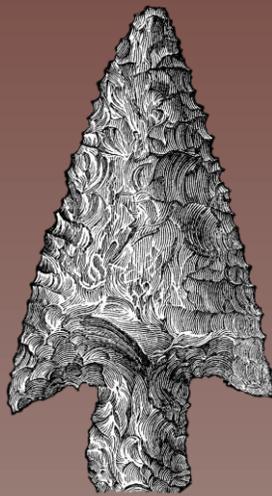


# Permian Basin Programmatic Agreement: Archeological Mitigation Program

Bureau of Land Management  
Carlsbad Field Office, New Mexico  
Jessica H. Han, Editor



2015



## DEVELOPMENT OF THE PERMIAN BASIN MITIGATION PROGRAM

The overall objectives of the Permian Basin Programmatic Agreement are as follows: The purpose of this program is to implement a creative, directed program to resolve adverse effects and, in particular, the cumulative and indirect effects of full-field oil and gas development in southeastern New Mexico. It will result in better decisions affecting the management of historic properties in the Permian Basin. High rates of erosion within the sand sheets of the region are compounding human-caused losses of artifacts, site features, and depositional integrity. The program seeks to acquire better knowledge about the prehistory of southeast New Mexico through the systematic application of a standard research design and a uniform field methodology. Information gained will improve the process for making determinations of eligibility to the National Register of Historic Places. Periodic public conferences and popular and technical synthesis will ensure that the public appreciates what the study of cultural resources can say regarding cultural developments in this frontier region.

The mitigation program was proposed as an alternative to the conventional process carried out under Section 106 of the National Historic Preservation Act. That process has resulted in numerous surveys and the generation of much redundant, survey-level data, resulting from a high intensity of oil and gas development on BLM- administered lands in southeastern New Mexico. But proportionately much less excavation activity has resulted from this process. As a result, the BLM began developing an alternative approach to the treatment of cultural resources in the area, and those efforts have culminated in the Permian Basin Programmatic Agreement. Originally called the Permian Basin Memorandum of Agreement (MOA), it was amended in 2013 to the Permian Basin Programmatic

Agreement (PA). The PA program allows oil and gas companies, potash miners, and local units of government to opt out of the conventional Section 106 process, which in common practice involves survey-level investigations for each proposed action. This can result in delays in a project imposed by the need to conduct survey fieldwork, prepare and submit a report, and have the report reviewed and approved by BLM staff. To follow this alternative Section 106 process, applicants can voluntarily pay into a dedicated fund that is being used for archaeological investigation to answer important research questions and provide better information than can be realized under continued compliance-driven, survey-level investigations. The results have greatly expanded the scientific and public understanding of cultural resources in southeastern New Mexico.

“In the first two years we have actually surveyed more acreage overall in the area than we would have seen without the program.”

With the PA, archaeologists can gain control over field programs, which means that archaeologists are “doing archaeology.” One of the most common concerns raised during the development of the Programmatic Agreement (PA) was that we would no longer require or carry out any survey in the Permian Basin PA area. In the first two years, we have actually surveyed more acreage overall in the area than would have been examined without the program, because we were able to contract for survey in areas which had not been well sampled by oil and gas development. More important than the increase in survey acres was the increase in control over where to look; we were able to look where additional survey was needed to improve our understanding of Permian Basin prehistory. “Doing archaeology” in the Permian Basin means that archaeologists identify sites for

study, rather than having the study sites determined by industry needs.

We are fielding intensive mapping and testing programs at the larger sites in the area, which were partly excavated, but poorly reported in the 1960s. We are designing and implementing field projects and experimental programs to improve survey, give us better tools for eligibility evaluations, and jump-start our understanding of area archaeology. We are doing critical, much needed work in the Permian Basin.

This booklet was created to provide brief synopses of projects that have been completed or are underway for the PA. Each synopsis describes the work done for that

project, for example an archeological survey, or exploratory test excavation, and then provides a highlight from the report and a summary statement. For those who are interested in learning more detail about these projects full reports can be found at the Digital Archaeological Record (tDAR) web site at <https://www.tdar.org>. Other reports may be available from the Bureau of Land Management, Carlsbad Field Office, or the Bureau of Land Management New Mexico State Office website <http://www.blm.gov/nm/st/en.html>. Use the “Quick Links” section then go to Cultural Resources - Research/Partnerships - Permian Basin Partnership. Reports for public distribution are also in the collections of community or school libraries in Chaves, Eddy, and Lea counties.

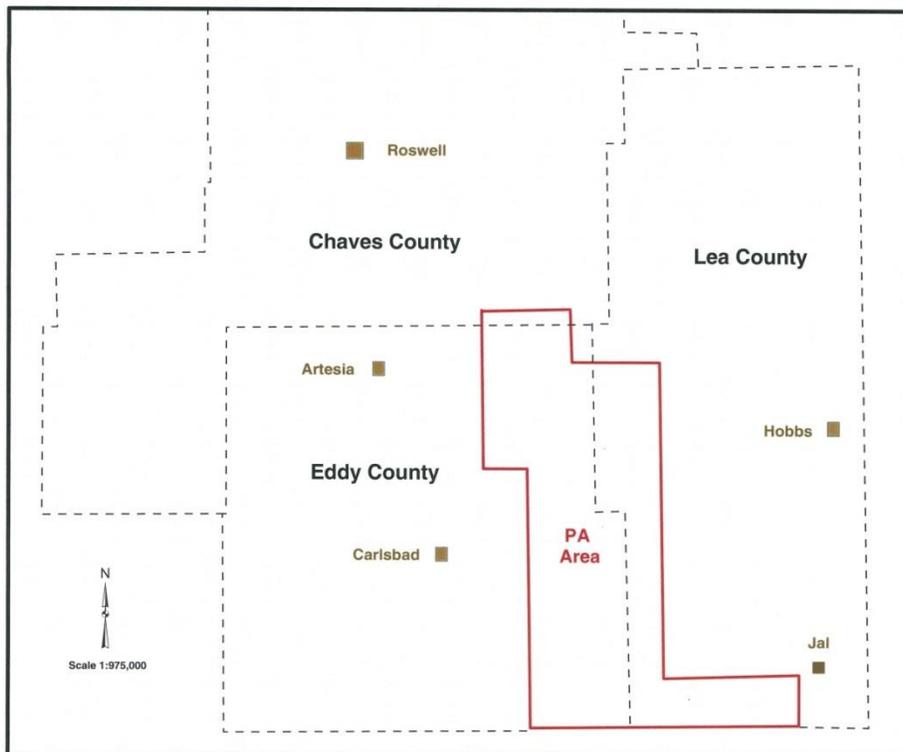


Figure 1. Map of the Permian Basin Programmatic Agreement Area in southeastern New Mexico.

