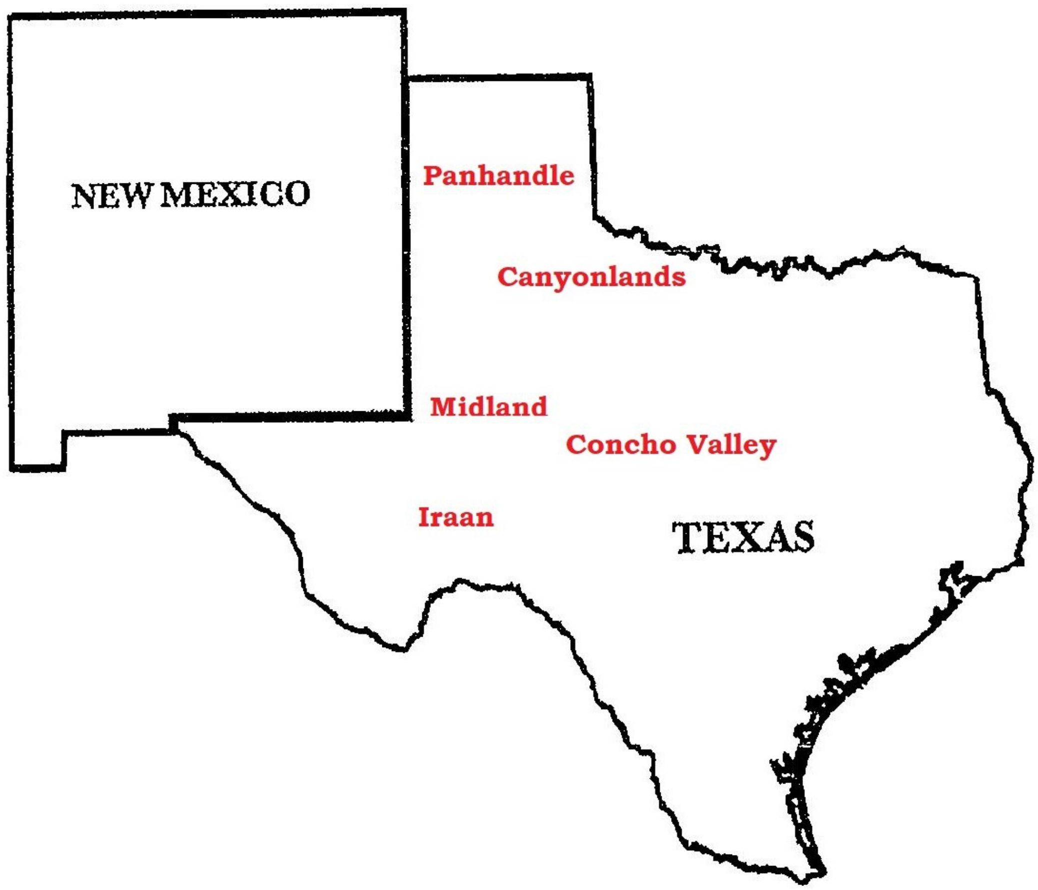
TRANSACTIONS OF THE 56TH REGIONAL ARCHAEOLOGICAL SYMPOSIUM FOR SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS



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TRANSACTIONS OF THE 56TH REGIONAL ARCHAEOLOGICAL SYMPOSIUM FOR SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS

PAPERS

Sites and Surveys

Earth, Wind, and Fire

Lithics and Lithic Procurement

THE MIDLAND DISCOVERY STORY

Barth Robbins

Abstract

The small bound book of only one hundred thirty-nine pages rolled off the University of Texas Press in 1955 and encapsulates the story of *The Midland Discovery: A Report of the Pleistocene Human Remains from Midland, Texas*. The book summarizes conclusions and the importance of the Midland Discovery that equaled or rivaled the knowledge of the scientific community in the early 1950's. The story, from June 1953 to the fall of 1955 when Dr. Fred Wendorf led his last excavation, takes us down a path of national recognition. We follow the discovery of the partial human skeletal remains of late Pleistocene age, which include over one hundred fragmented pieces of the cranium to its reconstruction. Its replica can be observed at the Midland County Historical Museum. Discovered by an amateur archaeologist on Monahans Draw, located at the southern end of the Llano Estacado, lie the skeletal remains on the surface of a gray sand deposit of an ancient lake bed.

Southern High Plains

Topography

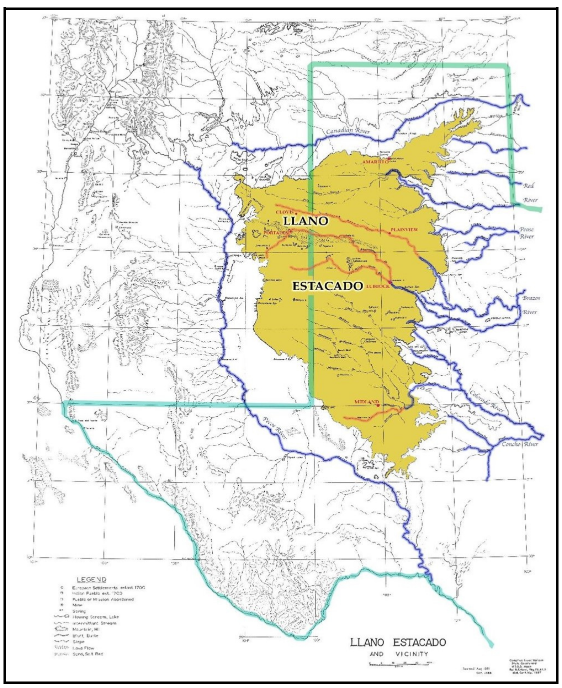

Figure 1. Map of Southern High Plains, highlighting significant draws that flow southeasterly from the Llano Estacado into the Brazos and Colorado River systems**.**

Midland County is on the Southern High Plains of western Texas and is typical of the entire Llano Estacado, or Staked Plain, which forms the southern edge (Evans and Meade 1945). It is a vast eastward sloping tableland of gentle descent, the remnant of a great alluvial plain which once extended westward to the Rocky Mountains and is now a relatively featureless plateau and a tributary of an easterly drainage to the Colorado river system. The boundary of these south plains is bordered by escarpments, small rivers, river valleys, and canyons (Wendorf, Krieger, and Albritton 1955). The provenience southwest of Midland in which the skull was found is within a small dune field that encroaches on the Monahans Draw (Holliday and Meltzer 1996) and consists of five masses of sand that lie in an area approximately a mile long, and half mile wide with a height of about 40 feet above the surrounding terrain at an elevation of 2,760 feet (Wendorf, Krieger, and Albritton 1955).

Locality 1

The site (41MD1) is located along the Monahans Draw, one of several draws that harbor other significant Llano Estacado archaeological sites. Some of the best-known Paleo Indian sites are Running Water Draw in Plainview, Blackwater Draw in Clovis, and Yellow House Draw in Lubbock.

Climate

These draws on the Llano Estacado flourished during the late Pleistocene and early Holocene period when pluvial conditions reflected a climate of milder winters, cooler summers, and more available moisture (Johnson 1987). The many draws and easterly flowing tributaries may have had a continuous flow of water with shallow lakes and marshes supplying an abundance of snails and clams. Meandering streams also helped sustain the recognized animal population at the time of turtle, rodents, and extinct species of horse, camel, antelope, peccary, wolf, mammoth, bison, and sloth.

Environment

The local environment was probably much like that used to describe our neighboring draw to the north, Yellow House Draw, an area described as a savanna of uninterrupted grasslands with occasional small groves and isolated trees (Johnson 1987).

The Story

Discovery (June, 1953)

In June of 1953, Keith Glasscock, a welder by trade from Pampa, Texas, walked the sand dunes that lie along the north side of Monahans Draw in Midland County. As Glasscock explores for artifacts in a wind-deflated basin on the western end of the dune field, he finds the skeletal remains of what looks to be extremely old, clearly fossilized bones of a human skeleton (fragmented human skull, first rib, and two metacarpals) along with two artifacts that were described (at the time) as unfluted Folsom points within just a few feet of the human bone.

Three weeks later, Glasscock goes to Santa Fe, New Mexico in hopes of finding someone that can direct him to a Holocene bison kill excavated by the Smithsonian Institution several years earlier. By happenstance, Glasscock ends up in the office of Dr. Fred Wendorf at the Laboratory of Anthropology, who was busy at the time with pipeline and highway projects for the state of New Mexico. After a handshake, Glasscock and Wendorf discuss the reason for Glasscock's visit and finish with an inquisitive Wendorf asking Keith what other sites he has visited. Glasscock describes his latest find of a partial skeleton and artifacts he found and collected on a ranch just outside of Midland, Texas. Wendorf is interested, thinking this could be important and tells Keith he would like to see the fossilized human remains. A week later Wendorf gets a small box in the mail full of skull fragments.

On initial inspection, Dr. Wendorf realizes the scope of trying to assemble the skull and contacts T. D. Steward, a physical anthropologist at Smithsonian Institution, to see if he might be interested in restoring this mineralized skull found in the strata of gray sand from West Texas. The reply was "send it on" (Figure 2). Dr. Wendorf's next contact was Alex Krieger, a research scientist in anthropology at the University of Texas who Wendorf had known for several years. Krieger was also interested and agreed to a field trip. He contacted Keith Glasscock who discovered the remains in hopes he would be willing to get permission from the land owner for the field trip and interested in leading a group of archaeologists to the site.

Glasscock was on board and ready to go. Wendorf extended his invitation to archaeologists Jess Nusbaum, Charlie Steen, Ed Jelks, Ed Moorman, Jack T. Hughes, his wife Polly Hughes, and photographer Gort Rushmer. The group is set and ready for Keith Glasscock to lead the party of ten to the point of provenience where he had made the discovery.

Figure 2. Side, top, and back views of the Midland calvarium. About sixty small pieces were assembled by T.D. Stewart, Curator of Physical Anthropology at the Smithsonian Institution.

Field Trip (October 1953)

In October of 1953, Dr. Fred Wendorf had assembled his group of archaeologists and was ready to follow Keith Glasscock into the sand dunes southwest of Midland, Texas to locate the exact spot that he had found the fragmented human skull on his previous trip in June. The group spent half a day surveying, photographing, and mapping the locality where the skull was found, along with fossilized animal bone on the surface of the blowout. A unit six feet square was excavated to a depth six inches where Glasscock had previously collected the fragmented skull with hopes of recovering any remaining pieces (Figure 3).

