td>Subsurface Pit 1</td>
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<tr>
<td>Refuse pit</td>
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<td>5</td>
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</tbody>
</table>

*plow zone (0-15 cm) in other excavated units
* *Worked awl
**Worked longbone
***Weaving tool
manufactured during the period A.D. 775-900, Piedra Black-on-white during the span A.D. 750-900, and Bluff Black-on-red from A.D. 750-900. The collection lacks later gray and white ware types such as Mancos Gray (A.D. 875-950) and Cortez Black-on-white (A.D. 900-1000). From assessment of the temporally diagnostic types present, it appears that the occupation can be assigned to the span A.D. 800-875, or the early McPhee Phase, according to the chronological scheme developed by the DAP (chapter 1 of this volume).

The ratio between jar and bowl fragments represented in the collection is approximately 7:1. Such a bias toward jars may reflect the role of storage as a major site function. However, comparison of this ratio with that of habitation sites of the same period has not been accomplished. Only three fragments of a specialized vessel form, the seed jar, were recovered from the site. Ceramic totals and a summary statement concerning the ceramic assemblage is available in appendix 6-3 of this report.

**Vegetal Remains**

Charred remains of five vegetal food types were recovered from Little House, as well as numerous pieces of charred sagebrush branches. Totals and proveniences are summarized in table 6.7. This table indicates that most of the food items were recovered from storage bins, hearths, and the refuse pit (fig. 6.24).

### Table 6.7 Little House (Site 5MT2191), provenience of vegetal remains

<table>
<thead>
<tr>
<th>Level 1‡</th>
<th>Non-identified wood</th>
<th>Juniper seeds</th>
<th>Cucurbit seeds</th>
<th>Yucca Seeds</th>
<th>Fruits</th>
<th>Corn Cobs</th>
<th>Kernels</th>
<th>Phaseolus</th>
<th>Sagebrush</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>Upper fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northeast storage bin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northwest storage bin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearth</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Room 2</td>
<td>Upper fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room 3</td>
<td>Upper fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower fill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Room 4</td>
<td>Intrusive hearth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation/Activity</td>
<td>Area 1</td>
<td>Surface 2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Occupation/Activity</td>
<td>Area 2</td>
<td>Refuse pit</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N</td>
<td>N</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Storage cist</td>
<td>N</td>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Other features</td>
<td>Pit 1 (modern?)</td>
<td>(south of roomblock)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fireplace south of Occupa tion/Activity Area 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

‡plow zone (0-15 cm²) in other excavation units
*tentative identification
**N - numerous
FIELD INVESTIGATIONS AND ANALYSIS—1978

Lithics

A total of 85 flaked stone tools and 511 debitage items were recovered from Site 5MT2191. The flaked tool inventory included cores, unifaces, bifaces, projectile points, and utilized flakes (figs. 6.25-6.29). There were no clusterings of these artifacts that would indicate specific work or processing areas. Raw materials used for flaked stone tools include quartzite, siltstone, basalt, andesite, and chert. This assemblage is described in detail in appendix 6-4.

A total of 117 nonflaked stone tools were recovered and all are utilitarian types (figs. 6.30-6.33). Manos, the most abundant category, were found in all the rooms, in both occupation/activity areas, and scattered throughout Stratum 1, the plow zone. Their abundance suggests a primary concern with processing of certain foodstuffs, such as corn, beans, and probably wild grains and seeds. Metates and grinding stones are also well represented. Other tools include hammerstones, choppers, polishers, pestles, and a maul, all of which are multiuse tools. Shaped stone slabs probably served as covers for cists, doorways, and hatchways. Raw materials used for the production of these tools are mainly sandstones, with some andesite, diorite, quartzite, and rhyolite. Totals and proveniences are tabulated in appendix 6-4.

DATING SAMPLES

The variety and number of dating samples recovered during the excavations at Little House were inadequate to derive absolute dates for occupation of the site. Besides
Figure 6.27 Little House (Site 5MT2191), flaked lithic tools. Upper left: scraper from modern ground surface 2 m south of roomblock area. Upper right: chopper from plow zone stratum 2 m southeast of roomblock area. Lower left: perforator from plow zone stratum in test square approx. 16 m southeast of the roomblock area. Lower right: utilized flake from plow zone stratum just east of the roomblock area.

Figure 6.28 Little House (Site 5MT2191), flaked lithic tools, unifaces. Top: from fill of refuse pit, Occupation/Activity Area 2. Right, center and left: all from upper fill, Room 3.

Figure 6.29 Little House (Site 5MT2191), flaked lithic tools: bifaces. (a) from modern ground surface 3 m south of roomblock, (b) from plow zone in test squares 4 m south of Occupation/Activity Area 2, (c) from plow zone stratum 2 m south of roomblock area.

Figure 6.30 Little House (Site 5MT2191), nonflaked lithic tool: unworked hammerstone from plow zone stratum above storage cist in Occupation/Activity Area 2.

Figure 6.31 Little House (Site 5MT2191), nonflaked lithic tools: manos. Upper left: from fill of refuse pit, Occupation/Activity Area 2. Upper right: from plow zone stratum in test square 2 m southeast of roomblock area. Lower left and center: both from upper fill, Room 1. Lower right: from plow zone stratum in test square about 2 m south of Occupation/Activity Area 2.
dateable ceramic fragments, other dating materials recovered from the site were three radiocarbon samples and two archaeomagnetic samples (app. 6-2). Due to poor preservation, no dendrochronological samples were obtainable. Table 6.8 presents the provenience and results for all dating samples taken at the site.

PRELIMINARY INTERPRETATIONS

Chronology

Based on ceramic and architectural remains, the occupation of Little House can be placed between A.D. 800 and 875, or in the early McPhee Phase (Pueblo I). The ceramic assemblage lends the strongest support to this chronological placement. The recovered collection includes Piedra Black-on-white and Moccasin Gray Wares which, according to Breternitz et al. (1974), were manufactured between A.D. 750 and 900. The presence of Moccasin Gray Ware in the collection implies the site was occupied after the appearance of this type in Anasazi ceramic inventories; this appearance date is cited as A.D. 775 by Breternitz et al. (1974). The collection also lacks Mancos Gray and Cortez Black-on-white wares, indicating that the site was occupied prior to A.D. 875-900.

Other evidence used to place Little House in a relative time frame is the architectural style manifested at the site. The rooms at this site apparently consisted of jacal walls with a stone base, a construction technique which appears to be more substantial than that used at Dos Casas Hamlet (A.D. 750-780) and less formal than McPhee Village (A.D. 875-950).

The fact that this site appears to be a field house also helps to place the occupation at Little House in the ninth century A.D., since field houses are thought to have been added to the Anasazi site set about A.D. 800-825, when the population became centralized in villages like McPhee.

Based on the available evidence, the length of occupation at Little House was probably less than a single generation, perhaps 30 years. There was no substantial architectural remodeling at the site; the various surfaces within Occupation/Activity Area 1 probably represent relatively short periods of use, and there is no apparent change in the material culture. Thus, only one element is represented at Little House.

The only datable archaeomagnetic sample obtained from this site came from the fireplace in Occupation/Activity Area 2 and yielded a date of A.D. 1130 ± 60 years (app. 6-2). This may suggest that last use of this outlying area was not associated with the occupation of the main structure at the site.

Adaptation and Economic Activities

Little House represents a seasonal locus probably used by a household or subhousehold group which resided permanently at a nearby village. Local McPhee Phase communities are assumed to have practiced a Formative Stage pattern of subsistence and adaptation. This involved primary reliance on the cultivation of vegetable foodstuffs combined with a lesser emphasis on raising domestic animals (the dog and turkey) and hunting and gathering nondomesticated food items. Little House is believed to have served as a field house or agricultural station in the local community cluster; that is, a location where a household or subhousehold group residing permanently at a nearby village centered its activities during the growing season. Thus, the site is viewed as a vital component in the local Formative settlement-subsistence system, a locus closely linked to primary subsistence (agricultural) activities. The vegetal remains recovered from the site include the common Anasazi cultigens: corn, beans, and
Table 6.8 Little House (Site 5MT2191), Carbon-14 and archaeomagnetic sample proveniences and results

<table>
<thead>
<tr>
<th>Sample type</th>
<th>Sample No. DAP</th>
<th>Sample No. Beta</th>
<th>Provenience</th>
<th>Sample date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^{14}$C</td>
<td>1</td>
<td>—</td>
<td>Test Trench I Level 1 0-3 cm</td>
<td>—</td>
<td>Sample was not run</td>
</tr>
<tr>
<td>$^{14}$C</td>
<td>2</td>
<td>—</td>
<td>Room 1 Level 1 (upper fill)</td>
<td>—</td>
<td>Sample was not run</td>
</tr>
<tr>
<td>$^{14}$C</td>
<td>3</td>
<td>Beta-1932</td>
<td>2x2016-012 Surface 1 slab-lined cist Occupation/Activity Area 2</td>
<td>A.D. 1310 ± 70</td>
<td>Sample was created from vegetal material</td>
</tr>
<tr>
<td>AM*</td>
<td>1</td>
<td>—</td>
<td>2x2014-012 Surface 1 fireplace Occupation/Activity Area 2</td>
<td>A.D. 1130 ± 60</td>
<td>Of the 12 specimens collected from the fireplace, 6 were used in the final analysis</td>
</tr>
<tr>
<td>AM*</td>
<td>2</td>
<td>—</td>
<td>Room 1 Surface 1 hearth</td>
<td>—</td>
<td>Directions for this sample were too scattered; thus no date was attempted</td>
</tr>
</tbody>
</table>

*AM - Archaeomagnetic sample

...squash, and also wild resources, specifically, yucca fruits and juniper berries. Sagebrush was apparently used as fuel in many of the firepits.

A consideration of the total faunal collection suggests that several animal species were used at the site and perhaps collected in the vicinity. These include cottontail rabbit (although remains of this species may be due to post-abandonment burrow intrusions into site strata), dog (perhaps representing a domestic individual kept at the site), sage grouse, and raven.

A number of economic and domestic activities can be inferred to have been performed at the site, based on architectural and artifactual analysis, provenience information, and associations. To describe these activities, the site has been divided into three "use areas" (areas which apparently served as loci for broadly similar activities). Individual activities are described below according to the defined use areas.

**Use Area 1**

The area is seen as a center for domestic maintenance, tool storage, and secondary processing activities; spatially, it includes Room 1 and Occupation/Activity Area 1. Room 1 is thought to be a living room because of the hearth and because the surfaces and walls are more substantial than those of Rooms 2 to 4. Domestic activities such as sleeping, cooking, and eating are inferred to have been centered in Room 1. Secondary processing (milling) of seeds and grains was apparently also centered in Room 1, as more than one-half of the total of metate and metate fragments recovered from the site were from proveniences in Room 1. These included one specimen apparently left propped against the front (south) wall by the prehistoric inhabitants. Several flaked lithic tools, a core, and a slab metate found in situ on the floor of Room 1, may represent maintenance of the tools used in everyday activities at the site and perhaps nonintensive manufacture of needed tools as well. The bins located in the northwest and northeast corners of the room are believed to have functioned as storage areas for tools; a mano was recovered in situ from the northwest bin.

Occupation/Activity Area 1, adjacent to Room 1 on the west side, is inferred to have functioned as an adjunct to Room 1. Evidence that some processing, probably of foodstuffs, was being performed in the area is provided by the recovery of a maize cob and kernels and five manos (from internal collecting proveniences). The assemblage of bone tools (an awl, a weaving tool, and one indeterminant
specimen, fig. 6.23) may indicate that repair of clothing, netting, or other workable material was performed in Occupation/Activity Area 1. The bin and pits in the area probably represent storage facilities; three manos were recovered from the bin in the northeast corner.

Use Area 2

The three smaller back rooms of the houseblock make up Use Area 2. This complex of structures provided storage of foodstuffs prior to and subsequent to mealing, parching, and other processing activities. The small size of these rooms in comparison to Room 1 and their lack of hearths, tools, and other utilitarian items, lead to this functional assessment.

Use Area 3

Use Area 3 is composed of the storage cist, fireplace, and refuse pit in Occupation/Activity Area 2. Complementary activities of processing, storage, and discard may have been performed in this portion of the site. Based on the provenience and type of vegetal remains recovered from this area, it is projected that the hearth was used for the parching, boiling, or other heat treatment of these foods which were then stored in bulk in Use Area 2. The slab-lined storage cist adjacent to the hearth may have been used for temporary storage before processing. Accidental charring of some of these products probably was commonplace and the unusable portion discarded in the refuse pit along with broken vessels, worn-out tools, and other trash. At some indeterminable point in the history of the site, the storage cist ceased to function as a cache and was subsequently used as a repository for discarded materials.

Reconstructed Vegetal Material Flow

Having identified the activities that took place in various areas within the site, a reconstruction of the probable vegetal material flow through Little House is presented in figure 6.34.

In late summer and early fall, members of one of the households of either McPhee Village or Crestview Hamlet moved to Little House to harvest wild grains, seeds, and fruits, as well as the corn, beans, and squash growing in their fields. The exact source locations of the wild foodstuffs cannot be determined, but they were undoubtedly growing fairly close to the site. Similarly, the exact location of agricultural plots has not been identified; however, Witt loam soil, suitable for farming, is found in the immediate site vicinity and within a radius of several kilometers surrounding the site.

Once these wild and domestic foods had been collected, they were stored in Use Area 2 until they could be processed. When time allowed, or perhaps as an ongoing process, these goods may have been transported to either Use Area 1 to be ground into meal, or to Use Area 3 where they were parched or boiled to prepare them for winter storage. These processing tasks, as well as day-to-day subsistence operations, would naturally result in a certain amount of waste material which was discarded in Use Area 3 and possibly also in the southern portion of the site, where diffuse sheet trash occurs.

Once the grains and seeds were processed, they were returned to Use Area 2 for temporary storage until they could be transported back to the permanent habitation.

Although there is little supportive material evidence, it is likely that Little House was also used during the planting and maintenance stages of the agricultural season. Whether the site was visited off and on during the season or whether certain individuals remained at Little House for the duration of the growing cycle is not clear, but certainly the site would have been used by those individuals involved in activities such as planting, cultivating, and weeding the nearby crops.

Paleodemography

It is hypothesized that Little House was seasonally inhabited by members of a household unit belonging to either the McPhee or Crestview Village Community. Both

![Figure 6.34](image-url)
Birkedal (1976) and Flannery (1976:23) indicate that households during the American Formative stage consisted of the nuclear family. This social unit can be described as the parent pair, their children, and perhaps a few close relatives. Thus the unit could vary between 2 or 3 individuals at the minimum and 8 to 10 individuals maximum, or an average of 5 or 6 persons.

However, it is not known if the entire household group would have used the seasonally occupied field house. Using Narroll's (1962) estimate of population size based on available habitation area, it is estimated that Room I, which has a total floor area of 8.51 m², could only be comfortably occupied by one person. However, this does not allow for the possible use of the storage rooms as sleeping areas when they were empty, i.e., during the planting season, nor does it allow for the fact that Little House was occupied during that part of the year that is favorable toward outside sleeping, cooking, and eating areas. Therefore, a roofed structure such as Room I would not always be necessary for domestic purposes, and perhaps the entire household unit could occupy the field house whenever it was in use. On the other hand, it may be that only certain members of the household unit visited and carried out the activities at the field house, in which case the available roofed living space would have been adequate.

Social Activities

It can reasonably be inferred from artifactual and architectural remains that activities at Little House were primarily focused on storage and processing, and on any social functions directly related to these operations. Activity sets performed by the household unit at the site include domestic types and processing of the harvest and of collected wild plants. Other extrastate activities were also probably performed by this unit, some of which may have necessitated intergroup cooperation (clearing, tilling, and the actual harvest process), and others that did not (hunting and collecting, weeding, and discouragement of predators and pests). In short, the site played a significant, specialized role in the food production chain. There is no perceptible evidence to indicate that any religious or ceremonial activities occurred at the site; corn pollen could be present due to sprinkling prior to planting (a perfunctory ceremonial activity) or to accidental deposition during harvest.

Trade

Although there are no articles in the cultural inventory that would indicate that the temporary occupants of Little House were involved in a trading system with cultural groups outside of the local community, this does not mean that such trading did not occur. Tradeware items would probably have had a certain amount of value and would be left at the permanent habitation rather than transported to the field house. However, Pilles (1978) has indicated that such is not the case at Sinagua field houses where trade items do occur, but in smaller quantities than would normally be found at permanent habitations.

The extent of trade and mutual cooperation between the inhabitants of Little House and others of the community cannot be estimated based on the evidence available at Little House.

Cultural Process

Based on the amount of material remains and on the lack of major remodeling episodes, it is believed that Little House was occupied on a seasonal basis for no more than 25 to 30 years. It would be expected that during this short time period, there would not be any significant internal cultural change, and this expectation is realized in the material remains at the site. Clearly, only a single element is represented at the site and the tools and ceramics and other material culture remain homogeneous in style and function.

On a broader scale, Little House documents the change from dispersed hamlets (Sagehen Phase) to centralized villages in cooperative, peripheral field houses, reflecting not only a change in the settlement pattern, but also a change in social structure.

SUMMARY

In summary, it can be concluded that Site 5MT2191 was a field house used during the agricultural growing and harvest season by members of a local community. Little House was used as a seasonal structure for a brief period and then it fell into disuse for unknown reasons. Perhaps the soils in the site vicinity had become depleted with continual use and new field locations were necessary. Future excavations in the Sagehen Flats Locality will help to further elucidate the role of the field house for prehistoric inhabitants living in centralized communities during the McPhee Phase.
APPENDIX 6-1

POLLEN REPORT FOR SITE 5MT2191

By Linda Scott

Pollen samples were collected at various sites to obtain information concerning the prehistoric environment and potential economic resources used by the prehistoric peoples. Discussion of the methodology involved and intersite comparisons are presented in the Pollen Administrative Report (Scott, 1981). Not all the pollen recovered is discussed in detail in that report, but mention is made of the various types and the entire pollen record is graphically represented.

The pollen samples from Little House (Site 5MT2191) were taken in a roomblock and two use areas at this site (table 6.9).

Pollen sample 3 was taken from Occupation/Activity Area 1, contiguous to the roomblock, against a west-facing wall. This sample did not yield sufficient pollen for analysis.

Pollen sample 7 was taken from the floor in Room 2. This sample yielded a very small amount of arboreal pollen (6 percent). Aside from the 2 percent Zea pollen noted in this sample, there is no indication of economic pollen. All other pollen types within this sample can be attributed to background or ambient pollen.

Pollen sample 25 was taken from the bottom of a pit in Room 3 and contains 23 percent arboreal pollen. There are

<table>
<thead>
<tr>
<th>Pollen sample No.</th>
<th>Field provenience No.</th>
<th>Cultural unit</th>
<th>Provenience and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>66</td>
<td>Occupation/Activity Area 2, SE quarter of NE quarter, against west-facing wall, no pollen</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>95</td>
<td>Room 2, Floor, SE quad, floor contact</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>85</td>
<td>Room 1, Floor, NE quad, floor contact</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>84</td>
<td>Room 1, Floor, SE quad, floor contact</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>122</td>
<td>Room 3, Bottom of Pit</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>125</td>
<td>Room 1, Floor, hearth, no pollen</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>136</td>
<td>Isolated firepit, Sq. 018-022</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>127</td>
<td>Occupation/Activity Area 2, Bottom of fill, large trash pit, no pollen</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>141</td>
<td>Occupation/Activity Area 2, Stone-lined fireplace,Sq. 014-012, no pollen</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>142</td>
<td>Occupation/Activity Area 2, Bottom of fill, Occupation/Activity Area 2, oval-shaped, stone-lined, storage cist, no pollen</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>142</td>
<td>Occupation/Activity Area 2, Bottom of fill, Occupation/Activity Area 2, oval-shaped, stone-lined, storage cist</td>
<td></td>
</tr>
</tbody>
</table>
no indications of economic pollen from sample 25; all pollen types present can be attributed to background or ambient pollen.

Pollen sample 2 was taken from the northeast quadrant of Floor 1, Room 1, while sample 22 was taken from the southeast quadrant of Floor 1 in Room 1. The pollen contents of these two samples are very similar and apparently represent ambient or background pollen. A small amount of *Cleome* (3 percent) was noted in sample 20, but no other economic pollen types were noted in either sample. The presence of *Cleome* pollen does suggest that *Cleome* was utilized in Room 1. Another sample, pollen sample 27, was also taken from the hearth on Floor 1 in Room 1, but it did not yield sufficient pollen for analysis.

An isolated firepit located approximately 8 m southeast of Occupation/Activity Area 2 was sampled for its pollen content (sample 28). This firepit contained 14 percent arboreal pollen. With the exception of the *Zea*, *Sphaeralcea*, and *Cleome* noted within sample 28, most of the pollen is attributed to ambient or background types. It is probable that the *Cleome* and *Zea* pollen observed in this sample may be accounted for by the cooking of food in this firepit or food preparation near the firepit.

Pollen samples 32 and 33 were taken from the bottom of the fill of a large trash pit and from a stone-lined firepit, both in Occupation/Activity Area 2; neither contained sufficient pollen for analysis.

Pollen samples 34 and 37 were taken from the bottom of the fill in the stone-lined storage cist in Occupation/Activity Area 2. Sample 34 did not contain sufficient pollen for analysis, but sample 37 did. This storage cist contains very little economic pollen. It is difficult to ascertain whether the 4 percent of *Cleome* pollen might have been due to the storage of *Cleome* within this cist or to ambient pollen which may have been present in the dirt that filled the cist. All other pollen in this sample may be attributed to the accumulation of ambient pollen.

