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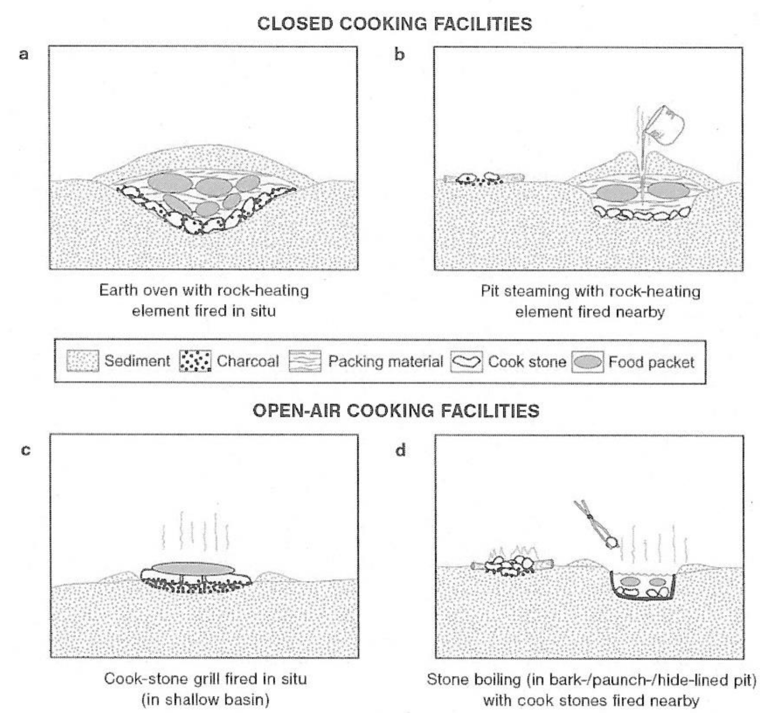

Figure 8.1. Examples of generic cook-stone facilities typical of those used in western North America: (*a*) closed earth oven with a fire-in-situ rock heating element, (*b*) closed steaming pit with cook stones heated outside the pit, (*c*) open-air hot-rock griddle, and (*d*) stone-boiling pit and surface fire for heating cook stones (from Thoms 2007:485, Figure 2).

These illustrations show four different cooking methods that produce burned rocks as a by-product. Burned rock is the signature artifact of an archeological site within the Permian Basin Programmatic Agreement Area in southeastern New Mexico. Read more about burned rock and its usefulness to people inside this newsletter.

Introduction to the Permian Basin Programmatic Agreement (PA)