Figure 3. Excavation in October 1953. Attempting to recover human bone fragments from the area of Glasscock's discovery in June. Pictured left to right: Dr. Jesse Nusbaum (Wendorf's boss), Keith Glasscock, Polly Hughes (wife of Jack T. Hughes), and Dr. Fred Wendorf.

Notes were made of the compacted white sand of an old stream bed that made up the bottom of the deflated blowout, along with the various sands that made up the basin margins. An attempt was made to collect and map any new surface finds of fauna or cultural material along with the fragment of another (so-called) unfluted Folsom point. Ed Jelks also found several dozen tiny bone fragments, three more skull pieces, one rib section, and one metacarpal about 75 feet from where the skull and unfluted points were found on Glasscock's earlier trip.

Before the group left the area, they also explored four other blowouts within the small dune field where Keith Glasscock had collected artifacts which included Folsom points. It became apparent that the sand deposits in the other areas were different than where the human remains were found and would require further excavation work to solve the stratigraphy.

Over lunch back in Midland, the group discussed whether any benefit would be gained in pursuing further work at the site. Wendorf, along with the support of Alex Krieger, thought something could be done. Wendorf immediately wrote to the Wenner-Gren Foundation for Anthropological Research asking for a grant of $2,500 dollars, which was approved and allowed the project to move forward.

Excavation (February, 1954)

In February of 1954, with grant money secured to further the project, Fred Wendorf and archaeologist Ed Moorman head back to Locality 1 with equipment and two laborers to pick up where they had left off in October. The intention of this excavation was to determine the stratigraphy of the different sands by trenching and placing test pits in selected areas. Wendorf also wanted to build a chronology of fossil animal bone collected from the various sand beds that could be used for chemical analysis. Collecting and recovering any remaining human skeletal remains was also a prerequisite.

The group worked the full month of February excavating and collecting from the trenches and test pits that were strategically located in relation to the six-foot square unit that had been laid out where Glasscock had found the skull. The excavation work was rewarded with three small flint chips, and several teeth and bone fragments of fossil horse and bison.

At the end of February, Dr. Claude Albritton, a geologist from Southern Methodist University, arrived at the site to profile the difficult Pleistocene sand formations. With the trenches and pits still open, Albritton worked several days doing the profile work before meeting with Wendorf to explain in detail the stratigraphy of Locality 1.

Analysis and Announcement (June and July 1954)

In June, Wendorf received news from the Los Alamos Laboratory that test results from chemical analysis done on extinct fossil horse bone found in the gray sand and the human remains also found in the gray sand were contemporaneous. Making a statement that the human skull was at least 10,000 years old, "these are the oldest known human remains found in the New World "Krieger said (Wendorf 1955).

In July of 1954, Wendorf and Krieger joined forces to announce the discovery of the remains of a human partial skeleton discovered by Keith Glasscock in June of 1953. After writing a press release and notifying a local Santa Fe reporter and photographer, Wendorf contacted Polly Hughes from Canyon, Texas, who was on the field trip that surveyed the Scharbauer site in October 1953. Polly was also a stringer for Time and Life magazines, two nationally recognized magazines at the time. After Wendorf described the recent findings and analysis with Polly, along with sending her his press release, she called Fred back with news that her magazine editors would like her to write a major story.

The Paleontologist (November and December, 1954)

In the fall of 1954, a subsequent excavation took place with the intention of identifying any existing cultural or fossil remains. A noted paleontologist arrived in Midland and proceeded to clear overburden with a road grader and a trencher to excavate five trenches across the gray and red sands at the Scharbauer site at Locality 1.

When Alex Krieger at the University of Austin and collaborator Fred Wendorf became aware of the excavation, tempers flared and a "breach of professional ethics" was leveled at the paleontologist (Wendorf 2008). Consequences for the behavior were agreed upon, one of which was that the paleontologist was to write a report of his excavations and send it to Wendorf. The report is included in "The Midland Discovery: A Report on the Pleistocene Human Remains from Midland, Texas" book as Appendix seven.

Salvage (October and November, 1955)

A year later, Fred Wendorf returned to the Midland site to assess what damage or had been caused by the paleontologist and the trenching equipment. With a crew of two men, Wendorf dug eleven pits, each 8 feet square, in relation to the trenches that had been dug earlier by the paleontologist. He was rewarded by finding a portion of maxilla (upper jaw) with eight teeth crusted with gray sand that was most assuredly another fragment of the skull found by Keith Glasscock in June of 1953. In addition to Wendorf's last excavation at 41MD1, his crew found several flakes, two side scrapers, the base of an unfluted Folsom (Midland) point, burned caliche rocks, two horse teeth, burned bone from an extinct antelope, mud turtle carapace, and several rodent bones.

As the excavation concluded, and having excavated and studied these complex sands over time, Wendorff had a different view of the stratigraphy at the Midland site than he and Alex Kreiger originally interpreted. Wendorf concluded that the Midland skull is between 10,800 and 9,500 years old, contemporary with Folsom and the same age as extinct fauna in the gray sand, including the Midland point and related fragments (Wendorf 2008).

Summary

Investigations at the Scharbauer site of human remains, indicating a thirty-year-old female that is 10,000 years old, leads to the announcement from Dr. Alex Krieger that "these are the oldest skeletal remains found in the new world" (Wendorf 1955).

The origin of projectile point typology started in the 1940's but came into its own in 1954 in *An Introductory Handbook of Texas Archeology* with general descriptions on projectiles and pottery. In 1953 the discovery of a new projectile point type, 'Midland', was found in close proximity to the skeleton and was initially described as an unfluted Folsom point.

These thin lanceolate points resemble one another with their excellent chipping, size, and shape, but differ by absence of the characteristic flutes usually (but not always) on both sides of the Folsom point. This gives the Midland point its own identity, while still having what is believed by most to have a contemporaneous relationship with Folsom.

The Midland discovery was the first archaeological site (41MD1) recorded with the State of Texas (TARL) from Midland County and is also currently recognized with a Texas Historical Commission (THC) plaque displayed at the Midland County Courthouse today.

News of this New World find not only received local publicity but national recognition as well in three prominent magazines: *Life* magazine (July 1954), *Time* magazine (November 1954) and *National Geographic* (December 1955). The written story ends in the fall of 1955 when a completed manuscript was published at the University of Texas Press in book form titled *The Midland Discovery: A Report on the Pleistocene Human Remains from Midland, Texas*.

A final note of the skull's association comes from a later publication by Wendorf and Krieger in 1959, *New Light on the Midland Discovery*, where they prove the skull's primary association thorough "an exhaustive series of chemical analyses which showed conclusively: a, that these fossils differed greatly in their chemical content from modern animal bones; b, that fossils from within the white, gray and red sands all were similar in their chemical content and therefore essentially contemporaneous; and c, that the human fossil was unquestionably contemporaneous with Pleistocene fauna from this site".

Acknowledgments

Thanks to my wife, Susan, for the continued support with editing and technology. My thanks to Richard Rose for proofreading and for the lengthy discussions about the Folsom-Midland relationship. Also to Michael Nickell with the Sibley Nature Center for the numerous updates on the Llano Estacado map. And my appreciation to Dr. David Meltzer for sharing reference material and an anecdote that enlightened a questionable part of the discovery story.

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A Review of 90 Years of Collaborative Archaeological Research at Blackwater Draw, Eastern New Mexico

Brandon Asher

Abstract

Blackwater Draw Locality No. 1, the Clovis type site, was first investigated by professional archaeologists 90 years ago. Since that time, numerous individuals and institutions have conducted excavations at the iconic locality, the results of which have shaped our current understandings of past human behavior in the Southern High Plains region. This paper reviews the rich history of archaeological research and excavations at the site over the last 90 years and highlights significant discoveries and contributions to the field of archaeology that have been made. Ongoing excavation projects and continued research, as well as the difficulties associated with maintaining an open excavation for public display, are discussed. Plans for future interactive exhibits and public outreach opportunities are noted.

HIGHLIGHTS OF THE PALO DURO FIRE SURVEY

Paul Katz

Abstract

At the end of June and into July, 1998, an intense grass fire burned all 1,079 acres of Alibates Flint Quarries National Monument, an adjacent 2,964 acres of Lake Meredith National Recreation Area, and 1,292 acres on the privately owned Palo Duro Ranch. The National Park Service took this opportunity to undertake the first intensive archaeological survey of the Monument since its authorization in 1965 and the largest block survey to date in the Recreation Area. PRIAM of Panhandle, Texas conducted a 100% pedestrian survey of the 4,043 acres of federally administered land during the months of December, 1998 through April, 1999. A crew of three persons covered 3,796 acres during he first three months, recording 39 new sites and revisiting 36 previously recorded ones. Surface visibility was excellent due to the complete absence of vegetation, resulting in an enlargement of the area of scatter at all revisited sites. The last two months were devoted exclusively to 41PT1, a site characterized by prehistorically hand dug pits to obtain Alibates chert from the unique deposit around which the Monument was established. A crew of two persons, augmented by NPS volunteers and members of the Panhandle Archaeological Society, located, recorded, and mapped 731 individual quarry pits. Again, this was the first time this comprehensive recording was carried out. The list of site types available in the regional literature provided general guidelines but not the final determination. The 75 sites were recorded using an extensive attribute list, resulting in a well-defined series of 14 types of sites groups into six categories: quarry, lithic scatter, structure, rock art, isolated feature, and historic homestead. The analysis considered site location, content, and chronology for each type of site across the project area, which consists of a portion of the south side of the Canadian River valley and five tributary stream drainage systems.

The Palo Duro Fire

The Incident

The call went out around 11 a.m. on June 29, 1998. Smoke had been spotted near the gate of the Palo Duro Ranch, which borders Alibates Flint Quarries National Monument on the south and east. Within ten minutes, a Park Service fire truck **[SLIDE]** arrived to find about 15 acres already burning, and steady winds of 15-20 mph from the SW quickly blew the fire into Alibates Canyon. All available firefighters and equipment were requested as the fire rapidly spread. The next six hours saw the mobilization of firefighters from all the surrounding communities and counties, as well as 23 engines, six water tankers, two roadgraders and hotshot crews from Concho, OK and Boise, ID. Due to the inaccessibility of the terrain and the intense fire behavior, air-tankers stationed in Amarillo were called to assist in initial attack.

The rugged terrain, wind, intense heat, and high fuel loads hindered the effort, and the firefront kept moving north. On June 30, backfires located in strategic positions began to have an effect. The Alibates/Palo Duro Ranch Fire was declared out on the morning of July 3, having burned

5,335 acres. These included *all* 1,079 acres of Alibates Flint Quarries National Monument (ALFL), 2,964 acres of Lake Meredith National Recreation Area (LAMR), and 1,292 acres of private land adjoining the Monument and the Lake. The fire was an act of arson. The dotted line in Figure 1 marks the extent of the fire.

