1992

Cultural Diversity & Adaptation: The Archaic, Anasazi, & Navajo Occupation of the Upper San Juan Basin

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CULTURAL DIVERSITY & ADAPTATION

The Archaic, Anasazi, & Navajo Occupation Of
The Upper San Juan Basin

Edited by
Lori Stephens Reed & Paul F. Reed

CULTURAL RESOURCES SERIES NO. 9, 1992
Cultural Diversity and Adaptation

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1992

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico
Foreword

The Four Corners area of the Southwest has fascinated professional and avocation archaeologists and laypeople since the turn of the century. Although lesser-known sites in southern Colorado and in the La Plata and Animas valleys of New Mexico were excavated, work in the Four Corners generally focused on the elaborate sites on Mesa Verde and in Chaco Canyon. Throughout the twentieth century, numerous research projects continued this emphasis. With the passage of cultural resource protection legislation, a multitude of small and often ephemeral sites were recorded and sometimes excavated prior to development projects. The Navajo Reservoir Project was certainly one of the most significant. In the 1970s, the exemplary research in Chaco Canyon overshadowed the many small projects that were adding sites to a growing archaeological data base and to the shelves of “grey literature” generated as a result of compliance by federal agencies with the National Historic Preservation Act. In the 1980s, the Dolores Project, itself a result of the compliance process, opened new doors to the interpretation of cultural resources in southwestern Colorado. Meanwhile small projects stemming primarily from widespread mineral development in the Upper San Juan Basin continued to expand the data base. In an insightful move, the State of New Mexico Archaeological Records Management System (ARMS) turned to a computerized data base to manage its exponentially growing site and project files. In 1992, the ARMS computer database included over 80,000 sites in New Mexico including 25,000 in the northwest part of the state. Although the data base grew rapidly over the years, most of the small sites it contained were ignored by southwest researchers in favor of the glamour of Chaco Canyon. At last, however, many of the papers in this volume are examples of how these resources (i.e., the ARMS data base and compliance-generated data) can be used to provide new interpretations of cultural adaptation and interaction in the Four Corners. In a workshop held at the 1992 Society for American Archaeology meetings, participants addressed the value of information derived from compliance-generated projects. We feel the analyses presented in this volume are excellent examples of what can be accomplished through contract archeology. As these papers demonstrate, the value of the compliance exercise cannot be doubted for its contribution to archaeology.

The Bureau of Land Management (BLM), administering more public lands and cultural resources than any other agency in New Mexico, takes pride in its compliance program. Most of the projects providing data for these papers stemmed from BLM’s adherence to the National Historic Preservation Act over the last 14 years, and more recently, its innovative approach to compliance and site management in the Navajo Reserve District.

These papers are only the beginning. With the implementation of a research design and data recovery program encompassing much of the Navajo Reserve District, the next five years of site mitigation will further expand our knowledge of the prehistory of this area, including Basketmaker, Pueblo, earliest Navajo, and historic Native American, Anglo, and Hispanic time periods. Sites in this region are significant, not just for the academic community, but also for Native people and visitors to the Four Corners area. In 1989, the Bureau of Land Management initiated a public outreach program entitled, “Adventures in the Past.” One of its objectives is to enlist public support for the management, interpretation, and protection of cultural resources.

As the data base continues to grow, we encourage interested scholars to consider opportunities now available through the BLM’s challenge cost share program. Cooperative projects are jointly funded and executed by the BLM and an outside partner. The New Mexico BLM currently sponsors nearly a dozen of these projects and provides anywhere, from $1,000 to $15,000 dollars per year to carry out the project. We are prepared to support long-term research which would provide vital information useful in the interpretation of New Mexico’s cultural resources. We are anxious to cooperate with you and, with your help, we can further explain the successes and failures of cultural adaptation in the Upper San Juan Basin over the past 1,000 years of occupation.

Lou Ann Jacobson
Stephen Fosberg

Preface

Recent work in the upper San Juan Basin has more than doubled the number of known sites, as well as excavated sites. Without exception, this work has modified and expanded long-held views of the Paleoindian, Archaic, Anasazi, and Navajo people who inhabited the area. The papers presented in this volume reflect these changes and represent the cutting edge of southwestern archaeology.

Tom Kearns presents a complete summary of the Paleoindian, Archaic, and Basketmaker II periods in the Upper San Juan Basin. Nancy Hambake takes on the unwieldy task of verifying the Sambrito phase through a discussion of the Oven Site. Shills and Dancer discuss the Loma Enchros Community, a predominantly Pueblo I period manifestation. Brown and Hancock argue convincingly for pushing the beginnings of the Navajo Diné phase back to A.D. 1,500. Reed and Reed provide a new perspective on Navajo/Pueblo interaction by using an alliance-based model. Jacobson, Fosberg, and Bewley utilize a GIS approach to explore the defensive systems associated with pueblos during the Gobernador phase. Cordell provides a summary paper (presented first in the volume) that encapsulates the papers presented and sets the tone for additional research in the area.

This volume is an outgrowth of a symposium held at the 56th annual meeting of the Society for American Archaeology in New Orleans in April 1991. The aims of the symposium were severalfold. First, we wanted to provide archaeologists working in the area with an opportunity to present the results of their research in a scholarly format. Second, we felt that the volume of work being completed in the area and the sheer accumulation of data demanded an outlet in a synthetic form that would be easily available to those interested. Lastly, we believed that the frequently overlooked upper San Juan Basin deserved greater visibility both in southwestern archaeology and at the national level.

Before the symposium was held, and especially after the papers were presented, we were sure we wanted to have the papers put together in published form. Thus, when LouAnn Jacobson and Steve Fosberg suggested the New Mexico BLM Cultural Resource Series as a publishing option, we welcomed the opportunity.

The overall success of the volume is a tribute to all of the contributors, who worked very hard to produce their papers. Although we consider the volume, successful, the task of interpreting the prehistory of the Upper San Juan Basin is by no means complete. In fact, as the volume goes to press, large-scale excavations are beginning on the Fruitland Coal Gas Project. Without doubt, the ideas presented here will be modified and refined as the data base expands as a result of this project. Nevertheless, these papers, in conjunction with previous work, particularly the Navajo Reservoir Project, provide a firm foundation for future research.

Lori Stephens Reed
Paul F. Reed
Acknowledgements

Many people contributed to the success of this volume. The Division of Conservation Archaeology (DCA) provided computer facilities, personnel time, and funding for the trip to New Orleans for the symposium. Byron Johnson, director of DCA, was particularly supportive and helpful. Leta Yazzie provided assistance with generating tables and initially typing several of the papers. Merry Lynn Brahant digitized many of the maps appearing in the papers and David Wagner assisted with computer graphics, data base development and management for several of the papers, and advice. Richard Corneliussen drafted the cover figure. Additional DCA employees who contributed to this volume in either technical support or advisory roles include Lynn Baca, Jan Allen, Penny Whitten, Jude Stern, and Joell Goff.

The Navajo Nation Archaeology Department also contributed funding for the symposium, as well as computer facilities. Kristen Langenfeld and Doug Dykeman read all of the papers and provided insightful comments. Jonathan Haas and Linda Cordell served as discussants for the symposium and Linda provided a paper for this volume. Jonathan was unfortunately unable to contribute a paper but his incisive comments are reflected in many of the papers.

LouAnn Jacobson and Steve Fosberg, in addition to writing a paper, provided us with the opportunity to publish the results of the symposium as a volume in the New Mexico Bureau of Land Management Cultural Resource Series, of which they are the series editors. Esther Sanchez prepared the tables and provided secretarial assistance during the BLM production of the volume.

Lastly, we wish to thank all of the participants, both of the symposium and those who also contributed written papers, for following our often tight schedule and responding cheerfully to our comments and those of our discussants and reviewers.

Lori Stephens Reed
Paul F. Reed

Contributors

Robert Bewley has a Masters degree in Geography from the University of New Mexico, Albuquerque. He is currently employed as the Chief of Mapping Sciences at the Bureau of Land Management, New Mexico State Office, Santa Fe, New Mexico.

Gary M. Brown holds a Masters degree in Anthropology from Arizona State University, Tempe. He is currently employed as a Cultural Resource Management Project Director at Mariah Associates, Inc., Albuquerque, New Mexico.

John D. Cater has a Masters degree in Anthropology from the University of Colorado, Boulder. He is currently employed as a staff archaeologist at Daggett and Chenault, Inc., Farmington, New Mexico.

Linda S. Cordell holds a Ph.D. in Anthropology from the University of California at Santa Barbara. She currently serves as Chair of the Department of Anthropology at the California Academy of Sciences in San Francisco.

Stephen L. Fosberg has a Masters degree in Anthropology from the University of New Mexico, Albuquerque. He currently holds the position of State Archaeologist at the Bureau of Land Management, New Mexico State Office, Santa Fe, New Mexico.

Nancy S. Hammack holds a Masters degree in Cultural Resource Management from the University of Arizona in Tucson. She is currently proprietor of Complete Archaeological Services Associates, Cortez, Colorado.

Patricia M. Hancock holds a Bachelors of Arts degree from the University of Illinois, Chicago Circle Campus. She is currently employed as a supervisory archaeologist with Moore Anthropological Research, Artec, New Mexico.

LouAnn Jacobson holds a Masters degree in Anthropology from the University of New Mexico, Albuquerque. She is currently employed as the Assistant State Archaeologist at the Bureau of Land Management, New Mexico State Office, Santa Fe, New Mexico.

Lori Stephens Reed has a Masters degree in Anthropology from New Mexico State University, Las Cruces. She is currently employed as a supervisory archaeologist and ceramic analyst at the Division of Conservation Archaeology, Farmington, New Mexico.

Paul F. Reed holds a Masters degree in Anthropology from New Mexico State University, Las Cruces. He is currently employed as a project director at the Navajo Nation Archaeology Department, Farmington, New Mexico.

Wm. Lane Shields holds a Bachelors degree in Anthropology from the University of Missouri, Columbia. He is currently employed as a staff archaeologist at Daggett and Chenault, Inc., Farmington, New Mexico.
<table>
<thead>
<tr>
<th>Table of Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreward</td>
</tr>
<tr>
<td>Preface</td>
</tr>
<tr>
<td>Acknowledgements</td>
</tr>
<tr>
<td>Contributors</td>
</tr>
<tr>
<td>List of Tables</td>
</tr>
<tr>
<td>List of Figures</td>
</tr>
<tr>
<td>Wellspring of the Anasazi, Home of the Navajo</td>
</tr>
<tr>
<td>The Preceramic Archaeology of the Upper San Juan River in Northwest New Mexico and Southwest Colorado</td>
</tr>
<tr>
<td>The Oven Site, LA 4169: A Reevaluation Based on Recent Excavations</td>
</tr>
<tr>
<td>The Cedar Hill Project: An Anasazi Frontier</td>
</tr>
<tr>
<td>The Dinetah Phase in the La Plata Valley</td>
</tr>
<tr>
<td>The Protohistoric Navajo: Implications of Interaction, Exchange, and Alliance Formation with the Eastern and Western Pueblos</td>
</tr>
<tr>
<td>Navajo Defensive Systems in the Eighteenth Century</td>
</tr>
<tr>
<td>References Cited</td>
</tr>
</tbody>
</table>
List of Tables

The Preceramic Archaeology of the Upper San Juan River in Northwest New Mexico and Southwest Colorado

Table 1. Distribution of all study area components from west to east (Colorado and New Mexico) ................. 15
Table 2. Distribution of New Mexico components from west to east ................................................. 15
Table 3. Distribution of Colorado components from west to east ..................................................... 16
Table 4. Radiocarbon dated preceramic sites in the upper San Juan River study area (uncalibrated) .............. 23
Table 5. Relative percentage of study area site types by component .................................................. 34

The Oven Site, LA 4169: A Reevaluation Based on Recent Excavations

Table 1. Number of pits per pit base diameter range, LA 4169 .......................................................... 45
Table 2. Estimated volume of pits per pit base diameter range, LA 4169 .............................................. 52
Table 3. Estimated person year equivalents of shelled corn per pit base diameter range, LA 4169 .............. 52

The Protohistoric Navajo: Implications of Interaction, Exchange, and Alliance Formation with the Eastern and Western Pueblos

Table 1. Distribution of site by type .................................................................................................... 94
Table 2. Number of sites with Eastern Pueblo ceramics by site type .................................................. 95
Table 3. Number of sites with Western Pueblo ceramics by site type ............................................... 96
Table 4. Number of sites with obsidian and associated ceramics by site type .................................. 97
Table 5. Distribution of sites containing Gobernador Polychrome in association with Puebloan ceramics 98
Table 6. Distribution of sites lacking Gobernador Polychrome, but having other ceramic types ...... 100

Navajo Defensive Systems in the Eighteenth Century

Appendix 1. Pueblos without line-of-sight ....................................................................................... 128
Appendix 2. Pueblos with line-of-sight ............................................................................................. 130
Appendix 3. Pueblo line-of-sight field tested .................................................................................... 135
**List of Figures**

The Preceramic Archaeology of the Upper San Juan River in Northwest New Mexico and Southwest Colorado

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Map showing location of the Upper San Juan study area</td>
</tr>
<tr>
<td>2</td>
<td>Map showing distribution of preceramic sites</td>
</tr>
<tr>
<td>3</td>
<td>Frequency of preceramic components in Colorado, New Mexico, and the total study area</td>
</tr>
<tr>
<td>4</td>
<td>Map showing distribution of Paleoindian and Early Archaic sites</td>
</tr>
<tr>
<td>5</td>
<td>Map showing distribution of Middle Archaic sites</td>
</tr>
<tr>
<td>6</td>
<td>Map showing distribution of Late Archaic sites</td>
</tr>
<tr>
<td>7</td>
<td>Map showing distribution of Basketmaker II sites</td>
</tr>
<tr>
<td>8</td>
<td>Intensity of Archaic and Basketmaker II presence in the Upper San Juan</td>
</tr>
<tr>
<td>9</td>
<td>Intensity of Archaic and Basketmaker II components by T4M zone in the Upper San Juan</td>
</tr>
<tr>
<td>10</td>
<td>Intensity of Radiocarbon dated Archaic and Basketmaker II sites from east to west</td>
</tr>
<tr>
<td>11</td>
<td>Relative percentage of Paleoindian and Early Archaic components from east to west</td>
</tr>
<tr>
<td>12</td>
<td>Relative percentage of Other and Unknown Archaic components from west to east</td>
</tr>
<tr>
<td>13</td>
<td>Relative percentage of Basketmaker II components from west to east</td>
</tr>
</tbody>
</table>

The Oven Site, LA 4169: A Reevaluation Based on Recent Excavations

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting of the 1987 excavations at the Oven Site; Navajo Reservoir at the confluence of the San Juan and Piedra rivers, looking north</td>
</tr>
<tr>
<td>2</td>
<td>Site plan map, 1962-1963 excavations at LA 4169 (Eddy 1966:216, Figure 26)</td>
</tr>
<tr>
<td>3</td>
<td>Location map, 1962-1963 and 1987 excavations, LA 4169</td>
</tr>
<tr>
<td>4</td>
<td>Site plan showing locations of pits and burials, LA 4169, 1987 excavations</td>
</tr>
<tr>
<td>5</td>
<td>LA 4169 pits excavated in 1987, looking west</td>
</tr>
<tr>
<td>6</td>
<td>Excavated pit with subfloor, LA 4169</td>
</tr>
<tr>
<td>7</td>
<td>Storage pit at Utsili Site, LA 493, showing superimposition of Rose phase trash midden and burial. After Schouwetter and Eddy 1964: Figure 17</td>
</tr>
<tr>
<td>8</td>
<td>Ceramic assemblages from burials, LA 4169, 1987 excavations</td>
</tr>
<tr>
<td>9</td>
<td>Plan view and cross-section, Pit 1, Burial 3, LA 4169, 1987 excavations</td>
</tr>
<tr>
<td>10</td>
<td>Estimated dates for Sambrite phase sites, calibrated and adjusted for old wood</td>
</tr>
</tbody>
</table>

The Cedar Hill Project: An Anasazi Frontier

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Map showing location of project area</td>
</tr>
<tr>
<td>2</td>
<td>Map showing spatial extent of Rosa phase</td>
</tr>
<tr>
<td>3</td>
<td>Map showing spatial extent of Piedra phase</td>
</tr>
<tr>
<td>4</td>
<td>Map showing spatial extent of Arboles phase</td>
</tr>
</tbody>
</table>

**List of Figures (continued)**

The Dinébáh Phase in the La Plata Valley

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location of La Plata Mine on the east side of the middle La Plata Valley in northwestern New Mexico</td>
</tr>
<tr>
<td>2</td>
<td>Plan map showing burned remains of a Dinébáh phase brush structure (Feature 9) associated with two extramural hearths (Features 2 and 4), LA 1848, Block A, Structure 1</td>
</tr>
<tr>
<td>3</td>
<td>Plan map of Dinébáh phase forked-pole hogan (Feature 3) in Block A and superimposed hearth series (Feat re 8-4D) in Block D, LA 61852 Block A, Structure 1</td>
</tr>
<tr>
<td>4</td>
<td>Buried remains of a Dinébáh phase forked-pole hogan, LA 61852, Block A, Structure 1</td>
</tr>
<tr>
<td>5</td>
<td>Plan map showing burned remains of a Dinébáh phase forked-pole hogan (Structure 1) and associated dump (Feature 2) and hearths (Features 7, 8, and 9), LA 61852, Blocks A (left) and B (right)</td>
</tr>
<tr>
<td>6</td>
<td>Plan map of Dinébáh phase forked-pole hogan (Structure 1), LA 61852, Block A, after exposure of floor materials (compare Figure 5)</td>
</tr>
<tr>
<td>7</td>
<td>Plan map and profile of Dinébáh phase forked-pole hogan (Structure 3/Feature 5), LA 61852, Block E, after exposure of floor materials</td>
</tr>
<tr>
<td>8</td>
<td>Buried remains of a Dinébáh phase forked-pole hogan excavated to floor level, LA 61852, Block C, Structure 2 (Feature 4). View is to the northwest with roasting pit incorporated into the north wall of the hogan</td>
</tr>
<tr>
<td>9</td>
<td>Internal features in Dinébáh phase activity area, LA 61858, Block C</td>
</tr>
<tr>
<td>10</td>
<td>Partially reconstructed Dinébáh Gray (La Plata variety) vessel recovered from Structure 1, LA 61852</td>
</tr>
<tr>
<td>11</td>
<td>Selected projectile points from Dinébáh phase contexts.</td>
</tr>
</tbody>
</table>

The Protohistoric Navajo: Implications of Interaction, Exchange, and Alliance Formation with the Eastern and Western Pueblos

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Map showing distribution of Navajo sites in the study area</td>
</tr>
<tr>
<td>2</td>
<td>Distribution of Eastern and Western Pueblo ceramics by site type</td>
</tr>
<tr>
<td>3</td>
<td>Distribution of Gobernador Polychrome and associated Eastern and Western Pueblo ceramics by site type</td>
</tr>
<tr>
<td>4</td>
<td>Distribution of Rio Grande Glazedware and associated Gobernador Polychrome ceramics by site type</td>
</tr>
</tbody>
</table>

Navajo Defensive Systems in the Eighteenth Century

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pueblo architectural elements at Three Corn Pueblos, LA 1871, include door lintels, a viguilla and lailing ceiling, and plastered masonry walls</td>
</tr>
<tr>
<td>2</td>
<td>Kin Yachi, LA 2433, perched on top of a sandstone monolith, with far-reaching views to the south and east</td>
</tr>
<tr>
<td>3</td>
<td>Standing forked stick hogan at Old Fort Ruin, LA 1869</td>
</tr>
<tr>
<td>4</td>
<td>Cross-section of GIS data showing intrusions into the line-of-sight between two pueblos, LA 55829 and LA 12929</td>
</tr>
<tr>
<td>5</td>
<td>Cross-section of GIS data showing clear line-of-sight between LA 12929 and LA 2137</td>
</tr>
<tr>
<td>6</td>
<td>Lines-of-sight between tree-ring dated pueblos</td>
</tr>
</tbody>
</table>
List of Figures (continued)

Navajo Defensive Systems in the Eighteenth Century (continued)

Figure 7. Location of recorded Navajo pueblos in GIS study ................. 117
Figure 8. Lines-of-sight between pueblos ........................................ 119
Figure 9. Number of sites vs. number of rooms (sites with and without views) ...................... 120
Figure 10. Number of sites visible vs. average number of rooms ................... 120
Figure 12. Features (sites with and sites without views) ................................ 121
Figure 13. Old Fort Ruin, LA 1869: a large pueblo and forked stick hogan complex built on a wide mesa bench. 123

Wellspring of the Anasazi,
Home of the Navajo

Linda S. Cordell

The Upper San Juan Basin of northern New Mexico and adjacent Colorado is an area of great natural beauty. The mountain streams and forests attract thousands of tourists each year. Visitors also come to see its justly famous archaeological sites. Most travelers go to Mesa Verde but many also explore Aztec Ruin, Salmon Ruin, and the Anasazi Heritage Center. For visitors and professional archaeologists alike, the Upper San Juan is the hearth and heartland of Anasazi culture. Although known to fewer people, Dinetah, the source of Navajo culture, is located in this area as well.

The richness of the Anasazi ruins in the Upper San Juan was explored and made famous in the early twentieth century when exhibitions of Basketmaker remains were organized at the American Museum of Natural History in New York, and articles on the early Anasazi appeared in National Geographic Magazine (see Lister and Lister 1968; Morris 1925). The Upper San Juan became known as the cradle of Basketmaker and Pueblo culture, although there was often confusion among the public about how the Basketmakers and Pueblos were related to each other or how each is related to modern Pueblo Indians rather than to the Navajo.

Sometimes in parallel with tourist exploration of the Upper San Juan, at other times preceding it, there has been prospecting for and subsequent mining of the region's minerals and damming of its rivers for flood control and irrigation. Pipelines have been built to transport water and fossil fuels. Roads, rail and power lines, essential for regional development, have been constructed. Accompanying these projects, there has been survey, excavation, and reporting of archaeological finds. The first major contract project in the Upper San Juan Drainage was the Navajo Reservoir Project (Eddy 1966), one of the earliest salvage archaeology projects anywhere in the Southwest. The Navajo Reservoir Project was begun in 1956 and concluded in 1968. It was therefore contemporary with, and financially partially overshadowed by, the Glen Canyon Project in Utah and Arizona. The Navajo Reservoir Project was lead by Drs. Alfred E. [Ed] Ditert and Frank Eddy, and it is a credit to them that they provided a solid base for the immediately subsequent work in the region as well as for the newer work that is reported here. As the title of these brief remarks suggests, I hope to look at the research reported in this volume in terms of various questions about the origins of the two major cultural traditions, Anasazi and Navajo, rather than to their subsequent development. The focus on origins seems to me to be at the heart of the contributions made in the studies presented here. In my remarks, I hope to provide some perspective for continued appreciation of the contributions of the Navajo Reservoir Project and subsequent work.

Before the Navajo Reservoir Project, particularly through the work of Earl Morris, A. V. Kiddler, Kiddler and S. Guernsey, Frank H. H. Roberts, Paul Martin, George Pepper, and for Chaco Canyon, the work of Neil Judd, Clyde Kluckhohn, Harold Gladwin, and others, there was a good, basic understanding of Anasazi cultural development in the northern San Juan Basin (see Lister and Lister 1968; Vivian 1990). That understanding was of a gradual development of the “Full Pueblo” Anasazi out of a Basketmaker [Basketmaker II] and pre-Pueblo [Basketmaker III] base. San Juan and Chaco branch Anasazi were interpreted as spatially and culturally differentiated variants of the same general culture. At some sites, such as Aztec Ruin and Lowry Ruin, both variants seemed to be represented sequentially, although why or in what cultural context the sequential occupations took place was not elaborated. In general, both the San Juan and Chaco branches were seen as ancestral to the modern
Pueblo Indians of New Mexico and Arizona. The two most salient cultural changes in the sequence, the degeneration of the Anasazi into great pueblo structures and the abandonment of the region, were explained by reference to climatic change, particularly arroyo cutting and drought, and the first intrusion of Anasazi peoples ancestral to the Navajo. Areas outside the San Juan core were treated as local, generally impoverished, and peripheral versions of either the San Juan or Chaco Anasazi. Innovations during the sequence were usually attributed to migrations from other regions.

When Dittert and Eddy began the program in the Navajo Reservoir District, they easily could have focused on simply developing a local sequence for their project area that would fit into the general scheme outlined above. In fact, however, Dittert and Eddy defined three broad problem areas and their implications for survey and excavation. The first was environmental; the second dealt with the cultural sequence; and the third concerned distributional studies. The environmental program examined the relation of the river flood plain to agriculture and shifts in the locations of settlements over time. Most of the environmental work was tremendously successful. It provided some of the first evidence of the shifting settlement patterns subsequently described in detail by Stuart and Gauthier (1988) and see Vrion 1990). These studies document changes in the locations of settlements as they alternate between highlands and lower elevations and between upstram and down­stream situations. The alternations are underlain by long-term environmental cycles of aggregating and cutting of arroyo flood plains and the effects of these on prehistoric agriculture.

The chronological questions concerned culture history, distribution, and development of a local sequence of phases. The sequence is both widely used and severely criticized. Among the problem areas is the definition and dating of the Sambrito phase and its relationship to Anasazi prehistory. A second issue of contention concerns defining and dating the Dinétah phase and the origin of the Navajo people today the largest Indian tribe in the United States.

The third of Dittert and Eddy's research interests, distributional studies, had to do with the geographic distributions of the Los Pinos, Arboles, and Dinétah phases and their appearance outside the Navajo Reservoir Project area. I suspect that the remaining two frontier research domains would have focused on defining the cultural interactions among peoples of the Colorado Plateaus during the temporal intervals defined by the phases. As such, it remains a major topic of study. In all, it is a remarkable tribute to Dittert and Eddy that so much of what they accomplished provided such a solid beginning for understanding the prehistory of the Upper San Juan. The papers in this volume build on this base. Some papers offer refinements or modifications of the arguments, based on new data, but the debt to the Navajo Reservoir Project is clear.

Foraging, limitation of the Navajo Reservoir studies (Dittert 1966), archaeological attention shifted away from the Upper San Juan to the central San Juan Basin. During the 1970s and 1980s, major projects were conducted in Chaco Canyon (see Lekson et al. 1988; Vivian 1990), at the large Chacoan Outlier of Salmon Ruin (Irwin­Williams and Shelley 1980), at the smaller Chacoan Outliers of Guadalupe Rupe (Pippen 1987) and Bis sa'si (Breternitz et al. 1982), and on the system of roads and outlet settlements scattered throughout the basin (Lekson et al. 1988; Marshall et al. 1979; Powers et al. 1983). Some of this work was "pure" academic research. Much more of it was related to the region. These studies bring a number of new concepts to the integration of their data. Over the past 15 years, a truly enormous amount of work, professional and amateur, has been carried out in the Upper San Juan Basin. The impressive amount of data that has accumulated is a major feature of the research described in this volume. For example, the data base of Navajo sites that Reed and Reed (this volume) develop for their work contains an astounding 1100 site records. In the brief remarks that follow, I hope to highlight the new data and conceptual frameworks and to present new data and ideas into perspective within the context of some current issues in Southwest archaeology.

For the Preceramic period in general, Kears (this volume) brings together far more data from the Upper San Juan than I would have expected. Despite his concerns about the quality of the data, he makes a strong case for the paucity of sites that have been excavated. Kears' total of 498 preceramic components is a large data base by any standard. In addition, because his data do not include diagnostic ceramic lithic scatter, Kears suggests that the 498 components actually underrepresent the number of preceramic loci in the region. Kears uses his data to begin to evaluate some of the dynamics of Paleocinadian and Archiac use of the region.

The kinds of patterning Kears' chapter explores concern the differential use of his study area over time. He finds support for Stuart and Gauthier's (1988) observation that the earlier (Cloris, Folsom) phase(s) of the Sambrito, with its associated habitation and skilled labor went into the Chaco system. Why the system developed where it did, how it lasted for as long as it did, and how it was structured are questions that are still being debated.

The focus on Chaco and its potential role in regional prehistory has seemingly eclipsed other areas of research. For example, although excellent research relating to Navajo archaeology was produced during the 1970s and 1980s (e.g., Brugge 1986; Kelley 1986), and there was a general interest in ethnohistory, style and social boundaries (e.g., Auger et al. 1987; Earle and Preucel 1987), the contemporary origins of the Navajo people was not a focus of study.

The work reported here is novel in two respects. First, it makes use of large data bases that were just not available years ago. Second, it represents a deliberately organized strategy to is be expected with a increase in the use of horticulture. Alternatively, as I comment on below, the same change may simply relate to an increase in sedentism, based on stored wild foods, rather than horticulture.

A key issue for the preceramic, and for later times, is that of continuity. Initially, Dittert and Eddy defined three phases of the Pueblo period based on their survey and on the work of others outside the immediate area. In the Los Pinos, Arboles phases dated to a span of 350 years from A.D. 300 to 850. A gap, indicating a break in occupation, was thought to separate this Pueblo period from the preceding Los Pinos phase (the local Basketmaker II), which had not been assigned to a time period. Subsequently, Eddy defined the Sambrito phase on the basis of excavation and analysis. It was dated between A.D. 400 and 700. The Los Pinos phase was placed between A.D. 1 and 400 (Eddy 1986:671-515). Therefore, defining and dating the Sambrito phase eliminated the proposed gap in occupation and the sequence, broken, over a period of one thousand years.

Michael Berry (1982) raised questions about the Sambrito phase as a whole, and he has questioned whether or not the Anasazi sequence in general.
sodic. He argued that gaps in the sequence of chronometric dates were periods of drought during which the Anasazi abandoned the Plateaus for refuge areas. In both the southern Basin and Range Province. Berry also attributed cultural interactions to the changes among peoples that occurred in the refuge areas during these intervals. With respect to the Upper San Juan specifically, Berry noted a lack of dates between Archaic and early Basketmaker peoples. He also found the evidence for the Sambrito phase unconvincing, contending that a hiatus occurred between Basketmaker III and Basketmaker IV and between Pueblo I and Pueblo II.