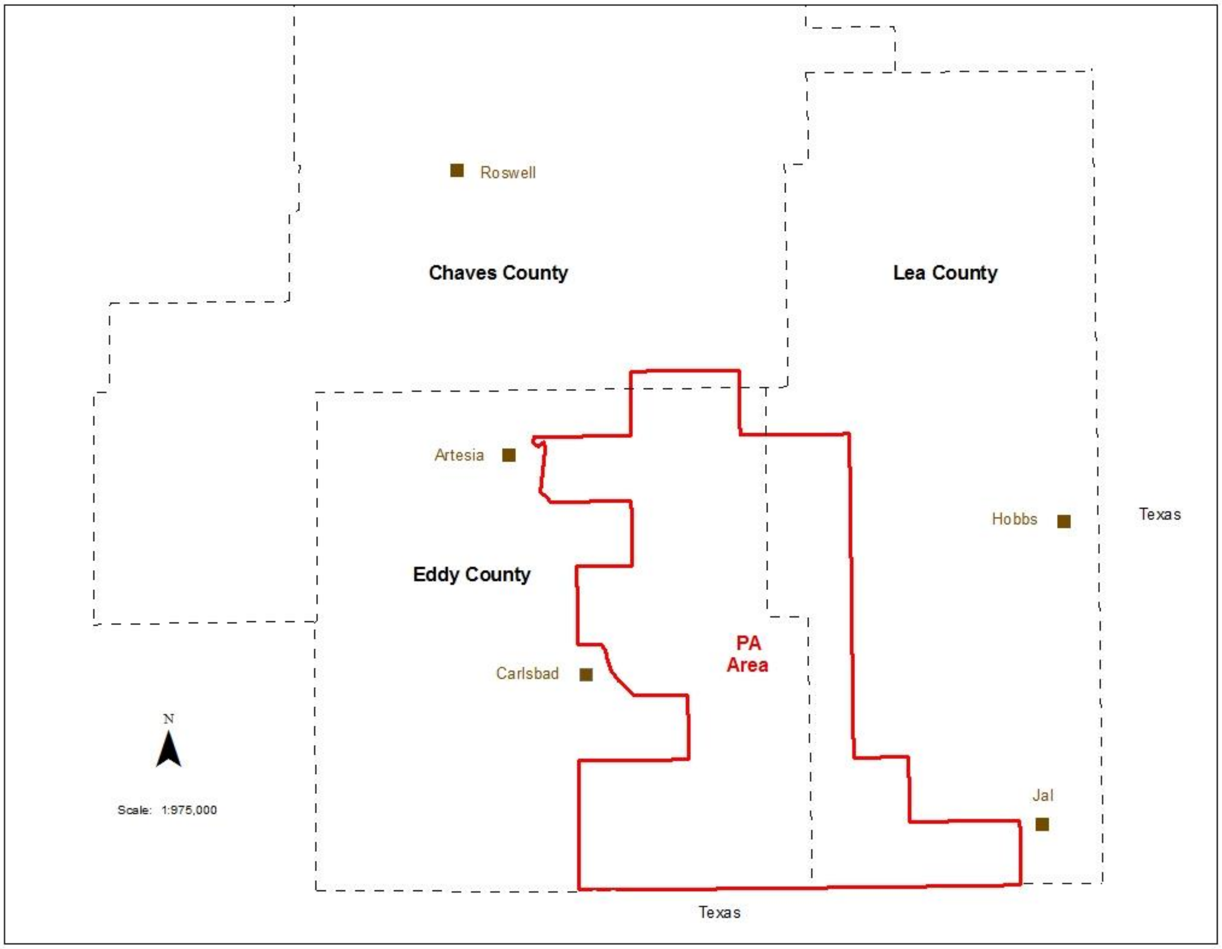

Figure 1. Map showing the Permian Basin PA Area.

The Permian Basin Programmatic Agreement (PA) is an alternate form of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, that is offered to the oil and gas industry, potash mining companies, and for other industrial projects located in southeastern New Mexico. The PA can be used for federal projects located on Bureau of Land Management (BLM) land or BLM sponsored projects located on private property. Originally begun as a Memorandum of Agreement (MOA), it was extended for a period of three years in April 2013 as a Programmatic Agreement (PA) and the PA was further extended for a period of 10 years beginning in May 2016. The PA area is located partially in Chaves, Eddy, and Lea counties. Proponents of projects within the PA area may contribute to a dedicated archeological research fund in lieu of contracting for project specific archeological surveys, provided their proposed projects avoid recorded archeological sites. This dedicated fund is used to study the archeology and history of southeastern New Mexico.

Current PA News

Research Update

Burned rock consisting of cobble-size pieces (64 mm to 256 mm) of locally available bedrock – caliche, sandstone, limestone, or dolomite – is the ubiquitous hallmark of a prehistoric site in southeastern New Mexico. Burned rock may sometimes be found in quantity, heaped into large doughnut-shaped piles, termed rock ring middens that represent continued use of a location through time to bake edible plants. To gauge the extent of rock used in features such as these, a sample of 66 burned rock middens that was excavated within training areas at Fort Bliss, Texas included counting and weighing the rocks present in the excavation units. These counts and weights were then extrapolated to the full extent of each of the features. These 66 plant baking features contained an estimated 179,525 kg (394,955 pounds or 197 US tons) of rock that had been transported from alluvial and colluvial gravel deposits or bedrock exposures. Further consideration of the 66 burned rock middens indicate they represent 12 percent of a total of 546 middens recorded in 28 sites. These 546 middens produced a total estimate of 1,496,042 kg (3,298,208 pounds or 1,649 US tons) of rock that were used in these features (Miller et al:2013:337). Hundreds of ring middens, similar in size and with some even larger, are commonly found within the Carlsbad Field Office (CFO) boundaries.

Burned rock may also be found in smaller quantities and in association with soils, stained black with carbon, that represent the remains of smaller roasting pits. Still other burned rock has been eroded from its primary context in the soil and it lies on the ground surface, sometimes as a pavement of rocks or at other locations as small scatters. These smaller roasting pits and eroded rocks have not been routinely counted or weighed, but in aggregate they would undoubtedly produce equally large numbers as the rock ring middens. Recording and interpreting burned rock in all its forms has been a continuing challenge for archeologists, particularly burned rock that has eroded from its primary archeological context. Recording and interpreting burned rock was addressed, among other topics, in the most recently completed Permian Basin Programmatic Agreement report entitled, *Camping and Hot-Rock Cooking: Hunter-Gatherer Land Use in the Southwest Pecos Slope*s, by Monica Murrell, Phillip Leckman, and Michael O'Connell of Statistical Research, Incorporated.

This project examined a stratified sample of 42 prehistoric sites located in the Southwest Pecos Slopes physiographic region of the field office and it was the first effort to study these sites in depth. Sites in the study area are generally small in size, contain few artifacts, and are generally interpreted to represent short-term camping locations of hunter-gatherers, created as they moved across the landscape. Basic questions were asked in the research design, as befitted this initial study. When were the sites occupied? Can a typology of sites be determined? Are there patterns in the distribution of the sites across the landscape or through time? Answers to these questions and others came from information gathered during the archeological work. The Transect Recording Unit (TRU) survey method provided a consistent means of site recording and measurement that facilitated making comparisons between and among sites. Small-scale excavations of features, such as hearths and roasting pits, provided charred material samples useful for obtaining radiocarbon dates and for the identification of plants used for fuel or food. Analysis of the stone tools, or stone debitage left from tool making, at each of the sites provided information on the types of stone used and their origins.