Elements of the prehistoric environment at this site represented in the pollen record include *Juniperus*, *Pinus*, *Quercus*, short-spined Compositae, *Artemisia*, high-spined Compositae, *Cheno-ams*, *Sarcobatus*, *Cleome*, *Lepidium*, *Ephedra nevadensis*-type, *Ephedra torreyana*-type, *Eriogonum*, Gramineae, *Polygonum sawatchensis*, and *Sphaeralcea*. *Zea* was the only cultigen noted in the pollen record. Most of these samples appear to be composed primarily of ambient pollen, with very little evidence of economic pollen. *Cleome* pollen was noted in Room 1, the isolated firepit, and the bottom of a stone-lined storage cist in Occupation/Activity Area 2. This pollen evidence suggests that *Cleome* was probably cooked and stored at this site. *Cleome* leaves could have been boiled down into a paste, then made into cakes, and allowed to dry (Robbins et al., 1916) before being stored for future use. *Zea* pollen was also noted in Room 2 and in the isolated firepit sample. If this site was a seasonal field house (chapter 1, this volume), the *Zea* pollen indicates the possible field preparation and storage of corn as it was brought in from the fields.
APPENDIX 6-2

ARCHAEO MAGNETIC RESULTS, SITE 5MT2191

By J. Holly Hathaway and Jeffrey Eighmy

INTRODUCTION

Archaeomagnetic dating is a relatively recent chronometric method which has important implications for the archaeologist. Utilization of this method will not only refine estimates of ancient chronology, but will enable archaeologists to assign dates in the absence of other dating methods (e.g., dendrochronology or carbon-14). Care should be taken, however, in reporting results because, in a young science, methodology needs thorough discussion. Archaeomagnetic methods are continually being refined in an attempt to increase the variety of datable features, to tighten temporal control, and to further understand the nature of magnetic change. For a more complete discussion of laboratory and field methods, refer to Hathaway and Eighmy (1981).

FIELD SAMPLING AND METHODS

Two samples were collected on Site 5MT2191 during the 1978 field season. The site is located at latitude 37° 56' N and longitude 121° 48' N in the Sagehen Flats area of the DAP. The site probably functioned as a field house during the early McPhee Phase (A.D. 850-970).

Sample 1 was collected beneath a slab-lined fireplace located at the site's southern perimeter in Occupation/Activity Area 2. Sample 2 was collected from a hearth in Room 1, located in the main roomblock. These were the only areas judged suitable for archaeomagnetic collection.

Twelve specimens were collected for each of the samples. Each specimen (an estimated volume of 3.4 cm$^3$) was encased in a 25-cm plaster cube (15.6 cm$^3$). The orientation of each specimen was maintained by leveling the cube and measuring the magnetic declination of one cube side. To control for the current local magnetic declination, the North Star was sighted on 5 September 1978. The average observed magnetic declination was 13.5°, 0.5° different than the USGS 1965 geological map, and in substantial agreement with expected values calculated from the National Oceanic and Atmospheric Administration map “Magnetic Declination in the United States-Epoch 1975.0.”

RESULTS

Results from samples 1 and 2 are recorded in table 6.10. The individual magnetic directions are plotted in fig. 6.35 for sample 1. Sample 2 was too scattered and was not plotted. In Sample 1, six outliers are identified. It is recognized that this is an uncomfortably large percentage of the collected specimens. Outliers were identified/defined in the following manner: The sample was rerun with relatively extreme specimens excluded, and a new mean and the angular standard deviation were calculated. The excluded specimens were defined as outliers of the new (smaller) sample if they fell beyond two standard deviations. It is believed there is a strong possibility that these “outliers” are not part of the same population and that the new sample is a better representation of the true direction created by the ancient firing.

Three tests were used to determine sample reliability. Alpha 95 is defined as the radius of a circle centered on the observed mean direction within which the true mean will fall 95 percent of the time. Small values indicate tighter clustering about the mean. The precision parameter is estimated by Fisherian statistics, and values increase geometrically with internal consistency. The mean sample vector indicates internal consistency as the value approaches the number of specimens used for determination of the mean. Error along the great circle and perpendicular to the great circle are functions of the alpha 95 which have an oval distribution when plotted, with a short axis (EP) which runs along the great circle between the collecting site and paleopole. The long axis is perpendicular to the short axis; both are centered on the paleopole.

The demagnetized and cleaned results of Sample 1 were then plotted on the Southwest master curve (fig. 6.36). The sample appears to fall near the A.D. 1130 segment of the curve with a relatively large error range (+ 60 years). Little scatter produces smaller error ranges. When plotted, this error has an oval distribution with a short axis (EP) which runs along the great circle between the collecting site and paleopole. The long axis is perpendicular to the short axis; both are centered on the paleopole. This range represents the area within which the true pole is likely to fall 95 percent of the time.
Table 6.10 Little House (Site 5MT2191), archaeomagnetic sampling results

<table>
<thead>
<tr>
<th>Archaeomagnetic designation</th>
<th>Sample 5MT2191-1</th>
<th>Sample 5MT2191-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature and provenience</td>
<td>Fireplace</td>
<td>Hearth</td>
</tr>
<tr>
<td></td>
<td>Occupation/</td>
<td>Room 1,</td>
</tr>
<tr>
<td></td>
<td>Activity</td>
<td>Floor 1</td>
</tr>
<tr>
<td></td>
<td>Area 2</td>
<td></td>
</tr>
<tr>
<td>Specimens used in</td>
<td>6/12</td>
<td>12/12</td>
</tr>
<tr>
<td>final analysis/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total collected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degauss level</td>
<td>150 oersted</td>
<td>150 oersted</td>
</tr>
<tr>
<td>Mean inclination</td>
<td>65.23</td>
<td>62.58</td>
</tr>
<tr>
<td>Mean declination</td>
<td>352.07</td>
<td>352.38</td>
</tr>
<tr>
<td>Mean intensity</td>
<td>0.172196 x 10^{-4}</td>
<td>0.873629 x 10^{-4}</td>
</tr>
<tr>
<td>Mean sample vector</td>
<td>5.99</td>
<td>11.22</td>
</tr>
<tr>
<td>Precision parameter (k)</td>
<td>402.15</td>
<td>14.19</td>
</tr>
<tr>
<td>Alpha 95</td>
<td>3.35</td>
<td>11.94</td>
</tr>
<tr>
<td>Paleolatitude</td>
<td>78.65 N</td>
<td>81.40 N</td>
</tr>
<tr>
<td>Paleolongitude</td>
<td>223.08 E</td>
<td>68.81 E</td>
</tr>
<tr>
<td>Error along great circle (EP)</td>
<td>4.38</td>
<td>14.59</td>
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<tr>
<td>Error perpendicular to great circle (EM)</td>
<td>5.41</td>
<td>18.66</td>
</tr>
</tbody>
</table>

Figure 6.35 Little House (Site 5MT2191), archaeomagnetic specimen plots, sample 1. * indicates the mean direction of the sample as determined from Specimens 3, 4, 6, 7, 11, and 12. All other specimens fall outside two standard deviations of the mean value and were defined as outliers. Specimens 1, 2, and 8 fall outside the plotting surface.

Solid portion is based on DuBois (1975)
Dashed portion is based primarily on Wolfman (1979)
Modern portion is calculated from USGS magnetic declination and inclination maps for the United States-Epoch, and from Svendsen (1962)

Figure 6.36 Little House (Site 5MT2191), Southwest master curve.
APPENDIX 6-3

DATA AND SUMMARY STATEMENTS,
CERAMIC MATERIALS FROM SITE 5MT2191

By William Lucius and Eric Blinman

Preliminary (inventory) analysis of the ceramic artifacts from Site 5MT2191 was carried out by members of the DAP additive analysis laboratory subsequent to the field operations. Descriptions of the preliminary analysis procedures and structure, and resulting data interpretability are available in Lucius (1981). Familiarity with the inventory analysis program will aid in the understanding of the data and interpretations provided below.

Table 6.11 is a summary of ceramic frequencies for the site as a whole (ceramics collected during the 1972 inventory survey were not available for analysis and are not included). Sherds are grouped by “culture categories and wares” (Lucius, 1978). All sherds from 5MT2191 were assigned to wares of the Mesa Verde Culture Category and reflect a local (Mesa Verde region) manufacturing tradition and exchange system. Pottery types within each ware are listed sequentially from early to late, and grouped types (e.g., Early Pueblo Gray) are listed last and include sherds not assignable to specific types.

Five partially or wholly reconstructable ceramic vessels were found at 5MT2191, and their counts and weights are excluded from table 6.11. All vessels were recovered from fill or plow zone proveniences and were broken and scattered prior to recovery by the excavation program. They

Table 6.11 Summary of descriptive frequencies of ceramics at Site 5MT2191

<table>
<thead>
<tr>
<th>Ware</th>
<th>Traditional type</th>
<th>Bowl</th>
<th>Jar</th>
<th>Other</th>
<th>Total</th>
<th>Rims</th>
<th>Modified</th>
<th>By weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td># %</td>
<td># %</td>
<td># %</td>
<td># %</td>
<td># %</td>
<td># %</td>
<td>g %</td>
</tr>
<tr>
<td>Mesa Verde Gray</td>
<td></td>
<td>57</td>
<td>3</td>
<td>67</td>
<td>59</td>
<td>3</td>
<td>59</td>
<td>436 4</td>
</tr>
<tr>
<td>Chapin Gray</td>
<td></td>
<td>157</td>
<td>9</td>
<td>157</td>
<td>39</td>
<td>8</td>
<td>28</td>
<td>1052 11</td>
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<tr>
<td>Moccasin Gray</td>
<td></td>
<td>1336</td>
<td>81</td>
<td>1336</td>
<td>6845</td>
<td>69</td>
<td>1</td>
<td>6845 69</td>
</tr>
<tr>
<td>Early Pueblo Gray</td>
<td></td>
<td>1336</td>
<td>81</td>
<td>1336</td>
<td>6845</td>
<td>69</td>
<td>1</td>
<td>6845 69</td>
</tr>
<tr>
<td>Mesa Verde White</td>
<td></td>
<td>15</td>
<td>6</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>4</td>
<td>90 1</td>
</tr>
<tr>
<td>Chapin Black-on-white</td>
<td></td>
<td>3</td>
<td>1</td>
<td>11</td>
<td>14</td>
<td>1</td>
<td>3</td>
<td>71 1</td>
</tr>
<tr>
<td>Piedra Black-on-white</td>
<td></td>
<td>156</td>
<td>62</td>
<td>25</td>
<td>181</td>
<td>9</td>
<td>20</td>
<td>866 9</td>
</tr>
<tr>
<td>Early Pueblo White</td>
<td></td>
<td>156</td>
<td>62</td>
<td>25</td>
<td>181</td>
<td>9</td>
<td>20</td>
<td>866 9</td>
</tr>
<tr>
<td>Mesa Verde Red</td>
<td></td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>40 &lt;1</td>
</tr>
<tr>
<td>Bluff Black-on-red</td>
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<td>46</td>
<td>18</td>
<td>41</td>
<td>88</td>
<td>5</td>
<td>3</td>
<td>330 3</td>
</tr>
<tr>
<td>Early Pueblo Red</td>
<td></td>
<td>24</td>
<td>10</td>
<td>26</td>
<td>50</td>
<td>3</td>
<td>2</td>
<td>184 2</td>
</tr>
<tr>
<td>Late Pueblo Red</td>
<td></td>
<td>24</td>
<td>10</td>
<td>26</td>
<td>50</td>
<td>3</td>
<td>2</td>
<td>184 2</td>
</tr>
<tr>
<td>Indeterminate Gray</td>
<td></td>
<td>2</td>
<td>&lt;1</td>
<td>2</td>
<td>2</td>
<td>&lt;1</td>
<td>1</td>
<td>5 &lt;1</td>
</tr>
<tr>
<td>Indeterminate White</td>
<td></td>
<td>1</td>
<td>&lt;1</td>
<td>1</td>
<td>1</td>
<td>&lt;1</td>
<td>1</td>
<td>1 &lt;1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>251</td>
<td>1655</td>
<td>3</td>
<td>1909</td>
<td>141</td>
<td>1</td>
<td>9920</td>
</tr>
</tbody>
</table>
include portions of two different Moccasin Gray jars (vessels 4 and 5) as well as the body of a jar that could not be classified to type (vessel 1). Two bowls (vessels 2 and 3) were also found, one Chapin Black-on-white and one Piedra Black-on-white.

Relative weights of temporally diagnostic types have been extracted from table 6.11 and are presented graphically in figure 6.37. Each type is expressed as a percentage of its ware total (excluding sherds not identifiable to type and excluding sherds from reconstructable vessels). The relative contribution of each ware to the classifiable site total is listed on the left. Temporal spans for the diagnostic types are based on Breternitz et al. (1974) with some adjustments based on dating results from within the DAP. This figure illustrates the intensity of occupation as well as the temporal range of occupation, and it can be compared with similar figures prepared for other DAP sites.

![Figure 6.37 Little House (Site 5MT2191), diagnostic type occurrences for ceramics.](image)

A conservative estimate of the range of occupation at the site is from A.D. 750 to 875. This is based on the presence of Chapin Black-on-white and the absence of Mancos Gray (found on project area sites as early as A.D. 850, but not common until about A.D. 875). However, the presence of Bluff Black-on-red, several slipped red ware sherds (Late Pueblo Red), and the abundance of Moccasin Gray suggest that the primary occupation of 5MT2191 occurred between A.D. 800 and 875. This places occupation of the site contemporaneous with sites assigned to the early MePhee Phase as outlined by the DAP.

No ceramics were recovered that reflect nonlocal origin (outside of the Mesa Verde region). Crushed igneous rock temper was present in 95 percent of the sherds, and the remaining 5 percent were tempered with a multilithic sand (percentages based on weight). Crushed rock temper is widely distributed throughout the Mesa Verde region. Although a specific source area has not been defined, the sand temper is currently thought to indicate intraregional exchange with areas to the southwest or west of the project area. Absence of definable trade wares from outside the Mesa Verde area is not unusual at this time period; Cibolan and Chuskan ceramics did not begin to appear in the project area until the latter half of the ninth century (about A.D. 875).

Table 6.12 subdivides the site ceramics into smaller provenience units. Temporally diagnostic sherds are not differentially represented in excavation vs. surface collections. The only unusual occurrence is the presence of 50 Late Pueblo Red sherds in the "other excavation" units; most of these sherds were recovered from the fill of the large refuse pit at the site. These sherds are red wares with a thin surface slip but without other diagnostic attributes. Although slipped red wares are more frequent after A.D. 900 (Deadmans Black-on-red), they are present in limited numbers from the onset of red ware production in the Mesa Verde region.
Table 6.12 Little House (Site 5MT2191), ceramic data from selected proveniences

<table>
<thead>
<tr>
<th>Surface collection</th>
<th>Excavated units</th>
<th>Total site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Units over Use Area 1 (N=3) %</td>
<td>Units over Use Area 2 (N=24) %</td>
</tr>
<tr>
<td>Mesa Verde Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapin Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moccasin Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Pueblo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mesa Verde White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapin Black-on-white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piedra Black-on-white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Pueblo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mesa Verde Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bluff Black-on-red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Pueblo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late Pueblo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indeterminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray ware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White ware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vessel Forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowl</td>
<td></td>
<td></td>
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<tr>
<td>Jar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*O/A = Occupation/Activity
APPENDIX 6-4

DATA AND SUMMARY STATEMENTS
LITHIC MATERIALS FROM SITE 5MT2191

By Thomas H. Hruby

The data presented in tables 6.13, 6.14, and 6.15 represent part of the lithic reductive-technology analysis completed for Site 5MT2191. From a 12-attribute FL T (Flaked Lithic Tool) analysis system, 4 attributes were selected to illustrate general technological, functional, and raw-material variability. A traditional morphological-use classification, a ranked estimation of production technology input for dorsal and ventral surfaces, and a grain-size evaluation are included. Six variables are included from the FLD (Flaked Lithic Debitage) analysis system: grain-size ranking, classification of items with cortex, items which retain a striking platform, obsidian items, mean weight, and total number of debitage items. The NFL T (Nonflaked Lithic Tool) analysis system is represented by four variables: traditional morphological-use item classification, production-input evaluation, indication of item completeness, and raw-material, grain-size evaluation. The complete lithic analysis systems are described elsewhere in DAP publications (Phagan, 1981).

During 1980, DAP lithic laboratory personnel have repeatedly reviewed the utility and reliability of the lithic analysis systems. In this review, a number of analysis variables have been modified, particularly the item morphological-use variables on both the FL T and NFL T systems. Analytical perspectives change as information accumulates and as models of tool production and use improve. In order to minimize the effects of this analytical modification on interpretation, the observed values of these variables have been regrouped into larger categories within which analytic consistency is reliable.

In addition to the individual site data and for comparative purposes, the tables include data for both a grouping of temporally and functionally similar DAP sites, as well as percentage data for all DAP Anasazi sites analyzed prior to the 1980 field season. These latter “Anasazi group” data have been generated from computer files which have not undergone complete editing, and final figures may differ slightly from those presented. Comparisons and interpretations presented here, particularly those of an inter-site nature, are based on a qualitative assessment of lithic profile variation, since significance has not been statistically established.

Site 5MT2191 is a small, seasonally used field house occupied during the Periman Subphase of the McPhee Phase. Two other field houses with the same temporal/functional classification, 5MT2205 and 5MT4512, are grouped together for comparative purposes. Site 5MT2191 is unique among Periman Subphase field houses: utilized flakes are underrepresented, while chopper/scaper planes and projectile points are overrepresented. The FL T profile for Site 5MT2191 probably represents a greater degree of hunting activities than is present at most Anasazi villages or field houses. Technological production input in the FL T system is quite high and probably represents considerable attention to and the importance of bifaces, specialized forms, and projectile points. Site 5MT2191 also differs from other Anasazi sites in the ratio of tools to the total number of flaked lithics. Site 5MT2191 has 14.3 tools per 100 lithic items, while the Anasazi group has 9.6 tools. Other Periman Subphase field houses have 7.6 tools per 100 items. Raw material counts are roughly comparable, even though the low percentage of nongranular items might indicate a selection for local materials.

The FL T profile indicates a focus on selection of local raw materials. Occupants of the McPhee Phase field houses appear to have selected raw materials in a rather expedient manner—Site 5MT2191 is probably the best example of this. The high cortex percentage and large flake size for Site 5MT2191 indicates that the production focus at the site was on the larger, lower input items rather than on projectile points or other high input items. Production at the site probably focused on low input tools with high input items brought into the site.

The NFL T system shows that the field houses are all very similar to each other, while being substantially different from the Anasazi group. Approximately 60 percent of the tools from the Periman Subphase field houses are nonflaked lithic tools, while the Anasazi group has 38 percent nonflaked lithic tools. This suggests that processing of agricultural foods is very important at field house locations. Supporting this conclusion is the high percentage of manos and metates present in these locations. Though Site 5MT2191 is dominated by manos and underrepresented in the hammerstone and generalized tool categories, these
differences are probably not very significant on a subphase level of comparison.

The lithic tools from Site 5MT2191 indicate a close technological relationship to other Periman Subphase field houses. Site 5MT2191 is unique with respect to other field houses because of the relatively large component of hunting associated tools. All Periman Subphase field houses are substantially different from the grouped total of all Anasazi sites, particularly in the higher percentage of nonflaked lithic tools found at the field house.
Table 6.13 Lithic analysis data summary for Site 5MT2191, flaked lithic tools

<table>
<thead>
<tr>
<th></th>
<th>Surface collection (N=5)</th>
<th>Room 1 floor (N=2)</th>
<th>Room 1 fill (N=3)</th>
<th>O/A* Area 1 (N=3)</th>
<th>Rooms 2, 3, &amp; 4 fill (N=8)</th>
<th>O/A* Area 2 fill (N=25)</th>
<th>Other excavated units (N=39)</th>
<th>5MT2191 total (N=85)</th>
<th>5MT2205 total (N=66)</th>
<th>Anasazi group total (N=7048)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morpho-Use Form</td>
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<tr>
<td>Indeterminate</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Utilized flakes</td>
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<td>2 66.7</td>
<td>1 33.3</td>
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<td>9 23.0</td>
<td>20 23.6</td>
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<td>2 25.0</td>
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<td>5 12.8</td>
<td>14 16.5</td>
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<tr>
<td>Chopper/scaper planes</td>
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<td>1 33.3</td>
<td>4 50.0</td>
<td>9 36.0</td>
<td>15 38.5</td>
<td>31 36.5</td>
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<td>6.0</td>
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<td>Projectile points</td>
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<td>10 11.8</td>
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<td>1 33.3</td>
<td>2 25.0</td>
<td>4 16.0</td>
<td>10 25.6</td>
<td>20 23.5</td>
<td>22 25.6</td>
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* O/A - Occupation/Activity
Table 6.14 Lithic analysis data summary for Site 5MT2191, flaked lithic debitage

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<th>O/A* Area 1 (N = 11)</th>
<th>O/A* Area 2 (N = 156)</th>
<th>Other excavated units (N = 286)</th>
<th>5MT2191 total (N = 511)</th>
<th>5MT2205 total (N = 1027)</th>
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*O/A - Occupation/Activity
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*O/A - Occupation/Activity
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Svendsen, K. L.

