The Morris Site 1 Early Navajo Land Use Study:

Gobernador Phase Community Development in Northwestern New Mexico

Volume 2

NNAD Fruitland Data Recovery Series No. 4

Edited by
Douglas D. Dykeman

with contributions by
Douglas D. Dykeman; James K. Feathers, Ph.D.;
John D. Goodman II; Richard G. Holloway, Ph.D.;
Kristin Langenfeld; Pamela J. McBride;
Mollie S. Toll; John A. Torres; Ronald H. Towner, Ph.D.;
Lawrence E. Vogler; and Jeffery T. Wharton

Submitted by
Anthony L. Klesert, Ph.D., Director
Navajo Nation Archaeology Department
P.O. Box 689
Window Rock, Arizona 86515

NM BLM Permits 10-8152-94-6, 10-8152-95-7, and 10-8152-96-8
State Permits 94-036, 94-061, 95-036, 95-061, 96-036, and 96-061

Prepared for

Williams Field Services
San Juan Basin Projects
P.O. Box 1456
Bloomfield, New Mexico 87413

Navajo Nation Papers in Anthropology No. 39

April, 2003

NN029292

Table of Contents

Table of Contents v

List of Figures ix

List of Tables xiii

CHAPTER 7: EARLY NAVAJO LITHIC TECHNOLOGY OF DINÉTAH 191

Introduction 191
Methods and Procedures 191
Lithic Data Collection 191
Lithic Analysis 192
Phase 1: In-field Analysis and Survey Collections—Lithic Data Summary 194
Chipped Stone Artifacts 194
Phase 2: Excavations of LA 11196 and LA 88766—Lithic Data Summary 212
LA 11196 Lithic Data Summary 212
LA 88766 Lithic Data Summary 217
Phase 3: Focused Data Recovery—Lithic Data Summary 218
Chipped Stone Artifacts 219
Battered Tools 219
Milling Implements 219
Ground Tools 219
Interpretation and Summary 220
Lithic Data Synthesis 221
Intersite Variability 221
Lithic Landscape Management 221
Early Navajo Reductive Technologies 226
Early Navajo Productive Technologies 227
Summary 231

CHAPTER 8: POTTERY OF THE MORRIS SITE 1 EARLY NAVAJO LAND USE STUDY 233

Introduction 233
Phase 1 Results: On-site Analysis and Collections Analysis 235
Phase 2 Results: Excavations at LA 11196 and LA 88766 236
LA 11196 236
LA 88766 257
Phase 3 Results: Midden Testing 258
The Data Set 259
Characteristics of the Assemblages 259
Vessel Counts and Midden Size Estimates 262
Summary 265
Consideration of the Research Questions 266
Association of Pottery by Site Type 266
Ceramic Diversity and Site Type 268
Pottery Assemblages on Habitation Sites 272
Pottery and Feature Function 275
Glaze Ware in the Morris Site 1 Project Area 280
The Origin and Characteristics of Gobernador Polychrome 285
Gobernador Polychrome in Early Navajo Households and Society 289
Summary and Concluding Remarks 291

NN029293

CHAPTER 9: VERTEBRATE FAUNAL REMAINS 297
Research Orientation 298
Effective Ecology 299
Faunal Analysis Perspectives 300
Analysis Procedure and Terminology 301
LA 11196 Results 302
Interpretive Summary 303
LA 79456 Results 303
Interpretive Summary 304
LA 83529 Results 304
Interpretive Summary 305
LA 105428 Results 305
LA 105530 Results 305
Interpretive Summary 306
LA 105630 Results 306
LA 105930 Results 307
Interpretive Summary 307
LA 106199 Results 307
Interpretive Summary 308
LA 106203 Results 308
Interpretive Summary 309
Species Descriptions and Ethnohistoric Data 310
Order Artiodactyla (Even-Toed Mammals) 310
Family Cervidae (Elk, Moose, Caribou, Deer) 310
Family Bovidae (Cattle, Sheep, Goats, Old World Antelope) 311
Order Perissodactyla (Odd/Even-Toed Mammals), Family Equidae 313
Order Lagomorpha (Rabbits, Hares, and Pikas) Family Leporidae (Rabbits and Hares) 313
Order Rodentia (Mice, Squirrels, and Allies) 314
Suborder Myomorpha, Family Cricetidae (Deer Mice, White-Footed Mice, Woodrats, and Allies), Subfamily Cricetinae (Cricetine Mice and Rats) 314
Class Reptilia 315
Order Squamata, Suborder Sauria (Lizards), Family Iguanidae 315
Interpretations and Conclusions 315

CHAPTER 10: FLORAL COMPONENTS OF EARLY NAVAJO LAND USE: THE MORRIS SITE 1 COMMUNITY 319
Introduction 319
Methods 319
Results 320
LA 11196 320
LA 88766 320
Discussion: Early Navajo Plant Use In The Four Corners Area 320
Summary 321

CHAPTER 11: POLLEN ANALYSIS OF NAVAJO PERIOD SAMPLES FROM THE MORRIS SITE 1 PROJECT 325
Introduction 325
Methods and Materials 325
Palynological Extractions 325

NN029294

Results 327
LA 88766 327
LA 11196 328
Discussion 330
Conclusions 333

CHAPTER 12: DENDROCHRONOLOGY IN THE MORRIS SITE 1 PROJECT AREA .. 335

Introduction 335
Research Domains 335
Tree-Ring Dating Theory and Interpretation 341
Formation Processes of Tree-Ring Dates 342
Heartwood/Sapwood Issues 342
The Approach Used Here 344
Methods 345
Field Sampling Procedures 345
Identifying Dateable Samples 345
Distinguishing Axe Marks 345
Laboratory Sample Analysis 346
Dendrochronological Results 346
Cumulative Date Distributions 346
Individual Site Analysis 349
Wood Use 353
Methodological Considerations 354
Discussion 355
Conclusions 356

CHAPTER 13: THERMOLUMINESCENCE DATING OF EARLY NAVAJO CERAMICS 357

Field Collection Methods 357
The TL Technique 357
Derivation of TL Dates 358
Procedures 358
Results 359
Ages 363
Discussion and Conclusions 363

CHAPTER 14: TREE RINGS AND THERMOLUMINESCENCE: CHRONOLOGY AND DATING ISSUES OF THE EARLY NAVAJO OCCUPATION 373

The Problem 373
Tree Ring Dates 375
Thermoluminescence Dates 376
Tree-Ring and TL Correlation 380
Direct Comparison 381
Aggregate Comparison 385
Thermoluminescence and Archaeological Dating 385
TL and Radiocarbon 385
TL and Ceramics 387
Conclusions 388

NN029295

CHAPTER 15: EARLY NAVAJO SETTLEMENT AND LAND USE 391

Time and Population, a Control for Settlement Analysis 391
Modeling Population 391
Settlement Pattern 398
Patterning in Site Distribution 401
Residential Patterning 406
Summary and Conclusions 414
Land Use 415
Landform and Settlement 415
Settlement Pattern and Resources 421
Summary and Conclusions 426

CHAPTER 16: THE EARLY NAVAJO COMMUNITY 427

Elements of Community in the Morris Site 1 Project 427
Economic Organization 427
Sociopolitical Organization 433
Religious Organization 441
Pueblito in the Community Context 443
Pueblito Architecture 443
Types of Pueblitos 443
Discussion 446
Frances Mesa Community: A Socioeconomic Perspective 447
Conclusions 450
Navajo Community, an Enduring Tradition 452

REFERENCES CITED: VOLUME 2 455

Appendix G: Lithic Assemblage Data

Appendix H: Obsidian Sourcing Analysis

Appendix I: Ceramic Analysis Methods

Appendix J: Ceramic Assemblage Data

Appendix K: LA 11196 Vessel Descriptions

Appendix L: Puebloan Glazeware Ceramics

Appendix M: Gobernador Polychrome Designs

Appendix N: Trade Ware Pottery Designs

Appendix O: LA 11196 Flotation Results, LA 88766 Flotation Results, Wood Species Composition, Macrobotanical Materials

Appendix P: Pollen Data, Principal Components Analysis, Simpson's Diversity Index

Appendix Q: Explanation of Symbols Used for Reporting Tree-ring Dates

Appendix R: Pueblito Data

NN029296

CHAPTER 7: EARLY NAVAJO LITHIC TECHNOLOGY OF DINÉTAH

by John A. Torres

Introduction

The following reports the findings of the lithic analysis conducted for the Morris Site 1 Early Navajo Land Use study. This chapter is organized in three parts: methods, lithic data summaries, and synthetic treatment of these data. The data summaries provide a descriptive presentation of all the data collected from the various phases of the Morris Site 1 project (also see Appendix G). The synthesis utilizes various data sets in combination in order to best address specific research issues regarding early Navajo lithic technology of the Dinétah. It also includes an interregional analysis of early Navajo sites including sites from La Plata valley, the Navajo Reservoir District, and the Piedra Lumbre type-site (LA 25293) of the Abiquiu Reservoir project.

The lithic analysis is based on the guidelines as described in the Fruitland research design (Hogan et al. 1991). The goal of this analysis is fourfold: 1) address technological questions regarding early Navajo lithic assemblages; 2) address site function and relate it to subsistence, economy, and settlement patterning; 3) address external relationships with other Southwestern tribes, and; 4) address the issues of early Navajo land use in intra- and interregional contexts.

Methods and Procedures

The methods and procedures outlined below are divided into two groups; the data collection methods, and the analysis methods for the entire Morris Site 1 project lithic analysis. The various limitations of the data collection methods directed the lithic analysis focus for each phase and therefore, the methods are described together.

Lithic Data Collection

This project examined three different data sets to better focus the research towards specific goals relating to early Navajo land use. These data were collected in three phases: in-field lithic analyses, data recovery excavations, and focused data recovery excavations. The focus of each phase was to collect research-specific data to be used in combination in order to explore specific research domains.

Phase 1: In-field Analysis and Survey Collections Lithic Analysis Methodology

Phase 1 of the Morris Site 1 project lithic analysis data collection included both in-field analysis and focused surface collection. The in-field lithic analysis was conducted under the direction of another analyst with a different methodological approach. This approach was geared towards lithic artifact morphology. As discussed below, the final analysis and subsequent interpretations were based on a technological approach. Therefore, a conversion program was used in order to be able to *infer* technological information from the described morphological attributes. This has been used successfully for other lithic data in the region (Torres 1999a). A combination of the conversion program and the limited amount of collectable lithic data from an in-field analysis resulted in a data set that was less precise than either of the Phase 2 or 3 data, and therefore, the in-field data are of limited usefulness regarding specific aspects of early Navajo lithic technology. However, where it is useful is in large-scale, general technological patterning as it relates to site function.

The artifacts collected during the survey phase were gathered under the guidelines established by the original research design. Artifact collection was conducted simultaneously with the in-field data collection. As prescribed by the research design, the survey collections were biased towards lithic tools in an attempt to gather site-specific functional data. This was done in order to compensate for the characteristically sparse nature of material remains associated with Navajo sites and effectively biased the data collection towards information potentially useful for determining site function. The artifacts collected during the survey were returned to the laboratory for analysis using the procedures described below.

Phase 2: Excavations of LA 88766 and LA 11196 Lithic Analysis Methodology

The lithic artifact collections at LA 88766 and LA 11196 were conducted following the data recovery research design (Dykeman and Wharton 1994). These artifacts were analyzed using the same technological approach used for the survey collections. These data, especially from LA 11196, allowed for increased precision and control in interpreting various lithic reduction and production technologies. Specific analysis procedures are outlined below.

NN029297

Phase 3: Alternative Mitigation Lithic Analysis Methodology

Like the Phase 1 and Phase 2 lithic collections, the alternative mitigation collections were examined under laboratory conditions. These collections were made by sample excavation units placed in early Navajo midden features (see chapter 6 for details). Therefore, the level of data quality was better than that of the in-field analysis, although not as extensive as the full-site excavation data. The quantity and type of data recovered during Phase 3 were different than expected. As result of the sampling methods, the small sample sizes, or the artifact discard behaviors of the early Navajo, these collections were biased towards waste flakes. Therefore, these data were only useful as site function indicators when added to survey collections data, because few tools were discarded in excavated areas (middens). These data, however, were ideal for exploring lithic reductive and productive technologies. Large-scale technological innovation through time and functionality were best explored with these data.

Lithic Analysis

The methods and procedures used during this project relied heavily upon observable technological attributes from known replicated examples, both for the in-field and collected materials. Additionally, functional aspects of tools, indicative of use, were similarly compared to known replicated use wear studies. All collected artifacts were examined with a 10X hand lens and a 80X binocular microscope. Particular attention was paid to use wear analysis and manufacturing technology.

There are several different methodological approaches to lithic analysis currently in use, all of them with varying benefits and limitations. Some approaches are designed to expedite analysis while others are designed to maximize anthropological data. Analytical approaches include morphological/descriptive analysis (Sullivan and Rozen 1985), functional analysis (Frison 1968; Wilmsen 1968), mass analysis (Ahler 1989), and replicative systems analysis (Flenniken 1981). Although many of these analytical techniques have merit, the following approach is based primarily on Flenniken's replicative systems analysis approach (RSA). This approach includes replicative modeling of lithic technologies to create known data sets to compare to those recovered archaeologically. These empirical data can then be used to model possible human behavioral systems. The artifacts are categorized with regard to technological characteristics as they convey information about tool function. These inferred functions are then collectively interpreted as behavioral systems placed within a cultural ecology paradigm.

Lithic Artifact Classification System

Lithic artifacts are those where the raw material is stone. These include artifacts that are manufactured by chipping, grinding, or battering. This class also includes artifacts that are not necessarily manufactured, but are identifiable as artifacts by the presence of observable cultural modification (e.g., battering on cobble hammers). Other lithic artifacts that are not utilitarian, but may have served a significant cultural function are also included, such as crystals, fossils, and polished pebbles.

Chipped Stone Artifacts

Chipped stone artifacts are lithic tools produced by direct free-hand percussion, indirect percussion, or pressure flaking. These artifacts are made on flakes (flake tools, projectile points, and bifaces), produce flakes (cores), or are end products thereof (core tools and debitage). Although many milling implements and ground tools are frequently flaked during their initial manufacture, they are classified under different artifact classes.

Projectile points are a functional lithic tool designed to be hafted to a projectile and propelled as part of a hunting tool kit. Projectiles can be propelled by hand (spears), by a throwing stick (atlatl), or by a bow. Projectile point forms are a direct product of their function and these forms have been shown to change through the use life of a single projectile point (Flenniken and Raymond 1986; Flenniken and Wilke 1989; Titmus and Woods 1986). There is rarely a correlation with cultures, traditions, or tribal affiliations except in adaptational patterns. Projectile points, especially dart points, as a dating technique are ineffectual and are described below only as representatives of broad time periods based on particular hunting technologies. The most notable example of this is a study conducted by Flenniken and Wilke (1989) on dart points of the Great Basin. In this experimental study, they manufactured and used dart points. The points were typed before and after each use. The result was the changing of types, and hence their temporal assignment, with each use. Dart point morphology was determined to be product of function and not some mental template. Applicable projectile name "types" are given only as morphological descriptors for comparative purposes and do not necessarily imply cultural affiliation or temporal marking. Several morphological attributes are coded, including basal form and hafting elements.

Bifaces are a class of lithic tools that are flaked on two faces. Unlike most other tool classes, this class is not functionally based and is used primarily as a matter of convention rather than analytical procedure. Bifaces are coded by technology of manufacture and use. Projectile points and cores are often bifacial; however, they are described under their functional artifact class. Bifacial artifacts include performs, knives, axes, etc.

NN029298

Flake tools are a class of lithic artifacts where the tool or intended tool is made on a flake, and flake tools are classified by tool functions: scrapers, cutting tools, drills, reamers, etc. The flake tool was the most versatile type of lithic tool made, frequently requiring no modification. These types of expedient tools form the bulk of most lithic tool kits. Flake tool type and assemblage diversity can be used as indicators of prehistoric band mobility (Kuhn 1989, 1994; Lurie 1990). Tools made on flakes that broke during their manufacture are classified as tool blanks under this class. Similarly, flakes that have edge modification without use wear are included under this class.

Cores are a class of lithic artifacts serving as parent material for the production of flakes, and are classified based on core configuration. Core configuration is determined by the number of striking platforms and flaking orientation. Different core configuration will produce different flake types for different purposes. Multidirectional cores often produce unpatterned, frequently thick flakes. Unidirectional (blade cores are specially prepared unidirectional cores) and bidirectional cores produce linear regular flakes. Tested cobbles, an aspect of raw material prospecting, are considered incipient cores (Wilke and Schroth 1989) and produce completely cortical flakes. Frequently the most common determining factor in core configuration is the nature and flaking quality of the raw material.

Core tools are a unique class of lithic tool made on cores instead of flakes and are classified by core type, use wear type, and use wear location. The most common core tool is the core scraper. These large scrapers were most frequently used in the preparation of large hides, especially elk and bison. Angular hammers are often made from exhausted cores or core scrapers; however, because their last use was as a percussive tool, they are classified under a battered tool class.

Debitage, both flakes and debris/shatter, is the waste product from the production and reduction of cores and the production of tools and are classified based on technological categories. The flake types used are a modified version of Flenniken's RSA flake types. These are based on the amount of cortex present (e.g., completely cortical), the platform configuration (e.g., single-faceted platform), and factors of reduction technology (e.g., biface thinning flake, late stage pressure). The debitage data sets were statistically compared to known data sets to derive technological information with regard to lithic reduction. Recent replicative research has shown that "primary," "secondary," and "tertiary" flake typologies alone are ineffective for assigning reduction technologies to flakes types (Bradbury and Carr 1995).

Battered Tools

Battered tools are a class of percussive tools used for battering/pecking/shaping (hammerstones) or are battered upon (anvils) and are classified by their morphological configuration as it implies function.

Hammerstones are a class of lithic artifact used as a hand-held or hafted percussor and are classified based on functional types. They can be unaltered cobbles (spherical hammers), exhausted cores (angular hammers), or shaped and ground tools (grooved hammers). It has been shown that different hammer morphologies have different functions (Dodd 1979; Pritchard-Parker and Torres 1998). Spherical hammers are most often used for flint knapping while angular hammers are most often associated with milling implement maintenance.

Anvils are a class of lithic artifact used to support an object, frequently a core, while hammering. They are recognized by characteristic pitting and bruising on flat or convex surfaces of large, hard rocks, frequently outcropping bedrock. Occasionally, inverted and/or broken metates served as anvils.

Milling Implements

Recent ground stone studies (Adams 1993; Mauldin 1993; Schneider 1993; Wright 1993) have noted that many kinds of artifacts are ground in their manufacture regardless of function. Therefore, the term "milling implement" has been chosen to better describe what most analysts refer to as "ground stone," commonly manos, and metates. Milling is used as a generic term for resource processing with paired milling tools; therefore, tools like mortars and pestles are included in this artifact class.

Manos or handstones are part of a paired milling tool kit to be used with a metate or grinding stone for the purpose of processing resources. Manos are classified by size, manufacture and use technology, and by the number of milling faces utilized. The terms one-hand mano, and two-hand mano are used only as descriptors of general size and morphology and do not necessarily imply actual use-handedness. The term cobble mano refers to opportunistic use of an unmodified cobble for milling.