Other scholars, who note gaps in the record of building and occupation events on the Colorado Plateau, endorse Berry's inferences about population movement to refuge areas and subsequent return with a modified cultural inventory. Plog (1985), Upham (1984), and Dean et al. (1985) suggest that the record reflects the episodic nature of much cultural change, the punctuated timing of such, and changes in strategies of adaptation that are also differentially visible to the archaeologists. For example, alternating strategies are sometimes characterized as reflecting adaptive differentiation as regional population increase, as producing strong vs. weak patterning and being resilient or hierarchical (Plog 1985).

It is clear that the data are not adequate to resolve all the continuity questions as phrased by Berry and the other investigators, the evidence presented in this volume supports continuity within the Archaic, and between Basketmaker II and Basketmaker III. The very tight clustering of dates reported here (Hammack, this volume) from LA 4169, falls within the Sambrito phase and therefore contradicts the notion of a hiatus in occupation at that time. The radiocarbon dates reported by Kears and Hammersmark for Archaic sites support the inference of continued occupation. The Archaic dates are not from structural wood. Therefore they presumably date people's living in or using the area rather than episodes of building. Building might or be appear to be episodic from the archaeological perspective for any number of reasons that do not involve migrations of Anasazi from the Plateaus to the southern basin and range regions. Finally, the number of Archaic components increases over time which is consistent with our ideas about populations developing in situ.

Returning to Kears' (this volume) suggestion, that an increase in diversity in types of projectile points and sites may relate to a shift to a logistic strategy accompanying an increase in the importance of horticulture, may help us begin to evaluate some recent ideas about the nature of Archaic adaptations. The use of disparate terminology for projectile point forms is unfortunately confusing because the name mask distinctions between potential stylistic and functional variation. Nevertheless, the names suggest that it would be worthwhile to explore patterning in reported points in point morphology over time. Such a study would allow estimation of the amount of stylistic variation in the Early, Middle, and Late Archaic in the area, which might support or refute: Wills (1988) suggestion that stylistic diversity increased at the end of the Middle Archaic, indicating competition and boundary formation just prior to the acceptance of cultivars rather than to increased importance of horticulture per se. If so, the increase in diversity of site types could relate to the people using the area for a broader range of foraging activities than previously believed. The excavations at LA 4169 and the recovery of the Oven Site (Hammack, this volume) are crucial for our understanding of the early periods of Anasazi occupation of the northern Southwest. As Hammack indicates, the surface indications at LA 4169 were sparse and misleading, suggesting only small Piedra and Navajo components. Sites of ritual activities such as those at the Middle of the Dolomite phases site recently excavated on Black Mesa (Plog 1986:69-75). In both cases, there are no surface indications of multiple hearths, storage cists, roasting pits, and bell-shaped storage structures eventually excavated. The great disparity between surface and subsurface material has undoubtedly caused us to underestimate, perhaps vastly, the size and intensity of Basketmaker occupation specifically in these areas, if not more generally. The problem of low site visibility for Basketmaker sites argues strongly for sub-surface testing programs and for rethinking our models of Basketmaker group size, mobility strategies, and subsistence activities.

Half of the Basketmaker II components reported by Kears (this volume) contain architecture. In addition, the size of the storage pits and evidence of cultigens among their contents at LA 4169 suggest greater sedentarism and use of crops at relatively higher elevations in the Upper San Juan than most models propose for this period. Although it is obviously premature to speculate, perhaps the proximity of the Upper San Juan (and perhaps Black Mesa) to the boundary between which maize production is precluded by short growing seasons might have increased storage earlier and in greater amounts than in the central Mogollon Highlands, the area with which Wills (1988), for example, is most concerned. North of the San Juan Basin, beyond the physical limits of maize cultivation, hunting and gathering peoples were well-established, and even with the early sparse population, presented a barrier to expansion of groups from the south. The hunting and gathering niche north of the Upper San Juan was filled. With any increase in population size and specialization in the Archaic, the only viable solution in the Upper San Juan may have been a "precocious" dependence on stores. This behavior would entail innovations such as pithouses, that would easily be visible to the archaeological as well as storage pits that would be less so. Once again, however, the ideas proposed are testable.

As I indicated above, the past two decades witnessed a single-minded Chaco-centric view of the Anasazi of the San Juan Basin as a whole. This is unfortunate for two reasons. First, whatever the Chaco system may be in terms of its organization and complexity, it ultimately must be understood in the context of the development of most of modern Pueblo culture, we need to focus more on the success stories. These are likely to be seen in the adaptation reflected at sites at the Mesa Verde, the northern San Juan Basin, the Jemez Mountains, the Chama Valley, and the Pajarito Plateau. Second, both the extent of the impact of Chaco on its region and some insight into how it functioned, must be explored by looking at the contemporary, smaller sites scattered through the Upper San Juan and elsewhere. The work of the Cedar Hill Project, particularly the discussion of the Loma Enbro Community (Shields and Cater, this volume) is most relevant in the San Juan Basin.

Shields and Cater (this volume) describe communities that are "nucleated" around large pithouses and whose population is of local origin. They consider these communities to be at the frontier of a variety of situations: physiographic, hydrologic, climatic, and social. The local population of the project area is described as having been in interaction differentially with the regions surrounding it, affiliating more strongly with some populations at some times than with others. These characterizations would seem to preclude them from being interpreted as Chacoan outliers, despite their occurrence in the literature, (i.e. Lekson 1991), there has been a tendency to label every nucleated Anasazi settlement a Chacoan outlier of some sort. This kind of over-generalization has caused some scholars to question the existence of an integrated Chacoan system (Wheat 1983).

Characterizing the way in which communities such as Loma Enbro (Shields and Cater, this volume) were organized, and how they sustained themselves in this way, can as producing strong vs. weak patterning and being resilient or hierarchical (Plog 1985).

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phase. With respect to the Dinetah phase, it is Dittert's original sequence that is validated. Brown and Hancock's contribution indicates the importance of obtaining radiocarbon and other kinds of dates as part of routine analytic procedures. Their investment in obtaining dates and their careful evaluation of dates from a variety of sites confirms a pre-Revolt Dinetah and became differentiated at the context and edge, in using the concept of alliances reflected in culture and archaeology in order to better understand the origins of patterning in Anasazi archaeology to develop a context for understanding the early Navajo. The success of this endeavor is most encouraging. The 'Reed's' use of alliance formation forces us to look at the context and type of interactions between linguistically, biologically, and ethnically different peoples. Their discussion makes the movement of Pueblo peoples into Dinetah during and after the Pueblo Revolt, not only plausible but logical. The Reed's analysis of Gobernador Polychrome as a Navajo product in part because this pottery is a mix of Rio Grande and Hopi wares, design styles, and motifs, in my opinion, is truly insightful. Finally, their thoughtful consideration of how alliances develop over time provides an important perspective for a variety of inferences about Navajo-Pueblo interaction.

As is the first to point out, Jacobson et al.'s (this volume) analyses of pueblos and defense in Dinetah raise more questions than answers. As with the Reed's discussion (this volume), emphasis is shifted away from assumptions about form and function in architecture and other artifacts to that of the context of interactions among Navajo, Spaniard, Pueblo, and Ute. The emphasis on context reveals the fact that Pueblos were built when Navajo and Spaniard were at peace with one another. That this was also a time of maximum Ute raiding and of the greatest increase in Navajo dependence on livestock are both important to any overall solutions about the functions of Navajo pueblos. Jacobson et al. (this volume) have given us a carefully considered argument that may allow us to better evaluate a variety of interpretations about Navajo and Ute and about defensive systems in general.

In sum, as I hope my title suggests, the papers in this volume are primarily concerned with the origins or beginnings of archaeologically identified patterns. These include the beginnings of settlement in general, in the Upper San Juan, the beginnings of the Anasazi sequence, the start of nucleated settlement in the Cedar Hill area, and more broadly the origins of the Navajo.

It is pleasing to me that conclusions from the earlier work of the Navajo Reservoir Project have been substantiated. The nature and timing of the Sambritos and Dinetah phases, at either end of the sequence, must now be reincorporated into our thinking when we plan projects or write summaries of prehistory. As a group, the papers force us to think about the context of the various patterns we take for granted in our summaries. As we move into another period of archaeological research, there are a number of lessons at pragmatic and theoretical levels that these chapters bring forward. We must be concerned with the lack of visibility of features for both the late Archaic and Basketmaker periods as well as for the Protohistoric Navajo. Subsurface testing and a battery of dating techniques should become routine parts of many projects. Complete metric analysis of projectile points and other lithic tools is essential. We must also consider the cultural as well as the natural environmental contexts of the behaviors we wish to understand. Within what setting and circumstances did the Anasazi emerge from the Archaic hunting and gathering? Within what context of trade and other forms of interaction with Pueblo peoples did recognizable patterns of Navajo culture emerge? Within what context were the Archaic and Navajo patterns of land use similar? These are multifaceted problems with a variety of potential answers about which the contributors to this volume encourage thought and discussion.
The Preceramic Archaeology of the Upper San Juan River in Northwest New Mexico and Southwest Colorado

Timothy M. Kearns

Introduction

The San Juan River has its headwaters along the west flank of the Continental Divide in the San Juan Mountains of southwest Colorado. From this majestic setting opposite the headwaters, the Rio Grande, the San Juan flows generally westward roughly 400 km (248 miles) to its confluence with the Colorado River. The San Juan River watershed was intensively occupied by the prehistoric past and is one of the most archaeologically rich areas of the American Southwest. The San Juan River drains the heartland of the Mesa Verde and Chaco branches of the Anasazi and flows through the Dinetah or traditional homeland of the Navajo.

It is the primary drainage for the northern portion of the Navajo Nation and its tributaries cut through the Jicarilla Apache, Southern Ute, Ute Mountain, Navajo, and Paiute territories. Although a substantial database has been built for the ceramic period in this region and despite almost a century of archaeological investigation, the preceramic occupational history of, and adaptive responses to, the Upper San Juan River region of northwest New Mexico and southwest Colorado, have only recently become subjects of interest. This paper summarizes the previous Paleoindian, Archaic, and Basketmaker II research in the San Juan River area from the La Plata River on the west to the headwaters in the San Juan Mountains on the east (Figure 1). The summary is followed by an appraisal of the current database and an evaluation of preceramic chronology, cultural affiliation, site distribution, and site types.

Setting

For this discussion, the Upper San Juan River includes that portion of the San Juan River watershed from the Continental Divide near Wolf Creek and Piedra passes in the San Juan Mountains downstream to its confluence with the La Plata River in the northern San Juan Basin of northwest New Mexico; and from the northern edge of Gallegos Mesa on the south to the San Juan-La Plata County, Colorado border on the north (Figure 2). For management purposes the data base was defined by the following UTM coordinates:

- SW - Zone 12 740000E 406000N
- NE - Zone 13 350000E 417000N
- NW - Zone 12 740000E 417000N
- SE - Zone 13 350000E 406000N

The Upper San Juan River is fed by a series of major tributaries including the Navajo, Piedra, Los Pinos (Pine), Florida, Animas, and La Plata rivers draining south from the mountains of southwest Colorado; and the Bancos, La Jara, Gobernador, Largo, and Gallegos canyons draining west and north from the mesa country of northwest New Mexico. Elevations range from roughly 1616 m (5300 feet) at the La Plata-San Juan confluence to over 3658 m (12,000 feet) along the Continental Divide above the river's headwaters. The lower elevations are characterized by desert scrub vegetation grading, with increasing elevation, into pithon-juniper woodland,
Figure 1. Map showing location of the Upper San Juan study area.

Adapted from U.S.G.S maps Cortez, Shiprock, Aztec, Durango
Figure 2. Map showing distribution of preceramic sites.
mountain scrub or oak-scrub, ponderosa pine-Douglas fir, and culminating in dense spruce-fir and aspen forests below the alpine tundra and tree line. This mountainous upland provides a cooler, more mesic setting than the lower San Juan Basin and the San Juan and Luis Valley to the east. The study area hosts a wide variety of floral and faunal resources which vary in location and availability with season and elevation. Floral resources potentially important to hunter-gatherer populations include grass and annual seeds at lower elevations, pine nuts and miscellaneous berries and fruits in the pinyon-juniper uplands, acorns in the oak belt, and the inner bark of various conifers in the higher reaches. In addition to a wide variety of small- to medium-sized mammals which occur throughout the area, pronghorn antelope and bighorn sheep would have been important game animals of the Pueblo era, and elk would have been important game animals in the forested uplands. The latter follow a general seasonal migration pattern from the mountains during the summer to the lower pinyon-juniper belt during the winter and their abundance and accessibility is expected to have influenced hunter-gatherer settlement and subsistence strategies (e.g., Ware 1981). Specific riverine resources including sedges, cattail, willow, cottonwood, and a host of roots, tubers, berries, and other floral resources would have additionally influenced preceramic group settlement, subsistence, and scheduling along the Upper San Juan River. Migratory waterfowl may also have had an important seasonal resource.

Previous Research

The earliest documentation of archaeological resources in the Upper San Juan area was by the Escalante Exploration Party in 1776 (Chavez 1976). Although they noted the presence of Puebloan ruins further west, they failed to document archaeological sites in the study area. In the late 1800s, Marcos Canyon and Mesa Verde were to the west of the study area, Chaco Canyon to the south, the lower La Plata River (e.g., the Holmes group), Aztec Ruins by the Animas River, and other Pueblo ruins along the San Juan River near Bloomfield and Farmington became focal points of interest for antiquities collectors and more scholarly researchers. Legitimate research on the Anasazi ruins began during this period and continues today. Within the study area, landmark research was conducted in the initial decades of the twentieth century by Morris (1919a) in the La Plata Valley and environs, by Roberts and Jacon (Roberts 1930) along the Piedra River, and by Morris (1919b) at Aztec Ruins.

In the early 1940s, Renau (1942a, 1944) proposed the existence of a pre-Puebloan "Upper Rio Grande Culture" based on studies in the San Lain Valley and the upper Rio Grande River immediately east of the study area. Definition of this "culture" was based on surface collections and limited excavations and represents a lumping of what are now identified as temporally differentiated Jay, Bajada, and San Jose point styles under one designation, "Rio Grandes Points" (Renau 1943b). Although Morris discussed Basketmaker I in his La Plata District Monograph (Morris 1939), formal documentation of a preceramic or pre-Puebloan occupation in the study area did not occur until Flora, Morris, and Burgh's 1938-1940 excavations at the Basketmaker II sites of Talus Village and Falls Creek Shelters near Durango, Colorado (Morris and Burgh 1954). Morris and Burgh's (1954) excavations solidly established the presence of Basketmaker II populations in the study area coupled with evidence for the earliest domestic structures in the northern Southwest. These included 13 house floors at the Falls Creek Shelter and 38 house floors at Talus Village and provided the earliest tree-ring dates for the Southwest at that time. Subsequent work in the early 1950s included Ferrigino and Wendorf's (1956) Basketmaker II site excavations at Ignacio, Colorado. No absolute dates were reported for this open architectural site, so the Basketmaker II designation was made on the basis of the architectural features, lithic assemblage, storage facilities, and absence of ceramics. Between the 1960s and 1960s, recognition of preceramic cultural complexes was occurring elsewhere in the southern Southwest (e.g., Bartlett 1943; Bryant and Touloise 1945; Campbell and Ellis 1952; Moho and Sample 1952; Moho and Sample 1952). Although this work included the identification of the "Gallupos Culture" in the upper La Plata Valley and the divide between the La Plata and Animas rivers (Fetterman and Honeycutt 1990; Hancock et al. 1988; Karlson and Biggs 1985). New insights into the prehistory of the Upper San Juan River is an anticipated result of the Animas-La Plata Project, a reservoir and canal system planned for the divide between the Animas and La Plata rivers (Fetterman 1989); and the cultural resource management projects associated with the exploitation of the coal gas resources within the Fruitland Formation in the southwestern New Mexico and southwestern Colorado (Hogan et al. 1991). Archaeological re-connaissance and testing associated with both these projects has provided significant new information relating to the preceramic occupation of the Upper San Juan River. Both projects are ongoing and significant data pertaining to the preceramic occupation of the Upper San Juan River should be forthcoming in the next few years.

More recent survey and excavation projects generally use Irwin-Williams' (1973) Oshara Tradition sequence developed in southwestern New Mexico, if they are to assign phase designations to Archaic sites. Less common, although with increasing frequency, is the use of Schroedl's (1978) Utah-Focused Northern Colorado Plateau Archaic phase sequence for Archaic sites in the general vicinity of the study area. Additionally, some researchers use phase designations derived from the Cochise Cultural Tradition of the southern Southwest (Sayles 1983; Sayles and Antevs 1941) or the Navajo Reservoir phase sequence (Dittett et al. 1961).

Data Base

The current data base is derived from the aforementioned research and cultural resource management projects. The study area cross-cuts the state boundaries of Colorado and New Mexico and is organized in two different data sets and organizational schemes were, of necessity, utilized. These include the Archaeological Records Management (ARM) data base encompassing the sites within New Mexico and managed by the Laboratory of Anthropology, and the Colorado site database managed by the Colorado Archaeological Survey. These two site record systems are differentially organized, therefore some data categories were not comparable and specific data sets had to be
modified to fit. For example, the ARMS data base uses a system which provides a general period category and a specific phase designation for up to three time periods, whereas the Colorado system is oriented toward a general period category without a phase designation. To accommodate the two state data sources, and UTM Zone changes, and to better visualize the distribution of the various preceramic components, the study area was divided into five areas running west-to-east and subdivided north-south along the Colorado-New Mexico State line (see Figure 2). The west-to-east divisions are divided along UTM easting coordinates and are approximately the same size; that is 30 km wide. The two western sections, however, are slightly smaller at 27 km and 28 km wide. The Colorado sections are roughly 45 km north-south while the New Mexico sections are roughly 35 km north-south. Although meshing the two state data bases proved to be a challenging task, certain sets of information relevant to the prehistory of the Upper San Juan River have been formulated.

The current data base is derived primarily from surveys supplemented with information from only a handful of excavated sites. These data must be regarded as tenous. For example, Moore and Anderson (1993) note that excavations at Gallegos Mesa in northwest New Mexico revealed that roughly 50 percent of the sites identified during surveys were assigned to the wrong temporal component or represented by more components than initially recorded. The majority of the preceramic components in the study area have been identified on the basis of surface artifacts, specifically projectile points. Excluding the illicit collection of points by collectors, one of the critical stumbling blocks for understanding the preceramic occupation of the Upper San Juan River is the confusion and lack of consistency evident in projectile point identification. Point designs include general morphological descriptions (e.g., large corner-notched or side-notched), Great Basin types (e.g., Elko Series), Oshara Tradition types (e.g., San Jose, Armijo), Northern Colorado Plateau Archaic Tradition types (e.g., Sudden Side-notch, San Rafael Side-notch), Cochise Complex types (e.g., Chihuahua-Cocheis, and McKean Complex types (e.g., Hanna). Many of these types overlap or are stylistically very similar (e.g., Pinto and San Jose points), some are ambiguous, and others are inappropiate for the study area. Another potential skewing factor is the problem of multicomponent sites or sites that represent palimpsests of multiple-use episodes. The temporal affiliation of these sites is frequently based solely on projectile point style and often on a single specimen. These sites can represent the cumulative residue of both differing temporal periods and diverse functions.

Therefore, the observations presented in this paper are considered tentative and subject to revision as additional data become available.

The Upper San Juan data base currently (i.e., as of March 1991) contains 498 preceramic components within the roughly 15,590 sq km study area. Two hundred thirty-two of these components are within the roughly 5075 sq km New Mexico portion and 266 are within the roughly 10,875 sq km Colorado portion (Tables 1, 2, and 3). Roughly one-third of these sites (154) are categorized as Unknown Archaic and lack period or phase designations (Tables 1, 2, and 3). The Unknown Archaic sites are included in the data base as a generic preceramic temporal category. Although the rationale for assigning many of these sites to the Archaic period is not explicitly stated and some of the Unknown Archaic sites may date to earlier or later periods, it is highly probable that the preceramic data base is underrepresented. That is, many of the myriad sites recorded as unknown or undetermined lithic scatters, and which are not included in the current data base, are probably preceramic in age. Although some researchers identify these unknown lithic scatters as a priori Archaic sites, the unknown lithic scatter sites are not included in the current data base because of the ambiguity inherent in their temporal affiliation.

The data base does contain 344 preceramic components identified by period. Considerably fewer of these components are assigned phase designations (e.g., San Jose, Armijo, En Medio, Los Pinos). Most of the phase designations are derived from the New Mexico ARMS data base where the Oshara, Cocheis, and Navajo Reservoir phase sequences are included in the coding system. Although the lack of adequate excavation data has precluded the development of a preceramic phase sequence for the Colorado portion of the study area, some of the Colorado sites do fit into the Oshara and Navajo Reservoir

### Table 1. Distribution of all study area components from west to east (Colorado and New Mexico).

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Pale-Indian</th>
<th>Early Archaic</th>
<th>Middle Archaic</th>
<th>Late Archaic</th>
<th>BMII Archaic</th>
<th>Other Unknown</th>
<th>Archaic Total</th>
<th>Other Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>#</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>9</td>
<td>44</td>
<td>2</td>
<td>69</td>
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<tr>
<td>(740000E to 767000E)</td>
<td>%</td>
<td>0</td>
<td>0</td>
<td>8.15</td>
<td>6.67</td>
<td>32.59</td>
<td>1.48</td>
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<tr>
<td>Zone 13A</td>
<td>%</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>17</td>
<td>58</td>
<td>10</td>
<td>37</td>
</tr>
<tr>
<td>(232000E to 259999E)</td>
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<td>0</td>
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<td>5.88</td>
<td>12.50</td>
<td>42.65</td>
<td>7.35</td>
</tr>
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<td>Zone 13B</td>
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<td>5</td>
<td>5</td>
<td>59</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>(260000E to 289999E)</td>
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<td>0</td>
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<td>0</td>
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<td>21.25</td>
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<td>10</td>
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<td>18</td>
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<tr>
<td>(320000E to 350000E)</td>
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<td>0</td>
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<td>16.13</td>
<td>22.58</td>
<td>6.45</td>
<td>14.52</td>
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<tr>
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<td>62</td>
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<td>23</td>
<td>154</td>
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<tr>
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<td>27.95</td>
<td>4.62</td>
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### Table 2. Distribution of New Mexico components from west to east.

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<thead>
<tr>
<th>Geographic Area</th>
<th>Pale-Indian</th>
<th>Early Archaic</th>
<th>Middle Archaic</th>
<th>Late Archaic</th>
<th>BMII Archaic</th>
<th>Other Unknown</th>
<th>Archaic Total</th>
<th>Other Total</th>
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<tr>
<td>Zone 12</td>
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<td>0</td>
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<td>49</td>
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<td>(740000E to 767000E)</td>
<td>%</td>
<td>0</td>
<td>0</td>
<td>11.11</td>
<td>6.17</td>
<td>20.99</td>
<td>1.23</td>
<td>60.49</td>
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<td>1</td>
<td>3</td>
<td>7</td>
<td>12</td>
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<td>22</td>
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<td>(232000E to 259999E)</td>
<td>%</td>
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<td>0</td>
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<td>8</td>
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<td>4</td>
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<tr>
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</tr>
<tr>
<td>(320000E to 350000E)</td>
<td>%</td>
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<td>0</td>
<td>7.69</td>
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<td>11.54</td>
<td>3.85</td>
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<tr>
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<td>6.47</td>
<td>37.07</td>
<td>3.88</td>
<td>42.24</td>
<td>100.00</td>
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</table>
sequences. Because an insufficient number of sites have been assigned phase designations, however, the preceramic components are divided into seven general temporal periods or categories (see Tables 1, 2, and 3). These include the Paleoindian, Early Archaic, Middle Archaic, Late Archaic and Basketmaker II temporal periods, along with Other Archaic and Unknown Archaic generic categories. The relative frequency of occurrence of the various components within the study area is illustrated in Figure 3.

Paleoindian

The Paleoindian period is represented by eight components totaling only 1.6 percent of the preceramic components. These components are widely distributed across the study area (Figure 4) and include three Folsom, one Folsom-Midland (?), one Midland, one Plano or late Paleoindian, and two components not specifically identified. Five Paleoindian components are incorporated into multicomponent sites with Archaic or Anasazi associations. One of the unspecific Paleoindian sites and two Folsom sites are lithic scatters, and one of the latter is associated with a historic site. These sites are supplemented by a possible Folsom-Midland point base from RIDGEs Basin (REYNOLDS and LOOFE 1987:330), one isolated Clovis point found south of Durango (USFS curation record), two isolated Folsom point fragments in the Navajo Reservoir District (Dittert et al. 1961:172, 173, 205; Dykeman 1985), and a reworked Eden point recovered from a Basketmaker III pithouse floor in the PLATa Valley (Hancock et al. 1988-471, 472). Also, although not associated with any diagnostic artifacts, an uncalibrated radiocarbon date of 8210 ± 170 B.P. (63629 ± 170 B.C.) was recently obtained during a pipeline monitoring in the Navajo Reservoir District (Rsed 1989). Four additional Paleoindian occurrences are reported from the San Juan Mountains in the Colorado portion of the study area (York 1991). These include two isolated projectile points identified as Alberta and Hell Gap, Lind Coulee or Alberta points, another point identified as Alberta-like, and a point identified as resembling a Pryor Steinned, Meserve, or Dalton point. The latter two points are from multicomponent sites. If these identifications are accurate, they represent isolated specimens far removed from the normally accepted area ranges for those point styles. Clovis, Folsom, Plano, and Cody Complex points have been noted in the adjacent San Juan Basin (e.g., ANDERSON and Gilpin 1984; Judge 1982) and San Luis Valley (e.g., Button 1987:1941, 1943; Jodry 1987; Swancara 1955; Weimer 1989). However, only one Hell Gap point has been reported from the San Luis Valley (Button 1987:179) and one possible Hell Gap point has been reported from northeast Arizona (Judge 1982; Morris 1958), and no Alberta, Lind Coulee, Pryor Steinned, Meserve, or Dalton points have been documented in the region. A more parsimonious explanation is that the two Alberta, Hell Gap, or Lind Roulle specimens are actually Jay points and the “Alberta-like” specimen is either a Jay or late Paleoindian lanceolate point. Also, the use of fine-grain black basalt for the latter specimen is not characteristic of Paleoindian lithic selection. These points are distinguished by relatively straight to only slightly convex bases (York 1991:Figures 6 and 7) and may conform to Jerry Dawson’s “Middle” or “Late” Jay styles (Judge 1982:23).
Figure 4. Map showing distribution of Paleolndian and Early Archaic sites.
Study area supports addition to a least three at relatively higher elevations. Otherwise undiagnostic component population in the study area and divided by the occurrence sites~ (1988:28-33)

Colorado contains on the west (1988:28-33) of the Basin south of the study area (Hadlock 1962; 1973) . Possible Folsom sites in the west of the study area (Hayes et al. 1981:23; Judges 1982:16, 23; Reher 1977:29, 30; Reynolds et al. 1984; Stuart and Gauthier 1988). It is possible that the San Juan River and tributaries provided a natural corridor for travel or exchange for these Folsom populations. Evidence for interaction or travel between the two regions is provided by the occurrence of Washington Pass chert, a distinctive lithic material from the Chuska Mountains on the west flank of the San Juan Basin, on Folsom sites in the San Luis Valley (Joddy 1987).

Early Archaic

The Early Archaic period dates roughly between 7950 B.P. (6000 B.C.) and 5150 B.P. (3200 B.C.) and corresponds with the Jay and Bajada phases of the Osha tradition (Irwin-Williams 1973). It is represented by 14 components, 12 in Colorado and two in New Mexico (see Tables 1, 2, 3). These comprise only 2.8 percent of the total component population in the study area and include two possible "Paleoindian or Early Archaic sites" in Colorado and one in New Mexico. In addition to a "late Paleoindian-Early Archaic bifacial point base" from a multicomponent site, the New Mexico sample includes one Jay point from a multicomponent site and a Bajada point from an otherwise undiagnostic lithic scatter. The Colorado sample includes the two possible "Paleoindian-Early Archaic" sites, both multicomponent, one Jay point from a multicomponent site, five unspecified Early Archaic components at multicomponent sites, and two unspecified Early Archaic single component sites. As Figure 3 illustrates, there are relatively fewer Early Archaic sites in New Mexico (0.9 percent) than in Colorado (4.5 percent). These sites are distributed across the study area (see Figure 4). In addition to those sites identified via projectile points, there is one uncalibrated Early Archaic radiocarbon date of 5840±150 B.P. (3890±150 B.C.) from a recent monitoring project (Reed and Walle 1992). Another site, SML45, in Piedra Pass above the San Juan River headwaters (Reed 1981), yielded an uncalibrated radiocarbon date of 7860±190 B.P. (5910±190 B.C.) and a series of two radiocarbon dates obtained from the same point type, Park Lake Point, ranging from roughly 6475±15 B.P. (4495 B.C.) to 5202 B.P. (3222 B.C.) (Reed 1981:59) suggests that the earliest dates are too early.

The 14 designated Early Archaic components within the study area may represent an over-inflated figure. Some of the designations are made on point types of dubious Early Archaic affiliation (e.g., Reynolds and Loose 1987), and two Paleoindian-Early Archaic examples may be Paleoindian. Also, 10 of the points are in multicomponent sites and may have been recycled prehistorically.