The goals of the project were several and included the following:

- the creation of a chronological framework based upon radiocarbon dates;
- the definition of a site typology for the study area;
- the elucidation of a settlement pattern or patterns for the study area;
- determining the function and chronological placement of small sites containing five or fewer artifacts and three or fewer fire-cracked-rock features;
- the creation of criteria for feature definitions;
- an examination of the patterns of lithic procurement, reduction, transport, use and discard;
- the identification of rock formations or formation members within or adjacent to the study area that potentially could provide sandstone, limestone, or dolomite for ground stone tools;
- the initiation of a ground stone tool typology for the Carlsbad Field Office;
- an evaluation of the importance of a site's physical integrity in the application of "Criterion d. That have yielded or may be likely to yield information important in history or prehistory." to determine site eligibility for listing on the National Register of Historic Places (NRHP);
- the definition of research questions specific to the study area and data needed to answer the questions that will form the basis for evaluating individual sites or groups of sites for their eligibility to be listed on the NRHP under "Criterion d. That have yielded or may be likely to yield information important in history or prehistory."
- the definition of the relationship between the research questions specific to the study area and the research questions contained in the *Southeastern New Mexico Regional Research Design and Cultural Resource Management Strategy.*

The report met all these goals and it will provide a useful beginning point for future studies in this region, as well as a valuable source of comparative information to complement studies undertaken elsewhere in the Permian Basin area. A review of the project goals indicate there are a number of interesting topics in the report that may be discussed, but this article will focus on the report's conclusions about the use of stone for cooking.

The Southwest Pecos Slopes region is characterized by large areas of outcropping limestone and gypsum forming an area of gentle slopes situated between the Guadalupe Ridge and Reef Escarpment and the Pecos River. Bedrock within the study area is composed of the Permian-age Castile formation consisting of anhydrite, gypsum, and small amounts of halite, dolomite, and sandstone. This formation outcrops in a broad belt south and southeast of the Black River. Limestone beds occur in the Castile Formation and in outcrops near the Yeso Hills, and locally, dikes and pipes of brecciated limestone have formed with collapse, flow, and replacement brecciation, as common features (Kremkau, et al. 2013:9).

The landscape within the study area is primarily formed by erosion. Most of the study area has shallow soils 10 to 14 inches (25 to 35 cm) deep. Some soils are described as "stony" or "rocky" and areas of exposed bedrock are common. In the eastern portion of the study area soils can be 32 inches (81 cm) deep, but some of these deeper soils occur in swales or the bottoms of draws and these are not suitable locations for habitation sites. The major soil type in the study area is the Reeves-Gypsum land complex,

Figure 2. A view of the landscape within the Southwest Pecos Slopes.

0 to 3 percent slopes, which is distributed across approximately four-fifths of the study area. This soil complex consists of Reeves loam, 0 to 1 percent slopes, which occurs in pockets, swales, and drainageways at depths of less than 14 inches (36 cm) and Gypsum land that consists of gypsiferous rocks and earths and very shallow soils, but sometimes in pockets up to 10 inches (25 cm) thick. Fine to coarse gypsum crystals are common on the surface of barren areas. Portions of the study areas have Gypsum land-Cottonwood complex soils, 0 to 3 per cent slopes. This complex consists of very shallow soils and barren gypsiferous rocks. Sinkholes are common, but they do not contain water. The balance of the soils is in the Ector, Reeves, and Reagan series. Ector series are very-shallow to shallow, well-drained, calcareous, stony, and extremely rocky soils. Bedrock is exposed in many places. Reagan series soils are deep, well-drained, moderately dark colored, calcareous loams developed in old alluvium derived from calcareous, sedimentary rocks of the uplands; while Reeves soils are light-colored, well-drained, calcareous soils that are shallow to moderately deep over gypsiferous earths or rocks (USDA 1971).

The descriptions of the geology and soils make it clear that rocks are abundantly available on the landscape in modern times and they were probably abundant in the past. The generally thin soils mean that many archeological sites will not be deeply buried and that is what the report notes:

> *The results of the small-scale excavations across the Southwest Pecos Slopes indicated that feature preservation was very low overall. However, that was not unexpected among the small variety of open-air sites typically composed of informal, ephemerally used features characteristic of the study area. The situation was compounded by the overall lack of surface deposition across*

the study area, which has resulted in the exposure and weathering of archaeological manifestations for hundreds and potentially thousands of years. This circumstance is similar to conditions in much of the PA region, especially within the dynamic sandsheet and dunal environments formed on the Mescalero Plain (Murrell et at 2018:8.8)

The researchers were thus presented with a familiar scenario in the Permian Basin and a question: How can you maximize data recovery from small sites that have been degraded by erosion? In the Southwest Slopes study part of the answer was to work with what was available – burned rock – and to put it into a context that would make its use understandable and allow its study to contribute partial answers to larger questions about the prehistory of the area.