Wolfman, Daniel
Chapter 7

THE DOLORES ARCHAEOLOGICAL PROGRAM
MAGNETIC RECONNAISSANCE SURVEY PROGRAM:
FIELD OPERATIONS
ABSTRACT

A magnetic reconnaissance survey was implemented in the initial year of the Dolores Archaeological Program to determine whether this method would be useful in revealing subsurface archaeological features and in delineating the boundaries of the archaeological sites. This report is a description of the field activities for the 1978 field season. The magnetic survey was useful in locating two pitstructures at Site 5MT2193 (excavated during the 1978 and 1979 field seasons by the Dolores Archaeological Program field crews), and subsequent investigations of magnetically surveyed sites are expected to yield similar results.
CHAPTER 7
THE DOLORES ARCHAEOLOGICAL PROGRAM
MAGNETIC RECONNAISSANCE SURVEY PROGRAM:
FIELD OPERATIONS

By J. Holly Hathaway

INTRODUCTION
A magnetic reconnaissance survey was initiated 28 August 1978 for the first year of field operations of the DAP (Dolores Archaeological Program). Magnetic survey is a relatively new research method that records variations in the earth’s magnetic field, enabling detection and definition of subsurface archaeological features prior to excavation. The survey is instrumental in the determination of perimeters, grid placement, and general delineation of features present on the sites.

Because this is among the first magnetic surveys attempted in the southwestern region of Colorado, the results of the survey need to be tested archaeologically to verify analysis of the anomalies. Essentially, this need only be done until a correlation can be established between the characteristics of magnetic anomalies and archaeological features.

During the 1978 field season, two prehistoric sites (Site 5MT2193, Dos Casas Hamlet, and Site 5MT2198, Sagehill Hamlet) were magnetically surveyed and consequently tested by excavation. For both sites, hand-drawn magnetic contour maps were made in the field. One site, Site 5MT2193, revealed two high anomalies which were then excavated and determined to represent two pithouse structures (Brisbin, 1981). The other site, Site 5MT2198, produced an anomaly which was thought to be of archaeological origin; however, test excavations proved to be sterile (chapter 5, this volume). It was later concluded that the anomaly was due to a fragment of metal (possibly a spike or tire rim), but nothing was proved. With ongoing magnetic analysis and research, nonarchaeological and archaeological features will be distinguishable by the type of anomaly produced. Refer to chapter 8, this volume, for a discussion of the criteria on which these distinctions can be based.

Different types of maps and an explanatory narrative for each site are being produced by NEBCAR (Nebraska Center for Archaeophysical Research) to aid in the analysis of the data (chapter 8). Future research will focus on the description of magnetically subtle features as well as the more obvious ones. It is also possible to filter out such obtrusive anomalies as produced from ferrous objects which are of no consequence in determination of prehistoric archaeological features. Dr. John Weymouth of the Department of Physics and Astronomy at the University of Nebraska is conducting the computer programming and analysis with the assistance of Robert Huggins, a graduate student at that institution.

METHODOLOGY
The magnetic field of the earth varies throughout the world according to latitude and to more local phenomena. This field of intensity is not temporally constant, but fluctuates diurnally and seasonally, and also exhibits longer-term variability. Within the main field, local magnetic fluctuations are apparently due to varying topographic, geologic, and vegetal factors as well as to subtle factors produced from cultural features. It is these subtle deviations from the magnetic field which are of interest to the archaeological discipline.

Magnetic surveying consists of measuring, mapping, and interpreting the magnetic intensities within specific areas of interest. Local variances from the magnetic field are referred to as anomalies and indicate fluctuations in the magnetic field which might be caused by a variety of factors. The interpretation of these anomalies enable the analyst to infer the presence of subsurface archaeological features.

The shape and type of anomaly produced from the data can be interpreted in terms of underlying causes, and it is possible to estimate the type of feature creating the anomaly. The size and amplitude of the anomaly are dependent on the vertical and horizontal distance from the instrument sensor, the amount of object magnetism, and the size of the magnetized object. Ferrous objects occasionally produce erratic results and obscure nearby
archaeological features. Geological influences can also obscure subtle features. All of these factors are pertinent in the final analysis and success of magnetic surveying.

The reliability of the data is dependent upon numerous factors, which is the reason magnetic surveying must be treated with professionalism by the entire field crew. It is essential that the “sensor holder” (that is, the person responsible for moving the remote sensor over the area being surveyed) be magnetically clean, because any metal objects close to the instrument will cause fluctuations and inaccurate information. The sensors must be very still during the readings or this can also obscure the data. When surveying, objects such as electrical wires, fences, and automobiles should be avoided. The presence of any of these types of materials will produce inaccurate data and adversely affect the analysis.

In extracting data from an area, several methods are possible, but the one found most effective for the DAP survey is the differential method. This method entails the use of two magnetometers, one to record the apparent spatial fluctuations in the area surveyed, and the other to record the diurnal fluctuations in the magnetic field. Variations in the readings of the two instruments are then calibrated to determine the true local subsurface readings, and these readings are interpreted to identify anomalies.

Most magnetometers used for geological purposes are sensitive to one gamma (10^{-5} gauss, the measurement used for indicating the intensity of the magnetic field); this is all that is necessary to detect features of geological origin. However, in detecting features of archaeological interest, a much more sensitive instrument is necessary because of the subtle nature of the features under study. Therefore, the magnetometers used for archaeological study are equipped with one-fourth gamma features, which enable them to be four times more sensitive. The use of this instrument in magnetic surveying enables a more accurate analysis of the possible features in the area.

**PRELIMINARY PROCEDURES**

The sites to be magnetically surveyed were selected from areas which will be affected in the near future by land-modifying activities of the Dolores Project. All sites selected, with the exception of 5MT23 (Grass Mesa Village), are located in Borrow Area A, a location where material will be removed for dam construction (figs. 7.1 and 7.2). The process of selection consisted of reviewing the site survey reports for the priority area and noting those sites that possess suitable physical characteristics for magnetic survey (suitable soils, topography, etc.). Site types, temporal assignments, and excavation priorities

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Figure 7.1 Location of sites subject to magnetic survey during 1978 (with the exception of 5MT23, Grass Mesa Village).
were then considered in selecting the sample. Most sites magnetically surveyed in the 1978 field season are scheduled for excavation in the 1979 field season; however, four additional sites (5MT4652, 5MT4657, 5MT4659, and 5MT2672), were selected because immediate input for evaluation was critical (the sites would be impacted by a proposed project haul road).

Allen Kane, co-principal investigator for the DAP, and Robert Huggins of NEBCAR, selected the sites and determined the areas of the sites that were to be magnetically surveyed. Before the actual survey procedure, the desired area for each site must be located and physically delimited. To accomplish this, a transit is set up on one of the established perimeter corners of the study area. From there, the desired number of survey blocks are defined and staked, and the grid blocks are oriented according to magnetic north. In general, blocks measure 20 by 20 m, but occasionally it is necessary to use 20 by 10-m blocks because of unsuitable topography or limits of areas of interest. Once the perimeters of the blocks are staked, each corner is marked according to location, with "1,1" indicating the southwest corner. In these designations, the first coordinate relates to the south-north location and the second coordinate relates to the west-east location, as shown in figure 7.3. This method facilitates interpretation of the computer maps (Dougenik and Sheehan, 1975) and relates easily to the actual layout of the grid in the field. One or more blocks with shared boundaries constitute a grid (fig. 7.3). There may be one or more grids per site, depending on the site size and/or the areas to be investigated.

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In order to conduct magnetic reconnaissance survey, a minimum of three technicians is required: one person to operate the stationary magnetometer and record data, another to operate the moving sensor, and a third to operate the moving magnetometer. It is necessary that the crew be magnetically clean so as not to affect the data; fluctuations of more than 4 quarter gammas from a position an arm's length from the sensor may cause contamination.

Following the establishment of the grids, the instruments should be positioned with the stationary sensor sufficiently far from the study blocks so as not to cause interference. Once the stationary sensor is installed in an area of low magnetic variance, it should not be bumped or moved until completion of the survey.

In order to keep the stations consistent within the block, ropes are used which are marked in 1-m intervals, and four guidelines are employed to mark the south-north and west-east lines which the moving magnetometer crew follow. Surveying begins in the southwest corner of the grid and/or block and the crew moves north and east. The stations normally progress to the north along the guideline until the end of the line is reached. The crew then moves east one line and repeats the procedure. Both
magnetometers are activated simultaneously at the call of
the moving magnetometer operator and information is re­
corded by the stationary magnetometer operator. When all
grids from a site have been surveyed, this information is
sent to NEBCAR for computer processing, printout
(SYMAP), and subsequent interpretation. It is also possi­
bile to draw hand-contoured maps, although these are less
accurate and more limited than the SYMAP’s.

SUMMARY OF 1978 OPERATIONS

On 28 August 1978, Robert Huggins of NEBCAR arrived
to begin field operations in conjunction with DAP person­
nel at several of the high priority sites in the dam project
area.

From 28 August through 5 September, Huggins, with the
assistance of Laura Maness (a University of Colorado field
crew member), surveyed the study sites with a transit to
delineate the boundaries of the magnetic survey test
squares. At this time, a total of forty-seven 20- by 20-m
and two 20- by 10-m blocks were established at 15
prehistoric sites.

On 11 September 1978, Huggins conducted a field training
session to teach techniques necessary to accomplish a
magnetic reconnaissance survey. This session consisted of
procedural enactment, participatory discussions on the
mechanics involved in magnetic surveying, general descrip­
tion of computer data printout and subsequent analysis,
and procedure for hand-contouring magnetic maps. Those
attending the session were Kyle Bauman, Laura Maness,
and Holly Hathaway (author). Gary Brown, Ray Har­
riman, and Jacqueline Litvak (University of Colorado
crew members) were later trained by Hathaway and used
to augment the Magnetic Reconnaissance Survey Crew.

The Special Studies Crew was organized on 25 September
1978 with implementation of the Magnetic Reconnaiss­
ance Survey as one of the major tasks. During the 1978
field season, Holly Hathaway served as crew leader with
Kyle Bauman, Gary Brown, Ray Harriman, Jacqueline
Litvak, and Laura Maness as Magnetic Reconnaissance
Survey Crew members.

The Magnetic Reconnaissance Survey field season began
on 11 September and ended 6 November, (because of in­
clement weather and poor road conditions). A total of 39
working days, or 840 man-hours, was expended in laying
out the blocks and collecting data on the sites; crews varied
from two to three technicians.

Fifty-two 20- by 20-m blocks, four 20- by 10-m blocks, and
one 20- by 5-m block were hand-mapped at the project and were not sent
to NEBCAR for computer analysis and interpretation.
Those sites surveyed were a subset of those eligible for ex­
cavation during the 1979 and 1980 field seasons.

Efficiency for the 1978 field season was somewhat
hampered by the inexperience of the crew and maintenance
problems with the sensitive instruments; however, a
minimum of two blocks were surveyed per working day.
Table 7.1 lists all the sites, the number of blocks per site,
and the date(s) surveyed.

The two magnetometers used on the DAP were of the port­
able proton magnetometer type, Model Number G-826,
and were purchased from geoMetrics of Sunnyvale, Cali­
fornia on 11 September 1978.

Table 7.1 Inventory of work completed, Dolores
Archaeological Program Magnetic
Reconnaissance Survey, 1978 field season

<table>
<thead>
<tr>
<th>Site No.</th>
<th>No. of 20- by 10-m blocks</th>
<th>No. of 20- by 10-m blocks</th>
<th>Date surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>5MT23</td>
<td>2 (Grid 1)</td>
<td>2 (Grid 2)</td>
<td>3 Oct</td>
</tr>
<tr>
<td>5MT2192</td>
<td>4</td>
<td>2</td>
<td>22 &amp; 25 Sept</td>
</tr>
<tr>
<td>5MT2193</td>
<td>1</td>
<td></td>
<td>12 Sept</td>
</tr>
<tr>
<td>5MT2194</td>
<td>2</td>
<td></td>
<td>13 &amp; 14 Sept</td>
</tr>
<tr>
<td>5MT2198</td>
<td>1</td>
<td></td>
<td>13 Sept</td>
</tr>
<tr>
<td>5MT2199</td>
<td>2</td>
<td></td>
<td>1 Nov</td>
</tr>
<tr>
<td>5MT2203</td>
<td>2</td>
<td></td>
<td>6 Oct</td>
</tr>
<tr>
<td>5MT2236</td>
<td>6</td>
<td></td>
<td>10 &amp; 11 Oct</td>
</tr>
<tr>
<td>5MT2672*</td>
<td>1</td>
<td></td>
<td>4 Nov</td>
</tr>
<tr>
<td>5MT2844</td>
<td>4</td>
<td></td>
<td>20 &amp; 23 Oct</td>
</tr>
<tr>
<td>5MT2848</td>
<td>4</td>
<td></td>
<td>19 &amp; 20 Oct</td>
</tr>
<tr>
<td>5MT2853</td>
<td>2</td>
<td></td>
<td>12 Oct</td>
</tr>
<tr>
<td>5MT4478</td>
<td>2</td>
<td></td>
<td>22 &amp; 25 Oct</td>
</tr>
<tr>
<td>5MT4512</td>
<td>2</td>
<td></td>
<td>6 Oct</td>
</tr>
<tr>
<td>5MT4545</td>
<td>4</td>
<td></td>
<td>19-21 Sept</td>
</tr>
<tr>
<td>5MT4614</td>
<td>4</td>
<td></td>
<td>12, 15, &amp; 19 Sept</td>
</tr>
<tr>
<td>5MT4652*</td>
<td>2</td>
<td></td>
<td>3 Nov</td>
</tr>
<tr>
<td>5MT4657*</td>
<td>1</td>
<td></td>
<td>5 Nov</td>
</tr>
<tr>
<td>5MT4659*</td>
<td>1</td>
<td></td>
<td>5 Nov</td>
</tr>
</tbody>
</table>

*Hand-contoured map only; no SYMAP available.
**Blocks not magnetically surveyed in 1978 field season.
RESULTS

Computer SYMAP's, line contour maps, and interpretive narratives for sites surveyed in 1978 appear in chapter 8 of this volume.

The four sites which will be discussed in the preliminary report are as follows: Sites 5MT4652, 5MT4657, 5MT4659, and 5MT2672. These sites were not programmed into the NEBCAR computer but were hand-contoured for result expediency. The sites would be impacted by a proposed Bureau of Reclamation access road, and a quick evaluation of the cultural resources present along the proposed access route was needed. As previously mentioned, the hand-contoured maps are less accurate than computer SYMAP printouts and the interpretive discussions take into account these limitations.

Site 5MT4652

Two grids, with one 20- by 20-m block in each, were established and surveyed at Site 5MT4652. The site is located on a south-sloping ridge of a plowed field in the Sagehen Flats area north of Road X (fig. 7.1). Grid 2 is located approximately 10 m north and west of Grid 1. Grid 1 is offset to the east of the ridgetop and appeared to be a good location for a structure. Block A, Grid 1, is fairly quiet magnetically (fig. 7.4); however, two anomalies are present. One large anomaly located at 13E, 12N is a dipolar phenomenon which is probably due to a metal object in the vicinity; it is oriented in a west-southwest/east-northeast position rather than in standard north-south orientation resulting from fire-hardened archaeological features or other features containing in situ burnings.

The anomaly located at 4E, 14N is a dipolar phenomenon, oriented north-south, which probably indicates an archaeological feature. The anomaly is relatively small, possibly resulting from a fire hearth or other such small feature.

Grid 2, Block A, is located on top of the ridge and is centered on one of the Bureau of Reclamation's road survey stakes. A metal rebar (road stake) situated at 7E, 10N (fig. 7.5) produced a large anomaly which does not appear to be dipolar, probably due to the vertical position of the rebar in the ground. A dipolar anomaly located at 15E, 14N, oriented west-northwest/east-southeast, is again probably due to a metal object which was not observed in the survey. Two separate anomalies located at 13.5E, 5N exhibit high magnetic areas with no associated negative pole (that is, a monopole). These may be of archaeological origin.

There is one other area which is apparently producing a dipolar effect, but the majority of the anomaly is located

Figure 7.4 Site 5MT4652, Block A, Grid 1, magnetic contour map.

Figure 7.5 Site 5MT4652, Block A, Grid 2, magnetic contour map.
east of the survey perimeters and proper assessment is not possible without complete information.

Site 5MT4657

This site is located in a plowed field of rolling hills and ridges at the bottom of a slightly depressed area (fig. 7.1). The site consists of a scant sherd and lithic scatter, with a rubble pile to the south. One grid, with a 20- by 20-m block, is located north of the rubble pile and centered over the sherd and lithic scatter. No anomalies are apparent in the hand-contoured maps; the field appears magnetically flat (fig. 7.6).

Another anomaly, located slightly south of the rubble mound at 11E, 9N, is a high monopolar phenomenon which is probably due to the proximity of sandstone rubble. Distinguishing features (such as walls) are not discernible on the hand-contoured map.

A very strong dipolar anomaly is located 6E, 18N with a northwest-southeast orientation (fig. 7.7); it is very prominent and probably not due to archaeological origins. The anomaly might be due to a rather large metal object located below the surface and situated in a northwest-southeast position.

Another anomaly, located slightly south of the rubble mound at 11E, 9N, is a high monopolar phenomenon which is probably due to the proximity of sandstone rubble. Distinguishing features (such as walls) are not discernible on the hand-contoured map.

A very high anomaly is located at 20E, 2N and influences a large area. It is very possibly due to an archaeological feature, probably a prehistoric pithouse. This anomaly extends outside the east and south perimeters of the surveyed area, so a complete description is not possible.

There is an odd triad of anomalies located in the northeast corner of the block. This consists of a high area at 19E, 18N with an associated low area at 16E, 17N to the west-southwest. Another low area at 16E, 14N exists due south of the first low area but is wider and more shallow and probably not related in origin. These anomalies are likely not due to archaeological factors.
Site 5MT2672

Site 5MT2672 lies on a small ridge in a plowed field (fig. 7.1) and consists of a fairly small but scattered area of sherds and lithics. One 20- by 20-m block was plotted on top of the ridge and covered the majority of artifactual debris. A fairly wide linear feature is apparent on this map, running north-south in the center of the block (fig. 7.8). It is perhaps due to the ridgetop or other topographic features. Just to the east of this feature at 14E, 12N, a small anomaly with a high magnetic field is apparent with an associated slight negative anomaly to the south-southwest. This possibly indicates a fire hearth or other such archaeological feature.

CONCLUSIONS

The 1978 field season of the Magnetic Reconnaissance Survey program was successful in locating two verified pithouses on a site excavated in the 1978 field season (Site 5MT2193). During the 1979 field season, most of the remainder of the sites magnetically surveyed in 1978 will be tested. Analysis and interpretation resulting from the magnetic survey will aid in formulating excavation strategy for these sites. With continuing analysis of anomalies produced and actual archaeological features discovered, better and more detailed interpretation will be possible. It is anticipated that Dolores Archaeological Program magnetic survey operations will be expanded in future years as the technique undergoes further refinement. In addition to providing input for conceiving excavation strategies and schedules at sites to be intensively investigated, other possible applications are in mapping of large prehistoric sites and regional sampling procedures.

Interpretation of the magnetometer survey of the four sites present in the proposed right-of-way for the project haul road suggested that significant subsurface archaeological structures or features were probably present at Site 5MT4652 and Site 5MT4659. It was therefore recommended to the Bureau of Reclamation that the road be rerouted to avoid these sites. The Bureau later changed the location of the road in lieu of the potentially damaging alignment.
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1978 Preliminary report on excavations at Dos Casas Hamlet (Site 5MT2193). Ms. on file, Dolores Archaeological Program, Dolores, Colorado.

Dougenik, James A., and David E. Sheehan
Chapter 8

MAGNETOMETER RESULTS
ABSTRACT

As part of Dolores Cultural Resources Mitigation Program field operations in 1978, a magnetometer survey test program was implemented to determine the efficacy of such methods in facilitating excavation strategies. The program was begun on 12 September 1978 and was continued until late October. A total of forty-six 20- by 20-m blocks at 14 prehistoric sites was surveyed and the resultant data sent to the University of Nebraska for analysis and interpretation. By the report submission date (May 1979) 90 percent of the data had been processed; the remainder was completed in the summer of 1979 and the results were added to the manuscript. Magnetic anomalies recorded at prehistoric sites in the program area appear to reflect several primary sources: prehistoric cultural architecture or features, geological features, and modern ferrous artifacts, such as nails and cans. By considering the characteristics of each individual anomaly, it is usually possible to make a preliminary interpretation regarding the source and the potential for recovering archaeological data. Interpretations of magnetic maps for all of the 14 prehistoric sites examined in 1978 are presented and recommendations are made for future testing of promising anomalies by excavation.
CHAPTER 8
MAGNETOMETER RESULTS
By Robert J. Huggins and John Weymouth

INTRODUCTION

As part of the Dolores Archaeological Program, a magnetic reconnaissance survey was implemented in the fall of 1978 to assist in the investigation of areas affected by the proposed construction of the McPhee Dam and reservoir and other facilities. The primary aim of the study was to use existing magnetic survey technology to aid in the location of subsurface archaeological features and to refine field and computing techniques to improve the resolution of magnetic methods in the Dolores River valley and similar archaeological areas. Preliminary results were presented in the form of a progress report submitted in February 1979. This report was submitted for editing and typing to the University of Colorado in May 1979. Most of this report is devoted to individual summaries for each tested site, including descriptions of the suspected features, and computer maps of the magnetic fields.

The area to be affected by project construction and other activities contains over 1,000 prehistoric archaeological sites, which range in age from perhaps 5000 B.C. (the Archaic Tradition) to A.D. 1300 (the Anasazi Tradition). Most of the sites appear to be small in size, consisting of one or two house structures and other smaller peripheral features; however, there are a few very large sites with 10 to 20 houses. The sites are situated in most cases on ridgelines, hillocks, or gentle slopes. The valley itself is a flood plain of the Dolores River and the sites in the valley are located on flat-lying sedimentary strata with few important discontinuities. The bedrock which underlies the sites (usually encountered between 1 and 5 m in depth) is a uniform sandstone and appears to have weak magnetic properties.