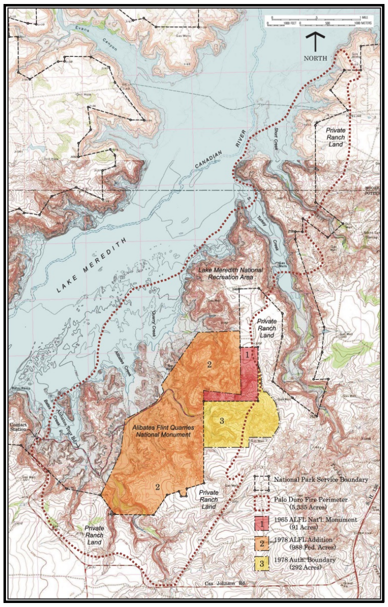

Figure 1. Boundary history and the extent of the fire.

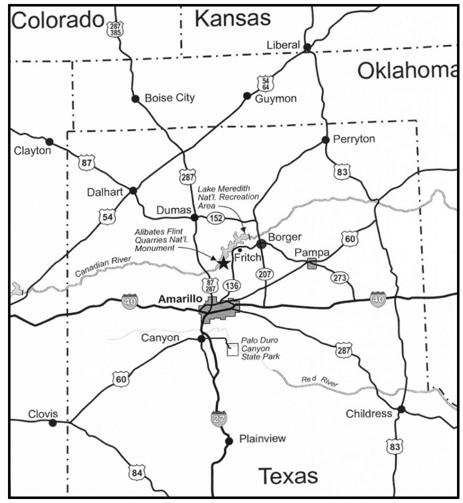

Figure 2. Texas Panhandle region, showing the location of the Monument and Recreation Area.

Lake Meredith National Recreation Area and the adjacent Alibates Flint Quarries National Monument are located ~ 35 miles northeast of Amarillo, Texas, in the valley of the Canadian River (Figure 2).

The Aftermath

Fuel loads were high in the Monument and the Recreation Area, where grazing ceased in the 1960s upon the establishment of the monument and the construction of Sanford Dam and Lake Meredith. Vegetation had been allowed to grow unchecked. The fire destroyed trees, ground cover, fences, and all the shade shelters on the Interpretive Trail up to the quarry pits. It was so hot that it even killed the mesquite. The loss of ground cover increased the threats of loose boulders rolling downhill and of landslides and mudslides (Figure 3).

A brief pedestrian archaeological survey was conducted immediately after the fire was declared out; the ground was still hot at the time. The purpose was to assess the nature and extent of damage to cultural resources resulting from the firefighting activities, particularly the bulldozed fire lanes, as well as the larger effects from the fire itself. It became obvious that the fire event caused many problems. Artifacts lay broken in-place, split by the intensity of the fire. Burned rock features were reburned, and the rocks were degrading. Bone artifacts had been incinerated. The loss of the vegetative cover made the surface unstable for artifact distributions (Figure 4).

Figure 3. A typical scene in the Monument after the Palo Duro Fire.

Figure 4. The survey crew at LAMR 52 (41PT31).

Problems can present opportunities, however, and there were some positive consequences of the fire. Brightly colored flakes of Alibates flint lying on the charcoal stained soil were as easy to see as Easter eggs on a spring lawn. Normally, the heavy vegetative cover would obscure sites and features, making them seem smaller than they actually were. The bare ground now allowed new sites to be identified and previously recorded sites to be more easily reassessed.

The NPS recognized the fact that there would never, we hope, be another chance to view as much of the surface archaeological record as occurred during the fall and winter months following the fire. There had never been a complete survey of the entire Monument, as well as portions of the surrounding Recreation Area. By conducting one immediately, the additional data added to the culture historical record would be substantial. Moreover, the collected data could be used to create a management database for this busy NPS property that would significantly improve planning, decision-making, and public interpretation.

The Survey

Administrative Summary

Credit for swift action goes to the then superintendent, John Benjamin. He acquired sufficient funds to conduct an archaeological survey of the burned acreage. The funding came from various sources, not an easy task at the end of the federal fiscal year.

Figure 1 provides a boundary history of Alibates Flint Quarries National Monument. The monument as established in 1965 contained 91 acres (the red area marked #1), which included some of the quarry pits but none of the Antelope Creek phase ruins. This original portion is listed on the National Register of Historic Places. In 1978, Congress authorized the addition of 1,279 acres to the monument. This includes many hundreds more quarry pits as well as several of the major Antelope Creek phase architectural sites and petroglyphic rock art. Only 988 acres were added at that time, however (the orange area marked #2). Today, 292 acres are still authorized for purchase but remain in private hands on the Palo Duro ranch (the yellow area marked #3). The current size of the monument remains at 1,079 acres. Only the federally administered lands of the Monument (1,079 acres) and the Recreation Area (2,964 acres) are included in the archaeological survey reported here, for a total of 4,043 acres. The remaining 1,292 acres burned in the 5,335-acre fire is privately controlled and were not surveyed.

PRIAM of Panhandle, Texas conducted an intensive pedestrian survey of 3,796 acres during the three months of December, 1998 through February, 1999. Fieldwork was undertaken by a crew of three persons, supported by a computer operator in the lab. Dr. Susana Katz, PRIAM's Principal Investigator, and Dr. Paul Katz, PRIAM's Research Coordinator, assisted the field crew and the computer operator on a regular basis. Seventy-five sites were visited. Thirty-six of these were newly recorded sites, including one previously unrecorded petroglyph, and thirty-nine were revisitations of previously recorded sites. In all cases the size and extent of the latter were expanded, and additional features were recorded at some of these sites.

Two additional months time, March and April, 1999, was required to record data and map every one of the quarry pit features at Site LAMR 100 or 41PT1, the 247-acre (1 km^2) site at the heart of the national monument. A total of 732 quarry pits were recorded in this first-ever total survey of the Monument.

Pre-Field Activities

A thorough literature search and a study of the project area were conducted prior to fieldwork. The objectives of this background research were to gather useful data for planning the fieldwork, to identify high potential areas for site locations, and to aid in report preparation.

Despite problems of data variability, detailed study of the available reports and archival material yielded a range of the types of features, artifacts, ecofacts, and sites previously recorded in the locality. The literature also provided a baseline for site size and general condition. As a check for accuracy, the Principal Investigators revisited several sites and reviewed their artifact collections. Once these activities were complete, the data from these reports were used to create categories in our field forms.

A thorough orientation of the crew was conducted prior to survey. NPS personnel provided a day-long session covering such topics as the history of investigations in the project area, artifact identification, and safety issues. Then a representative sample of previously recorded sites and features was visited and recorded for practice. The field crew were also given a tour of the Alibates quarry and the Alibates Ruin.

Ground Control

The highest level of survey control was the UTM grid system of 1000 m squares. Each 1000 m square block contained 247 acres, and the 4,043 total acres in the survey area covered 16.4 of these blocks (Figure 5).

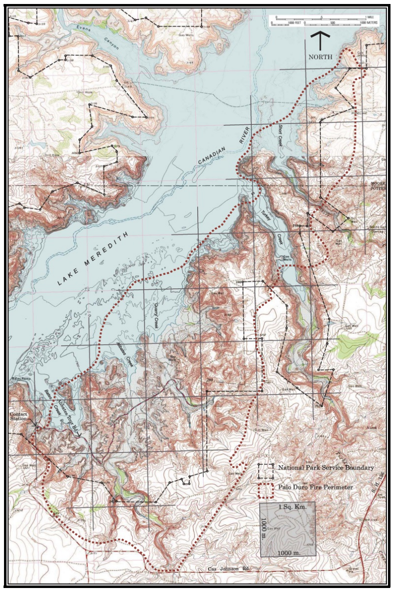

Figure 5. The 1000-meter survey grid system.

Three months, November, 1998 through January, 1999 were allocated for the survey, and the crew of three pedestrian surveyors was responsible for completing an average of one 500 m square survey unit each day. This represented 1/4 of a UTM grid block, or ~ 62 acres. This is an average of ~ 21 acres per person per day, an achievable objective in variable terrain with a high probability of recording sites each day.

The crew walked in straight lines wherever possible, primarily along the stream valley bottoms and on the upland ridges. When confronting sloping terrain, contours were followed. The total width of a survey transect was 50 m, with ~ 17 m maintained between each of the three surveyors.

The transect length varied depending on terrain and visibility. It was never less than 100 m; and when possible it reached 500 m, representing one complete side of the daily square survey unit. A Garmin II+ handheld GPS receiver was used to keep track of the distance walked, providing a much more accurate method than topographic map estimates of position and distance.

The survey began along the Tour Road, for convenience and to accustom the surveyors to the nature of the survey area and its cultural resources. They gradually worked inland, away from the shore of Lake Meredith. This plan had the added advantage of placing the crew at a safe distance from deer hunting activities in the Recreation Area during November. The 1000 m blocks were surveyed contiguously as much as possible, assuring that no portion of the survey area was missed and that sites falling on the boundary between two survey units would be fully recorded.

USGS 7.5' topographic maps of the survey area were marked with the UTM grid lines, thus delineating the 16.4 1000 m survey blocks to be covered during the survey. The crew was supplied with an enlarged portion of the map each day. This served the dual purpose of outlining the intended survey area for that day and providing a large-scale map for site recording. Each 500 m survey unit was shaded in the field as it was completed. Each evening the daily shading was transferred to the project base map, so that the progress of the survey was immediately visible and the next day's activities could be efficiently planned.

At the conclusion of the budgeted three months of survey, all but one square kilometer (the equivalent of one 1000 m block, or 247 acres) had been surveyed to the 100% level. This last square kilometer represented Site LAMR 100 / 41PT1, the quarry pits at the heart of Alibates Flint Quarries National Monument. This one-kilometer unit required another two months to completely survey and record. Because the methodology differed from the rest of the survey area, it is described and discussed separately.

Seventy-five sites were located and a complete data record established for each one. Of these, 36 were recorded for the first time and 39 were revisits of previously recorded sites.

Data Recovery

A site form was developed specifically for this project. It contained all the data required by the State of Texas Archeological Site Data Form, as well as additional information considered useful for this particular project. These additional fields included specific types of sites.

The form was installed in a Palm Pilot III hand held data recorder, as part of our efforts to conduct a paperless survey. Drop-down lists were designed whenever possible to speed data entry and provide consistency to the database. Provision was made for comments on certain fields and for the site as a whole. Those data fields that were considered critical for the eventual state form or for our interpretations were programmed so that the next field could not be accessed unless the previous one was completed.