During the initial phase of data collection it was anticipated that evidence for adaptive response to the Altithermal would be expressed by greater numbers of Early Archaic components in the study area uplands. Using data primarily from the Continental Divide region west of Boulder, Colorado, Benedict (1979, 1981) has hypothesized an Altithermal "mound-building program." Benedict (1979) proposes the occurrence of two major Altithermal droughts, one at 7000 to 6500 B.P. (5450 to 4950 B.C.) and another at 6500 to 5000 B.P. (4050 to 3500 B.C.). He envisions Early Archaic hunter-gatherers retreating from the plains and plateaus into the more mesic mountain uplands during these periods. The current data indicate, however, that the Upper San Juan area did not function as a similar mountain refugium during the Early Archaic. The relative paucity of Early Archaic components is in contrast to the lower San Juan Basin and to the upper Rio Grande Valley where Early Archaic sites, while not numerous, are well represented (e.g., Button 1987; Judge 1982:26; Renaud 1942a, 1942b, 1944)

Tentatively, however, and may simply reflect the relative intensity of survey coverage. The apparent scarcity of Early Archaic components in the Upper San Juan area does appear to support the model of specialized versus generalized adaptations via-a-via upland resource used proposed by Stuart and Gauthier (1988:28-33) for Paleoindian and Early Archaic groups. The small number of Early Archaic sites, however, and their frequent association with multicomponent sites negates meaningful discussion regarding site type, land use patterns, and interregional relationships. It seems likely, however, that Early Archaic populations were not routinely exploiting the Upper San Juan area.

Middle Archaic

There are 48 components assigned to the Middle Archaic period: 18 from New Mexico and 30 from Colorado (see Tables 1, 2, 3). These components essentially fall between 5150 B.P. (2000 B.C.) and 3750 B.P. (1800 B.C.), and correspond roughly to the San Jose phase of the Osha tradition. In addition to the identified components, there are six radiocarbon dates obtained from recent monitoring projects in the study area (Havel 1990; Randolph and Reed 1990; Reed 1981; Whitten 1988). These dates range from 4900±180 B.P. (2950±100 B.C.) to 3590±100 B.P. (2000±100 B.C.). Although not associated with diagnostic Middle Archaic artifacts, these dates are indicative of the increased presence of hunter-gatherer populations in the study area during the Middle Archaic.

The Middle Archaic sites are distributed throughout the study area; the greatest number of them occur in the uplands of Colorado with major concentrations noted on the divide between the La Plata and Animas rivers and east of the Piedra River (Figure 5). These components constitute almost 10 percent of the study area sample and represent a dramatic increase over the preceding Early Archaic period (see Figure 3). This increase corresponds closely with the general increase in San Jose phase sites documented for the San Juan Basin.
Figure 5. Map showing distribution of Middle Archaic sites.
Late Archaic

The Late Archaic is identified as that period from roughly 3700 B.C. (1800 B.C.) to 2750 B.C. (800 B.C.) and corresponds to the Armijo phase of the Osha tradition. The En Medio phase of the Osha tradition, considered by some to be Late Archaic, is grouped in this paper with the Basketmaker II component. Although the En Medio phase begins prior to the commonly cited beginning of the Basketmaker II period, Irwin-Williams (1973) considered it the Arroyo Cuervo equivalent to Basketmaker II. Also, elsewhere in the northern Southwest where linked to a strong reliance on corn agriculture, Basketmaker II beginnings are being re-evaluated (e.g., Smiley and Parry 1990) and more closely correspond to the En Medio phase dates (i.e., 3200 to 800 B.C.-A.D. 400).

A total of 62 Late Archaic components are documented in the study area; 15 from New Mexico and 47 from Colorado (see Tables 1, 2, 3). Late Archaic sites represent roughly 13 percent of the study area preceramic components. Propor tionately, however, there are a greater number of Late Archaic sites in Colorado than New Mexico (see Figure 3). There are also six radiocarbon dates from this period (see Table 4) ranging in age from 3420±60 B.C. (1470±60 B.C.) to 2730±80 B.P. (780±80 B.C.). These data indicate that although Archaic populations were increasing over the previous period, there was not a dramatic increase in population density within the study area during this period. Elsewhere in the San Juan Basin (Brancard 1983; Kremer 1982) and in southeast Utah (Kearns 1990), the Armijo phase appears to have been a period of general population decline. Hogan (1985), however, has argued that there was heavy use of the uplands along the northeastern edge of the San Juan Basin during the Armijo phase. Also, Fuller (1988:344) notes that the use of large base camps in the Animas-La Plata region intensified between 2000 B.C. and A.D. 1.

The distribution of Late Archaic sites in the study area (Figure 6), in part, supports these arguments. Although there appears to have been a slight decrease in the numbers of high altitude sites during the Late Archaic, this period is well represented in the Animas-La Plata region, the Navajo Reservoir District, and in the intervening area. Late Archaic populations also continued to use the same general area east of the Piedra River that had been exploited by Middle Archaic groups.

Other Archaic

There are 23 components in the Upper San Juan study area that are included in an "Other Archaic" category, 9 from New Mexico and 14 from Colorado (see Tables 1, 2, 3). These components are identified by the presence of non-Osha tradition projectile points and represent 4.6 percent of the study area sample (see Figure 3). The projectile points that identify the Other Archaic components are typically variations of large side-notched dart points that include specimens identified as Chiricahua-Cocheche, Sudden Side-notched, Northeast Side-notched, and San Rafael Side-notched. Often the identifications of these points overlap or conflict with other and specimens identified as San Rafael, Sudden, or Northern Side-notched have frequently been lumped as Chiricahua-Cocheche and vice versa. The lack of consistency in the identification of these points makes interpretation difficult. Compounding the problem is the identification of some of these points as Navajo (Chapman 1977-80), Gallina (Ellis 1988), or Piedra Lumbre phase (Schaasfma 1979), all post-Archaic manifestations. They appear to represent Middle to Late Archaic (cf., Copeland 1985; Ehret et al. 1979; Fetterman and Hucnbeet 1982; Gipin 1984; Hue et al. 1978:50) and possibly Basketmaker II artifacts, and have been noted in association with diagnostic Middle and Late Archaic Osha tradition points (e.g., Fuller 1988:280; Reed 1979; Winter et al. 1986). Bronner and Ireland (1984) date the "Chiricahua" points from the Jicarilla Reservation to roughly 3000 to 3500 B.C. (3000 to 1500 B.C.). A point identified as a Cochise point by Vogler et al. (1984:341) from excavations on Gallegos Mesa south of the study area is associated with a 5300 B.P. (3250 B.C.) date. Hogan et al. (1991) identify this specimen as a Sudden Side-notched point. Hogan et al. (1991) also note that radiocarbon dates from the Bolack Exchange funds south of Farmington associate the San Rafael Side-notched style point with a 3900 B.P.
Table 4. Radiocarbon dated preceramic sites in the Upper San Juan River study area (uncalibrated)* (continued).

<table>
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<th>Site</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
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<td>A.D. 210±150</td>
<td>LA 4257</td>
<td>Eddy 1961</td>
</tr>
<tr>
<td>A.D. 220±80</td>
<td>5LP478</td>
<td>Fuller 1988</td>
</tr>
<tr>
<td>A.D. 250±60</td>
<td>LA 37972</td>
<td>Foster 1983</td>
</tr>
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<td>A.D. 260±150</td>
<td>LA 4257</td>
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<td>A.D. 270±80</td>
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<td>Fuller 1988</td>
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<td>Fuller 1988</td>
</tr>
<tr>
<td>A.D. 310±90</td>
<td>LA 4289</td>
<td>Eddy 1961</td>
</tr>
<tr>
<td>A.D. 320±80</td>
<td>5LP478</td>
<td>Fuller 1988</td>
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<td>Havel 1990a</td>
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<td>A.D. 370±60</td>
<td>LA 52397</td>
<td>Kearns 1988a</td>
</tr>
<tr>
<td>A.D. 380±60</td>
<td>DCA-88-251</td>
<td>Reed 1989</td>
</tr>
<tr>
<td>A.D. 390±80</td>
<td>DCA-88-251</td>
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<td>A.D. 430±100</td>
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<td>Fuller 1988</td>
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<td>A.D. 470±120</td>
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<td>Eddy 1966</td>
</tr>
<tr>
<td>A.D. 530±80</td>
<td>LA 4289</td>
<td>Eddy 1961</td>
</tr>
<tr>
<td>A.D. 560±170</td>
<td>Uells Site (possibly noncultural)</td>
<td>Eddy 1966</td>
</tr>
</tbody>
</table>

*Data adapted from Whitten (1992).

(1950 B.C.) structure. Two other medium-sized, side-notched points identified as resembling Southern Side-notch or San Rafael Side-notched points are associated with a Basketmaker II site south of Durango. These points are associated with radiocarbon dates of 2390±70 B.P. (440±70 B.C.) and 2090±70 B.P. (140±70 B.C.) respectively (Fuller 1988;278, 280). Another point identified as a Southern Side-notched specimen had been previously collected from the same site (Fuller 1988:276).

Hogan et al. (1991) and others (e.g., Marshall 1985) consider these large side-notched points more diagnostic of the Northern Colorado Plateau Archaic Tradition (Schroedl 1976) than the Cochise Culture. Hogan et al. (1991) note that in the northern San Juan Basin, these point types appear to have their highest density on the northeastern periphery, an area that equates well with the study area, and in the north-central part of the basin (Hogan and Vierra 1990). They argue that the distribution of the large side-notched points contrasts to the distribution of San Jose points and suggest that they may be indicative of an Archaic Tradition distinct from the Oshara. The presence of these “other” point types in the study area may be underrepresented in the current data base. Some site records document the presence of large side-notched points yet fail to provide illustrations or descriptions. The available data do indicate, however, that there are two distinct clusters of these point types in the study area. One cluster falls within the Animas-La Plata divide and equates well with observations made during the Animas-La Plata Project surveys that large side-notched points were common occurrences (Fuller 1989:280; Winter et al. 1986). The second cluster occurs along the eastern periphery of the study area along the western flank of the Continental Divide and equates well with the occurrence of “Chiricahua-Cochise” points in the Jicarilla Reservation (Broster and Ireland 1984).

The association of these point types with an intrusion of Northern Colorado Plateau Archaic or Cochise Archaic groups has yet to be demonstrated. At least one of the large side-notched points lumped into this group appears to be a
Figure 6. Map showing distribution of Late Archaic sites.
distinctive San Juan Basin style (e.g., Chapman 1977:Figure 11.11; fourth row left) and, aside from a flaring concave-base side-notch form (e.g., Dick 1965:26-27; Irwin-Williams 1979:Figure 9), most of the published Chiricahua-Cochise points resemble stemmed indented-base points found with San Jose or Armijo phase sites (e.g., Sayles 1983:120). Points similar to those included in this group are found in the northern Rio Grande region (Klager 1980; Thoms 1977), in southeast Colorado (Linz and Anderson 1989), and along the Front Range (e.g., Benedict 1975; Benedict and Olson 1978). Also, a number of these points from the study area appear to be made from Jemez Mountains obsidian. Gilpin (1984:295), discussing the occurrence of Chiricahua-Cochise points in the San Juan Basin, notes that rather than being a southern manifestation, side-notched points appear to be most common in the Rocky Mountains, the Colorado Plateau, and the Rio Grande Valley. It is possible, given their presence along the northeastern periphery, that these points or their makers were coming into the San Juan Basin and adjacent uplands from the northeast or east.

**Basketmaker II**

As discussed here, the Basketmaker II period ranges from ca. 800 B.C. to A.D. 500 and combines early, or pre-A.D. 1, and late, or post-A.D. 1, Basketmaker II components under a single heading. This includes components identified in the site records as Basketmaker II, En Medio, En Medio-Basketmaker II, San Pedro-Basketmaker II, and Los Pinos. A total of 189 Basketmaker II components was identified in the Upper San Juan study area; 97 in New Mexico and 92 in Colorado (see Tables 1, 2, 3). This represents roughly 38 percent of the pReceramic component sample and marks a dramatic increase in the number of components over previous periods (see Figure 3). In addition, in the study area there are 22 radiocarbon dates ranging between 620±60 B.C. and 60±90 B.C. that correspond to an early Basketmaker II period and 29 radiocarbon dates between A.D. 30±60 and A.D. 560±170 that correspond to a late Basketmaker II period (see Table 4). Even though the Basketmaker II sample contains the greatest number of pReceramic sites, it may be underrepresented. For example, following excavations in the Bodo Canyon area south of Durango, Fuller (1988:351) identified a set of "Basketmaker II signatures" which, in various combinations, includes:

1. An absence of ceramics.
2. A high frequency of cracked igneous cobbles removed from their natural context.
3. The presence of burned popcorn-sized adobe daub.
4. Basketmaker II-style projectile points: broad, large corner-notched points with prominent tangs.
5. Magnetometer data indicating structures on aceramic sites.

Using these criteria, Fuller (1988:351) identified 20 possible Basketmaker II site components from the Ridges Basin-Bodo Canyon area which had not been identified as Basketmaker II sites by the original site recorders. These sites, and presumably similar sites, are not included in the current Basketmaker II data base.

Although the Basketmaker II components are widely scattered throughout the study area, over 80 percent occur in the western half and there are at least four areas where Basketmaker II sites form discrete clusters (Figure 7). These clusters include a major concentration of habitations, temporary camps, and other site types along the lower Los Pinos River and adjacent San Juan River in the Navajo Reservoir District. This area corresponds to the core area of Los Pinos phase sites identified by Dittert et al. (1961) and Eddy (1961, 1966). Other Basketmaker II site concentrations occur in the upper Gobernador Canyon and La Jara Canyon uplands southeast of Navajo Reservoir, in the middle La Plata River Valley, and on the Animas-La Plata divide. These areas are mid-elevation settings (i.e., 5800-7200 feet) in piñon-juniper and sage-dominated environs.

Although not adequately illustrated in Figure 7, the current data (Fetterman and Honeycutt 1981, 1982, 1990; Fuller 1988, 1989; Winter et al. 1986) indicate that the Animas-La Plata divide from just south of the Colorado-New Mexico border north to Hesperus and Durango was another major Basketmaker II settlement area comparable to the Navajo Reservoir District. It is also apparent that another focus of Basketmaker II
Figure 7. Map showing distribution of Basketmaker II sites.
settlement occurred in the Ignacio-middle Los Pinos region. Based in the work of an avocational archaeologist, Eddy et al. (1984:76) report that Basketmaker II cobbled ring sites cover not only the entire middle reach of the Los Pinos River but also extend north almost to Vallecitos Reservoir. Eddy (1966, 1972) has suggested that the Los Pinos Basketmaker II population center was in the Bayfield-Ignacio area, and that the Navajo Reservoir District settlements are south of the primary area of occupation. Although the Basketmaker II cluster site in the upper Gobernador-La Jara Canyon area was apparently an important focal point for resource extraction, it does not currently appear to have been a key Basketmaker II habitation. Only 2 out of 17 sites in this area have evidence of architecture; the remainder are open linear clusters of the camps.

Almost half of the Basketmaker II sites in the study area have evidence of architecture and represent a significant departure from the earlier settlement patterns. Also, as noted by Eddy et al. (1984) and Fetterman and Honeycutt (1990), the location of many of the Basketmaker II settlements are in areas where today the short growing season makes corn agriculture a tenuous undertaking. Finally, the distribution of Basketmaker II settlements in the study area closely corresponds to the distribution of the subsequent Basketmaker III settlements.

Chronology and Cultural Affiliation

Two of the major problem domains of the preceramic archaeology of the study area are chronological and cultural affiliation. There is presently no clear understanding of the chronology and cultural affiliation of the groups who occupied the Upper San Juan region prior to the emergence of sedentary Basketmaker III populations. This is due in part to the lack of sufficient excavation data, particularly from well-stratified contexts, and in part due to the lack of a local projectile point sequence. Based on projectile point styles from dated contexts, there is little to no evidence of a Paleolithic occupation in the study area may have begun as early as 11,500 to 11,000 B.P. (Clovis period), intensified between 11,000 and 10,000 B.P. (Folsom period), and continued (albeit less intensively) during the subsequent Early Archaic period. The relatively few sites and the questionable context of some of the diagnostic points restrict the evaluation of the timing and duration of the Paleolithic occupation in the study area. Cultural affiliation of the Paleolithic occupants is similarly difficult to assess given the limited data base.

Many researchers use the Oshara Tradition phase sequence outlined by Irwin-Williams (1975) for the Arroyo Cuervo region of northwest New Mexico to organize Archaic period sites in the study area. As recently noted by Fuller (1988), however, the data used in which this sequence was built have not been published and, increasingly, researchers are beginning to question the utility of the construction sequence (e.g., Smith 1981; Stuart and Gauthier 1988). Despite the increasing skepticism of the Oshara Tradition sequence, however, most researchers in the San Juan Basin continue to apply it to Archaic period sites. Moore’s (1985) analysis of chronometric dates associated with Oshara Tradition projectile points indicates that there is general agreement between the point types and the Oshara phase sequence. Although there are occasional misplaced points in Moore’s tabulation, these are all later rather than earlier and may be indicative of prehistoric scavenging or reuse. Viera (in press), however, observes that differences exist between the intensity of Archaic (Oshara Tradition) component population in the northern San Juan Basin when projectile point dated sites are compared or contrasted to radiocarbon dated sites. Rather than question the validity of the point chronology or the point designations, Viera (in press) suggests that the difference “may be due to the long-term redistribution of Archaic projectile points that occurred between the San Juan Basin and surrounding upland areas,” and that the samples may be biased. It is likely that long-term redistribution of Archaic populations did occur in response to environmental and social changes. Any generalizations based on Archaic projectile point data must remain tentative, however, until the Oshara Tradition sequence projectile point data base is made available and prior projectile point designations are reassessed.

There are currently 64 radiocarbon dates for the preceramic occupation of the study area (Table 3). These are uncalibrated dates ranging from 8210 ± 170 B.P. (6260 ± 170 B.C.) to 1390 ± 170 B.P. (A.D. 560 ± 170). The context of these dates varies considerably. Some are from discrete excavated cultural features (e.g., hearths, structures), while others represent dates obtained from cultural features exposed in pipeline trench and data recovered during pipeline monitoring. Also, one and possibly two of the dates have dubious cultural affiliation. Although there may be some ambiguity in individual dates, the collective sample should represent a rough measure of the relative intensity of occupation in the study area through time. The sample surveyed here as a representation of the types, but their ultimate validity must await further investigation.

The dates (see Table 4) do indicate a relative early occupation in the study area during the Early Archaic, Middle Archaic, and Late Archaic periods, with a dramatic increase in cultural activity during the Basketmaker II period.

The chronology of the study area is based primarily on projectile point identification, and as noted previously, there is a great deal of confusion and misapplication in the extant records. Relative to point typologies and chronological placement. The general trajectory is similar, however, when the intensity of Archaic and Basketmaker II presence in the study area based on site record identifications derived primarily from projectile points (Figures 8 and 9) is compared to the intensity based on radiocarbon determinations (Figure 10). Both methods indicate relatively light use of the Upper San Juan study area during the Early Archaic (i.e., ca. 6000 to 3200 B.C.) with a steady, although not dramatic, increase in the relative intensity of use through the Middle (i.e., ca. 3200-1800 B.C.) and Late (i.e., 1800 to 800 B.C.) Archaic periods. This is followed by an abrupt and significant rise in use intensity during the subsequent Early Basketmaker II (i.e., 800 B.C. to A.D. 1) and Late Basketmaker II (i.e., A.D. 1 to 450) periods. This dramatic rise in component occurrence parallels a dramatic parallel increase in the number of sites with architectural features and heralds a commitment to agriculture and the beginning of a sedentary lifestyle in this area.

There is no regional expression of the Archaic component. The distribution of Archaic components within the study area remains undetermined.

It is possible that the study area was being shared or differentially used by Archaic populations from the Rio Grande region and by populations operating out of the San Juan Basin. Oshara Tradition points are common in both areas and the large side-notched point styles also occur in both areas. Some researchers consider the large side-notched points indicative of a Cothic intrusion into the Colorado Plateau while others have noted the similarity of some of these points to styles associated with the Northern Colorado Plateau Archaic. Large side-notched points occur in Archaic contexts in north-central Colorado (e.g., Benedict 1975, 1981). One projectile point type frequently referred to as the San Juan Basin point style with a serrated basal notch or concavity, more closely resembles points from the Albin Mountain (Borden 1979) and the granddaughter Gulch (Kainer 1974) sites from north-central Colorado than the Northern Colorado Plateau Archaic San Rafael side-notched point style (cf., Copeland 1983:36, 27).

Determining the affiliation of Archaic populations in the study area and the representative interaction spheres awaits future analyses of lithic material types. For example, the relative frequency of obsidian at Archaic sites in the upper and eastern portions of the study area (e.g., Broster and Ireland 1984; Copeland 1983; Reed 1981; Toulmin and Kane 1986) indicates connections or affiliation with Archaic groups utilizing the Jemez Mountain area, most notably the Polvadera Peak source. This is consistent with obsidian use by San Juan Basin Archaic groups and may indicate an affiliation between the study area Archaic populations and Archaic populations to the south and southwest.

The study area and the groups who inhabited them is not completely understood. The Durango area, the Animas-La Plata divide-La Plata Valley area, and the Los Pinos River-Na'virono Reserve District area were focal points of Basketmaker II settlement. These settled areas are connected with the San Juan-Basketmaker II region combining the “Durango” Basketmaker II expression with the Los Pinos phase Basketmaker II expression. The origin of this regional expression is unclear. Irwin-Williams (1973) argues that the En Medio phase of
the Oshara Tradition represents an in situ continuum of Late Archaic-Basketmaker II development. Conversely, Berry (1982; 1985) suggests that Basketmaker II populations represent an intrusion of groups into the Colorado Plateau from the south. Whether the Basketmaker II populations in the study area represent an in situ development or whether they represent an influx of southern populations awaits further investigation.

**Settlement**

The evaluation of patterns of preceramic settlement in the Upper San Juan study area is based on component distribution, site type definitions, assemblage data, and features. The distribution of the preceramic components within the study area is presented in Tables 1, 2, and 3 and illustrated in Figures 11 through 14. Although scattered, the general paucity of Paleoindian components negates meaningful discussion of their occurrence across the study area. The Early Archaic sites are distinctly associated with the middle to upper reaches of the study area with roughly 64 percent occurring in the Colorado section of the eastern portion (zones 13C and 13D) of the study area (Figure 11). The distribution of Middle Archaic and Late Archaic components is roughly similar. They are scattered across the study area, and include a substantial increase in site locations in the western portion and lower elevations of the study area (Figure 12). The Other Archaic sites occur primarily in the eastern and western upland portions of the study area (Figure 13). The Unknown Archaic sites occur throughout the study area, yet tend to be clustered in the western area (Figure 13). The distribution of Basketmaker II components is focused in the western and central portions of the study area (Figure 14) with few components in the eastern uplands. The distribution of Basketmaker II components reflects focused settlement in the La Plata Valley, Animas-La Plata divide, Durango, and Los Pinos-Narajo Reservoir District areas.

Due to the generally limited descriptive data, the site type categories are, of necessity, rather
Figure 11. Relative percentage of Paleoindian and Early Archaic components from east to west.

Figure 12. Relative percentage of Middle and Late Archaic components from west to east.

Figure 13. Relative percentage of Other and Unknown Archaic components from west to east.

Figure 14. Relative percentage of Basketmaker II components from west to east.
The Paleoindian and Early Archaic site types, and ultimate settlement patterns, are obscured by the occurrence of most of these components on multicomponent sites (see Table 5). The limited data do suggest, however, that Paleoindian and Early Archaic open camp sites were a part of a larger settlement plan.

The Middle Archaic data do suggest that the Late Archaic period is characterized by a change in the settlement pattern of the study area. These data indicate a divergence from the early settlement patterns and an increase in the diversification of sites in the study area. The Middle Archaic open camp sites imply a shift in settlement strategy, perhaps from a foraging-oriented lifestyle to a more logistically oriented lifestyle, and presumably the initial shift to an agricultural lifestyle. This departure from the early pattern may be indicative of an in situ development of incipient agricultural groups. These groups may have formed the nucleus of the later Basketmaker II development in the region.

The Middle Archaic site types are dominated by lithic scatters and open camps (see Table 5). There are, however, a smaller percentage of sites that represent more diversified settlement types. These include sites characterized by architectural features that probably date to the Late Archaic or Baskemaker II periods.

The Baskemaker II site types continue the pattern of diversification begun during the Late Archaic. The sites are, however, dominated by the presence of open architectural sites (see Table 5) and indicate that the shift from a fully mobile foraging-oriented lifestyle to a sedentary logistically-oriented lifestyle had begun in earnest. The investment in domestic structures, their frequency of occurrence, and the common association with storage facilities implies that the Basketmaker II populations of the Upper San Juan were fully commuted to an agricultural economy.

Conclusion

This overview has evaluated the current data base pertaining to the preceramic occupation of the Upper San Juan River region. There are presently only a few sites documented for the preceramic settlement area. These sites do not include undiagnostic aceramic lithic scatters and presumably do not represent the preceramic site total. The current data base indicates an initial, albeit sparse, occupation during the Paleoindian period with a predominance of Fremont or Folsom-Midland component. This period is followed by a similarly sparse Early Archaic occupation. The data indicate that the subsequent Middle Archaic and Late Archaic periods witnessed increasing occupational intensity, greater diversity in land use, and possibly an influx of populations from outside of the San Juan Basin. A dramatic change is evident during the Basketmaker II period when site density and variability increases dramatically. The Basketmaker II occupation coincides with increased evidence for architecture, site complexity, and presumably increased dependence on corn agriculture.

In a 1984 review of the prehistory of southwestern Colorado, Eddy et al. (1984:4) noted "As with the earlier Paleoindians, abundant evidence for early and middle era maps. Lefebre's centered site data and Leta Yazzie typewritten the manuscript. Lori and Paul Reed's edit of the original manuscript resulted in some productive changes and reorganization. Lori and Paul also redrew the graphs and Lori, particularly, was patient, although relentless in the goal to keep the manuscript preparation on schedule.
The Oven Site, LA 4169:
A Reevaluation Based on Recent Excavations

Nancy S. Hammack

Introduction

In the summer of 1987, the water level of Navajo Reservoir was drastically lowered to facilitate repairs on the dam. This drawdown exposed over 60 vertical feet of shoreline, and wave action resulted in the erosion of a narrow ridge extending into the reservoir at the junction of the Piedra and San Juan rivers (Figure 1). Upon the report of an eroding burial, the Bureau of Reclamation authorized emergency salvage excavations. Twenty-three pits and six separate burned rock and artifact concentrations were mapped, collected, and excavated by the staff of Complete Archaeological Service Associates (CASA), under contract to the Bureau of Reclamation.

From the geographical location and the nature of the burned pits, it was originally assumed that these features were within a previously unknown portion of the Oven Site, LA 4169, excavated in 1962 and 1963. Based on this premise, all data from the 1987 project have been collected and analyzed under the LA 4169 site designation. Data resulting from these excavations will be used to review the functional and social implications of these subterranean features and their associated artifactual contents in relationship to the latest Archaic and earliest Formative cultural resources in the Navajo Reservoir District of Colorado and New Mexico.

History and Context of the Oven Site

In 1956, the Bureau of Reclamation, managing agency for the proposed Navajo Reservoir, requested that the National Park Service arrange for the recording and study of archaeological sites threatened by the new reservoir, which was to flood the San Juan River valley from just downstream of the Los Pinos River in northwest New Mexico to several miles upstream in Colorado. Eventually, a system of canals was to be installed to transport the impounded water to the area south of the San Juan River between Bloomfield and Farmington, New Mexico, where it would support an extensive irrigation project to be developed in compliance with United States treaty obligations to the Navajo Nation.

The National Park Service in turn contracted with the School of American Research and the Museum of New Mexico to carry out the survey, which was begun that year under the direction of Dr. A. E. Dittett, Jr. (Dittett et al. 1961). The various phases of this project were, over the years, to account for some of the largest cultural resource management (CRM)/research projects ever carried out in the Southwest. The Navajo Reservoir survey and ensuing mitigation effort was the first of these, but eventually they included studies on the canals and other components of the Navajo Indian Irrigation Project.

The team assembled by Dittett carried out the first large but genuinely interdisciplinary archaeological project ever done in the San Juan Basin, in one of the least-studied parts of the basin. The field team surveyed in the expected disturbance area between 1956 and 1959 (Dittett et al. 1961). Excavation work in the reservoir began in 1957 and continued into 1963.

The resulting data base allowed Dittett, Eddy, and their many collaborators to synthesize and, to some degree, test a model linking cultural adaptation and change to conditions and changes in the environment. The synthesis integrated environmental studies (Harris 1963; Schoenwetter
and Eddy 1964) with cultural studies (Eddy 1966) into a model of climatic change and human response in the reservoir area. This model contained some important surprises. Among the most startling of these was the discovery that the relatively well-known Rosa phase, dated at A.D. 700 to 800, was already understood to be ancestral to the Large Gallina phases to the south and probably also the ancestor of the Piedra, Arboles, and Chimney Rock phases to the northeast, was itself preceded in the reservoir by perhaps as much as 700 years of sedentary, agricultural occupation by people of recognizably Anasazi culture who made brownware ceramics.

This early brownware-producing occupation was seen by the Navajo Reservation team as being divisible on architectural and technological grounds into two successive cultural periods or phases, the Los Pinos (A.D. 1 to 400) and the Sammrito (A.D. 400 to 700), roughly equivalent to Basketmaker II and Basketmaker III elsewhere in the greater San Juan area (Dittert et al. 1963; Eddy 1961, 1966). The Los Pinos phase was viewed as essentially like the Durango Basketmaker phase (Fetenga and Wendt 1956; Morris and Burgh 1954), but with local peculiarities, including the construction of somewhat unusual and often rather large surface or shallow pit habitation structures, built up with and possibly surrounded with a paving of river cobbles. Small quantities of a plain brownware (Los Pinos Brown), believed to closely resemble Alma Plain, the earliest Mogollon native ceramic type, were manufactured during the Los Pinos phase. A recent conference in Santa Fe (Wilson in prep.), convened to address this problem, concluded that Los Pinos Brown was an early, locally manufactured variant of Sammrito Brown.