**Synthesis of Excavation Data for the Permian Basin Mitigation Program  
2009**

**Jim A. Railey, John Risetto, and Matthew Bandy  
SWCA Environmental Consultants  
tDAR Identification Number 378484**

**The synthesis of data from 116 excavated sites in the Permian Basin MOA area marks the first task in the BLM's special mitigation program.**

This synthesis brought together information from a large number of projects that were not originally coordinated as part of a unified research effort. Each was examined for its contributions to four problem domains defined in the Southeast New Mexico Regional Research Design: chronology and culture history; subsistence strategies; settlement systems/mobility strategies; and environment. As expected, the most important discovery and clearest regional pattern was found in the chronological data, most notably in the patterning of 220 radiocarbon dates that show a dramatic spike in occupational intensity of the area during the early Formative period. A hypothesis is posed to explain this pattern, namely, that population densities and intensity of land use increases beginning in the late preceramic centuries and peak in the Early Formative. The sharp drop off in dates in the Late

Formative period, and into the Protohistoric, may mark a widespread shift to the Pecos River, the base of the Mescalero Ridge, and certain playa settings; and the resulting curtailment of hunting and gathering activities within the open desert floor that covers most of the study area. The synthesis also provided recommendations for future research including survey to identify possible agricultural sites along the Pecos River and the base of the Mescalero Ridge; excavations at Boot Hill (LA 5148) and Laguna Plata (LA 32229) to recover subsistence remains and chronometrically datable materials; coring of playa sediments to obtain detailed paleoclimatic data.; the identification and characterization of lithic raw material sources; and the standardization of debitage analysis methods. A number of these recommendations were adopted and the results are described below.

**A Class III Cultural Resource Survey of the Permian Basin MOA Area, Chaves and Eddy  
Counties, New Mexico  
2010**

**Beth McCormack, Douglas H.M. Boggess, Peggy Allison, Teresa Cordua, Brian Deaton, Vicki  
Menchaca, Tomasz Wasowski, and Andrew Zink  
Lone Mountain Archaeological Services, Inc.  
tDAR Identification Number 378468**

**The purpose of this project was to inventory and characterize the archaeological landscape in the portions of the Permian Basin Programmatic Agreement (PA) area in Chaves and Eddy Counties that are underrepresented by previous archaeological inventories.**

The project area encompassed 3,358.91 acres of BLM- managed lands located along the base of the Mescalero Ridge and the Pecos River. The survey identified both prehistoric

and historic sites. Of the prehistoric components found two-thirds were classified as artifact scatters. Two quarries were found and four sites had evidence for possible

structures. The historic remains were related to ranching and refuse dumping. Ninety-six archaeological sites were either newly identified or revisited during this survey. Twenty-eight of the sites examined have been

recommended eligible for nomination to the National Register of Historic Places, nine are recommended not eligible, and fifty-nine have undetermined eligibility recommendations.

**Ethnographic and Archaeological Inventory with the Mescalero Apache Tribe of Potential Traditional Cultural Properties in the Vicinity of the Permian Basin MOA, BLM Pecos District, Eddy County, New Mexico**

**2010**

**Kenneth L. Brown, Martha Graham, Howard Higgins, Timothy G. McEnany, Stephanie Owens, and Mary Quirolo**

**TRC Environmental, Inc.**

**This report contains confidential information and is not available for public distribution.**

**TRC inventoried nine locations selected in cooperation with the Mescalero Apache Tribe of Otero County, New Mexico.**

The BLM contracted with TRC to conduct a joint archaeological and ethnographic inventory of nine areas on BLM managed land that are of potential importance to the Mescalero Apache. Although the present-day Mescalero Apache Reservation is restricted to a small part of northern Otero County, their aboriginal territory encompassed most of southeastern New Mexico, portions of west Texas, and extended into northern Mexico.



Figure 2. Mescalero Informants visit a landmark important in Mescalero tribal history.

**Archaeological Data Comparability for the Permian Basin Mitigation Program**

**2010**

**Jim A. Railey**

**SWCA Environmental Consultants**

**A paper copy is available by request.**

**This project established a set of standards to be used by anyone conducting fieldwork in the PA area so that sites, features, and artifacts would be recorded in a consistent manner.**

To enhance the success of the Permian Basin Programmatic Agreement a certain minimum level of data comparability in the analysis of artifacts is needed. Such comparability does not currently exist between the participating contractors and their respective analytical classification systems, methods, and protocols. Standards and guidelines for artifact analysis were provided in Chapter 6 of the Southeastern New Mexico Regional Research Design, but it was recognized that not all of these standards were ideal, and it could be argued that they perpetuate some systemic problems, especially in the analysis of

debitage.

SWCA Environmental Consultants, Parametrix, Inc., and Eastern New Mexico University teamed together to provide a workshop that was the centerpiece of this task. The workshop was attended by archaeologists from the BLM, New Mexico Historic Preservation Division, members of the contracting teams participating in the Permian Basin Programmatic Agreement, and other interested parties. New comparability standards for the Permian Basin Programmatic Agreement were established.

**The Laguna Plata Site Revisited: Current Testing & Analysis of New and Existing Assemblages**  
2010

**Edited by Kenneth L. Brown**  
**TRC Environmental, INC.**  
**tDAR Identification Number 378476**

**This project examined artifact and faunal collections from the site, relocated previous excavations, described the archeological potential of two landforms in the site's vicinity, provided an interpretation of the site's use in the Archaic and Formative periods, and evaluated the site's future archeological research value.**

The Laguna Plata Site is part of the Laguna Plata Archeological District listed on the National Register of Historic Places in 1989 and added to the State Register in 1990. The site evaluation consisted of a phased testing strategy that included site survey and documentation, geophysical testing, test excavations, and a 25-acre survey. The beginning phase documented the site through the point provenience of artifacts and features. At the end of the first phase, a geophysical survey of a portion of the site was carried out using three techniques: ground penetrating radar, a magnetometer survey, and ground conductivity profiler. Geophysical testing and evaluation followed immediately after the geophysical survey. The fourth phase consisted of mechanical trenching of areas significant to understanding the geomorphology and contextual composition

of the site and environs. Finally a pedestrian survey was completed of 25 acres adjacent to the site. Forty-four features were

“... the development of cultural interaction is promoted by the seasonal aggregation of populations into a recognized locale, one in which trade and exchange is facilitated. The Laguna Plata site, with its sweeping vista, freshwater springs, and diverse resources, may have served as one such locality.”

documented, the majority of which were identified during the site survey phase. Testing focused on the hand excavation of Features 2 and 3 previously identified as irregular-shaped pithouses. During this

project 9,006 artifacts were analyzed. Radiocarbon samples, combined with the diagnostic artifacts, identified three periods of increased site use: C.E. 200/400 -1100; C.E. 1100 -1300; and C. E. 1300-1450. These age brackets are thought to reflect activities oriented around seasonal site use during the Formative period.

The results of the testing and analysis cover different topics and are extensive. The pottery analysis included comments on the inhabitant's possible contacts. Exchange and interaction on a regional scale was primarily evaluated through nonlocal pottery types tentatively seen as a marker of regional interaction. Whether this interaction is buffered through a broad network of trade and exchange or is the result of direct interchange along trade routes is unclear. The frequency of pottery associated with the Sierra Blanca highlands points toward a relationship

northwest of the Laguna Plata site. The presence of pottery types sourced to the west of the project area further suggests some cultural linkage with populations within and peripheral to the greater Jornada-Mogollon region. Alternatively, no evidence for interaction with populations with the Plains was identified. As has been previously noted the role that regional interaction plays in the adaptive strategies carried out in the Jornada-Mogollon region suggest a higher level of importance than previously allotted. It is further suggested that for the Formative period in southeastern New Mexico, the development of cultural interaction is promoted by the seasonal aggregation of populations into a recognized locale, one in which trade and exchange is facilitated. The Laguna Plata site, with its sweeping vista, freshwater springs, and diverse resources, may have served as one such locality.