Features observed within sites were treated in much the same manner as the sites themselves. There was a feature form developed specifically for this project, which was installed in the Palm Pilot data recorder. Once the general characteristics and quantitative data about the site were recorded, each internal feature was measured and described as well. Rather than develop a separate form for isolated features and petroglyphs, the site form was used to record these two cultural manifestations.

UTM coordinates were recorded at the center of each site. The precise location of site centers, large site boundaries, and internal features becomes an important addition to the LAMR/ALFL cultural resources management database. All UTM coordinates were recorded using the North American Datum of 1927 (NAD 27).

To increase the accuracy of the position data, a special form for recording up to 15 position readings was installed in the Palm Pilot data recorder. It was used for both site and feature center points. The multiple position readings were averaged in the laboratory. Averaging allowed the final position to achieve an error of less that 5 m. Today's GPS devices can achieve sub-meter accuracy, but five meters was pretty good in 1999.

A wooden stake was placed in the ground at the center of each site and at the center of each feature. This was the point at which UTM coordinates were recorded. The Scope of Work specified that the site center stake appear in two photographs, each taken from a different direction and with a locational reference on the horizon appearing in the photograph. In addition, one site overview, one picture of each feature identified at a site, and pictures of any unusual or unique artifacts observed were taken.

Each site was assigned a unique number in the series maintained by the National Park Service for this property. These are designated LAMR numbers, for Lake Meredith Recreation Area. Previously recorded sites were designated by their existing LAMR number, except in those instances where a previously recorded site was incorporated into newly recorded one. Newly recorded sites were given a new LAMR number in consecutive order, starting from the last number used prior to the current survey.

At the conclusion of the survey, State of Texas trinomial site numbers were requested from the Texas Archeological Research Laboratory (TARL) in Austin for all newly recorded sites and for any previously recorded sites that did not have one. The temporary wooden stakes in the center of each site were replaced with a permanent reinforcing rod 16" long, on which was placed an aluminum cap. Stamped into the cap are both the LAMR and the State trinomial numbers. This procedure required a second visit to all 75 sites recorded during the survey. It was during this second visit to the site that the Principal investigators made a determination of the site's research potential and its eligibility for listing on the National Register of Historic Places.

The placement of the stake, first wooden and then metal, represents the best determination by the survey crew of the geometric center of the site, i.e., the point approximately equidistant from the boundary as defined by artifact distribution and density.

A traditional field notebook was not maintained for this project. The Site, Feature, Position, and Photographic log forms programmed into the Palm Pilot recorded all the data normally written by hand, and usually in less detail, in a field notebook. Each site form ended with a place for comments, and the crew used this field to enter other variables affecting the site recording procedure.

The single drawback to the Palm Pilot programming was the simplicity of its graphics capabilities, and subsequent models of handheld data recorders have become much more sophisticated in this regard. When it was found advisable to make a drawing in the field, traditional graph paper was used. These instances usually involved the recording of petroglyphs or other pictorial subjects.

Photographs were taken with a digital camera, and a 35 mm camera with color slide film was available as a backup to the digital camera. The photographic log was another form developed for this project and installed in the Palm Pilot data recorder.

All the data from the Site, Feature, Position, and Photographic Log forms entered into the Palm Pilot were downloaded daily into a Microsoft Access database with identical fields to those used in the field forms.

LAMR 100 / 41PT1, the Alibates Flint Quarry

Recording this site required a different methodology and separate documentation, in that it was a single site comprised of many hundreds of individual features. This type of feature was identified at only one other site in the survey area. Our task was two-fold: 1) to create a map of the site showing the spatial relationship of every quarry pit feature to every other, and 2) to collect data on each one for quantitative and comparative analyses. Neither had ever been done before. A reconnaissance had been conducted in 1931 by Floyd Studer, a local avocational, and he excavated a quarry pit sometime after that date. Except for this one photograph of Studer and

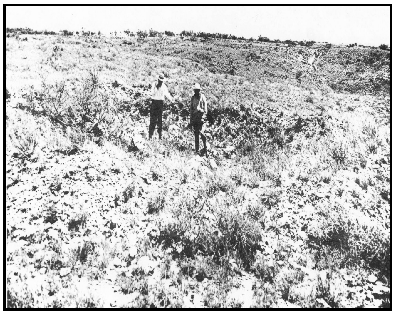

Figure 6. Studer and Hagy in the largest recorded pit.

his friend Lawrence Hagy standing in the middle of very large pit (Figure 6), no documentation of that excavation has been located. Over the years, archaeologists and geologists have subsequently visited the site and expanded Studer's descriptions. In the 1960s, the Bureau of Reclamation produced a map indicating general areas of pit concentrations, indicating that there were about 500 features in the quarry.

Precise quarry pit mapping was accomplished in two phases, extending over a two-month period (February and March, 1999) immediately following the three-month survey portion of the project. Phase 1 involved locating every quarry pit and completely describing each one. A new form was developed and programmed into the Palm Pilot, which captured data on size, shape, depth, associated artifactual material, and distance to adjacent pits. This required a minimum crew of two persons, one measuring and describing, while the other recorded the data (Figure 7).

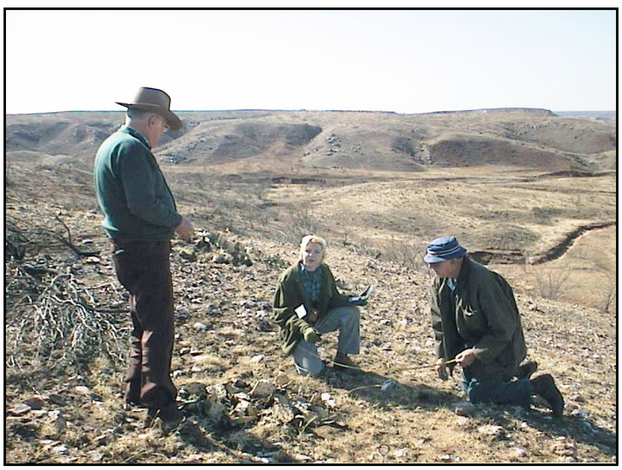

Figure 7. Recording a quarry pit.

Figure 8. Kathy Bartsch using the EDM.

When more persons were involved, a cluster of pits could be described at one time. Tour guides at Alibates Flint Quarries National Monument and members of the Panhandle Archaeological Society generously volunteered their time to help record these features, since these two months were not budgeted as part of the general survey.

Each pit was assigned a consecutive integer identification number, beginning with #001 and eventually ending with #731. The number was placed on a pin flag and on a piece of flagging fastened to a metal spike. Both flag and spike were positioned in the center of the pit so that it could be located again during the mapping phase.

Phase 2 involved the use of a Sokkia EDM lent to us by the Department of Anthropology at Texas Tech University. Kathy Bartsch, the data analyst during the survey, recorded the distance and direction of the pits from a total data station she established (Figure 8). Because of the terrain, it eventually required nine different stations before all the quarry pits could be viewed with the EDM. A second crew member held the target in the center of each pit and then retrieved the pin flag after the distance and direction from the data station was measured by the EDM. Contact was maintained by the use of two-way radios, as the distance between the instrument and the target was often considerable. Collecting the flags at the end of this process insured that no pit was missed. The UTM coordinates of each data station were taken with the Garmin II+ GPS receiver. From these, the UTM coordinates of individual pits was calculated and thus all features mapped for the first time (Figure 9).

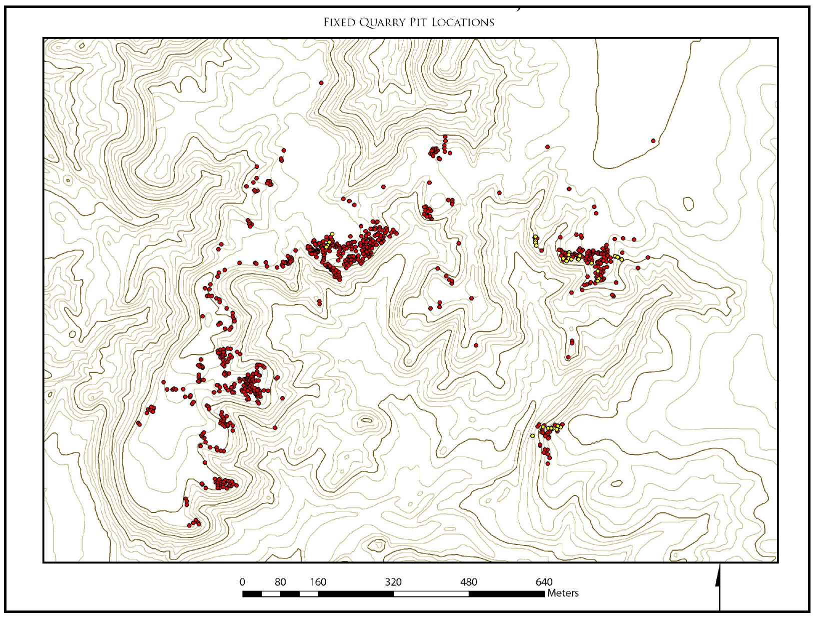

Figure 9. The locations of all 731 quarry pits in Alibates Flint Quarries National Monument.

Site Classification

Introduction

During field work, site attributes were recorded in quantity and in detail. In all, 138 individual observations, measurements, and comments were made at each site, exclusive of feature data. The Palm Pilot III data recorder was programmed for this task and kept a site form active until a response was given for each field.

Though many attributes were recorded at each site, just a few were used to assign a provisional site type. For example, only the presence of upright dolomite slabs was needed to identify a 'structure' site. An assemblage of tested nodules and primary and secondary flakes was sufficient to denote a 'quarry' site.

Table 1. Site Classifications.

SITE TYPES USED IN THE FIELD	SITE CLASSIFICATION USED IN THE ANALYSIS	
	CATEGORY	TYPE
burial	quarry	outcrop
cave		boulder
chipping station		stream
hamlet		surface gravel
historic homestead	lithic scatter	type I
kill site		type II
isolated structure	structure	subhomestead
lithic scatter		homestead
lithic and ceramic scatter		hamlet
quarry		village
shelter	rock art	petroglyph
village	isolated feature	cairn
		cist
	historic homestead	dugout
		ranch house

The number of site types used in data collection was also limited to the 12 options drawn from previous archaeological investigations in the locality (Table 1). Half of these options were never used in the current project, while others were used extensively. Cave and shelter sites, for example, were not found, while lithic scatters, quarry, and structure sites were common. These types were only used to categorize sites during fieldwork since they have little analytical value. Take, for example, the type 'open camp.' It is not a descriptive, a functional, or a morphological type. Open camps tend to have some flakes and perhaps a hearth on the ground surface. Are all open camps alike? If not, how can they be distinguished from one another? Do they have similar tools, toolkits, locations, or the same kinds of burned rock? Do we even know that they are camps? This commonly used site type is so vague and ambiguous that we did not even include it in our field list of site types.