The Sammrito phase was considered to continue but greatly amplify this local ceramic tradition. This Basketmaker III occupation was characterized by locally manufactured Sammrito Brown, a brownware differing only in detail from Los Pinos Brown, but occurring much more abundantly. The Sammrito occupation appears to have been initially dependent entirely on Sammrito Brown vessels in a variety of shapes. By the late Sammrito phase, Anasazi Basketmaker grayware and whiteware ceramics, such as Chapin Gray and Chapin Black-on-white (including Durango Vari- ety), were obtained from neighboring groups to the north.

The Sammrito phase was succeeded by a local variant of the Rosa phase, characterized by the same ceramic assemblage together with locally made plain (Rosa Gray and Rosa Neckband) and decorated (Rosa Black-on-white, Bancos Black-on-white) wares. Sammrito Village, LA 4195, was first settled in the early Sammrito period and was considered by Eddy to be the first centralized community of the reservoir district by the late Sammrito/early Rosa period.

In addition to abundant brownware ceramics, the Sammrito phase was characterized by the use of very large conical (jug-shaped or bell-shaped) subterranean cists, almost always displaying evidence of intense burning. Because of this burning, these features were interpreted by Eddy as "ovens." Sammrito "ovens" were commonly reused as burial vaults, trash dumps, or both. These features were found in varying quantities at a number of locations around the reservoir, in late Los Pinos through Rosa associations. Only at the Oven Site, LA 4169 (SAA1345), were they present in quantity. Here over 40 "ovens" were excavated or mapped within an area of less than 5000 square meters (Eddy 1966:214-229).

The Oven Site, which was to share importance only with Sammrito Village as a type site of the Sammrito phase, was thought by the original surveyors to contain only a small Piedra habitation and a sparse historic Navajo sherd scatter. No ovens were evident on the surface. The site was scheduled for excavation as a Piedra site, but was inadvertently bulldozed by the clearing contractor, who obliterated the Piedra component almost entirely. This small disaster was actually of great significance to Southwest archaeology, as it revealed the burned orifices of numerous previously unsuspected pit features. During the 1962 and 1963 field seasons, 45 "ovens," 5 pithouses, a refuse area, and numerous associated human and dog burials were excavated (Figure 2). The assemblages recovered were dominated by Sammrito Brown pottery, in- cluding some vessels in burial association.

The Oven Site data base was correctly viewed (Eddy 1966) as being central to understanding the Sammrito phase. The "ovens" seemed to contain relatively pure Sammrito and Sammrito/Rosa transi- tion assemblages, together with considerable arachnobotanical and arachnofaunal material, human and dog burials with associated mortuary offerings having chronological value, and abundant tools and tool sets. The "ovens" themselves were interpreted as having played a substantial and probably central role in social and subsistence processes within the district.

The 1987 Study

In 1987, salvage excavations of 23 burned pits were carried out by the staff of Complete Archaeological Service Associates. These pits were located along the top and edges of a narrow clay ridge on the eastern shore of Navajo Reservoir near the junction of the Piedra and San Juan rivers. Large burned pits had been uncovered during the extreme drawdown of the reservoir and were eroding from the lower exposed edges of the ridge. Others, less eroded, were visible as circular depressions on the top of the ridge.

From the geographical location of the site and the nature of the burned pits, it was assumed that these pits formed a previously unknown portion of the Oven Site, LA 4169, located upslope from that portion of the site excavated in 1962 and 1963. Later reevaluation of the location indicated that the pits excavated in 1987 were not, as first presumed, an extension of the original Oven Site. This new concentration of "ovens" excavated thus far within the Navajo Reservoir area were not detectable during survey and were only revealed after removal of deep overburden by bulldozing or wave erosion.

Twenty-two of the pits were clustered in a 200 square meter area, with a single isolated pit located to the east of this main concentration (Figure 4). Three of the pits were apparent only as eroded burned surfaces representing the base, although the subsists of two of these pits were still

Figure 1. Setting of the 1987 excavations at the Oven Site; Navajo Reservoir at the confluence of the San Juan and Piedra rivers, looking north.
Figure 2. Site plan map, 1962-1963 excavations at LA 4169 (Eddy 1966:216, Figure 26).
Figure 3. Location map, 1962-1963 and 1987 excavations, LA 4169.
Figure 4. Site plan showing locations of pits and burials, LA 4169, 1987 excavations.
of the walls and floor (Figure 6). These subcists may be burrowing attempts by trapped animals before or after firing or deliberate human constructs of unknown function. These subcists usually appear to have been fired in the same manner as the main pit.

Ignoring the subcists, the basal diameters of the pit features range from just over a meter to just under three meters, with the largest and smallest occurring in the 1962-63 clusters. Both the 1962-63 and 1987 samples display a bimodal distribution of basal diameters (Table 1). For both groups of pits, this distribution has a higher peak at about 1.6 m (about 3/4 of the 1987 pits and 2/3 of the earlier pits) and a lower peak at about 2.2 m.

As all of the "ovens" excavated to date were eroded or disturbed, the initial depth and character of the entrance orifices can only be inferred, but several lines of evidence suggest that the original depths were typically almost equal to the basal diameters. First, the majority of the pits had, within their fill, large, worked, and unburned slabs of thin sandstone. When reconstructed, these slabs tended to measure about 0.35 m in diameter. Most were round-to-oval-to-rectangular in shape and have been interpreted as cist covers. Secondly, the covers or cover fragments were often associated with conical piles of slump from the throat and upper wall, indicating that the features originally had considerable depth. We judge that the original shape of the "ovens" was that of a frustrum of a cone, with an entrance opening about 0.75 m in diameter at the top.

The pit walls were trimmed smooth but were never plastered. The completed features were then intensively and deliberately burned, producing hard terra cotta walls. Burning was visible in both the 1962-63 pre-inundation and 1987 post-inundation pits as a layer of hard, discolored fired clay which graded from dark gray smudging, sometimes with associated smudging, on the wall surfaces down to bright orange oxidation layers that penetrated 5 to 10 cm into the soil matrix. In a few cases, burning was less dramatic, involving

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**Figure 5.** LA 4169 pits excavated in 1987, looking west. Intact. Human burials were recovered from five of the pits. The only structural features present on the ridge were the pits (Figure 5). Unlike that portion of the Oven Site excavated in 1962 and 1963, no pit structures, hearths, or other domestic features were located. Six sparse artifact scatters were mapped and collected on the lower slopes of the ridge. These scatters were mainly composed of fire-cracked sandstone, and flaked and ground lithics. Small quantities of bone and ceramics were also present. Due to the differential sorting from wave action, these scatters are difficult to interpret.

**Pit Form and Function**

The group of "ovens" investigated by CASA in 1987 proved to be smaller and more concentrated than those excavated in 1962 and 1963 at LA 4169. It contained about half as many pit features (but in a single compact cluster) and was not associated with any structures. A total of 21 single "ovens" and 1 "oven" with an intruded unburned pit, all eroded to some degree, were recorded by CASA. These have proved to be comparable in construction and proportions to those originally excavated. The following description is based on, and applies equally to, both data sets.

A typical "oven" was excavated with a digging stick into the underlying massive, Late Pleistocene pond-deposited bank of clay with a very high bog-iron content (Schoenwetter's Pleistocene bench), to make a regular and usually circular pit, in form, the frustrum of a cone. The angles of the flaring walls of those pits excavated in 1987 typically ranged between 23 degrees and 29 degrees to the vertical. The original pits had somewhat sharper pit wall angles, probably due to slumping from the weight of the bulldozer.

Although the majority of the features had flat floors, over half of those excavated in 1987 had one or more subcists excavated at the intersection

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**Figure 6.** Excavated pit with subcist, LA 4169.
only the edges of subsists or the central area of 
Floors. Only one of the pits excavated in 1987 was 
clearly never burned. This pit was intruded into an 
early typically burned feature. 
The current interpretation of the pits is that 
they functioned as storage cells rather than as 
oven. The uniformity of size and shape, their 
ocurrence in clusters of 9 to 23, the intense burn-
ing, and the lack of evidence for overheating of the 
cover slabs supports the current functional inter-
pretation. They are, we believe, the local ex-
pression of the ubiquitous Basketmaker slab-lined cell. 
In this area, the cells were dug into massive silt clay 
and then fired to produce in-place, terra cotta 
storage jars, rather than being carefully plastered 
and slab-veneered as are examples built in other 
soil elsewhere. They would have provided dry, 
sterile storage for corn, pinon nuts, or other 
gathered or cultivated products. Similar storage pits 
with hard-fired walls were excavated during the 
Black Mesa Project in northern Arizona (Smiley 
1985:290-308). These pits are associated with 
Lolomi Phase, or Basketmaker II sites, and 
closely resemble the Oven Site pits both in form and 
function.

Dating

Firing was so intense, and the resulting terra 
cotta walls so stable, that the archaeological 
samples collected from five of the pits excavated in 
1987 produced a remarkably tight and precise clus-
ter of paleo magnetic observations. Eighty (1988) re-
ported, "I believe all these features were fired at 
the same time...I have never seen a set of samples 
plot so close together before, and this observation 
includes experimental hearths which I knew to be 
contemporary. If there is ever going to be a case 
made for contemporaneity based on archaeological magnetic results, this will be the case."

Eighty's enthusiasm is understandable; these 
samples and the associated dendrochronologic 
dates allowed the local paleo pole curve to be 
tended back to ca. A.D. 600. 
Of some 30 dendrochronologic samples sub-
mittted, only four were datable (Dean 1987), and 
all indicated dates late in the 6th or early in the 
seventh centuries. Three +v dates had se-
quences reaching back to A.D. 455 and implied 
cutting or death in the middle or late sixth century 
(A-795: OVS-1 @ A.D. 458 to 525 +v; OVS-2 @ A.D. 455 to 528 +v; OVS-24 @ A.D. 469 to 595 +v). A single + + B date (A-795: OVS-3 @ A.D. 485 to 595 + B) at the turn of the seventh century was commented on specifically by Dean: 
"The + + B indicates that OVS-3 possesses a 
three attributes suggestive of a natural tree death. Thus, 
this date probably specifies the use of wood from a 
tree that died long before being incorporated into 
a site context...the chances are strong that the 
event postdated 600."

With a unique exception (see below), no 
radiocarbon dates were submitted from the 1987 
excavations. The tree-ring and archeomagnetic 
dating would appear to indicate occupation in the 
late 6th and early seventh centuries. This agrees 
with radiocarbon assessment of the 1962-63 data 
(Eddy 1966). Geomorphological fieldwork at 
the Uclls Site, LA 4363 (Figure 7), further supports 
this dating. Schoenwetter and Eddy (1964:45, 
Figure 17) illustrate and discuss the superposition 
of a Rosa phase burial within Rosa phase vessel 
manden on an erosional surface that had tran-
cated a typical Sambrito "oven."

* Intrusive unburned pit not included.

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**Table 1. Number of pits per pit base diameter range, LA 4169.**

Ceramics placed as funerary items with burials 
(Figure 8) indicate a late Sambrito phase (A.D. 600 
to 700) context (Errickson 1990). Sambrito Brown 
vegents or sherds accompanied four of the five 
burials. In two of the burials, Sambrito Brown 
ocurred with nonlocal whiteware and 
grayware. If the vessels accompanying the burials 
are examined as a collection or assemblage, the association of Sambrito Brown vessels with Chapin 
Black-on-white and Chapin Gray designates a late 
Sambrito phase (A.D. 600 to 700) or early Rosa 
phase (A.D. 700 to 800) context. However, the lack 
of early Rosa phase vessels or sherds (e.g., Rosa 
Black-on-white, Rosa Gray, Rosa Neckband) 
indicates that the burials predate the Rosa phase 
and likely date to the late Sambrito phase.

More detailed attribute analysis of the mortu-
ary vessels and sherds suggests manufacturing 
dates during the latter part of the late Sambrito 
phase, post A.D. 650 (Errickson 1990). Desings 
on the white bowls and sherd display late 
Chapin Black-on-white characteristics such as a 
trend toward bolder and broader lined execution 
and the symmetrical placement of elements 
within the field of decoration, precedent to 
Piedra Black-on-white. In addition, two of the six 
Sambrito Brown vessels are unpolished and were 
fiend in a more controlled reducing atmosphere 
that is typical for Sambrito Brown. These vessels 
may be representative of a transitional stage prior 
to true grayware technology and production 
which becomes dominant in the Reservoir Dis-
trict during the early Rosa phase.

**Figure 7. Storage Site at Uclls Site, LA 4363, showing superimposition of Rosa phase trash 
midden and burial. After Schoenwetter and Eddy 1964: Figure 17.**

**Figure 8.** Storather at Uclls Site, LA 4363, showing superimposition of Rosa phase trash 
midden and burial. After Schoenwetter and Eddy 1964: Figure 17.

**Nancy S. Hammack**

**Modern**

**Surface**

**Rosa Phase Burial Pit**

**Sterile**

**Gray Clay**

**Exterior Pit Oven**

**Rosa Phase Midden Deposits**

**Erosional**

**Disconformity**

The lowest fill stratum above the floor of the 
entrance was usually clean, finely stratified alluvium
Figure 8. Ceramic assemblages from burials, LA 4169, 1987 excavations.
with few cultural inclusions and little ash. Often overlying this stratum were conical strata of burned terra cotta fragments identifiable as cist throat collapse and mixed sheet-wash fill with some ash, charcoal, and cultural material. In a few cases, defined layers of charcoal were encountered. These layers tended to lie well up in the fill sequence. Once their covers failed, the pits seem to have filled rapidly with midden soil and sheetwash alluvium.

When these features were reused as burial pits, the burials were usually placed directly on the clean cist floors or on microlaminated alluvial fill a few centimeters above the floors. In two of the five pits with burials excavated in 1987, the surface layer above deeply stratified trash and alluvium (Figure 9). Burials were found both above and below layers of cist cover fragments and wall throat collapse materials.

Although two examples of these cists have been found still filled with their original contents, the redeposited cultural fill of the pits, as well as the contents of the burial offerings, was rich in botanical remains. Matthews' (1988) analysis of bulk soil and vegetal samples identified copious burned and unburned maize cobs (almost all 12-row), a few burned maize kernels, an unburned (but probably prehistoric) cactus fruit seed, and wild food and fuel species, especially purslane seeds, goosefoot seeds, and charcoal of pinon, juniper, willow, poplar/cottonwood, oak, and sage. Less abundant were sunflower seeds, buhrush seeds, wild tobacco, Indian ricegrass, marsh elder, peppergrass, stickleaf, nighlshade, and ground cherry. All of the taxa listed above were recovered from the fill of burial offerings, and most or all were also present in the general pit fill. The original ground surface surrounding the pits would have been rich in charcoal from the original pit fillings, as well as vegetal materials from processing and storage activities that would have been carried out around the pits. Pollen samples from the CASA excavations have not been submitted for study. When analyzed, they will probably prove to be heavily dominated by maize and Mormon tea pollen, as were the pollen samples studied in the 1962-63 project.

As noted above, preservation of unburned vegetal materials was common in the pit fill and in association with the burials. This may have been due to the unique water-retention properties of the terra cotta pit walls. Although no evidence of matting was associated with the burials as in the 1962-63 excavations, a pitch-impregnated coiled basket of “kiva-jar” shape was found with one of the 1987 burials. The 1987 collections were generally richer in faunal materials (Bertram 1988) than were the original collections as reported by Harris (1963). Cooked bone was almost exclusively limited to cottontail rabbits. Both the upland and desert species of cottontail were present, as in Harris’ study. Other probable food species included jackrabbit, deer, wapiti (American elk), and turkey. Bone tools were also much more common in the 1987 collections and were made almost exclusively on the long bones of wapiti and male deer. Tool types conform well to those already described for the reservoir (Eddy 1966) and for the Durango Basketmaker sites (Morris and Burgh 1954). The 1987 tool sets (roughouts, blanks, finished tools, and worn items) were included as burial goods. Numerous individuals of small forms, especially Ord kangaroo rat and Woodhouse toad, appear to have been trapped in the pits over the years. Again, this agrees well with Harris’ observations.

Shell jewelry was found with three burials and additional shell beads were found in a fourth pit. All 45 items identified as Oliva (Agaricia) testacea, of the Family Olissidae, a form rarely reported in the Southwest (Urban 1988). The unusual wear patterns and body holes identified on examples associated with the wrists and arms of two of the burials indicate that the shells may have been sewn onto an armband.

The osteology of the 1987 burials and most of the 1962-63 burials was restudied by Nickens (1988), who reported degenerative lesions strongly suggestive of tuberculosis in several individuals. If Nickens’ interpretation is correct, then tuberculosis would seem to have been present as early in the Navajo Reservoir area as anywhere in North America. An unexpected aspect of the 1987 excavations was the recovery of a partial skeleton and an isolated tooth of a terminal Pleistocene giant pecary, found imbedded in the claybank surface near the cist complex. This specimen was identified (Bertram 1988) as a semic individual of Platymys compressus. The well-preserved pec.
cary bones were radiocarbon dated by Beta Analytic, in cooperation with the Eidgenössische Technische Hochschule des Zürichs (Beta 22669; ETH 350), to 12,060 ± 170 B.P. uncorrected. This date solidly confirms Schenwetter and Eddy's (1964) interpretation of the late Pleistocene swamp preserved in the valley as the lowest set of erosional benches. A peccary tooth recovered from Sambritro Village, and identified by Harris (1963) as being from a white-lipped peccary imported from central Mexico as a trade item, is probably a similar Pleistocene fossil.

Discussion

Other than the Navajo Reservoir sites, very few early northern brownware sites have been reported. This lack of sites with brownware ceramics may be due to the low surface visibility of these early, very friable browns. Nevertheless, the near absence of reported sites with brownware ceramics in the San Juan area, as noted by Hogan et al. (1991), indicates that such sites must be uncommon.

Previously-reported brownware sites include 5MTUMR2389 and 5MTUMR2344, from the Mancos Canyon road project (Breternitz 1986; Halloy 1974, Lucius 1982), an unpublished site (LA 9037) from the lower middle La Plata Valley (Warren 1986), and LA 3376 (FA 2-8), a multi-component scatter near the mouth of the Animas River tested during the Elena Gallegos project (Bertram 1991). The Mancos Canyon sites seem anomalous; UMR2344 has "Mogollon" brownware associated with Chapin plain and whitewares in a late-looking, deep pithouse. Although the main points of the potsherd were solidly dendrochronologically dated at A.D. 468 to 485, a full ceramic or chronological analysis of the site has never been done. LA 5037 in the La Plata Valley is, based on ceramics, probably of Sambritro age, but is currently undated. LA 3376, on the Elena Gallegos project, produced seven radiocarbon dates with calibrated central tendencies ranging from 82 B.C. (TX 4922) to A.D. 840 (TX 4972). Most of the dates would indicate Los Pinos or Sambritro occupation.

Since their discovery, the brownware sites in the Navajo Reservoir have been the subject of controversy. Issues most discussed have related to chronology, settlement and demographic interpretation, and ceramic typology. Probably the most extreme views are those of some ceramists who have simply ignored the early northern brownware sites entirely. Among those who do consider the issues, Berry (1982) and Eddy (1966) are probably farthest apart.

Berry dismisses dates, stratigraphic data, and ceramic associations for the Sambritro phase. He would combine the Sambritro with Los Pinos phase, which he would date to no later than about A.D. 350. Berry (1982:48-54) argues that the most reliable dates for the Sambritro phase are from rock fall in LA 3430 and from the floor hearth in the odd, large Pithouse 1 at the Oven Site. He discards Eddy's later dates on less than unpeachable grounds. Berry does not recalibrate the radiocarbon dates, although he compares them to dendrochronologic dates for the Durango sites. Berry does not consider the old wood/interior ring problem in this context, although he uses equally pertinent old or interior wood arguments convincingly a few pages earlier to dismiss inconveniently early dates from Hay Hollow (Berry 1982:39-42).

If modern recalibration is done, and if a reasonable allowance of 75 years is made for old wood/inner ring problems (Figure 10), then Berry's favored dates come in with central tendencies of A.D. 200 or 280 (LA3430 TBN41) and A.D. 330 or 390 (Oven site I-1342). These dates are not inconsistent with Eddy's (1966) ceramic interpretations for late Los Pinos and early Sambritro. Eddy's own favored dates, treated in the same way, come in at A.D. 715 (Uells site, Zone 10A-I-1344) and A.D. 650 or 670 (Oven site Pit 13 Fill I-1343), agreeing quite well with earlier interpretations (Eddy 1966) of late Sambritro ceramics and with present interpretations from the 1987 excavations.

The author's assessment of dating for the Oven Site(s) and for the early brownware horizons at Navajo Reservoir does not differ greatly from Eddy's. Previously published and new data indicate that Sambritro Brown, as defined at the recent Santa Fe ceramic conference on this topic (Wilson in prep.), was produced from about A.D. 275 to about A.D. 775. There are indications that the Rosa and Piedra phases may have begun later than originally suggested by Eddy. These indica-
tions have been confirmed by Eddy at the above-mentioned conference. Present data lead to the conclusion that Sambrito Brown, a locally made ware using bog-deposited, iron sesquioxide-enriched (Hill 1986; Wilson 1989) San Juan River alluvial clays, especially the Pleistocene terrace clays, remained in production as long as large populations were resident in the alluvial clay bottomlands and low benches of the Navajo Reservoir area. In short, Eddy’s overall model, with refinements, is supported by presently available data.

A conservative, insightful, and carefully reasoned assessment of Basketmaker organization and of the chronology of early agriculture and ceramic development is presented by LeBlanc (1982). He models the growth of agriculture in terms of archaeologically observable data and artifacts: grooved axes, trough maceheads, the bow, occupation of well-watered bottoms at or below 6000 feet, early pottery, large pithouses, and many big storage features.

Using LeBlanc’s (1982:37) arguments, which are based on estimates from Ford (1968) and Nelson (1980), about 0.8 cubic meters of shelled corn would have fed one person for one year. Unfortunately, he made an algebraic error. A typical large cist 1.5 m deep and 2.5 m in maximum diameter would have 5.0 cubic meters of volume, and not 0.5 cubic meters as he calculated. Using the corrected volume calculations, the storage cist data from the Oven Site (Table 2) supports LeBlanc’s model superbly. Table 3 presents estimated person/year equivalents for the Oven Site, based on the assumption that all pits were filled and used simultaneously. Given this extreme assumption, the storage capacity represented at the Oven Site would have fed at least 136 persons, or 27 families, for one year.

Conclusions

Reevaluation of the Oven Site, based on original data from the 1962 and 1963 excavations and new data from the 1987 excavations, indicates that the features originally believed to be cooking ovens were actually sophisticated storage cists, later used as convenient burial vaults. The concentrations of these cists, which may have been constructed simultaneously, indicates a favorable climate conducive to surplus production and an expanding population in the A.D. 600s. Reevaluation of the data also confirms the validity of Sambrito Brown as a dated ceramic type and the Sambrito phase as a definite cultural entity.

Further application of LeBlanc’s model to the San Juan River area may prove extremely rewarding. The Los Pinos-Sambrito period should eventually be seen as a precocious but regionally continuous development from En Medio Archaic to full-fledged Pueblo I Formative, broken only by local and predictable altitudinal population shifts (i.e., short local abandonments) up and down the Animas, Los Pinos, Piedra, Gobernador, and Largo drainages. These shifts, like the ones documented in the Mesa Verde area (Petersen 1980), will prove to have occurred in response to climatic and demographic factors.

There is no way to assess the potential of the area to contain more Sambrito storage locations. We may speculate confidently that similar concentrations composed of multiple features await detection within the Durango-Piedra-Largo country, but their abundance is unpredictable. They may be a specialized adaptation to unique claybank soils peculiar only to this one location, but they could be easily be ubiquitous, although undetectable through surface surveys.

The unusually high volume of storage capacity represented at the Oven Site raises numerous questions concerning the nature of the late Sambrito occupation in the San Juan River drainage. Known late Sambrito habitation sites are scarce and would not account for the unusual number of pits present in these concentrations. One possible interpretation is that the Oven Site was a unique example of centralized storage, which in turn implies a centralized society. It is also possible that late Sambrito occupations, like Basketmaker III occupations in other areas, are masked by later superimposed settlements and not apparent during surface surveys and that the late Sambrito population was much higher than indicated by presently available data.

Acknowledgements

This article is based on a paper presented by Jack Bertram (Bertram and Hammack 1991) at the 50th annual meetings of the Society for American Archaeology. Most of the data discussions and interpretations, including Figures 4 and 10, are the product of Jack Bertram. The author would also like to thank the excavation and laboratory staff of CASA, without whose help this paper could not have been successfully completed. Their insights and suggestions were invaluable.

Table 2. Estimated volume of pits per pit base diameter range, LA 4169.

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<thead>
<tr>
<th>Basal diameters (m)</th>
<th>Volume (m^3)</th>
<th>Total</th>
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<tr>
<td>0.9-1.2</td>
<td>0.3</td>
<td>3</td>
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<td>1.2-1.5</td>
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<td>1.5-1.8</td>
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<td>1.8-2.1</td>
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<td>7.5</td>
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<tr>
<td>2.1-2.4</td>
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<td>7.5</td>
</tr>
<tr>
<td>2.4-2.7</td>
<td>1.5</td>
<td>5.2</td>
</tr>
<tr>
<td>2.7-3.0</td>
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<td>7.5</td>
</tr>
<tr>
<td>Total</td>
<td>30.1</td>
<td>110.5</td>
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Table 3. Estimated person year equivalents of shelled corn per pit base diameter range, LA 4169.

<table>
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<th>Basal diameters (m)</th>
<th>Person equivalents (1 person year = 0.8 m^3)</th>
<th>Total</th>
</tr>
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<td>2.7-3.0</td>
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<tr>
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The Cedar Hill Project: An Anasazi Frontier

Wm. Lane Shields and John D. Cater

Introduction

The investigations discussed are referred to as the Cedar Hill Project (CHP), and are concerned with nearly 34 km (over 21 miles) of pipeline corridors within a 5 km N/S x 8 km E/W (3 x 5 miles) area adjoining the Colorado border between the Animas and La Plata rivers (Figure 1). The CHP is near physiographic, hydrologic, climatic, spatial-cultural, and temporal boundaries or frontiers (Pitblado and Shields 1990; Shields 1989, 1990a, 1990b; Shields and Cater 1991b).

The concept and the implications of frontiers have been discussed by numerous investigators (e.g., Green and Perlman 1985). Essentially, a frontier is marginal to a core area or to several core areas. As such, it is exposed to influences from more than one source. Simultaneously, a frontier is also a core in as much as it provides a normative view for in situ populations.

Although only a small portion of the CHP area has been inventoried, well over 100 sites are known to exist. The majority of these sites are associated with a complex of sites which are considered to constitute an Anasazi community (e.g., Dykeman and Langefeld 1987; Eddy 1977). Anasazi settlement patterns, although they may vary in different geographic settings/areas, are determined by the relationship of the sites to great pithouses located in nuclear communities throughout the Four Corners area. As such, each nuclear community is a core for affiliated populations.

The Loma Enebro Community

The center, or nucleus of the CHP site complex, the Loma Enebro Community, covers more than 1.5 square km at the confluence of several wide valleys. Numerous pithouses, semi-sunterranean/surface structures, middens, and other complex features, as well as a great pithouse, are present within the constituent sites. These latter features are more commonly termed great pithouses (Brew 1946) or great kivas (Ballard 1962) and are the ceremonial center and unifying factor in Anasazi communities (Dittet al. 1961:221; Dykeman and Langefeld 1987:105-107; Eddy 1977:29).

Currently, 10 sites with arbitrarily defined boundaries are recorded as the nucleus of the community. Several multiple room block mounds and up to 60 pithouse depressions are known. Although the number of pithouses appears to be low, three structures have been located along cutbanks and within a backhoe trench. The tops of the structures are from about 1 m to over 2 m below the present ground surface. There are no surface indications such as circular depressions, charcoal stains, etc. that would indicate the presence of these structures.

Many of the surface structures within the community nucleus had burned at, or subsequent to, abandonment, leaving vitrified jacom hummocks to mark their presence. On the east side of the community, two large sets of roomblocks are positioned atop massive platforms constructed of cobbles on the crest of a low ridge. On the south side of the community is a pithouse village on a hilltop with an estimated 30 depressions. The majority of the pithouses within the community range from 6 to 8 m in diameter and as such, are termed oversize pithouses. The great kiva is located near the center of the community in the middle of the broad valley and measures between 15 and 18 m in diameter.

The most obvious settlement pattern for the CHP area is the location of sites at the confluence of valleys. Another apparent pattern is the location of village sites on the mesa edges and on low ridges which extend into the valleys. The largest village which is not a portion of the nuclear com-
Figure 1. Map showing location of project area.
community, Hawk House (LA10723), is located on a large bench with very high and vertical cliff drop-offs vertically.

Hawk House may represent a smaller community center, with up to 13 pithouses and associated jacial and cobble rubble mounds. Near the center of this village is a pithouse with a 9 m 3 interior which is identified as a great pithouse. The area surrounding Hawk House has had less survey than that around the Loma Enebro Community and the number of contemporary sites which could be associated with Hawk House is unknown. Four sites are currently considered to be a part of this small community.

A total of 25 sites which are associated with the Loma Enebro Community are identified in the CHP corridors. It is known that this is a small fraction of the sites in the valley.

**Frontiers: Physiographic**

The CHP is located in the extreme east-central portion of the Colorado Plateau physiographic province, in the northeastern portion of the Central Basin of the San Juan Basin. The San Juan Basin is an asymmetrical, structural depression with a northwest-trending axis. The central basin is bound to the east, north, and west by the Hugodoc-Monocline, and to the south by the Chaco Slope (Plog 1977). Elevations within the project area range from approximately 1823 to 2077 m (5890 to 6815 feet).

The project area is dominated by Tertiary period outcrops of the San Jose and Animosas (New Mexico Geological Society 1981). These formations are composed primarily of resistant sandstone beds which form mesas and buttes bound by near vertical to overhanging bluffs. The maximum relief of the bluffs is approximately 40 m. The calcareous sandstones are weathering rapidly and are a major soil component throughout the region.