Metates or grinding stones are the stationary portions of a paired milling tool. Metates are classified by manufacture and use technology, by the shape of the milling surface (flat, basined, or troughed), and by the number of milling surfaces. Milling surface maintenance in the form of pecking is also noted.

NN029299

Ground Tools

Ground tools are a broad class of artifacts that are ground, but are not milling implements. This includes large ground tools like axes, arrow shaft straighteners, tchamahias, etc. It also includes various small ground pendants, beads, and burnishing/polishing tools.

Database

The lithic artifacts were entered into five separate relational databases (Paradox ver. 5.0 for Windows) for each phase of data collection. The lithic artifact databases are: in-field, survey collections, LA 11196, LA 88766, and focused data recovery. The new in-field database derived from the previous analyst for the RSA analysis was exported to a spreadsheet file and standard correlation coefficients were generated using Excel ver. 5.0 for Windows. Statistical analysis and generation of dendrograms were performed using SPSS for Windows.

Phase 1: In-field Analysis and Survey Collections—Lithic Data Summary

The in-field and survey collection data represent the largest lithic data set collected from the Morris Site 1 project. These data also include the greatest diversity of site types and cultural affiliations. Of these two data sets, the in-field data set is the larger. This data set, although gross in precision due to the number of different data collectors and their own personal biases, proved useful for large-scale analyses where the large frequencies normalized most data collection discrepancies. A total of five cultural groupings was identified during Phase 1, including Archaic, Anasazi, early Navajo, components of unknown cultural affiliation (also referred to as "unaffiliated"), and mixed components (including more than one affiliation). These data are summarized below by artifact type and component.

A total of 4,769 lithic artifacts was analyzed during Phase 1 of the Morris Site 1 project (Table 28). These include 4,234 from the in-field data set and 535 from the survey collections.

Chipped Stone Artifacts

A total of 4,348 chipped stone artifacts was analyzed from Phase 1: 39 from the Archaic period components, 176 from the Anasazi components, 3,417 from the early Navajo components, 315 from mixed components, and 401 from unaffiliated components.

Projectile Points

A total of 73 projectile points was analyzed from Phase 1 collections: including 2 from the Anasazi components, 60 from the early Navajo components, 10 from mixed components, and 1 from an unaffiliated component. These include 17 dart points, 50 arrow points, and 6 point fragments. The six point fragments are too fragmentary to identify technology or type.

Dart Points

The 17 dart points analyzed from Phase 1 collections comprise 13 from early Navajo components, 3 from mixed components, and 1 from component of unknown affiliation. Twelve of the dart points are complete enough to be typed (Table 29), and examples showing the range of variability are illustrated in Figure 103. Because dart points were not in use as hunting weapons during late prehistoric and protohistoric times, it is believed that those recovered from early Navajo components represent curated Archaic period points. These points were collected for reworking into functional tools like knives and scrapers, or for nonutilitarian purposes, such as, use in various ceremonies. Two of the dart points collected for nonutilitarian purposes, "offering" or "jish" points, must have served such a function based on their morphology and archaeological contexts (Figure 104). "Old" points were and are often used in various Way ceremonies. In the Enemy Way ceremony, points of contrasting colors are often used, usually black- and white-

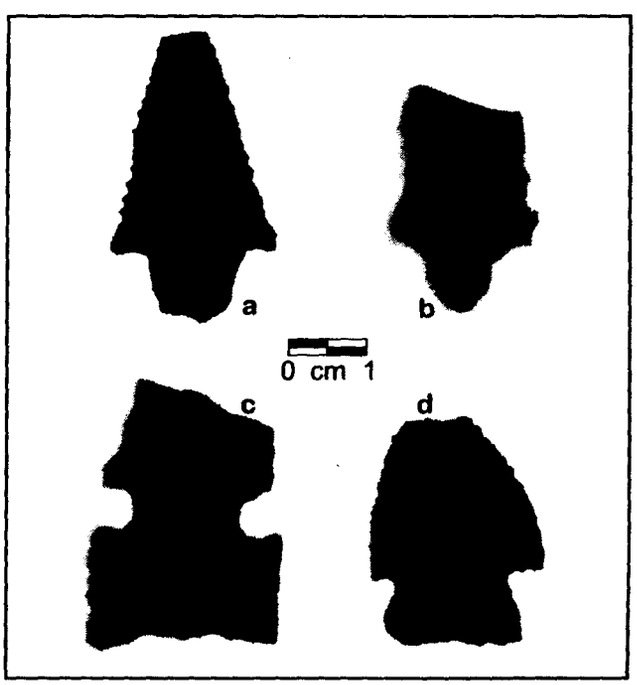


Figure 103. Dart points from the Morris Site 1 project area.

Table 28. Lithic Artifacts from Phase 1 Components

Lithic Class	Archaic		Anasazi		Navajo		Mixed		Unknown Affiliation		Total
	IF[1]	SC[2]	IF	SC	IF	SC	IF	SC	IF	SC	
Projectile Point	-	-	-	2	-	60	-	10	-	1	73
Biface	-	-	-	1	-	47	-	4	-	2	54
Flake Tool	-	4	-	17	-	204	-	23	1	5	254
Edge-modified Flake	-	-	-	1	-	8	-	1	-	-	10
Core Tool	-	-	1	-	7	11	-	2	2	1	24
Core	3	2	13	-	122	17	14	3	33	1	208
Debitage	23	7	137	5	2,874	74	252	6	356	2	3,736
Mano	2	-	12	-	133	-	12	-	19	-	178
Metate	-	-	1	-	36	-	5	-	2	-	44
Milling Implement Fragment	-	-	-	-	41	-	18	-	-	-	59
Arrow Shaft Straightener	-	-	-	-	-	3	-	-	-	-	3
Pendant	-	-	-	-	-	1	-	-	-	-	1
Pestle	-	-	-	-	-	1	-	-	-	-	1
Polished Pebble	-	-	-	-	3	1	-	-	-	-	4
Pigment Stone	-	-	-	-	-	1	-	-	-	-	1
Polished Pebble	-	-	-	-	-	1	-	-	-	-	1
Gaming Stone	-	-	-	1	-	-	-	-	-	-	1
Hammer	1	-	2	3	94	2	10	-	5	-	117
Total	29	13	166	30	3,310	431	311	49	418	12	4,769

[1] Data from in-field analysis
Survey collections analyzed in the lab

colored points. The extreme differences between the black obsidian and the multicolored silicified wood may have served a similar purpose. Both points show evidence of reworking, suggesting they were originally manufactured during Archaic period times but were brought into symmetry for use in a nonhunting context. The remaining dart points may have been collected for similar purposes, although they are all fragmentary in nature.

Arrow Points

The 50 arrow points are: 2 from the Anasazi components, 41 from the early Navajo components, and 7 from mixed components. Fifteen of these are complete enough to type, although as mentioned above this, does not imply ethnic or cultural significance. These include 4 Cottonwood Triangular, 10 Desert Side-notch, and 1 Rose Spring. The remaining arrow points are: 2 untyped corner-notched points, 18 untyped side-notched, 1 untyped stemmed, and 5 untypeable fragments. Table 30 provides details on the 41 arrow points found on early Navajo components.

Bifaces

A total of 54 bifacially flaked artifacts was analyzed from Phase 1 collections. There is 1 from an Anasazi component, 47 from the early Navajo components, 4 from mixed components, and 2 from unaffiliated components. They represent a variety of functional tools, although most represent projectile point preforms broken during manufacture. Eighteen of these are too fragmentary to determine function.

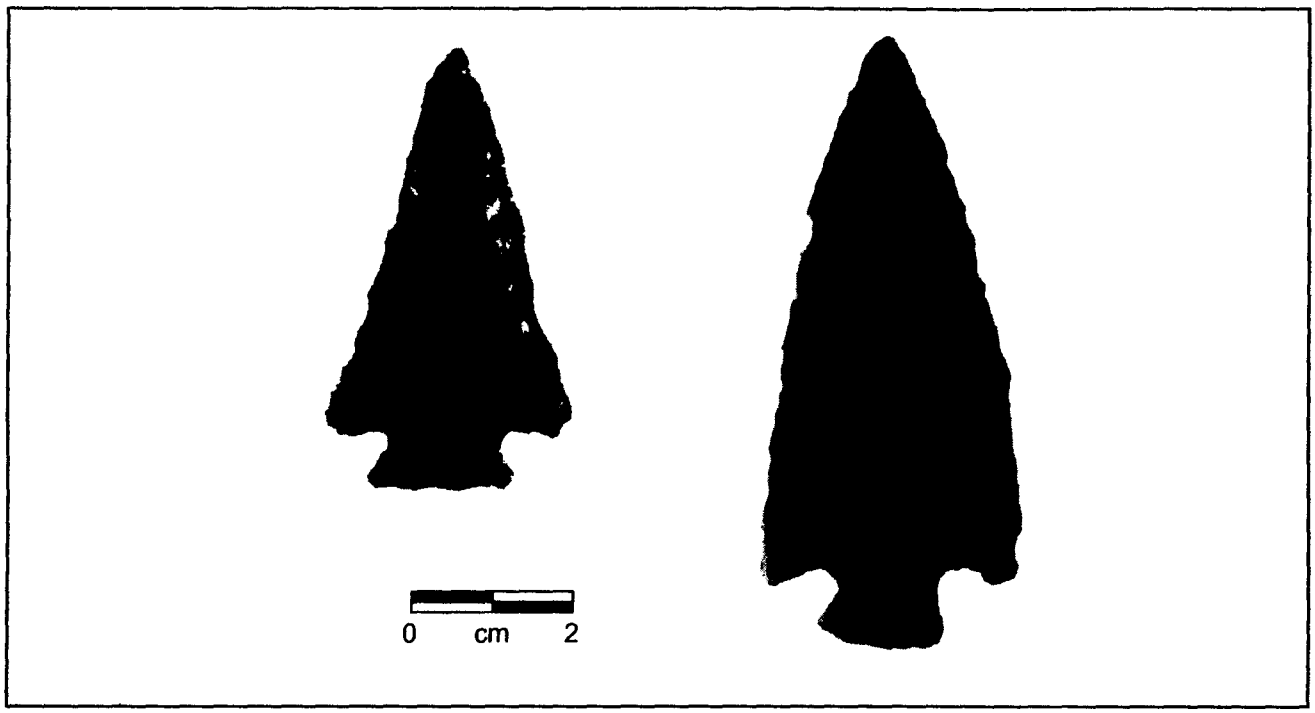


Figure 104. Large Elko-style corner-notched points evidencing jish wear.

Dart Point Preforms

Two dart point preforms were analyzed and both are from early Navajo components. It is unknown if these preforms represent curation of older items or evidence of an older occupation at these sites. Both are made by bifacially pressure flaking large chert flakes. The technology of manufacture suggests they are from late Archaic or Basketmaker II period sites or components based on their thinness, suggesting they were made from flakes, not bifaces, like the early and middle Archaic dart points.

Arrow Point Preforms

Twenty arrow point preforms were analyzed: 1 from an Anasazi component, 18 from the early Navajo components, and 1 from a mixed component. All are bifacially pressure flaked and most were discarded due to various manufacturing errors (Table 31). The preforms were made on flakes of high quality siliceous rocks, chert and chalcedony. They were systematically pressure flaked around the margins of the flake until the desired shape was obtained. The manufacturing technology is consistent with Apachean arrow point production. Manufacturing fractures include bending, perverse, and multiple step fractures.

Knives

Five bifacial knives were analyzed. Four are from early Navajo components and one is from a mixed component. Most resemble similar knives of the late prehistoric period thought to represent Shoshonean knives. The shape of these knives is a result of the practice of bilateral resharpening of the knife while it was hafted to a handle (Figure 105). It has been overstated that these tools are diagnostic of Shoshonean occupation of this and surrounding regions, when in fact these types of bifacial knives are more characteristic of pan-late prehistoric phenomena on the high plains (Frison 1991). These knives are made from chert, chalcedony, and orthoquartzite. Two were discarded complete for unknown reasons. One suffered a perverse fracture during manufacture. The remaining two suffered bending fractures, presumably while hafted.

Nonutilitarian Bifaces

One large biface was analyzed from an early Navajo component. It differs from the bifacial knives described above, in that it is rounded and all of the high topography on the faces is highly polished (jish wear). The biface suffered a perverse fracture, however, was utilized for unknown

Table 29. Dart Points from Phase 1 Components

Point Type	Navajo		Mixed		Unknown Affiliation		Total
	IF[1]	SC[2]	IF	SC	IF	SC	
Elko	-	3	-	1	-	-	4
Gypsum	-	3	-	-	-	-	3
San Rafael Side-notch	-	1	-	1	-	-	2
Large Elko (offering point)	-	2	-	-	-	-	2
Large Elko	-	1	-	-	-	-	1
Untypeable Fragment	-	3	-	1	-	1	5
Total	-	13	-	3	-	1	17

[1] Data from in-field analysis
[2] Survey collections analyzed in the lab

Table 30. Arrow Points from Early Navajo Phase 1 Components

Point Type	Material Type	Dinetah	Dinetah-Gobernador	Gobernador	Total
Cottonwood Triangular	Chalcedony	-	-	3	3
	Obsidian	-	-	1	1
Desert Side-notch	Chalcedony	-	-	1	1
	Chert	-	2	3	5
	Obsidian	-	1	1	2
	Silicified Wood	-	1	-	1
	Silicified Tuff	-	-	1	1
Rose Spring/Anasazi	Chert	-	-	1	1
Untyped Corner-notched	Chalcedony	-	-	1	1
	Obsidian	-	-	1	1
Untyped Side-notched	Chalcedony	-	1	7	8
	Chert	-	-	5	5
	Obsidian	-	-	4	4
	Orthoquartzite	-	-	1	1
Untyped Stemmed	Obsidian	-	-	1	1
Arrow Point Fragments	Chalcedony	-	-	2	2
	Chert	1	-	1	2
	Obsidian	-	-	1	1
	Total	1	5	35	41

Table 31. Arrow Point Preforms from Phase 1 Investigations and Reasons for their Discard

Reason for Discard	Anasazi	Navajo	Mixed	Total
Bending Fracture	-	4	-	4
Complete, Unknown	1	3	-	4
Flaw in the Material	-	2	-	2
Multiple Step Fractures	-	2	1	3
Perverse Fracture	-	4	-	4
Thermal Fracture	-	1	-	1
Unknown Fracture Type	-	2	-	2
Total	1	18	1	20

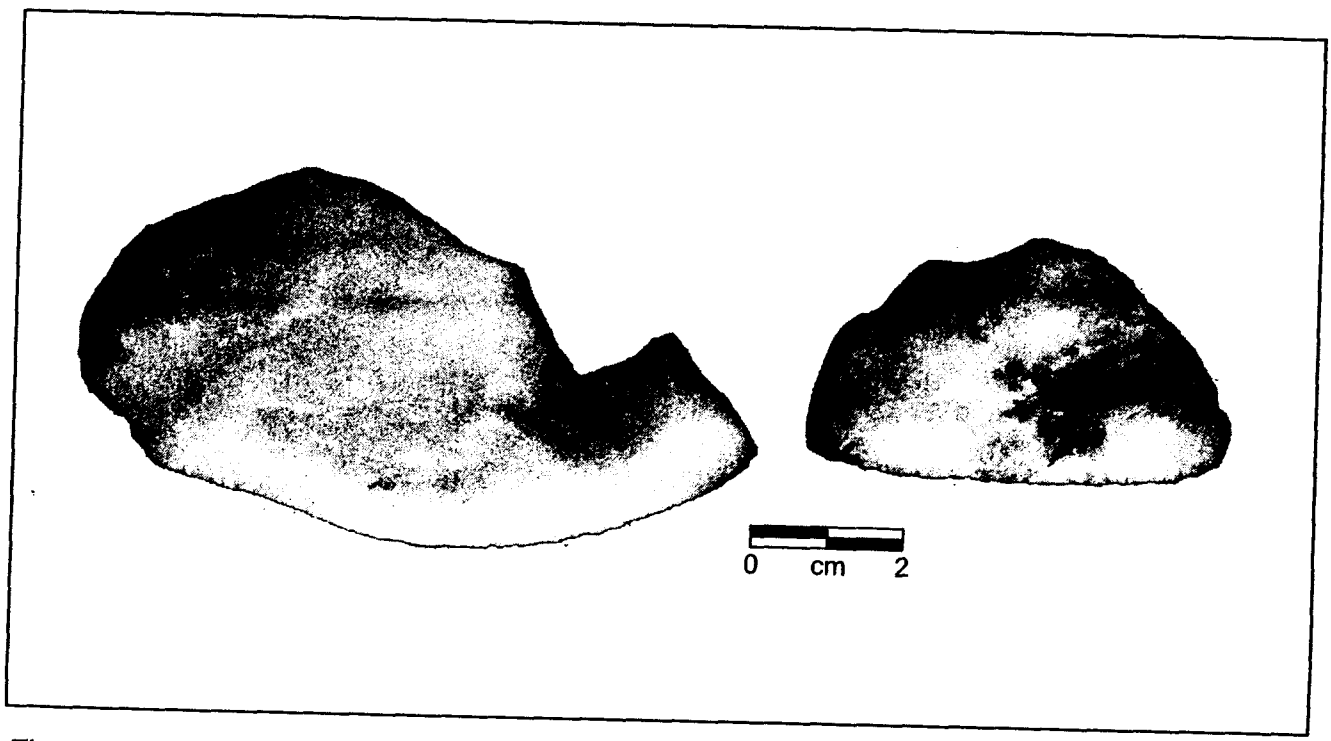


Figure 105. Flake knives made on large biface thinning flakes.

NN029304

purposes long after this fracture occurred as evidenced by the rounding and polish along the fractured surface. This suggests that the artifact may originally be of Archaic period manufacture and was collected during the early Navajo occupation. The wear suggests the artifact may have been stored in a leather bag and served a nonutilitarian function.

Unknown Biface Preforms

Eight unknown biface preforms were analyzed: seven from early Navajo components and one from a mixed component. All of them are bifacially percussion and/or pressure flaked, although their intended functional tool types could not be inferred.

Flake Tools

A total of 254 flake tools was analyzed from Phase 1 collections. Four are from Archaic period components, 17 from Anasazi components, 204 from early Navajo components, 23 from mixed components, and 6 from components of unknown affiliation. One hundred eighty-seven of the flake tools are various scrapers, 56 are cutting tools, 9 are drills or perforator/drills, and 2 are reamers. They show wear suggesting use on various media while processing resources or manufacturing nonlithic tools (Table 32).