The survey presented an ideal situation for studying and improving upon a site typology for the Recreation Area and the Monument. Almost all surface artifacts and features would be seen on the bare ground surface. The extent of a site, as judged by the area of scatter, could be accurately measured. The survey covered a large, contiguous block of space, so that attributes of inter-site distribution could be examined. Last, the computerized site and feature forms provided a ready database for the study of these relationships.

The first use of the database was to refine, redefine, and expand the existing site typology. The revised list of types uses traditional and familiar names whenever possible. What is new is a formal definition of each site type, based on a cluster of diagnostic attributes that emerged from the field forms. These clusters are unique to each site type and can be used to provide an 'assemblage profile' for each type.

It is possible to graphically present the artifact assemblages that define the type, if three conditions are met: 1) the type has a sufficiently large number of associated sites; 2) these sites have a sufficient quantity of artifactual material; and 3) only sites with single functions are used to avoid contaminating the profile. Unfortunately, only three site types allowed this presentation for the current survey: surface gravel quarries, lithic scatters, and hamlets.

In this scheme, site type artifact assemblages have been organized into four groups: chipped stone debris; chipped stone tools; grinders, percussors, and ceramics; and ecofact and non-local materials. Bar graphs provide a visual definition for each type of site. They also allow the reader to compare and contrast the artifact assemblage of different types within the same category of sites (e.g., lithic scatter type I vs. type II), and between the three site categories.

Quarries (N=37)

Although the location of quarries is straightforward, it is nonetheless an important site attribute: quarry activity always takes place at the source of the raw material. In the case of stone, the raw materials are fixed resources; their occurrence is predictable and unchangeable. A limited assemblage of artifacts is associated with quarries, and these are directly related to the quarrying activity: tested nodules, chunks of weathered material, primary and secondary flakes. The common tool type is the hammerstone.

There are four site types within the quarry category, each related to a specific location of raw material. At the *primary outcrop quarry*, the in-situ, partially buried layer of Alibates material is being exploited. The *boulder quarry* and *stream quarry* use displaced materials from the Primary Quarry. At a *surface gravel quarry,* the Alibates material is mixed with quartzites, chert, and other reworked and redeposited stones in a thin Potter gravel stratum.

Primary Outcrop Quarries (n=2)

Description. Extraction of agatized dolomite from the primary outcrop involves the excavation of a pit to expose and recover the material. Digging the pit and removing the in-situ material is more laborious than other types of stone gathering, but there are rewards. Quarried material has not been subjected to the effects of weather or battering, making it more reliable for flintknapping. Quarried material also can be extracted in much larger pieces than are available on the surface, and it is well suited for forming standard-sized large cores, large flakes, flake blanks, and bifacial blanks.

Figure 10. Alibates topography.

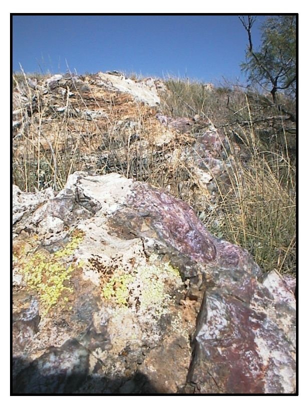

Figure 11. Alibates ledge.

Location, Setting, and Size. In-situ outcrops of agatized dolomite for quarrying occur in only one portion of the Monument, a multi-lobed, steep-sided mesa overlooking the Canadian River valley (Figure 10). Within the monument, the outcrop extends one mile from LAMR 436 on the north to the southern edge of LAMR 100 and 3500 feet from the Canadian River escarpment on the northwest to the southeast side of LAMR 100 . The area covered by this outcrop is about 1.8 km^2 (0.7 mi^2). On the upper surface of the mesa, irregularly shaped boulders of agatized dolomite protrude along the upper rim of the lobes (Figure 11), and these boulders have been exploited by removing flakes and chunks from them. In some instances, the boulders have been rounded and pared away along the base so that they are attached to the outcrop by only a narrow stem. The partially-to-fully buried resource has been exploited by digging pits into the outcrop to remove boulders of high-quality, unweathered material. The pits are all near the mesa edge, either because the material was easier to obtain or because the interior of the mesa does not contain the agatized dolomite.

Figure 12. Quarry pits at LAMR 100 (41PT1).

Figure 13. Example of a round quarry pit.

Two sites at the Monument have been recorded with quarry pits, but they are exploiting the same outcrop. LAMR 100 is the massive Alibates quarry, covering 1 km^2, with hundreds of quarry pits and millions of flakes, chips, and chunks of Alibates material (Figure 12). The other site, LAMR 436, is much smaller (125,000 m^2) and has just three well-defined quarry pits and several more indistinct ones. These sites were given separate numbers because they are cut off from one another by steep drainages. The elevation of the outcrop averages 3190' asl.

Artifacts and Ecofacts. Each quarry pits is surrounded by a debris ring of hundreds of flakes and chunks, mostly primary and secondary stage pieces. At LAMR 100, tertiary flakes were seen as well, usually near but not at a pit. Some hammerstones have been identified in debris rings and proximate to quarry pits. They may have been used for reducing the agatized dolomite piece and/or for making the shaped unifaces, bifaces, and retouched flakes that occur at quarry sites. These shaped pieces are not directly associated with the quarry pits but occur several meters from the pit activity area. The tools used to dig the pit are unknown. No pits have been investigated by professional archaeologists, nor has any of the surrounding matrix been excavated. Tools that might have been used to remove the stone from the dolomite bedrock are also unknown.

Burned rocks (quartzite, dolomite, and chert) occur at quarry sites. These have not yet been found in concentration, and they are not directly associated with the quarry pits. The possible uses for heated rock include human maintenance, tempering of tools, or heat-treating the Alibates material.

Features. Roughly 900 pits occur within the Monument and on the surrounding private property, with over 700 within the Monument alone. Pits may be elliptical, circular, linear, or polygonal. In each case, a depressed, cleared area is surrounded by a spoil pile of quarry debris Figure 13. Hammerstones, secondary and tertiary flakes, and bifacial blanks may be mixed with the other debris. The spoil pile is about 15-20 cm above ground surface. About 10-20 cm of windblown sand has accumulated in the bottom of each pit; chipping material occurs to an unknown depth below. In some pits, a nub of in-situ Alibates material remains from boulder removal.

Boulder Quarries (n=2)

Figure 14. Alibates boulder.

Description. At the two sites categorized as boulder quarries, displaced masses of pure Alibates material are the major source of exploitation. These boulders exhibit hundreds of facets and flake scars where material has been removed for tool manufacture. At one site, LAMR 473, 10 large boulders are clustered on a pinnacle; at the other, LAMR 445, the boulders are spread out at the base of a talus slope (Figure 14).

Location, Setting, and Size. Since the worked boulders originated at the primary outcrop or on the nearby hillsides, they are spatially associated with that area. One boulder quarry described here covers part of a ridge and pinnacle below LAMR 436; the other is on a ridge in the intermediate uplands below LAMR 100. The distribution of boulders determines the site size since the boulder is the focal point of the site's activity.

Artifacts and Ecofacts. Tested nodules of material identical to the boulders, flakes, hammerstones, and fire-cracked rock occur at boulder quarries. One site, LAMR 445, has a scraper.

Features. No features other than the worked boulders were identified at either site. The presence of fire-cracked rock suggests some sort of thermal feature was once associated with the site type.

Discussion. Other sites in the project area have worked boulders, but there other raw material resources appear to have provided most of the raw material. For example, similar worked boulders occur along the rim of LAMR 100, the primary Alibates outcrop. These boulders are often clustered at the very edge of the mesa or on narrow ridges and benches where the mesa top has slumped. At LAMR 100, the boulders are just a minor source of quarry activity.

It is most likely that the displaced boulders were moved downhill by natural processes. The steep-sided, poorly vegetated mesas and hills are composed of sand, and sizeable portions of a landform can slump, moving huge boulders downhill. This occurred in several locations within the monument after the Palo Duro Fire. Simple erosion, while not as quick or as drastic, may also have moved boulders that were precariously positioned on the mesa edge.

Stream Quarries (n=5)


Figure 15. stream quarry site.

Description. Five lithic resource sites consist of Alibates material moved by water action from the talus slopes of the outcrop quarries and redeposited in the creeks below. Stream quarries are large 'sites,' actually resource zones for a second harvest of lithic debris. They are composed of chunks to boulder-sized pieces of Alibates material, some naturally fractured Alibates material, and some quarry debris. This redeposited material has been exploited.

Location, Setting, and Size. Stream quarries provided an easy way to use the debris generated at the primary outcrop. These sites are low on the landscape, easy to get to, and in level landscape positions near water (Figure 15). They are tied to the location of the primary outcrop. There are three stream quarries surrounding LAMR 100 on the east and west; another is downstream of LAMR 436, the smaller outcrop quarry. A fifth, LAMR 58, is at the confluence of all these streams. Stream quarries are typically very large due to the natural processes that created them.

Artifacts and Ecofacts. The artifacts associated with a stream quarry are the same as those found at other quarry types: tested nodules and thousands of primary and secondary flakes. Tools are very rare here, consisting of just a few hammerstones, and burned rocks occur along the sides of the creek channels. Ecofacts are limited to fire-cracked rock. Only burned chert and quartzite have been identified.

Features. No features have been identified at stream quarries, although the presence of fire-cracked rock shows that some type of activity using heat took place at them.

Discussion. Defining a boundary for the stream quarry site type is hard, and it has been drawn close to the sides of the channel. Water action, erosion, and deposition have done much to obscure artifact distribution, but the occurrence of fire-cracked rock and several thousands of flakes shows that the activities here were not serendipitous.

Surface Gravel Quarries (n=28)

Description. Surface exposures of the Tertiary Potter gravel occur throughout the project area and most of them show signs of exploitation. The exposures, and the quarries, are on the tops and sides of hills, ridges, canyon rims, and on low rises wherever the thin stratum of gravels pierces the surface (Figure 16). Unlike the outcrop quarries, Potter gravel quarries contain an assortment of excellent knapping minerals such as chunks of petrified wood, nodules of quartzite, lumps of fine gray Potter chert, and pieces of Alibates. Hard, grainy sandstone is also a common gravel component.

Figure 16. Surface gravel quarry.