**The Boot Hill Site (LA 32229): An Oasis in the Desert, Eddy County,  
New Mexico**

2011

Edited by Marie E. Brown.

TRC Environmental, INC.

tDAR Identification Number 37547

**This site was listed on the New Mexico State Register of Cultural Properties in 1970. It had been dug into by members of the Lea County Archeological Society in 1957 and 1958. Only a brief preliminary report of these excavations was published. One goal of this project was to provide a better assessment of the earlier work.**

The archaeological work at this site consisted of a geophysical survey, using ground penetrating radar and a magnetometer, geoarcheological testing, detailed mapping of surface features, and the hand excavation of three trenches in order to document previous excavations at the site and to provide an evaluation of the site's future research potential. The ceramics from the Boot Hill site indicate three major points: 1) the occupation of the Boot Hill site extended throughout the Formative period until A.D.

1300/1350 with periods of more intense occupation of the site, 2) the predominant quantity of jar sherds suggests the occupants of the site were seasonally mobile rather than sedentary, and 3) the diversity, but infrequent occurrence of non-local pottery points towards local trading with minimal regional interaction or long range trade associations. It is likely that the site's occupants primarily hunted pronghorn and bison, herd species that provide a large quantity of meat per individual. Rabbits were secondary meat

resources that were probably procured opportunistically in the immediate vicinity of the site.

The six radiometric dates associated with the main site are indicative of a more intensive site occupation during the Formative period, particularly from ca. A.D. 575, the Formative 1, through the early Formative 6 period, and abandonment of the site by A.D. 1225 .

Based on the results of testing, LA 32229 may have served as a residential site or base camp

during the Archaic and Formative periods. The re-occupation and density of the artifact assemblage attests to the importance of this site locale to regional hunter-gatherer groups. Although no discernible pit houses have been excavated at the site, it is likely that ephemeral pit houses are present in the well-developed anthrosol that extends across the site. The location of the site on the landscape appears to have resulted from the inhabitants' desire for a combination of suitable topography, access to reliable water, and their ability to exploit a mixed-resource economy.

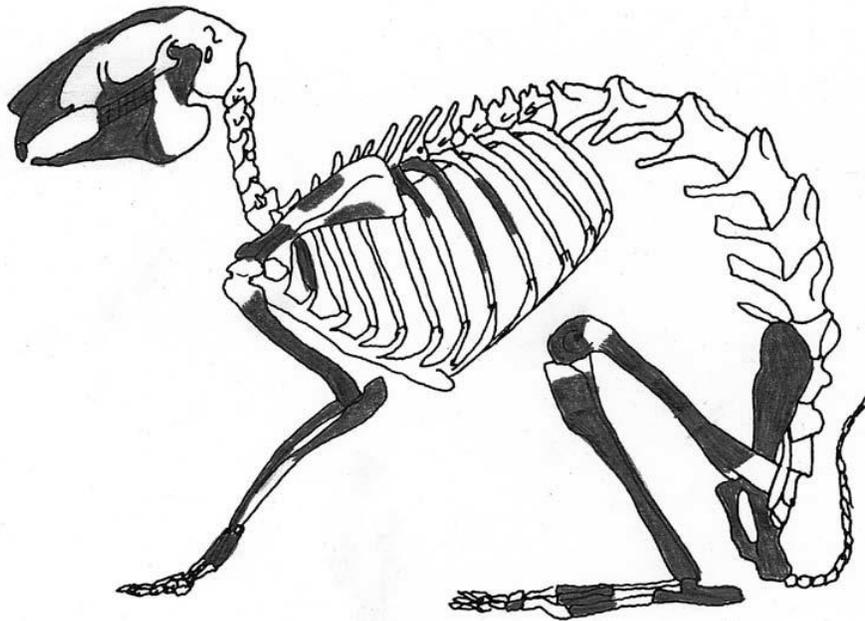


Figure 3. Jackrabbit skeletal parts found in Trench 1 at the Boot Hill Site are illustrated here by shading. Rabbits were an important source of food for the prehistoric people living in what is now southeastern New Mexico.

**A Class III Transect Recording Unit Survey and Geophysical Prospection at the  
Burro Tanks Site (LA 32227), Chaves County, New Mexico  
2011**

**Matthew S. Bandy, Jim Railey, Christopher Carlson, and Blake Weissling  
SWCA Environmental Consultants  
tDAR Identification Number 378478**

**The purpose of this project is to provide detailed baseline documentation of the present condition of the site, including protection and research recommendations.**

This survey investigated Burro Tanks Site, a large (399 acre) site that was occupied repeatedly through the prehistoric period. Field methodology employed Transect Recording Units (TRUs), which are 15 m square units superimposed on the site area, to record all artifacts and man-made features. The TRU grid imposes a regular order to the surveyor's observations. Geophysical methods were also utilized, including ground penetrating radar, magnetic gradiometry, and electromagnetic induction. The survey resulted in the delineation of the site's boundary, the identification of different sectors- discrete, bounded concentrations of cultural material - within the site, and a comprehensive characterization of its surface assemblage.

Analysis of the survey results enabled the researchers to demonstrate that a major transformation took place in the use of the site in the later Formative period, beginning perhaps around A.D. 1100. This occupation can probably be fairly characterized as a small village, and it is entirely possible that the residents lived on the site year-round. Earlier occupations at the site, including Paleoindian, Archaic, and early Formative components were low intensity, characterized by short-term campsites probably related to hunting or gathering. Most of the sectors at the site comprise the mixed remains of short-term occupations recurring at the same locations over the millennia. Between A.D. 1100 and 1300, however, an intensive, large-scale

occupation was established in Sectors 1 and 2 of the site. This occupation created large areas of midden and deposited tremendous quantities of lithics and ceramics. There is also some evidence for an increase in trade at this time, since obsidian is present only in these later sectors. Approximately A.D.1300-1400, the focus of occupation shifted to Sectors 3 through 5. This occupation was even larger, with more artifacts deposited and more extensive midden deposits formed. Again, it can probably be characterized as a small village.

This florescence of modest village life at LA 32227 is consistent with a recently identified pattern, in which the number of sites on the Mescalero Plain is significantly reduced in the

“...sometime around A.D. 1400 village life was abandoned at Burro Tanks and probably throughout southeastern New Mexico. Subsequent occupations were ephemeral and transient, similar to the occupations of the Archaic and Early Formative...”

thirteenth century and the probably growing population became concentrated into fewer, larger, and presumably more permanent settlements. This change was accompanied by other indicators of more permanent village life, such as, more substantial architecture and significant midden deposits. Finally, sometime around A.D. 1400 village life was abandoned

at Burro Tanks and probably throughout southeastern New Mexico. Subsequent occupations were ephemeral and transient, similar to the occupations of the Archaic and Early Formative. It is generally accepted that

this change represents a shift in economic focus to a more nomadic lifestyle, perhaps depending upon bison hunting. At the same time, however, there was a dramatic reduction in regional population.

### **Delaware River Thematic Survey 2012**

**Douglas Boggess, Beth McCormack, Catherine Spude, and Kimberly Parker  
Lone Mountain Archaeological Services, INC.**

**This survey was an inventory of prehistoric and historic sites located in the Delaware River Valley to be used for the preparation of a National Register of Historic Places Nomination form. Information from the survey is also used for management of the Delaware River Area of Critical Environmental Concern, as defined by the BLM Carlsbad Field Office.**

Cultural resources encountered during the survey include 51 new sites, and 14 previously recorded sites, for a total of 65 sites. Thirteen of the sites date to the late 19<sup>th</sup> Century (circa 1895) including remains of an irrigation system and three homesteads. The irrigation system includes a concrete dam and earthen ditches.