Bilateral Side Scrapers

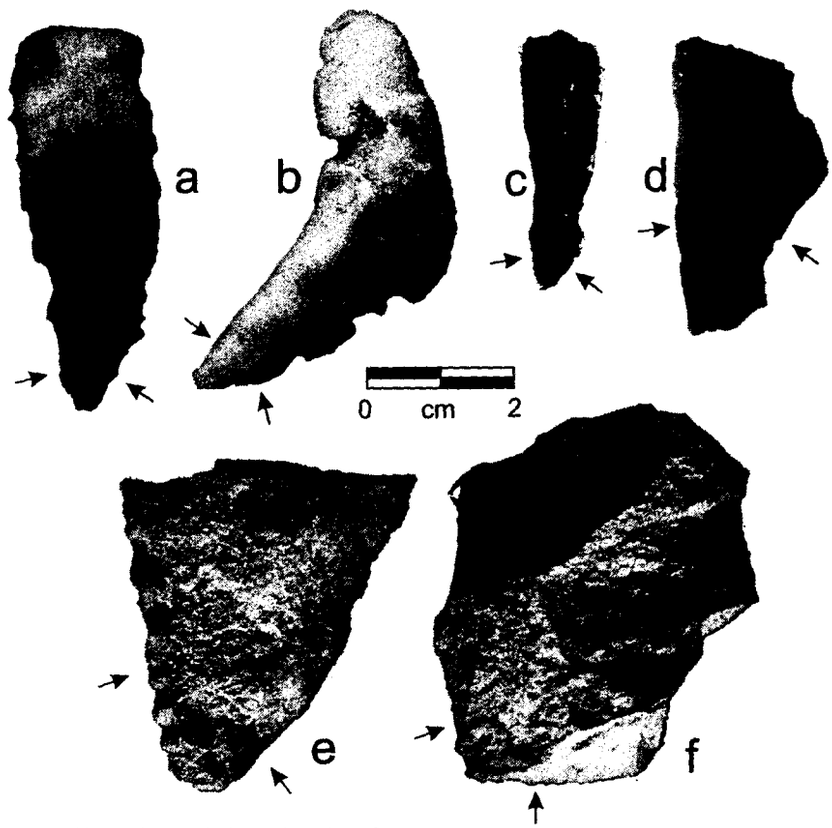
Forty-two bilateral side scrapers were analyzed from Phase 1 collections (Table 33). They are represented by three morphological variants, including parallel margins, converging margins, and scraping and cutting margins (Figure 106). These scrapers were used on a variety of media ranging from soft to abrasive materials (see Table 32). The use of multipurpose flake tools has been suggested as an indicator of increased residential mobility, whereby cultures with low residential mobility tend to have low frequencies of multipurpose tools and those with high residential

Table 32. Evidence of Use Wear Media Observed on Flake Tools from Phase 1 Components

Lithic Subclass	Soft (fresh hide, meat)	Moderate (dried/tanned leather)	Medium Hard (bone, green wood)	Abrasive (wet hide,sand-tempered pottery)	Hard (dried wood)	Unknown	Total
Bilateral Side Scraper	5	7	5	7	-	-	24
Bilateral Side Scraper, Converging Margins	3	8	3	3	-	-	17
Bilateral Side Scraper and Cutting Tool	-	-	1	-	-	-	1
Ceramic Scraper	-	-	-	3	-	-	3
Concave Side Scraper	5	1	1	1	-	-	8
Denticulated Scraper	2	1	-	-	-	1	4
End Scraper	8	14	1	1	-	1	25
Hide Scraper	8	15	-	2	-	-	25
Notched Scraper/Spoke Shave	6	1	-	-	-	-	7
Side Scraper	1	41	19	4	-	6	71
Spurred End Scraper	-	2	-	-	-	-	2
Cutting Tool/Flake Knife	23	27	2	3	1	-	56
Drill	1	2	-	-	-	1	4
Perforator/Drill	1	3	-	-	-	1	5
Reamer	-	-	2	-	-	-	2
Total	63	122	34	24	1	10	254

Table 33. Bilateral Scrapers from Phase 1 Components

Cultural Affiliation	Material Type	Bilateral Side Scraper	Bilateral Side Scraper, Converging Margins	Bilateral Side Scraper and Cutting Tool	Total
Anasazi	Quartzite	-	1	-	1
Navajo	Basalt	-	1	-	1
	Chalcedony	5	3	-	8
	Chert	3	3	1	7
	Obsidian	10	4	-	14
	Quartzite	-	2	-	2
Mixed	Chalcedony	1	1	-	2
	Obsidian	3	1	-	4
	Quartzite	1	-	-	1
	Silicified Wood	1	-	-	1
Unknown Affiliation	Quartzite	-	1	-	1
	Total	24	17	1	42



Note: Arrows indicate location of use wear

Figure 106. Bilateral side scrapers.

mobility have higher frequencies of flake tools. Given that, the high frequencies of these bilateral scrapers on early Navajo sites might suggest a greater likelihood of frequent residential mobility.

Ceramic Scrapers

Three ceramic scrapers were analyzed from Phase 1 collections (Figure 107). All of them are from the early Navajo components. These scrapers, as there type implies, show wear suggesting use on a highly abrasive materials like rock- or sherd-tempered pottery. The margins are heavily rounded and striated. The extreme use wear present on these tools suggests they were utilized for extended periods of time and were not used expediently or opportunistically. There does not appear to have been a raw material preference for these tools which included obsidian, siltstone, and quartzite. The obsidian ceramic scrapers, however, are significantly more worn than either of the others. This increase in observable use wear probably resulted from the brittle nature of obsidian verses the hard siltstone or quartzite.

Concave Scrapers

Eight concave scrapers were analyzed from Phase 1 collections. All of them are from the early Navajo components. These scrapers appear to have been used on a variety of media ranging from soft to abrasive (see Table 32). This type of scraper is usually thought to have been used for the manufacture of bone or wooden tools and used as a spokeshave; however, the high frequency of soft media use suggests otherwise. Many of the concave scrapers were likely used on fleshy plant parts and not bone or wood. Most of these scrapers are made from high quality lithic materials including heat-treated chalcedony, chert, and obsidian. The brittle nature of the preferred raw materials is consistent with use on soft media. Use wear similar to this can be produced while cleaning green reeds in their preparation for arrow shaft production.

Denticulated Scrapers

Four denticulated scrapers were analyzed from Phase 1 collections. All of them are from the early Navajo components. These scrapers appear to have been used mostly on soft and moderately soft media. It is thought that the denticulations must have functioned as comb-like teeth. These could have been used for separating soft plant fibers or shredding sinew. Similar tools are known for yucca fiber separation among the southern Shoshone in basketry manufacture. Two of these scrapers are made of chert and two are made of quartzite.

End Scrapers

Twenty-five end scrapers were analyzed from Phase 1 collections. One is from an Archaic period component, 6 from Anasazi components, 13 from early Navajo components, and 5 from mixed components (Table 34, Figure 108). These scrapers appear to have been used on a variety of materials, although the majority of the media are moderate, like tanned hides (see Table 32). Many of these scrapers are unidirectionally pressure flaked and have rounded margins. Stria and unidirectional microflaking are also present on some specimens.

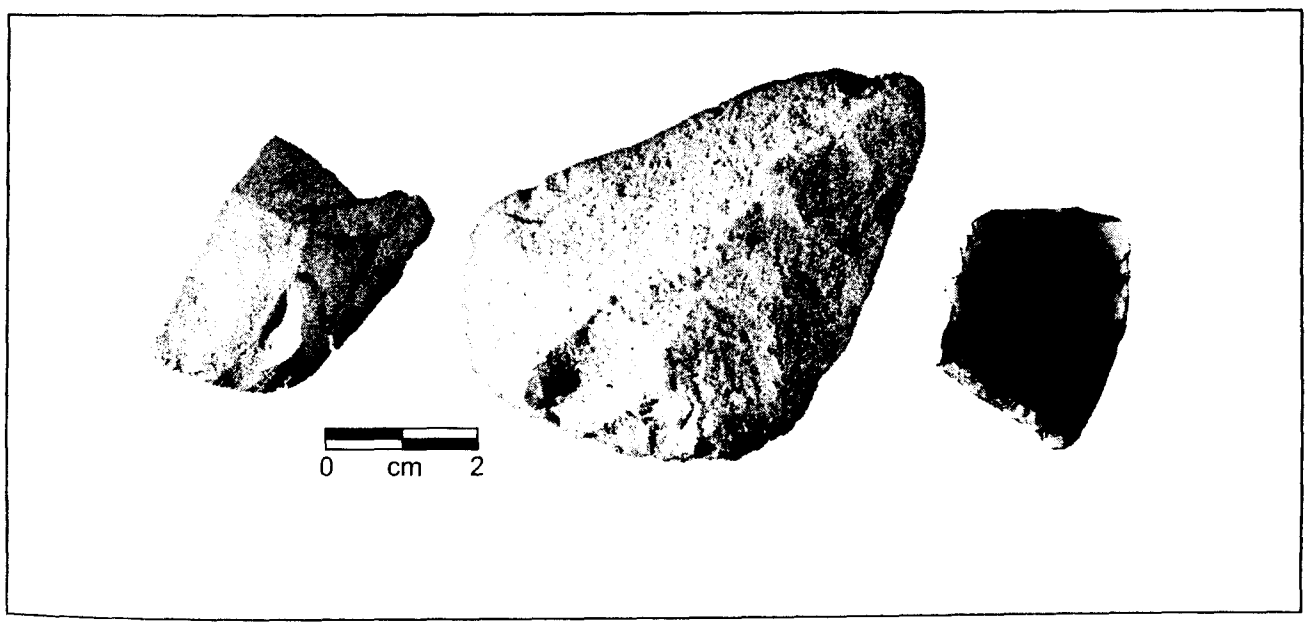


Figure 107. Scrapers used as ceramic manufacturing tools.

NN029307

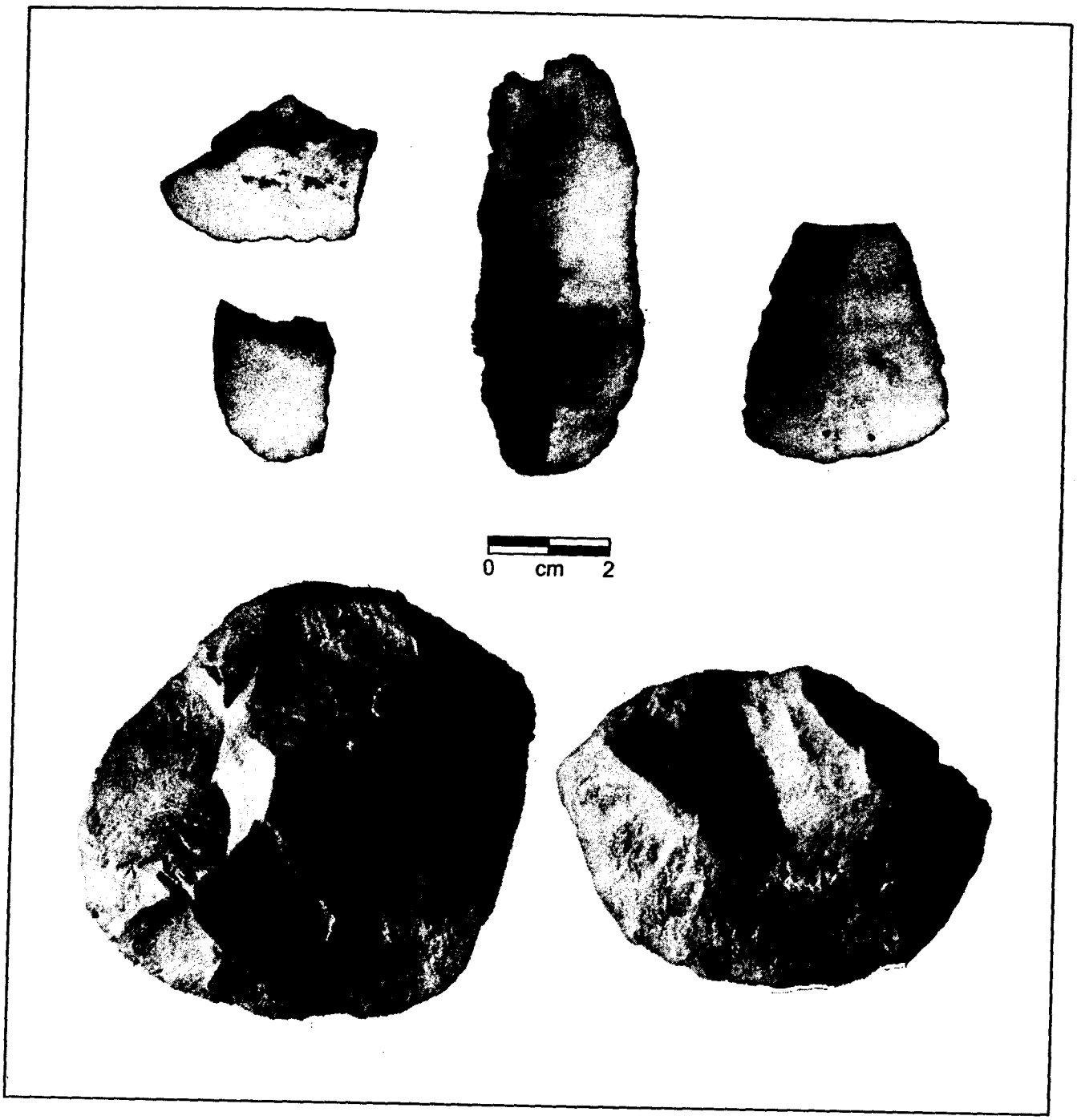


Figure 108. End scrapers.

NN029308

Table 34. End Scrapers from Phase 1 Components

Material Type	Archaic	Anasazi	Navajo	Mixed	Total
Chalcedony	-	-	4	-	4
Chert	-	-	4	1	5
Gray Chert	-	-	1	-	1
Narbona Pass Chert	-	1	-	-	1
Obsidian	-	1	-	1	2
Quartzite	1	3	4	3	11
Siltstone	-	1	-	-	1
Total	1	6	13	5	25

Hide Scrapers

Twenty-five hide scrapers were analyzed from Phase 1 collections. One is from an Archaic period component, 3 from Anasazi components, 17 from early Navajo components, 1 from mixed components, and 3 from unaffiliated components (Table 35). Like the majority of the end scrapers, these appear to have been used on moderate media like tanned hides (Figure 109; also see Table 32). Many of the hide scrapers are unidirectionally pressure flaked and have rounded margins and are miniature versions of the more common core tool hide scrapers described below. These may have been functionally equivalent tools, but for smaller sized hides, (e.g., rabbit) or delicate regions of hides (e.g., neck). They show a very characteristic wear pattern of rounded margins, stria, and polished high topography along the used face.

Notched Scrapers

Seven notched scrapers were analyzed during Phase 1. One is from an Archaic period component and six are from early Navajo components (Table 36). Most of the scrapers appear to have been used on soft media (see Table 32). Similar tools were observed in the production and preparation of basketry materials, but have been replaced by perforated tin cans in recent times (Fowler and Dawson 1986:720). Fresh plant materials were run through the notch of one of these scrapers to standardize the width. Many of these scrapers have multiple notches of varying widths (Figure 110) making them multifunctional tools, perhaps for different sized baskets or for varying the thickness of materials for various portions of the same basket.

Side Scrapers

Seventy-one side scrapers were analyzed (Table 37) during Phase 1. Of these, 4 are from Anasazi components, 62 from early Navajo components, 4 from mixed components, and 1 from an unaffiliated component. Of all of the flake tool types, these scrapers were used on the widest variety of materials (see Table 32). They show use wear in the form of rounded, bifacial and unifacial microflaked, striated, and/or polished margins. Many of these scrapers also show unidirectionally pressure flaking from the rejuvenation of tools edges. Side scrapers appear to be the most versatile of all of the analyzed flake tools.

Spurred End Scrapers

Two spurred end scrapers were analyzed from Phase 1 collections. Both are from early Navajo components and show wear that suggests use on hides (see Figure 108). There are no obvious indications of hafting, although scrapers of their morphology are often found hafted to wooden handles. Although frequently thought of as a Paleoindian or early Archaic tool type (Frison 1991), spurred end scrapers are ubiquitous across the southern plains in protohistoric times as well. Tools like these have been observed in use as hide preparation tools by northern Athabascans, the Déné (Wilson 1997).

Cutting Tools/Flake Knifes

Fifty-six cutting tools were analyzed during Phase 1: 1 from an Archaic period component, 1 from an Anasazi component, 48 from early Navajo components, and 6 from mixed components (Table 38). These cutting tools appear to have been used on a variety of materials, although the majority of the media are soft to moderate like fresh and tanned hides. Some of these cutting tools are unifacially and bifacially pressure flaked and have rounded margins (Figure 111). Most were made on large biface thinning flakes or long blade-like flakes of fine-grained materials.

Drills and Perforator/Drills

Nine drills and perforator/drills were analyzed from Phase 1 collections. Two are from Anasazi components and seven are from early Navajo components (Table 39). These tools appear to have been used mostly on soft to moderate

NN029309

Table 35. Flake Tool Hide Scrapers from Phase 1 Components

Material Type	Archaic	Anasazi	Navajo	Mixed	Unknown Affiliation	Total
Basalt	-	-	1	-	-	1
Quartzite	1	3	16	1	3	24
Total	1	3	17	1	3	25

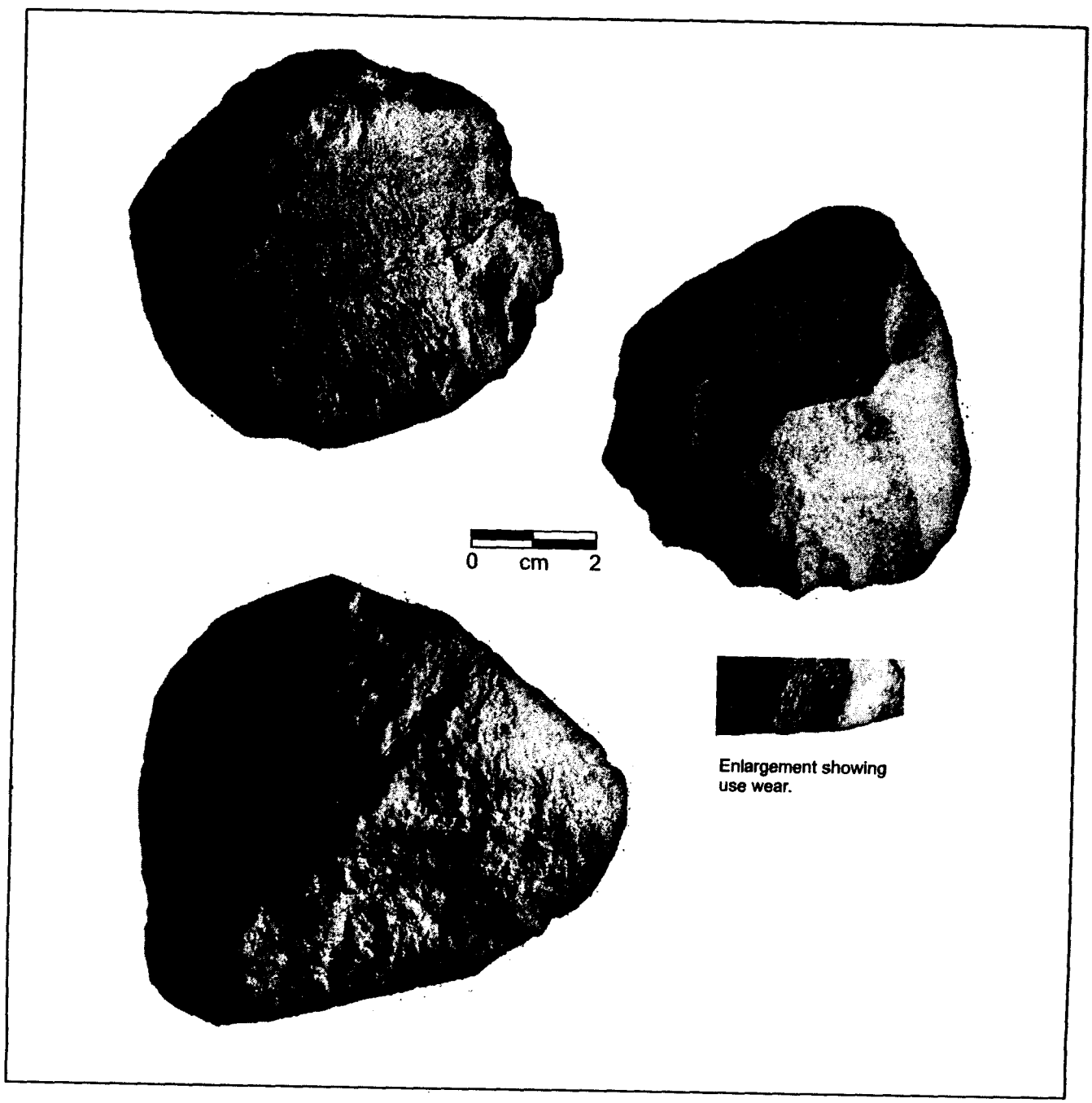


Figure 109. Hide scrapers.