Location, Setting, and Size. The location of surface gravel quarries is resource dependent, and they may occur in places that might otherwise seem unlikely from an anthropological viewpoint. Quarries can be found on broken ground, at locations with no visible springs or seeps, or in areas with very difficult access. The gravel stratum appears to have been exposed by wind and water erosion; they are always among the highest points on a landscape and in exposed positions. The physical extent of the quarry corresponds to the extent of the gravel exposure, and sizes vary greatly.

Empirically, gravels containing the highest quality and largest-sized nodules of chert and agatized dolomite occur nearest the outcrop quarries. As distance from the outcrop increases, the quality and size of nodules and chunks decrease or is absent. Although surface gravel quarries occur throughout the project area, most of the larger quarries occur on 'Quarry,' Alibates, and Bates Creeks; another cluster occurs in the northeastern part of the project area around Turkey and Short Creeks

Artifacts and Ecofacts. The characteristic assemblage at a surface gravel quarry is small in number and variety (Figure 17). Flakes are in the 10s to 100s. The typical assemblage contains tested nodules (at 100% of the sites), primary (at 100%) and secondary (at 85%) flakes, and hammerstones (at 77%). Advanced tool production rarely took place at surface gravel quarries; tertiary flakes were recorded at just 19% of the sites. The most common chipped stone tool at surface gravel quarries is a bifacially worked piece, and its frequency of occurrence is similar to the tertiary flakes (at 22% of sites). A scattering of fire-cracked rock is much more frequent at surface gravel quarries; fire-cracked dolomite occurs at 54% of the sites, quartzite at 73%, and chert at 89%. Bone fragments were observed at 14% of the sites.

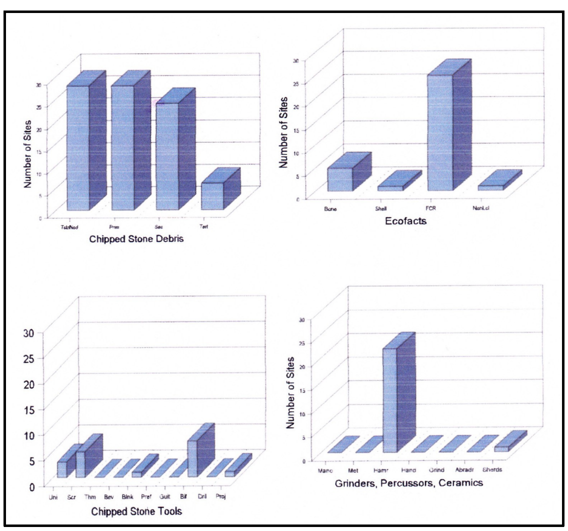

Figure 17. Assemblage profile for surface gravel quarry sites.

Features. Features were recorded at five sites, but none appear to be directly associated with the worked boulders. LAMR 430 has a petroglyph and knapping areas, LAMR 440 has a cairn, LAMR 462 has a pile of tabular dolomite, and LAMR 463 and 464 have modern knapping areas.

Discussion. Using the size of the existing raw material and waste products as a guide, the Potter and Alibates nodules were large enough to be worked into chipped stone tools such as bifaces or scrapers. The quartzite nodules are also in this size range and made convenient hammerstones and shaped tools. Bifaces could have been up to 15 cm in length, but probably not much greater. It is possible, of course, that larger chunks and nodules were available before selective removal of choice specimens took place. Thousands of years of exploitation will have an effect, even on the not-so-choice pieces.

Lithic Scatters (N=21)

General Category

Description. The key identifier of a lithic scatter site is the preponderance of middle-to-late stage (secondary and tertiary) chipping debris. Relative to these flat, thin, well-shaped flakes, there are only a few early stage pieces. Likewise, shaped or expedient tools also occur in limited numbers.

Location, Setting, and Size. Scatters are situated on flat to gently sloping surfaces near a creek or spring. A favored spot is above and beside the head of a spring, but they may be situated anywhere along a drainage channel (Figure 18).

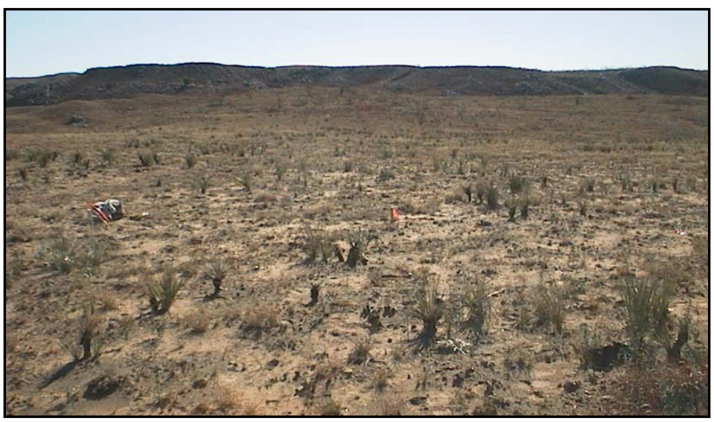

Figure 18. Lithic scatter.

The landforms on which these sites occur are quite varied; they include terraces, benches, ridges, mesas, hills, plains, and floodplains. Lithic scatters occur most often at mid-to-upper elevations. Half the scatters in the survey area occur in the 2900' elevation range, and half that many in the 3000' elevation range. The few remaining sites are higher. The Canadian River bottom may have been used for camping more often than this survey revealed. The lack of a thorough survey program before reservoir construction makes it impossible to confirm or deny this possibility. Scatters are small to medium-sized sites. Only one lithic scatter site, LAMR 67, is classified as large, but it is an unusual stratified site in an unusual setting at the back of the Canadian River valley. Both of the site types discussed below have similar size distributions.

Artifacts and Ecofacts. Tertiary flakes comprise most of the artifact assemblage. These flakes result from the manufacture of unifacial, bifacial, or core chipped stone tools. Among the most common flakes examined in the field were the ‘thinning flake,’ a broad, flat, expanding flake with a feathered edge, and the ‘sharpening flake,’ a thin, flat, square to oval-shaped flake used to create or maintain a sharp tool edge. Within the assemblage, Alibates is the most common material used for flintknapping. Fine-grained quartzite is second in popularity, and Potter chert is a distant third.

Fewer primary flakes, tested nodules, chips, and chunks occur, and even less frequent than these are shaped tools. Of the latter, simple marginally retouched flake scraping and cutting devices predominate.

Burned rock routinely occurs at lithic scatter sites, and bone and shell fragments are present in small numbers but not at every site.

Discussion. Many artifacts found at quarry sites also occur at lithic scatters, but the proportions are different. Quarries have many nodules and primary flakes; lithic scatters have fewer of these but more secondary or tertiary flakes. Both site types have hammerstones, but these occur more regularly at quarry sites. Bone and shell also occur at both, but most often at lithic scatters. Shaped tools are associated much more frequently with lithic scatters.

A problem that we observed in studying earlier survey data was a confusion between a lithic scatter that has some surface quarry debris and a surface gravel quarry with some lithic flaking debris. In the site records, the former might be called "lithic scatter," "workshop," "quarry/workshop," "chipping area," or "chipping station." The latter might be called "lithic scatter," "workshop," "quarry/workshop," or "chipping station." All these possibilities come down to two site types, *surface gravel quarry* and *lithic scatter*. The types are distinguished primarily by the proportion of quarry material and initial reduction to later stage reduction. If a site has proportionately more tested nodules and early stage flake debris, it is most likely a quarry site; if the proportions are reversed, it is likely to be a lithic scatter. It is possible that the remaining attributes of the artifact and ecofact assemblages and of site size and setting may contradict the identification. This rarely occurs, however, and we have seen it only when the two site types are contiguous. An example is LAMR 474, where the northern part of the site is a lithic scatter and the southern part is a quarry.

Types of Lithic Scatters

Two types occur within the lithic scatter site category. The first type is the 'typical' dispersed accumulation of chippage and burned rock; the second contains one or more tight clusters of thousands of tertiary flakes. Key differences between the types are shown in Table 2.

Table 2. Type I vs. Type II Lithic Scatters.

	SPATIAL DISTRIBUTION	FLAKE CONCEN-TRATIONS	SHAPED TOOLS	ASSEMBLAGE SIZE [RANGE]
Type I (n=14)	throughout project area	absent	uncommon	majority (8) in the 100s [10s-1,000s]
Type II (n=7)	Alibates and 'Quarry' Creeks only	present	common	majority (6) in the 1000s [100s-10,000s]

Type I Lithic Scatters (n=14)

Description. Type I lithic scatter sites occur throughout the project area. The site size, elevation, and landforms supporting these sites are diverse, but all of them are situated close to the valley rim of the river or a creek. Eight of the sites are single function lithic scatters, and seven are classified as mixed types. The mixed group includes six Type I lithic scatters found at surface gravel quarries and one with a petroglyph.

The characteristic Type I assemblage contains several hundred pieces of chipped stone, consisting of tested nodules, primary and secondary flakes, and tertiary flakes. The raw material is a mixture of Alibates, quartzite, and often a small amount of Potter chert. While primary and secondary flakes may outnumber interior flakes, the proportions of flakes to each other and to tested nodules definitely distinguishes a Type I lithic scatter from a surface gravel quarry assemblage. If a chipped stone tool is present, it is most likely a flake scraper. The artifacts may be broadly scattered or loosely concentrated, but not tightly clustered.

The predominance of cortical flakes at Type I lithic scatters suggests that the source of raw material is close by and that suitable material was brought to the site in nodular form from a surface gravel quarry. This proximity accounts for the fact that at several of these lithic scatter sites, the primary and secondary flakes may equal or outnumber the interior flakes. The mixture of raw materials found at the lithic scatters is the same as that found at surface gravel quarries, and the nodules at both types of sites resemble each other in size and shape.

The suggested behavior is one in which the knapper selects raw material nodules at a surface gravel quarry and removes them to a nearby campsite. Reduction takes place at the camp, producing tested nodules, cores or chunks, flakes, blanks, or tools. Heated rock is probably associated with processing food materials, especially since bone and shell occur at these sites. Heat-treating the lithic material prior to knapping is also a possibility. Chunks of raw Alibates material may contain imperfections, and heat-treating can improve its conditions. Although many pieces of Alibates show evidence of heating (e.g., potlids, crazing, cracking, or heightened colors), these characteristics may have resulted from intense fires in recent or prehistoric times. In a personal communication, the late Ed Day, considered one of the most expert knappers of alibates chert, never found the need to heat treat the material before working it.