The archaeological features excavated are constructed of a variety of natural materials ranging from adobe to sandstone blocks and wood substances. During archaeological excavations, burned features (potential magnetic anomalies) are often encountered; these include burned pithouses, storage rooms, and hearths. Several of the sites have been disturbed by farming and it is likely that historic iron objects are present on and in the sites.

MAGNETIC RECONNAISSANCE FIELDWORK

The magnetic reconnaissance survey field operations were initiated in September 1978 and were directed by Rob Huggins. For the first week, suitable field equipment was devised for accurately locating the reading points; grids were set out to define the boundaries of the survey; and a field crew of three people was trained and tested to ensure accurate data collection. The actual survey commenced 12 September 1978 and continued until late October. Two quarter-gamma-sensitive proton magnetometers were used to take readings of total magnetic field in the difference mode with one stationary and one moving magnetometer. All the sites were surveyed at a 1-m² sampling rate, and a total of forty-six 20- by 20-m “blocks” (13 400 m²) was ultimately sampled in this fashion. A more detailed presentation of magnetic reconnaissance field operations is presented in chapter 7 of this volume.

INTERPRETATIONS

The results of the reconnaissance will be presented on a site-by-site basis since the interpretation of each requires a separate report. The interpretations follow a common format: (1) a written description detailing all of the pertinent anomalies with suggestions about their origin, geometry, and depth (where possible); (2) suggested location of excavation test squares; and (3) projected areas of interest outside the survey boundaries.

Data Description

As in archaeology, physics has developed a nomenclature to aid in the accurate description of the quantities with which it deals. This complicates communication in an interdisciplinary field such as archaeomagnetism, so the following discussion has been included to help clarify any ambiguity in the site-by-site description of the magnetic reconnaissance.

In simplified terms, a magnetic anomaly is caused by differences in the concentration, orientation, and mineralogical composition of the iron oxides between the feature of
FIELD INVESTIGATIONS AND ANALYSIS--1978

interest and the surrounding medium. This difference is known as the "susceptibility contrast" and is produced by a variety of cultural and noncultural processes. When the contrast of a feature has sufficient magnitude, an "anomaly" in the earth's magnetic field can be detected in the vicinity of the feature, using a proton magnetometer. There are several cultural processes which can produce susceptibility contrasts. These are:

1. Intense burning, found in fire hearths and other burned architectural features. Anomalies produced by this process are generally the largest in magnitude.

2. Differences in compaction of the soil, as found in frequently traveled pathways, masonry structures, and softer fill in buried architectural features.

3. Organic fermentation, as occurs in trash-filled cists or food storage areas. Production of this contrast requires moisture, so it is of lesser importance in the dry Dolores area.

Delineation of cultural features would be simplified if not for noncultural geological and more recent processes. Because of varying rates of sedimentation and changes in source areas, soil in river bottoms and flood plains such as the Dolores River valley can have a variety of susceptibility contrasts and introduce unwanted anomalies. Other anomalies, such as those resulting from other artifacts or iron implements of historic origin, also confuse the magnetometer readings.

Anomalies produced from cultural and noncultural processes have a large range of sizes and shapes. One of the most distinctive shapes is the "dipole," which is typified on a computer-generated map (Dougenik and Sheehan, 1975) or a line contour map by a high region with a closely associated low, or negative, region. Undisturbed prehistoric culturally formed dipole anomalies also have an "orientation" which can be used to distinguish them from recent or geologic features. In the former case a line drawn from the center of the high to the center of the low, points toward the magnetic north pole present at the time the anomaly was formed—which was in the range of 0° to 10° east of our present-day magnetic north. This particular orientation will be referred to as "normal" because it is the position in which most dipole prehistoric anomalies are formed. This position is contrasted with "reoriented" dipoles, whose orientation is other than 0° to 10° east of north. The sources of reoriented dipoles are usually nonarchaeological in nature. Shallow, localized archaeological features such as fire hearths and well-decayed cists produce normally oriented dipoles whose low contribution is about 15 percent of the high. Bits of metal, igneous glacial boulders, and other nonarchaeological magnetic materials usually produce reoriented dipoles which typically have a low-to-high ratio of greater than 15 percent.

If an anomaly-producing feature is less localized and more extended, the contribution from the low is reduced, often to such an extent that only a single high region is detectable with the magnetometer. In other cases only isolated lows or negative anomalies are observed, a result of a reduced susceptibility contrast. These types of anomalies are known as "monopoles." High monopoles occur over (1) larger or deeper burned features such as the pithouses at Dos Casas Hamlet (Site 5MT2193), (2) frequently traveled pathways, or (3) masonry structures with a high susceptibility contrast. Geological features such as resedimented streambeds can also produce low or high monopoles, depending on their susceptibility contrast; the size of these latter phenomena usually suggests they are nonarchaeological. In summary, archaeologically encountered magnetic anomalies can be described as a continuum ranging from the dipole to the monopole, each with a different possible shape, orientation, and magnitude.

Depth calculations to features are sometimes possible and are elementary if the source can be approximated by a single point dipole or monopole. This depth estimation is gained from a formulation known as the FWHM (full width half maximum) method. In this method the depth to the feature from the sensor is equal to the width of the anomaly profile at one-half the maximum value.

Where practicable, actual susceptibility measurements have been taken from soil samples of the archaeological features using a separate instrument. These measurements can be used to create models of what the magnetic field might look like over idealized features, to aid location and depth estimations.

Fortunately, most of the noncultural anomalies have either distinctive shapes or orientations which distinguish them from archaeological ones. However, there are cases where the difference is indistinguishable; for example, when archaeological sources have been physically reoriented or when nonarchaeological sources are small in magnitude and have fields directed northwards. The solution to many of these problems appears to lie in a combination of analytical calculation and plain experience. However, there are cases where the source produces an ambiguous anomaly and only excavation will yield the answer.

Assignment of Test Squares

The test squares on each grid were chosen on the basis of several interacting criteria. For each site there is a high degree of confidence that certain anomalies are caused by cultural features; whereas others are due to recent historical, geological, or unknown factors. Consequently, test squares over suspected cultural anomalies are

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numbered in preferred order of excavation, with "1" indicating the square in which there is a greater likelihood of encountering an archaeological feature. However, digging a sterile square reduces the probability of similarly numbered squares being productive, so a decision should be made whether it might be worth continuing their excavation. Some suspected noncultural anomalies are also occasionally of interest, and it would be useful to excavate them if time permits. This would give a better understanding of their source and aid in interpretation when similar responses recur. Test squares over these anomalies have a similar priority scheme but they are marked with an "E" to distinguish them from test squares of primary interest.

Areas of Projected Interest

Some of the anomalies extend off the map or imply features in areas not surveyed. A suggestion has been made in each case as to the direction that the survey might take, if a decision is made to extend the grid.

RESULTS OF THE ANALYSIS

Analysis of the data collected in the field and submitted to the University of Nebraska in the fall of 1978 was approximately 90 percent complete by the submission date of this report (May 1979); the remainder was completed during the following summer. Detailed analysis and finished maps are now completed for all sites (5MT23, 5MT2192, 5MT2193, 5MT2194, 5MT2198, 5MT2199, 5MT2203, 5MT2236, 5MT2844, 5MT2848, 5MT2853, 5MT4478, 5MT4512, 5MT4545, and 5MT4614). A site-specific discussion of analytical results to date is presented below for the 15 sites. Preceding the detailed discussion, a glossary of technical terms is included to aid in interpretation.

Glossary

A brief glossary of technical terms used in the site-specific narrative is as follows:

dipole — a feature whose anomaly is characterized by an associated low-high pair.

normal dipole orientation — a line, from the center of the high to the center of the low, points between 0° to 10° east of north.

reoriented dipole — the line, from the high to the low, points other than from 0° to 10° east of north.

monopole — a feature whose anomaly is a separate high or a separate low.

susceptibility contrast — a quantitative measurement of the magnetic properties of a feature distinct from the magnetic properties of the material which surrounds it.

High positive susceptibility = high anomaly
Low positive susceptibility = low anomaly
Negative susceptibility = negative anomaly

Site 5MT23, Grass Mesa Village, Grid 1

Grid 1 at Site 5MT23 (Grass Mesa Village) was surveyed on 3 and 4 October 1978; Grid 1 covered two full blocks (20 by 20 m) and two half blocks (20 by 10 m). Several problems were encountered in the field and during the data processing; corrective measures were taken where possible. Thick vegetation on the site impeded progress and had to be removed manually. Holes large enough to affect the magnetic field were present at several locations and had to be mapped carefully in relation to the survey grid by the field crew. These irregularities are too numerous to list; the reader should refer to the original field notes for a comprehensive map. Besides the small "pot hole" topographic irregularities, a large circular depression approximately 25 m in diameter and 2 m deep in the center was included in the grid location. Because of the moderate slope of the depression, pronounced effects on the magnetic field are unlikely. The magnetic features visible within the depression are caused by varying susceptibility contrasts rather than by contributions from the topography.

During the course of the survey, several ferrous metal objects were found on the site and removed. Erratic readings in other localized areas suggested the presence of ferrous metal objects buried beneath the surface; the effects of these objects were reduced during the data processing, but some ambiguities still remain.

In an attempt to minimize the smaller topographic effects, the topographic variation was plotted directly on the line contour maps during analysis, which allowed a qualitative judgment of how the terrain affected the magnetic field. The unfiltered, despiked magnetic field is shown in the two different magnetic representations of the surveyed area, figure 8.1, the SYMAP, and figure 8.2, the line contour map. The despiking procedure (to remove large intrusions in the field most likely caused by ferrous objects) was calculated by hand and involved replacing the irregular data value by an average of its surrounding neighbors. In total, about 60 data values were replaced by this method, which improved the resolution of the type of anomalies suspected to be caused by archaeological features.

Filtering methods were utilized in an attempt to gain more information. Convolution filtering was carried out on the data, and parameters were chosen to enhance anomalies that were 1 to 2 m wide (fig. 8.3) and 3 to 5 m wide (fig. 8.4).

In examining the despiked, unfiltered data (figs. 8.1 and 8.2), a few dominant features are evident. The large depression is magnetically lower than its surroundings. This implies a feature which was originally deeper than at
present and which has accumulated a depth of less consolidated sediment. This appears likely because the soil has the characteristics of windblown deposition.

In the center of the depression is a pronounced high, centered on point 32N, 11E, which rises about 20 gammas above the background (assumed to be about −65 quarter gammas in this locale). The FWHM measurements suggest an unreasonable depth; it can only be inferred that the source might be a buried, burned feature. However, the presence of a low anomaly to the northwest introduces an ambiguity: whether the high is actually an isolated monopole. If the high and low are magnetically associated, the anomaly might be caused by a piece of metal. In figure 8.3 (the band pass filtered data which enhance anomalies under 2 m wide) the high and low anomalies are more distinct. Another high, at point 28N, 26E, appears, which was masked in the unfiltered data (fig. 8.1). Like the larger monopole high to the southeast, this high is close to the low but lacks the tight association that is characteristic of an anomaly caused by an iron object. In summary, it appears that there is a feature in the center which might have archaeological affiliations, but if the source is entirely cultural it is more complex than a simple hearth. It is worth investigating, and an excavation test square has been assigned to the anomaly (fig. 8.2).

Around the periphery of the depression is an area of high magnetic variability. This is due in part to the topography and partly to some unwanted ferrous contributions to the magnetic field that the despiking was unable to remove. Although several anomalies are visible, only those which appear to have archaeologically significant contributions to the magnetic field (accounting for topography and metal
objects) have been selected as test locations. The first, visible in the area 11-14N, 6E on the line contour map (fig. 8.2) and on figures 8.3 and 8.4, is a monopole high, suggestive of a burned region. Because of the disturbances in the field introduced by despiking and filtering, depth estimates to the source of the anomalies have not been considered in the following cases.

Another monopole high of potential interest is located at point II N, 15E. There are no despiked points here and no prominent topography; thus the contribution might be from a burned feature.

The next monopole high is located within the points 11N, 19E; 16N, 22E; 15N, 27E; and 11N, 24E, and corresponds to a section with a mound of earth in the center, but the anomaly appears to be somewhat larger than the contribution expected from the topographic feature. Recommended locations of excavation test squares are indicated in figure 8.2. The third anomaly in this area, characterized by high magnetic variance, is a circular low, situated around the point 14N, 33E. It has all the characteristics of a circular feature filled with soft sediment and is best illustrated in figure 8.4.

Another region of interest is a monopole high centered on the point 33N, 38E. The area is topographically flat and there are no despiked points close by. It appears to be one of the better possibilities for indicating an archaeological feature.

One anomaly visible on the filtered map is almost undetectable on the unfiltered data. It is a monopole high situated on the point 30N, 31E and appears to indicate a burned feature.

In summary, there are other anomalies which might have archaeological sources but, because most of these anomalies have a close association with the topography or an irregular data value caused by metal objects, there is a degree of uncertainty about the source. This region of Grass Mesa Village represents conditions which tax the
utility of the magnetic reconnaissance method by introducing enough nonarchaeological debris to greatly increase the possibility of erroneous interpretation. The magnetic maps can be used to select other excavation test squares, but the probability of success is reduced.

Site 5MT23, Grass Mesa Village, Grid 2

The data collection at Site 5MT23, Grid 2 (fig. 8.5), commenced on 11 May 1979 and continued intermittently until the beginning of August. Grid 2 is located east of Grid 1, which covers the depression on the west end of the site. Repetition of two blocks was necessary because of inconsistency in the data caused by the highly irregular terrain and instrument difficulties. Although the magnetic field over Grid 2 has a high degree of variation, individual anomalies of potential archaeological interest are much more distinct than on Grid 1. Several igneous river cobbles composed of a rock with a typically high magnetic contrast were found on the site. These cobbles could be the source of the strong localized dipole and monopole anomalies found intermittently on Grid 2 and in abundance around the periphery of the large depression on Grid 1. Some of these strong anomalies can also be accounted for by the presence of ferrous objects, such as tin cans found on the surface.

The topography of the site was highly irregular and contributed to difficulties in both the data analysis and the fieldwork. Copies of the field maps drawn by the field crew are shown in figures 8.6 through 8.10 and proved very useful in distinguishing the potential archaeological anomalies from those caused by terrain.

After preliminary analysis, in early July, information on Blocks C and D was sent to the DAP, with a description of four anomalies and a computer map, for use in the field. Once the data on the remaining three blocks arrived and were interpreted, a second preliminary report was sent (on 2 August), including maps and an explanation of the juxtaposition of Grid 1 and Grid 2 (shown in fig. 8.5). The
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Figure 8.4 Magnetic contour map (SYMAP) of Grid 1, Site 5MT23, showing data filtered with a convolution filter to enhance anomalies 3 to 5 m wide. Contour levels include data ranges of 30, 25, 20, 25, 15, 10, 10, 15, 15, and 20 quarter gammas.

The remainder of the report reexamines each anomaly to attempt a more exacting description as well as showing some other filtering experiments which revealed two more anomalies of potential archaeological interest. The anomalies are indicated in the SYMAP’s (figs. 8.11 and 8.12) and the line contour map (fig. 8.13) of Grid 2, Site 5MT23.

**Anomaly 1a**

This anomaly appears likely to be a pit structure. It is a monopole high located at point 38N, 40E with a small low to the north, suggesting that the structure is composed of burned material. The anomaly is too wide for standard depth estimations. There is a lobe which extends to the southwest, but it is difficult to assess what the cause of this might be. However, the anomaly warrants investigation. Profiles of the potential pit structure are shown in figure 8.14.

**Anomaly 1b**

This is also a likely candidate for a pit structure. The similarity of this anomaly at point 29.5N, 36E to Anomaly 1a suggests they might be contemporaneous (they are similar in shape and magnitude, and both have small associated lows to the north). Because of the width of the anomaly, depth calculations are inaccurate, but a moderate depth of under 1 m is likely. Profiles are shown in figure 8.15.

**Anomaly 1c**

This anomaly is a monopole high situated about the point 24N, 32.5E and also having pit structure characteristics. It has a different magnitude than the previous two anomalies and has a strong low to the southeast which suggests the possibility that the anomaly is due to a metal object. A test
Figure 8.5 Outline of the block designations for Site 5MT23, Grid 2 (upper diagram), and positioning of Grid 1 with respect to Grid 2 (lower diagram).

Figure 8.6 Field map showing approximate topographic relief for Block A on Site 5MT23, Grid 2. Depth of depressions are expressed in centimeters.

Figure 8.7 Field map showing approximate topographic relief for Block B on Site 5MT23, Grid 2. Depth of depressions are expressed in centimeters.

Figure 8.8 Field map showing approximate topographic relief for Block C on Site 5MT23, Grid 2. Depth of depressions are expressed in centimeters.
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Figure 8.9 Field map showing approximate topographic relief for Block D on Site 5MT23. Grid 2. Depth of depressions are expressed in centimeters.

Figure 8.10 Field map showing approximate topographic relief for Block E on Site 5MT23. Grid 2. Depth of depressions are expressed in centimeters.

square here would be valuable to resolve the ambiguity. The profile is shown in figure 8.16.

Anomaly 1d

A smaller, more diffuse monopole high is located at point 36.5N, 53.5E. Of the four anomalies, this appears to be the least likely choice for a pit structure. There is a lobe which extends to the southwest to two other anomalies which may be associated features such as fire hearths. Again, no depth calculations could be made. A profile is shown in figure 8.17.

Anomaly 2a and Anomaly 2b

Two weaker monopole highs, located at the points 38.5N, 34.5E and 41.5N, 36E, could represent features associated with the suspected pit structure shown by Anomaly 1a. They might be activity areas where burned material is present. Profiles are shown in figures 8.18 and 8.19.

Anomaly 2c

A monopole high is located at point 35.5N, 28.5E. This anomaly covers a fairly broad region and is not sufficiently defined to suggest other than a burned region for the source. A profile is shown in figure 8.20.

Anomaly 2d

The anomaly is a monopole high located about the point 30N, 51E. Although this is suggested as a peripheral feature to either Anomaly 1d or 3b, both of which are possible pit structures, the anomaly itself might represent some burned architectural feature. The anomaly has a similar shape to other pit structure anomalies but its magnitude is not as large, as shown by figure 8.21, the west-to-east profile. In summary, it is likely a burned feature, possibly architectural.

Anomaly 2e

An anomaly 2c

A monopole high is centered on point 40N, 51E. As its magnitude is weak and it has a broad extent, it is possibly a burned or compacted region. Figure 8.22 illustrates the profile.

Anomaly 2f

A broad monopole high is centered on point 33N, 52E whose profile is shown in figure 8.23. If it is an archaeological feature, it might be a fire hearth.

Anomalies 2g, 2h, 2i, 2j

These small localized monopole highs occur at points 34N, 42E; 35N, 44E; 37.5N, 47.5E; and 39N, 46E. They could be small burned features near the surface, perhaps fire hearths. It is estimated that 2g and 2h are associated with the suggested pit structure represented by Anomaly 1a.
Figure 8.11 Magnetic contour map (SYMAP) of Blocks A, C, and D, Grid 2, Site 5MT23. Contour levels include data ranges of 24, 12, 10, 8, 12, 16, 22, 20, and 24 quarter gammas.
Figure 8.12 Magnetic contour map (SYMAP) of Blocks B and E, Grid 2, Site 5MT23. Contour levels include data ranges of 25, 15, 15, 10, 10, 10, 10, 10, 10, and 20 quarter gammas.
Figure 8.13 Line contour map of Grid 2, Site 5MT23 with contour intervals of 20 quarter gammas.

Figure 8.14 Magnetic profiles of Anomaly 1a, a potential pit structure in Grid 2, Site 5MT23. The left profile (a) is according to an east-west axis (on Grid Line 38N), while the right (b) is oriented north-south (on Grid Line 40E).
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Figure 8.15 Magnetic profiles of Anomaly lb, a potential pit structure in Grid 2, Site SMT23. The top profile (a) is oriented east to west, on Grid Line 29N, while the bottom (b) is north-south, on Grid Line 30E.

Figure 8.17 East-west magnetic profile of Anomaly ld, an ambiguous feature in Grid 2, Site SMT23. Profile positioned on Grid Line 36N.

Figure 8.18 East-west magnetic profile of Anomaly 2a, a feature possibly associated with Anomaly la, in Grid 2, Site SMT23. Profile positioned on Grid Line 39N.

Figure 8.19 East-west magnetic profile of Anomaly 2b, a feature possibly associated with Anomaly la, in Grid 2, Site SMT23. Profile positioned on Grid Line 41N.
Figure 8.20  East-west magnetic profile of Anomaly 2c, a burned area in Grid 2, Site 5MT23. Profile positioned on Grid Line 28E.

Figure 8.21  East-west magnetic profile of Anomaly 2d, a possible burned feature, in Grid 2, Site 5MT23. Profile positioned on Grid Line 30E.

Anomalies 2g, 2i, and 2j suggest sources which lie at a maximum of 0.5 m beneath the surface. The profiles of each are shown in figures 8.24 and 8.25.

Anomaly 3a

A monopole high at point 15.5N, 32E is situated in a region of generally higher susceptibility contrast. If the anomaly represents an archaeological feature, it might be a pitstructure. A profile is shown in figure 8.26.

Anomaly 3b

This magnetic feature is an elongate monopole high centered at the point 24N, 51E. The magnitude of the response suggests that it is an extensive well-burned phenomenon, probably a pitstructure. A profile is shown in figure 8.27.

Anomaly 3c

Although this anomaly is reduced in magnitude, its shape suggests another pitstructure. It is located at the point 29N, 13E and its profile is shown in figure 8.28.

Anomaly 3d

This monopole high, situated at the point 29N, 22.5E is the last reasonable choice for a pitstructure. Its magnitude is substantially reduced but the anomaly retains elements of pithouse form. A profile is shown in figure 8.29.
Figure X.17 East-west magnetic profile of Anomaly Jh, a possible pit structure in Grid 2. Site 5MT2J. Profile positioned on Grid Line 25N.