The majority of the prehistoric sites are artifact scatters associated with burned rock features often in the midst of extensive scatters of burned rock. While some Archaic and Formative-period artifacts were encountered, there seemed to be no discernible difference in the expression of these components. Archaic and possible Archaic-period components were found on 11

sites, while Formative-period and possible Formative-period components numbered 14. There were no features on these sites that were clearly affiliated with one period over another. If there was Formative-period or even Late Archaic agriculture in this area, it may have been on the scale of a small garden plot occasionally tended by a mobile group moving through, more likely exploiting riparian resources such as shellfish and making use of any readily available lithic resource. There is no evidence of the bison hunting adaption suggested for the Late Formative Period. Likewise, no sites were encountered that might argue for the sedentism proposed for riparian settings in southeastern New Mexico.

### **Macrofloral, Phytolith, and Starch Analysis, and AMS Radiocarbon Dating for the Permian Basin MOA, New Mexico**

**2013**

**Linda Scott Cummings and Peter Kováčik  
PaleoResearch Institute  
tDAR Identification Number 39881**

**The goal of this project was to analyze 500 AMS radiocarbon samples collected from feature contexts by BLM Carlsbad Field Office cultural resources staff, as well as analyzing 500 duplicate samples collected at the same locations for environmental and subsistence related evidence using starch, phytolith, and macrobotanical analyses.**

In order to facilitate site selection for research into the prehistory of the MOA area a project was undertaken to collect samples of charred wood and other charred plant material from sites for the purpose of obtaining radiocarbon dates and plant identification information. This report describes the analysis of soil samples taken from 500 features, primarily hearths, distributed across the MOA area. Although the samples were small - each one approximately 8 oz or a measuring cup in size - each produced a radiocarbon date and information about the plant remains in the sample. The samples were subjected to a variety of analyses including macrobotanical flotation. This is a technique where soil samples are placed in agitated water, causing any charred floral remains to float to the surface where they can be collected in

fine mesh cloth. A portion of each sample was also analyzed for starch grains from plants and for phytoliths, small silica structures in plant cells that remain in the soil after the plants decay. Starch and phytolith remains identify plants that are physically present at the sampled location, as opposed to pollen analysis which can include pollen carried in to the sample site from relatively long distances by wind. However, the starch and phytolith remains may come from plants brought to the sample site by humans and may not necessarily reflect plants naturally growing there.

Dating was accomplished using the Accelerator Mass Spectrometry (AMS) radiocarbon method which can be used on very small sample sizes. Annual plant remains, such as acorn caps or grass seeds, were used for dating when available in an effort to avoid the “old wood problem.” However most of the samples consisted of mesquite, typically used for fuel in hearths, which is long-lived. Some trees are known to be over 100 years old and dead wood found in arid regions such as the Mescalero Plain can survive on the ground for many years before being collected and burned. Also related to

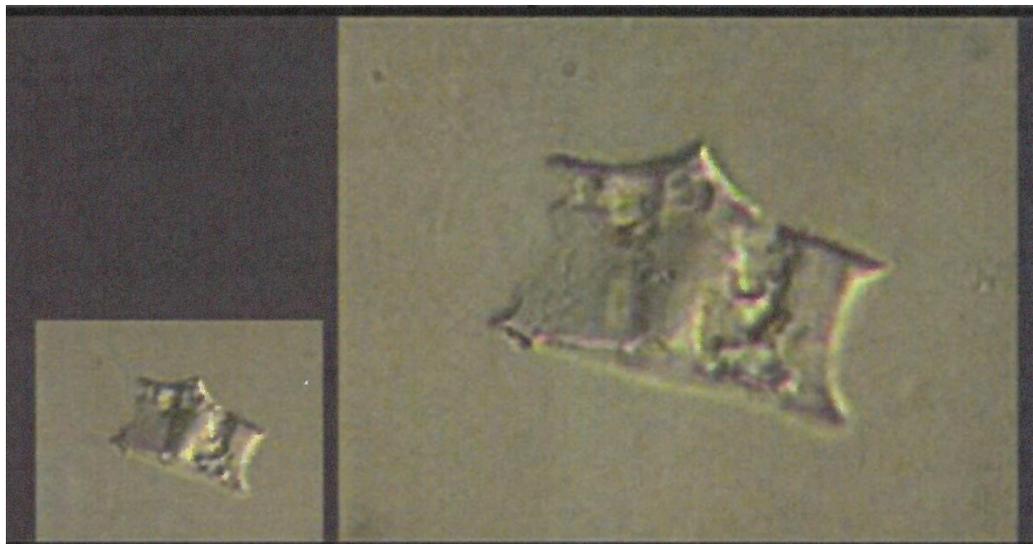


Figure 4. Corn (*Zea mays*) wavy top roundel phytolith (side view) from site LA 99436. Left image to scale, right image enlarged to show detail. The surface of this phytolith is pitted. Ten samples had corn phytoliths and one sample had charred corn cupules and kernels in the 500 samples analyzed.

dating problems is that charred wood remains may be from the interior or heartwood, portions of trunks or limbs which have stopped exchanging carbon with the atmosphere before the outer rings. The outer exhibit an age close to the cutting or death date of the tree while the inner rings will reflect the age of the tree.

Because the samples were primarily from hearths plants used for fuel were most common, with mesquite dominant. Other

woods selected in declining order of use include members of the buckthorn family, saltbush/winterfat, oak, cholla, juniper, creosote bush, members of the sunflower family (including sagebrush), pine, sumac, and members of the rose family. There is limited evidence for food or medicinal use of plants as indicated by the presence of sumac, sunflower, cactus, ribbed small/medium-sized

cylindrical cacti, prickly pear cactus, chenoam, saltbush, copperleaf or 3-seeded mercury, sandmat, acacia/mesquite, acacia, honey mesquite, acorns, carpetweed, and dropseed. This can be interpreted either as the processing of a wide variety of plants or perhaps accidental burning of some of these remains that are not well known as edible or medicinal plants in the ethnobotanic record.

## **The Geologic and Archaeological Contexts for Lithic Resource Acquisition in Southeastern New Mexico**

2013

**Scott H. Kremkau, Kate E. Zeigler, and Bradley J. Vierra**  
Statistical Research, INC.

tDAR Identification Number 391880

**This is a multidisciplinary study by archaeologists and geologists to identify geological formations in Chaves, Eddy, and Lea counties that contain rocks suitable for making stone tools and to document the methods used by prehistoric people to obtain those lithic resources.**

Knowing the location of suitable raw stone for making artifacts was important to people using a stone tool technology. It is also important to us today, because studying the prehistoric past depends upon interpretation of the artifacts people left behind and stone is among the most durable of all artifacts. The distribution of stone sources across the landscape figured into prehistoric people's decision making about where they would locate camps or villages, or with whom they would trade or otherwise associate. The stone artifacts they left behind, to some extent, provide a visible trail of those decisions and interactions. Archeologists and geologists examined 18 sites and localities within the Carlsbad Field Office boundaries ranging from San Andres chert quarries in the foothills west of the Pecos River to silicified

sandstone sources located along the caprock of the Llano Estacado east of the river. Many of the stone sources exploited by prehistoric people east of the Pecos River come from terraces containing cobbles of chert and quartzite, as well as smaller quantities of other stone types, concentrated there by erosion.