Figure 3. An example of a burned-rock midden or earth oven as it appears on the ground surface.

During the last 20 years archeologists have investigated hot-rock-cooking methods and collected ethnographic accounts of hunter-gatherer subsistence practices to better understand this technology. One advantage of hot-rock-cooking is that rocks can hold heat generated by fast-burning fuels, such as saltbush or mesquite, commonly identified in southeastern New Mexico site features, allowing for a wider range of foods to be prepared. The report discusses cooking technologies.

Earlier overviews by Thoms (2009:577) centering on earth-oven technology further distinguished between a small variety of closed and open-air cook-stone facilities (Figure 8.1). Among these various feature types are four distinct cooking technologies that consist of (1) roasting or grilling in open-air pits with stone-heating elements; (2) baking with stone-heating elements in closed pits and mounds; (3) steaming with stone heating elements, fired in situ or elsewhere, in closed pits and mounds; and (4) stone boiling in open pits and non-ceramic vessels with stones heated on nearby surface hearths or fires. Each of these cookstone facilities vary considerably in construction technique, size, morphology, and rock type (Thoms 2009). Thoms (2009) also posited a chronological trend in the use of these distinct technologies through time, based on land-use intensification, technological shifts, and agricultural intensification (Murrell et al 2018:8.1). [Editor's note: Figure 8.1 is illustrated on the cover of this newsletter]

The authors proposed a set of feature-definition criteria, including size, morphology, and associated elements in an attempt to distinguish unique feature types.

Implicit in these types is a more-well-defined suite of morphometric attributes that can be used to further distinguish technological aspects of hunter-gatherer cooking technology and provide a richer interpretative potential across the study area. It is important to recognize that some evidence of specific behavioral activities, such as concentrations of FCR/BC [fire-cracked-rock/burned caliche] *with associated shallow carbon-stained or oxidized sediment, may be difficult to distinguish as roasting pits vs. evidence of shallow cook-stone heating pits. Furthermore, factors such as raw-material availability and breakage as a result of heating also greatly influence the size distributions of FCR/BC. Thus, roasting pits and hot-rock heating pits may be more appropriately subsumed into a single FCR feature type in the absence of more detailed analytical data. Presently, these features are distinguished in the definition criteria solely by the size and density of associated FCR/BC elements. The results of small-scale feature excavations provided important evidence as to whether these expectations bear out for the Southwest Pecos Slopes study area. It is important to note that the exact detail of feature interpretation regarding these functional types may implicitly rest in the level of investigation and specialized analysis conducted at a given site, and it is identified by the totality of evidence suggestive of the range of activities that took place in a specific area. Additionally, poor preservation resulting from deflation and the prevalence of these types of features contained within an unconsolidated sandy matrix further hampers our understanding of feature construction. The level of implied behavioral inferences within the proposed feature types are specifically fashioned to avoid ambiguous or overlapping feature types, as indicated by Thoms' (2008) definitions, in which he also readily pointed out issues of equifinality in hot-rock-cooking technology.*(Murrell et al 2018:8.5).

Table 1 below indicates the criteria used to distinguish the different features. Expanded remarks about the feature types follow the table:

Table 1. Proposed Feature-Definition Criteria (after Murrell et at 2018, Table 8.2)

Feature Type	Size Characteristics	Construction and Fill	FCR/BC Elements (a)
Thermal feature/hearth	<1 m maximum dimension; 0.2-0.45 m deep	shallow unprepared pits filled with charcoal and ash-laden sediments	none
Hot-rock discard	<2m in maximum dimension; no depth	surface concentration or scatter of hot-rock cooking elements; no evidence of any depth and lacks charcoal or ash-laden sediments	<100 medium-sized to small elements that typically lack sooting
Hot-rock feature	<1.5 m in maximum dimension; 0.2 m deep	concentration of FCR/BC contained within a shallow pit; filled with charcoal flecking and ash-laden sediments	<10 medium-sized to small; may exhibit sooting
Roasting pit	<1.5 m in maximum dimension; 0.2–0.5 m deep	concentration of FCR/BC contained within and resting over a lens of charcoal and ash-laden sediments	<100 FCR/BC elements; large to medium-sized, sometimes flattish rocks;may exhibit sooting
Steaming/boiling pits	<1 m in maximum dimension; 0.3–0.45 m deep	basin-shaped or vertical wall pits lined with FCR/BC or clay partially filled with FCR/BC; no charcoal or ash-laden sediment	<50 medium-sized to small (<25 cm); lack evidence of sooting
Earth ovens	>1.5 m in maximum dimension; 0.1–0.3 m deep	Dense concentration of FCR/BC contained within a pit that may be rock lined; underlain by and intermixed with oxidized, carbon-stained, and ash-laden sediments; oftentimes called an FCR midden	>150 medium-sized to small; fragmented and often carbon sooted
Ring middens	>1.5 m in maximum dimension; >0.1 m deep	dense concentration of FCR/BC mounded around a central pit; underlain by and intermixed with	yes, >150 medium-sized to small; fragmented and often carbon sooted