Table 36. Notched Scrapers from Phase 1 Components

Material Type	Archaic	Navajo	Total
Chalcedony	-	3	3
Chert	-	1	1
Obsidian	-	1	1
Quartzite	1	-	1
Silicified Wood	-	1	1
Total	1	6	7

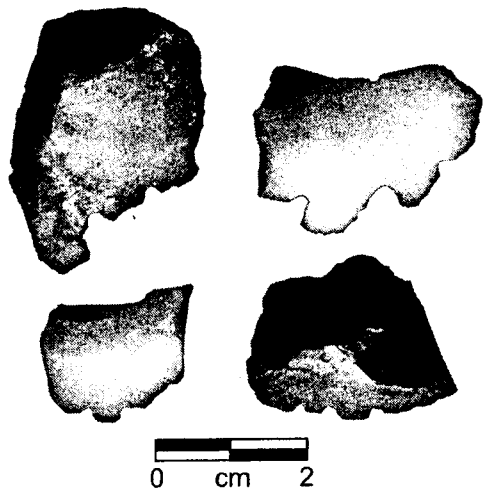


Figure 110. Notched scrapers made on flakes.

Table 37. Side Scrapers from Phase 1 Components

Material Type	Anasazi	Navajo	Mixed	Unknown Affiliation	Total
Chalcedony	-	18	-	-	18
Chert	1	11	1	1	14
Obsidian	-	17	2	-	19
Quartzite	3	11	1	-	15
Silicified Wood	-	4	-	-	4
Siltstone	-	1	-	-	1
Total	4	62	4	1	71

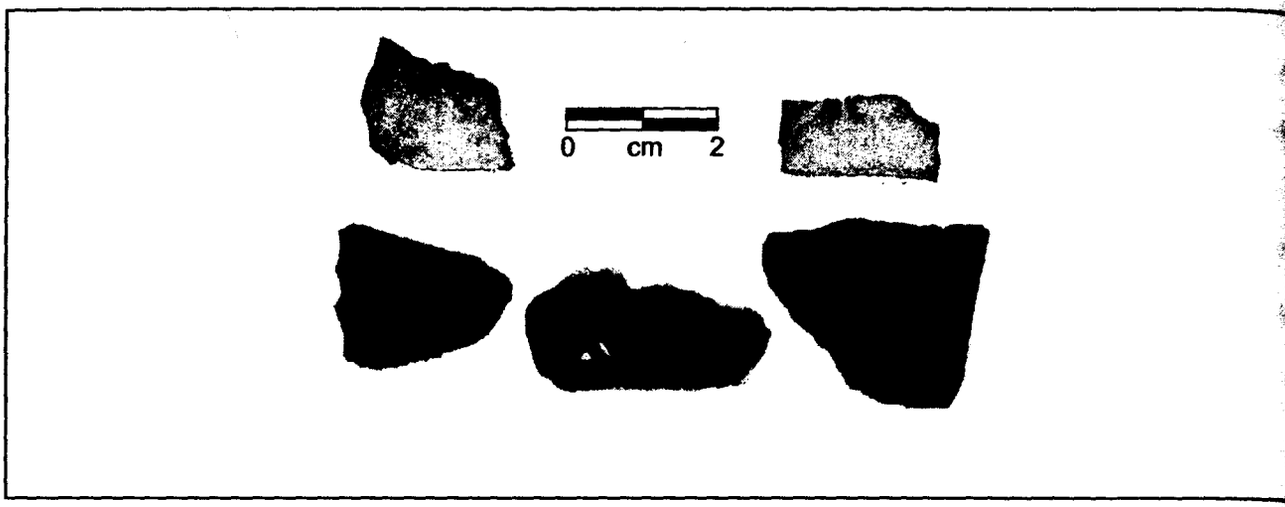


Figure 111. Cutting tools made on blades.

Table 38. Cutting Tools from Phase 1 Components

Material Type	Archaic	Anasazi	Navajo	Mixed	Total
Basalt	-	-	1	-	1
Chalcedony	-	-	21	4	25
Chert	-	-	8	1	9
Obsidian	-	1	16	1	18
Quartzite	1	-	1	-	2
Silicified Wood	-	-	1	-	1
Total	1	1	48	6	56

Table 39. Drills and Perforator/Drills from Phase 1 Components

Lithic Subclass	Material Type	Anasazi	Navajo	Total
Drill	Chalcedony	-	3	3
	Chert	-	1	1
Drill Total		-	4	4
Perforator/Drill	Chalcedony	-	1	1
	Chert	1	-	1
	Obsidian	1	1	2
	Quartzite	-	1	1
Perforator/Drill Total		2	3	5
Total		2	7	9

NN029312

media like fresh and tanned hides. The margins also show use wear suggesting use as piercing tools as well as rotary tools (Figure 112). It is likely that these tools were used the manufacture of leather goods.

Reamers

Two reamers were analyzed during Phase 1. Both are from early Navajo components and show wear that suggests rotary use on medium-hard materials like wood. They may have been used in the production of wooden tools.

Edge-Modified Flakes

A total of 10 edge-modified flakes was analyzed during Phase 1. These comprise 1 from an Anasazi component, 8 from early Navajo components, and 1 from a mixed component. They include flakes that were modified by pressure flaking of lateral margins, although no obvious use wear is present. In some cases the intended tool is difficult to determine, while others can be speculated upon, based on replicative research. Four of the edge-modified flakes probably represent tool blanks or flake tools that had been resharpened, but not used to the point of producing wear. Six of the edge-modified flakes appear to represent flake margin trimming thought to be associated with early stages of projectile point production. Most of these show manufacturing fractures that are consistent with this type of interpretation, including perverse and bending fractures.

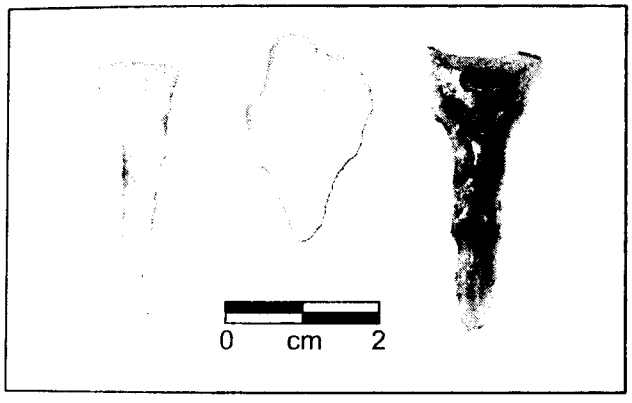


Figure 112. Chipped stone drills.

Core Tools

A total of 13 core tools was analyzed from Phase 1 collections. Of these, 11 are from early Navajo components and 2 from mixed components (Table 40). All of the core tools are made from exhausted cores and are made from tough materials. Most represent various hide processing and woodworking tools (Figure 113). The use wear on the large concave and side scrapers is consistent with wood scraping (Torres 1998). Few of these tools show evidence of tool-edge reworking, suggesting that use-produced rounded margins were desirable. This has been noted elsewhere, where it was indicated that sharp acute margins were more damaging to hides than were rounded edges (Kluckhohn et al. 1971).

Cores

A total of 208 cores was analyzed from Phase 1 collections: 5 from Archaic period components, 13 from Anasazi components, 139 from early Navajo components, 17 from mixed components, and 34 from components of unknown affiliation (Table 41). All of these cores were analyzed during the in-field analysis and the core types were not specified. A detailed analysis from the excavated materials of early Navajo reductive technology is presented later in this chapter.

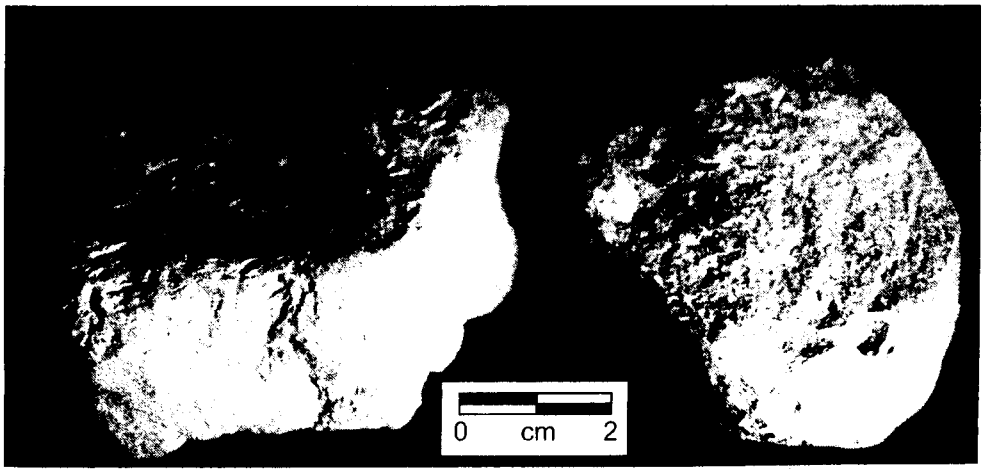


Figure 113. Hide abraders made on cores.

NN029313

Table 40. Core Tools from Phase 1 Components

Lithic Subclass	Material Type	Navajo	Mixed	Total
Concave Side Scraper	Quartzite	1	-	1
Hide Scraper	Orthoquartzite	1	-	1
	Quartzite	6	2	8
	Siltstone	1	-	1
Side Scraper	Quartzite	1	-	1
Hide Abrader	Quartzite	1	-	1
	Total	11	2	13

Debitage

A total of 3,736 pieces of debitage was analyzed during Phase 1 collections. These breakout as follows: 30 from Archaic period components, 142 from Anasazi components, 2,948 from early Navajo components, 258 from mixed components, and 358 from unaffiliated components (Table 42). The debitage analysis suggests a variety of human activities with regard to lithic reduction technology. The number of flakes recovered from some of the components is minimal for an RSA-type analysis and the following descriptive summary is all that will be presented.

The debitage analyzed during Phase 1 was mostly examined as part of the in-field analyses. The data collected were designed to maximize technological data from a wide variety of early Navajo sites. This data collection method proved to be sufficient to address some important technological issues. The vast majority of the early Navajo debitage data came from Gobernador phase sites (Table 43).

Battered Tools

A total of 128 battered tools was analyzed from Phase 1 collections. Of this number, 1 is from an Archaic period component, 6 from Anasazi components, 103 from early Navajo components, 10 from mixed components, and 8 from components of unknown affiliation. All of the battered tools are hammers of various morphologies, including spherical hammers and angular hammers. Differing morphologies are thought to represent different functions.

Hammerstones

Some 128 hammers were analyzed including 2 spherical hammers and 4 angular hammers (Table 44). Like the cores and debitage, much of the data on the hammerstones was collected during the in-field analysis. Therefore, the vast majority of the hammerstones were described only as such and not as specific types that might more accurately infer function. Unfortunately, this means that 122 out of 128 hammerstones are of unspecified type.

Milling Implements

A total of 281 milling implements was analyzed during Phase 1. Of these, 2 are from Archaic period components, 13 from Anasazi components, 210 from early Navajo components, 35 from mixed components, and 21 from unaffiliated components. All of these artifacts were analyzed during the in-field analysis. In addition to the manos and metates described below, 59 milling implement fragments were analyzed; however, their function could not be determined.

Manos

One hundred seventy-eight manos and mano fragments were analyzed during Phase 1: 2 from Archaic period components, 12 from Anasazi components, 133 from early Navajo components, 12 from mixed components, and 19 from components of unknown affiliation (Table 45). These manos include one-hand manos, two-hand manos, and mano fragments. The vast majority of the analyzed manos are too fragmentary to determine milling technology. The one-hand manos are oval and shaped and were intended for use on basin metates in a circular motion. The two-hand-type mano is rectangular and flat and intended for use on slab or trough metates in a back-and-forth motion.

Metates

Forty-four metate and metate fragments were analyzed from Phase 1 collections including 1 from an Anasazi component, 36 from early Navajo components, 5 from mixed components, and 2 from unaffiliated components (Table 46). Most of the metates are represented by fragments and type could not be identified. The remaining metates are various shallow basin and slab types.

Ground Tools

A total of nine ground tools was analyzed during Phase 1, all from early Navajo components. All of the ground tools were ground during their manufacture or use, but are unassociated with milling activities. These artifacts include

NN029314

Table 41. Cores from Phase 1 Components

Lithic Subclass	Material Type	Archaic		Anasazi	Navajo		Mixed		Unknown Affiliation		Total
		IF[1]	SC[2]	IF	IF	SC	IF	SC	IF	SC	
Bifacial Core	Chert	-	-	-	-	1	-	-	-	-	1
	Quartzite	-	-	-	-	1	-	-	1	-	2
Bipolar Core	Chalcedony	-	-	-	-	4	-	2	-	1	7
	Chert	-	-	-	-	3	-	-	-	-	3
	Obsidian	-	-	-	-	2	-	-	-	-	2
Multidirectional Core	Chert	-	-	-	1	-	-	-	-	-	1
	Quartzite	-	-	-	10	2	-	-	-	-	12
Tested Cobble	Quartzite	-	-	-	-	3	-	-	23	-	26
Unidirectional Core	Quartzite	-	2	-	-	1	-	1	3	-	7
Core Type not Specified	Argillite	-	-	-	1	-	-	-	-	-	1
	Basalt	-	-	-	1	-	-	-	-	-	1
	Chalcedony	-	-	-	2	-	-	-	1	-	3
	Chert	-	-	1	2	-	-	-	-	-	3
	Obsidian	-	-	-	1	-	-	-	-	-	1
	Quartzite	3	-	9	92	-	14	-	3	-	121
	Silicified Wood	-	-	1	2	-	-	-	-	-	3
	Siltstone	-	-	2	10	-	-	-	2	-	14
	Total	3	2	13	122	17	14	3	33	1	208

[1] Data from in-field analysis

[2] Survey collections analyzed in the lab

three arrow shaft straighteners, a ground pendant, a hide polisher, and three polished pebbles.

Arrow Shaft Straighteners

Three arrow shaft straighteners were analyzed from Phase 1 collections, all from early Navajo components (Figure 114). One is made from a fine-grained quartzite. It has a single groove and is shaped on all sides. It may have been half of a pair of arrow shaft abraders that was made into a straightener. The difference between the two is that abraders are used in pairs and sand solid wood-shafted arrows into the correct diameter. Straighteners are used singly with heat and are used to bend the nodes of cane-shafted arrows until they are straight. A second of the arrow shaft straightener is also made from quartzite. It is an unmodified cobble, with the exception of a pair of grooves. The remaining straightener is a single-grooved ultramaphic rock. It too is unmodified with the exception of the groove. All three show evidence of having been heated in their use.

Pendants

A single pendant was analyzed from a Phase 1 early Navajo component (Figure 115). It is made of black jet and is shaped into a rough diamond shape. It has a single biconically drilled hole on one end.

NN029315

Table 42. Debitage from Phase 1 Components

Lithic Subclass	Archaic		Anasazi		Navajo		Mixed		Unknown		Total
	IF[1]	SC[2]	IF	SC	IF	SC	IF	SC	IF	SC	
Alternate Flake	-	-	-	-	-	4	-	-	-	-	4
Biface Thinning, Early Stage Percussion	-	-	-	-	-	2	-	-	6	-	8
Biface Thinning, Late Stage Percussion	-	-	-	-	-	1	-	1	2	-	4
Biface Thinning, Late Stage Percussion, Abraded Platform	-	-	-	-	-	3	-	-	-	-	3
Outré Passé	-	-	2	-	12	-	2	1	1	-	18
Bipolar Flake	-	-	-	-	4	8	-	1	-	-	13
Blade	-	-	-	-	13	-	3	-	3	-	19
Completely Cortical, Natural Platform	-	-	-	-	-	1	1	-	12	-	14
Completely Cortical, Platform Absent	-	-	-	-	1	-	-	1	13	-	15
Completely Cortical, Single-Facet Platform	-	-	3	-	-	1	1	-	6	-	11
Core Rejuvenation Flake	-	-	9	-	27	1	4	-	-	-	41
Noncortical, Abraded Platform	-	-	-	1	-	3	-	-	-	1	5
Noncortical, Multiple-Facet Platform	-	-	-	-	-	3	-	-	-	-	3
Noncortical, Natural Platform	-	1	-	1	14	-	1	-	20	-	37
Noncortical, Platform Absent	9	1	22	-	844	13	80	1	66	-	1,036
Noncortica,l, Single-Facet Platform	9	-	39	3	730	11	89	-	55	-	936
Partially Cortical, Abraded Platform	-	-	-	-	-	1	-	-	-	-	1
Partially Cortical, Natural Platform	-	1	4	-	47	5	3	-	39	1	100
Partially Cortical, Platform Absent	-	-	9	-	101	1	4	-	19	-	134
Partially Cortical, Single-Facet Platform	1	2	13	-	169	8	13	1	37	-	244
Tool Rejuvenation Flake	-	1	-	-	-	3	-	-	-	-	4
Cortical Shatter	-	-	-	-	-	-	-	-	21	-	21
Noncortical Shatter	4	1	36	-	764	5	44	-	51	-	905
Flake Type Not Specified	-	-	-	-	148	-	7	-	5	-	160
Total	23	7	137	5	2,874	74	252	6	356	2	3,736

[1] Data from in-field analysis

[2] Survey collections analyzed in the lab

NN029316

Table 43. Debitage from Early Navajo Period Components (Phase 1)

Lithic Subclass	Dinetah	Dinetah-Gobernador	Gobernador	Total
Alternate Flake	-	-	4	4
Biface Thinning, Early Stage Percussion	-	-	2	2
Biface Thinning, Late Stage Percussion	-	-	1	1
Bipolar Flake	-	4	8	12
Blade	-	3	10	13
Biface Thinning, Late Stage, Percussion, Abraded Platform	-	1	2	3
Completely Cortical, Natural Platform	-	-	1	1
Completely Cortical, Platform Absent	-	1	-	1
Completely Cortical, Single-Facet Platform	-	-	1	1
Core Rejuvenation Flake	-	2	26	28
Flake Type Not Specified	1	18	129	148
Noncortical, Abraded Platform	-	1	2	3
Noncortical, Multiple-Facet Platform	-	-	3	3
Noncortical, Natural Platform	-	2	12	14
Noncortical, Platform Absent	32	132	693	857
Noncortical, Shatter	8	127	634	769
Noncortical, Single-Facet Platform	33	165	543	741
Outré Passé	-	-	12	12
Partially Cortical, Abraded Platform	-	1	-	1
Partially Cortical, Natural Platform	-	8	44	52
Partially Cortical, Platform Absent	3	11	88	102
Partially Cortical, Single-Facet Platform	9	27	141	177
Tool Rejuvenation Flake	-	-	3	3
Total	86	503	2,359	2,948

Table 44. Hammerstones from Phase 1 Components

Lithic Subclass	Archaic	Anasazi		Navajo		Mixed	Unknown		Total
	IF	IF[1]	SC[2]	IF	SC	IF	IF	SC	
Angular Hammer	-	-	1	-	2	-	-	1	4
Spherical/Knapping Hammer	-	-	2	-	-	-	-	-	2
Hammer Type Not Specified	1	3	-	101	-	10	7	-	122
Total	1	3	3	101	2	10	7	1	128

[1] Data from in field analysis.
[2] Survey collections analyzed in the lab.