**Frontiers: Hydrologic**

The landscape has been sculpted by Pleistocene epoch glacial outwash which eventually dissected the sandstone and formed broad canyons-valleys. Terraces and other deposits from these actions are present throughout the project area. They are identified by surfaces paved with large, well rounded cobbles and often by distinctive slicks. These Pleistocene deposits are more prevalent along the eastern survey corridors which are atop a high ridge overlooking the Animas River valley. The majority of the cobbles are "various types of quartzite and were used for both construction materials and for lithic artifacts.

In the project area the stream systems, which are now deeply entrenched and ephemeral, drain in an east-to-southeast direction into Cox Canyon. Cox Canyon, along with the major drainages in the Central Basin, flows south and drains into the Animas River (Loose 1977). The Cox Canyon debocheau into the Animas River is located less than 2 km (1.2 miles) from the southern end of the survey area. Scarp slopes and common and quite large perennial springs are located on either side of the community along the Loma Enebro valley. Based on the size of the intermittent channel floors, most of which are flat bottomed and sandy, seasonal runoff has been high in the past. The project area drains into the San Juan River sub-basin of the Upper Colorado River Hydrologic Region (Bureau of Land Management 1989:50).

The valley floors of Cox Canyon and its tributaries are low gradient surfaces without impediments to pedestrian traffic. Although the bluffs on either side of the valleys are generally vertical and quite high, there are enough discontinuities to allow fairly easy access to the mesa and ridge tops. The Cox Canyon tributaries are situated in broad valleys draining Lone Tree Mountain to the west. The headwaters of the Cox Canyon valley are on the east side of Black Ridge about 11 km (6.8 miles) north of the project area. The Loma Enebro Community is located about halfway along the length of a long valley which offers easy access west into the river. The calcareous sandstone mesas are weathering rapidly and are a major soil component throughout the region.

From the river, which is the closest permanent stream. During recent investigations, the water table was encountered at a depth of least 2 m below the present ground surface near the community. Based on historical downcutting of the arroyos within the CHP, we posit that the Loma Enebro valley contained at least a low-capacity perennial stream during the period of occupation. Based on the location and extent of known cultural manifestations in the center of the valleys, agricultural fields were apparently located along the periphery of the valley and relied on springs for moisture.

The location of a large settlement is generally not in the center of potentially arable lands. The usual or expected pattern of such settlements would be on the peripheries of such lands. Based on the location of the Loma Enebro Nuclear Community at the confluence of several wide valleys is unexpected. For an agricultural group to consume primary arable land for a community settlement seems counterproductive, unless there is an overriding reason to do so. Whether this reason was culturally oriented or resource-based remains unclear. Two possibilities can be ruled out, however. Although the community location is astride a transportation corridor, ease of access to higher ground does not seem to be a factor. Additionally, water needs do not seem to be a factor. That is, fields were placed along the edges of the valleys not only for access to spring water, but because that was the only space available for field locations.

**Frontiers: Climatic**

With average annual precipitation ranging from 25 to 80 cm (10 to 12 inches), the CHP is located within a semi-arid climate. Although there is a positive correlation between the amount of summer precipitation and elevation within the San Juan Basin, the correlation is generally less than in other areas of New Mexico which are lower in elevation (Gillespie 1984:14-16). There is a significant increase in summer precipitation along a south-to-north gradient and along a west-to-east gradient. Due to the continental scale of the summer monsoon, there are no local orographic precipitation factors for the region. However, the Mogollon Rim creates a summer rain shadow for the basin and, as a result, the area is less influenced by summer monsoon circulation patterns than by other factors. Statistically, area precipitation is less than 2 cm below the present ground surface near the community.

The general area receives approximately 6.8 to 8.0 cm (2.3 to 3 inches) of precipitation in each of the four seasons. The San Juan Basin is typically in a transition zone between summer-dominated precipitation patterns to the south and winter-dominated precipitation patterns to the north (Shields 1990a:39-40).

Just as the San Juan Basin in general is in a transition zone, the CHP is located generally along the north/northeastern portion of the basin. That is, the project area is near the northern edge of the boundary. This boundary reflects the transitional nature of the flora and fauna (Dittert et al. 1961;266; Woodbury 1961a, 1961b). As a result, even a minor shift in the jet stream path would effect precipitation within the CHP (Dittert et al. 1961:260). Simply stated, a southerly shift will increase precipitation, especially if that shift occurs during the winter, but also during the summer. A northerly shift in the jet stream path in combination with stronger summer monsoon flows or a very strong monsoon flow will also increase summer precipitation. Discussions of the complex interaction of the various factors involved in arcc precipitation patterns may be found in many synthesis studies (e.g., Allan 1977; Davis 1989; Peterson 1982), as well as in Tuon et al. (1973), A State of New Mexico 1989. For purposes of this report, the presence of the Loma Enebro Community indicates that at least during the period of greatest population density, sufficient precipitation was available to support the life styles of the inhabitants. Such conditions also existed to the east of the valley (Schowengerter and Eddy 1964:108-128). Paleoclimatic data is not currently available for the CHP, but the presence of the Loma Enebro Community indicates that at least during the period of greatest population density, sufficient precipitation was available. Conditions such as these also existed to the west of the valley (Schowengerter and Eddy 1964:110-113). Although, the data is not sufficient to determine if the CHP area was under a less suitable climate at other times other than the present time.
Regional overviews of the cultural prehistory and history of the northern San Juan Basin have been presented by numerous authors (e.g., Cassel 1983; Cordell 1984; Hancock et al. 1988; Stuart and Gauther 1988; Woenak 1982). However, the spatial/cultural setting of the CHP appears to create a problem of affiliation as it is near the boundaries of several previously defined culture areas. That is, based on some reports, the CHP is near the intersection of the La Plata District to the west (Morrish 1939), the Durango District to the north (Gooding 1980), and Navajo Reservoir District to the east (Gooding 1980). As a result, some have questioned the use of the Navajo Reservoir District phrase within the CHP.

These criticisms and the problem of affiliation have arisen from confusion concerning the definitions of "district" and the current, inappropriately used in the literature (v. Shields and Cater 1991a). Although it is easy to comprehend what the term refers to when original sources are consulted, some archaeologists have recently been utilizing the term "district" in the sense of a geographically delimited area which contains an internally cohesive cultural sequence specific to that area (Collins 1983). These investigators, usually incorrectly, reference earlier works to lend credence to their "districts" (e.g., Adams 1975; Gillespie 1976; Gooding 1980). At worst, researchers define space (a district) by what is found within their project area and compare cultural manifestations outside that project area (e.g., Adams 1975). As Stuart and Gauther (1988:2-3) point out, this can lead to fallacious interpretations of the spatial distributions of cultural concepts.

The issue of whether the term "district" refers to a project area or a culturally significant unit of space has been directly addressed by Collins (1983) and Eddy et al. (1984). Eddy et al. (1984:7) now reserve the term "district" to designate an administrative unit and the term "drainage unit" to identify cultural space (Dr. Frank W. Eddy, personal communication 12 November 1990). This apparently returns to a concept first explicated by Edgar Lee Hewett in 1908 (Collins 1983).

In any event, the spatial extent of the various Navajo Reservoir District phases was always defined as extending beyond the boundaries of that project's area (Dittert et al. 1961:235-236). This paper is partially in response to the Navajo Reservoir investigator's call to conduct surveys into other areas in order to determine (Dittert et al. 1961:263-264)

... the extent of the manifestations that have been uncovered as well as an indication of the direction and extent of outside influences. Through research outside of the Reservoir, it should be possible to delineate spatial divisions for the cultures represented in the Reservoir District, and to relate those divisions to surrounding archaeological based.

Based on similar population/settlement patterns, structural orientation, cobble architecture, and the ceramic assemblage, the Navajo Reservoir sequence has been applied to the CHP. The growth and decline in population, as reflected in survey-level sherds counts, is nearly identical between the Navajo Reservoir and the CHP from the Rosa through the Arboles phases (BMIIICearly PI through the PI horizon). The Loma Enchoso Community sites are generally multicomponent and exhibit a clear pattern of a growing BMIIICearly PI occupation followed by a major late PI component. A major PI occupation is then present, which is occasionally followed by a very limited PII element. Settlement patterns and random construction arrangements are virtually the same in the CHP (Shields and Cater 1991b) as that reported by Eddy (1966:93). The actual number and type of structures are quite different but this may only reflect the presence of the great kiva. Additionally, the use of cobble architecture in both contexts (within the Anasazi occupation) is viewed as significant (Dittert et al. 1961:213, 220, 261; Shields 1990c).

The ceramic assemblages are also very similar. In the early portion of the Anasazi occupation, ceramics are constructed of poor quality clays with rolled quartzite sand temper. During the middle of the sequence, better quality clays begin to dominate the collections and crushed rock, in combination with sand, appears to be the preferred additive material. By the end of the sequence, ceramics no longer follow a localized technology, but have been supplanted by technologies from the Mesa Verde region (Brummert et al. 1984), including crushed igneous rock temper. Thus, the primary concern here is with the Anasazi Rosa, Piedra, and Arboles phases formally defined for the Navajo Reservoir Project which spans the time of occupation at the Loma Enchoso Community.

The Rosa Phase of the Anasazi Tradition

The Rosa Phase was defined by Hall in 1944 based on: (1) his excavations in the Gobernador south of the Navajo Reservoir area, (2) H. P. Mera's (1935, 1938) previous survey work in the La Plata River and north of the Gobernador, and (3) Robert's (1929) work at Shabik'eeshie Village. Hall (1944:43) defined the Rosa phase as a local expression of, or derived from, Morris' (1939) La Plata phase. Using the scheme presented by Willey and Phillips (1958), Dittert et al. (1961:220-236) formally expanded the concept for the area surrounding the Navajo Reservoir. As defined, the Rosa phase dates from ca. A.D. 700 to 850 (Eddy 1966:484; Eddy et al. 1984:70-81). However, west of the Reservoir area, this time marks the beginning of the Piedra phase from ca. A.D. 700 to 900 (Eddy et al. 1984:66). By A.D. 850, the Piedra phase replaces the Rosa phase in the Reservoir area.

Spatial Extent

The center of the Rosa phase (Figure 2) is apparently in the upland Gobernador country (Eddy 1968:199). The maximum spatial extent of the Rosa phase manifestation south and east is well delineated. To the south, it occurs over the entire Gobernador area but has a gradual transition in time and space into the Largo-Gallina phase (Dittert et al. 1961:236; Hall 1944). The eastern boundary of the Rosa phase was first plotted by Dittert et al. (1961:235) to be the Continental Divide, although Eddy (1968:199) would place the eastern border just west of the Divide. Recently, new evidence supports extending it to the Divide (Donaldson 1983).

Although Dittert et al. (1961:235-236) identified the northern extent of the Rosa phase only about half-way up the Pine drainage unit and the headwaters of both the Piedra and Upper Reach of the San Juan drainage units, it is now known to be present in at least a few per cent of the northern headwater's of the Pine drainage and is dense to the headwaters of the Piedra drainage (Eddy et al. 1984:76-85). Only along the Upper Reach of the San Juan drainage does it still follow the distribution first proposed (Eddy et al. 1984:85-88). Although Eddy et al. (1984:65-66) discuss the continuation of BMIIIC occupations and lack of PI occupations in the Animas drainage, they note that PI sites are being documented in the northern reaches of the drainage. Based on Cater's analysis of the CHP ceramics, Rosa phase occupation clearly are present in the southern portion of the drainage west of the Alkali River (Pilbado and Shields 1990; Shields 1989, 1990a, 1990b, Shields and Cater 1991b). Based on this information, it seems likely that the northern border drops to the south as it heads west.

Dykeman and Langenfeld (1987) identified Rosa phase ceramics at the East Side Roncino site located on the east side of the La Plata River. Cater has recently studied ceramics from excavations conducted by the San Juan College Archaeological Field School (Watson in prep.) at the East Side Roncino and from excavations conducted by the Fort Lewis College Field School on a site in the upper La Plata River drainage north of the Colorado-New Mexico state line. Rosa phase ceramics were confirmed for the East Side Roncino while BMIIIC and PI horizon ceramics of the Mesa Verde tradition were identified in the assemblage from the site excavated by the Fort Lewis field school.

Based on these data and investigations in progress along the lower La Plata drainage conducted by the Research Section of the Museum of New Mexico's deciduous (communication 17 September 1989), it is suggested here that the westernmost extent of the Rosa phase is at least west of the La Plata River and south of the Colorado-New Mexico border. If this interpretation is true, it mirrors a similar northern boundary extending beyond the Piedra and Arboles phases which are discussed below. The southwestern extent of the manifestation is less clear but Dittert et al. (1961:235) and Eddy (1968:199) document it as far as Blanco...
Figure 2. Map showing spatial extent of Rosa phase.
Although a lack of absolute dates somewhat hampers interpretation, it seems most likely that the northwestern boundary of the phase was expanding from the core of the Rosa phase occupations in the Gobernador until it met the southeastern expansion of the Piedra phase from the Mancos drainage. This Piedra phase expansion is discussed below. It thus appears that Hall's original concept that the Rosa phase was a derivative of the La Plata phase should be more closely examined.

**Settlement Patterns and Traits**

The Rosa phase settlement pattern reflects a population both aggregated and dispersed across the landscape in the Navajo Reservoir area (Eddy 1968:203-204). Because of winter-dominated precipitation patterns and large-scale spring water overflow events, most of the lower terraces contained at least some boggy areas which could not be farmed. But because of slightly wetter conditions than present, farming was possible in what would normally be less desirable areas such as Pleistocene terraces and mesa tops (Eddy 1968:54-56). Site clusters begin to appear where populations are aggregating. However, the horticultural techniques and field locations required numerous small farmsteads. Thus, the overall number of sites is highest for this phase. It appears that the population was increasing at the start of the phase and reached a peak which was sustained during the Piedra phase (Eddy 1966:492-494).

**The Piedra Phase of the Anasazi Tradition**

Employing the Midwest Taxonomic System (McKern 1939), Erik K. Reed (1958) defined the Piedra Focus from two data sources. The first source was from excavations he conducted in the Mancos Canyon, and the other was Frank H. H. Roberts' (1930) excavations north of the Navajo Reservoir area. However, using the scheme presented by Willey and Phillips (1958), Dittert et al. (1961:236) refined the concept and defined the late PI horizon Piedra phase for the area surrounding the Navajo Reservoir ("phase" and "focus" are different terms for the same level of abstraction in the two classificatory schemes [Willey and Phillips 1958:21-23]). As defined, the Piedra phase dates from ca. A.D. 700 to 900 (Eddy et al. 1984:59-60; Reed 1958). However, in the Reservoir area, this time is split into the Rosa phase from ca. A.D. 700 to 850 and the Piedra phase from ca. A.D. 850 to 950 (Dittert et al. 1961; Eddy 1966; Eddy et al. 1984:76-89). The Piedra phase is thus earlier in the western portion than in the eastern portion of its spatial extent.

**Spatial Extent**

The maximum spatial extent of the Piedra phase manifestation west-to-east is well-delineated (Figure 3). It is present on the west from the area south of the Mesa Verde, or within the south central portion of the Mancos drainage unit (Eddy et al. 1984:60; Stewart L. Peckham, personal communication 15 November 1990; Curtis F. Schaafsma, personal communication 15 November 1990), and extends east to the Upper Reach of the San Juan drainage unit (Eddy et al. 1984:83) or to the Continental Divide (Dittert et al. 1961:236).

However, during the time of the Piedra phase within the Reservoir area, the western spatial extent of the manifestation is nebulous (Dittert et al. 1961:236). Bullard (1962:59) notes that ceramics along the La Plata drainage are very similar to ceramics near the Reservoir area. The similarity of ceramics in these two project areas during this time has been noted by other investigators (Dittert et al. 1961:236; Dykeman and Langenfeld 1987; Pitblado and Shields 1990; Shields 1989, 1990a, 1990b, Shields and Cater 1991b). Additionally, the presence of Piedra phase manifestations along the east side of the La Plata River valley (Dykeman and Langenfeld 1987), coupled with data collected by the CHP east of the Farmington Glade, contrasts sharply with a near absence of Piedra phase manifestations west of the La Plata River (C. Dean Wilson, personal communication 29 October 1990). This may indicate that the area west of the La Plata River and east of the Mancos River drainage was never occupied by Piedra phase populations. That is, Piedra phase populations either went around this area or leap-frogged across it.

The maximum northern extent of the phase is identified as the Mancos drainage unit in the west (Eddy et al. 1984:57-62) and the Piedra and Upper Reach of the San Juan drainage units in
Figure 3. Map showing spatial extent of Piedra phase.
The Cedar Hill Project

The Arboles Phase of the Anaazi Tradition

The Arboles phase was first defined from Navajo Reservoir Project data (Dittert et al. 1961:221) and dates from A.D. 925 to 1050 (Eddy 1966:452, 457, 458, 504). The spatial extent of this phase is not clearly delineated, but sites assigned to this period are documented over most of the Navajo Reservoir area and as far west as the Pinta Verde Project (Dittert et al. 1961:236; Eddy 1968:80, Eddy et al. 1984:76). Based on ceramic analysis conducted by Cather, sites in Arboles-phase occupations have been identified in the CHP (Pitblado and Shields 1990; Shields 1989, 1990a, 1990b, Shields and Cather 1991b). The ceramic assemblages from the East Side Rincon site and from the Fort Lewis College site discussed previously did not contain any Arboles-phase ceramics. Based on these data and the chronology of New Mexico's immigration along the lower La Plata drainage (C. Dean Wilson, personal communication 17 September 1990), it is suggested here that the western extent of the Arboles phase may have been along the Farmington Glade.

Spatial Extent

The northern boundary of the Arboles phase apparently dips to the south in in east-west arc (Figure 4). In the east, it is identified as extending to the northern boundary of the Upper Reach of the San Juan drainage unit (Eddy et al. 1984:51-53) and to the south of Chimney Rock (Eddy 1977) in the Piedra drainage unit (Eddy et al. 1984:51-53; Eddy 1985:137-139; Stuart and Edwards 1986:36-44). The lower boundary of the Arboles phase was tentatively identified as extending along the lower La Plata drainage valley where a large population increase occurred during this time (Dittert 1966:502), on ridges, or other elevated localities (Wozniak 1982:23-24 citing Tainter and Gifford 1980) and on high mesa terrain above 2000 feet in elevation (Schoenwetter and Eddy 1964:125-126).

The summer-dominant precipitation pattern associated with heavy rainfall events began during this time. It is inferred that the predominant precipitation has continued to this present time in the Arboles phase.

Settlement Patterns and Traits

Identification of settlement patterns again reflects farming practices adapted to summer-dominant precipitation. These include site locations on floodplains. Some sites have been identified as cobbled architecture is found within the upper reaches of the lower La Plata drainage valley where a large population increase occurred during this time (Dittert 1966:502), on ridges, or other elevated localities (Wozniak 1982:23-24 citing Tainter and Gifford 1980) and on high mesa terrain above 2000 feet in elevation (Schoenwetter and Eddy 1964:125-126).

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Figure 4. Map showing spatial extent of Arboles phase.
Premises for the Northern San Juan Basin

Based on the data and discussions presented above, several premises have been formulated (Shields 1990c):

- It appears that an indigenous northern San Juan Basin population adopted an Anasazi ideology. This probably took place during the BMII horizon but was definitely integrated by the BMIII horizon (Dyckman and Langenfeld 1987:22; Morris 1939).
- From the BMII through the PI horizon, this population had stronger affiliations with Mesa Verde than with Chaco Canyon developments and may have had more contact with the Chuska Mountains/southeast Utah region than Chaco Canyon.
- From BMIII to PI, major portions of this population were focused on and lived in and around both the Loma Encrobo and East Side Rincon communities.
- During the Arboles phase, as a result of population movements, the La Plata River drainage was of greater importance to this population than the CHP area.
- One of the earmarks of this population is the use of cobble instead of dressed sandstone for construction. The extent of this in situ population is reflected in similar architectural styles seen from the Navajo Reservoir area (Dittert et al. 1961:213, 226, 261), west into the La Plata River valley. It is this population that remodeled portions of Salmon Pueblo and built roomblocks at Artec Pueblo (Dyckman and Langenfeld 1987:87 citing Irwin-Williams 1972).
- Another distinctive trait of this population is the presence of oxidized pithouses compared to other Anasazi populations (Cater 1989). In many instances, structures (both surface and subterranean or semi-subterranean) were intentionally burned at abandonment.
- During the PIH horizon, the CHP area was used primarily either as a travel corridor or for resource procurement but may also have contained a small population with permanent habitations.

Conclusions and Remarks

The CHP identified a community center dating from the Rosa phase through the Arboles phase located along an easily traversed route between the Animas and La Plata rivers. It is the second large community of its kind to be identified in the area. The first community of this type, centered around the East Side Rincon site, was identified a short distance west in the La Plata River valley (Dyckman and Langenfeld 1987).

Although the community is nucleated, the orientation and arrangement of structures within the community is random. This is similar to village layout noted throughout the region (Eddy 1966:493). The occupation sequence of the CHP area appears to parallel the sequence in the Navajo Reservoir area during the time discussed herein (Eddy 1966). However, when settled to the Reservoir area, there appears to have been only minor occupation during the early BMII horizon in the CHP area. A major component of cobble architecture in both areas throughout the Anasazi occupation is viewed as significant.

The occupation sequence and settlement pattern noted within the CHP reflects a trend which took place during the PI horizon throughout the Four Corners region. At that time, the population of the region, which had been reduced in relatively scattered farmsteads or multi-family units, began to aggregate into larger communal settings, often around oxidized structures in a village locus. This type of aggregation has been noted in the Dolores Valley (Kane 1984), the Navajo Reservoir area (Eddy 1986), Alkali Ridge (Brew 1946), and in the La Plata River valley (Dyckman and Langenfeld 1987).

What functions these aggregated systems served is still unclear, but it can be suggested that they afforded the opportunity to communally practice intensive farming in a limited spatial area, as well as exploit several micro-niches, because of the topographic location of the villages. These community centers undoubtedly served as trade and redistributional loci as well as serving as centers of ritual activities. In a very real sense these communities were the "cities" of their day.

Throughout the Four Corners region, community aggregations exhibit rapid growth during the late BMIII-early PI horizons, when a population peak is reached. This population is stable during the mid-late PI horizon but breaks down precipitously during the PI horizon in the northern Anasazi area. This timing of these population fluctuations varies from subregion to subregion. Although the topic of abandonment is not directly addressed herein, some causative factors can be suggested. It is possible that as populations continued to grow within these limited spatial areas, they outstripped the resource potential around them. This, in combination with shifting climatic conditions, could create devastating effects on a large, centralized population. That environmental shifts were taking place at this time is evidenced by work done in the Dolores Valley (Peterson 1981, 1983) and in the Navajo Reservoir area (Eddy 1966, 1968; Schoenwetter and Eddy 1964).

Eddy reports that headward erosion and arroyo downsizing in the Navajo Reservoir area parallels the abandonment of that area (Eddy 1974). If this trend continued west into the CHP area, the water table could have been lowered enough to make floodwater farming impossible. This may also have affected the flow of the local springs which are today the only source of permanent water in the CHP area.

At the time the CHP was being abandoned, the population within the La Plata Valley to the west was growing (Morris 1939) and local cobble masonry appears at the Artec and Salmon pueblos south of the CHP along the Animas and San Juan rivers (Dyckman and Langenfeld 1987). It is likely that the CHP populations shifted to the well-watered valleys, reverting to smaller hamlet or farmstead settlement patterns. A final point which should be made is that although Eddy (1966, 1968) describes headward erosion along the upper San Juan, Piedra, and Pine rivers, this may not have affected the lower reaches of these and other river valleys, where sailing would have occurred. It is unknown whether similar headward erosion took place along the upper reaches of the Animas and La Plata rivers, but the population centers of the Pueblo II horizon appear to be located in the lower reaches of those valleys.

Postscript

Early in the summer of 1991, Dr. James Judge, assisted by Dr. Richard P. Watson of San Juan College, directed a field school for Fort Lewis College in the Loma Encrobo Community. Several remote sensing techniques were employed with considerable success and in addition to the field school report, professional papers are planned (Dr. Richard P. Watson, personal communication 27 July 1991).

Later in the summer of 1991, the Bureau of Land Management (BLM), Farmington Resource Area, which administers the property containing the nuclear community, in consultation with the New Mexico State Historic Preservation Office, designated approximately 16 square km (10 square miles), including most of the CHP as well as additional areas, as the Loma Encrobo Community Special Treatment Area (STA). This designation stipulates protective measures beyond those usually required on public lands and coordinates the BLM to acquire all private holdings in the STA. Additionally, a large area around the nuclear community will be intensively surveyed and a large area surrounding it will be sampled. The focus of these investigations will be to define contemporaneity of structures and to fully replicate settlement patterns. These investigations, in conjunction with the field school, should be a major contribution toward refining our understanding of nuclear communities.

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We would like to thank Douglas D. Dyckman, Kristen Langenfeld, Dr. Richard P. Watson, and Dr. W. James Judge for their help and advice during field trips in the CHP. We would also like to thank Dr. Alfred E. Dittert, Jr., Dr. Frank W. Eddy, Stewart L. Peckham, Curtis F. Schaafma, and C. Dean Wilson for technical advice and literature clarifications.
The Dinetah Phase in the La Plata Valley

Gary M. Brown and Patricia M. Hancock

Introduction

During test excavations in 1984 by the Division of Conservation Archaeology (DCA) at an Anasazi site (LA 38353) in the La Plata Valley, an extramural hearth was routinely sampled for radiocarbon dating. To the investigators’ astonishment, this sample produced a date much younger than expected—A.D. 1510±50 years (uncalibrated) (Beta-13878). Ceramics associated with the hearth, originally classified as plain Anasazi graywares, were reexamined and found to fit Brugge’s (1963) description of Dinetah Gray Ware, a protohistoric ceramic manufactured by Athapaskan groups ancestral to the Navajo. This discovery prompted a scrutiny of all testing-phase ceramics recovered by the project, and resulted in a small number of other sites (LA 38536) with Dinetah Gray sherds. A radiocarbon sample from this site was submitted, producing a date of A.D. 1570±50 (uncalibrated) (Beta-13241). DCA went on into the subsequent mitigation phase with the aim of recovering as many chronometric dates from these sites as possible to substantiate the Dinetah phase in the La Plata Valley. These dates, plus additional dates and a wealth of data from subsequent discoveries at the La Plata Mine, are the topic of this paper.

History of Dinetah Phase Research

The Dinetah phase was first proposed during contract archaeological studies in the Navajo Reservoir district (Dittett 1975; Dittett et al. 1961). Based initially on survey data collected during the late 1950s, Dittett defined the Dinetah phase as the earliest occupation by Athapaskan groups, encompassing the time between the initial Spanish colonization of the Southwest and the Pueblo Revolt of 1680 when aboriginal groups drove out the Spanish. Dittett placed the beginning of the Dinetah phase at around A.D. 1550-1600, suggesting that both early Navajos and Apaches were descended from a hunter-gatherer tradition adapted to the High Plains of eastern Colorado (Dittett et al. 1961:247). He hypothesized that the Navajo-Apache split occurred at about the same time as the earliest Athapaskan entry into the Southwest, shortly after initial European contact between 1540 and 1542. Thus, the Dinetah phase was proposed as the earliest occupation of the San Juan Basin by Athapaskan groups, with Navajo culture differentiated from that of the Apaches in terms of this new adaptation to the Southwest at a time when the Athapascans retained a Plains orientation.

Dittett defined the Dinetah phase using a subtractive approach. Assuming the pre-Revolt complex to be relatively unaffected by European and Pueblo contacts, traits attributable to their influence were subtracted, including painted and slipped pottery, masonry architecture, and animal husbandry. The hypothesized core of the Dinetah phase included forked-pole hogans, Dinetah Gray pottery, side-notched and corner-notched projectile points, side-notched axes, full-ground manos, and a fairly sophisticated and diverse chipped stone technology based on local materials (Dittett et al. 1961:246). Although Dittett was unsure whether or not to include agriculture, one of his collaborators includes corn, bottle gourds, and beans in the list of Athapaskan cultural elements (Hester 1962:63).

Because all traits associated with the Dinetah phase are also included in the post-Revolt Gobernador phase, identifying Dinetah occupations was difficult for archaeologists, and in the minds of some it was suspect. Eddy (1966) rejected the Dinetah phase as an identifiable occupation associated with a ceramic assemblage that included Gobernador Polychrome (Hester and Shiner 1963:41-47). Eddy (1966:285) questioned the excavators’ assignment of the lower component to the Dinetah phase because of the later two ceramic assemblages consisting of only nine sherds (all Dinetah Gray).

Excavations atTodos Rock Shelter (LA 4298) revealed comparable stratigraphy (Hester and Shiner 1963:35-45). The upper, dry zone included a rich assemblage of perishable materials, while the lower, wet zone lacked perishables but contained additional Navajo remains overlaying a basal deposit which contained Anasazi remains. A single sherd of Gobernador Polychrome in the uppermost fill suggested a post-Revolt occupation, but the uppermost deposit contained only Dinetah Gray. Again, the excavators’ assignment of the intermediate deposit (upper portion of the wet zone) to the Dinetah phase was questioned by Eddy (1966:506), though the hypothesized Dinetah component in this case included 51 sherds. It seems there is a bit of a paradox that Eddy, while sensitive to the small samples comprising the hypothesized Dinetah phase ceramic assemblages, chose to ignore the evidence for repeated occupation of this site, and relied on a single polychrome sherd to use Todos Rock Shelter as the site type for assigning a distinctive sandal (cupped-heel style) and additional perishable materials to the Gobernador phase (Eddy 1966:268).