The value of this study is that it includes a geological context, which explains the origin and distribution of "local" stone sources, as well as an archeological evaluation of how the stone was obtained and distributed through time and space in the archeological record. The study also defines site attributes that should be recorded when a stone source is documented and criteria to be used in evaluating the research potential of these specialized types of sites.

**Rocks and Ancient People in Southeastern New Mexico  
2013**

**Bradley J. Vierra, Kate E. Zeigler, and John V. Cafiero  
Statistical Research, Inc.**

**tDAR Identification Number 391882**

Available at BLM NM State Office website <http://www.blm.gov/nm/st/en.html>

This is a companion publication to The Geologic and Archaeological Contexts for Lithic Resource Acquisition in Southeastern New Mexico and it is designed for public distribution.

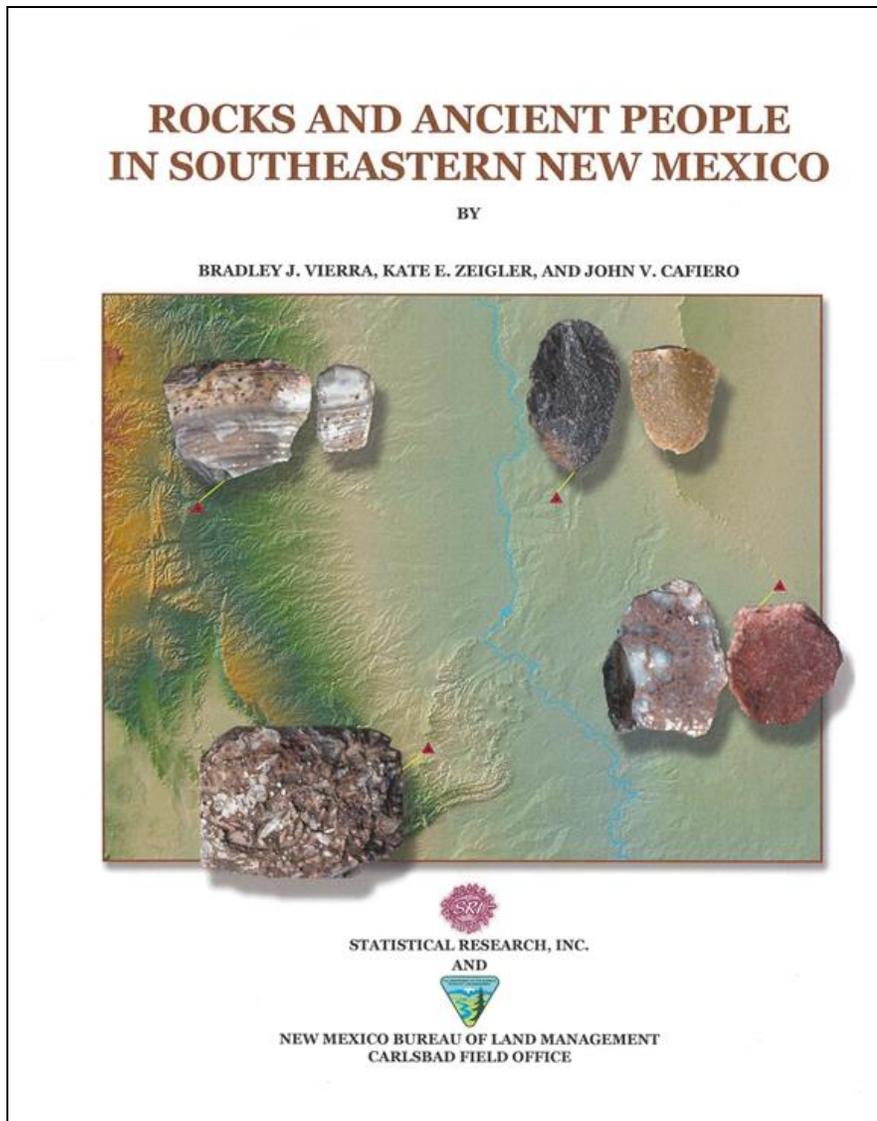


Figure 5. The cover of the booklet describing stone sources in the Carlsbad Field Office.

This publication has all the significant information and conclusions of the full report, but removes all the details and discussion of methods primarily of interest only to other archeologists.

## CURRENT PPROJECTS

Currently five projects are under way and they are expected to be completed in 2015.

### Archaeological Inventory and Historic Context for Areas of Early Oil & Gas Exploration and Development in the Permian Basin of Southeastern New Mexico SWCA Environmental Consultants

The project is to develop a historic context document and associated GIS data for oil & gas development in the BLM Carlsbad Field Office region that will identify significant property types and discuss evaluation criteria. This document will provide a guideline for determining National Register Eligibility of historic oil & gas infrastructure and managing these resources in a way that will preserve key elements and representative samples of important property types while facilitating environmental cleanup of non-contributing oil field locations. This document will also

provide easy to follow guidelines as to National Register eligibility evaluation of oil and gas related sites.

A National Register Multiple Property Documentation Form and at least one property nomination will also be completed as part of this project. The contractor will also prepare a public outreach product (illustrated pamphlet or booklet) that describes historic oil & gas development in Southeastern New Mexico in a format that is suitable for distribution to the general public.

### Selection of Sites to Address Questions Identified in The Southeastern New Mexico Regional Research Design: A Landscape Approach SWCA Environmental Consultants

This project will be to discover patterns and relationships inherent in the data collected in the Macrofloral, Phytolith, and Starch Analyses, and AMS Radiocarbon Dating for the Permian Basin report that was completed by the PaleoResearch Institute. This GIS assisted study will identify sites, or groups of sites, that have common attributes of age, contents, or topographic location that will make them candidates for additional research in order to answer questions contained in the Southeastern New Mexico Regional Research Design.



Figure 6. Chupadero Black-on-white sherds (circa A.D. 950- A.D. 1400) are the most commonly found decorated pottery in the PA Area.

## The Relationship Between Surface and Subsurface Components of Archaeological Sites Statistical Research, Inc.

This project will provide a process for the evaluation of the eligibility of archaeological sites to be listed on the National Register of Historic Places by gathering information to help identify a site's research potential and integrity. To a greater or lesser extent all archaeological sites within the Carlsbad Field Office have been damaged by natural erosion processes. Damage to sites is particularly severe within the Permian Basin PA area, due to the nature of its easily disturbed sandy soils. Erosion, primarily from the wind, has exposed features, such as hearths, in deflation basins and has displaced artifacts from their original depositional context. The perennial

question is to ask whether other features or artifacts in context are present under the dunes that surround the basins. The relative lack of site excavations in southeast New Mexico, particularly of small sites of unknown temporal period or cultural affiliation, inhibits formulating a reasonable answer to that question. This project will examine four sites with the express purpose of recording their surface indications and then evaluating them for the presence of subsurface features or artifacts in primary context. The decisions made at each stage of the evaluation process will be documented.

### Remediation at the Merchant Site (LA 43414), Lea County, New Mexico Versar, Inc.

The Merchant Site, LA 43414, is a *circa* A.D. 1400 village site investigated by the Lea County Archaeological Society (LCAS) primarily in the early 1960s. The excavations were never back filled and a complete report of the excavation and its results were never published. In 1984/1985 Dr. John Speth of the University of Michigan did limited testing at the site and screened some of the back dirt from the LCAS excavations.