NN029317

Table 45. Manos from Phase 1 Components

Lithic Subclass	Archaic	Anasazi	Navajo	Mixed	Unknown Affiliation	Total
Biscuit/One-hand Mano	1	2	37	3	12	55
Two-hand Mano	-	1	18	5	-	24
Mano Fragment	1	9	78	4	7	99
Total	2	12	133	12	19	178

Table 46. Metates from Phase 1 Components

Lithic Subclass	Anasazi	Navajo	Mixed	Unknown Affiliation	Total
Basin Metate	-	1	-	-	1
Metate Fragment	1	25	5	2	33
Milling Slab	-	10	-	-	10
Total	1	36	5	2	44

Hide Finishers

A single hide finisher was analyzed from a Phase 1 early Navajo component. It is an unmodified quartzite cobble that was used in the finishing stages of hide working. It is extremely polished along one face with polish and stria present from wear along the high topography of the face. These types of tools are discussed in detail by Kluckhohn et al. (1971).

Pecking Stones

A single, pestle-like ground tool was analyzed from a Phase 1 early Navajo component. It is an elongated cobble with extensive battering wear on one end. It appear to have been used as some type of pecking stone where some control was required, perhaps in making petroglyphs.

Miscellaneous Lithics

A total of 7 miscellaneous lithics was analyzed during Phase 1: 1 from an Anasazi component and 6 from early Navajo components. All of these artifacts show cultural modification, however it is not extensive. One is a small piece of gypsum that is out of geologic context and shows some polish along its rectangular corners. It is hypothesized to represent a "gaming" piece. Two other miscellaneous lithics are a small piece of hematite and one of malachite. They are both ground smooth on one face and were probably abraded in the production of pigments. The remaining miscellaneous lithic artifacts are polished pebbles. Their function could not be determined and wear is not consistent with known polishing tools. They may have served a nonutilitarian function.

Phase 2: Excavations of LA 11196 and LA 88766 —Lithic Data Summary

Phase 2 of the Morris Site 1 project included the data recovery excavation of two sites: LA 11196 and LA 88766. Both of these are early Navajo sites, although LA 11196 was clearly a more substantial assemblage than LA 88766. The quality of the Phase 2 data set allows for specific questions regarding early Navajo technologies to be addressed. These data are summarized below by artifact type and locus.

LA 11196 Lithic Data Summary

A total of 425 lithic artifacts was analyzed during the data recovery excavations at LA 11196 (Table 47). These are 373 chipped stone, 21 battered tools, 26 milling implements, and 5 ground tools.

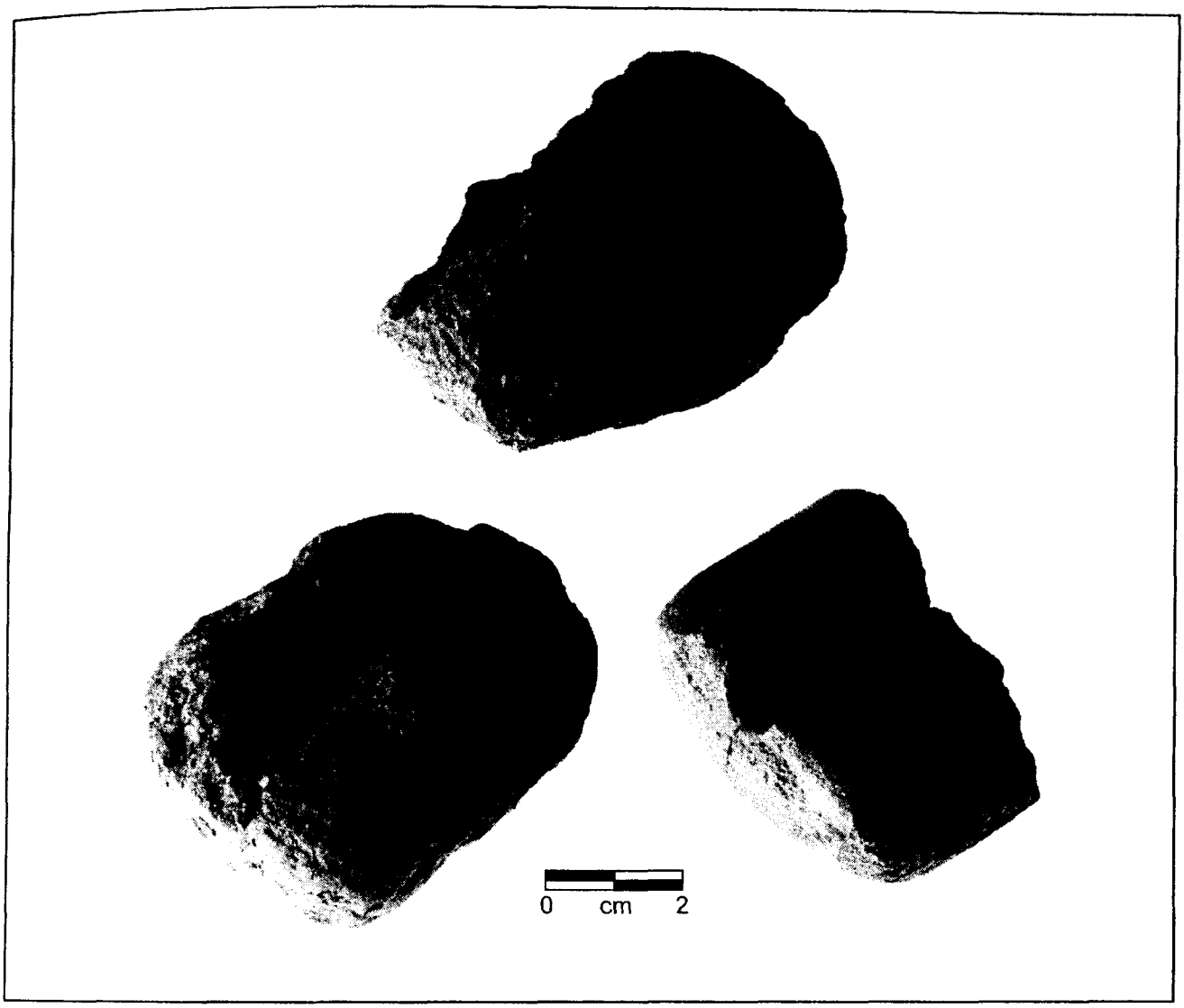


Figure 114. Arrow shaft straighteners.

Chipped Stone Artifacts

A total of 375 chipped stone artifacts was analyzed from LA 11196: 125 from Locus 1, 239 from Locus 2, 8 from Locus 3, and 1 from the general site area.

Projectile Points

Of the 3 projectile point from LA 11196, 2 are from Locus 2 and 1 is from Locus 3. All of the projectile points are represented by small arrow points.

Arrow Points. The three arrow points analyzed from LA 11196 are small side-notch types. They could be typed as a variant of the Desert Side-notch series. One is made from nonlocal chalcedony and another from silicified wood. Both appear to have been heat treated. The remaining arrow point is made from a local orthoquartzite.

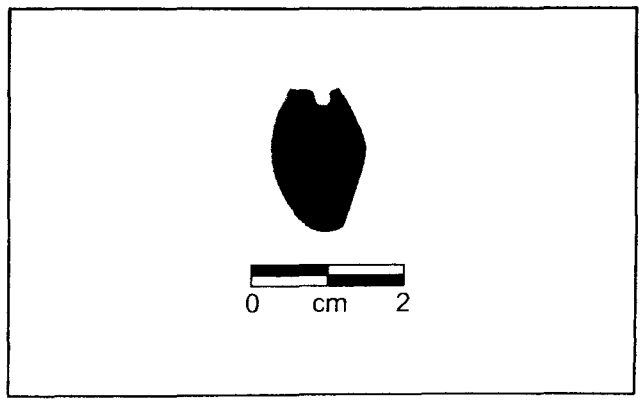


Figure 115. Pendant.

Table 47. Lithic Artifact Summary, LA 11196

Lithic Class	Locus 1	Locus 2	Locus 3	General Site	Total
Biface	1	4	-	-	5
Core Tools	7	4	-	-	11
Cores	13	25	2	-	40
Debitage	97	180	5	1	283
Edge Modified Flake	1	-	-	-	1
Flake Tools	6	24	-	-	30
Projectile Point	-	2	1	-	3
Mano	4	16	1	-	21
Metate	1	1	1	-	2
Milling Implement Fragment	1	1	-	-	3
Hammer	7	12	1	1	21
Arrow Shaft Abrader	-	1	-	-	1
Arrow Shaft Straightener	-	1	-	-	1
Hide Finisher	-	2	-	-	2
Slab/Pallet	1	-	-	-	1
Total	139	273	11	2	425

Bifaces

A total of 5 bifacially flaked artifacts was analyzed from LA 11196: including 1 from Locus 1 and 4 from Locus 2. All of them are too fragmentary to determine function. One biface, however, showed a considerable amount of polish and rounding, suggesting jish wear, and it may have served a nonutilitarian function.

Flake Tools

The 30 flake tools analyzed from LA 11196, comprise 6 from Locus 1 and 24 from Locus 2. The flake tools represent various functional tool classes: 27 scrapers, 1 cutting tool, and 2 drills or perforator/drills. They show wear suggesting use on various media while processing resources or manufacturing nonlithic tools.

Bilateral Side Scrapers. A single bilateral side scraper was analyzed from LA 11196. It represents a multipurpose flake tool where both lateral margins were used; these converging margins form a pointed bit. Multipurpose tools are often indicators of increased residential mobility.

Ceramic Scrapers. Two ceramic scrapers were analyzed from LA 11196. Both of them show use wear suggesting use on highly abrasive materials like rock- or sherd-tempered pottery. The margins are heavily rounded and striated. The extreme wear present on these tools suggests they were utilized for extended periods of time and were not used expediently or opportunistically. Both are made from locally available quartzite.

End Scrapers. Four end scrapers were analyzed from LA 11196. These scrapers appear to have been used on a variety of materials, although the majority of the media are moderate, like tanned hides. Many of these scrapers are unidirectionally pressure flaked and have rounded margins. Unidirectional microflaking is also present on one specimen.

Notched Scrapers. One notched scraper was analyzed from LA 11196. Its wear pattern suggests that it may have been used on a medium-hard material. As suggested earlier in this chapter, tools like this may have been used in the process of making baskets.

NN029320

Side Scrapers. Nineteen side scrapers were analyzed from LA 11196. Of all of the scraper types recovered from this site, the side scrapers were used on the widest variety of materials. These show use wear in the form of rounding, unifacial microflaking, striations, and margin polishing. Many of these scrapers also show unidirectionally pressure flaking from the rejuvenation of tools edges. Side scrapers appear to be the most versatile of all of the analyzed flake tools.

Cutting Tools/Flake Knifes. A single cutting tool was analyzed from LA 11196. It appears to have been used on a soft material, like fresh hides. It shows no retouch in the form of pressure flaking. It was made from a long, blade-like flake.

Drills and Perforator/Drills. Two rotary tools were analyzed from LA 11196. One is a drill and one is a perforator/drill. Both tools appear to have been used mostly soft to moderate media like fresh and tanned hides. The margins also show wear suggesting use as piercing tools as well as a rotary tools. It is likely that these tools were used in the manufacture of leather goods.

Edge-Modified Flakes

A single edge-modified flake was analyzed from LA 11196. It was modified by pressure flaking of both lateral margins, although no obvious use wear is present. It probably represents a tool blank or possibly an early stage projectile point blank. It suffered a perverse fracture which resulted in its discard.

Core Tools

A total of 11 core tools was analyzed from LA 11196: 5 hide abraders and 6 hide scrapers. All of the hide abraders are made from rounded cobbles and all of the hide scrapers are made from exhausted cores. Few of these tools show evidence of tool-edge reworking, suggesting that use-produced rounded margins were a desirable. This has been noted elsewhere, where it was noted that sharp acute margins were more damaging to hides that were rounded edges (Kluckhohn et al. 1971).

Cores

A total of 40 cores was analyzed from LA 11196. These are: 6 tested cobble cores, 2 bifacial, 3 bidirectional, 11 multidirectional, 13 unidirectional, and 5 bipolar cores. These cores represent both formal and opportunistic flake production technology and are made from various local and nonlocal lithic raw materials.

Two bifacial cores, both made from a locally quarried quartzite, were analyzed from LA 11196. Unlike bifacial cores that were made from nonlocal obsidian and chert, these cores probably do not represent portable core technology.

Three bi-directional cores were analyzed from LA 11196. All three are made from locally available lithic raw materials. They represent morphological variants of the unidirectional cores where two opposing striking platforms were used.

Eleven multidirectional cores were analyzed from LA 11196. All but a single silicified wood core are made from a locally quarried quartzite. Many of the multidirectional cores were relatively large when discarded. This practice is thought to have occurred because many of these cores could then be recycled into core tools like the numerous hide scrapers recovered during this project.

Thirteen unidirectional cores were analyzed from LA 11196. All but a single siltstone core are made from a locally quarried quartzite. Like many of the multidirectional cores, most of the unidirectional cores were discarded as large pieces, a practice thought to allow them to be recycled into core tools like the many hide scrapers recovered during this project.

Five bipolar cores were analyzed from LA 11196. All of them are made from nonlocal lithic raw materials including obsidian and chert. All of these cores represent efforts to maximize the utility of valuable lithic resources.

Debitage

A total of 283 pieces of debitage was analyzed from LA 11196: 97 from Locus 1, 180 from Locus 2, 5 from Locus 3, and 1 from the general site area. The debitage analysis suggests a variety of human activities with regard to lithic reduction technology. The number of flakes recovered from Locus 1 and Locus 2 is minimal for an RSA-type analysis but Spearman's Rho similarity coefficients were generated. They suggested that a combination of flake production from unidirectional and multidirectional cores was likely. Tool production was also suggested, although only through a weak correlation. Locus 3 and the general site area produced too few flakes for further analyses.

Battered Tools

A total of 21 battered tools was analyzed from LA 11196: 7 from Locus 1, 12 from Locus 2, 1 from Locus 3, and 1 from the general site area. All of the battered tools are hammers of various morphologies including spherical subangular, and angular hammers. Differing morphologies are thought to represent different functions.

Hammerstones

Twenty-one hammers were analyzed from LA 11196: 14 spherical hammers, 2 subangular hammers, and 5 angular hammers. All of these hammers represent two basic functional activities, knapping and pecking or pounding.

NN029321

The 14 spherical hammerstones are made from locally available quartzite and sandstone cobbles. They all show bruising along distal and lateral edges, suggesting glancing blows. Glancing blows are characteristic use wear that id produced during flint knapping activities.

The two subangular hammerstones are made from multidirectional cores. The acute angles formed by intersecting flake scars have been extremely truncated through pounding activities. These tools were probably used during the manufacture of masonry stone as evidenced by the excessive wear.

Five angular hammerstones were analyzed. Most are made from exhausted multi- and unidirectional cores. Like the subangular hammerstones, the intersecting flake scars have been truncated during pounding and pecking activities. Unlike the subangular hammerstones, these hammerstones do not show the same type of excessive use wear. It is thought that these hammers were used for resurfacing of milling tools and the heavy pounding associated with shaping masonry.

Milling Implements

The 26 milling implements analyzed at LA 11196 consist of 21 manos and 3 metates, In addition to the manos and metates described below, two milling implement fragments were analyzed, however their function could not be determined.

Manos

Of the 21 manos and mano fragments, 4 are from Locus 1, 16 from Locus 2, and 1 from Locus 3. These manos include cobble manos, one-hand manos, two-hand manos, and mano fragments. Several are too fragmentary to determine milling technology.

Three cobble manos represent the opportunistic use of rounded cobbles as one-hand manos. They show some pecking on a single milling surface and were probably used in shallow basin metates.

The seven one-hand manos are more formalized versions of the cobble manos. Prior to their use as milling tools, these manos were manufactured into oval shapes with a single flat milling surface. These manos were probably used on a slab metate. The milling surfaces on these manos show evidence of pecking.

Six two-hand manos were analyzed and are all rectangular and flat and intended for use on slab metates in a back-and-forth motion. Evidence of resurfacing is present in the form of milling surface pecking.

Metates

Three slab metates are made from local sandstone slabs and show little effort in their manufacture. Milling surface pecking is the only observable modification. The wear suggests they were used with both one-hand manos in a circular motion and two-hand manos in a back-and-forth motion.

Ground Tools

A total of five ground tools was analyzed from LA 11196. Four are from Locus 2 and one is from Locus 3. All of these tools were ground during their manufacture or use, but are unassociated with milling activities. These artifacts are one arrow shaft straightener, an arrow shaft abrader, a slab/palette, and two hid finishers.

Arrow Shaft Abraders

The arrow shaft abrader is made from a local sandstone slab and has a single longitudinal groove. Is was probably part of a matched pair used to abrade solid wood arrows into arrow shafts. This is a significant ethnic marker artifact for Navajo sites in the region.

Arrow Shaft Straighteners

One arrow shaft straightener was analyzed from Locus 2. It is made from a fine-grained quartzite sandstone. It has a single groove and is shaped on all sides. It may have been half of a pair of arrow shaft abraders that was made into a straightener. The difference between the two is that abraders are used in pairs and sand solid wood-shafted arrows into the correct diameter. Straighteners are used singly with heat and are used to bend the nodes of cane-shafted arrows until they are straight.

Palettes

The single sandstone palette is made from a small milling implement fragment. Several parallel grooves and stria are present, suggesting it may have been used to abrade small items. It may have been used as a lap stone for the manufacture of jewelry.

Hide Finishers

Two hide finishers were recorded from midden deposits associated with Artifact Concentration 1 (Figure 116). The hide finishers are made on well rounded sandstone cobbles and exhibit polishing wear on multiple surfaces. Kluckhohn et al. (1971) describe the use of these tools for smoothing and softening the hide in the final stage of processing. The smooth working surfaces of these tools contrast with the more aggressive edges of hide scrapers (see Figure 109) and hide abraders (see Figure 113).