Table 1. Proposed Feature-Definition Criteria (after Murrell et at 2018, Table 8.2)			
Feature Type	Size Characteristics	Construction and Fill	FCR/BC Elements (a)
		oxidized, carbonstained, and ash-laden sediments; represents a specialized earth-oven feature	
Key: BC = burned caliche; FCR = fire-cracked rock. (a) Rock sizes: large rocks > 25 cm in diameter; medium-sized rocks = 10–25 cm in diameter; small rocks <10 cm in diameter			

Small stain features measuring 1 m in diameter or less that lack any evidence of associated FCR/BC representative of hot-rock-cooking elements are most accurately characterized as hearths. Although the absence of artifacts may call in question the cultural origin of such features, typically root burns or other in situ, noncultural burning events exhibit linear characteristics. Features previously classified as FCR/BC concentrations lacking any evidence of carbon-staining fall into the category of hot-rock discard piles or cleaning events. Hot-rock discard piles encompass smaller feature types, typically measuring 2 m or less in diameter, to avoid being confused with a larger and higher-density concentration of FCR/BC, sometimes referred to as FCR middens.

Features previously categorized as FCR/BC concentrations with stains may be classified as one of two possible feature types, based on the size and density of associated FCR/BC. Each of these features consist of smaller FCR/BC concentrations, typically measuring less than 1.5 m in diameter, encased in and resting upon a thin lens of carbon-stained, ash-laden, or oxidized sediments. However, FCR/BC features with stains that incorporate a layer of larger FCR/BC are more akin to shallow open-air roasting pits or surface griddles, whereas smaller FCR/BC concentrations with stains that may include only a few scattered, medium-sized to small FCR/BC are likely related to cook-stone heating pits. Steaming and boiling pits are expected to consist of basin-shaped or vertical-walled pits measuring less than 1 m in diameter and exhibit rock or clay-lined walls with associated FCR/BC; the lack of available bark in this region would preclude the use of bark lining. The specialized nature of these types of pit features may preclude identification in the absence of detailed excavation data. Earth ovens and ring middens representative of baking activities are expected to measure greater than 1.5 m in diameter and consist of dense concentrations of smaller to medium-sized FCR/BC exceeding 150 heating elements. Ring middens are distinguished from earth ovens solely based on the presence of circular berms of FCR/BC elements oftentimes surrounding a central pit; however, these features are technologically indistinguishable (Murrell, et al 2018:8.7).

The authors then applied these criteria to 137 features located at 37 of the sites included in the project. Note that ring middens are located within the project area, but they were specifically excluded from this project. The ring middens will be examined in a future project devoted to their study.

Roasting pits were the most numerous (102 features), consisting of 77 percent of the total, followed by earth ovens (17 each) comprising 13 percent. Four features (3 percent) were placed in an indeterminate roasting pit/earth oven category. Hot-rock discard locations numbered six or 5 percent of the total. Two were categorized as hot-rock heating features. Most interesting were two features that were interpreted as "stone boiling in a container" features. These last two categories each comprised 1 percent of the total.

Figure 4. A bisected open-air roasting feature at LA 145582 that produced gelatinized starch remains. The scale is 25 cm or almost 10 inches long.

The stone boiling in a container features were located at sites LA 145582 and LA 174278. These fire-cracked-rock (FCR) features resembled open air roasting pits, but analysis of the FCR found gelatinized starch remains suggestive of stone-boiling. Neither of the features contained a formally constructed boiling pit, such as bark- or clay-lined steep- or vertical-walled pits lacking carbonized materials. It is most likely that the gelatinized remains resulted from either stone boiling in a container or direct-container-boiling, with a ceramic vessel sitting directly above a fire or bed of coals and hot-rocks. An historical observation made by the A.D. 1527 Spanish castaway Cabeza de Vaca described bison hunters in northern Mexico cooking food by heating stones that were then placed in a water-filled gourd (Murrell et al 2018:8.17).

As the authors have noted above, the level of the investigation can enhance feature interpretation and in order to add evidence to the interpretation of the features ancillary studies were undertaken including macrobotanical studies of floatation samples, along with starch and phytolith analysis.