Figure X.26 East-west magnetic profile for Anomaly 3a, a possible pit structure, in Grid 2. Site 5MT23. Profile positioned on Grid Line 16N.

Figure 8.24 East-west magnetic profiles for Anomalies 2g and 2h, possible fire hearths associated with Anomaly 1a, in Grid 2. Site 5MT23. The top profile (a) represents Anomaly 2g (profile positioned on Grid Line 34N), the bottom profile (b) is Anomaly 2h (profile positioned on Grid Line 47N).

Figure 8.25 East-west magnetic profiles for Anomalies 2i and 2j, possible fire hearths, in Grid 2, Site 5MT23. The top profile (a) represents Anomaly 2i (positioned on Grid Line 47E), the bottom profile (b) is Anomaly 2j (positioned on Grid Line 39N).

Figure 8.26 East-west magnetic profile of Anomaly 3c, a possible pit structure, in Grid 2, Site 5MT23. Profile positioned on Grid Line 30N.

Figure 8.27 East-west magnetic profile of Anomaly 3b, a possible pit structure, in Grid 2, Site 5MT23. Profile positioned on Grid Line 25N.
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Anomalies 4a and 4b

If Anomaly 3a represents a pitstructure, then these two anomalies, located at points 14N, 36E and 17N, 38E, respectively, are potential peripheral hearths. Contributions from geological phenomena are strong in this region and these anomalies are weak, so there is a good deal of doubt in this assessment. Profiles are shown in figure 8.30.

Anomaly 4c

The anomaly is a small monopole high at point 18N, 53E which is perhaps a hearth. It is illustrated by the profile shown in figure 8.31.

Anomaly 4d

A monopole high located at the point 14N, 54E is designated Anomaly 4d. This anomaly is rather puzzling; although the shape and area are suggestive of a pitstructure, the profile (fig. 8.32) suggests it is very close to the surface. As well, the presence of a low to the west might imply contributions from a metal object. Although there is the possibility that the source is nonarchaeological, it is worth investigating.

Other Anomalies

The remaining anomalies have shapes and magnitudes which are too indistinct to suggest specific features; however, they have characteristics which imply an archaeological source. They are as follows:

5a — a small monopole high at point 33N, 2.5E
5b — a monopole high at point 24.5N, 8E
5c, 5d — monopole highs in a region of geologic variation at points 23.5N, 19.5E and 22N, 22E.

Because of the abundance of potential pitstructure anomalies on this site, a filter was designed to examine the data for suspected archaeological features measuring 1 to 2 m wide that might be hidden by high background levels. Convolution filtering was performed on all the data, and two additional possible pitstructure anomalies were
found in the northeast section of the grid in Block E. Figure 8.33 depicts the filtered version of the data, with the anomalies located at points 24N, 58E and 31N, 59E.

In summary, several anomalies are present in the data which might represent pit structures and associated features such as fire hearths. The noise level in the data is higher than in most of the sites in the project area due to undulate terrain, igneous cobbles, and metal debris on Site 5MT23. This introduces a higher degree of ambiguity for this site, but many of the higher priority anomalies look promising.

**Location of Test Squares**

All previously mentioned anomalies are enclosed in the numbered rectangles shown in figure 8.13. The numbering system is a priority list with "1" indicating the squares in which there is the highest probability of locating cultural features. Excavation should begin within the rectangle—the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

**Site 5MT2192, Pheasant View Hamlet**

Surveying at Site 5MT2192 began on 9 September 1978, and continued intermittently until 2 November 1978, in which time a five-block area was covered. When the data were initially examined in 1978, several linear trends were apparent on the map. As the trends were parallel to the direction of the magnetometer traverses, it was suspected that instrument malfunction had caused irregularities in...
the data. Traverses were rerun later in the season to ascertain whether these linear features were real. Close correlation was obtained between the two sets of readings, indicating the presence of long linear sources.

There is an abundance of anomalies on this site which might be interpreted to indicate archaeological features. These anomalies are shown in figures 8.34 and 8.35 and are discussed as follows:

Anomaly 1a

This anomaly, a monopole high at point 32N, 40E, represents a pitstructure. It has a lobe to the south, which might indicate an antechamber or ventilator system, and a continuation of a high ridge extending southwest from the pitstructure, which might indicate some other burned material or activity area. A profile of the anomaly is shown in figure 8.36.

Anomaly 1b

This monopole high also suggests the presence of a pitstructure centered at the point 25N, 13E. Although the anomaly has a reduced magnitude, it has a typical pitstructure shape and has lobes extending to the north for a short distance and to the south, an area of high variance where it is difficult to suggest individual features. A profile is shown in figure 8.37.

Figure 8.34 Magnetic contour map (SYMAP) of Site 5MT2192, with contour intervals of 4 quarter gammas.
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Figure 8.35 Line contour map of Site 5MT2192 with 1/4 quarter-gamma contour intervals. Numbered squares indicate areas to be tested.

Figure 8.36 East-west magnetic profile of Anomaly la, a probable pitstructure, Site 5MT2192. Profile is centered on Grid Line 32N.

Figure 8.37 East-west magnetic profile of Anomaly 1b, possible pitstructure, Site 5MT2192. Profile positioned on Grid Line 13E.
Anomaly 1c

This anomaly, located at point 35N, 48E, also has a pitstructure outline. However, it is more irregular in shape and as a consequence might be a burned area. A profile is presented in figure 8.38.

![Figure 8.38 East-west magnetic profile of Anomaly 1c, ambiguous feature. Site 5MT2192. Profile is positioned on Grid Line 35N.](image)

Anomaly 2a

This larger plateau high surrounding the point 40N, 39E suggests that the source of the anomaly is either slightly burned or compacted, or both. A large area has been enclosed in 2a because of the size of the anomaly and the presence of a region of high variance to the south, both of which increase the likelihood of finding an archaeological source. Perhaps there are some features there which are associated with the pitstructure. A profile of Anomaly 2a is depicted in figure 8.39.

![Figure 8.39 East-west magnetic profile of Anomaly 2a, a possible burned feature, Site 5MT2192. The profile is positioned on Grid Line 40N.](image)

Anomaly 2b

The anomaly is a smaller monopole high, located at point 25N, 9E, which may be a fire hearth associated with Anomaly 1b. Its profile is shown in figure 8.40; a maximum depth of 0.5 m was calculated.

![Figure 8.40 North-south magnetic profile of Anomaly 2b, a potential fire hearth, Site 5MT2192. The profile is positioned on Grid Line 9E.](image)

Anomalies 2c, 2d, and 2e

All three anomalies are monopole highs located at points 19N, 9E; 19N, 16E; and 20N, 20E, respectively. They were chosen as possible fire hearth features because of their localized size, reduced magnitude, and proximity to Anomaly 1b. Their profiles, shown in figure 8.41, all indicate moderate depths.

Anomaly 2f

This anomaly is an indistinct monopole high located at the point 36N, 43.5E; its profile is illustrated in figure 8.42.

Anomaly 2g

The anomaly is a monopole high, located to the north of Anomaly 1c, at the point 40N, 47E. This is a more extensive anomaly than those caused by either fire hearths or pitstructures and may indicate an architectural feature with compacted or slightly burned fill, similar to Anomaly 2a. The profile is shown in figure 8.43.

Anomaly 2h

The magnetic feature is defined as an extreme of the monopole lobe which extends south of Anomaly 1c. It is difficult to associate a distinct archaeological feature with
Magnetometer Results

The anomaly is a monopole high with an irregular shape and reduced magnitude, surrounding the point 39N, 20E. It might represent an activity area. A profile is shown in figure 8.45.

Anomaly 3a

The anomaly is a monopole high with an irregular shape and reduced magnitude, surrounding the point 39N, 20E. It might represent an activity area. The profile is shown in figure 8.45.

Figure 8.41 East-west magnetic profiles of Anomalies 2c, 2d, and 2e, possible fire hearths, Site 5MT2192: (a) is Anomaly 2c, positioned on Grid Line 19N, (b) is Anomaly 2d, also positioned on Grid Line 19N, and (c) is Anomaly 2e, positioned on Grid Line 20N.

Figure 8.42 East-west magnetic profile of Anomaly 2f, an ambiguous feature, Site 5MT2192. The profile is positioned on Grid Line 36N.

Figure 8.43 North-south magnetic profile of Anomaly 2g, an ambiguous feature, Site 5MT2192. The profile is positioned on Grid Line 47E.

Figure 8.44 East-west magnetic profile of Anomaly 2h, an ambiguous feature, Site 5MT2192. The profile is positioned on Grid Line 48N.

Figure 8.45 North-south magnetic profile of Anomaly 3a, a potential activity area, Site 5MT2192. The profile is positioned on Grid Line 20E.
Anomalies 3b and 3c

These anomalies are two extremes of a monopole high situated at point 31N, 29E. Again, the shape of these anomalies is rather irregular and it is most likely that this represents a burned region with two locations of more intense firing. Profiles are illustrated in figure 8.46.

Anomaly 4b

This anomaly, located at point 33.5N, 23E, is similar to Anomaly 4a. If it is archaeological in nature, it is a burned feature. A shallow depth is indicated by the profile, shown in figure 8.48.

Anomalies 4c and 4d

Two monopole anomalies of almost inconsequential magnitude are located at points 38N, 27E and 40N, 25E. Both are suggestive of small hearths. Profiles for these potential features are illustrated in figure 8.49.
Anomaly 5a

The anomaly is a monopole high located at the point 23N, 25E. This anomaly appears to be associated with the long linear feature running north to south. Although the anoma- lcy could be an extension of the lineation, it appears to be sufficiently distinct to consider it separately. Again, a profile has been constructed (fig. 8.50).

![Figure 8.50 Magnetic profile of Anomaly 5a, an ambiguous feature, Site 5MT2192. The profile is according to an east-west axis and is positioned on Grid Line 23N.](image)

Anomaly 5b

A monopole high is located at point 24N, 47E, and lies on one of the linear geologic trends. It might represent a hearth. The profile is shown in figure 8.51.

![Figure 8.51 Magnetic profile of Anomaly 5b, a potential hearth, Site 5MT2192. The profile is according to an east-west axis and is positioned on Grid Line 1N.](image)

Anomaly 6

A small monopole high, situated at point 18N, 32E, looks strikingly like a small hearth. The source is very close to the surface. Its profile is shown in figure 8.52.

![Figure 8.52 Magnetic profile of Anomaly 6, a potential small hearth, Site 5MT2192. The profile is according to a north-south axis and is positioned on Grid Line 32E.](image)

which there is the highest probability of locating cultural features. Excavation should begin within the rectangle—the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

Site 5MT2193, Dos Casas Hamlet

On 12 September 1978, a one-block area was surveyed at Site 5MT2193 and, when it became apparent that archaeological features were present, an additional six lines were added to the east side of the grid on 19 September. The surveyed area sloped gently to the south and had no small-scale topographic disturbances save for several test squares located around the periphery of the grid. These occurred at points 21N, 31E; 1N, 31E; 1N, 17E; 2N, 1E; and 21N, 2E and caused disturbances in the magnetic field close to those points.

Several important anomalies occur on the site, as shown in figure 8.53, the SYMAP representation of the total field, and in figure 8.54, a contour map with 8 quarter-gamma intervals.

Anomaly 1

Two strong monopole highs are centered on points 10N, 23E and 18N, 22E. Subsequent excavation revealed two pithouses with an abundance of burned soil and charcoal. The pithouses are good examples of features whose extended geometry allows the detection of only the high contribution to the field. Both anomalies yielded shapes similar to the true outlines of the archaeological features. Such a correspondence cannot always be expected because variations in the magnitude and distribution of the susceptibility contrasts are often present. Several soil samples were collected from in and around the pithouses and susceptibility measurements will be taken for use in computer-modeling the field above similar features. This will be done at a later date.
Anomaly 2

A monopole high is situated in the region of 7N, 35-36E, the highest point in a localized plateau. Its source appears to be elongated in the east-west direction and could be caused by an oval burned feature. The FWHM measurements suggest that the source is at most about 1 m deep.

Anomaly 3

A localized plateau high occurs in the area 14-17N, 33-35E and has an extreme of 20 quarter gammas. Because of its extended nature, depth estimates are difficult; but it is suspected to have an archaeological source.

Anomaly 4

A plateau high in the southern portion of the grid is located in the area 1-5N, 26-29E, with an extreme of 25 quarter gammas occurring at point 2N, 28E. Profiles show that the anomaly has much internal variation and must have a complex source. Again, because of its width, depth estimates are not accurate. However, it warrants examination as it has reasonable magnitude and geometry for an archaeological source.

Anomaly 5

Several small monopole highs, no larger than 2 m², occur at points 19N, 29E; 15N, 30E; 19N, 35E; and 10N, 30E.
These anomalies could be due to small burned features, such as hearths, at a depth of under 1 m. Most of these anomalies are fairly weak compared to the burned pithouse, but this is probably due to the smaller volume of burned material in the suspected hearths.

**Anomaly 6**

An unusual monopole low anomaly occurs in the northwest corner of the surveyed area, west of the north pithouse. A feature with very loose fill might cause this response, but this seems unlikely to occur. Similar lows can be found on other sites, and excavation here would provide valuable information in interpreting similar responses.

**Location of Test Squares**

Figure 8.54 shows the suggested location of excavation test squares, based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

**Areas for Future Surveying**

Lines 23E through 31E might be extended southward if Test Square 3 proves productive.

**Site 5MT2194**

Site 5MT2194 was first surveyed in September of 1978, but because of data problems, it was redone on 1 June.
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1979. The ground was free of topographic variations which might cause disturbances in the magnetic field, and a total of two blocks were surveyed. Six interesting anomalies are present on the site, as shown in figure 8.55, the SYMAP representation of the total field, and figure 8.56, a line contour map on which is drawn the suggested excavation areas.

CONTOUR INTERVALS = 8, 4, 4, 4, 4, 4, 4, QUARTER GAMMAS

Figure 8.55 Magnetic contour map (SYMAP) of Site SMT2194 with contour intervals of 8, 4, 4, 4, 4, 4, and 4 quarter gammas.
Anomaly 1

A monopole high surrounds the point 12N, 10E and covers about 3 m². It is indicative of a burned area and is either a large fire hearth or a pistructure. Depth estimations suggest that the feature is at most 1 m deep. A profile through its center is shown in figure 8.57.

Anomaly 2

A monopole high is located at point 38N, 6E; the anomaly covers several meters and is another likely candidate for a fire hearth. The top of the feature is at a maximum depth of 1 m from the surface. The profile of the anomaly is shown in figure 8.58.

Anomaly 3

A monopole high is located in the region of point 29N, 20E; it extends off the east end of the map and is suggestive of either an activity area or an area with a high ash content. Although a portion of the anomaly is not visible, it is distinct enough to advise that it be investigated. A profile is shown in figure 8.59.

Anomaly 4

A combination of highs and lows is located at point 31N, 10E and is difficult to interpret as any distinct feature. As suggested by the high gradients in the region, the possibility exists that this anomaly is caused by an iron source, but this is not certain. Excavation here would clear up the ambiguity and show whether the source of the anomaly has cultural affiliations. As this magnetic feature is of uncertain origin, a profile is not included.

Anomaly 5

A monopole high at point 33N, 13E is interconnected with one of the highs in anomalous region 4, but it is sufficiently distinct to be viewed as a separate test area. If it is caused by a cultural feature, it is likely to be a burned region or an activity area. A profile is shown in figure 8.60.
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Anomaly 6

This is a long, linear high connected to Anomaly 7. Although it covers a larger region than is suggested for testing, an exploratory excavation square has been located at about the point 20N, 11E. It is suspected to represent some form of pathway or compacted feature and might be quite subtle. Understanding its source would be very useful. A profile is not included.

Anomaly 7

A slightly stronger monopole high is located on the same linear trend as Anomaly 6. As it is more distinct, it might have contributions from a burned feature. A profile is not included.

Location of Test Squares

The locations of recommended excavation test squares, centered on archaeologically interesting anomalies, are indicated on figure 8.56. The numbering scheme indicates which anomalies are most likely to be caused by archaeological features, “1” indicating the square in which there is the highest probability of locating a cultural feature. Excavation should begin within the rectangle—the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares or terms used in the description of the anomalies, refer to the Introduction.

Areas for Future Surveying

If the anomaly indicated in Test Square 3 proves interesting, an additional half block should be added to the east side of the grid from Grid Line 21N to Line 41N.

Site SMT2198, Sagehill Hamlet

Survey operations at Site SMT2198, Sagehill Hamlet, covered one block and were accomplished on 13 September 1978. Since immediate feedback was necessary in order to facilitate the ordering of excavation priorities, the difference values were calculated and line contour maps drawn by hand. An unusual dipole anomaly, for which no adequate explanation exists, dominates the maps (figs. 8.61 and 8.62). The most likely source for this anomaly might lie in a combination of fields from an iron object and a geological feature. Additional testing should be done on the site using a metal detector.

As advised, a complete analysis of the remaining features is omitted, since excavation on this site has been completed.

Site SMT2199, Horse Bone Camp

Site SMT2199 was magnetically surveyed 7 June 1979; operations covered a two-block area. The ground surface slopes towards the south and, although this general trend is unlikely to affect the magnetic field, the two drainages running north to south are magnetically detectable.

Figure 8.63, the SYMAP representation of the total field, and figure 8.64, the line contour map, show several areas of archaeological interest. There are no large features on the site which definitely indicate a house structure, but there are some smaller anomalies which could be caused by fire hearths or similar localized sources. The north-south drainages are detectable magnetically, but a comparison of the topographic map drawn by the field crew and the magnetometer map shows that the easternmost drainage is actually a bit west of its associated anomaly. This suggests the presence of another linear effect, perhaps a paleodrainage. The westernmost drainage lines up fairly well, although the anomaly does not extend as far north as the geological feature.

Preliminary examination of the data took place in early July 1979, and a computer map indicating four anomalies was sent to be used in the field. After reexamination of the data, a more complete description of the anomalies was accomplished. The archaeologically significant anomalies are summarized below.
Figure 8.61 Magnetic contour map (SYMAP) of Site 5MT2198, Sagehill Hamlet. The contour levels include data ranges of $12, 4, 4, 4, 4, 4, 4, 8, 20, 20$ quarter gammas.
Figure 8.62 Line contour map of Site 5MT2198 with 8 quarter-gamma contour intervals.
Figure 8.63 Magnetic contour map (SYMAP) of Site 5MT2199, Horse Bone Camp, with contour intervals of 4, 4, 6, 4, 4, 6, 8, 10, and 22 quarter gammas.
Anomaly 1

The anomaly is a dipole surrounding the point 40N, 11E. This is possibly a large burned area, but the presence of a strong low to the northwest makes the source of the anomaly a likely candidate for a metal object. Because a part of the anomaly is not visible, it is difficult to suggest anything with certainty. Figure 8.65 shows a profile through the anomaly.

Anomaly 2

A monopole high is located at the point 6N, 5E. This anomaly is much more localized. Although it appears to be connected to the anomaly to the east, the response is similar in shape to a fire hearth. Its profile is shown in figure 8.66. Calculations indicate a maximum depth of about 1 m.

Anomaly 3

A monopole high is centered at the point 18N, 15E. This anomaly is a high plateau in the north-south elongated anomaly which runs between the two drainages. It is likely a geological feature, but a test square at an extreme would clear up the ambiguity. A profile running west to east through the anomaly is shown in figure 8.67.

Anomaly 4

The anomaly is a monopole high centered at the point 6N, 16E. Again, this is an extreme on the north-south trend, but it warrants investigation. A profile is shown in figure 8.68.
Anomaly 5

After reexamination of the data, another anomaly with possible archaeological implications has been identified—a small isolated monopole high situated about the point 29N, 5E. It is a candidate for a fire hearth. The anomaly is too broad for an accurate depth calculation, as shown in figure 8.69.

In summary, this site appears to have few or no features which have detectable magnetic responses. The two "fire hearth" anomalies (2 and 5) appear more likely to have archaeological sources; however, they have been assigned low priority because they are somewhat weak and improperly shaped. It is unlikely that this site has many archaeologically interesting features.

Location of Test Squares

The locations of recommended excavation test squares centered on potentially archaeologically significant anomalies are indicated in figure 8.64. The numbering system indicates the likelihood of encountering archaeological features, with "1" indicating the square with the highest priority. Excavation should begin within the rectangle—the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares, refer to the Introduction.

Site 5MT2203, Casa Roca

Site 5MT2203 was surveyed on 6 October 1978 and operations covered a two-block grid. The site is topographically flat with the exception of a few rodent holes and a pile of stone rubble centered on 16.7N, 14.4E and consisting mostly of unshaped sandstone blocks.

Figure 8.70, the SYMAP representation with contour intervals of 8, 8, 4, 4, 4, 4, and 8 quarter gammas, and figure 8.71, a line contour map with a 4 quarter-gamma contour interval, show the following notable anomalies.

Anomaly 1

The anomaly is a monopole high around the point 20N, 16E covering a 3-m² area. It is situated to the northeast of the rubble and indicates a burned region at a maximum depth of 1.5 m.

Anomaly 2

A long linear monopole high runs from point 1N, 22E to point 14N, 23E. It is suggestive of a burned region, but its elongated shape and south-trending orientation imply a geologic contribution. A test square would resolve the ambiguity.

Anomaly 3

A circular monopole high, or collection of highs, is present in the southeast section of the grid around point 4N, 36E. The undulate nature of the high suggests a complex source and makes depth estimations difficult. Several test pits are recommended here, since the magnitude of the anomalies indicate archaeological features are present.
Figure 8.70 Magnetic contour map (SYMAP) of Site 5MT2203, Casa Roca. The contour levels include data ranges of 8, 8, 4, 4, 4, and 8 quarter gammas.
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Figure 8.71 Line contour map of Site 5MT2203 with a 4 quarter-gamma contour interval, showing the suggested location of test squares.