NN029322

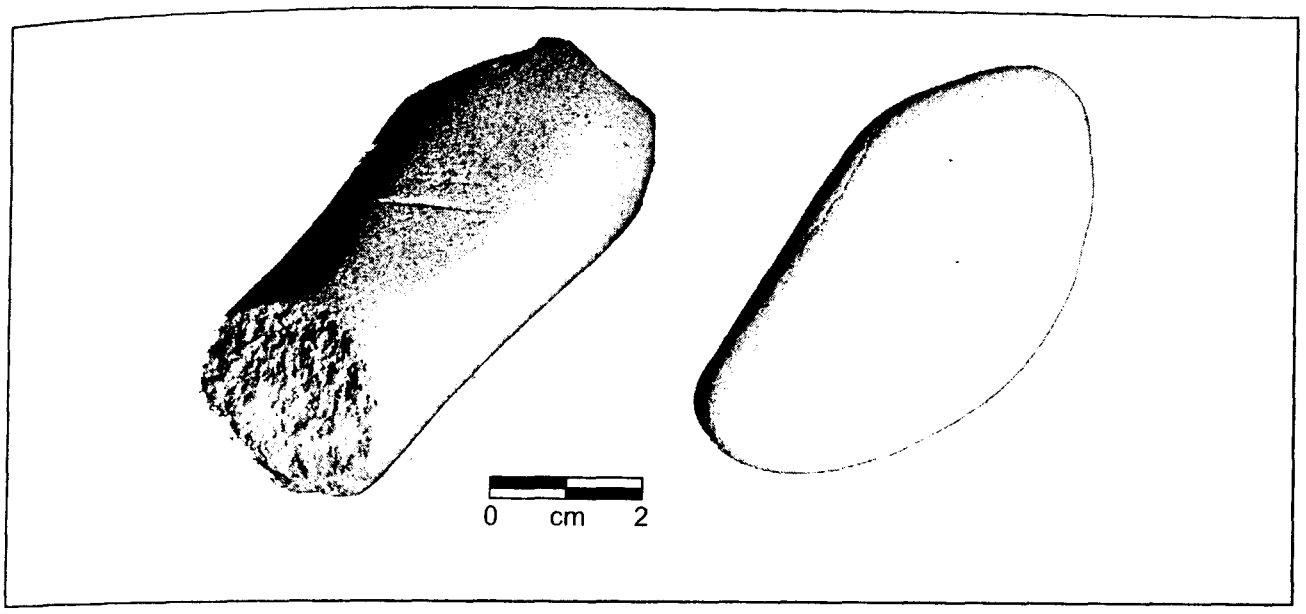


Figure 116. Hide finishers.

Conclusions

LA 11196 is a prime example of a classic Gobernador phase early Navajo site. It is a multiple-residence with many characteristic features of early Navajo life represented. One of the most important features is the amount of faunal resource processing tools relative to milling tools. Although milling tools are clearly represented with a total of 21 manos and 3 metates, they are small and underdeveloped compared to their Puebloan contemporaries. If agricultural crops, especially corn, were making a large impact on early Navajo life, it is not reflected in the milling implements recovered at LA 11196. Similarly, with 30 flake tools and 11 core tools, faunal resources were clearly still an important aspect of early Navajo life. The abundance of nonlocal lithic raw materials in the form of Pedernal chert and Jemez obsidian is an indicator of the need for high quality tool stone, a pattern completely absent from any Puebloan context, prehistoric or otherwise.

Of equal import is the presence of ceramic manufacturing tools and probable buckskin sewing tools (perforators and bilateral scrapers with converging margins). Jewelry manufacture may also be suggested by the presence of the palette.

Although LA 11196 is a relatively late Gobernador phase Navajo site, the lithic assemblage still suggests a mixed economy. This is evidenced by the high frequency of hide tools and hunting gear including projectile points, cutting tools, and the arrow shaft abrader. Similarly, small one-hand manos outnumber the larger two-hand mano types.

LA 88766 Lithic Data Summary

A total of 20 lithic artifacts was analyzed during the data recovery excavations at LA 88766. These total 4 from Locus 1, 8 from Locus 2, and 8 from the general site surface.

Chipped Stone Artifacts

A total of 19 chipped stone artifacts was analyzed: 1 projectile point, 2 flake tools, 1 core tool, and 15 pieces of debitage.

Projectile Points

The single arrow point is a small side-notch type. It could be typed as a variant of the Desert Side-notch series. It is made from local orthoquartzite. It does not appear to have been heat treated.

Flake Tools

Two flake tools consist of a side scraper and a cutting tool. They show wear suggesting use on various media while processing faunal resources. The side scraper is made from a local quartzite. It has rounded margins and probably represents a small finishing hide scraper. Similarly, the wear present on the cutting tool suggests use on soft media, possibly fresh hides.

Core Tools

A single core tool is represented by a large quartzite hide scraper made from an exhausted unidirectional core. It has rounded margins and polished high topography. It is very typical for hide scrapers found in Navajo sites.

Debitage

The 15 pieces of debitage are too few to make any technological generalizations; however, it is important to note that they seem to reflect a single flake production episode.

Battered Tools

A single spherical hammerstone represents the only battered tool from Site 88766. It shows only minimal use wear and probably represents opportunistic use of a local cobble for use in flake production activities. It is made from a hard quartzite and was probably used for the production of flakes from local materials. It would have been too hard to have been used on an obsidian core.

Conclusions

Although the assemblage is very limited, collectively it can address a specific aspect of early Navajo life. LA 88766 appears to represent a special activity site. The toolkit, flakes, and tools probably represent hide-finishing activities. The single ceramic vessel recovered from the site supports this, as pots are often used in the boiling of hide in the finishing and dyeing process (Kluckhohn et al. 1971)

Phase 3: Focused Data Recovery—Lithic Data Summary

The focused data recovery phase of the Morris Site 1 project included 1-m and 2-m collection units that were placed within site middens. This was done in order to characterize typical domestic debris from early Navajo sites. The data collected during this phase represent the smallest data set from this project in terms of the number of artifacts recovered. It is also the most uniform. This is probably a factor of middens being a poor indicator of early Navajo material culture due to Navajo discard practices. The Phase 3 data, however, do provide a control sample of debitage data from midden contexts. The data from the 11 focused data recovery sites are summarized below.

A total of 193 lithic artifacts was recovered from the focused data recovery sites of the Morris Site 1 project (Table 48). These are 4 projectile points, 1 biface, 2 flake tools, 176 pieces of debitage, 4 milling implements, 4 hammerstones, and 2 ground tools.

Table 48. Lithic Artifacts Collected from Focused Data Recovery Sites

Lithic Class	LA 79456	LA 83529	LA 105428	LA 105475	LA 105530	LA 105630	LA 105930	LA 106168	LA 106199	LA 106203	LA 110278	Total
Projectile Point	-	1	-	-	1	-	1	1	-	-	-	4
Biface	-	-	-	-	-	-	1	-	-	-	-	1
Flake Tool	-	1	-	-	-	-	-	-	1	-	-	2
Debitage	91	13	4	1	21	14	9	-	11	5	7	176
Mano	1	-	-	-	-	-	-	-	-	-	-	1
Metate	-	-	1	-	-	-	-	-	-	-	-	1
Milling Implement Fragment	-	-	-	-	1	1	-	-	-	-	-	2
Hammer	1	1	-	-	1	-	-	-	-	-	1	4
Gaming Stone	1	-	-	-	-	-	-	-	-	-	-	1
Slab/Palette	-	-	-	-	-	1	-	-	-	-	-	1
Total	94	16	5	1	24	16	11	1	12	5	8	193

NN029324

Chipped Stone Artifacts

The 183 chipped stone artifacts recovered from the focused data recovery sites of the Morris Site 1 project are 4 projectile points, 1 biface, 2 flake tools, and 176 pieces of debitage.

Projectile Points

Four projectile points are represented by small arrow points (Table 49). Three of them are made from a nonlocal white chalcedony, probably from the Pedernal source. The other point is made from nonlocal obsidian. Both of these raw materials can be collected in and near the Jemez Mountains. All four could be classified as part possible variants of the Desert Side-notch series.

Bifaces

The single large biface recovered from LA 105930 is made from a nonlocal chalcedony and was probably salvaged from an Archaic period context. Polish along the arrises on the faces suggest that it might represent "jish wear." Therefore, the biface may have been a discarded dart point preform that was subsequently collected and used by the early Navajo for "ceremonial" purposes.

Flake Tools

Two flake tools were recovered, one each from LA 83529 (Morris 1) and LA 106199. The flake tool from LA 83529 is a small drill recovered from a midden. It is made from a small chert flake with converging margins. The bit shows a wear in the form of rotary stria and polish suggesting use on a soft material. The flake tool from LA 106199 is a bilateral side scraper. It is made from Jemez obsidian and has unidirectional microflaking from use along two lateral margins. The margins appear to have been used independently on a medium-hard material like green wood.

Debitage

A total of 176 pieces of debitage was recovered from the focused data recovery sites (Table 50). There are too few flakes from any one site to be useful in interpreting early Navajo lithic reduction technologies. Collectively, some generalizations can be made. The debitage data from the alternative mitigation sites suggest generalized core reduction from prepared cores of local quartzite and bifacial core reduction from nonlocal materials. It is interesting to note that no cores were recovered from the focused data recovery sites. Unlike Anasazi sites, where cores were often discarded in the midden, the Navajo of Dinétah recycled many of their tools and discarded only the most useless of artifacts.

Battered Tools

A total of four battered tools was recovered from four of the focused data recovery sites. They all represent hammerstones of two different functional hammerstone types. Two angular hammers were recovered from LA 79456 and LA 83529, and two spherical hammers from LA 105530 and LA 110278. The angular hammers were used to peck the surface of milling implements in the process of resurfacing. The spherical hammerstones have wear suggesting glancing blows from flint knapping activities.

Milling Implements

A total of four milling implements was recovered from four of the focused data recovery sites. These include 1 mano from LA 79456, 1 milling slab fragment from LA 105428, and 2 milling implement fragments from LA 105530 and LA 105630. The mano is small two-hand type with wear suggesting use in a back-and-forth motion on a flat milling slab. The milling slab fragment is represented by a margin fragment. The two recovered milling implement fragments are too small to determine function.

Ground Tools

Two ground tools were recovered. These items were ground in their manufacture, but were not used in milling activities. One of the ground tools is "gaming piece" recovered from LA 79456. It is a shaped disk that served some nonutilitarian function. The other ground tool is a small palette recovered from LA 105630. Its margins are

Table 49. Arrow Points from Focused Data Recovery Sites

Material Type	LA 83529	LA 105530	LA 105930	LA 106168	Total
	FCR Concentration	General Site	Midden	General Site	
Chalcedony	1	1	-	1	3
Obsidian	-	-	1	-	1
Total	1	1	1	1	4

FCR = Fire-cracked Rock.

Table 50. Debitage Collected from Focused Data Recovery Sites

Lithic Subclass	LA 79456	LA 83529	LA 105428	LA 105475	LA 105530	LA 105630	LA 105930	LA 106199	LA 106203	LA 110278	Total
Alternate Flake	4	-	-	-	-	-	-	-	-	-	4
Biface Thinning, Early Stage Pressure	1	-	-	-	-	-	-	-	-	-	1
Biface Thinning, Late Stage Percussion	7	1	-	-	-	2	-	-	1	-	11
Biface Thinning, Late Stage Pressure	13	-	-	-	-	-	-	-	-	-	13
Bipolar Flake	-	-	-	-	-	1	-	-	-	-	1
Completely Cortical, Natural Platform	-	-	-	-	-	-	-	1	-	-	1
Completely Cortical, Platform Absent	-	-	-	-	-	-	-	-	-	1	1
Core Rejuvenation Flake	-	-	-	-	1	-	-	-	-	-	1
Hammerstone Flake	-	-	-	-	3	-	-	1	-	-	4
Noncortical, Natural Platform	2	-	-	-	-	-	-	-	-	-	2
Noncortical, Platform Absent	9	1	1	-	1	1	3	3	1	1	21
Noncortical, Single-Facet Platform	29	2	-	1	3	1	3	4	2	2	47
Partially Cortical, Natural Platform	1	4	-	-	-	-	-	-	-	-	5
Partially Cortical, Platform Absent	2	-	2	-	-	-	2	-	-	-	6
Partially Cortical, Single-Facet Platform	5	4	-	-	9	5	1	-	1	2	27
Tool Rejuvenation Flake	-	-	-	-	-	-	-	1	-	-	1
Cortical Shatter	-	1	-	-	3	1	-	-	-	1	6
Noncortical, Shatter	18	-	1	-	1	3	-	1	-	-	24
Total	91	13	4	1	21	14	9	11	5	7	176

shaped and small stria are present on one of the flat faces, suggesting some grinding of hard materials, perhaps for pigments or temper.

Interpretation and Summary

The initial plan was to examine early Navajo middens to aid in the interpretation of the generalized domestic debris for understanding habitation site activities. However, few lithic artifacts were recovered from this type of archaeological investigation. It is possible that relative short time of occupation of the sites did not allow for the substantial midden development. However, it is likely that the disposal pattern utilized by the early Navajo was different than any of the people that came before in the American Southwest. Despite their small size as a control sample the alternative mitigation collections proved useful for some interpretive purposes.

Although many of the early Navajo sites examined during this project may have only been occupied for a short period of time, this alone does not explain the paucity of artifacts recovered from the focused data recovery phase of the Morris Site 1 project. There are probably several reasons for this discard pattern, although the majority of the lithic data indicate the early Navajo tradition of hunting probably is the greatest cause for this pattern.

Hunting and gathering cultures of the desert west often produced large middens at seasonal camps, so it is clear that this pattern of midden development is not an Anasazi phenomena. Settled agricultural groups merely have

increased population densities and are not residentially mobile, therefore their midden deposits are very large. Cultures that focus much of their economy on hunting are inherently mobile. As a result, portable technologies are important, as is the conservation of the tools and tool stone that they do use. Artifact recycling has also been shown by these data to have been a major part of early Navajo life. Therefore, when artifacts are finally discarded due to attrition they are small and don't accumulate into a formal midden very quickly.

Lithic Data Synthesis

The following lithic data synthesis utilizes different data sets from the various phases of the Morris Site 1 project to maximize their interpretive value as appropriate in order to address specific research domains. For example, larger-scale questions like settlement patterns and raw material resource exploitation, can use a wider spectrum of data. Conversely, specific research questions like hunting technology or flake production technology require more refined data. Therefore, in-field data and excavation data can be used differently to address distinct, but equally important questions. The following interpretation examines intersite variability, lithic landscape management strategies, early Navajo lithic technologies, and early Navajo internal and external social dynamics as exemplified by early Navajo lithic tool kits.

Intersite Variability

The primary focus of the Morris Site 1 project was to explore the land use practices of the seventeenth- and eighteenth-century Navajo of Dinétah. As discussed above, functional site-type categories were developed in order to examine the site types within a community. Using lithic data, intersite variability was examined in order to: 1) help test the validity of the site typology; and 2) use these data to address the issue of early Navajo land use.

Chapter 4 outlines the site typology used for the Morris Site 1 project and its justification. These types, which are based on feature groupings, relied heavily on the functional interpretation of these features. An examination of the lithic data collected from these site types and features revealed consistent results. Spearman's Rho similarity coefficients of lithic assemblages from the sites revealed that in all cases where sufficient lithic data were available, sites classed as the same type were technologically very similar. The greatest diversity was observed among special activity areas. This diversity occurred for several reasons; most important was the small sample size, but it also probably occurred as a result of the different activities represented at the special activity area sites. Habitation sites, whether single or multiple, were highly correlated in their lithic technology and thus the activities represented there. Whether a single hogan was occupied on a site or multiple hogans were simultaneously occupied at a site, the site boundaries, as they could be identified on the landscape, seem to be an accurate reflection of some "real" social unit.

All of the domestic activities that were represented at any of the habitation sites appear to be replicated at all other habitation sites, regardless of size or number of hogans. One site type that consistently showed internal similarity with habitation sites was camp sites. Whether the sites classed as camp sites represent residential sites where a hogan could not be identified or the domestic activities conducted at these sites mirror those at habitation sites, is unknown. Other significantly correlated sites are the two pueblito sites in the project area. Both Morris Site 1 and Romine Canyon ruin are highly correlated to each other. Although these sites probably functioned as habitations, it is uncertain if the correlation distance between them and the other single- and multiple-unit habitation sites is due to specialization or due to the fact that by the time of their occupation, metal tools had begun to replace stone tools in the assemblage, thereby making the sites appear divergent from the rest of the habitation sites. The paucity of artifacts from the pueblito sites is probably an indication of the latter.

The lithic technologies used for the site-type correlations as they are represented by the lithic assemblages show very consistent patterns. All of the site types seem to represent the same kinds of activities and are internally consistent. This greatly differs from the pottery distribution (see chapter 8). Therefore, the mechanisms for lithic tool production and use must have been so deeply embedded into early Navajo culture, that new environs, new social dynamics, and a developing new lifeway, had little or no effect on intrasite diversity. This is especially true for chipped stone technology, which stems from long traditions among the Navajo and Apache people. Chipped stone technology remained internally consistent and distinguishable on a site-function level for both early Navajo and protohistoric Apachean sites.

Lithic Landscape Management

To prehistoric societies, the management of lithic resources was as important to sustaining a lifeway as was food or energy resource management. This was no less important to the early Navajo of Dinétah. Their land use system and economy placed greater significance on their lithic landscape management strategies than nearly all of their predecessors in the American Southwest. Reduced residential mobility due to the introduction of horticulture, combined with the high demands of lithic resources required

NN029327

to maintain their hunting-based economy, made lithic landscape management an important part of daily life.

Lithic landscape management can be divided into two constructs: lithic raw material procurement and lithic resource use life. The first describes the methods of tool-stone acquisition to meet the everyday needs of the community. The second describes the use life of that tool-stone from the time it is acquired until its ultimate discard. The various people of the American Southwest dealt with these issues differently, all of which are quite distinctive and reflective of their various subsistence strategies. The early Navajo of Dinétah implemented both of these constructs by employing a complex and efficient lithic landscape management strategy.

Lithic Resource Procurement

There are three primary strategies for lithic resource procurement: direct quarrying, indirect raw material prospecting, and nonlocal exchange. All of these procurement strategies were employed by the early Navajo of Dinétah, and all three fit into the larger early Navajo cultural system in various ways and to various degrees. Direct quarrying, for instance, was often a scheduled resource procurement activity that was independent of other resources. Indirect raw material prospecting, however, was a more passive aspect of early Navajo land use and was embedded into other aspects of daily life. Nonlocal exchange was an integral part of early Navajo life.

Direct Quarrying

Prehistoric quarrying for lithic raw materials is a well-studied phenomenon with some lithic quarries dating to very early times in the prehistoric West (e.g., Tosowi, Casa Diablo, Knife River). Quarrying, as a raw material procurement strategy, often includes specific excursions to point-source lithic resources that were visited and revisited at regular, often scheduled, intervals. This method of lithic resource procurement most often occurred in areas of low population densities and vast exploitable landscapes with predictable, point-source quarry areas, and required a high level of mobility and quarry land access. This strategy provided the early Navajo with a substantial amount of tool stone. One such quarry area (LA 114509) was identified during the Morris Site 1 project. It consists of a large bedrock outcrop of San Jose Formation quartzite. Although not specifically identified in the project area, other outcrops of San Jose quartzite probably served as formal quarries as well, as evidenced by the ubiquity of this lithic material on early Navajo sites.