This project is to salvage archaeological information from the site by accurately mapping areas of the site that were the focus of the LCAS excavations, by reexamining the features uncovered by the LCAS, and by analyzing the artifacts left behind by the excavators, in particular numerous animal bone fragments that can be seen eroding from LCAS back dirt piles. A detailed report of the remediation efforts will be produced and it is intended to be the definitive work on the Merchant Site.

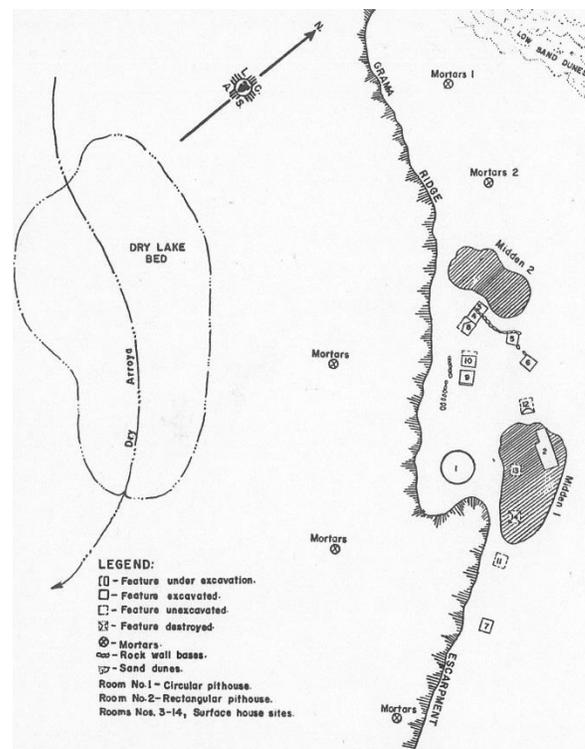


Figure 7. This sketch map of the Merchant Site shows its layout circa 1965.

**A Reference Book: Prehistoric Plant Utilization in Southeastern New Mexico**  
**SWCA Environmental Consultants**

This project is to produce a reference book describing plant utilization by the prehistoric populations living in what is now southeastern New Mexico. The booklet will be suitable for use by the professional archaeological community as well as the general public. The book will be illustrated with color photographs of the identified plants and maps

showing the distribution of plants found in an archeological context. The text will describe the uses of the plants, primarily based upon ethnographic and historic accounts, the time of the year that the plants mature, or the time that the fruit ripens or the probable time of the year each plant was harvested and/or used.

**Lidar Aerial Survey of the Azotea Mesa, Box Canyon, and Upper Rio Felix Study Areas, Chaves, Eddy, and Lincoln Counties, New Mexico**  
**Statistical Research, Inc.**

This is an archaeological survey using Lidar (Light Detection and Ranging) technology of three localities located west and northwest of Carlsbad, New Mexico. The Azotea Mesa study area is approximately 54 square miles, the Box Canyon study area is 64 square miles and the Upper Rio Felix study area is 254 square miles in size. These study areas encompass complete drainages, including named and unnamed tributaries to the Rio

Felix, Box Canyon, and the West Fork Little McKittrick Draw. The study areas also include portions of other stream basins that will produce partial data for those drainages. The intent of the survey is to identify locations of rock ring middens, above ground doughnut-shaped heaps of burned rocks that resulted from roasting (primarily) plants, such as mescal (*Agave neo-mexicana*).



Figure 8. A sample image from the Azotea Mesa Lidar data showing rings found at the juncture of a side arroyo in the Boyd's Canyon drainage.

## PERMIAN BASIN PROGRAMMATIC AGREEMENT SMALL GRANTS PROGRAM

Initially administered by the BLM, a small grants program is now funded by the PA in cooperation with the Historic Preservation Division of the New Mexico Department of Cultural Affairs. In the recently completed round grants up to an amount of \$15,000 were awarded for projects that were

completed during the period from July 1, 2013 to May 15, 2014. The intention of these grants is to fund projects that are restricted in scope and the number of researchers involved, but that contribute important information or that promote public appreciation of the archaeology of southeastern New Mexico.

### **Berino Paleosol, Late Pleistocene Argillic Soil Development on The Mescalero Sand Sheet in New Mexico**

2012

Stephen A. Hall and Ronald J. Goble

**The focus of this project was to use Optically Stimulated Luminescence dating to determine the geochronology and paleoenvironment of the Berino Paleosol.**

The Berino paleosol is the first record of a directly dated Aridisol in the American Southwest where paleoclimatic conditions during the time of pedogenesis can be estimated. The noncalcareous, argillic paleosol formed in eolian sand during the cool, wet climate of the mid- and late Wisconsin, marine isotope stages 3 and 2, in presently semiarid southeastern New Mexico. Optically stimulated luminescence dating of the Mescalero sand sheet and the Berino indicates that soil formation occurred during the period 50-18 ka. The paleosol is a red 2.5YR hue Bt horizon, 120 cm thick, with 25% clay, 0.36% Fe, and an absence of visible carbonate. It is buried by younger eolian sand, although at the edges of the sand sheet, it is unburied and a relict soil. Red argillic paleosols in other sand sheets in the region may correlate with the Berino. The Berino paleosol is formally named as a pedostratigraphic unit.

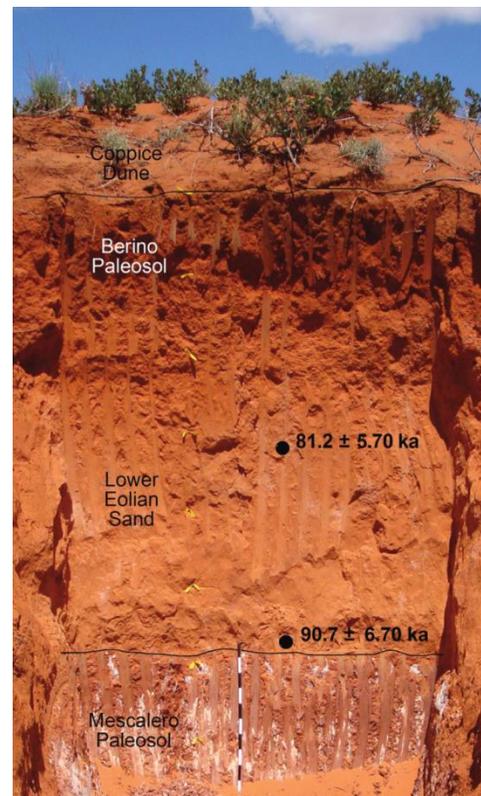


Figure 9. A soil column showing the relationship of the upper Berino Paleosol to the lower Mescalero Paleosol.

## **Investigations at LA 143472: An Unusual Village in Southeastern New Mexico 2011**

**Tim Graves and Mark Willis**

**This research project involved investigation and testing of an unusual village site atop Guadalupe Ridge in Eddy County New Mexico.**

This research project was conducted on a site situated on Bureau of Land Management (BLM) lands and State of New Mexico Lands. Extensive aerial photographic documentation of the site was made to assist in identifying possible structural remains. The site contains twenty-five possible structures, consisting of circular or semi-circular rock alignments, with at least nine that are located on the BLM portion of the

site, with the remainder located on State of New Mexico lands. The presence of unusual rock structures in a unique and strategic location in southeast New Mexico, as well as more than 100 burned rock ring midden features with chronological and subsistence remains that date back to the Middle Archaic period, indicates the site is unique to the region and can provide significant data regarding prehistory.