Anomaly 4

Toward the north, at point 15N, 31E, another plateau high occurs with a maximum of 16 quarter gammas. Again, it is interesting as a potential archaeological feature.

Anomaly 5

In the northeast corner are several 1- or 2-point anomalies at 17N, 37E; 15N, 40E; and 12N, 37E. The FWHM measurements indicate a maximum depth of 0.9 m for all of them. One of these should be examined, because the anomalies are suggestive of small hearths. Further to the north, about the points 19N, 39E to 21N, 39E, is an elongated high which runs off the map. An excavation test pit should be located here.

Anomaly 6

A pronounced monopole low is centered at point 18N, 22E. This is typical of low anomalies which have occurred on other sites and it is very important that its cause be ascertained. A test pit might be assigned at the discretion of the archaeologist.

Anomaly 7

Pronounced plateau highs are present in the northwest and southwest corners of the survey grid. Although these extend outside the limits of the survey area, they have appropriate characteristics to be considered as possible archaeological features.

Location of Test Squares

Figure 8.71, the line contour map for the site, also indicates the suggested location of excavation test squares derived from the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

If the southwest and northeast corners of the grid prove to be of archaeological interest, north-running lines can be added to the western edge. The linear anomaly trending south at point 1N, 22E and the plateau high in the region of point 1N, 36E indicate that additional east-running lines from 18N to 41N might provide additional information.
Site 5MT2236

Site 5MT2236 was surveyed 2, 10, and 11 October; the operations covered six blocks, the largest contiguous area examined to date for the DAP. The site was relatively flat except for a 0.15-m-high knoll which covers 5 to 6 m² surrounding the point 34N, 49E where there appears to be a reoriented dipole. The southern and western edges of the site slope gently downwards, but this apparently has no affect on the magnetic field.

The site has a variety of anomalies which includes some apparent geologic trends. These are shown on the SYMAP representations (figs. 8.72 and 8.73) and the line contour map (fig. 8.74), and are described as follows.

Anomaly 1

A wide prominent monopole high is located at about the point 21N, 31E. All signs indicate a possible pithouse.

Anomaly 2

Another less prominent monopole high is located to the southeast of the previous anomaly, at point 18N, 40E. The high is too wide to make accurate depth estimations, but
its shape and intensity suggest an associated burned feature such as a fire hearth. At point 14N, 30E a subtle dipole with normal orientation can be discerned. This implies a feature which has a near-surface contribution as shown by the existence of the low pole to the north. The FWHM estimates show a maximum depth of 1 m.

If these two anomalies prove to have archaeological sources, the other, smaller monopoles in the immediate vicinity should be investigated in the event that they are also caused by burning.

Anomaly 3

A region in which there are several monopoles within the confines of the rectangle is defined by the points 3N, 53E; 16N, 43E; 19N, 53E; and 5N, 53E. It is difficult to pinpoint any individual anomaly which might represent an
architectural feature, but the region may be an area of prehistoric activity, providing there is no geological contribution. Excavation test squares have been assigned to three positions and might prove interesting.

Anomaly 4
A similar monopole high is situated in the area of point 16N, 60E. It is of the same extended nature as the other highs which makes depth estimates impractical and suggests a feature which has an extended vertical dimension. This anomaly should be tested.

Anomaly 5
A high monopole extends off the northern edge of the map at point 41N, 46E. It has sufficient magnitude to be a burned region, but, because the entire shape of the anomaly is not known, it is difficult to estimate the likelihood of the anomaly being attributable to an archaeological source. Although a test pit is indicated, it would be advisable to magnetically survey a small region farther to the north before excavating.

Anomaly 6
The anomaly is a region of high magnetic field variance where it is difficult to pinpoint individual areas which might suggest the location of a feature. This appears to be a region that might warrant investigation as an activity area. Two excavation test squares have been assigned in the vicinity of point 2N, 40E.

Anomaly 7
A localized monopole high is situated around the point 16N, 16E and shows promise of having an archaeological source. There is no apparent low pole associated with the anomaly, which suggests a feature of extended vertical geometry.

Anomaly 8
A monopole high, centered at point 14N, 23E, has a magnitude of only 3.5 gammas. It is suggestive of a burned region.

Anomaly 9
Two monopole highs at points 2N, 68E and 3N, 75E are extremes of a broader plateau. The first anomaly extends off the southern edge of the survey grid, but has an angular shape which is indicative of a low-contrast architectural feature. The second anomaly, although possibly a reoriented dipole with a weak low pole, is also worth investigating as a potential archaeological feature.

Anomaly 10
The final anomaly of interest is located in the northern portions of the grid at point 40N, 37E and is circled in figure 8.74. It has an unusual "H" shape, atypical of geologic features and more like an architectural form. The region is indicated by a dotted line; assignment of test pits is left to the discretion of the archaeologist.
Location of Test Squares

Suggested areas for test excavations are indicated in figure 8.74. The numbering scheme is explained in the Introduction.

Areas for Future Surveying

Evaluation of excavated test pits which are on the periphery of the grid will dictate whether it is advisable to continue to survey additional small regions. It is advised in particular that a small section be tacked on to the north of Test Square 5.

Site 5MT2844

Site 5MT2844, which is located in a southwest-sloping plowed field, was surveyed 20 October 1978. A total of two blocks were examined and the field crew reported that there were no irregularities in the surface which might contribute to the magnetic field. The total magnetic field over the site is shown in figure 8.75, the SYMAP representation with contour intervals of 8, 4, 4, 4, 4, 4, and 8 quarter gammas, and in figure 8.76, a line contour map with 8 quarter gamma intervals. Attention is drawn to the following magnetic anomalies.

Anomaly 1

A monopole high is located at point 33N, 5E. The FWHM measurements suggest an unreasonable depth; the source cannot be approximated by a point dipole if it is archaeological in nature. The source is likely longer in the north-south dimension implied by the south-extending lobe; a pithouse is suspected.

Anomaly 2

A high lobe extends from point 1N, 8E to point 8N, 7E. Although the anomaly is of sufficient size to merit consideration that its source might be geological, the magnitude suggests that it is worth investigating. Again, it is too wide for FWHM measurements.

Anomaly 3

A small monopole high is located at point 23N, 5E and appears to be one of the extremes in a long northwest-southeast trend on the map. It is suggestive of a burned region, and an excavation test pit has been assigned there.

Anomaly 4

Another small monopole high has an extreme on the point 18N, 6E. It is also located on the long northwest-southeast high incorporating Anomaly 3, but the high is suggestive of a shallow source elongated in the east-west direction.

Anomaly 5

A normally oriented dipole is centered at point 26N, 18E. The strong gradient between the poles and the magnitude of the low strongly suggest the presence of an iron object.

Anomaly 6

Directly south of the anomaly mentioned previously is a strong low with a high directly to the east that appears to be associated with it. This anomaly is typical of those found on other sites: a large extensive low region with a strong high forming a reoriented dipole. This region should be further investigated by excavation of test pits situated to locate the source of the response. Because the grid covers only part of the high, a greater chance for positioning inaccuracies exists.

Location of Test Squares

Figure 8.76 shows the suggested location of excavation test squares based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

Should the test pits centered on Anomaly 5 prove interesting, the grid should be extended eastward to line 30E from 5N to 15N.

Site 5MT2848

Site 5MT2848 was initially surveyed on 20 October 1978, and when the data were examined it became apparent that faulty equipment necessitated reestablishment of the data in Block A. In total, a four-block area was surveyed over a gently sloping plowed field. The field crew suggested that some metal objects might be present on the site, and these caused several localized dipoles apparent on the maps. No small-scale topographic features which disturb the magnetic field are apparent on the site.

As shown in figure 8.77, a SYMAP representation of the total field, and in figure 8.78, a line contour map indicating the suggested excavation areas, there are several anomalies of interest.

Anomaly 1

A strong dipole is located about the point 20N, 17E and covers several square meters. Because of the classic shape of this anomaly, several things about its source can be suggested. The feature is likely to have a rectangular outline, and a layer of intensely burned material is concentrated at a depth of approximately 1.4 m. The sides of the rectangle are likely in the order of 4 m in length, and there is an antechamber or a burned region on the south side of the
Figure 8.75 Magnetic contour map (SYMAP) of Site 5MT2844. The contour levels include data ranges of 8, 4, 4, 4, 4, 4, and 8 quarter gammas.
Figure 8.76 Line contour map of Site 5MT2644 with 8 quarter-gamma contour intervals. Numbered squares indicate areas to be tested.
Figure 8.77 Magnetic contour map (SYMAP) of Site 5MT2848 with contour intervals of 10, 6, 4, 4, 4, 12, and 36 quarter gammas.
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Figure 8.78 Line contour map of Site 5MT2848 with 8 quarter-gamma contour intervals. Numbered squares indicate areas to be tested.

Anomaly 1

A comparison with a theoretical anomaly from a magnetized rectangular feature shows a very similar response, both in profile and in plan view. Figure 8.80 shows a line contour map over a stylized house structure with dimensions similar to the pitstructure expected on Site 5MT2848. The magnitude of the high and low poles for Anomaly 1 and the distance separating them are similar to this theoretical model. This comparison suggests that similar modeling might be done with other pitstructures once more information concerning the distribution and geometry of burned material is known.

Anomaly 2

A monopole low is centered on point 10N, 11E; it extends over several square meters and is perhaps a soft fill feature such as a borrow area or even an unburned pitstructure. The profile is shown in figure 8.81.

Anomaly 3

A relatively weak monopole high is situated about the point 18N, 9E; it might indicate an area of high ash or localized burning. The profile is shown in figure 8.82; it is worth investigating.

Anomaly 4

Another monopole high, similar to Anomaly 3 but with less horizontal extent, is found in the vicinity of point 13N, 15E. Excavation is also suggested here and a small hearth is suspected. Figure 8.83 depicts a magnetic profile.

Anomaly 5

A monopole high, located well away from the pitstructure anomaly, may be another activity area; it is centered at the point 15N, 29E.
Figure 8.80 Theoretical anomaly over buried rectangular structure.

Figure 8.81 Magnetic profile of Anomaly 2, a possible borrow or activity area, Site 5MT2848. The profile is oriented north to south and is positioned on Grid Line 11E.

Figure 8.82 Magnetic profile of Anomaly 3, a potential fire hearth, Site 5MT2848. The profile is oriented east to west and is positioned on Grid Line 18N.

Figure 8.83 Magnetic profile of Anomaly 4, a potential hearth, Site 5MT2848. The profile is oriented north to south and is positioned on Grid Line 15E.
Anomaly IE

A rather confusing combination of highs and lows in the northeast quadrant of the survey grid may have archaeological associations. It is similar to unknown anomalies found in other sites and might be investigated to permit correlation studies. If the anomaly is due to geologic effects, the source might be distinguished by subtle variations in compaction and grain size, rather than by more distinct culture variations. It has been labeled as an "E" square as it is less likely to contain culture features, but its excavation would provide useful information for interpretation of future survey data.

The other anomalies visible on the maps are most likely caused by geologic or iron sources and do not warrant excavation. However, this does not suggest that archaeological features do not exist in these vicinities, just that they are not easily recognizable in the magnetic record.

Location of Test Squares

On figure 8.78 are several rectangles indicating recommended excavation test squares which enclose the anomalies described in the previous discussion. The numbering system is a priority list, with "1" indicating the square in which there is the highest probability of locating cultural features. Excavation should begin within the rectangle; the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

Areas for Future Surveying

Before this site is subjected to intensive work, it is highly recommended that two blocks be added to the south of the site. There are two anomalies present near the south limit of the survey grid, points 1N, 16E and 1N, 27E, which imply the presence of other large-scale cultural features.

Site 5MT2853

Site 5MT2853 is located in a uniformly plowed field which slopes gently to the southeast. Two blocks were surveyed on 12 October 1979. Besides the typical anomalies caused by iron objects, there are some anomalies of potential archaeological interest, as shown in figure 8.84, a SYMAP with 3, 4, 4, 4, 4, 4, 4, 4, 8, and 10 quarter-gamma intervals.

Anomaly 1

A large monopole high with a maximum magnitude of 48 quarter gammas is located about the point 7N, 17E. The anomaly has magnitude and geometry similar to a burned region and might be a pithouse-like structure. Although the two anomalies mentioned next are connected to this large high by magnetically high lobes, there is sufficient distance between the anomalies to consider them separately.

Anomaly 2a

A monopole high is located at point 10N, 9E. The FWHM measurements done using a north-south profile suggest a depth of less than 1.2 m.

Anomaly 2b

A monopole high is situated directly west of the previous anomaly at point 10N, 6E. Its profile suggests a shallow source which is lengthened in the vertical direction. A burned region is suspected.
Anomaly 3

A monopole high is centered on point 5N, 9E, just south of the previous anomaly. Potentially, its source is linked to the anomaly to the north but is probably sufficiently removed to warrant a separate excavation test pit. The anomaly is too broad to try an FWHM depth estimation.

Anomaly 4

A monopole high is located at point 25N, 16E and is suggestive of another burned region. It has been given a somewhat lower priority in the numbering scheme because of an associated low region to the north which increases the probability of a nonarchaeological source. However, if the low and the high are unrelated, this would be a good area for testing by excavation.

Anomaly 5

A broad monopole high in the vicinity of point 33N, 18E is a region of interest. A specific test square has not been assigned, but the region is indicated with a dotted line in figure 8.85. Investigations here are left to the discretion of the archaeologist.

Anomaly 6

A monopole low is located at point 12N, 13E. Although this might be part of the larger-scale low trending to the northwest, it is slightly greater in magnitude and might be an architectural feature filled with less compact soil. It is worth investigating and has been numbered in figure 8.85 accordingly.

Anomaly 7

Several dipoles are present on the site. The first is a reoriented dipole of considerable extent at point 30N, 10E. It is unlikely to be of archaeological importance. The second is located at point 20N, 19E and is oriented directly east to west. It is probably a piece of iron on the surface. The third is a normally oriented dipole located at point 14N, 4E. If the background surrounding the region is considered to be about 5 quarter gammas, the minus pole is about 30 percent (9/32) of the high, suggesting that despite the normal orientation, the source of this anomaly is ferrous rather than archaeological.

Location of Test Squares

Figure 8.85 shows the location of test squares, based on magnetic reconnaissance. The numbering scheme is explained in the Introduction.

Areas for Future Surveying

Most of the anomalies on Site SMT2853 are fairly isolated. Block B might be extended westward, should Test Square 5 prove interesting.
Site 5MT4478

Site 5MT4478 was surveyed on 22 and 25 October 1978, and operations encompassed a two-block section on a small knoll. The site had been used as pasture, and several metal objects, including long strands of barbed wire, were removed from the grid. It is inevitable that the odd piece of iron went unnoticed and is responsible for some of the strong dipole anomalies shown on the total field maps. Besides the southeast-sloping topographic trend, localized sandstone rubble mounds occurred at points 13N, 11E, covering a 20-m² area, and 19N, 18E, covering an 18-m² area. A refilled excavation of undetermined depth, noticed at point 16N, 12E, disturbed about 6 m² of the surface.

Several anomalies present in the surveyed areas may have archaeological sources, as shown in figure 8.86 (a SYMAP with 15, 10, 10, 8, 8, 10, 10, 12, and 11 quarter-gamma intervals) and figure 8.87, a line contour map in 8 quarter-gamma intervals.

Anomaly 1

An extended high region, with several local extremes, is surrounded by a line joining the points 21N, 6E; 13N, 9E; 12N, 16E; and 21N, 16E. Because of the undulate nature of the high it is difficult to assign an exact location for a single excavation test pit. The extreme at point 19N, 16E and the dipole at point 15N, 13E suggest ferrous contributions to the magnetic field, but the anomaly is much too broad and of too low a magnitude to be entirely caused by metals. Locations for two test pits have been suggested.

Anomaly 2

Another large extended high occurs directly to the east of the first. Roughly, the high would be enclosed by a line joining the points 21N, 21E; 9N, 21E; 9N, 26E; and 21N, 29E. The extremes, which are found at points 19N, 23E; 17N, 25E; and 11N, 24E, would be feasible locations for test pits, but the dipole anomaly centered on points 16N,
19E is undoubtedly caused by an iron object very close to the surface. Part of the extended high is an arm which trends to the southwest. A test here is indicated in figure 8.87 since it might be an area of higher compaction.

**Anomaly 3**

A monopole high at point 1N, 18E lies on an extended arm of the two previous highs. Because one edge of the anomaly is truncated, the depth to source is difficult to estimate.

**Anomaly 4**

A monopole high is located at point 14N, 33E. Again the anomaly is too broad for an accurate depth estimation, but, as the high covers a 4-m² area and has a maximum amplitude of 10 gammas with no associated low pole, it appears that the geometry of the source is extended in the vertical direction. The location of a potential excavation test pit is indicated in figure 8.87.

**Anomaly 5**

A monopole high at point 15N, 41E extends off the eastern edge of the grid. Because one edge is truncated, it is unclear whether this is a true monopole or whether it is the high pole of a reoriented dipole resulting from an iron object. A few additional lines on the east edge would clear up the ambiguity. The location of a potential test pit is indicated in figure 8.87.

**Anomaly 6**

Two reoriented dipoles at points 2N, 39E and 12N, 8E are likely to have ferrous sources.

**Location of Test Squares**

Figure 8.87 indicates the suggested location of test squares based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

**Areas for Future Surveying**

If the anomaly at point 15N, 41E has an archaeological source, it would be worthwhile to add 6 m to the east edge of the grid from lines 10N to 20N. As well, lines 4E through 31E might be extended northwards if the two large monopole highs have cultural sources. It is also suggested that the spoil from excavations be located other than north of the grid if future surveying is to be done in this region.

**Site 5MT4512, Cascade Hamlet**

Site 5MT4512, Cascade Hamlet, was surveyed on 6 October 1978; the operations covered a rectangular block grid.
whose long axis runs magnetic west to east. Magnetometer traverses were run south to north. Topographic features occurring on or near the grid are (1) a steep-sided arroyo which borders the south edge of the grid; (2) an area with stone rubble, about 10 m² in area, centered on point 15N, 4E; and (3) a circular depression at point 19N, 3.5E, about 0.75 m wide and 0.25 m deep. All of these features might cause minor variations in the field.

Several anomalies are of interest as shown in figure 8.88, a SYMAP representation of the total field, and in figure 8.89, a line contour map of the same data with 4 quarter-gamma intervals.

Anomaly 1
A monopole high is centered on point 17N, 6E. It is the highest value on an elevated plateau and could indicate a burned area about 0.6 m in depth, if it is caused by a localized source.

Anomaly 2
A monopole high extends from point 7N, 7W to point 8N, 8W. Although there is a low situated to the north of the feature, it is suspected that the two anomalies are not related. The high is again possibly due to a burned feature at a depth of roughly 1.3 m. Also of interest is the extended low which circles the high, perhaps suggestive of some larger-scale archaeological feature.

Anomaly 3
An extended high region, consisting of several dipole and monopole anomalies, is located in the north central section of the grid. The dominant feature here is a strong dipole at point 14N, 24E with normal orientation and a high of 1179 gammas. Because of the magnitude of the high, the source of this anomaly must be an iron implement; but it is unlikely that the iron is entirely responsible for the high region surrounding it. There is a high extension which runs from point 13N, 26E to another "normal" dipole located at point 16N, 27E. It is unrelated to the dipoles and appears to be of archaeological interest. Although the small dipole has the correct orientation for a cultural feature, the relative magnitudes of the high and low increase the possibility of a near-surface ferrous source. If the high area in which this smaller dipole anomaly is located proves to be of cultural interest, a test over the dipole should be considered.

Figure 8.88 Magnetic contour map (SYMAP) of Site 85T4512, Cascade Hamlet.
Figure 8.89 Line contour map of Site 5MT4545, Cascade Hamlet, in 1 gamma intervals, showing suggested location of test squares.

The general high region continues northward off the map, with a monopole peak at point 20N, 24E. Although this high area is not excessively strong (6 gammas except for isolated dipoles), it suggests a region of some form of activity and should be tested, as indicated in figure 8.89. Because of the extended nature of the high, depth estimations are difficult.

Anomaly 4

A large "normal" dipole anomaly is located at point 8N, 26E. It is obviously not from a point source, as both the high and low are elongated in the east-west direction. Comparison with a theoretical curve suggests that this is a likely possibility for a linear burned feature such as a wall or an elongated fire hearth. The FWHM measurements indicate a depth of about 0.5 m.

Anomaly 5

A subtle monopole at point 3N, 28E marks the extreme of another high plateau in the central south of the survey area. Because of the extended nature of the high and its lack of variation, it is suggested that this region could be an area of prehistoric activity. It has a higher possibility of containing cultural features than other areas on the map.

Anomaly 6

Another plateau high is located in the vicinity of point 6N, 16E. A test pit might be assigned to this location to determine whether the source of the anomaly is archaeological or geological.

Location of Test Squares

Figure 8.89 shows the suggested location of test squares based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

Area of Future Surveying

Lines 23E through 27E might be extended north, should the region covered by Test Square 2 prove productive.

Site 5MT4545, Tres Bobos Hamlet

Site 5MT4545 was surveyed on 19, 20, and 21 September 1978; survey operations covered a four-block area. The site is situated on a flat-topped knoll and, except for an occasional rodent hole, no topographic discontinuities are present which might affect the magnetic field.
The total magnetic field on the site is generally more undulate than other surveyed sites and this implies magnetic field contributions from a variety of archaeological and nonarchaeological sources. Figures 8.90 and 8.91, the SYMAP and line contour maps, show the following anomalies.