> *The assortment of botanical evidence collected and analyzed from the sampled features provided varying degrees of information linked to the use and types of plants cooked within these features. Macrobotanical remains identified from the flotation samples predominantly consisted of fuelwood, including both shrubs and arboreal remains of mesquite, creosote bush, saltbush, and juniper. Thus, it is probable that many of the small, open-air cook-stone features may have been used for cooking meat. However, in a few instances, preserved succulent-plant remains including yucca and/or agave were identified in association with four of the investigated features at LA 161928, LA 174793, LA 176255, and LA 183708 (Table 8.4; Figure 8.3). Additionally, a monocot leaf and grasses identified in association with Feature 2576 at LA 161928, which also yielded agave, likely reflected vegetal packing materials used to line the baking pit (see Appendix D). The starch-extraction process largely failed to produce residues for subsequent analysis; among the 34 total archaeological and control samples, only 7 yielded starchy remains (see Appendix F). In most cases, FCR from feature fill was also submitted for starch analysis. It is important to note that a few important details were gleaned from the results of the starch analysis. Most significantly, the analysis resulted in the identification of gelatinized starches within the archaeological samples at LA 144582 and LA 174278, in addition to grasses consistent with wild rye or little barley at LA 174278 (Table 8.5).*
>
> *Although the phytolith analysis was considered to be a promising technique that could potentially produce information regarding functional aspects of hot rock features and serve as a proxy for food processing and diet, these results largely reflected the local vegetation community and possible fuelwood (Table 8.6). Even in instances that phytoliths from features were interpreted to reflect fuelwood, similar materials were also identified within the phytolith assemblages analyzed from the corresponding off-site controls. Thus, it is questionable as to whether this particular type of analysis provided results that can be definitively linked to cultural activity. Moreover, succulent plants produce a specific type of calcium-oxalate phytoliths that rarely preserve in open-air settings (see Appendix E). It appears that succulent-plant collecting and processing played a major role in local subsistence patterns within this region. The phytolith studies obtained from the project serve as a far-better proxy for local environmental conditions, but explicit data relating to food processing and diet were not represented within the analytical results and presently remain unclear* (Murrell et al 2018:8.8).

The authors critiqued their studies

> *As would be expected, the greatest degree of ambiguity rests in the functional interpretation of the small FCR-concentration features. The vast majority of the smaller FCR concentrations failed to exhibit attributes that would imply detailed differences in construction techniques (Figure 8.4). Most of these FCR concentrations were characterized as extremely shallow lenses of ashy deposits intermixed with FCR elements that typically lacked clearly definable cross-sections or evidence of intentional placement of hot-rock elements related to feature construction (Figure 8.5). Horizontal displacement of associated cooking stones and a general lack of feature depth further presented the most difficulty in distinguishing between hot-rock discards and open-air*

roasting pits, in that it was challenging to determine whether scattered cooking stones may have once been contained within a shallow lens of carbonized materials that has since weathered away. Thus, hot-rock-discard features may be easily confused with deflated roasting pits, especially in the case of scattered FCR that lacks the association with other thermal features necessary to imply that they reflect true discard piles.

For this reason, assignment of the investigated features to the category of potential hot-rock discards was strictly confined to surface scatters of FCR situated in close proximity to FCR middens, which would most likely imply a potential clean-out event. Most of the smaller FCR features were tentatively assigned to the roasting-pit category based on aspects of feature size and depth that matched with the expected archaeological correlates presented in Table 8.1, in the absence of additional evidence necessary to assign a probable different function. In a single instance, two stains that also included only a few associated pieces of FCR (n < 7) were identified at LA 183664 and may be related to stone boiling activities…

As eluded to above, the most obvious functional difference among the investigated FCR features was between potential open-air surface roasting pits and closed baking facilities consisting of earth ovens (mostly classified as FCR middens in Chapter 5). The primary distinguishing factors between these different cooking facilities rest in both the quantity and the extent of associated FCR and are characterized by more than 150 cooking stones and spread over more than 1.5 m in maximum dimension (see Table 8.2). Most of the FCR middens were characterized by extensive scatters of FCR that extended more than 3 m in maximum dimension and included 200+ associated pieces of FCR. In a few cases, we encountered smaller FCR concentrations containing up to 150 total associated cooking stones dispersed over 1.5 m in spatial extent. Thus, they were classified as potential open-air surface roasting pits in the absence of more-detailed analytical results. It is very likely that some of these features do reflect earth ovens. A single FCR concentration bisected at LA 161928 was manifested on the surface as measuring just under 1.5 m in maximum dimension, with approximately 50 visible associated pieces of FCR, and a similarly sized feature with approximately 100 pieces of surface FCR was bisected at LA 176255. Once the features were bisected, they were found to contain somewhat-well-defined basin-shaped pits that did not extend much beyond 1 m in length and 16–17 cm in depth within the excavated portions (Figure 8.8) (Murrell et al 2018:8.17).