## **Detection of Buried Archaeological Features in the Mescalero Sand Plain Using Geophysical Survey Methods**

**2014**

**David Maki, Joshua Feinberg, Julia Palmquist and Michael Tomiak  
Archaeo-Physics, LLC and University of Minnesota**

**The objective of this investigation was to assess the effectiveness of non-invasive geophysical methods in detecting and mapping buried archaeological features in the Mescalero sand plain.**

The study focused on magnetic survey methods as this is traditionally considered one of the most reliable and cost effective methods of archaeological prospection in North America. Five precontact archaeological sites were investigated by magnetic field gradient survey. One of these sites was also investigated with ground penetrating radar. The five sites all had at least one known feature within the survey area.

The plan was to observe the magnetic signature over known features then search the data for magnetic anomalies with similar characteristics as these would likely represent buried features

Examination of the magnetic field gradient

survey results showed that none of the six known features created a detectable magnetic anomaly. The magnetic survey results did identify numerous high intensity magnetic anomalies, often in close proximity to known archaeological features. The source of these intense magnetic fields was suspected to be lightning induced remnant magnetization (LIRM).

Sand and burned caliche samples were collected from the six known features, and control samples of unmodified sand and caliche were also collected from each individual site. Additionally three samples of unburned caliche were collected from suspected lightning strike locations.

Our analysis showed there was very little contrast in magnetic susceptibility between samples from the archaeological features versus the surrounding soils. What little contrast there was tended to be negative, that is the features had lower magnetic susceptibility values than surrounding soils (and hence contained less magnetic material). This is the opposite of what is normally observed at sites in more temperate regions, where a positive anomaly is associated with hearths due to the formation of the mineral magnetite during heating of soils with more iron-rich organic material. The negative contrast between the features and the surrounding natural soils in the Mescalero Plain was too small to create a detectable magnetic field, and this is the reason the features were “invisible” to our magnetic gradiometer.

Testing also detected elevated magnetic remanence in samples of burned caliche collected from archaeological features. These are examples of thermoremanence acquired when the samples cooled after being heated in archaeological hearths or were used as boiling stones. Some of the burned caliche samples from features displayed a multicomponent demagnetization path that was inconsistent with other forms of remanence). We interpret these multicomponent demagnetization paths as evidence that certain caliche blocks were reheated, possibly multiple times, as parts of hearths or as boiling stones. Future research may exploit these characteristics to examine the “use history” of caliche stones (for example, to establish a minimum number of times that a stone has been heated), or to determine the age of last heating using paleomagnetic field intensity methods.

Six magnetic anomalies were identified as possible archaeological features and tested by BLM staff archaeologists. Five of these tests were negative, but data from one site was promising. Ground penetrating radar at one site was more promising. Although testing of

this site will require an effort beyond the scale of the current research, initial results suggest faint patterning that may be cultural in origin. Very careful ground truthing utilizing methods of micromorphology, grain size analysis, and detailed plan view and profile mapping is recommended.



Figure 10. Two examples of remote sensing at sites in the PA area are shown. Collecting data for the magnetic field gradient survey (top photo) and using ground penetrating radar (bottom photo).

**Survey and Documentation of Four Rock Art Sites in Eddy County, New Mexico  
2014**

**Lawrence L. Loendorf, Laurie White, Mark Willis, and Myles R. Miller  
VERSAR/Geo-Marine Inc.**

**The current study is part of an ongoing research program to document and interpret the rock art of the Guadalupe Mountains, the southeastern plains of New Mexico, and the greater Jornada Mogollon and Trans-Pecos regions.**

Four sites, Walt Canyon, Boyd's Cave, Ruby Canyon, and the Roney Site, with 29 panels of rock paintings were recorded during this project. Twenty-eight of the panels contained only abstract motifs; some of which had only two or three elements on the panel while others have more than 30 elements. The only panel with a representational figure is an eroded black quadruped suspected to represent a deer and a partial anthropomorph. While this panel is noteworthy, the overwhelming numbers of abstract images are more significant when trying to understand the sites.

Rock art archaeologists generally accept that abstract forms are older. Across the desert west, from South Dakota to Nevada, curvilinear and rectilinear abstract petroglyphs dominate the Archaic period. The same is true in the Carlsbad region for the abstract Chihuahuan Polychrome-style. The abstract painting of Ojos de Chuisca and Cueva de las Monas in central Chihuahua are the same as abstract painted sites in Hidalgo, Luna and Eddy counties in New Mexico. This large number of sites across a wide region of pecked petroglyphs and painted pictographs

are relatively solid evidence for an Archaic-age tradition of making abstract rock art figures. At the same time, the four sites recorded during this project are made up almost exclusively of abstract figures, but they are thought to date to the Formative period.

These four sites, plus a group at Fort Bliss, combine to form a type of rock art that should be recognized as Jornada Abstract. Although there are no radiocarbon dates for the sites, ceramics and projectile points at Ruby Canyon suggest it is a Formative age site. The other sites are dated by exhibiting comparable motifs to those on ceramics. The designation of a Jornada Abstract *descriptive type* rather than a style is based on previous research with rock art nomenclature, where descriptive type is used to group together similar motifs that are not well dated or do not have a well contained distribution. A major research goal for the future is to resolve why there are sites where nearly all of the figures are abstract when representational forms are made at the same time at nearby sites.

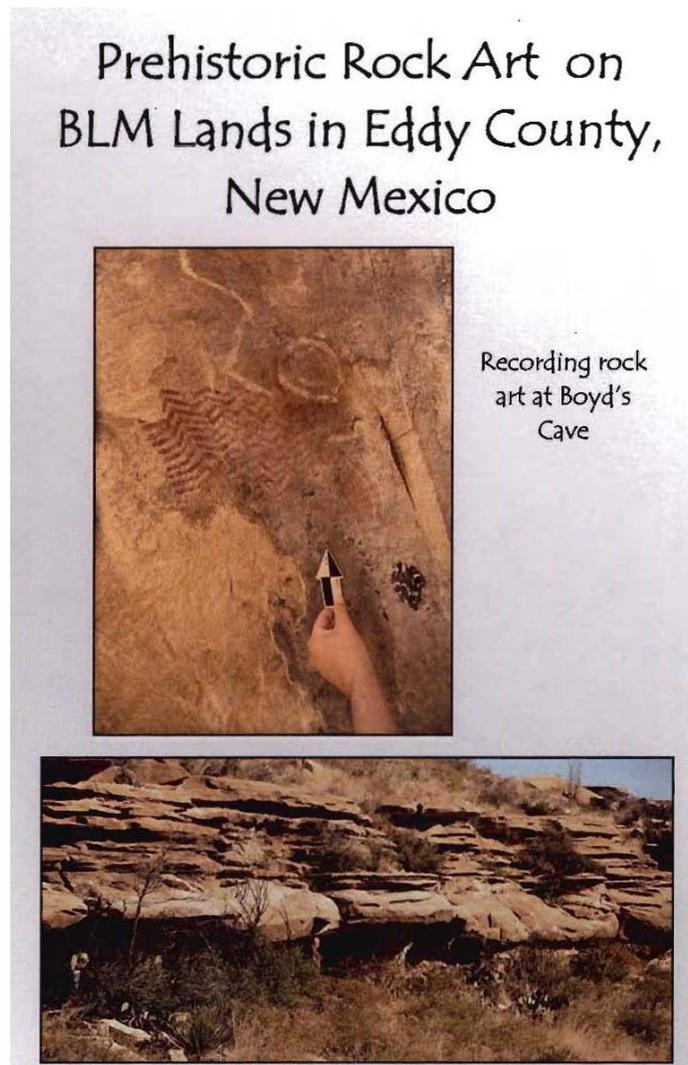
**Prehistoric Rock Art on BLM Lands in Eddy County, New Mexico  
Versar/Geo-Marine Inc.  
2014**

Available from the BLM New Mexico Office website <http://www.blm.gov/nm/st/en.html>  
or as a paper copy from the BLM Carlsbad Field Office.