Three additional Navajo sites were identified as Dinetah phases by excavators at Navajo Reservoir, while additional “indeterminate Navajo” sites were shown to lack Gobernador Polychrome or other elements of the lower occupation. One such site was Parching Tray Shelter (LA 3491) where perishables included beans embedded in clay plugs from Dinetah Gray vessels. Still, the best arguments for pre-Revolt occupation were based on negative evidence. Eddy (1966:507-508) concluded that the best positive evidence for a Dinetah component in the Navajo Reservoir District was the occurrence of maize pollen in alluvial deposits cross-dated on the basis of geomorphic studies to the A.D. 1300-1700 time interval. He interpreted the pollen data as evidence of floodplain farming by early Navajo groups but...
does not acknowledge this as collaborative evidence in support of arguments for a Dinéhah occupation at Navajo Reservoir.

Supporting evidence for the Dinéhah phase was extremely slow in coming. Although many pre-Revolt tree-ring dates have been obtained from Navajo sites elsewhere in the San Juan Basin, none are cutting dates. Six sites on Chacra Mesa produced tree-ring dates, many indicative of occupations during the eighteenth century (Gobernador phase). One of these sites had a forked-pole hogan that appears to have been built during the seventeenth century, possibly as early as A.D. 1600 (Vivian 1960). More convincing evidence was not obtained until the early 1980s when work in Blanco Canyon by the Office of Contract Archaeology at the University of New Mexico was reported by Marshall (1985). who assigned components at two sites to the Dinéhah phase based on analysis of the ceramic assemblages and associated radiocarbon dates. The early Navajo component at El Campo Navaí (LA 38946) contained both Dinéhah Gray and Gobernador Indentified, a four-post structure with interior hearth and milling bin, and an extramural activity area with hearths (Marshall 1985:83-95). Both maize and wild plant resources appear to have been exploited. La Caja Blanca (LA 38951) also contained temporary structures, probably made of brush, with occupations inferred during both Dinéhah and Gobernador phases (Marshall 1985:101-121).

A great deal of additional evidence supporting the concept of the Dinéhah phase has been unearthed by recent excavations at the La Plata Mine. (Figure 1). Beginning with the investigations at LA 38555 and LA 38536, described in the introduction of this paper, 11 sites at the La Plata Mine have been assigned to the Dinéhah phase based on chro-nometric and ceramic data. Field work started in 1984 and continued intermittently until 1989 with the efforts of DCA, Nies, and Associates, and Marshall Associates, all supported by San Juan Coal Company (Brown 1991; Hancock et al. 1988; Reed et al. 1986; Reed and Horn 1986, 1989).

**Dinéhah Phase Sites in the La Plata Valley**

La Plata sites comprise a distinct cluster near the confluence of McDermott Arroyo, a major tributary of the La Plata River, and Cinder Gulch, a minor tributary of McDermott Arroyo. Both drainages are intermittent, while the La Plata River, only a short distance downstream, supports a lush riparian environment. Despite the long history of both survey and excavations in this rich archaeological district (see Dikeman and Langanfeld 1987), Dinéhah sites have been documented only in the McDermott Arroyo area. Additional sites may occur to the northeast up McDermott Arroyo in southern Colorado (Karlson and Biggs 1985; Liddy 1976). Archaeological visibility may play a role in the apparent clustering, with Dinéhah sites becoming more common in other parts of the San Juan Basin as archaeologists during the late 1980s and 1990s have become increasingly aware of these unobtrusive remains. Still, Dinéhah sites have not been documented in other parts of the La Plata Valley despite ongoing survey and excavation projects in the middle and lower sections.

These sites have a "low profile" in terms of surface indications. This is due, in part, to the temporary nature of the structures, where present, and to the limited number of artifacts. In general, surface indications are limited to a light scatter of lithic and ceramic artifacts, fire-cracked rock, burned sandstone, and, occasionally, ephemeral charcoal staining. In addition to these subtle surface indications, the associated gray and brown ceramics easily blend into the soil. Their friable nature makes for very small sherds. It is possible in a survey situation that these sites could be classified as Anasazi because the sherdscan easily be mistaken for local Basketmaker III gravelers.

The sites are located in a variety of settings between 9000 and 6100 feet. Most are in gently rolling terrain dominated by pinon-Juniper woodlands adjacent to sage parks or grassland meadows. All of the Dinéhah sites are associated with intermittent drainages. Shelter is mainly offered by the woodland setting. Despite the rich riparian environment and floodplains along the La Plata River, a zone densely occupied by the Anasazi, the Dinéhah phase sites are consistently located in upland settings or on terraces along tributary drainages. Interestingly, these settings are also where most Archaic sites in the region appear to be located, possibly due to similar ad-

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**Figure 1. Location of La Plata Mine on the east side of the middle La Plata Valley in northwestern New Mexico.**
aptations. Both the Archaic and Dinéh phase sites appear to be oriented toward wild plant exploitation with cultivation and hunting less important subsistence pursuits.

Two different types of domestic architecture have been defined at Dinéh phase sites in the La Plata Valley: brush structures with foraged pole hogan. The first and most expedient type occurs archaeologically as an adobe, charcoal-stained lens with charcoal concentrations, representing charred posts in some cases. These simple dwellings appear to have been built entirely of perishable material. There are minimal remains of a log superstructure, while brush covering materials like those used in modern-day Navajo summer brush structures are suggested by the abundance of ash and the presence of identifiable charcoal other than that attributed to the main posts and beams. Botanical analyses indicate that green branches and bark of both juniper and pinon, along with rabbitbrush and possibly additional materials, were used to cover the log framework.

Six brush structures were defined by DCA's excavations at three sites (LA 56841, 56842, and 56843) in the La Plata Mine lease (Reed et al. 1986). These ranged from ovoid to irregular in shape, with at least four examples having very shallow, basin-shaped floors. Size was fairly consistent, ranging from a minimum dimension of 2.0 m to a maximum of 2.9 m; floor area ranged from 3.5 to 5.1 square meters, averaging 4.4 square meters (standard deviation 0.709). Only three of the brush structures had central hearths, while one had a hearth on the north edge, and two were associated only with extramural hearths. One structure contained both a hearth and a shallow, rock-lined pit. Four of the six brush structures were excavated at a single site, but it is unclear whether any are contemporaneous; the other two structures occurred singly. DCA interpreted one other feature at a fourth site (LA 38536) as a brush structure (Hancock et al. 1980), but subsequent studies suggest that this feature could be a heavily eroded hogan (see below). A seventh brush structure was excavated, a) by Mariah, being larger than those defined by DCA and appearing more square in shape, with the corners rounded (Brown 1991). This feature measured 3.45 by 3.75 m with a floor area of 10.2 square meters. More evidence of charred posts occurred in this structure, but there were no internal features. Two hearths were located outside of the structure (Figure 2).

The second type of domestic structure is a unique kind of foraged-pole hogan constructed over a previously excavated hexagonal floor pit. This type of structure has been defined in five instances at three separate sites (LA 61828, 61838, and 61852) excavated by Mariah (Brown 1991). An additional hogan tested by DCA and later excavated by Nickens and Associates (LA 49098) may be similar, though architectural details are not as clear (Hancock et al. 1986; Reed and Horn 1988b, 1990). As noted, one additional feature originally interpreted as a brush structure by DCA (LA 38536) may be a seventh example of a hogan (Hancock et al. 1980). Ethnographically, some brush structures have shallow floor pits, but these are excavated after construction of the dwelling (Stephen C. Jetti, personal communication, 1990). The hogans excavated by Mariah, however, were unquestionably built after excavation of the hexagonal foundation, with six sturdy logs abutting the corners of the hexagon or resting just outside the corner. The spaces between these primary support poles were filled with smaller logs and the conical framework was then layered with juniper bark and boughs which were, in turn, covered with 5-10 cm of earth. This type of structure represents an interesting blend of two different traits in ethnographically known Navajo domestic architecture — conical, foraged-pole construction and multi-sided floor plans. Traditionally, multi-sided hogans are built using cribbed-log construction, while foraged-pole structures have informal, ovoid floor plans. The size of Dinéh phase hogans is more variable than brush structures. The six definite hogans ranged from a minimum dimension of 3.2 m to a maximum of 6.0 m; floor area ranged from 8.6 to 18.7 square meters with an average of 13.9 square meters (standard deviation 3.737). The structure at LA 38536 is consistent with the larger size range of the hogans, suggesting that our reinterpretation of this feature as an eroded hogan is plausible. Five of the six definite hogans (and the possible hogan at LA 38536) contained central hearths, more precisely described as slightly south or southeast of the center (i.e., between the center and the typical location of the entryway). The remaining hogan had a slab-lined hearth built

![Figure 2. Plan map showing burned remains of a Dinéh phase brush structure (Feature 9) associated with two extramural hearths (Features 2 and 4), LA 1848, Block A, Structure 1.](image-url)
into the north wall, forming a small alcove that could possibly have been opened to the outside to clear the dwelling of smoke. Additional intramural features were rare; two hogans had small interior warming pits and one had a low bench in the northern floor area.

The first forked-pole hogan, where a multi-sided floor plan could be defined, was excavated by Marish in 1988 (Figure 3). Similar features were defined at two other sites the following year. The best preservation of Dinétah phase architecture occurred at LA 61852 where three forked-pole hogans had evidently been intentionally burned at the time of abandonment. Structure 1 contained a thick, grayish stratum of burned roof material surrounded by dense charcoal where the superstructure had articulated with the protohistoric ground surface (Figure 4). Patterns of charcoal and oxidation where burning structural materials had collapsed on the floor assisted architectural reconstruction (Figure 5). In addition to a hexagonal floor pit excavated prior to construction, a well-defined entry lobby was observed on the southeast (Figure 6). Structure 3 at this site showed the most unequivocal evidence for excavation of a hexagonal floor pit prior to construction, especially with the major support posts which had heavily oxidized the abutting ground surface just outside the hexagon corners (Figure 7).

Structure 3 at LA 61852 had the most complex suite of intramural features with a central hearth and two warming pits. The roasting-pit (Feature 13) to the immediate north of the hogan is rather unusual. Structure 2 at the same site is characterized by an even more unusual roasting pit that had been built into the north wall of the hogan (Figure 8). Although this feature, may have been covered with a removable flap during intermittent weather, such an arrangement would have prohibited its use at such times unless a hood or some sort of covering had been incorporated into the wall covering the feature.

Extramural features were frequently associated with both hogans and brush structures. Such features were commonly hearths, sometimes overlapping stratigraphically, suggesting reuse of the same activity areas (Brown 1991). The hearths south of Structure 1 at LA 61828 provide one such example (see Figure 3). At least one such activity area appears to have been partially sheltered by a shade. This area contained a small roasting pit and two small warming pits, along with various artifacts and site furniture (Figure 9). The two excavated basins on the right of the photo in Figure 9 (Feature 7B and 7C) were filled with charcoal and appeared to be warming pits, while the unexcavated hearth filled with ash and burned rocks on the left (Feature 7A) proved to be a shallow roasting pit. The large slab at the top of the picture and additional remains suggest that this cooking area may have been partially sheltered by a windbreak or ramada. Other extramural features include ash lenses that appear to have been refuse areas. The absence of storage features and meal bins distinguishes the Dinétah sites from Gobernador phase sites documented elsewhere in the San Juan Basin (Brown and Evavskoh 1991; Dittert et al. 1961; Edel 1986; Vision 1990).

**Artifacts**

Protohistoric ceramics recovered from the La Plata Mine sites were compared with Bruge's (1963) description of Dinétah Gray. In particular, seven attributes showed interesting similarities or differences: exterior surface treatment, interior treatment, temper, color, wall thickness, rim style, and fracture. In both interior and exterior surface treatment, ceramics fit the type description except for a lack of cornel-scraped vessels and a scarcity of mica glints. Tempering material frequently differs from the type description in that most of the La Plata ceramics have detrital sandstone from an igneous source, along with sand and quartz temper. Tempering material is not abundant. Exterior and paste colors are quite variable, but they fall within the previously described range. The variety of colors recorded for one vessel are believed to be the product of uncontrolled firing techniques. Rim style differs from the type description with the La Plata ceramics tending to curve outward at the lip, a characteristic occasionally observed by Bruge. The shell fractures, or profile of the shell's broken edge was crumbling or irregular and ragged. This is consistent with the vessel wall hardness which was weak to medium weak.

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**Figure 3.** Plan map of Dinétah phase forked-pole hogan (Feature 3) in Block A and superimposed hearth series (Feature 5A-5D) in Block D, LA 61828. Note: Heaths to the east of the hogan (Features 5A, 5B, and 5C) occurred slightly deeper than the Dinétah phase deposits, dating to the Archaic Period.
The Dinetah Phase in the La Plata Valley

Figure 4. Buried remains of a Dinetah phase forked-pole hogan, LA 61852, Block A, Structure 1 (Feature 1). View is to the north with entryway on the southeast.

The only distinctive attribute differences between Brugge’s type description and the La Plata ceramics are rim lip and tempering material. Temper in the La Plata collections displays a wide variety of mixed materials of various mineral compositions, size, and degree of sorting. Some of the fragments appear to be quartzite, granite, gneiss, and diorite. Sherds containing sand or sandstone and crushed andesite or diorite are very common. No consistent pattern of temper choice can be seen. Most of the material looks more like coarsely sorted lithic fragments from detrital outwash slopes than from well-sorted riverine sands. Sandstone from this area has more uniformity in composition than the temper in most of these sherds. Materials from various localities occur in the temper. Tempering materials were not the product of intentional crushing of volcanic rocks, as with the Anasazi, but rather the collection of sands having igneous rock as part of their composition. The original source of the igneous rocks is believed to be the La Plata Mountains to the north; however, the material was evidently transported by river and simply gathered as sediments by protohistoric potters, potentially within the project area.

Using Colton’s typology (1953:Figure 10), rim styles from DCA’s collection fall into the following categories: IA3, IIIA3, IIIB6, IIIB7, and IIIB10. Brugge’s rim forms are IA3, IB3, IB4, IIIA4, IIIB3, IIIB10, IIIA5, IIIB5, VB4, AND VB5.

The slightly curved/flared lip morphology distinctive of La Plata Variety ceramics is illustrated by a partially reconstructed vessel excavated from floor context in one of the Dinetah phase hogans (Figure 10). The vessel has a globular body built up with wide coils that have been bonded together but only partially smoothed. The coils can still be distinguished individually, especially at the top where three fillets evidently were intentionally left unobliterated to create a neckbanded style reminiscent of early Pueblo plainware jars. In this regard, the vessel is rather unique. It was recovered from one of the most tightly dated contexts, dated to the early 1500s. The interior of
Figure 5. Plan map showing burned remains of a Dinetah phase forked-pole hogan (Structure 1) and associated ash dump (Feature 2) and hearths (Features 7, 8, and 9), LA 61852, Blocks A (left) and B (right).
Figure 6. Plan map of Dinétah phase forked-pole hogan (Structure 1), LA 61852, Block A, after exposure of floor materials (compare Figure 5).

Figure 7. Plan map and profile of Dinétah phase forked-pole hogan (Structure 3/Feature 5), LA 61852, Block E, after exposure of floor materials.
The Dinetah Phase in the La Plata Valley

Figure 8. Buried remains of a Dinetah phase forked-pole hogan excavated to floor level, LA 61832, Block C, Structure 2 (Feature 6). View is to the northwest with roasting pit incorporated into the north wall of the hogan.

Gary M. Brown & Patricia M. Hancock

this cooking jar contained traces of organic residue, probably some kind of broth or stew.

The Dinetah Gray collections from the La Plata Mine can be sorted into three groups. In decreasing order of abundance these are: (1) La Plata Variety; (2) standard Dinetah Gray, and (3) Gobernador Varieties. La Plata Variety ceramics have temper like that just described, consisting mainly of local detrital sand and igneous rock. Standard Dinetah Gray is characterized by quartz sand, while Gobernador Variety ceramics (Bragge 1980), also referred to as Gobernador Indented (Carlson 1965), are distinguished by shallow, finger-impressed indentations on a surface that is otherwise smooth. The last two varieties are fairly uncommon in the La Plata Valley. We propose that Dinetah Gray, La Plata Variety ceramics (1) are the product of Athapaskan groups ancestral to the Navajo; (2) are among the earliest pottery manufactured by Athapaskan groups in the Southwest; and (3) differ slightly from standard Dinetah Gray in tempering material due to the nature of local resources.

Lithic artifacts were fairly common at these sites, including both chipped stone tools and debitage, along with moderate quantities of ground stone. Sites with forked-pole hogan contained between 16 and 66 chipped stone tools and cores, averaging about 20 tools per hogan, while brush structures were associated with a comparable number (Brown 1991). Ground stone was more variable in occurrence, but generally occurred in similar numbers, while hammerstones and other pecked stone tools were less common. Various unflaked lithic tools were generally more common in Dinetah phase assemblages than at either Anasazi or Archaic sites at the La Plata Mine. Interestingly, formal tools were more common than at the earlier sites, even the Archaic assemblages. Formal tools, including bifaces, projectile points, scrapers, choppers, and other items, made up nearly half of the chipped stone tools and cores, with expedient flake and core tools comprising much of the remainder. The ground stone assemblages were diverse, containing one-hand and two-hand manos (both cobbles and shaped forms), basin and slab metates, and some additional formal tools such as shaft adzes.

Most of the projectile points were small unnotched triangular arrow points (Cottonwood series) and small side-notched arrow points with a concave base and/or basal notch (Desert series). Examples of these two main forms occurred at several sites (Figure 11). Both forms are common in protohistoric collections through much of the western U.S. Scavenging of points and other tools from Anasazi sites appears to have been fairly common at the La Plata sites (Hancock et al. 1988). The Late Pueblo style point (Figure 11-e) may be one such example. It occurred on the east edge of a hogan that appears to have been ritually abandoned and burned. The two large serrated "points" (Figure 11-f and 11-m), one stained with ochre, were collected from the floor of the hogan, along with a deer antler that had been placed in the entry (see Figure 6). The neckbanded jar described above also was found on the floor of this structure.

Chipped stone debitage was fairly abundant in Dinetah assemblages, generally including about 80 to 100 items per dwelling, although debitage was not actually common within the domestic structures. The ratio of flakes to angular debris was slightly higher than even Archaic assemblages. Although biface reduction and thinning flakes were somewhat less common than at the Archaic sites, smaller-sized tool retouch and refurbishing debris were more common than in any of the other assemblages at the La Plata Mine. A variety of debitage types in a collection of 797 pieces from Dinetah phase contexts were represented in the following percentages: 38 percent core reduction flakes, 15 percent biface flakes, 9 percent retouch flakes, 11 percent indeterminate flake fragments, and 7 percent shatter. Overall, the debitage assemblages complemented the number of formal chipped stone tools.

81

Figure 9. Internal features in Dinetah phase activity area. LA 61838, Block C.
Figure 10. Partially reconstructed Dinetah Gray (La Plata variety) vessel recovered from Structure 1, LA 61852. Width of vessel at the neck is 17 cm.

Figure 11. Selected projectile points from Dinetah phase contexts. Cottonwood Triangular and Desert Side-notched points from LA 61882 (a, b); LA 61848 (c, d); LA 61852 (e, f, g, h, i, j, k); serrated "points" (l, m) from LA 61852; and Late Pueblo style point (n) from LA 61852.
The Dinetah Phase in the La Plata Valley

Gary M. Brown & Patricia M. Hancock

Subsistence

One of the most salient characteristics of the Dinetah phase is the emphasis on hunting and gathering compared to the post-Revolt Gobernador phase when the use of domesticated animals and plants increased along with various other influences from the Spanish and various Pueblo groups (Hester 1962). The degree of reliance on agricultural resources was uncertain, as was the status of the Dinetah phase in general, during the course of most of the field work at the La Plata Mine. Although ethnological studies at these shallow sites have not been extremely productive, they have produced some subsistence data. One of the major conclusions is that although domestic plants were raised, they appear to have made a relatively minor contribution to the subsistence base. Despite intensive pollen and flotation analyses, domestic plants were represented only rarely. Corn was found in only one flotation sample and in one other context during normal excavation procedures; domestic beans were recovered from one hearth. Corn pollen was identified in Dinetah contexts at six sites. Corn pollen was very scarce, with no aggregates, thus, we are unsure whether or not corn was actually cultivated in the prior area.

In contrast, a great deal of information on wild resource procurement has been accumulated. Pollen from the Dinetah phasert sites is very rich and includes many larger seeded grasses and bushy plants. The emphasis on these plants is especially pronounced in the La Plata Mine area. Corn was found in only one flotation sample and in one other context during normal excavation procedures; domestic beans were recovered from one hearth. Corn pollen was identified in Dinetah contexts at six sites. Corn pollen was very scarce, with no aggregates, thus, we are unsure whether or not corn was actually cultivated in the prior area.

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wood washed down from higher elevations to the north probably can be found in the major drainages.

Faunal remains were not common at Dinetah phase sites, but various artiodactyls, lagomorphs, rodents, and birds were identified. One site (LA 61852) where faunal remains were unusually common produced all of these taxa, with mule deer (Odocoileus hemionus), cottontail (Sylvilagus sp.), and jackrabbit (Lepus sp.) well represented. Given the excellent deer habitat in the project area, the minimal presence of deer bone and faunal remains generally appears to be noteworthy. It would appear that hunting was relatively opportunistic rather than selective, at least during spring and summer when botanical data suggest most sites were occupied. Botanical analyses suggest overwintering only at the one site that did produce substantial faunal remains. Artiodactyls were richer in spring and summer, and, given that early modern humans are better able to take advantage of such prey, it is possible that spring and summer hunting was more productive, although in this case the scarcity might be due to taphonomic factors.

Chronology

Since the Dinetah phase was defined in the Navajo Reservoir district, there has been considerable effort to place it into an absolute chronological context. Assuming that a pre-Revolt Athapaskan occupation did occur in the San Juan Basin, there are two important chronological issues to be assessed. The first is the age of the Dinetah phase specific occupations. The second is the initial arrival date of Athapascan in the region, a subject beyond the scope of this paper. There is some evidence from the La Plata Mine suggesting that occupation between the Anasazi abandonment and the earliest Dinetah phase may be quite different from either of these better-documented occupations. It is possible to be anecdotally and even more unobtrusive phenomenon than that characteristic of the Dinetah phase (Brown 1991). We regard the origins of Athapaskan in the Four Corners region as an open question that cannot necessarily be equated with the Dinetah phase.

Chromometric dating has been successful to some extent at most of the La Plata sites. DCA obtained radiocarbon dates from most excavated protohistoric components, as well as obsidian hydration and thermoluminescence (TL) dates (Hancock et al. 1986; Reed et al. 1988). Additional radiocarbon dates were obtained from one site by Nickens and Associates (Reed and Horn 1988), while another radiocarbon date was secured from a small camp associated with a few Dinetah sherds by the BLM (Gaudy 1986). Mariah secured numerous additional radiocarbon dates, along with obsidian hydration dates and the only protohistoric tree-ring dates from the La Plata Valley (Brown 1991). Archaeomagnetic dating was also attempted, but the only protohistoric sample that proved successful was from an accreted rim.

The results of the chromometric assays are provocative. The small site investigated by the BLM provided the oldest radiocarbon date at 600±40 B.P. (ca 1250–1300). Comparably radiocarbon dates were generated by DCA’s work, the mean on the majority ranging between 570 and 210 B.P. (ca 1332–1659). DCA obtained more direct dates by TL dating on 27 Dinetah sherds from seven protohistoric sites. Mean dates ranged from 470 to 250 B.P. (AD 1480–1700) except for one very early outlier having a large standard deviation (610±122 B.P.). The dates are consistent with the other radiocarbon dates from the same sites, but they are substantially younger than radiocarbon dates that were tree-ring corrected (Reed et al. 1988:356). Thirty obsidian artifacts from protohistoric contexts also were dated. The mean dates ranged from 643 to 333 B.P. (AD 1307–1617), comparing favorably with corrected radiocarbon dates but, on the whole, are substantially earlier than TL dates from the same sites (Reed et al. 1988:356). Radiocarbon dating is difficult to apply archaeologically, especially with relatively young sites such as those occupied during the Dinetah phase. DCA attempted to circumvent problems with radiocarbon dating by relying on alternative dating methods. This was done with ceramics using TL dating, which has the advantage of dating the object of interest (pottery) directly rather than by associated materials. A question of great concern is the origin of Navajo pottery mar furnace. Based on studies at Abiquiu Reservoir, Schanina (1979) argues that Navajo pottery dates only after the Pueblo Revolt because the associated radiocarbon dates could be earlier than the actual occupation.

Once the presence of Dinetah phase sites at the La Plata Mine was identified, DCA made a concerted effort to determine the age of the associated ceramics. TL dating was one important means of doing this, producing a median date of 1560 and a mode of 1510. These dates strongly suggest that Dinetah Gray pottery from the La Plata Mine was made prior to the Pueblo Revolt of 1680. In this study, TL dating was consistent in that sherds from the same vessel, submitted to the laboratory without information on their association, yielded nearly identical dates. At one site (LA 38535), two closely-related sherds were dated within 10 years of each other (A.D. 1460±98 and 1470±96). At another site (LA 50642), two sherds with similar physical characteristics and believed to be from the same vessel were dated to A.D. 1510, ±88 (Alpha-3133) and ±24 (Alpha-3129). Burned sandstone and its matrix from the same feature as the sherds provided a somewhat younger date: A.D. 1590±40. A radiocarbon date from the same feature yielded a calibrated date of A.D. 1439–1660 (Beta-17918).

Obsidian hydration dating was also attempted at Dinetah phase sites. The results have been more problematic than for the other radiocarbon dates from the same sites, but they are substantially younger than radiocarbon dates that were tree-ring corrected (Reed et al. 1988:356). Thirty obsidian artifacts from protohistoric contexts also were dated. The mean dates ranged from 643 to 333 B.P. (AD 1307–1617), comparing favorably with corrected radiocarbon dates but, on the whole, are substantially earlier than TL dates from the same sites (Reed et al. 1988:356). Radiocarbon dating is difficult to apply archaeologically, especially with relatively young sites such as those occupied during the Dinetah phase. DCA attempted to circumvent problems with radiocarbon dating by relying on alternative dating methods. This was done with ceramics using TL dating, which has the advantage of dating the object of interest (pottery) directly rather than by associated materials. A question of great concern is the origin of Navajo pottery mar furnace. Based on studies at Abiquiu Reservoir, Schanina (1979) argues that Navajo pottery dates only after the Pueblo Revolt because the associated radiocarbon dates could be earlier than the actual occupation.
Brown (1990) was most interested in sites that would demonstrate the need to revise the current beginning date of ca. A.D. 1550 for the Dinéh phase. Employing the lag-time hypothesis for wood-use model, he argued that only dates 150 years older than the originally proposed date of A.D. 1550 provided convincing evidence that the behavior associated with the radiocarbon dates occurred prior to that time. Probability distributions generated through computer analysis of the radiocarbon data were used to identify all radiocarbon dates with a major probability during the fourteenth century or earlier. Eighteen of the 46 probabilistic Navajo dates from the La Plata Mine fit into this range (39 percent). Eight of 13 sites in the sample produced one or more early dates, but two early dates produced the (1443-1600) range, i.e., LA 38538 (Hancock et al. 1988) and LA 56841 (Reed et al. 1988), each site having disparate dates obtained from a single hearth. As suggested, the most prudent conclusion in such cases is to accept the later of the two dates and attribute the earlier date to wood characteristics.

One of the DCA sites (LA 56043) has three early dates, all associated with an open camp area in the south center of the site (Reed et al. 1988). A fourth date of A.D. 1332-1924 (cal A.D. 1332-1424) in this part of the site was not classified as "early" (i.e., pre-1400) but supports a relatively early occupation. Two protohistoric structures elsewhere at the site have younger dates, suggesting the probability of two separate components: a relatively early Dinéh phase open-air camp and a later Dinéh occupation that included forked-pole hogans. The four dates associated with the former are statistically contemporaneous and can be averaged to provide a single date (cal A.D. 1332-1424; cal A.D. 1332-1446) with a 93 percent probability in the A.D. 1394-1440 range. This component is regarded as a strong case for a Dinéh occupation prior to 1550. In terms of the lag-time hypothesis, the radiocarbon date might suggest a fifteenth century occupation, but two TL dates from the same context indicate a younger age: A.D. 1550 (cal A.D. 1413-1627 with a 90 percent probability in the 1413-1524 range). Assuming the use of dead wood in building the structure, construction during the sixteenth century is most probable. As noted above, the TL dates rejected by Reed and Horn (1990) indicate occupation during the seventeenth century.

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Conclusions

To summarize, the earliest Dinetah occupation at the La Plata Mine appears to date around A.D. 1500. With the evidence currently available, we do not see any justification in pushing the Dinetah phase back further than this, although earlier occupations may be documented through future work. The Dinetah example shows how misleading reliance on a single dating technique can be. The use of multiple dating techniques is especially critical with periods requiring tight chronological control like the protohistoric.

We prefer to characterize the Dinetah phase as a discrete cultural and chronological unit with specific architectural and artifactual traits, rather than to associate it necessarily with the earliest Athapaskan occupation of the Southwest. Caution should be exercised against loading too much meaning into a chronological unit. There are several testable hypotheses embedded in Dittert’s original description of the Dinetah phase that still merit rigorous evaluation. The Athapaskan entry into the Southwest, the beginnings of Athapaskan pottery making, the differentiation of Apache and Navajo cultures, and the establishment of the latter in the Dinetah region were not necessarily simultaneous. Our main concern in this paper has been with chronological parameters of the Dinetah model and providing as full a description of its cultural and archaeological traits as we can for the La Plata region.

The origins of the Dinetah phase are still poorly known. Only recently has it been possible to clearly identify such a phenomenon as more than just a complex lacking certain Gobernador phase diagnostics. Tentative dates of A.D. 1500-1700 can be placed on the Dinetah phase, but the early protohistoric is still fertile ground for continued research.