The relatively deep basin-shaped pits identified during the feature bisections were noticeably different in construction from the typical shallow, lenticular deposit of carbonized remains intermixed with FCR that characterized the profiles of the majority of the investigated FCR features. The recovery of agave-plant parts from these smaller features confirmed the use of these pits as earth ovens for baking succulent plants. These results indicated that earth ovens, in and of themselves, exhibit variability in regard to material correlates and construction techniques, ranging from small, single-use pits to extensive FCR and ring middens that reflect multiple-use life histories. Each of the smaller earth ovens that we excavated likely only reflects a single use with a use life of 24 hours or less (Thoms 2009:588).

In sum, the results of the small-scale excavations suggested that there is some degree of overlap in feature characteristics observed among the various hot-rock-cooking facilities that may necessitate more detailed excavation and analysis of associated botanical evidence before a true *function may become clearly evident. This level of observation requires the use of intrusive excavations in order to reveal aspects of feature construction and to recover samples for subsequent analysis. Among the various botanical-analysis techniques used to further distinguish aspects of feature function, macrobotanical analysis resulted in the richest data sets relating to cultural activity. Although the starch analysis only yielded remains from 20 percent of the submitted samples, important information was also gleaned from that analysis, namely the identification of gelatinized masses suggesting that boiling, likely within a container over an open fire, occurred at two of the sites. Feature bisections largely did not reveal detailed differences in*

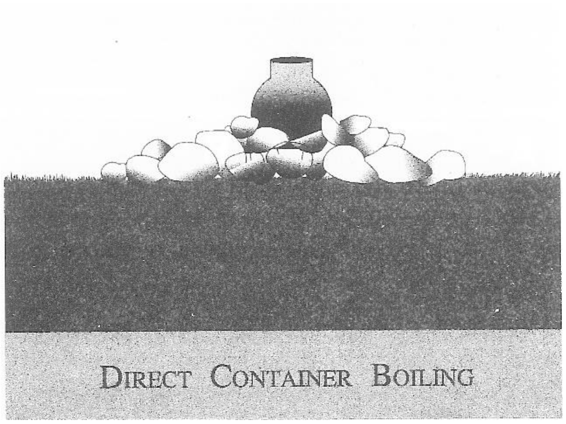

Figure 5. Example of boiling in a container. (from Black et al. 1997:Figure 13).

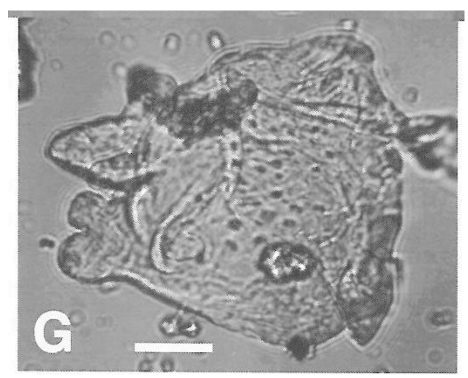

Figure 6. Gelatinized starch mass. Scale is 20 microns.

feature construction among many of the investigated features examined across the study area. The size and quantity of associated FCR remain gross indicators of open-air vs. closed cook-stone facilities. It is this distinction that appears to be of most importance in distinguishing different aspects of hot-rock-cooking technology across the study area, and these functional differences may be initially designated on the basis of survey-level data. However, these types of observations may not clearly distinguish open-air roasting pits from smaller, single-use earth ovens. The results of our investigations warrant additional research. Additional investigations, consisting of targeted excavations and a suite of detailed analyses focusing specifically on the examination of FCR features, may serve to further clarify functional interpretations of the range of hot-rock technologies used across the CFO region. Additional types of residue analyses *conducted on thermally altered rock elements contained within these features, such as lipid and facile residues, may greatly compliment the results of starch and macrobotanical analyses (Murrell et al 2018:8.21).*

Some of the problems encountered in the Southwest Slopes study are common to the Permian Basin PA area and to southeastern New Mexico in general. Included as problems are the extensive erosion of the majority of archeological site locations that result in displaced artifacts and truncated, shallow features. For instance only 80 out of a total of 137 features examined had any depth below present-day ground surface, ranging from a shallow 2 cm (about ¾ inch) to 25 cm (almost 10 inches) for the deepest.

A person may ask if the result of the study is worth the effort of the analysis? The answer is yes! One goal of the Permian Basin PA is to study human adaptation and social organization through time and space within the Permian Basin PA area specifically and within southeastern New Mexico generally. This goal is greatly hampered by the effects of erosion on the sandy soils of the region that destroys the context of features and artifacts within the sites. This study is an initial effort to move beyond the characterization of burned rock in general terms as eroded burned rock scatters. It attempts to see the human behavior behind the presence of the burned rock and to factor out the natural erosional processes.