**This is a booklet developed from the report Survey and Documentation of Four Rock Art Sites in Eddy County, New Mexico.**

This illustrated booklet is a summary of the report with its evidence and major conclusions. It is designed for public distribution.

Figure 11. The booklet *Prehistoric Rock Art on BLM Lands in Eddy County, New Mexico* is available online at [www.blm.gov/nm/st/en.html](http://www.blm.gov/nm/st/en.html).



**Compositional Analysis, Nutt Mountain Obsidian Source, Sierra County, NM  
2014**

**Jeff Ferguson  
Research Reactor Center University of Missouri-Columbia  
And  
M. Steven Shackley  
Geoarchaeology XRF Lab**

The primary goal of this project was to collect source samples from the Nutt Mountain obsidian source near Hatch, NM, and establish compositional data in order to identify archaeological specimens produced from this obsidian.

The Nutt Mountain obsidian source appears to be a part of and at the southern edge of the 300 km diameter Mogollon-Datil Volcanic Province, a 35-17 ma volcanic province in southwestern New Mexico that through a number of caldera events produced rhyolite and obsidian including major archaeological obsidian sources at Mule Creek, Gwynn/Ewe Canyons in the Mogollon Mountains. These sources are prominent in archaeological contexts from Paleoindian to historic period sites throughout the North American Southwest, although there is little documented use of the Nutt Mountain obsidian specifically.

A small previous study by Steve Shackley identified a compositional similarity between Nutt Mountain and Gwynn/Ewe Canyon sources, so an additional source visit was incorporated into this project. The collection and analysis of source samples from Nutt Mountain, Antelope Creek, and Gwynn/Ewe Canyon sources confirmed earlier

observations by Shackley that these three sources are difficult to chemically differentiate using XRF (X-ray fluorescence), particularly without the analysis of barium. Given the similarity of all three sources, it is clear that the Nutt Mountain source will not account for any previously analyzed samples from the American Southwest that remain unassigned. Most likely, any Nutt Mountain samples would be provisionally assigned to either Gwynn/Ewe Canyon or Antelope Creek. This project analyzed 134 samples by XRF and 38 samples by NAA (Neutron Activation Analysis).

The Nutt Mountain source was certainly used prehistorically, but the small size nodule, relatively low local population throughout most human occupation of the southwest and comparatively much more attractive obsidian from other sources (particularly Mule Creek) suggest that it was rarely used. Most obsidian was probably procured as a secondary resource when the primary target was the local dacite or chalcedony.

## **Understanding Sources of Variability in Brownware Ceramics from Southeastern New Mexico**

**2014**

**David Hill**

**APAC**

**The goal of this project was to identify possible sources of undecorated ceramics, referred to as “Brownware.” These are common artifacts found on archaeological sites in Southeastern New Mexico.**

This project studied potsherds collected from five sites in the vicinity of Carlsbad and Artesia, which were termed “Lowland Sites” and compared them to sherds obtained from four excavated sites located over 100 miles to the west, which were termed “Upland Sites.” This research was a pilot study to evaluate the success of different methods to categorize brownware sherds.

The analysis relied on a visual classification of

a study sample of 80 sherds, coupled with thin section petrographic, and Instrumental Neutron Activation Analysis (INAA) studies of the same sample. It was intended to answer two questions: Is it possible to visually identify brownware ceramics that share a common mineralogical and chemical composition? and “How do ceramics that have been identified as originating from different sources correspond to the different

typological classifications that have been applied to brownware ceramics in southeastern New Mexico?” Another topic of research was to compare the physical attributes of brownware ceramics with the results of thin section petrography and INAA to determine the sources of those ceramics. It may be possible, by monitoring visual attributes of brownwares, to identify ceramics from different regions and place individual sherds in previously established ceramic types. The result of the current study found that potentially all of the brownware ceramics recovered from the Carlsbad area represent vessels that were made outside that area. In many cases vessels would have been transported distances of greater than 100

miles from their potential sources of manufacture. However, when comparing data from chemical and mineralogical data with typological analysis it was not always possible to distinguish the origin of a particular sherd based on physical attributes alone. Even when typed by archaeologists who have extensive backgrounds in the classification of brownware ceramics in southeastern New Mexico, their classifications did not always correlate with source data derived by analytical techniques. There are also discrepancies between chemical and mineralogical data that make the use of a single technique to assign a particular sherd to a specific source problematic as well.

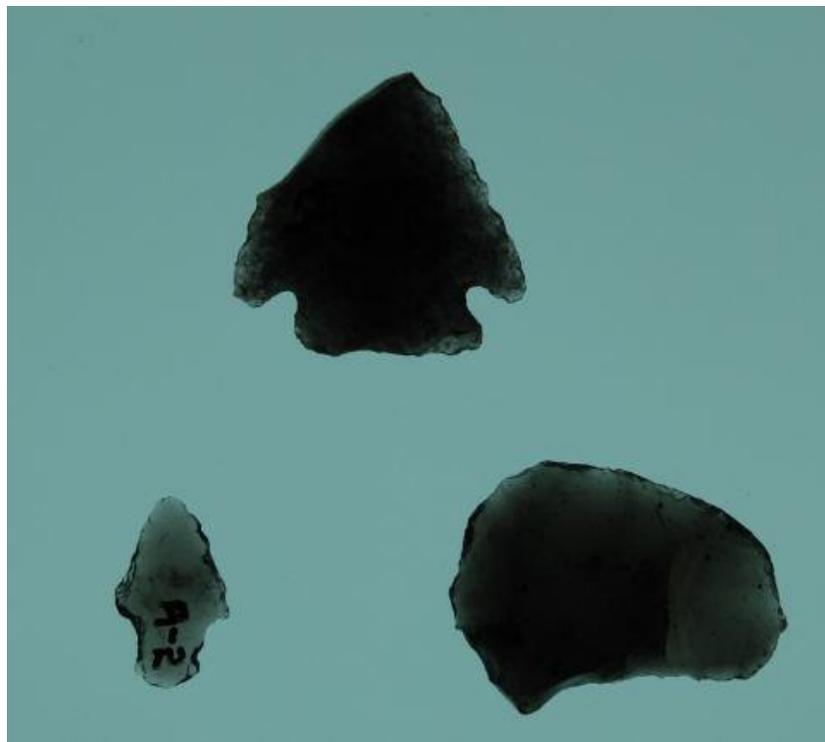


Figure 12. Obsidian points and a biface from the PA Area. Most of the obsidian found in the PA Area has been sourced to the Valles Caldera located in the Jemez Mountains northwest of Albuquerque.