Figure 8.90 Magnetic contour map (SYMAP) of Site 5MT4545, Tres Bojos Hamlet. The contour levels include data ranges of 8, 6, 4, 6, 6, 4, and 4 quarter gammas.
Figure 8.91 Line contour map of Site 5MT4545 with 8 quarter-gamma intervals. Numbered squares indicate areas to be tested.
Anomaly 1

A monopole high is centered on the point 30N, 22E and is elongated in a north-south direction. The anomaly is of sufficient size and magnitude to be caused by a burned region, but the low situated just to the east implies the possibility that the source of the anomaly is an iron object. However, the existence of other lows to the east of the high, in what appears to be a reduced susceptibility geologic feature, lends support to the argument that the low and high are unrelated. If the source is archaeological in nature, it is at least 1.5 by 2.5 m in size.

Anomaly 2

A monopole high is centered about the point 33N, 14E. This anomaly also has a closely associated low towards the north, but again it appears that they are two separate entities. Both this high and this low should be investigated as possibly having archaeological sources.

Anomaly 3

A monopole high is located in the eastern section of the map at point 26N, 39E. It is suggestive of a complex source as there are two extreme data values within the high, located at points 26N, 37E and 26N, 41E. This might be a burned region and should be investigated.

Anomaly 4

A monopole low occupies about 12 m² in the region of point 31N, 37E. It is the extreme low of another southwest to northeast-running large-scale trend. Although it is difficult to imagine an archaeological source with a geometry to producing such a large-scale anomaly, this region should be tested because it might represent a feature filled with soft sediment, such as a borrow area.

Anomaly 5

A monopole high is located at point 37N, 5E and has a signature similar to a burned region. It is rather subtle and has an extreme of only 4 gammas, but the SYMAP (fig. 8.90) shows it as a rather distinct anomaly.

Anomaly 6

A monopole high is situated at point 8N, 7E and appears to lie on a larger-scale geologic feature. It is too wide to calculate accurate depth estimations, but the shape and magnitude of the anomaly indicate that assignment of a test pit here might be valuable.

Anomaly 7

A monopole high at point 14N, 17E is located on the same larger southwest-northeast geologic trend. The anomaly is not dramatically higher than the trend on which it is situated, but the amount of magnetic contrast present suggests the possibility of an archaeological source.

Anomaly 8

A large-scale circular feature is located in the southeastern section of the grid. The dotted line (fig. 8.91) outlines its periphery, and although it is probably caused by a combination of geologic effects, it is described here in the event that an archaeological feature with these characteristics might exist. Test pits might be conducted on an experimental basis in this region, at the discretion of the archaeologist.

Anomaly 9

A number of dipoles are likely caused by metal objects and should not be confused with archaeological sources. They are located at points 22N, 11E; 10N, 22E; 9N, 24E; 20N, 27E; and 33N, 29E.

Anomaly 10

In addition, there is a monopole low, located at point 36N, 16E, close to anomalies 1 and 2, which might indicate a soft-fill feature. The strong gradients in the area lessen the likelihood of this possibility, but the anomaly warrants testing by excavation. A test square has not been located on the map.

Location of Test Pits

Figure 8.91 shows the suggested location of the test pits. The numbering scheme is explained in the Introduction.

Areas for Future Surveying

The southeast section of the grid has interesting anomalies which continue beyond the limits of the surveyed area. Lines 1N to 31N may be extended eastward after the initial testing, so prudence should be exercised in locating spoil disposal areas.

Site 5MT4614

Site 5MT4614 was surveyed on 14, 15, and 19 October 1978; survey operations covered a four-block square section oriented magnetic north to south. The magnetometer traverse lines for the survey were run west to east. No field disturbances are expected from topography and no ferrous materials were encountered on the surface.

Several features on the grid are of interest, as illustrated in figure 8.92, which was generated using the graphics routine SYMAP, and in figure 8.93, a line contour map with 8 quarter-gamma intervals.
Figure 8.92 Magnetic contour map (SYMAP) of Site 5MT4614.
Figure 8.93: Line contour map of Site 5MT4614 in 2 gamma contour intervals, showing the suggested location of test squares.
Anomaly 1

A strong monopole high extends from the southeast to the northwest of the survey area, starting about point 1N, 30E through point 21N, 17E to point 31N, 1E. This anomaly might be caused by either (1) a row of house blocks which has been thoroughly burned, although it might be expected that burned houses produce a less continuous anomaly (however, this might be a reasonable interpretation if the volume of burned soil was large), or (2) a geologic feature such as an arroyo or creekbed which has been resedimented to ground level. The sediment would most likely be derived from an upstream source, higher in iron oxides, which would increase the susceptibility contrast. Other contributing sources might be: nearby areas high in burned material, perhaps derived from the surrounding village; in situ compacted fill, resulting in an increase in ox­ides per unit volume, and thus raising the susceptibility contrast; or any combination of these.

Anomaly 2

An equally strong anomaly occurs in the southwest corner of the survey area. The anomaly’s limits are not discernible but its magnitude is 12 or 13 gammas, comparable to the elongated high. Its extent will have to be determined before making any suggestions as to its source.

Anomaly 3

A monopole high is located about the point 20N, 36E. It is an extended source and is roughly rectangular with a lobe out the southwest side. It has great similarities to anomalies produced by pithouses.

Anomaly 4

A roughly perpendicular extension of the central elongated monopole high originates near point 23N, 21E and fades out toward the northeast corner of the survey area. Its source could be linked to the central high, suggesting that it might be either an extension of an archaeological feature (for instance, a pathway) or a tributary feature, depending on whether the central high is cultural or geologic in nature.

Anomaly 5

A high peaks in the area of point 3N, 16E. Its source is extended and covers a relatively broad region.

Anomaly 6

A monopole high runs off the survey grid and originates at point 41N, 22E. Although it is difficult to postulate a source without seeing the entire anomaly, it seems unlikely to be due to a ferrous source because of its extended nature.

Anomaly 7

Three dipolar anomalies occur at points 33N, 7E; 35N, 39E; and 14N, 13E. All have reoriented dipole directions, so it is likely they are due to ferrous sources. One of these might be worth excavating as a control on the type of iron we might expect to find on the sites.

Location of Test Squares

Figure 8.93 shows the suggested location of test squares based on the magnetic reconnaissance, and these have been positioned to minimize unproductive excavation. The numbering system, as explained in the Introduction, indicates the priorities for excavation.

Areas for Future Surveying

As there are anomalies which continue outside the area of survey, it might be advantageous to extend lines 1E to 4E to the north and south, as well as adding lines to the east of the grid. Lines 20N through 23N should be extended northward if Test Pit 5 proves productive. Finally, the lines to the south of the large elongated anomaly might be done if this area is cultural in origin.

SUMMARY OF THE 1978 PROGRAM

With the conclusion of the analysis on the data collected for the Dolores Archaeological Program, a few general comments are in order.

Physical Suitability of Sites for Magnetic Surveying

First, it appears that the soils in the Dolores River valley have sufficient amounts of hematite ($\text{Fe}_2\text{O}_3$) to allow increased susceptibility contrasts when burning takes place during the occupation of an archaeological site. Organic decay and soil disturbance are also suspected of causing notable magnetic anomalies, but this will not be confirmed until examination of the excavation information takes place. The topographic relief of most of the sites is insufficient to cause unwanted disturbance in the magnetic field although some sites, such as 5MT23 and 5MT2320, have higher noise levels caused by irregularities from looting activity.

Magnetic contributions from soil irregularities due to uneven sedimentation (e.g., soil lenses, coarse-grained deposits, etc.) appear to have magnetic signatures which can either be visually distinguished from those features of potential archaeological interest or can be removed from the magnetic record using convolution filtering or a trend analysis. However, these methods were ineffectual when applied to the geologic noise caused by the igneous cobbles on Site 5MT23, where the noise signature is similar in frequency and magnitude to that of archaeological sources.
Historic trash, specifically that of a ferrous nature, appears occasionally on these sites. In most cases it is easy to distinguish these contributions from archaeological sources, but occasionally, as with the confusing effects from geological noise, ambiguity in interpretation arises.

In most cases the sites are suitable for magnetic surveying and most have anomalous signatures which are typical of archaeological features.

Data Collection

The instruments utilized for measuring the magnetic field (two Geometric G826 models) have proven fairly reliable and have a typical failure rate for geophysical equipment. It appears that unusual stress was placed on the electrical connection between the sensor and the counting instrumentation. This has been reinforced, but more care should be taken. Only 5 percent of the data had to be retaken because of instrument malfunction. One of the inherent disadvantages of these instruments is the large number of batteries used in the process of exciting the protons in the sensor. Some of these costs can be alleviated by purchasing rechargeable "D" cells, if it is anticipated that data collection will continue.

The crew, assembled to collect data under the direction of a field crew chief, worked thoroughly and efficiently during the field season. Instruction and supervision were necessary for only a month before the crew was able to operate on its own. The legibility of the data and the mailing system for sending the data to NEBCAR (Nebraska Center for Archaeophysical Research) appear adequate.

Processing, Interpretation, and Dissemination of the Magnetic Data

After the data were received at the University of Nebraska, the processing procedure, in which the data are worked into an intelligible form, took a minimum of 3 days. Interpretation of the data takes somewhat longer, depending on the complexity and size of the data set. As it is very advantageous during the field season to have quick information turnaround, suggestions on the locations of archaeological features were either phoned to Dolores from NEBCAR, after 3 days of processing, or a brief summary of the more obvious anomalies were mailed about a week after the data were received. Occasionally, because of backlog, longer periods of time elapsed before information could be passed along. To avoid this problem, it is recommended that the magnetometer field crew be advised well in advance of any excavation schedule, so that the data can be shipped to NEBCAR well before excavation begins.

Because no standardization procedure was established for the dissemination of the magnetic information after it was mailed to Dolores, some confusion arose in getting maps and their descriptions to the field crew chiefs before excavation. It was suggested that a central file be created at the project laboratory where the information for each site could be stored. The field crew chiefs could consult this data bank when deciding on the sampling design for their site. They could also reference a general information section which would include the folder of papers with the theory and methodology of magnetic surveying, the field manuals for the magnetometer crew, and the introduction and finalized descriptions of each site in this report. This procedure was implemented in August 1979.

In conclusion, it appears that the magnetic field measurements recorded during survey operations in the DAP area contain a significant amount of information. From the study done under the auspices of the 1978 purchase order, it is apparent that many features have anomalous magnetic responses. The larger architectural features, such as pit-structures, are easily discernible (such large structures were potentially present at Sites 5MT2193, 5MT2848, 5MT2236, 5MT4545, 5MT2194, 5MT2203, and 5MT2192), and it may be possible to extract more information about the size, shape, and content of these features. Smaller features with localized burning, such as fire hearths, are also detectable (such features were recorded at Sites 5MT2193, 5MT2192, 5MT2848, and 5MT4545), and areas with higher ash content and disseminated burning, such as room blocks or activity areas, are visible in some cases (Sites 5MT2203, 5MT2192, and 5MT4545). With the implementation of a correlation study to examine the excavation results and to compare their spatial positioning with the anomalous magnetic signatures, it is hoped that the success rate of magnetic surveying can be assessed more quantitatively. This should yield information on what features were undetectable and on the geometry and content of the features that were located. Although at present the utility of magnetic surveying is intuitively obvious, the correlation study should help improve the resolution of this prospective technique. It will also contribute to the formulation of more effective sampling strategies.
Chapter 9

AN ARCHAEOSTRONOMICAL RECONNAISSANCE
OF THE DOLORES ARCHAEOLOGICAL PROGRAM AREA
ABSTRACT

As a portion of the nonintensive investigations proposed for the Dolores Project Cultural Resources Mitigation Program in 1978, Dr. John A. Eddy of the Astrophysics Department, University of Colorado, and Allen E. Kane, program co-principal investigator, carried out a reconnaissance relating to possible knowledge and use of astronomy in southwestern Colorado Anasazi communities. Investigations were conducted at eight prehistoric sites: McPhee Pueblo (Site 5MT4475), Little House (Site 5MT2191), Cline Crest Ruins (Site 5MT2663), Emerson Ruins (Site 5MT4447), Yucca House, Yellowjacket Spring Ruins, Goodman Point Ruins, and Mud Springs (Toltec) Ruins. The data obtained during the reconnaissance were ambiguous; some structures exhibited no obvious astronomical alignments, while others revealed potentially significant alignments that are probably coincidental. More positive results were obtained from the tri-wall structures at Emerson Ruins, Yucca House, Mud Springs, and the great kiva at Goodman Point Ruins. Measurements recorded along wall lines indicated that these structures may have been oriented according to north-south cardinal directions and to the winter and summer solstices. Several hypotheses concerning the use of astronomical data by Anasazi communities in southwestern Colorado are presented. These formulations can be used as source material for further such studies in the area.
Figure 9.1 Location of archaeological sites included in the 1978 archaeoastronomy reconnaissance.
CHAPTER 9

AN ARCHAEOASTRONOMICAL RECONNAISSANCE OF THE DOLORES ARCHAEOLOGICAL PROGRAM AREA

By John A. Eddy and Allen E. Kane

INTRODUCTION

An archaeoastronomical reconnaissance was specified in the original work plan submitted by the University of Colorado (Breternitz and Kane, 1978) detailing proposed operations for the Dolores Cultural Resources Mitigation Program 1978 field season. The intent of this study was to gather data relating to the possible use of astronomical knowledge by prehistoric groups in the project area. It was thought that such data could be used to answer questions posed in the DAP (Dolores Archaeological Program) Research Design (chapter 2, this volume).

Astronomy can be viewed as a multifunctional tool with applications to economic, social, and ideological systems integral to human societies (Aveni, 1981:9-10). Specifically, astronomical alignments can serve as a guide for scheduling agricultural activities (and may therefore provide input for reconstructions of prehistoric economics, DAP Research Design Problem Domain 1) and as an adjunct to community ritualism (input to Problem Domain 3, Social Organization). Prehistoric astronomical knowledge and construction were probably managed by community specialists. Ethnographic evidence supporting the concept of religious/astronomical specialists in southwestern communities is provided by Fewkes (1891, 1898, 1920), who studied ceremonies incorporating astronomical phenomena at Zuni and the Hopi Pueblos. Such phenomena also have implications for social inference and integration (Problem Domain 3). There is a good possibility that local prehistoric cultures indirectly received this and other knowledge from Mesoamerica through the San Juan Basin area (Hedrick et al., 1974). Evidence for astronomical knowledge, therefore, might provide evidence of extraregional interaction (Problem Domain 4).

METHODS

The first step in implementing the reconnaissance was to select a group of sites from which to obtain astronomical measurements. Because project excavations were in a very early stage during the scheduled period of the reconnaissance, consideration was given to several sites outside the project’s administrative area. The latter were included to provide a broader perspective for estimating the use of astronomy by local prehistoric peoples. Ultimately, four sites within the project area and four nearby locations were chosen (fig. 9.1). The selection process was based on a review of early archaeological reports that described possible astronomical alignments (Holmes, 1878; Prudden, 1903; Fewkes, 1919) and on a field assessment of locations where measurements could be easily obtained (done by Kane during the week before the scheduled reconnaissance). Eight sites were chosen for investigation:

1. McPhee Pueblo (Site 5MT4475). The site is a large roomblock unit at McPhee Village, a population center located in the Dolores River valley which dates to A.D. 800-950.

2. Little House (Site 5MT2191). Little House is a small seasonal pueblo, perhaps used by one household group as a base for tending agricultural plots. The site is located in the Sagehen Flats area and dates to A.D. 800-900.

3. Cline Crest Pueblo (Site 5MT2663). This site is the central architectural complex at Cline Crest Village, a large population center located on the uplands, west of the Dolores River valley. The site is contemporaneous with the occupation at McPhee Village (A.D. 800-900).

4. Emerson Ruins (Site 5MT4447). This site is believed to be a tri-wall structure. Such edifices are rare in the Four Corners area and may reflect specialized social or ceremonial activities. Emerson Ruins is believed to date to the period A.D. 1100-1250.

5. Yucca House Ruins (no Smithsonian site designation). Yucca House (also known as Aztec Springs) is a large, late Anasazi village incorporating specialized architecture. Yucca House is located near the present alinement of the proposed Towaoc Canal, a project construction feature, and dates to the A.D. 1200's.
6. Mud Springs (Toltec) Ruins (no Smithsonian site designation). This site is a large village which includes a tri-wall structure. It is located approximately 3 km (2 mi) east of the proposed alinement of the Towaoc Canal and probably dates to the A.D. 1200's.

7. Goodman Point Ruins (no Smithsonian site designation). The site is a large prehistoric community that includes a great kiva. It is located several miles west of the Towaoc Canal and probably dates to the period A.D. 1100-1300.

8. Yellowjacket Spring (Surouaro) Ruins (no Smithsonian site designation). This site is a large prehistoric village that includes a great kiva. It is located several miles west of the proposed Dove Creek Canal and probably dates to the period A.D. 1000-1200.

The actual field reconnaissance took place on 23 and 24 August 1978.

Astronomers studying prehistoric cultures for evidence of knowledge and use of astronomy recognize two basic ancient astronomical systems. The first, horizon-based astronomy, is based on celestial events that take place at the horizon (rising and setting of the sun, etc.); the second, polar-ecliptic, or polar-equatorial, systems, are based on the identification of a "north" star (Aveni, 1981:12). New World astronomical systems have been horizon-based types (for example, Aveni and Hartung, 1979; Thompson, 1974; Eddy, 1977; Hawkins, 1975). Aveni (1981:12, 24) describes five classes of horizon celestial events that may have been of importance to prehistoric astronomers: (a) rising and setting of the stars, (b) rising and setting of the sun, (c) rising and setting of the moon, (d) rising and setting of the planets, and (e) heliacal rising and setting of stars and planets (that is, when they first appear in the morning or evening sky after previously being obscured by the sun).

The DAP reconnaissance was designed to investigate horizon phenomena. At each of the selected sites, Eddy and Kane chose wall or other architectural alinements along which to measure azimuths (degrees of arc along the horizon from astronomical north to the orientation being measured). The field azimuths of the alinement and the sun's position were then recorded using a surveyor's transit (fig. 9.2); the exact times of the measurements were also recorded. Procedures used were similar to those described by Aveni (1981:26-29). All recorded field azimuths were later converted in the laboratory to true azimuths (hence the measurements presented in this report are given in degrees "T," or true). A second laboratory task was the determination of the positions of significant horizon events at the time the measured structure was in use (sunrise and sunsets at solstices and equinoxes, rise and set of prominent stars, etc.).

**RESULTS**

Results of the reconnaissance are reported in the following site-specific narratives. Information presented includes measurements obtained and inferences as to possible astronomical implications.

**McPhee Pueblo (Site 5MT4475)**

Transit measurements were taken of the centerline of the large horseshoe-shaped pueblo roomblock (149° - 329° T, or true) (fig. 9.3) and of two alinements in the kiva under excavation (Kiva 2): the southern wall of the central hearth (78° - 258° T) and a line through the sipapu to the center of the ventilator tunnel (162° T) (fig. 9.4). The horseshoe structure opens to the southeast (31° east of south) and seems oriented more to fit the lay of the land than to reflect specific astronomical phenomena. The site is generally open to the south and this orientation would provide more sunshine into the court around the kiva. As surveyed during an early state of excavation in August 1978, the structures at the pueblo did not indicate any particularly precise layout; that is, the axis of the kiva (sipapu to ventilator tunnel) is not collinear with the axis of symmetry of the horseshoe-shaped roomblock (they are separated by 13°); nor is the south wall of the hearth in the kiva perpendicular to the kiva axis—the error here is 6°. The measurements recorded are depicted in figure 9.5.
Neither the axis of the horseshoe-shaped structure, nor the kiva axis, is directed toward astronomically unique points of the horizon. At the time of construction of this portion of the site (around A.D. 900), there were no bright stars that rose in this direction in the southeast; in addition, the structure shows no obvious associations with the movements of the sun along the horizon.

McPhee Pueblo is thought (based on field interpretations) to be an edifice planned and built as a unit, perhaps during a short period by a large labor force. Analysis of the orientations of the major architectural units suggests that topography and winter exposure to the sun were important factors in the site's construction and that astronomical phenomena were unknown or ignored. A comprehensive report of the 1978 excavations at McPhee Pueblo has been prepared by Brisbin (1980).

**Little House (Site 5MT2191)**

Transit measurements were taken of the main south wall of the northern row of rooms under excavation (72.5° - 252.5° T) and of an apparently perpendicular wall that ran from the corner of the single southern room (158.5° - 338.5° T) (fig. 9.6). The two walls are within 4° of perpendicular, which seems about as accurate as might be expected of a modestly skilled builder. At the time the structure was built (around A.D. 850), one could have sighted along the main wall from west to east to the place on the horizon where the bright star Aldebaran rose; sighting
Figure 9.6 Alignments measured at Little House (Site 5MT2191): (A) south wall of northern rooms; (B) west wall of south room.

from east to west along the wall would have pointed to within 2° of where Sirius, the brightest star in the sky, set. These two stars have been cited as ceremonially, and perhaps architecturally, important in certain Anasazi sites (Reyman, 1976) and in certain Plains Indians structures (Eddy, 1974). However, in this apparent seasonal farming structure, the alignment seems to have been accidental. The measurements recorded at Little House are illustrated in figure 9.7. Analysis did not indicate that such seasonal structures were oriented according to astronomical phenomena with potential importance for farming cultures, such as sunrise or sunset at the spring and fall equinoxes. A report of the excavations at Little House is presented in chapter 6, this volume.