Dating. Type I lithic scatters may have been used throughout prehistory and into the Protohistoric period. Based on the very few temporally diagnostic artifacts recovered during this project, however, these sites seem to date during the more restricted time span from the Late Archaic (ca. 4000–2000 BP/2000 BC–AD 1) to the early part of the Late Prehistoric stage (ca. 1500–900 BP/AD 450–1050).

Type II Lithic Scatters (n=7)

Description. Spatial distribution is the first distinctive attribute of a Type II lithic scatter site. All these sites are in the Alibates and ‘Quarry’ Creek watersheds (see Figure 1). Other aspects of distribution (size, elevation, landform, and proximity to water courses) are similar to Type I scatters.

The characteristic Type II assemblage is the second defining attribute. It contains several thousand pieces of chipped stone, consisting primarily of small (≤ 0.5 cm) tertiary flakes, many of which are pressure flaked. The flakes may occur in tight clusters; in these cases, very few flakes are between clusters. Chipped stone tools are more common on Type II sites; a typical site has a few bifaces, unifaces, and scrapers. Grinding tools and ceramics are absent.

The preponderance of tertiary flakes and the corresponding low percentage of tested nodules and flakes with cortex suggests a different raw material source than that exploited by the knappers associated with Type I scatters. The most prevalent source of cortex-free Alibates material is the tailings from the hundreds of hand-dug quarry pits on upland landforms around 'Quarry' Creek. Literally tons of material represented by millions of flakes are available for the picking up, material that has already been processed to remove cortex during the reduction of ledges and boulders in the quarry blank production sequence. These tailings consist of large refuse flakes that could be easily removed to a campsite where they would be further reduced into flake tools, some of significant size. The knapping debris at the campsite would be characterized predominantly by tertiary flakes, since most of the cortex had been removed at the quarry pit.

The identification of Type II sites only along Alibates and 'Quarry' Creeks adds strength to this interpretation. The hand-dug quarry pits are themselves spatially restricted to this same locality.

Dating. There are chronological implications for this interpretation. If one accepts the primary source of raw material at Type II scatters to be the quarry pit tailings, then Type II scatters could not exist any earlier than the creation of the quarry pits. Since the quarry pits are generally assumed to date to the Antelope Creek phase, Type II scatters would date no earlier. Most likely they are even later, dating to the Protohistoric period of the Contact stage. The rationale for this interpretation is that Type II scatters are open campsites containing burned rocks. There may have been cooking fires at every one. With a perfectly adequate village in the vicinity, it is not likely (although not impossible) that these Antelope Creek phase knappers would establish a separate camp to manufacture their chipped stone tools.

A corollary chronological argument may be made concerning Type I scatters. The fact that surface gravel quarries were exploited at all suggests that the pit tailings, and the pits themselves, were not available at the time. This would place at least some Type I scatters in the pre-Antelope Creek portion of the Late Prehistoric stage, the Archaic stage, and even the Paleoindian stage.

Type I vs. Type II Lithic Scatters: a Summary Comparison

A comparison of the Type I and Type II assemblage profiles is instructive, and this can be done visually by looking at the graphs in Figures 19 and 20. In chipping debris, the Type II sites have more tertiary flakes and less of the early stages of manufacture than do Type I sites. Type II sites have a broader range of chipped stone tools and more restricted ranges of non-chipped stone artifacts (mainly hammerstones) and ecofacts (mainly burned rock) than are found at Type I sites.

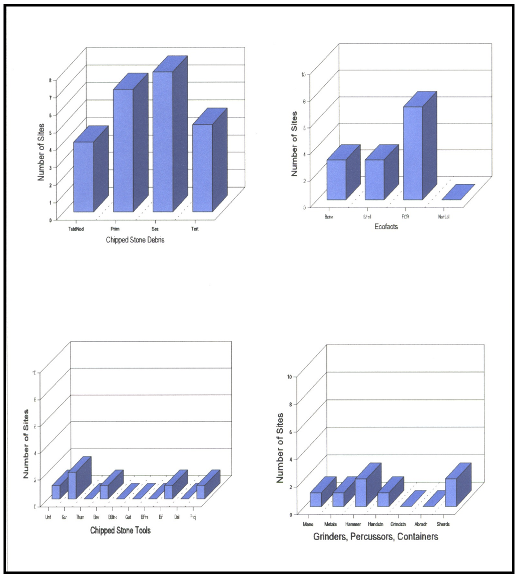

Figure 19. Assemblage profile for Type I lithic scatter sites.

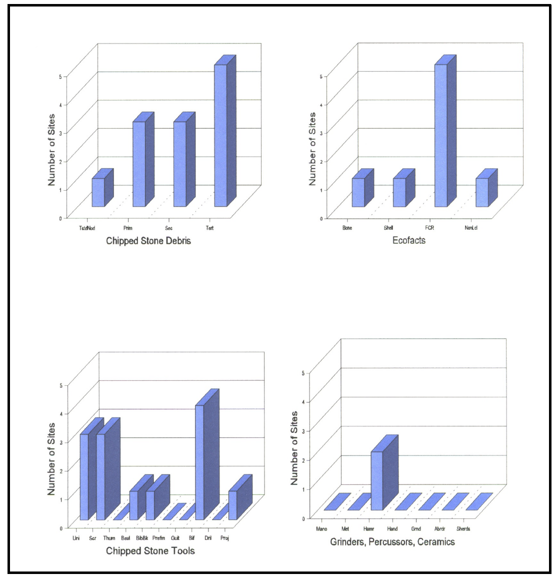

Figure 20. Assemblage profile for Type II lithic scatter sites.

The overall impression is one of a well-rounded encampment at Type I lithic scatters in contrast to a more focused activity at Type II sites, probably a chipped stone tool workshop. It is interesting that we may finally have given some definition to the commonly used site type of ‘open camp’ which we dismissed earlier in this report and which we can now replace with a Type I lithic scatter.

Structures (N=14)

Fourteen sites with dolomite slabs in roughly circular, rectangular, or squared alignments were identified. They occur in two clusters; one is in the Alibates Creek watershed and other is at the junction of Turkey and Short Creeks with the Canadian River (see Figure 1). No structure sites lie between these two clusters, not even in the intervening creek valleys.

Rather than create new categories for structure sites, we will use the ones developed by Lintz (1986). Variability in the size, shape, location, and content of Antelope Creek phase structures has long been a topic of discussion. Lintz suggested that this variability was the product of working with incomplete data and with overstating small differences. In classificatory terms, Green and Krieger were ‘splitters,’ while Lintz was a ‘lumper.’ In his 1986 dissertation, *Architecture and Community Variability within the Antelope Creek Phase of the Texas Panhandle*, Lintz used a cluster analysis of 62 variables of structural data to develop a typology of 11 types of Antelope Creek structural units. The units consist of combinations of dominant and subordinate rooms, plus cist and pit features. Typically, a dominant room is larger than a subordinate one and has interior features. A subordinate room is smaller, lacks interior features, and may be more simply built. The typology enabled Lintz to get beyond architectural complexity to uncover patterns of social complexity.

Subhomesteads are simple small rooms with no interior features. The simple form has one or two rooms, and the complex form has three or more. Typically, subhomesteads are situated on low terraces close to agricultural soils along the Canadian river (80%) or at midrange distance from the river (20%). There are few tools, and these tools relate to horticultural production and processing. Trade goods are rare, and the sites do not contain burials. All of the dated subhomesteads in Lintz' sample belong to the early Antelope Creek phase, A.D. 1150-1300. Subhomesteads are interpreted as seasonal or otherwise limited use structures. Duffield (1970) proposed that they are field huts, and this is a possibility for at least the valley structures.

Homesteads have a dominant room with pits and cists. Simple forms do not have subordinate rooms, while complex ones do. Homesteads are located either near (60%) or far (40%) from the river, but not in the intervening area. They are found on the inner valley floor or on the rim. Tools are more common and tool variety is greater than at subhomesteads, and Southwestern trade goods are common. Burials may be present. Homesteads probably represent single family dwellings.

Hamlets have multiple dominant rooms. Simple hamlets do not have subordinate rooms, and pits or cists are optional. Complex ones have both kinds of rooms, as well as pits and cists. The hamlet tool assemblage is greater and more varied than the homestead assemblage. Hamlets are probably associated with multiple families and a longer-term occupation. They occur predominantly at midrange distance from the river (70%) as opposed to either close (15%) or far (15%). They tend to be 3-4.5 km from the river on an inner valley wall bench or rim.

Lintz does not include *village* sites in his sample, but it would be safe to say that both villages within the Monument would be classified as complex. Villages represent an intensification of community life. First, there are more people living in proximity to one another. With increased population, there are more structures, more structural variety, more tools and tool types, and more trade goods. Excavations have shown that villages were occupied for decades; middens have formed and later structures are superimposed or intrude upon earlier ones. This aggregation of the settlement pattern is thought to have taken place in the late Antelope Creek phase, from A.D. 1300-1450.

Subhomesteads (n=3)

Description. Three isolated structures are consistent with the subhomestead structure type. All are single-room stone enclosures, with walls made of tabular pieces, chunks, and cobbles of dolomite in square or rectangular alignments. The presence or absence of internal features cannot be assessed from surface data, but no external features are present. The sites are small, and any lithic debris associated with the structure is concentrated within a few meters of it (Figure 21).

Figure 21. Subhomestead.

Location, Setting, and Size. The structures are low on the landscape - actually in the floodplains - and have few artifacts. There are two on Alibates Creek and one at the base of the Canadian river bluffs north of Short Creek. Chipped stone debris occurs in the 1s to 100s; only one shaped tool, a biface fragment, was observed. There are no rough or ground stone tools or faunal remains. The absence of these archaeological materials probably relates to the activities that occurred at isolated structures, activities that did not require stone tools or stone tool manufacture and that did not generate faunal remains. All isolated structure sites are in the very small size range.

Since these structures are located close to water and to floodplain soils, which suggests that they are field huts, the paucity of artifacts is consistent with seasonal pursuits. This interpretation raises as many questions as it appears to affirm. For example, why build seasonal huts when hamlets and villages were not far away? Why are there no tools for plant processing (scrapers, grinders, knives)? Last, why are the structures isolated instead of in groups?

Homestead (n=0)

No site in the current survey sample could be positively identified as a homestead. One site, LAMR 267, on a bench above Alibates Creek, is possibly a homestead, but the site is eroded and partly buried under colluvium. The number and complexity of features are indeterminate. However, since it has two areas of potential structural debris, and its assemblage is similar to the sites in the hamlet category, it is included in the discussion of hamlets.