The quartzite quarry identified during the Morris Site 1 project was an important tool-stone source for the region. There were no diagnostic artifacts (e.g., pottery or projectile points) that could be used to assign the quarrying activities to a particular cultural group. Although it is clear from the in-field lithic analysis that the site had been used by various cultures for probably several millennia, the preponderance of evidence, in the form of flake type attributes and core fragments, suggests the last visitors to, and probably the most extensive users of the quarry, were the early Navajo.

The quartzite was quarried by reducing large eroding angular blocks (100-200 x 50-100 x 20-50 cm). These blocks lent themselves to various core configurations, although the debitage and the few failed cores at the quarry suggest that a unidirectional configuration was probably the most common. This is consistent with the cores and debitage recovered from many of the Morris Site 1 project early Navajo sites. Similarly, very few cores of this configuration were recovered from either Archaic or Anasazi period sites during the Morris Site 1 Early Navajo Land Use study or other large projects in the area.

The evidence of core production activities on the quarry site is significant. It illustrates an important procurement technology shift from the Anasazi pattern. The early Navajo carried away prepared cores and not chunks of raw material. Most of the core production at the quarry appears to have been done with a hard-hammer percussion reduction technique. This differs from the soft-hammer reduction technique used by the Archaic period people of the region (Torres 1999a). In some instances, very large flakes could be driven from these cores, most of which were probably reduced to smaller unidirectional cores by utilizing the new bulbar surface as a platform. These smaller cores are the type most often recovered from early Navajo sites and were used for the production of the many hide scrapers recovered. It is important to note that very little biface thinning debitage was present on the quarry site, even though it is this author's experience that the quartzite from this quarry does lend itself to such a reduction technique. It is clear that this quarry, and others like it in the area, probably served the early Navajos' needs for tool-stone for large core tools and flake production for durable flake tools. It did not, however, meet their requirements for high quality lithic materials. This was accomplished by a combination of indirect raw material prospecting and a complex system of exchange.

Indirect Raw Material Prospecting

Unlike lithic quarrying, raw material prospecting has only been minimally addressed in the Southwest. It has been argued to have been a highly developed and efficient strategy adopted by the Anasazi in Basketmaker II times and has become a signature of their chipped stone lithic technology (Parry and Kelly 1987; Torres 2000). Raw material prospecting is the process of searching, evaluating, and

NN029328

collecting small packets of tool-stone as a means of raw material procurement (Wilke and Schroth 1989). The significant difference between quarrying and prospecting is in their primary goals. In quarrying, the primary goal is to acquire and prepare specific lithic materials for transport back to a home base or residential site. In raw material prospecting, however, lithic resource procurement is epiphenomenal to larger resource procurement goals. Under these conditions, if hunting, gathering/harvesting, or other procurement activities happen to be conducted near a patchy lithic resource collection area (e.g., river gravels or silicified wood deposits), both resources could be procured simultaneously. Raw material prospecting often does not allow for the best possible selection of lithic resources, due to the needs of acquiring other resources more important to the subsistence system. Therefore, lithic resource quality is often secondary and is compromised for the sake of other life-supporting resources. Standard raw material prospecting activities, as well as two variations of this strategy, were employed by the early Navajo.

Standard raw material prospecting as practiced among the early Navajo involved the exploitation of cobble material from the San Juan river gravels. These gravel terraces provide a wide range of chert, silicified wood, quartzite, basalt, and other cobbles for tool stone. Patchy and unpredictable locations of exposed river gravels were exploited as raw material prospecting areas. The majority of the lithic cobbles were too small to meet the needs of the Archaic period people and occur in low frequencies in these sites. There is evidence that by Anasazi times, these locations were exploited to various degrees. The Anasazi, however, collected cobbles from these locations and returned them to the habitation sites for testing and reduction. The early Navajo appear to have prospected for lithic materials, tested them, and if they were of good quality, produced cores at the locations where the materials were found. As with the quartzite quarries, the early Navajo didn't carry materials to the habitation without having removed at least some unnecessary and unusable mass at the procurement location. There appear to have been only two exceptions to this observation that are part of an indirect resource procurement strategy.

One of these exceptions was pebble-size material that was collected from the river gravels. This raw material prospecting variant involved collecting small chert and chalcedony pebbles, but unlike the larger cobbles, these were returned to the habitation sites and were reduced by the bipolar reduction technique. These small bipolar cores provided the only high quality, local lithic resource. A very small number of similar bipolar cores appear in Anasazi assemblages in the region as well, but they are nearly absent in Archaic period sites. For the Anasazi, these materials provided one of the few fine-grained lithic resources they could use for the production of projectile points and it satisfied most, if not all, of their needs for such material. The pebbles were probably too small to be of any use to the Archaic period people. Collection of the few high quality chert pebbles available, however, could not meet the high demands for high quality lithic raw materials for the early Navajo.

The other prospecting variant employed for the collection of small amounts of high quality local lithic raw material was gleaning from older sites. Archaic period sites, in particular, were often prospected for large chert and obsidian flakes that were too small to have been useful during the Archaic period, but were large enough to produce small arrow points and flake tools during the early Navajo occupation of the area. Site gleaning was documented often enough in the project area to suggest that many older site locations were exploited frequently and at least as often as the San Juan river terraces. Early Navajo sites further south showed site gleaning as a major resource collection strategy (Torres 2001). Collecting of older projectile points to use both as knives and for ceremonial purposes was also very common. Bipolar reduction and site gleaning could only satisfy a small portion of the early Navajo high quality tool-stone needs. Their need for high quality lithic resources helped create a system of exchange like no other in the American Southwest, and resulted in a symbiosis with the Jemez people that persists today.

Nonlocal Exchange

Although quarrying and raw material prospecting are logistically complex in terms of scheduling and travel, nonlocal exchange systems are by far the most socially complex method for the procurement of lithic resources. Unlike most other resources, stone is not very portable. It also requires the production of commodities worthy of exchange. And most importantly, it requires established relationships with people willing to exchange lithic raw material (or at least permission to access lithic resource areas) for a particular commodity. Even with all of these obstacles, lithic raw materials were obtained from Valle Grande Caldera in the Jemez district in large amounts.

Prehistoric exchange systems have long been studied by archaeologists, and the fact that the early Navajo and other Apacheans traveled to non-Apachean communities for commodity exchange is well documented both archaeologically and by the historical record. We know that Pueblo peoples, especially the Jemez and Pecos people exchanged textiles, agricultural goods, and pottery for meat, hides, and leather goods with the Navajo and the Apache (Brugge 2000). We also know that obsidian and Pedernal chert from the Jemez Mountains made their way back to

Dinétah in large amounts, sometimes comprising over 20 percent of a lithic assemblage. The reasons for the early Navajo need for large amounts of high quality lithic materials were hypothesized elsewhere (Torres 1999b). Mechanisms aside, the fact remains that these lithic resources must have been important constituents of the larger exchange system for the Apacheans (early Navajo and Apache people). At the center of this resource procurement strategy lies the question, how did these lithic materials reach Dinétah? Due to current land access issues in the Valle Caldera, this issue remains unresolved; however, the following outlines what is known thus far based on the Morris Site 1 and other project data, and proposes some hypotheses and predictions for Valle Caldera obsidian quarries.

Several pieces of the obsidian recovered from the Morris Site 1 project were chemically sourced to the Jemez Mountains, and specifically to the Cerro del Medio chemical type (Appendix H). This dome is located on the easternmost edge of the caldera. This source is located approximately 140 km to the southeast of the Morris Site 1 project area and most of the obsidian artifacts recovered are represented by debitage and flake tools, suggesting that prepared cores probably entered the site rather than cobbles of obsidian or completed tools. Cortex is present on some of the cores and flakes, however, suggesting that the cores brought to the site were probably reduced only to the point where they were easy to transport. This probably attests to the confidence the early Navajo had in obsidian reduction technology. When transporting a relatively nonportable commodity like tool-stone, only the most usable material was carried away. This usually resulted in preparation of cores prior to transport. Cerro del Medio obsidian is very uniform and relatively free from hidden cracks, a fact that was not overlooked by the experienced early Navajo flint knappers. How did this material make its way to Dinétah?

The fact that the early Navajo and Apache people made periodic excursions to Pueblo country in order to exchange "wild" goods including deer, elk, and bison hides and meat is well established (Correll 1979). We assume that during these excursions obsidian and chert were acquired in addition to the other exchange commodities. The early Navajo (and apparently the Apache as well; see Baugh and Nelson [1987]) were very particular about their obsidian. Although several chemically distinguishable domes are know in the Valle Caldera, the Cerro del Medio source was the most utilized. The easiest access to this source is from the southern edge of the caldera, presumably up the Jemez River. This path, however, would have put the Jemez villages along the route. So, were the Jemez people acting as middlemen, who quarried Cerro del Medio obsidian and transported it to the villages as a trade commodity?

A recent lithic analysis of protohistoric Jemez pueblo assemblages hoped to address this issue (Torres 1999c). That analysis revealed some important aspects of Jemez lithic technology, especially their resource acquisition and their reduction strategy. The results of that investigation were not as expected. It was initially believed that the Jemez people quarried the obsidian and brought prepared cores to the villages for trade. However, despite the fact that obsidian was recovered from these Jemez sites, none was from prepared, quarried cores. Although not chemically sourced, they visually appeared to have come from one of the more western domes, possibly San Antonio. If the Jemez people quarried lithic materials for trade to the Athabascans, why did they not use any of it for themselves? The fact is, the Jemez people did not quarry for lithic raw material. The lithic materials recovered at the site originated as cobbles from the immediately local drainages. This is a very typical pattern of resource acquisition from all Pueblo periods (see Torres 2000). So if the Jemez people did not quarry obsidian and instead practiced a standard Puebloan lithic reduction technology, how did the Athabascans acquire Cerro del Medio obsidian?

It is suggested that a complex combination of exchange and direct quarrying were practiced by the early Navajo in order to acquire obsidian, the mechanisms of which are not fully understood. Although the Cerro del Medio dome can be reached from a northern access route that may have taken the Navajo around the Jemez villages without being detected, this path would have taken them through several other Valle Grande obsidian source localities. Therefore, if detection was an issue, there would not have been a reason to take such risks, if good quality obsidian was the only goal. Additionally, the Polvadera Peak obsidian source is also north of Jemez and could have been collected without entering the caldera at all. Commando-style raiding could not have resulted in the large amounts of Cerro del Medio obsidian recovered from the Dinétah early Navajo sites. Therefore, it is now thought that, unlike a standard exchange system where something was traded for something else, permission-to-access may have been the commodity exchanged. The salt mines at Zuni are thought to represent a similar social situation. The early Navajo traded hides for cotton mantles and salt at Zuni (Correll 1979). Although it is known that the Zuni often mined salt, it is uncertain if they mined and traded salt at the pueblo or they allowed others to visit the region to mine their own. Only a thorough study of the Cerro del Medio obsidian quarries could address this issue further, but it will suffice to say that a complex exchange system developed early in Apachean history. This system was a necessity in order for Apacheans to acquire the much needed tool-stone to continue their hunting lifeway.

NN029330

Tool-Stone Use Life

Lithic landscape management does not stop with raw material resource procurement. How the stone was managed once it was acquired was an equally essential part of early Navajo lithic landscape management. There is evidence to suggest that not only were the early Navajo masters at chipped stone technologies, but they were equally skilled at the management of that tool-stone's use life. This can be seen in their treatment of both local and nonlocal lithic materials. Tool-stone conservation was managed utilizing two different strategies; raw material-specific reduction technologies and tool recycling.

Unidirectional and bipolar core reduction technologies are two methods of conserving high quality lithic raw materials. As discussed in detail below, most of the obsidian debitage recovered during the Morris Site 1 project appears to have come from unidirectional cores. Cores reduced in this fashion produce very predictable flakes with a specific morphology. The cores produce long linear flakes that can be used for the production of projectile points and flake tools, especially cutting tools. This type of core produces linear flakes consistently with only a loss in flake length as the core is reduced. The continued reduction of such cores results in a microblade technology once the core reaches a small size. Microblade technology is a common lithic technology among most Athabascan groups (Clark 1982), and it is thought to have developed in the subarctic regions as a means of extracting small useable flakes while conserving the rare lithic materials (Anderson 1970). Once these cores were reduced to a point that they could no longer produce usable bladelettes, they were frequently reduced further using the bipolar technique. The bipolar technique was also used on some of the local pebble chert found in the San Juan river terraces as discussed above. The result of both of these reduction techniques was the maximization of high quality tool-stone utility. This allowed small-sized tool-stone to have an extended use life.

Another way the early Navajo managed to conserve tool stone was to reuse and salvage many of their tools. This included exhausted formal and informal tools, flakes, and cores that they produced, as well as those left behind by prehistoric cultures in the region. There were two primary use-life trajectories that recycled tools followed, depending upon whether the tool started as a flake or a core.

The early Navajo relied heavily on large game hunting and this required high quality lithic material, both for hunting gear manufacture and game processing tools. Cutting tools are more effective as flake tools than formal tools. The edge produced from a fresh flake is superior to that of one reworked or resharpened. Therefore, it is thought that these tools were frequently produced by a single blow from a bifacial or unidirectional core to produce a flake knife. Once dull, a new flake could be struck and butchering continued. The dull flake tools were not discarded, however, but were frequently made into projectile points. Several arrow point blanks from the Morris Site 1 project were discarded due to manufacturing fractures. Many show remnant use wear in the form of rounding along margins, suggesting their former use as flake tools. Similarly, the vast majority of the flake types used for arrow points and flake tools were the same, suggesting they were struck from similar cores. Therefore, they probably represent separate stages along a single use-life trajectory. There is also evidence that the early Navajo used flakes and flake tools from older prehistoric contexts. Differentially hydrated surfaces were noted on obsidian arrow points analyzed from the Morris Site 1 project. In fact, the only obsidian point that did not source to the Cerro del Medio chemical type was one such point made on an older flake with two different hydration rinds. It sourced as the Polvedera Peak chemical type, an obsidian that is commonly found on both Anasazi and Archaic period sites in the area.

Flake tool use-life trajectories were mirrored with the core tools, which were often treated similarly and frequently went from a being part of a chipped stone technology to a milling implement technology. Because nonlocal lithic materials were too valuable as tool-stone to have been recycled into core tools or hammerstones, this trajectory applies mostly to local lithic raw materials. Quarried cores of local quartzite were configured as both multi- and unidirectional cores. Once these cores were exhausted, either failing to produce usable flakes or due to various manufacturing flaws that prevented flake production, they were frequently made into core tools. These consisted mostly of hide scraping tools, although various woodworking scrapers and choppers were also made. Once these cores were used as tools, they very rarely returned to flake production. Core tools are more effective as a hide scrapers when the margins are rounded; therefore, there was no need to produce sharp edges by removing new flakes.

Exhausted cores were also recycled into angular hammerstones. These were frequently used for resurfacing milling implements by pecking. The battering effectively prevented them from being used as flake producers by initiating fractures that altered the predictive knapping qualities of the stone. Angular hammerstones were also made from core tools and exhausted core tools were used as angular hammerstones. Several of these tools from the Morris Site 1 collections show wear suggesting they were recycled from cores to hammers, then to tools, and then back to hammerstones. Once cores entered this recycling circle they never seem to have recycled back into flake production. The only exception to this pattern seems to be very large cores or core tools that were gleaned from older

NN029331

contexts. Large cores often became exhausted due to the production of obtuse platform angles and were discarded because they were too large to have made effective core tools. Conversely, gleaned cores were often used until they were too small to have made good core tools. It was also uncommon for chipped stone tools to have ended up as milling implement tools by being transformed from cores to metate pecking stones. Similarly, broken milling implements were not often recycled into chipped stone tools.

Both cores and core tools were often made from broken milling implements. The final stages of hide preparation and tanning often requires an abrading tool with no sharp edges. This was usually accomplished by using rounded cobbles, but broken manos were also often used (Kluckhohn et al. 1971). The use wear produced by hide preparation and by milling is quite distinct (Adams 1988) and this level of data collection is necessary for a correct interpretation of an assemblage.

The early Navajo had a great number of strategies and technologies at their disposal for the management of their lithic landscape. All of these appear to have stemmed from a long history of this type of land use. The various reductive and productive technologies employed in the manufacture of their various tools show similar skill and deep-seated traditions.

Early Navajo Reductive Technologies

The early Navajo utilized a variety of reductive technologies in order to fulfill their flake production needs. By applying efficient reductive techniques to particular raw material types, a wide range of core forms resulted. As discussed above, many of the reductive techniques were applied to various materials in stages. For example, nonlocal lithic raw materials may be imported into a site as unidirectional cores; once these cores were too small to be productive, they may have been reduced into multidirectional or unidirectional microcores; and ultimately small core nuclei would be reduced using the bipolar reduction technique. The following provides a technical description of the reductive technologies employed by the early Navajo.

Bifacial Core Reduction

Although relatively rare, bifacial cores are known from the early Navajo sites of the Morris Site 1 project. It has been suggested that portable bifacial cores are much more common in Dinetah phase sites than they are in Gobernador phase sites (Elyea and Eschman 1985). The results of this project did not support such a relationship. Bifacial cores, or large biface thinning flakes produced from them, are known from both Dinetah and Gobernador phase sites in the project area. The analysis of LA 55979, the earliest dated Navajo site (tree-ring cutting date of A.D. 1541) does show an increase in number of bifacial cores over later dated sites; however, they occur in the same proportions. Regardless of their decline or frequency of use, bifacial cores were used among the early Navajo when it proved to be efficient and necessary.

Bifacial core reduction in early Navajo sites is evidenced by large nonlocal Pedernal chert and Jemez obsidian biface thinning flakes and a few core margins. The success of producing large biface thinning flakes was probably increased by the practice of platform abrasion. Highly abraded platforms are common features on many of the flakes. Although helpful in producing large flakes from several core types made of brittle materials, platform preparation in the form of abrasion is most effective with bifacial cores because of their narrow and acute-angled striking platforms. Many of these large flakes were used as butchering knives and ultimately made their way into other tool forms or projectile points once they were dull. Similarly, many of the bifacial cores themselves were probably reduced using other techniques when they were too small to produce usable flakes. Both of these practices probably masked much of the evidence of this portable technology.

Bipolar Core Reduction

Like the bifacial core reduction described above, bipolar core reduction is common in early Navajo sites and occurs throughout the entire early Navajo occupation of Dinétah. Despite the fact that bipolar reduction was an important part of the technologies available to the early Navajo, it was not always identified archaeologically.