Cline Crest Pueblo (Site 5MT2663)

Transit measurements were taken along two wall alignments at the central horseshoe-shaped room complex at the site (fig. 9.8). The inner wall of the north arm of the horseshoe is oriented 157.5° -337.5° T and the inner wall of the south arm is oriented 135° - 315° T. A reading was also taken to establish the compass bearing of the Emerson Ruins (Site 5MT4447) from the Cline Crest site (157.5° T), which is the same as the measurement recorded for the north arm wall. This coincidence suggests that this portion of the roomblock was intentionally laid out to point toward the Emerson Ruins; however, no certain conclusions can be drawn at this point. Similarly, sighting along the same wall from southeast to northwest would have pointed to within 3° of the point on the horizon where the bright star Fomalhaut rose in A.D. 900. However, these alignments should be presumed to be coincidental until other evidence of similar alignments on the same stars is found. Astronomical measurements recorded at Cline Crest Pueblo are shown in figure 9.9. It is notable that the structure measured at Cline Crest Pueblo has the same general orientation as the horseshoe room complex at McPhee Pueblo. The builders of both complexes apparently adopted the same orientation strategy during planning and construction.
Emerson Ruins
(“Sundial Palace,” Site 5MT4447)

Prior to the archaeoastronomy reconnaissance, this site was regarded as the location in the project area with the most potential for exhibiting evidence of prehistoric astronomical knowledge. The main architectural unit at the site is a circular structure described by J. W. Emerson, a forest ranger who visited the site in 1916, as a “Sundial Palace” (Fewkes, 1919:34-35). A visit to the site in the spring of 1978 convinced DAP archaeologists that the site is probably a tri-wall structure, similar to the one at the Mud Springs Ruins described by Holmes (1878:398-399) and to the example at Aztec Ruins (the Hubbard Mound) excavated by the National Park Service (Vivian, 1959). Tri-wall structures, because of their unique construction, are believed to have ceremonial and social implications (Vivian, 1959:85).

Transit measurements were taken of the directions of the remains of radial walls that fan out from the center of the circular edifice (fig. 9.10). Alignments given in table 9.1 are true azimuths as measured from the center, and are compared with values given in Emerson’s original map of the site (fig. 9.11) as published by Fewkes (1919:35).

Several differences seem noteworthy. First, Emerson identified two walls (between Walls J and K, in fig. 9.10) that were not found in the 1978 reconnaissance. Similarly, two walls (E and I) were found in the 1978 survey that were not...
noted in his survey. Second, and probably more significant, Emerson's survey shows the walls as symmetrical about a north-south line. This would make the site especially interesting astronomically, since sky features rise and set symmetrically about this axis. However, the DAP survey does not confirm this situation. A likely explanation is that Emerson made his drawing with this constraint imposed.

The 14 wall alignments measured in the DAP survey define 28 specific azimuths, and it is possible to associate 8 of them with places on the horizon where prominent stars rose or set in A.D. 1100, the presumed date of construction of the site. Among these, Wall C (fig. 9.10) marks the direction of summer solstice sunrise and winter solstice sunset with an error of 1.5°.

This analysis suggests that astronomical phenomena may have been considered by the builders of the Emerson Ruins. The orientations of the 14 walls are illustrated in figure 9.12.

Yucca House Ruins

Transit measurements were taken of architectural orientations at three structures at the site: a large (about 40- by 40-m) square enclosure with an intact wall on the north side, a double-walled circular structure (perhaps a double-walled tower), and a square "apartment house" consisting of a row of rooms around a central enclosure (fig. 9.13). In Holmes' 1876 description of the ruin (1878:399-400), the first structure is termed the "Lower House," and the square apartment house is referred to as the "Upper House." Holmes' terminology has been maintained in the following summary, and the double-walled circular structure is referred to as such.

The walls of the Lower House are perpendicular within 4°, representing the ability of a modestly skilled artisan. They are not laid out according to the cardinal directions, but are rotated about 10° counterclockwise from true north. It is possible that the builders intended the structure to be oriented in the cardinal directions and that this error represents their level of skill without a compass. It was not particularly easy to define the precise cardinal directions in A.D. 1200, when the structure is presumed to have been built, since the present North Star, Polaris, was not as near the celestial pole as it is now. Thus, a 10° error in layout does not seem unusual.
The four walls of the Lower House define eight azimuths, since there is a factor-2 redundancy in the direction of sighting along a straight wall. Of these eight directions on the horizon, two come close to where bright stars crossed the horizon (Aldebaran in Taurus and Rigel in Orion) at the time of construction. This seems close to the number that could be derived by chance alone. The compass directions recorded for the Lower House are reproduced in figure 9.14.

The wall orientations of the Upper House are close to the cardinal directions and are perpendicular within about 8°. The degree of perpendicularity again seems to be expected. The east-west walls of the structure (including the high wall) are oriented 92° - 272° T, or within 2° of east-west. The north-south walls are 8° - 188° T and 177° - 357° T, or in error (assuming precise cardinal directions were sought) by 8° and 3°, respectively. It is suspected that they were intended to be laid out on the cardinal directions, based on the importance of these directions in ethno­graphic accounts, and that these errors measure the skill of the A.D. 1200 builders. The compass readings obtained during measurement of the Upper House are illustrated in figure 9.15.

Transit measurements were made from the center of the double-walled circular structure along radial walls that fan out from the center (fig. 9.16). These were found to be oriented in the true compass directions shown in table 9.2.
Table 9.2 True azimuths measured at the double-walled circular structure at Yucca House Ruins

<table>
<thead>
<tr>
<th>Alinement (radial walls)</th>
<th>Azimuth (° T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>41</td>
</tr>
<tr>
<td>B</td>
<td>87.5</td>
</tr>
<tr>
<td>C</td>
<td>122.5</td>
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<tr>
<td>D</td>
<td>200.5</td>
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<tr>
<td>E</td>
<td>254</td>
</tr>
<tr>
<td>F</td>
<td>315.5</td>
</tr>
<tr>
<td>G</td>
<td>341.5</td>
</tr>
</tbody>
</table>

The radial-wall directions do not exhibit any obvious symmetry about the north-south directions, as might be expected if the structure were laid out astronomically. The 7 wall alignments define 14 compass directions; 5 of these come within 2° of where bright stars rose or set in A.D. 1200, the presumed date of construction for the structure. This is close to what could be derived by chance. The stars are Deneb (19), Vega (5), Arcturus (4), Antares (16), and Fomalhaut (18). The numbers in parentheses give the rank of the star in brightness; i.e., a rank of 1 indicates the brightest star visible at Yucca House, a rank of 2 indicates the second-brightest star visible, etc. One of the walls (Wall C) is laid out to within 2° of the direction of the sun’s rise at winter solstice (21 December) and of its setting at summer solstice (21 June). The compass readings obtained from investigations at the double-walled structure are illustrated in figure 9.17.

Figure 9.17 Graphic summary of measurements obtained at the double-walled circular structure, Yucca House Ruins. Letters correspond to alignments illustrated in figure 9.16.

Mud Springs (Toltec) Ruins

Within the cluster of crumbling roomblocks at this late Anasazi village (occupied about A.D. 1200) is a tri-wall structure first described by Holmes (1878:398) (fig. 9.18). Transit measurements were taken of the compass directions of 10 radial walls at this edifice (fig. 9.19).

Figure 9.18 The tri-wall structure at Mud Springs Ruins. Top: plan view of architectural unit incorporating tri-wall structure; bottom: sketch of tri-wall structure. (Adapted from Holmes, 1878:399.)

Directions given in table 9.3 are true bearings as measured from the center of the structure.

Walls A and E fall nearly on the north-south axis and may be significant in this regard. The alignment of Wall G, sighted toward the center of the structure, points to within 1° of the place of sunrise at summer solstice at the site. The opposite direction, sighted out from the center of the structure along the wall, points to the place of sunset at winter solstice. Wall B is nearly a continuation of Wall G, on the other side of the center, and thus it defines the same directions with regard to the sun. Wall I, sighted toward the
structure it seems unwise to presume that these are more than accidental. The measurements obtained from the structure are graphically illustrated in figure 9.20.

![Graphic summary of measurements obtained at the tri-wall structure, Mud Springs Ruins. Letters correspond to alignments illustrated in figure 9.19.](image)

**Figure 9.20**

Table 9.3 True azimuths measured at the Mud Springs Ruins tri-wall structure

<table>
<thead>
<tr>
<th>Alignment (radial walls)</th>
<th>Azimuth (°T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>62</td>
</tr>
<tr>
<td>C</td>
<td>82.5</td>
</tr>
<tr>
<td>D</td>
<td>131.5</td>
</tr>
<tr>
<td>E</td>
<td>179.5</td>
</tr>
<tr>
<td>F</td>
<td>202.5</td>
</tr>
<tr>
<td>G</td>
<td>241.0</td>
</tr>
<tr>
<td>H</td>
<td>254</td>
</tr>
<tr>
<td>I</td>
<td>298.5</td>
</tr>
<tr>
<td>J</td>
<td>331.5</td>
</tr>
</tbody>
</table>

Two great kivas have been reported by Pinkley at this large village (in Vivian and Reiter, 1965:105). The astro-astronomical reconnaissance was performed at the structure built on bedrock adjacent to Juarez Springs. Transit measurements were made of several alignments suggested by visible remnants of walls and features: the apparent axis (as defined by two entranceways spaced diametrically opposite on the circular, bounded structure) and a square of apparent footings for four main roof posts (fig. 9.21). Table 9.4 presents the true bearings based on these measurements. The axis of the structure is remarkably close to the north-south line—within about 2°, which is probably as closely as the entranceways, taken as measurement points, could be defined; that is, it could have been constructed with an exact north-south axis. Similarly, the four footing locations are laid out in a square whose sides are also remarkably close to the cardinal directions. The two north-south sides are within 1° of true north-south; one east-west side is within 3° and the other within 2° of the true east-west direction. The closeness to true cardinal directions is notable. Measurements recorded at the Goodman Point great kiva are graphically illustrated in figure 9.22.
Table 9.4 True azimuths measured at the great kiva, Goodman Point Ruins

<table>
<thead>
<tr>
<th>Alinement</th>
<th>Azimuth (°T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (through two entrance gaps in outer wall)</td>
<td>3-183</td>
</tr>
<tr>
<td>B (through western post supports)</td>
<td>178-358</td>
</tr>
<tr>
<td>C (through eastern post supports)</td>
<td>2-182</td>
</tr>
<tr>
<td>D (through northern post supports)</td>
<td>92-272</td>
</tr>
<tr>
<td>E (through southern post supports)</td>
<td>86-266</td>
</tr>
</tbody>
</table>

Yellowjacket Spring (Surouaro) Ruins

The site is a very large Pueblo II and Pueblo III habitation complex that has been described by several early explorers and archaeologists studying the area (Prudden, 1903:262-263; Fewkes, 1919:16-17). Compass readings were obtained from the large, southernmost room block at the site, approximately 600 m south of the “large mound in the village” described by Fewkes (1919:17) (fig. 9.23); the great kiva in the northern units was not measured because of the lack of visible alinements. Transit readings, obtained from the back and east walls of the structure, are graphically illustrated in figure 9.24. The back wall exhibits an orientation within 2° of the east-west line, while the east wall is oriented northwest to southeast (345° - 165° T). The almost exact east-west orientation of the back wall is perhaps significant and may reflect a deliberate preference by the builders.

SUMMARY AND CONCLUSIONS

The archaeoastronomical reconnaissance produced mixed results although several promising avenues for further study are suggested. Analysis of the measurements recorded at the two large late Pueblo I-early Pueblo II habitations (McPhee and Cline Crest Pueblos) reveal no
Astronomically significant alignments. The same conclusion can be drawn regarding the alignment of architecture at Little House (the Sagelten Flats Locality field house). Architectural alignments at all three sites appear to reflect a preference for maximum sunlight exposure; the room fronts face southeast and outdoor activity areas are to the south of roomblocks.

A comparison of wall alignments in the tri-wall structures at the Emerson and Mud Springs Ruins and in the similar structure at Aztec Ruins (the Hubbard Site [Vivian, 1959]) (fig. 9.25) suggests some possible architectural correspondences and astronomical alignments (table 9.5). Similarities are seen in three areas: number of outer rooms, angles between the radial walls of these rooms, and orientation of these walls.

The Hubbard tri-wall structure incorporates 14 outer rooms, 8 inner rooms, and a central kiva. Measurements of angles between radial walls at this structure, based on the original plan map (Vivian, 1959:6), average about 25° to 27°. True azimuths were not obtained for wall alignments because the exact orientation of the structure could not be determined; from the plan map (fig. 9.25) the orientation appears similar to the Emerson and Mud Springs structures. The plan maps for the Emerson tri-wall (figs. 9.10 and 9.11) suggest that 14 outer rooms might be present, if possible missing alignments are considered. This structure exhibits radial wall angles approximating the 25° to 27° figure obtained for the Hubbard tri-wall; discrepancies are noted for the angles between Walls C and E (37°), and I and J (35°), and J and K (54°). It is suggested that

Figure 9.23 Alignments measured at Yellowjacket Spring (Suroaro) Ruins: (A) back wall of roomblock in the southern units; (B) east wall of same roomblock.

Figure 9.24 Graphic summary of measurements obtained at Yellowjacket Spring Ruins. Letters correspond to alignments illustrated in figure 9.23.

Figure 9.25 Plan of the tri-wall structure at the Hubbard Site. (Adapted from Vivian, 1959:9.)
Table 9.5 Possible correspondences among radial walls of Anasazi tri-wall structures

<table>
<thead>
<tr>
<th>Hubbard Site</th>
<th>Emerson Ruins</th>
<th>Mud Springs Ruins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-9' — (26.5)'</td>
<td>A (010)' — (026)'</td>
<td>A (002)' — (40.5)'</td>
</tr>
<tr>
<td>9-10 — (27)</td>
<td>B (035) — (25)</td>
<td>B (062) — (60)</td>
</tr>
<tr>
<td>10-11 — (28)</td>
<td>C (062) — (27)</td>
<td>C (82.5) — (20.5)</td>
</tr>
<tr>
<td>11-12 — (27)</td>
<td>E (099) — (37)</td>
<td>D (131.5) — (49)</td>
</tr>
<tr>
<td>12-13 — (22.5)</td>
<td>G (127) — (28)</td>
<td>E (179.5) — (48)</td>
</tr>
<tr>
<td>13-14 — (27.5)</td>
<td>H (152) — (25)</td>
<td>F (202.5) — (23)</td>
</tr>
<tr>
<td>14-15 — (28.5)</td>
<td>I (178) — (26)</td>
<td></td>
</tr>
<tr>
<td>15-15a — (27.5)</td>
<td>J (213) — (35)</td>
<td></td>
</tr>
<tr>
<td>15a-16 — (14)</td>
<td>K (269) — (54)</td>
<td></td>
</tr>
<tr>
<td>16-17 — (26.5)</td>
<td>L (294) — (25)</td>
<td></td>
</tr>
<tr>
<td>17-18 — (24)</td>
<td>M (317.5) — (23.5)</td>
<td></td>
</tr>
<tr>
<td>18-19 — (28.5)</td>
<td>N (344) — (26.5)</td>
<td></td>
</tr>
<tr>
<td>19-20 — (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-21 — (20)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inside walls

1-2'
2-3
3-4
4-5
5-6
6-7
7-8
8-1

1Identifies rooms on either side of radial wall (fig. 9.25); azimuths not measured, as the exact orientation of Vivian’s map (1959:9) is uncertain.
2Wall alignments and true azimuths shown in figures 9.12 (Emerson Ruins) and 9.20 (Mud Springs Ruins).
3Angle (degrees) between this wall and next counterclockwise wall.

perhapse some walls were hidden and not measured, or the structure is not symmetrical in these locations. The plan map of the Mud Springs Ruins tri-wall structure, as presented by Holmes (1878:399) indicates 14 outer walls (fig. 9.18). This could not be substantiated during the archaeoastronomy reconnaissance and the wall angles appear ambiguous (table 9.3). Some of the angles are fairly close to 25° or multiples of that figure. The orientation of the radial walls is similar between the Mud Springs and Emerson structures (in table 9.5, note similarity between Emerson C and Mud Springs B, Emerson I and Mud Springs E, Emerson L and Mud Springs I, and Emerson M and Mud Springs J). A possible conclusion, based on these correspondences, is that tri-wall structures in the Northern San Juan Culture Area were similar in plan, with 14 outer rooms arranged in a symmetrical fashion and with similar orientations. Additional wall tracings and exact measurements would have to be obtained to verify or negate this hypothesis. Unfortunately, these correspondences could not be extended to other similar structures (the examples at Pueblo del Arroyo, Chacra Mesa, and on the San Juan River near Shiprock) described by Vivian (1959:61-79), either because alignment seemed in no way similar (the del Arroyo structure) or because the data needed were unavailable.

A comparison of the architecture of the tri-wall structures, the Yucca House double-walled circular structure, the Goodman Point great kiva, and the Yellowjacket Spring roomblock with potentially significant astronomical phenomena suggests that the latter may have been taken into account when the structures were built. The possible significant alignments are summarized in table 9.6.

Correspondences to true or cardinal directions (important in an astronomical sense in that, to an observer, the heavens would seem to revolve around the true north-south axis and to be perpendicular to the east-west axis) and
Table 9.6 Potentially significant alignments recorded during the archaeoastronomy reconnaissance

<table>
<thead>
<tr>
<th>Site/Structure</th>
<th>Alinement</th>
<th>Astronomical observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerson Ruins tri-wall</td>
<td>Wall C (62° T)</td>
<td>summer solstice sunrise/</td>
</tr>
<tr>
<td></td>
<td>Wall I (178° T)</td>
<td>winter solstice sunset</td>
</tr>
<tr>
<td>Yucca House</td>
<td>North-south walls</td>
<td>true north-south</td>
</tr>
<tr>
<td>Upper House</td>
<td>(F and H)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>East-west walls</td>
<td>true east-west</td>
</tr>
<tr>
<td></td>
<td>(E and G)</td>
<td></td>
</tr>
<tr>
<td>Yucca House</td>
<td>Wall C</td>
<td>winter solstice sunrise/</td>
</tr>
<tr>
<td>double-walled</td>
<td></td>
<td>summer solstice sunset</td>
</tr>
<tr>
<td>circular structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mud Springs</td>
<td>Walls A and E</td>
<td>true north-south</td>
</tr>
<tr>
<td>tri-wall</td>
<td>Walls B and G</td>
<td>summer solstice sunrise/</td>
</tr>
<tr>
<td></td>
<td>Wall I</td>
<td>winter solstice sunset</td>
</tr>
<tr>
<td>Goodman Point</td>
<td>Alinements A, B, C</td>
<td>true north-south</td>
</tr>
<tr>
<td>great kiva</td>
<td>Alinements D, E</td>
<td>true east-west</td>
</tr>
<tr>
<td>Yellowjacket Spring</td>
<td>Back wall (A)</td>
<td>true east-west</td>
</tr>
<tr>
<td>roomblock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solstice positions occur at several of the sites and probably represent deliberate positioning rather than happenstance (although this has not been statistically tested). The correspondence of Wall I at the Mud Springs tri-wall with the rising of Sirius is probably coincidence, as it is apparently an isolated event.

The data recovered during the reconnaissance thus suggest that the Anasazi may have considered astronomical phenomena in the orientation of certain structures. The data are not sufficient to generate definite conclusions; however, several hypotheses may be used to structure future archaeoastronomy studies undertaken in the area:

1. **Local**: In the vicinity of the Dolores River valley, Anasazi structures (rooms or pitstructures) built and occupied before A.D. 900 (those structures assigned to the Basketmaker III and Pueblo I periods) do not exhibit alignments corresponding to astronomical phenomena. Either prehistoric peoples during these periods were not cognizant of such phenomena or, more likely, solstices and cardinal directions were not afforded symbolic importance.

2. **Specialized structures**: Double- and tri-walls and great kivas occurring in later Anasazi (post-A.D. 1000) sites do exhibit alignments corresponding to astronomical phenomena. These alignments are also seen in certain large architectural units. The correspondence is to solstices and cardinal directions rather than to prominent star positions. This trend appears to be firmly established after A.D. 1100 and may indicate the presence in the Anasazi society of astronomical specialists who directed or were consulted concerning the construction of these structures.

3. **Double- and tri-wall structures** apparently exhibit the most astronomical correspondences. Certain alignments may be common to most such structures and may provide one line of evidence for evaluating the functional implications of these enigmatic units.

It is emphasized that these are preliminary hypotheses and have been formulated from a local perspective. They are only intended as aids for future studies. Obviously more data must be acquired and evaluated before more definite conclusions can be reached concerning the use of astronomical knowledge by the Anasazi.
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Vivian, G. R., and Paul Reiter
ABSTRACT

As a portion of the nonintensive investigations proposed for the Dolores Project Cultural Resources Mitigation Program in 1978, Dr. John A. Eddy of the Astrophysics Department, University of Colorado, and Allen E. Kane, program co-principal investigator, carried out a reconnaissance relating to possible knowledge and use of astronomy in southwestern Colorado Anasazi communities. Investigations were conducted at eight prehistoric sites: McPhee Pueblo (Site 5MT4475), Little House (Site 5MT2191), Cline Crest Ruins (Site 5MT2663), Emerson Ruins (Site 5MT4447), Yucca House, Yellowjacket Spring Ruins, Goodman Point Ruins, and Mud Springs (Toltec) Ruins. The data obtained during the reconnaissance were ambiguous; some structures exhibited no obvious astronomical alignments, while others revealed potentially significant alignments that are probably coincidental. More positive results were obtained from the tri-wall structures at Emerson Ruins, Yucca House, Mud Springs, and the great kiva at Goodman Point Ruins. Measurements recorded along wall lines indicated that these structures may have been oriented according to north-south cardinal directions and to the winter and summer solstices. Several hypotheses concerning the use of astronomical data by Anasazi communities in southwestern Colorado are presented. These formulations can be used as source material for further such studies in the area.
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