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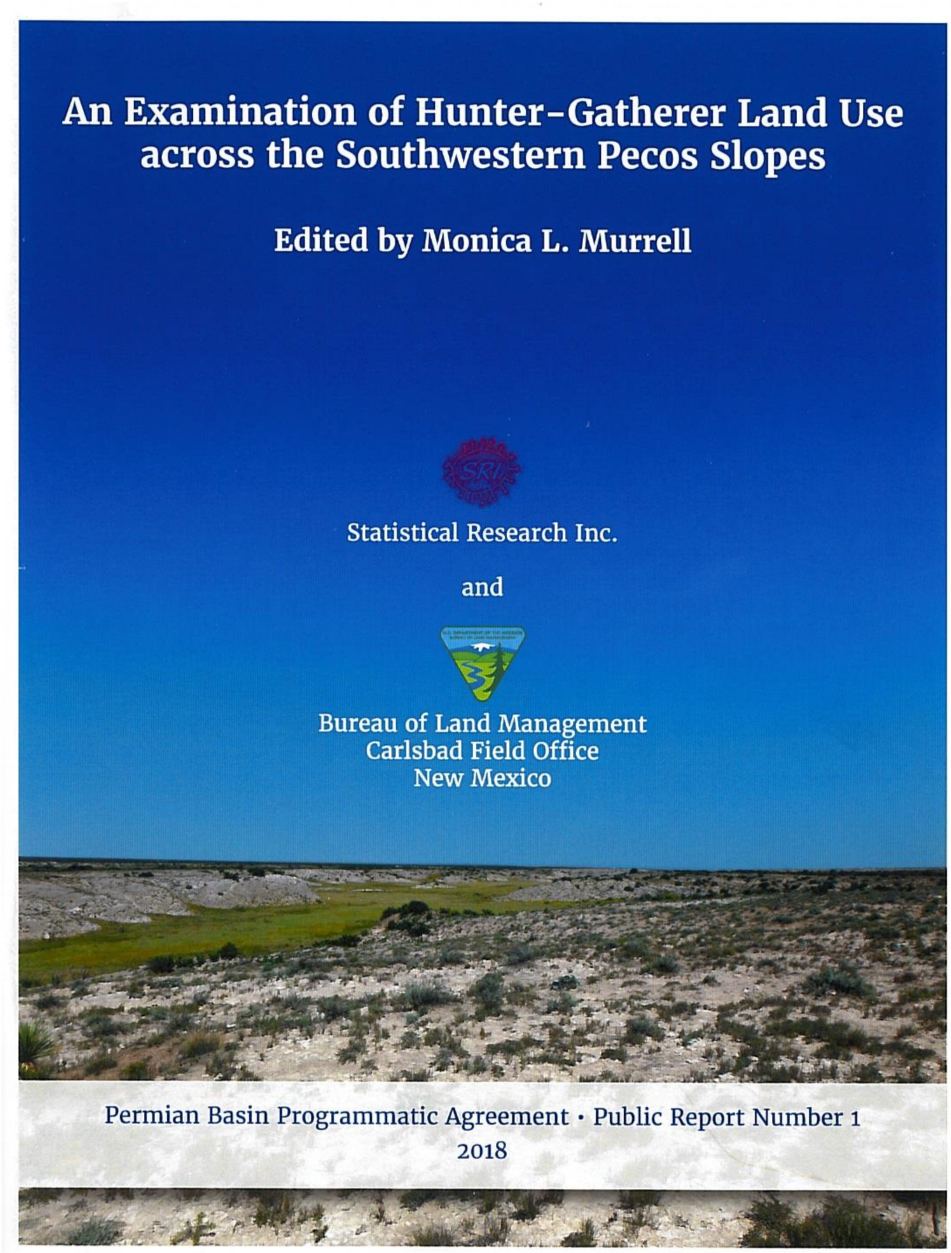
Permian Basin PA Public Report is Available



A new public report, *An Examination of Hunter-Gatherer Land Use across the Southwestern Pecos Slopes* is now available. This 51-page booklet is a distillation of the technical report describing the survey and testing of 42 sites located in the Southwest Pecos Slopes physiographic region of the CFO. Photographs, maps, charts, graphs and tables illustrate the goals of the research design, the questions asked, and the research accomplished. Copies are available at the Carlsbad Field Office, 620 East Greene Street, Carlsbad, New Mexico. Alternatively, requests for the booklet can be made by e-mail to Elia

Perez at eperez@blm.gov. Please provide a U.S. Postal Service mailing address and a copy will be sent to you. There is no charge for the booklet.

Newsletter Contact Information

Questions or comments about this newsletter or the Permian Basin PA may be directed to Martin Stein, Permian Basin PA Coordinator, BLM Las Cruces District Office, 1800 Marquess Street, Las Cruces, New Mexico 88001. Phone: (575) 525-4309; E-mail address: cstein@blm.gov. Unless otherwise attributed all newsletter content was written by Martin Stein.