Two types of raw materials were reduced using the bipolar technique. Local pebbles collected from the various gravel terraces and nearly all nonlocal lithic raw materials. As part of the early Navajo repertoire of reduction techniques of local lithic resources, small chert pebbles were reduced using an anvil and hammerstone. Any of the large quartzite boulders or exposed bedrock could have served as an anvil for this technique. The pebble could be held between the thumb and index finger and struck with a hard hammerstone. The resultant compressive force sheared the cone of force and produced two pebble halves (Crabtree 1982). Each half could then be used to make small flat plates, any of which could be used to make small flake tools or projectile points. Similarly, most any small piece of chippable stone could be and was treated in this fashion. This included small cores that were incapable of producing flakes by other conventional reduction techniques. Nonlocal lithic materials, mostly obsidian and Pedernal chert, were treated in this manner. Gleaned cores and biface fragments were also

NN029332

treated in this manner, thus producing usable flakes from otherwise discarded artifacts. The bipolar reduction technique allowed the early Navajo to maximize the resources they had locally in the form of cherty pebbles and gleaned artifacts, and also the "expensive" nonlocal raw materials.

Unidirectional Core Reduction

Unidirectional cores were the second most common of the core types recovered from the Morris Site 1 project sites. In addition to the portable bifacial cores that were hypothesized to have entered the site, ample evidence is present to suggest that nonlocal materials were also imported as unidirectional cores. Many of the flakes of Pedernal chert and Jemez obsidian suggest they were removed from unidirectional cores and like many of the other nonlocal materials, these cores were ultimately reduced using the bipolar technique. As a result, they, too, were probably underrepresented in the assemblages.

Unidirectional cores were used with both local and nonlocal lithic raw materials. Although not as common as multidirectional cores in the assemblages, it is believed that it was still the most common core form utilized by the early Navajo; however, subsequent reduction destroyed most of the evidence of their use on nonlocal lithic raw materials. Local quarried quartzite cobbles were frequently made into unidirectional cores. The angular nature of the quartzite more easily allowed for multidirectional core reduction, although when possible unidirectional cores were made. As described above, it was very common for the exhausted form of unidirectional cores to be made into core tools, primarily for hide working. These cores were reduced using a hard-hammer technique, often utilizing a cortical platform. When possible, large flakes were driven from large angular cobbles. The large flake was made into a unidirectional core by using the interior flake surface as the striking platform. Both of these unidirectional core types were recovered during the Morris Site 1 project. Although few were recovered, it is believed that the majority of the cores of nonlocal lithic raw materials arrived configured as unidirectional cores. This is evidenced by the many linear flakes recovered of these nonlocal lithic materials. Many of the flake tools were also made on linear flakes, most of them cutting tools. As argued above, many of these valuable cores were probably reduced using the bipolar technique, thus masking their true importance. Only access to the Jemez quarries could further address this important research issue.

Multidirectional Core Reduction

Multidirectional cores make up the majority of the recovered core types. Although nonlocal lithic materials were very important to the early Navajo, they still only comprise a [illegible] of the lithic materials needed. Daily tool-stone [illegible] locally quarried local quartzite and cobble core reduction of large cobbles. The ubiquity of these raw material types did not necessitate conservation efforts. Therefore, a more opportunistic flake production technique was sufficient.

This opportunistic reduction technique is common throughout the region. Many of the cores, once exhausted, were then utilized as angular hammers in the process of resurfacing milling implements. These cores, like the unidirectional cores of local lithic materials, were reduced using a hard hammer. It is possible that some of the nonlocal materials arrived configured as multidirectional cores, although there is little evidence to support this. Further reduction using the bipolar technique may have also masked the potential importance of this core form.

Early Navajo Productive Technologies

The products of the various core reduction techniques employed by the early Navajo were the goal of their reductive technologies. How these flakes were used and how informal and formal tools were manufactured and used are equally important to understanding early Navajo technology. This synthesis examines early Navajo productive technologies from a techno-functional perspective. For example, whether a scraper is made from a simple flake, a biface, or an old projectile point is not nearly as important as understanding the functional aspects of the tool, such as whether the tool was used on soft or hard materials. Tool morphology and original configuration are only secondary to the functional interpretation of the tool as a scraper. The tool assemblages are divided into two basic groups, which roughly correspond to small tools (flake tools) and large tools (core tools). Flake tools are those made on flakes and core tools are those usually made on exhausted cores, but also included are those made on angular cobbles, etc. The following describes the production technologies of the various early Navajo tool assemblages.

Flake Tool Production

Early Navajo lithic tool production is directly related to flake production technology. The morphology of the flake types greatly influenced the tool types produced from them. Two sets of flake types were commonly used by the early Navajo for flake tool production; large biface thinning flakes and linear blade flakes. The blade flakes included both macro- and microblades. Tool function appears to have been the most significant factor affecting flake tool production technologies. For instance, scrapers were made from thick flakes with broad, durable margins and cutting tools were made on thin flakes with long lateral margins.

Scrapers were made from the greatest variety of flake types and raw materials, attesting to their variety of uses.

Most scrapers were made on unpatterned flakes, probably struck from multidirectional cores. The only observable modification is in the form of pressure flaking a notch or concave margin to produce a scraping edge for a specific purpose. Some reworking activity in the form of pressure flaking was observed on a few specimens. Formal end scrapers are the only exception to this general scraper production pattern.

End scrapers are the only formal flake tools made by the early Navajo. Most were pressure flaked during their manufacture and were resharpened beyond the point of observing their original flake morphology. Most of the formal end scrapers were made from nonlocal materials, mostly various cherts, including Pedernal, jasper, Brushy Basin, and others. Most were probably thick-struck flakes from unidirectional cores, although strategically struck flakes from multidirectional cores could have produced similar flakes. The platform of the flake was oriented towards the proximal end of the tool and the distal end was pressure flaked on the dorsal face of the original flake. The overall morphology of the tool is very characteristic of the end scrapers from across the Plains, including Dismal River and Jicarilla Apache sites.

As the diversity of scraping tools suggests, scrapers were an important part of early Navajo tool assemblages; cutting tools, however, were the most demanding on flake morphology. This can be seen in the flake types used for the production of various flake tools (Table 51). Many of the flake knives are made on large biface thinning flakes, although no large bifacial cores were recovered that could have produced such large flakes. These flake knives show only minimal reworking of the edge in the form of fine pressure flakes, usually along a single margin. This probably allowed for maximizing the utility of these relatively costly tools. The same resharpening pattern can be seen in beveled knives of the southern plains (Sollberger 1971).

Similarly, many of the cutting tools were made on blades, both macro- and microblades. Like the bifacial cores, no large blade cores were recovered. It is possible that many of the large unidirectional cores were reduced into unidirectional microcores or reduced using the bipolar technique, thereby removing all traces of their existence. The flakes, on which the cutting tools were made, are evidence of their existence. Like the macroblade flake tools, several microblade tools were recovered. Most of these were made into small cutting tools. There is no evidence that these tools were laterally hafted into wooden handles as by other protohistoric groups (Flenniken 1981). These tools were probably hand-held knives that were used along a single margin. One flake knife made on a large blade did show evidence of hafting in the form of notches, but it was probably hafted on an end and not laterally. Nearly all of the flake knives show little or no retouch flaking and minimal use wear, suggesting use on a soft medium.

Core Tool Production

Most of the core tools recovered are represented by hide scrapers that were usually made from exhausted cores; a few were actually manufactured. Therefore, their manufacturing technology is more directly related to flake production than actual core tool production. One consistent pattern is related to their size and use. Commonly, cores were considered exhausted by analysts when they appear to have no longer produced useable flakes; however, some of the hide scrapers were made from cores that appear to have still been capable of producing large flakes. Therefore, it is thought that core tool production was also a consideration in determining the point of discard for cores by the early Navajo. The only exceptions to this observation are those core tools that were actually manufactured for specific functions such as choppers.

Choppers or hand axes were among the few core tools that were expediently manufactured for a specific purpose and were not made by recycling cores. Although typed as choppers due to their morphology, the use wear present on most of these tools suggests their use on wood, probably as expedient hand axes. They consist usually of flat basalt or quartzite cobbles that were percussion flaked along a single margin. The sinuous edge created in this way was then used as a chopping edge. Once rounded from use,

Table 51. Flake Types Used for Flake Tool Production

	Biface Thinning, Late Stage Percussion	Noncortical, Platform Absent	Noncortical, Single-Facet Platform	Partially Cortical, Single-Facet Platform
Scrapers	2%	41%	46%	11%
Cutting Tool	54%	13%	33%	-
Drills/Reamer	1%	35%	46%	18%
Projectile Point	54%	-	46%	-

NN029334

these edges were frequently resharpened by the removal more flakes. Although these artifacts are few in number, they were probably the main tool used by the early Navajo for most of their wood procurement needs. Many of them may have remained at the wood collection areas and not returned to the site. This is supported by the fact that no ground axes have been recovered from early Navajo sites during this or other large-scale projects in the area such as the Frances Mesa project (Wilshusen et al. 2000).

Projectile Point Production

A discussion of early Navajo technology would not be complete without an in-depth discussion of projectile points. Several archeologists have struggled with "typing" early Navajo points. As many have since learned, typing any points, especially protohistoric projectile points, can be difficult to impossible (see Kehoe 1966 for a complete analysis of late period arrow points). The following will describe the variability of early Navajo arrow points as they are represented in the Morris Site 1 project. This will be followed by a functional discussion of early Navajo projectile points and their role in the subsistence system. Together, both variability and the techno-functional aspects of the arrow points associated with early Navajo points lend themselves to the definition of distinct and discernable new late-period projectile point type: Diné Side-notch.

As noted by many archaeologists, there is considerable variability in early Navajo projectile point morphology (Brugge 1986; Elyea 1992; Vierra 1995). Some interesting observations can be made regarding the technology of early Navajo projectile points. Basically, projectile points from early Navajo sites can be grouped into two basic functional categories: projectile points used for hunting and those that were used in ceremony. The former were made by the early Navajo and the latter were usually collected from older contexts. The dichotomy of this use pattern often produces misidentification of early Navajo points (Honeycutt and Fetterman 1994; Schaafsma 1979). This discussion will deal primarily with the functional aspect of early Navajo points as hunting weapons.

Early Navajo hunting points are of two morphological types, with the vast majority represented by side-notched varieties (Table 52). The side-notched varieties differ in their basal treatment: some bases are notched, some are concave, some are straight, and some are convex. Most of these can be typed as Desert Side-notch, Prairie Side-notch, or Plains Side-notch (Kehoe 1966; Thomas 1981). The other variety is unnotched with concave or straight bases and could be typed as Cottonwood Triangular.

Both of the hunting projectile point styles were skillfully manufactured from thin flakes. Fine, collateral pressure flaking was conducted with a sharp bone or antler tool. The narrow, yet deep notches were probably made with a sliver of antler. Many of the projectile points were incomplete due to various use and manufacturing fractures. One of the most notable characteristics of these points is their mass to length ratio. Mass to length and cross section area have been shown to be the best means to judge killing power of projectile points (Christenson 1986). The mass to length ratio for the Morris Site 1 project early Navajo arrow points compares well to other small side-notch points from the central and high plains (Table 53). Large game hunting was central to these peoples' economy, and the technology probably has a common origin (Torres 2000). Therefore, the general morphological characteristics of these points might not be distinguishable from other point types; however, other technological aspects of their manufacture and use are significant enough to warrant a new arrow point type.

TYPE: Diné Side-notch (Figure 117)

Significant Features: very fine pressure flaking, although not necessarily bifacial; deep, often square side notches; very low mass to length ratio (.9-1.5 g : 15-30 mm).

Table 52. Early Navajo Arrow Point Types

Material Type	Side-notched	Unnotched	Total
Pedernal Chert	29%	7%	36%
Obsidian	22%	4%	27%
Chert	27%	-	27%
Orthoquartzite	7%	-	7%
Silicified Wood	2%	-	2%
Tuff	2%	-	2%
Total	89%	11%	100%

Data from a study of a collection of complete Numic arrows (Christenson 1997) showed that side-notched points that were hafted to single shafts were, on average, 15 percent longer than the Morris Site 1 project early Navajo points; however, the early Navajo points are 45 percent lighter (given a similar distribution of raw material types). The result is greater killing power for the early Navajo arrows than the Numic arrows. Both populations of arrow points show equal numbers of side and tri-notching, although a significantly large number of the Numic arrows are composite and not single shaft. Basal treatment is directly related to the technological concepts of haft material and hafting technique, and are not related to ethnicity or cultural origin.

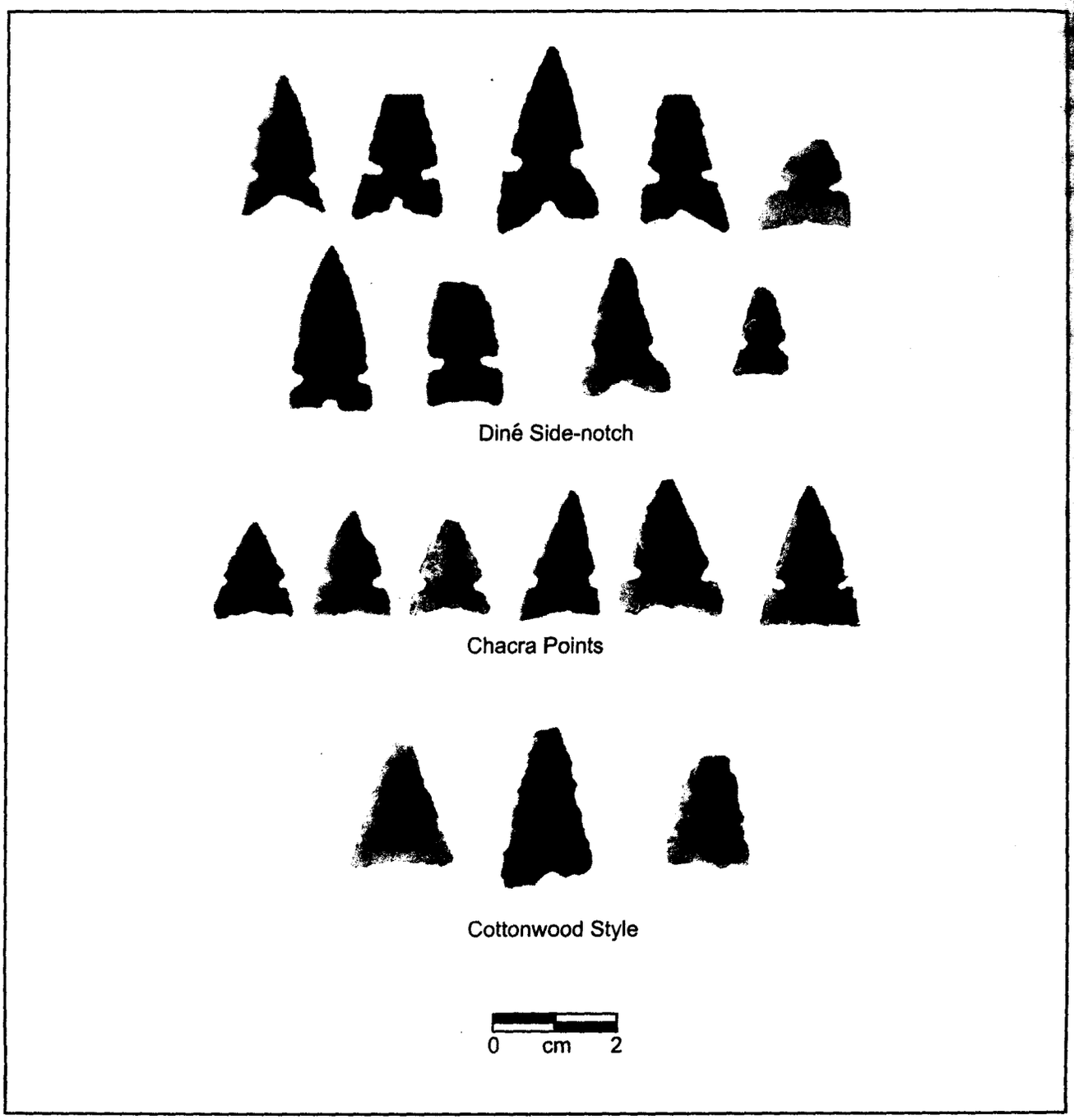


Figure 117. Early Navajo arrow point types.

NN029336

Table 53. Early Navajo Arrow Points Compared to Other Side-notch Points (Avonlea, Prairie Side-notch, Plains Side-notch Data From Kehoe [1966]; Numic Data from Christenson [1997])

	Early Navajo	Avonlea	Prairie Side-notch	Plains Side-notch	Numic
Mean Length	21.78	22.00	26.00	22.70	26.10
Mean Mass	0.67	0.73	0.8	0.8	1.2
Mass to Length Ratio	0.0308	0.0332	0.0308	0.0352	0.0460

Two different types of arrows were produced in North America. These are the single-shaft arrow and composite arrow. The first arrow points to have entered the American Southwest, via the Great Basin, were small, corner-notched stemmed points. As argued for the Great Basin (Yohe 1992), many of the Rose Spring or Eastgate points were smaller morphological versions of their late Archaic/Basketmaker II counterparts. The first bows that accompanied these arrows had very little power and the first arrows were probably very light in order to maximize the killing power of the new weapon system. These first arrows were probably also smaller versions of the dart shafts, which were often cane/reed shafted (*Phragmites commonus*). The stem on these first arrow points may have been made to fit within the hollow of the reed arrow shafts. As bow technology developed so did arrow technology. As a result, composite arrows were developed with reed mainshafts and wooden foreshafts. It was probably as a result of the use of foreshafts, that the first side-notch points developed in both the Great Basin and the Southwest.

Single-shaft arrows were made from one piece of solid wood, including willow, mountain mahogany, and others. These were shaped with paired sandstone shaft abraders and had a single U- or V-shaped nock. They were fletched with three feathers in a radial fashion. The wood shaft could sustain compressive forces much greater than the composite arrow that was in use before. The combination of the heavy wood shaft, drag created by the relatively large fletching, and long arrow points made for a superior projectile. The force generated by the sinew-backed recurve bow was the perfect match to complete the weapon system.

The apparent independent development of side-notched points in the Great Basin/Southwest and the high plains (Avonlea) may be a significant factor in the difference in their mass to length ratio, as well as other dissimilarities in their manufacturing technology (Kearns 1996; Torres 1999b; Towner and Torres 1999). These thicker and shorter side-notched arrow points were probably the first arrow points developed locally in the Southwest. The first appearance of the thin, longer, high plains-influenced side-notch points into the Southwest seems to correspond to the arrival of the Apachean people. With them came the recurved bow, the single-shaft arrow, and a lithic tool kit made up of hunting gear and hunting gear manufacturing paraphernalia. It was the new bow and arrow technology as a superior hunting tool that sparked the merging of a new economic lifeway into the Southwestern system and helped define the early Navajo as a new Apachean group.

Summary

Although the Paleoindians were expert knappers and the Archaic period people exploited expanses of space and were masters of portable technology, the early Navajo melded the skills of the high plains hunters and the settled lifeway of the agriculturists of the Southwest into a complex amalgam of lithic technologies. The flexibility of Apachean culture easily annexed the best of their new neighbors and held firm to the traditions that worked for them for so many centuries. Adaptation of their hunting lifeway to a new social system required certain raw material types and a market in which to trade their commodities (hides and meat). The result was a complex lithic landscape management strategy that was directly and indirectly intertwined with their neighbors. This analysis has shown that early Navajo culture was able to absorb and adopt cultural traits of their many new neighbors to varying degrees (see chapter 8), but held firm to the heart of their Apachean and Athabascan culture. The result was the emergence of the Navajo people.

NN029337