Endnotes

1 Radiocarbon dates have been corrected based on tree-ring calibrations published by Stuiver and Pearson (1986) so that these dates can be compared with dendrochronological, obsidian hydration, TL, and other calendar dates (e.g., historic events). A computer program developed by the Quaternary Isotope Lab at the University of Washington (Stuiver and Reimer 1986, 1987) was employed in all calibrations, probability plots, and averaging done in this study. Calibrated dates are rendered in years A.D. with the “cal.” prefix, while radiocarbon dates with the suffix “BP” are uncorrected dates as reported by the radiocarbon labs. Radiocarbon age ranges were calculated based on two standard deviations. The chromatic analysis is discussed further in Brown (1990).

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The Protohistoric Navajo: Implications of Interaction, Exchange, and Alliance Formation with the Eastern and Western Pueblos

Lori Stephens Reed and Paul F. Reed

Introduction

The protohistoric Navajo occupation of the Upper San Juan Drainage Basin spans the time period from approximately A.D. 1500 to 1780. Contact between the Navajo and the Eastern and Western Pueblo groups began during the Dinetah phase (A.D. 1500-1690). Although this interaction was limited, by the beginning of the Gobernador phase (A.D. 1690-1780), contact between the two groups had increased to a great extent. This interaction climaxed during the Pueblo Revolt and Spanish Reconquest when Eastern Pueblo refugees from the Jemez Mountains, and several other areas, fled to live with the Navajo and their Western Pueblo neighbors. The degree and significance of exchange and interaction between the Navajo and Pueblo groups has been an issue for many years. Traditionally, the interaction has been viewed as a significant development for the Navajo, whereby they adopted many Pueblo cultural traits. Among the more significant traits adopted were the use of masonry architecture (pueblitos) and the manufacture of sophisticated polychrome ceramics (e.g., Gobernador Polychrome) (Carlson 1965; Dittrt 1958; Hester and Shiner 1963).

In this paper, we draw upon a data base of over 1100 Navajo sites located in the Upper San Juan Drainage area (Figure 1) in order to discuss the extent and significance of interaction between the Navajo and Pueblo on several levels. Our primary focus is on interpreting this interaction as it relates to the alliance behavior that developed between the Navajo and Pueblo cultural groups and how this contact provided networks by which Pueblo refugees were able to rely on the Navajo for sanctuary during the aftermath of the Pueblo Revolt.

Dinetah Phase

The earliest period of Navajo occupation in the Upper San Juan Drainage area is termed the Dinetah phase. The Dinetah phase was defined by Hester (1962) as the period during which the Navajo settled in the Southwest. Although extensive work in the Navajo Reservoir District (Dinetah area) was conducted during the 1950s and 1960s, no concrete evidence of Navajo occupation prior to A.D. 1700 was uncovered (Eddy 1966).

Identifying the time frame during which the Navajo entered the Dinetah area has been problematical. Some researchers believe the Navajo were in the Southwest by approximately A.D. 1500 (e.g., Bailey and Bailey 1978; Brugge 1984; Hester 1962), while others believe they arrived at the time the Spanish entered New Mexico in A.D. 1540 or even later (Gunnerson and Gunnerson 1971; Schaafsma 1976, 1979, 1981; Schroeder 1974; Wilcox 1981). New evidence that supports an early entry for the Navajo into the Southwest, as well as supporting the proposed Dinetah phase, has been accumulating over the last decade. These data indicate that the Navajo were in northwestern New Mexico by A.D. 1500 and probably had arrived in the A.D. 1400s (Brown...
Figure 1. Map showing distribution of Navajo sites in the study area.
and Hancock, this volume; Hancock et al. 1988; Hogan and Manfred 1988; Marshall 1985; Reed et al. 1986; Reed and Horn 1988, 1990; Reynolds et al. 1984), although this latter date has been questioned (Brown 1990). At the present time, the Diné phase is dated from ca. A.D. 1500 to A.D. 1690.

Dinéth phase sites are characterized by brush structures and forked-pole hogan, light ceramic and lithic artifact scatters, and hearths (Brown and Hancock, this volume). The Navajo of the Diné phase are assumed to have been non-agricultural hunters and gatherers who lived in mobile bands, and used highland and lowland areas of northwestern New Mexico on a seasonal basis (Hester 1962). Contact with other groups such as the Eastern and Western Pueblo is believed to have begun during the early Dinéth phase and continued on a limited basis into the following Governor phase (Dittert 1958; Hester and Shiner 1963).

**Gobernador Phase**

The Gobernador phase (A.D. 1690-1780) is traditionally defined as a period of extensive Pueblo influence manifested by the presence of high numbers of Northern Rio Grande and Hopi ceramics, manufacture of Governor Polychrome ceramics (which resemble Puebloan ceramic styles), construction of defensive structures or "pueblos" (which resemble Puebloan architecture), and the appearance of Puebloan-style masked dancers and kachina-like figures in Navajo rock art (Carlson 1965; Hester 1962; Powers and Johnson 1987). This evidence of Puebloan influence is augmented by historical documentation of increased Navajo/Pueblo political interaction and trade networks and by the presence of Puebloan groups along the Jemez and Rio Grande following the Pueblo Revolt of 1680 (Forbes 1960; Hammond and Rey 1966; Spruce 1962).

Governador phase habitation sites exhibit great variability in dwelling types. These dwellings include any combination of forked-stick hogan, masonry-walled pueblos, kivas, and ramadas. The range of site complexity for habitations is difficult to specify, but pueblos sites range from 1 to 35 rooms with as many as eight associated hogan (Carlson 1965; Powers and Johnson 1987). A great variety of traded ceramics are found on habitation sites, as well as on associated limited activity nonhabitation sites. These ceramics include Rio Grande Glaze ware, Rio Grande Biscuitware, Jemez Black-on-white, Tewa Polychrones, Eastern Keres ceramics, Zuni ceramics, and Hopi ceramics. Obsidian from the Aboqui and Jemez areas is also present.

**Evidence of Interaction and Exchange**

Navajo/Pueblo interaction and exchange in the early Diné phase has been demonstrated by the presence of Jemez Black-on-white and Jeddito ceramics on several dated sites (Hester and Shiner 1963; Mills 1989). Other materials such as Pedernal Chert from the Jemez-Abiquiu District, obsidian from the Apache Canyon and the Flaggstaff, Arizona area, and copper pigments from the Ojo Caliente District have been recovered from Dinétah phase sites (Hancock and Moore 1988; Hester and Shiner 1963; Kearns 1988). These raw materials may have been obtained through trade networks or by means of procurement expeditions. Evidence of imported ceramics and lithic raw materials is more abundant during the Gobernador phase than during the Dinétah phase and has been attributed to both exchange and the presence of Pueblo refugees at Navajo pueblo sites. Gobernador phase sites included ceramics from both Eastern and Western Pueblo sites as well as other Puebloan items and characteristics as described above. However, as Hogan et al. (1991) and Marshall (1985) indicate, there are no formal archaeological data other than the presence of trade ware ceramics and Puebloan-like architecture that demonstrate that the pueblo sites were built or occupied by Pueblo refugees. The only data that support the latter assumption come from historical Spanish documents (cf. Hogan 1991).

Spanish documents indicate that during the time of the Spanish Reconquest (A.D. 1690s), following the Pueblo Revolt of 1680, Puebloan populations were leaving many areas of the northern Rio Grande region and moving north or west to escape Spanish reprisals. It has been documented that most of the Tano groups, most of the Tewas from Santa Clara, some of the Tewas from San Ildefonso and Pojoaque, and some of the Jemez fled the northern Rio Grande during the revolt and subsequent reconquest. Many of these refugees went to the Hopi, Zuni, or Acoma regions and a smaller group of refugees went to live with the Navajos (Dittert 1966; Forbes 1960; Hogan 1991; Spruce 1962).

Based upon the presence of Pueblo refugees at Navajo sites, Bailey and Bailey (1986:15) have suggested that the Navajo became "biological and cultural hybrids" as a result of this contact. In order for this to have happened, a substantial number of Pueblo refugees would have had to have fled to the Navajo area, and merged with the Navajo population. There is, however, no archaeological or historical evidence to suggest that great numbers of Pueblo refugees went to the Navajo area or remained permanently with the Navajos. Thus, as recently suggested by Hogan (1991), this assumption of biological and cultural mingling is probably unrealistic.

**Data**

The data used in this study were derived from the Archaeological Records Management System (ARMS) database maintained by the Laboratory of Anthropology in Santa Fe, New Mexico. In addition, data on numerous sites not currently in the ARMS database were taken directly from the site files of the Division of Conservation Archaeology and the San Juan College Cultural Resource Management Program. A total of 1146 sites were used in the study.

In order to understand the patterning and distribution of site types, a site-typology was necessary. Because the site typology used by the ARMS database was too complex for the purposes of this paper, each site was reclassified using a more simplistic typology. Sites were grouped into one of four categories based on number and types of features: pueblo, habitation, camp, and scatter. Certain specialized sites such as rock art and sweatlodges were excluded from the study. The frequency and percentage of these site types are presented in Table 1.

Because the ARMS database does not code information on ceramic types present, this information, along with the retrieved site types had to be taken from each individual site form. The presence or absence of obsidian, Governor Polychrome, and trade ware ceramics by type was coded for all Navajo sites in the data base. The types of trade ware recorded for these sites include Rio Grande Glaze ware, Biscuitware, Jemez Black-on-white, and ceramics from the Tewa, Keres, Hopi, and Zuni-Acoma areas. These data for each site were coded into the Phase data management system and various sorts on the data were generated. In addition to coding the presence of trade ware in this manner, two subsequent categories were added to the data base: Eastern Pueblo and Western Pueblo. Sites coded as having Eastern Pueblo ceramics included those sites with either Rio Grande Glaze ware, Biscuitware, or ceramics from the Jemez, Tewa, or Keres areas. Western Pueblo ceramics included those ceramics from either Zuni/Acoma or Hopi.

In Table 2, the distribution of Eastern Pueblo ceramics on Navajo sites is presented. In most cases, Jemez Black-on-white ceramics are present on more sites than any other ceramic type. Next in frequency are Tewa ceramics followed by Tewa ceramics, then ceramics from the Keres pueblos, and finally Biscuitware from the Aboqui/Chama area. Taking the Eastern Pueblo ceramics as a group and plotting the percentage of sites within type that contain these ceramics, a definite pattern emerges. Figure 2 depicts the percentage of sites within Eastern Pueblo ceramics by site type. As the figure shows, for the presence of Eastern Pueblo ceramics there is a downward trend from pueblos to habitation to scatter to camp. The pattern is not unexpected for several reasons. First, given that Navajo ceremonial centers in Governor phase settlements, pueblos are presumably linked to extensive contact with Puebloan groups. Furthermore, ethnic co-resi-

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Table 1. Distribution of sites by type.

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pueblo</td>
<td>63</td>
<td>5%</td>
</tr>
<tr>
<td>Habitation</td>
<td>390</td>
<td>34%</td>
</tr>
<tr>
<td>Camp</td>
<td>455</td>
<td>36%</td>
</tr>
<tr>
<td>Scatter</td>
<td>258</td>
<td>23%</td>
</tr>
<tr>
<td>Total</td>
<td>1146</td>
<td>100%</td>
</tr>
</tbody>
</table>

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Lori Stephens Reed and Paul F. Reed

The Protohistoric Navajo

93
Because the Jemez Mountains...
are a major source of obsidian in the area, as well as being a source of Eastern Pueblo ceramic types such as Jemez Black-on-white and glaze ware. A strong association of obsidian with these ceramics was expected. This probable association was not, in fact, revealed, suggesting that the procurement of obsidian was largely independent of trade in ceramics. Thus, one can perhaps postulate an even higher degree of interaction between Navajos and Pueblos, assuming that obsidian was not obtained by the Navajo without the help and/or permission of the Pueblos. Independent trade in both ceramics and obsidian, if such was the case, could only have served to increase the links between Navajo and Pueblo groups.

Table 5 and Figure 3 show the distribution of Gobernador Polychrome ceramics alone and in association with a number of different ceramic types. In comparison to other ceramic types, Gobernador Polychrome is found at a considerably higher percentage of sites (33 percent). This is not unexpected given that Gobernador Polychrome is thought to have been manufactured by the Navajo and/or refugee Pueblo groups in the Dinétah area (Brugge 1981, 1984; Dittert 1958; Marshall 1985). The figure also shows that Gobernador Polychrome is found more in association with Eastern Pueblo ceramics than with Western Pueblo ceramics, again a reasonable expectation given the proximity of the Eastern Pueblos. Pueblitos have the highest association of Gobernador Polychrome with both Eastern and Western Pueblo ceramics. Other interesting associations include Gobernador Polychrome with Jemez Black-on-white and glaze ware. The number of sites having both of the above combinations are nearly identical, and in the case of habitation sites, represent approximately 10 percent of the sites. Lastly, numerous sites of all types had Gobernador Polychrome and no trade ware—a total of 22 percent.

The data described above are necessarily atemporal and include sites that date between ca. A.D. 1500 to 1780. Few temporal markers are present on the 1146 Navajo sites in the study area, especially sites classified as habitation, camp, and scatter. Many pueblo sites, on the other hand, have been dated dendrochronologically, and most have occupations from the early to mid-1700s, although some have cutting dates in the 1500s and 1600s (cf. Towne 1991). Several of the ceramic types found on Navajo sites are dated. Unfortunately, the primary Eastern Pueblo type in Jemez Black-on-white which dates from A.D. 1500-1750, a date range too broad for use as a cross-dating tool. Gobernador Polychrome also has potential but its date range is generally too late (A.D. 1700-1800) for the data being considered. It is also unlikely that all of the sites with Gobernador Polychrome date after the turn of the eighteenth century. Rio Grande Glaze ware, on the other hand, includes a

**Table 4. Number of sites with obsidian and associated ceramics by site type.**

<table>
<thead>
<tr>
<th>Ceramic Type</th>
<th>Pueblo</th>
<th>Habitation</th>
<th>Camp</th>
<th>Scatter</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gobernador Poly</td>
<td>47 (75%)*</td>
<td>163 (42%)</td>
<td>101 (23%)</td>
<td>62 (24%)</td>
<td>33%</td>
</tr>
<tr>
<td>Gobernador Poly &amp; E. Pueblo</td>
<td>17 (27%)</td>
<td>49 (13%)</td>
<td>18 (4%)</td>
<td>20 (8%)</td>
<td>9%</td>
</tr>
<tr>
<td>Gobernador Poly &amp; W. Pueblo</td>
<td>13 (21%)</td>
<td>16 (4%)</td>
<td>5 (1%)</td>
<td>4 (2%)</td>
<td>3%</td>
</tr>
<tr>
<td>Gobernador Poly &amp; Jemez B/W</td>
<td>6 (10%)</td>
<td>30 (8%)</td>
<td>10 (2%)</td>
<td>9 (3%)</td>
<td>5%</td>
</tr>
<tr>
<td>Gobernador Poly &amp; Glaze ware</td>
<td>4 (6%)</td>
<td>25 (6%)</td>
<td>9 (2%)</td>
<td>10 (4%)</td>
<td>4%</td>
</tr>
<tr>
<td>Gobernador Poly &amp; no Trade ware</td>
<td>27 (43%)</td>
<td>107 (27%)</td>
<td>82 (19%)</td>
<td>41 (16%)</td>
<td>22%</td>
</tr>
</tbody>
</table>

*Relative percentages are based on totals in Table 1. Note: Categories are not mutually exclusive; some sites are represented in several of the above categories.

**Figure 3. Distribution of Gobernador Polychrome and associated Eastern and Western Pueblo ceramics by site type.**
series of dated types that are based on changes in rim shape (Hawley 1936; Howe 1967; Mera 1933). Many of these types are found on Dinóteh and Gobernador phase sites and provide a means of relatively dating these sites by ceramic cross-dating. In order to attempt to date some sites in the period prior to A.D. 1700, sites with specific Rio Grande Glaze ware types (C-E) were tabulated and the number of sites with these types of glaze ware is presented in Figure 4.

As Figure 4 shows, few sites with identified glaze ware types are present in the sample. Unfortunately glaze ware types (A-F) were not specified for the majority of sites that contain Rio Grande Glaze ware. There are two sites with Glaze C, which dates from A.D. 1450-1490. One of these sites also has Gobernador and three of these had Gobernador and three of these had Gobernador Polychrome. Thus, one could postulate that Gobernador Polychrome may predate the advent of pueblos, perhaps going back as far as the early 1600s. This point is taken up below.

In an attempt to see how many sites may potentially predate the production and use of Gobernador Polychrome, sites lacking Gobernador Polychrome but containing other early ceramics (Jemez Black-on-white and Glazes C-E) were selected. Table 6 shows the distribution of these sites by type site. Not unexpectedly, few of the pueblos fell into any of the categories. There is little question that most of the pueblos post-date A.D. 1600 and would have strong Gobernador Polychrome associations (cf. Towner 1991). The other site types, however, reveal interesting patterns. Numerous habita-
tions, camps, and scatters have Jemez Black-on-
white and lack Gobernador Polychrome. These sites represent 11 percent of the total site sample and 15 percent of the sites having trade ware. The number of sites having either Glaze C, D, or E and no Gobernador Polychrome is very low (n = 14). However, many sites are simply noted as having glaze ware without any specific type being mentioned. Thus, typed glazeware is probably under-reported in the literature.

In any case, between those sites having Jemez Black-on-white and Glazes C-E and lacking Gobernador Polychrome, there is a sizeable number of sites that may predate the Gobernador phase and thus be indicative of Dinóteh phase settlements. This must be considered tentative evidence, of course, since the lack of Gobernador Polychrome does not necessarily mean that such sites do predate the Gobernador phase. Neverthe-
less, it is possible that some of these sites are earlier, and this suggestion lends support to the view that the Navajo were trading extensively with the Pueblo as early as the A.D. 1400s or 1500s.

### Table 6. Distribution of sites lacking Gobernador Polychrome, but having other ceramic types.

<table>
<thead>
<tr>
<th>Ceramics Present</th>
<th>Pueblo</th>
<th>Habitation</th>
<th>Camp</th>
<th>Scatter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jemez B/W (no GP)</td>
<td>1</td>
<td>34</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>Glaze C (no GP)</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Glaze D (no GP)</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glaze E (no GP)</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: These sites do not represent wholly exclusive categories—some sites have several glaze types present.

### Alliances

The alliance concept has been used in the Southwest to describe the ways in which diverse groups interact with one another, exchanging both material goods and ideas (Cordell and Plog 1979; Plog 1984; Upham 1982, 1987). As noted in Upham and Reed (1982:65) the alliance concept is used by archaeologists in much the same manner as formal alliance theory intended. Much of the core of alliance theory stems from the work of Claude Levi-Strauss (1969).

Levi-Strauss' ideas of generalized exchange include both the more specific us exchange of marriage partners and also, at a higher and more inclusive level, the exchange of all forms of material and information. In fact, his elucidation of alliance formation and generalized exchange is embedded in a conception of information theory that includes both material and nonmaterial (read symbolic) dimensions. Consequently, when a claim is made that an alliance of fourteenth-century settlement clusters "may have involved the establishment of affinal kin ties, the transmission of esoteric knowledge, and the exchange of material" [Upham 1982:157], that claim rests on correlations in archaeological data used in conjunction with a structuralist definition of the alliance concept (Upham and Reed 1989).

### Discussion

In this section, we apply the concept of alliance as used in southwestern archaeology to the ex-
change of ceramics and, to a lesser degree, ob-
idian, between the Navajo and Pueblo. It is apparent from the data generated in the study that some kind of informal alliance network was in place and guid-
ing the exchange relationships that occurred, as well as allowing for the influx of Pueblo refugees in the 1690s and later.
As Upham and Reed (1989:65-66) note, "the foundation of the alliance concept is the ability to demonstrate that there is a high degree of exchange and interaction. In the context of high levels of exchange and interaction, we may regard the exchange of marriage partners between diverse groups. The basis for linking two of these activities is found in the ethnographic literature of a number of diverse societies which illustrate the clear relationship between the exchange of material goods and the exchange of marriage partners (Levi-Strauss 1969). In addition, the exchange of goods themselves, in a sense, convey information in the form of overt and covert stylistic messages (Plog 1983; Upham and Reed 1989; Upham 1982; Wauchope 1978, 1977)."

The following alliances have been previously defined in the Southwest: White Mound, Unit Pueblo, Chaco, Mesa Verde, Little Colorado, Kayenta, White Mountain, Jeddito, and Salado (Plog 1983, 1984; Upham 1982). Furthermore, alliances have been proposed for various areas in the northern Rio Grande region (Reed 1990; Upham and Reed 1989). These alliances are based upon the distribution of highly distinctive ceramic wares which occur across wide areas. It should be noted that all of these alliances vary considerably in terms of extent and complexity. It has thus been suggested that different ceramics of the sites containing these wares were engaged in extensive exchange relationships that comprised the respective alliances.

The alliance concept, as illustrated by the Navajo-Pueblo Exchange as Alliance Behavior

Based upon the data presented above concerning the distribution of Pueblan ceramics and Gobernador Polychrome on Navajo sites, we believe that the Navajo engaged in extensive exchange and interaction with the Eastern and Western Pueblos at an early date, probably in the 1500s (Dittert 1958; Hester and Sherry 1963; Mills 1969). Given the number of trade-related sherds present on these early Diné Phase sites, this interaction has been viewed as minimal. Although the evidence for early contact is not overwhelming, the significance of the interaction in terms of alliance formation and social interaction cannot be overstated.

In addition to the evidence provided in the literature mentioned above, the present study has revealed several trends which may support Navajo-Pueblo exchange in the Diné Phase period. First, a sizeable number of sites in the study contained Jemez Black-on-white ceramics without Gobernador Polychrome being present. Interestingly, none of these sites are Puebloan, which is not unexpected since these sites generally date to the Gobernador phase. Second, Rio Grande Glaze C, D, and E are present on a number of habitation, camp, and scatter sites but not on any pueblo sites (Table 6). These three glaze types are collectively dated from A.D. 1450 to 1625, well before the beginning of the Gobernador phase and the construction of pueblos. The data are not, of course, conclusive, but when examined in combination with other evidence about trade during the Diné phase, it is clear that trade was important during this period. The importance of this trade, however, was not primarily economic but rather social, relating to the ties that were made and maintained. These ties were very important during the later Gobernador phase.

Gobernador Polychrome

Our discussion of Gobernador Polychrome involves several points. First, it is our contention that it was manufactured by the Navajo and not by Puebloan groups. Several lines of evidence support this view. As Dittert (1958) notes, Gobernador Polychrome appears to represent a change of elements present in both Hopi and Rio Grande glaze ceramics. Carlson (1965), on the other hand, suggests that Gobernador Polychrome was derived from elements present in Jemez Black-on-white and Tewa Polychrome. We think that Dittert's suggestion is more reasonable given that Gobernador Polychrome is essentially a yellow ware, thus more closely resembling Rio Grande and Hopi ceramics than Jemez and Tewa types. Furthermore, we feel that in terms of design styles and motifs, Gobernador Polychrome appears to reflect the style of both Rio Grande and Hopi ceramics. If a Puebloan group was manufacturing Gobernador Polychrome, then it is unlikely that these styles would be mimicked. It is more likely that the Navajo would combine elements of several Pueblan ceramics in order to produce a unique ceramic type such as Gobernador Polychrome. Second, given that most of the refugees who went to live with the Navajo were apparently derived from the Jemez and Tewa pueblos, it is unlikely that the Navajo, who had an essentially black-on-white ceramic tradition, would have manufactured a yellow ware with polychrome designs.

Lastly, we believe that Gobernador Polychrome may predate the beginnings of the Gobernador phase by several decades. Hogan (1991) suggests that Gobernador Polychrome was a fully developed type by at least A.D. 1669 - 1694, before the construction of the first pueblo on the Rio Grande. In addition, data obtained during the current study also suggest that Gobernador Polychrome predates the Gobernador phase. As shown in Table 6, several sites contain Gobernador Polychrome along with Rio Grande Glazes C through E. Considering that these glaze types date from A.D. 1450 to 1625, it is possible that Gobernador Polychrome was being manufactured sometime during this interval. Recent excavations at a Navajo habitation site, DCA-88-257 (Ayers 1992), also provides support for this hypothesis. Low-fired Gobernador Polychrome sherds were recovered from the excavations at a date of 400 ± 65 years B.P. The two sigma dendrocalibrated range is A.D. 1410 to 1630. Given the other evidence presented above, it seems reasonable to assume that the latter end of the range is a realistic approximation of the initial manufacture of Gobernador Polychrome. The sherds from the site appear to be a crude version of the type. The paste is extremely soft compared to most other Gobernador Polychrome sherds which have an extremely hard paste and tensile strength (Brugie 1981). Considering that Gobernador Polychrome is one of the highest fired ceramic types (A. E. Dittert, personal communication 1991), it is possible that these low-fired sherds from DCA-88-257 are an early Navajo attempt at producing polychrome vessels. Thus, the data from the site suggest that Gobernador Polychrome was manufactured at least as early as the mid-1600s. As we have shown above, Gobernador Polychrome is a ceramic tradition whose development was influenced by the Hopi and Rio Grande yellow pottery traditions. As such, it is another link in a yellow pottery continuum first postulated by Upham and Reed (1989). Upham and Reed (1989:70) suggest that "... broad comparisons can be made between the yellow pottery traditions of the fourteenth and fifteenth centuries link populations from the Hopi Mesas to the Galisteo Basin." They further suggest that these links allowed for the movement of people from the Galisteo Basin to Hopi following the pueblo Revolt. Gobernador Polychrome, of course, postdates...
the zenith of the other yellow wares by at least a hundred years, although the Pueblo tradition continued into the sixteenth and seventeenth centuries. Nevertheless, Gobernador Polychrome does represent a continuation of the yellow ware tradition as reinterpreted by Navajo potters. As such, it is illustrative of informal alliance behavior and the sharing of information across spatial, cultural, and temporal boundaries.

Navajo/Pueblo Ties and Pueblo Refugees

During the Spanish Reconquests of 1692 and 1696, substantial numbers of Pueblo Indians from the Tano, Tewa, Tiwa, Keres, and Jemez villages fled to the west (Dozier 1966; Forbes 1966a; Spicer 1962). Many went to other Puebloan villages such as Hopi, Zuni, and Acoma to take refuge with distant relatives. The historical record also documents that Pueblos joined the Navajo in the Dinéháh area. There is considerable debate concerning the actual number of Puebloan people who came to live with the Navajo. Hogan (1991) believes that the number was not as great as others have suggested (e.g., Bailey and Bailey 1966). Similarly, the building of the pueblos in the same approximate period as the arrival of the Pueblo people has prompted many researchers to assume that the pueblos were built by Pueblo refugees (e.g., Carlson 1965; Hester 1962). However, Hogan (1991) disputes this by suggesting that the Navajo may have adopted pueblos as defensive structures to ward off Ute raids, which had intensified during the same period (see Jacobson et al., this volume).

In any case, the presence of Pueblo refugees with the Navajo (no matter how large or small the actual numbers were) suggests that some type of relationship existed between the two prior to their arrival. Indeed, the trade discussed above and the ties that were formed in conjunction with it allowed the Dinéháh area to serve as a refuge for Puebloan groups, particularly the Jemez and Tewa. It is impossible to say whether or not the exchange of marriage partners was a part of the alliance behavior that occurred, but given the relative case with which the Pueblos were taken into Navajo settlements, it is certainly possible and even likely. Hester (1962) unequivocally states that intermarriage did occur between the Navajo and Pueblo during this period.

Finally, it is unlikely that Pueblo refugees would have migrated to the Navajo area with the specific intention of seeking refuge if strong social ties did not exist between the two groups. Given the cultural differences between the Navajo and Pueblo, it is more likely that the latter would have sought refuge at Hopi, Zuni, or Acoma, as many did. The fact that some groups took refuge with the Navajo is proof of a strong social relationship. Thus, the alliance-based ties that developed out of the long-term trading relationships between the Navajo and certain Puebloan groups allowed refugees to join the Navajo.

Conclusions

In this paper, we have attempted to explain and elucidate several aspects of the interaction that occurred between the Navajo and various Puebloan groups during several hundred years of contact. The alliance concept has been applied to aid in understanding the nature of the economic and social context that developed. Several key points emerge from our discussion:

- The Navajo and Pueblo were engaged in socially-significant trade (an early component of alliance formation behavior) as early as A.D. 1500 during the Dinéháh phase. This initial contact laid the groundwork for the more intensive trade and social interaction that occurred later.

- Gobernador Polychrome was apparently made by the Navajo drawing on the styles, motifs, and designs of Puebloan ceramics, particularly Hopi types and Rio Grande glazeware. Based on several lines of evidence this type may have been made as early as A.D. 1650, over 50 years prior to the beginning of the Gobernador phase. As a yellow ware, Gobernador Polychrome represents a continuation of the yellow ware tradition of the Hopi and Rio Grande sillas. The type thus represents additional proof of the alliance concept as manifested in the diffusion of an idea - yellow pottery.

- The movement of Pueblo refugees into Navajo settlements in the 1690s was made possible by over 200 years of alliance-based interaction of both an economic and social nature between the two groups. Such a joining of these groups in the absence of previously existing, alliance-based interaction is highly improbable.

We consider the above statements as testable hypotheses and welcome additional inquiries that may serve to refute or verify them. We fully expect that the impending large-scale excavations in conjunction with the Fruitland Coal Gas Project will provide the perfect opportunity to do just that. Given the current uncertainty regarding the nature of Navajo-Pueblo interaction and the origin of Gobernador Polychrome, however, we consider our hypotheses to be both apropos and reasonable.

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Navajo Defensive Systems in the Eighteenth Century

LouAnn Jacobson, Stephen Fosberg, and Robert Bewley

Introduction

The Navajo pueblo sites of northwestern New Mexico were the result of an intensive period of contact between the Navajo and Pueblo people from approximately A.D. 1660 to 1780. Armed conflict during the Gobernador phase forced the use of defensive mechanisms by the early Navajo and resulted in a tightly woven social network and defensive architecture.

An analysis of attack and defense in relation to eighteenth century cultural goals concludes that this network was established for protection against the “hit-and-run” raiding tactics of the Ute. Geographic Information Systems software was utilized to calculate the potential for line-of-sight contact between pueblos. Sites were then examined to determine if sites with line-of-sight and sites without line-of-sight differed in key attributes such as number of rooms, associated features, and topographic situation. This analysis concluded that pueblos with lines-of-sight contained more rooms but that larger pueblos had fewer potential visual ties than smaller pueblos. In addition, pueblos without line-of-sight were more inaccessible while more vulnerable sites were participants in visual networking. Finally, pueblos with lines-of-sight had more evidence of permanent residence and had substantially more features than pueblos without lines-of-sight.

Background and History

The Navajo and Pueblo people probably first encountered one another sometime after A.D. 1500. Although periodic Navajo raids against the Pueblos were carried out, the Navajo-Pueblo relationship was generally one of trade. As a result of these periodic contacts, Pueblo influence is evident in eighteenth century Navajo ceramics, rock art, and architecture. Most notable, and enigmatic, is the Puebloan architectural influence (Figure 1) seen in the multi-roomed masonry dwellings referred to as pueblos.

The majority of Navajo pueblos were occupied during the Gobernador phase—a time of social disruption, turmoil, and hostility beginning soon after the Pueblo Revolt in 1680 and ending about 100 years later. The revolt broke the Spanish hold on Puebloan villages along the northern Rio Grande, but when the Spanish regained control following a second revolt in 1696, many Pueblo groups fled westward into traditional Navajo territory. Although tree-ring dates indicate that pueblo construction began as early as 1570 (Towne 1991), the number of pueblos increased dramatically after 1700 and the occupation peaked between approximately 1715 and 1735, probably in response to Ute attacks that threatened the survival of the Navajo and Pueblo people in the Largo-Gobernador area after 1715.

The pueblos were built on mesa tops, cliff faces, and large boulders (Figure 2), and were obviously positioned for defense. Most pueblos also have expansive views to the surrounding territory, and have line-of-sight to other pueblos nearby. In addition to topographic and visual defense, architectural elements often contributed to the defensive nature of the pueblos. Small observation ports, called loopholes, were almost always angled downward for visual sighting along access routes into the pueblo and, presumably, for shooting projectiles down onto unwanted visitors. Although the pueblos were often surrounded by steep-sided cliffs or embankments, points of access from below were blocked by masonry walls or log roofs over crevices. “Entryways were secured by using deadend ‘entries,’ serpentine passages, narrowed entrances, single points of access to room complexes, and removable logs for bridges and ladders” (Powers and Johnson 1987:9).

As an example, Shaft Ruin contains many of these features. Its two-story tower encloses the only access (by log ladder) to the upper rooms. If intruders actually were able to enter and climb to the top of the shaft, the entryway to the upper rooms forces a blind 90 degree turn into the cramped upper rooms. Downward slanting loopholes provide excellent visibility from the upper story and also could have served as arrow portals. High masonry walls are constructed at critical areas not visible from the second story and form a protective barrier to the north.

The pueblos’ size varies from single rooms to a large multi-storied building with 38 rooms. Many of the sites still have standing walls, intact

Figure 1. Pueblo architectural elements at Three Corn Pueblo, LA 1871, include door lintels, a viga and latilla ceiling, and plastered masonry walls.
Navajo Defensive Systems

Ranchers and Hispanic shepherds were probably the first to observe the pueblos after they were abandoned. Some of the sites were professionally recorded by A.V. Kidder in 1912 (Kidder 1920) and excavated by Earl Morris in 1915. Between 1934 and 1941, both amateur and professional investigators (Farmer 1942; Ker 1944) recorded sites, collected tree-ring samples, and excavated forked-stick hogan and pueblos.

A third period of intensive research began in the 1950s when sites were documented as part of Navajo Land Claim investigations. The most important archeological work associated with the Land Claim was the collection and analysis of tree-ring samples (Navajo Land Claims, various dates). The San Juan Archaeological Society, an amateur archeological group, also recorded many Gobernador phase pueblos at this time.

Interest in the sites continued through the 1960s and 1970s with a variety of projects completed by individuals (Haskell 1975; Wilson and Warren 1974), amateur groups, and Federal agencies. In 1962, Roy L. Carlson (Carlson 1965) relocated some of the sites excavated by Earl Morris and published the results based on Morris' field notes. Carlson's study is still the most important publication documenting early investigations at the pueblos.

Between 1973 and 1975, the BLM sponsored stabilization at eight pueblos (Bureau of Land Management 1975). In 1985, the San Juan County Museum's Division of Conservation Archeology and the New Mexico Historic Preservation Division sponsored a project to record pueblos and compile a National Register nomination for sites on private, State, and Federal lands (Powers and Johnson 1987). During this project, 76 sites were visited, 49 were fully documented, and 48 were listed on the National Register of Historic Places. This work reinforced the significance of the sites and the Navajo's unique approach to survival in the eighteenth century.

In 1988 and 1990, the BLM sponsored a comprehensive inventory of lands surrounding nine of the pueblos. This work by Marshall (1991) was the first to identify and record, in detail, the multitude of features associated with the pueblos. Marshall concludes that the pueblo structures were only one component of much larger and complex occupational clusters that included forked stick hogan (Figure 3), ramadas, corrals, sweat lodges, work areas, etc.

The pueblos are located in the heavily dissected mesa-canyon country of the Largo-Gobernador area east of Farmington, New Mexico. Mesas rise 400 to 500 feet above deep, narrow canyons with elevation ranging from 5,800 to 7,000 feet. Mesa tops are covered with juniper, piñon pine, and sagebrush. Yucca and prickly pear are also found in some areas. The mesa benches are dominated by sagebrush with some Mormon tea, juniper, and piñon. Canyon bottoms are densely covered with rabbitbrush, saltbush, and sage. Small stands of cottonwood are found near drainages.

The Issue of Defense

That the pueblo sites exhibit obvious defensive characteristics has already been noted. But let us examine this issue more carefully. In what way were the sites defensive? And what sort of hostilities were the sites designed to protect against?

Any effective defensive system must accomplish two basic tasks. First, it must detect an impending attack and, second, it must communicate the nature of the threat to decision makers. The response to the perceived attack might be an alert, mobilization, or redeployment. It is important to remember that detecting evidence of a threat is only a prerequisite for warning; this information must pass through the bottlenecks of bureaucracies, political hierarchies, and/or analytical screens before it is communicated. Because surprise attacks succeed despite warnings, effective defensive systems must succeed despite surprise (Betts 1980:551-572). The fortified pueblos enabled smaller forces to hold off against superior forces. They provided rest and refuge to their occupants and increased substantially the costs to an attacker of a frontal assault. A fortress can be defeated only through surprise, bombardment, or the starvation resulting from a formal siege. We will shortly examine the effectiveness of these fortifications against the principal Navajo antagonists of the early eighteenth century.

First, however, we should review the nature of the defensive system afforded by these sites. Powers and Johnson (1987:9) noted that the defensive strategy employed included a warning or communication system with other sites and the limitation of access to each pueblo. Many of these sites are situated on high buttes, mesa rims, or canyon mouths, locations that provide substantial views and which allow direct line-of-sight with other pueblos and hogans in the surrounding region. Hostile entry into the sites was prevented.

LouAnn Jacobson, Stephen Fosberg, and Robert Buxley

Figure 2. Kin Yazhi, LA 2433, perched on top of a sandstone monolith, with far-reaching views to the south and east.
Some researchers have postulated that the masonry architecture of the pueblos reflects the influence of Pueblo refugees from Jemez, Cochiti, and San Ildefonso who fled to the Diné in order to escape Spanish retribution following the revolt of 1696. Keur (1944:85) argued early on that the Diné represented a refuge area, "a place where uprooted Pueblos joined the erstwhile hostile Navahos to hide out against a common foe (i.e., the Spanish)."

Certainly, Spanish-Navajo relations were strained in 1700. Navajo raids against frontier Spanish settlements and Pueblos in northern New Mexico took livestock, horses, and captives. Spanish campaigns against the Navajo began in the 1670s and culminating in the successful suppression of the Navajo by Roque de Madrid in 1705 were large-scale affairs. They frequently included 50 to 100 soldiers, militiamen, and several hundred Pueblo auxiliaries (Reeve 1958:228). Against such a large force, retreat into a small pueblo perched atop a boulder would not have been a particularly effective strategy. Indeed, historical Spanish accounts of the 1705 campaigns describe defeated Navajos as melting away before they could be reached (MeNitt 1972:22). Such descriptions do not fit the image of siege warfare against pueblo sites. Spanish objectives were to kill the enemy, capture others for the slave market, rescue those captives held by the Navajo, take horses or livestock, and destroy crops. So effective was Roque de Madrid's strategy of "laying waste the fields" that after the successful campaign of 1709, the Navajo entered into an unprecedented period of peace with the Spanish from roughly 1709 until 1760. During this period, Spanish documents do not record a single Navajo raid upon a Spanish settlement (MeNitt 1972:23). Interestingly enough, this is the very time when most of the pueblos were built and occupied. In contrast, Ute attacks reached their peak in north central New Mexico from 1696 until 1727 (Jefferson et al. 1972:5). With the acquisition of the horse in the mid-seventeenth century, the Utes increased the range of their territory and earned a well-deserved reputation as accomplished horse-mounted warriors. Ute raiding tactics and objectives differed radically from the Spanish. Ute warfare was launched by stealth. They hoped to surprise the enemy, burst into their camps on their fastest horses, and make off with personal property, horses, and women or children. The objective was to capture livestock, slaves, and such prized possessions as blankets and pottery, not to kill the enemy or burn his corn fields (Marsh 1982:145-146).

Ute raiding strategy, then, was to goulp up into an enemy's camp and grab the goods and women before an adequate defense could be organized. As Haskell (1975:173) has noted, "In light of the fact that the principals were technological equals, the Navajo in all probability were more than able to hold their own against attacks."

To counteract Ute tactics of surprise, the Navajos of Diné-tah needed to spot a raiding party in advance of the attack and signal this fact to the rest of the settlement system. Occupants of surrounding hogans could have sought refuge in the defensive pueblos until the raiders had passed through. Given the lack of a water source within any of these defensive sites and the limited foodstuffs which could have been stored there, all indications are that refuge would have been sought for no more than a matter of days. While they might lose some livestock and personal possessions, the Navajo were fairly secure in knowing that the Utes were not willing to suffer the casualties required to make a frontal assault upon a walled and sealed masonry fortification.

**GIST Description**

In order to measure the effectiveness of such a sighting and signalling system, an analysis of pueblo distributions was conducted utilizing the Bureau of Land Management's Geographical Information System (GIS). The viewed analysis executed on the 72 selected pueblo locations used the cell processing portion of the GIS. Elevation data from USGS 1-degree Digital Elevation Models (DEMs) were used to determine visibility between pueblo locations. Data from the 1-degree DEM are highly consistent with the planimetric features normally found on 1:250,000 scale topographic maps.

Visibility was determined by first calculating a line-of-sight vector between each of the 72 pueblos. For each line-of-sight vector, an angle of observation from the observer location to the viewing location was computed using the elevation of the two locations. Subsequently, the elevation of all cells between the two locations was
checked for possible obstructions. If elevations were detected that were greater than or equal to the maximum elevation along the line, then the location was not visible (Figure 4). If all elevations along the line-of-sight vector were less than the elevations of the observer location and the viewing location, the pueblo location was assumed to be visible (Figure 5).

It should be noted that line-of-sight projections were not systematically field checked, but visits to about one-third of the pueblos over a period of five years confirm the accuracy of many of the projections. Powers and Johnson (1987) also discuss and confirm line-of-sight from pueblo to pueblo, based on their field observations during preparation of the National Register nomination. However, further systematic work is needed using binoculars, smoke, and/or mirrors to absolutely verify GIS line-of-sight projections and the maximum distance signals might be observed. Field testing is tentatively planned for the Spring of 1992 (see Endnotes, this paper).

Emerging Patterns

The GIS software produced two maps. The first (Figure 6) identified point locations of the 23 pueblos dated by tree-ring analysis and those pueblos with line-of-sight to other pueblos. The intent was to determine if there were any changes in line-of-sight through time, particularly if the number of pueblos with line-of-sight increased in response to the threat of Ute attacks. Twelve of the dated pueblos had line-of-sight connections. Beginning construction dates for these sites varied from 1570 (not a cutting date and suspiciously early) to dates in the first quarter of the eighteenth century. Final construction dates within this group are generally in the ten year period from 1735 to 1745. The latest construction date is 1783. With the exception of a site built in 1705, the Cabrero Mesa Ruin, which will be discussed in a moment, there is no obvious increase or decrease in the number of lines-of-sight through time.

It is apparent that the Cabrero Mesa Pueblo, even in the smaller sample of dated sites, served an important function within the network. Perhaps most noteworthy are the six line-of-sight connections between Cabrero Mesa and other dated sites (see Figure 6). The limited data available at this time make it impossible to demonstrate conclusively that the line-of-sight pueblos were all occupied at the same time, although the range of cutting dates leads us to believe that all twelve of the dated sites could have been in use during the first fifty years of the Gobernador phase. The significance of Cabrero Mesa in the pueblo network is amplified further when all the pueblos, both dated and undated, are considered.

The second and third GIS maps plotted the location of 72 pueblos (Figure 7 and Appendixes 1 and 2) and identified those pueblos with line-of-sight to other pueblos (Figure 8). With this larger sample, even more fascinating patterns began to emerge. As you can see, over 75 percent of the plotted sites either have line-of-sight ties or are within or immediately adjacent to the communication network. Again, Cabrero Mesa, along with LA 12929, emerges as a key point in the system. Two other smaller networks within the larger network also appear on the west side of Navajo territory.

Of the 72 pueblos, 42 have line-of-sight to at least one pueblo (see Appendix 2). Although in the general scheme of things, Cabrero Mesa does not appear to be a particularly unusual site in terms of architecture, the number of features present, or unique attributes, its location high on a talus slope affords it spectacular views to the west and south. In fact, the computer analysis showed lines-of-sight from 11 to 14 miles to the west and 22 miles to the southwest. A field visit to Cabrero Mesa confirmed this incredible viewshed. Within this viewshed, Cabrero Mesa had (projected) visual ties to 10 pueblos.

The significance of Cabrero Mesa is reinforced by its construction in 1705 before the intensive pueblo building phase of 1715 to 1740. The site was therefore occupied prior to the final attack of Roque de Madrid in 1709 and could have been established as an outpost adjacent to and above what was probably a primary transportation corridor for Spanish incursions into the area from the Spanish settlement of Chama. In addition, as the threat of Ute attack became more prevalent, Cabrero Mesa, as one of the early northernmost points, could also have served as an outpost for observation of Ute movement.

Since working with dated sites really did not provide us with any concrete patterns, we moved to comparisons of pueblos with lines-of-sight to other pueblos versus pueblos without lines-of-sight. Comparisons were made of room counts, topography, and site complexity. In addition, the relationship of room count to number of sites visible was also plotted. Using these attributes, some interesting patterns emerged.

There were 39 pueblos with lines-of-sight for which room counts were available. These 39 pueblos contained a total of 212 rooms for an average of 5.44 rooms per site. The twenty-four pueblos without lines-of-sight had a total of 84 rooms and averaged 3.5 rooms per site. Therefore, the average pueblo with line-of-sight had 55 percent more rooms than a pueblo without line-of-sight (Figure 9). Room count versus the...
number of sites visible was also examined. Again, an interesting but somewhat unexpected pattern
developed. As the average number of rooms in-
creased, the number of lines-of-sight decreased.
That is, pueblos with an average of two or three
rooms had lines-of-sight to seven and eight
pueblos respectively, while larger sites had views
to only two or three pueblos (Figure 10).

Definite patterns also emerged in the topo-
graphic comparisons (Figure 11). Pueblos with-
out line-of-sight were concentrated on boulders,
cliff faces, and areas generally regarded as inacces-
sible. In fact, 71 percent were inaccessible, while
13 percent were located adjacent to steep-sided
mesa or bench edges with generally excellent
viewsheds but were vulnerable from at least one
side. Other topographic situations such as
benchs, mesa tops, gentle ridges, or valley bot-
toms were occupied by 16 percent of the sites. In
comparison, 50 percent of the sites with lines-of-
sight were located in inaccessible areas, 26 percent
were on mesa and bench edges, and 24 percent
were in “other” topography. We therefore see sites
that were isolated from direct means of communi-
cation in more defensible positions, while those
that could participate in an “early warning system”
were located in areas that were more vulnerable.

Finally, the type and variety of features in
pueblos with and without lines-of-sight were com-
pared (Figure 12). Although there were only one-
more sites in the line-of-sight group, this same
group had almost twice as many feature occur-
cences than the group without line-of-sight. It
should be noted that the number of features within
each site was not counted because of the inconsis-
tency of data available. At this level of analysis,
however, the sites with line-of-sight had more evi-
dence of residency as indicated by the presence
of hooded fireplaces, forked-stick and masonry-
based hogan, and trash middens. Although differ-
ences were less pronounced, these pueblos also
had more defense-related features, such as defen-
sive walls and passageways, and interior courtyards
or small plazas. Both groups had a similar occur-
rence of loopholes (or “observation points in
masonry walls”), burned rock piles—which are gen-
erally associated with use of sweat lodges, and
storage areas. It is worth recalling at this point that,
although pueblos with lines-of-sight have more
feature occurrences, pueblos with an average of
fewer rooms have more lines of contact with other
pueblos.

**Directions for Future Research**

The application of our GIS technology essen-
tially represents a sophisticated approach to basic
pattern recognition. Early impressions that the
pueblo settlement system was characterized by
line-of-sight relationships between communities
have been confirmed. And while we do not pro-
fess to have the answers at this point, numerous
research questions are suggested by the intriguing
patterns. These questions can be grouped into
several broad categories.

First, let’s examine the operation of the defen-
sive system itself. For these visually linked sites
to function effectively, a signalling or communi-
cation system was required to transmit warnings
of impending attacks. How did the communica-
tion take place? Line-of-sight distances generally
range from 2 to 5 miles between sites although
some distances were as great as 22 miles. Were
signal fires employed? Few of the sites exhibit
any definitive evidence for large burned areas
that could have resulted from fires. Is it possible
that burned rocks currently being interpreted as
the remains of sweat lodges actually are the re-
mains of signal fires? Could small smudge pots
have been employed? If large bonfires were not
utilized, were mirrors or sonic devices employed?
Given the remarkable distances between some
line-of-sight points, what are the effective limits
for these means of communication?

The actual function of different site types
within the defensive system also merits explora-
tion. Site types which are highly defensive, such
as those located on cliff faces and those perched
atop sheer boulders, often enjoyed inferior
viewsheds compared to sites in slightly less defen-
sive locations along mesa edges. Does this sug-
gest that cliff and boulder sites were more or less
on their own whereas the less defensive sites
could signal danger and marshall forces to coun-
ter the threat? A comparison of the number
of rooms at each pueblo with the number of
other sites which could be spotted from a given
location demonstrates clearly that as the number
of rooms increases, the number of other sites

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**Figure 6 (north half). Lines-of-sight between tree-ring dated pueblos.**
Navajo Defensive Systems

LouAnn Jacobson, Stephen Fosberg, and Robert Bewley

Figure 6 (south half). Lines-of-sight between tree-ring dated pueblos.

Figure 7 (north half). Location of recorded Navajo pueblos in GIS study.
Figure 7 (south half). Location of recorded Navajo pueblos in GIS study.

Figure 8 (north half). Lines-of-sight between pueblos.
Figure 8 (south half). Lines-of-sight between pueblos.

Figure 9. Number of sites vs. number of rooms (sites with and without views).

Figure 10. Number of sites visible vs. average number of rooms.
Navajo Defensive Systems

SITES WITHOUT VIEWS  SITES WITH VIEWS

Figure 11. Topography (sites with and sites without views).

LouAnn Jacobson, Stephen Fosberg, and Robert Bewley

within the area that are visible decreases. This suggests perhaps that small sites functioned as signaling stations or observatory points while the larger sites were located on landforms which could support larger concentrations of inhabitants (Figure 15). The larger sites may have housed a sufficient number of Navajos whose very presence served as a kind of deterrent. So the question arises: were "lookout" families designated to live in the pueblos while the remainder of the extended family or survival unit occupied hogans nearby? Given that two-thirds of the pueblos have six rooms or less and barely enough room for a small extended family, it may well be that they were strictly used as a defense mechanism rather than for domestic purposes.

Second, a host of issues related to the political and social relations between pueblito communities merit investigation. Was a site that could see six or seven others more important politically than one that possessed line-of-sight with only one other location? Were the sites with more restricted viewsheds dependant politically or militarily upon the key nodal sites which could communicate with a much larger community? Since we know that larger sites generally enjoyed an inferior viewshed compared to the smaller sites, it may be that the role and function of the smaller sites was merely to spot and then communicate the presence of enemy forces, after which, the inhabitants fled to the protection of larger compounds, or simply disappeared into the surrounding territory.

As these sites are examined more closely, we should attempt to discover whether common site characteristics are found among sites with similar view sheds. Analyses should compare such site characteristics as hogans, hearths, storage, benches or low rises near canyons, defensive walls, burned rock, hogans, trash scatters, courtyards, storage features, hearths, sweat lodges, and pathways with the numbers of other sites visible from a given structure. On a gross level, we know that sites with views contain similar evidence of domestic use such as hogans, trash scatters, and pathways to sites without viewsheds.

It is fascinating to ponder whether or not line-of-sight implied anything in terms of social relations. Were sites linked visually also related by marriage or blood? Do groups of linked sites represent different classes?

SITES WITHOUT VIEWS  SITES WITH VIEWS

Figure 12. Features (sites with and sites without views).
Navajo Defensive Systems

position that the initial influx of Pueblo people fleeing to the Dinéh following the revolt of 1698 was so large as to result eventually in an overtaxing of the available natural resources. Hogan (1991), however, argues that the Pueblo influx has been severely overestimated and that very few Pueblo people actually lived in Navajo territory.

We do not profess to have the answers to the many questions we just posed. It is clear, though, that our understanding of the evolution, strategic operation, and eventual collapse of this defensive site settlement system is far from complete. We are hopeful that the profession will recognize the tremendous potential in studying the defensive sites of Dinéh. This region offers unique opportunities to study a culture's systemic response to increasing military pressure over time. Given the application of what can be learned here to our understanding of the collapse of other cultural systems due to unrelenting competition over resources, this surely is an endeavor worth pursuing.

Conclusions

Navajo Pueblos represent some of the most visually arresting and intriguing sites in northwestern New Mexico and further systematic study could shed light on important questions pertaining to raiding and defensive military strategies. In the above discussion, it is stated that military principles dictate that successful and defense systems detect threats and notify system participants of danger. Defense networks offer additional protection if participants have at least one alternative to fall back upon in case the primary defense fails.

The Navajo pueblos were, in fact, a successful adaptation of the above principles, using a line-of-sight communication network to provide advance warning of trespassers in Navajo territory and heavily fortified architecture as an alternative defense in cases where attack was too swift or was so stealthful that broadcast of an alarm could not provide sufficient time to allow dispersal and concealment in the rugged countryside. This strategy was implemented primarily and most effectively as a defense against the relentless Ute, who were sweeping into Navajo territory from the north.

GIS projections of lines-of-sight between 42 pueblos combined with defensive features in pueblos both with and without lines-of-sight, demonstrate the apparently well-planned and executed existence of a Navajo system that offered not only the requisite early warning to prepare for attack but also a fall back position for protection within impregnable masonry fortresses.

An analysis of pueblo attributes concluded that pueblos with lines-of-sight had more rooms than pueblos without lines-of-sight but that as the number of rooms increased the number of lines-of-sight decreased. As might be expected, pueblos lacking line-of-sight were the most defensively positioned and inaccessible. (Admittedly, this is partially because of some locations on canyon cliff faces with limited views.) Pueblos with lines-of-sight were more complex, containing more residential-type features and, although less pronounced, more defensive features than pueblos without line-of-sight. It is therefore suggested that pueblos without line-of-sight were not occupied for long periods of time because of their potential vulnerability, in spite of their relative inaccessibility, but served as defensible fortresses, gathering spots, and points to escape to once the alarm was issued. Inhabitants of smaller pueblos with numerous lines-of-sight could send warnings throughout the system and then had the option of fleeing to and congregating in larger or more impregnable structures.

This system provided safety to the Navajo for almost 100 years. Constant Ute pressure, combined with environmental and economic factors, probably forced the Navajo to move south and west, away from their Ute attackers and into areas more amenable to the pastoral lifestyle that replaced the earlier hunting and gathering economy.

Endnotes

On May 9, 1992, a field test of the GIS line-of-sight analysis was conducted as a New Mexico Heritage Preservation Week event. The field test had two goals: to test the accuracy of the GIS analysis and to involve the public in cultural resource interpretation. The second goal was particularly successful. Over 70 professional and amateur archeologists and interested laypeople participated in the "Pueblo Flare-up." In spite of the threatening weather, the enthusiasm was evident.

Twenty-one pueblos were included in the field test using smoke bombs which emitted white smoke for three minutes. Smoke was selected for the test because it could have easily been generated in a small, smudgy fire. A modern source was readily available and relatively easy to create. Two smoke bombs were lit simultaneously at each site and placed in a coffee can. The bombs were either lit directly on the site or in a nearby position with excellent visibility. Wind was a deterring factor, making ignition difficult and causing rapid dispersal of the smoke. In spite of the wind, results were generally good and there were some unexpected sightings. Binoculars and compasses were allowed, as partial compensation for the fact that the Navajo residents would have known exactly where to watch and what to expect from the signals.

LouAnn Jacobson, Stephen Fosberg, and Robert Blevley
One enthusiastic participant tested not only the smoke bombs, but also fired a pistol and used a small military signalling mirror. All three were successful signalling devices between his pueblo, Gomez Canyon, and the Adolfo and Gould Pass pueblos.

Not all of the pueblos tested were included in the original GIS analysis (i.e., the recently relocated Morris #1 and newly recorded Kiva); they were included in the field test because of their location within clusters of line-of-sight pueblos. Others were tested even though they did not have GIS-projected line-of-sight because other visual sightings had been previously noted or they appeared to be in a cluster of pueblos that did have line-of-sight. Pueblo clusters were selected where the sites were generally one to two miles apart, because, in a trial run, it became obvious that smoke bomb visibility would probably be limited.

Appendix 3 lists the 21 sites tested and identifies what sites were and were not visible. In many cases, participants could clearly see each other in the pueblos without any visual assistance or signalling device. For others, the pueblo location was unclear until the smoke bombs were set off. Confirmed and reported "maybe" lines-of-sight are shown on Figure 14.

The longest line-of-sight reported was by observers at Three Corn, who saw signals from two points on Cabresto Mesa 12 miles away. The specific pueblos could not be identified. The pueblos with the most sites visible was the newly discovered Kiva Pueblo, located high on a sandstone butte and accessible only with an extension ladder. From this location seven other sites could be seen. Although the Kiva Pueblo remnants are less than impressive, its strategic location is a key point in the central Largo site cluster. Other line-of-sight clusters were found in the pueblos off Cereta Canyon and Gobernador Canyon, as well as the small cluster near Cabresto Mesa.

Of the 26 GIS-projected lines-of-sight for the pueblos tested, 16 were confirmed visible and 10 not visible. Seventeen additional sightings were reported that were not predicted by the GIS. Nineteen more sightings were reported when Morris #1 and Kiva pueblos (not in the GIS analysis) are included in the counts. The total number of lines-of-sight confirmed is 52.

The GIS was 62.1% accurate in its predicted lines-of-site but only 38% accurate in locating all visually confirmed lines-of-site. Accuracy of the GIS predictions may be lessened given the potential 100 meter error in the topographic projections of the GIS data and other vagaries such as the earth's curvature, vegetation, weather conditions, etc. In addition, some leeway was allowed in the placement of smoke bombs, as noted above.

The many research questions originally posed in 1991 must continue to go unanswered, pending excavation and analysis of environmental and cultural data gathered at the pueblos and their affiliated forked stick hogans, hearths, corrals, and other features. The 1992 Pueblo Flare-up visually confirmed the defensive network, demonstrated its complexity and scale, confirmed one method of signalling warnings, and reinforced the utility of GIS applications in pattern recognition and prediction of line-of-sight systems.

Recent inventory and reexamination of treecircles at several pueblos have yielded tantalizing new data about the pueblos and their occupants. However, much more research is still needed if an accurate interpretation of the role and function of these sites within the Navajo settlement system is to be determined.
Appendix 1. Pueblitos without line-of-sight.

<table>
<thead>
<tr>
<th>Site #</th>
<th>Name</th>
<th>Topography</th>
<th>Date</th>
<th># Rms.</th>
<th>Attached Feature</th>
<th>Unattached Feature</th>
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### Appendix 1. Pueblos without line-of-sight (continued).

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### Appendix 2. Pueblitos with line-of-sight.

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<th>Topography</th>
<th>No. Rms.</th>
<th>Sites Visible</th>
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<th>Unattached Features</th>
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<td>1732–1735c</td>
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<td>2138</td>
<td>loopholes</td>
<td>burned rock, hogan, trash</td>
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<td>12929</td>
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<td>1722–1749c</td>
<td>bench edge</td>
<td>12</td>
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<td>bastion, defensive wall, closets, hatchway, niches, cubbyholes, passageways</td>
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<td>1871</td>
<td>Three Corn</td>
<td>1712G–1745G</td>
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<td>2138</td>
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<td>Frances</td>
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<td>stone &amp; adobe steps, hogan, sweat lodges</td>
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<td>Tapacito</td>
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<tr>
<td>Site No.</td>
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<td>Date</td>
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<td>No. Rms.</td>
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<td>Attached Features</td>
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<td>Rincon Largo</td>
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<tr>
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<td>Gould Pass</td>
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<td>2138</td>
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<td>trash, burned rock, sweat lodge, hogans</td>
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<td>Pork Chop Pass</td>
<td>1725-1747</td>
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## Appendix 2. Pueblitos with line-of-sight (continued).

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