Hamlets (n=9)

Description. The nine recorded hamlets contain more complex structures, presumably dwellings, and outlying features. The structures and the artifact scatters around them are larger than those found at simpler structure sites, although, from the surface, the building technique appears the same. Like the smaller dwellings, the surface appearance of hamlets is one of straight or curved lines of dolomite tablets or nodules. In heavy ground cover they can be easily overlooked, were it not for the multitude of chipped stone debris associated with them (Figure 22).

Figure 22. Hamlet.

Location, Setting, and Size. The hamlets in this sample occur in elevated positions such as hilltops and the canyon rim, between 2940' and 3140' asl. The structural remains vary in appearance and position, affected by landform, site condition, and number of structures. In all hamlets, however, the structures are placed within a few meters of each other. By modern American standards, these houses are much too close. One reason for this hamlet plan may be that they were occupied by family groups. Site size ranges from very small (900 m^2 at LAMR 61) to very large (175,100 m^2 at LAMR 62), but the majority are small to medium. LAMR 61 may have been modified by reservoir construction, which would account for its unusually small size.

Artifacts and Ecofacts. Typically, hamlets exhibit a lithic assemblage that is consistent with tool shaping or maintenance, but not freshly quarried material. That is, the assemblage contains thousands of primary, secondary, and tertiary flakes, but only half the sites had tested nodules. Chipped stone tools are not as common as expected, and only projectile points (at 100% of sites), generic scrapers (at 88%), and bifaces (at 75%) were widely observed. Other chipped stone tools include unifaces, 'guitar picks,' beveled knives, bifacial blanks, preforms, and a drill. Manos, metates, and hammerstones were observed at half the sites. *Borger Cordmarked* sherds also occur at half the sites, but in very small numbers. Two sites have obsidian flakes.

Bone and shell are frequent components of hamlets, observed at 88% and 62% of sites respectively. Fire-cracked rock occurs at 88% of these sites.

Discussion. The tool assemblage, dominated by projectile points, scrapers, and knives, is more reminiscent of hunting and gathering activities than agricultural pursuits. Perhaps this is the assemblage of a community that was peripherally involved in agriculture, but more actively involved in hunting. In part, sampling bias may have affected the assemblage, since the artifacts observed are only those that were on the surface. The intensity of the Palo Duro fire also damaged the surface assemblages. Another possible explanation is that these tools had been made for hunting use but remained at the site when it was abandoned.

Villages (n=2)

The two village sites within the Monument (Figures 23 and 24) were the focus of excavations and intensive digging by several agencies and individuals (e.g., Baker and Baker 1941).

Figure 23. Village (LAMR 52 / 41PT31).

Figure 24. Village (LAMR 54 / 41PT11).

From surface remains left behind by these activities, and from the artifacts uncovered since those activities, the villages appear to be large aggregations of the same types of domestic units, artifacts, ecofacts, settings, and, presumably, functions, as the hamlets. The reason for this aggregation is currently speculative. One explanation is a mobilization of labor to exploit the quarry pits, which are located close to these villages. The need for more and better chipped stone tools may be indirectly related to a change in climate ca. A.D. 1300, at the beginning of the late Antelope Creek phase. This climatic change may be associated with or actually responsible for the return of the bison, which may have triggered a significant increase in hunting activity. This in turn may have necessitated a reorientation of subsistence activities and division of labor, including the development of a quarrying industry.

Lintz' (1986:260) study of all levels of architectural complexity found that:

> None of the sites examined in this study were arranged around a plaza or common use area, and no definable public structures were evident from morphology or artifact contents. . . . Evidence derived from mortuary practices suggests no significant rank or status differentiation among the Antelope Creek individuals. Consequently, the society is regarded as politically egalitarian.

Both villages within the Monument are on the rim of the inner valley, about 3 km from the river, and both fall in the medium size range. Water must have been available from freshwater springs that still moisten the soil in this area.

Artifacts at village sites are more numerous and more varied. Ceramics, which occur but are not abundant at hamlets, are more common here.

Rock Art (N=9)

Description. Petroglyphs were the only type of rock art found during the survey. At all these sites, the image has been pecked or ground into a flat surface on a dolomite boulder. Petroglyph panels at least three of the sites contain human or animal figures . The animals – bison and turtle – are local types extant at the time the rock art was created. The human shapes include individual, oversized footprints and smaller images of full human figures. The range of depictions is similar to rock art from the Trans-Pecos and the Southwest. LAMR 53 has the greatest variety of petroglyphs, including cupules, human feet (Figure 25), turtles, and a four-legged animal, probably a bison (Figure 26). Table 3 summarizes the variety of petroglyphs encountered during this survey.

Table 3. Summary of Rock Art.

LAMR	CUPULES	FIGURES
50	✓	
53	✓	✓ (3 human feet, 2 turtles, 4-legged animal, stick figure)
54	✓	✓? (badly eroded)
62	✓	
83		✓ (two feet)
261	✓ (above LAMR 50)	
272	✓	
430	✓	
449	✓	✓ (foot, stick figure)

Figure 25. Footprint and cupules.

Figure 26. Bison and cupules.

At eight sites, another type of petroglyph, the cupule, has been pecked and abraded into the rock. Cupules are small, circular, basin-shaped depressions, less than 10 cm in diameter and depth. The marks of pecking and abrading that created them are most apparent at LAMR 62. At LAMR 54, the cupules are outlined in orange. Cupules often co-occur with human and animal depictions and may intersect the figures. They can be arranged in short lines as wall as randomly, but they do not outline a figure or form a recognizable shape on their own.

Location, Setting, and Size . The distribution of rock art is the same as the distribution of hamlets and villages, strongly suggesting that the same people who built the structures also created the rock art. In the Monument, habitations were clustered in the upper reaches of Alibates Creek and at the mouth of Turkey Creek, and the same distribution applies to rock art (see Figure 1).

Individual rock art sites appear to be associated with particular hamlets or villages. All but one hamlet has a rock art site close to it. The single exception, LAMR 61, the Turkey Creek site, is at the edge of Lake Meredith, and a slope that may have had the rock art boulder is now covered by rip rap composed of large dolomite boulders.

Size is not a meaningful attribute of petroglyph sites, as individual panels all occur on small boulders. 'Size' in comparison to other sites is used to refer to the area covered by the boulders and the artifact scatter that may occur with them.

Discussion. Since rock art locations are so closely associated with Antelope Creek phase sites, it can be assumed that at least some are contemporaneous with the structure sites. The full extent of the Antelope Creek phase is A.D. 1150-1450. The villages, however, where most of the representational art occurs, probably date to the late Antelope Creek phase, from A.D. 1300-1450.

The purpose of the particular images, or of the cupules, is not known. The images of feet and local animals can be found throughout the West and are generally believed to have ritual significance. Cupules occur worldwide, and they may have different functions in different locales and at different times. While we cannot assess the function of rock art at the Monument and in the Recreation Area, its co-occurrence with sedentary dwellings suggests they are in some way associated with the ritual life of the Southern Plains Village tradition.

A petroglyph panel at LAMR 53 provides some indication of chronology of application. A large footprint is pecked into the surface of the rock, not just an outline but the entire footprint recessed below the surface of the boulder. Four cupules are within the periphery of the footprint and would have been erased or at least modified by the creation of the footprint. Since this is not the case, the application of the cupules followed the carving of the footprint.

Isolated Features (N=3)

Cairns (n=2)

Location, Setting, and Size. Two small sites featuring a single stone cairn each occur above Turkey Creek on the canyon rim. The sites are about 435 m apart on level surfaces, and each measures about 1 m^2 in area. The features are composed of cobbles, predominantly quartzite, placed in a circle. The circle is about 70 cm in diameter and about 5 cm high (Figure 27).


Figure 27. Cairn.

Artifacts and Ecofacts. One chipped stone primary flake was observed at LAMR 459. The single feature is a pile of mostly quartzite cobbles associated with a small amount of lithic debris. The lithic debris is primarily Alibates material, but some Potter chert is also present.

At LAMR 460, tested nodules, primary flakes in the 10s, and a bifacial blank were observed. These artifacts may be associated with the cairn, or there may be a small surface gravel quarry at this same valley rim location. The function of cairns at the Monument has not been determined, but suggested functions include grave markers, trail markers, or boundary markers. The absence of historic material suggests that they are prehistoric.

Cist (n=1)


Figure 28. Cist.

Location, Setting, and Size. This extremely small site (1 m x 1 m) is situated on the floor of Short Canyon. The site is limited to an isolated structure made of dolomite slabs. Some of the slabs are upright in the ground, and the structure does not appear to be modern (Figure 28).

Artifacts and ecofacts. There are no directly associated artifacts. Tertiary flakes are present around the periphery and number <10. There is also a piece of burned quartzite.

Discussion. Lintz' (1986) extensive study of Antelope Creek phase architectural remains has these small cists consistently associated with habitation structures. However, no structure or evidence of structural remains was identified at LAMR 468. The authors have also recorded a site in LAMR on the north side of the Canadian River with two isolated cists and no evidence of a habitation structure (Katz and Katz 2001) . The conclusion is that, based on available survey data, isolated cists do occur but only as a rare item in the prehistoric site inventory.

Historic Homesteads (N=4)

Dugouts (n=2)

Figure 29. Dugout.

Description. LAMR 260 is a single 8 m x 6 m room dug into the foot of a dolomite-strewn hill on the second terrace above Alibates Creek, about 10' above the floodplain. It had a superstructure of stacked limestone blocks which has collapsed into the interior. Very few artifacts are associated with the structure (Figure 29).

The dugout at LAMR 269 was a single dolomite-lined room, 10 m x 5 m, excavated into the base of a low gravelly slope beside the headwaters of an unnamed drainage which flows into Alibates Creek. A dolomite slab-lined well or cistern is about 10 m south of the dugout in the middle of an unnamed draw. Historic debris is lightly scattered throughout the area, but most heavily concentrated between the dugout and the creek. Historic material includes metal stove parts and some 'Dresser' brand oil-related pieces, glass, and ceramics.

Discussion. Dugouts were a typical form of housing for newcomers to the area during the late 19th and early 20th centuries. Both of these dugouts are purported to be the home of Allen Bates, an early cowhand in the locality. He is most well known for giving his name, "Allie Bates," first to the distinctive geological formation and then to the national monument.

Ranch Houses (n=2)

Figure 30. Corral.

Description. The remnants of two early ranch houses, outbuildings, walls, and cisterns are located on the east side of Turkey Creek. The various features were constructed of dolomite slabs, as were their prehistoric precursors in the same vicinity. Like the prehistoric sites, only partial foundations and a scattering of artifacts, metal and glass in this case, remain (Figure 30).

Site Analysis

Introduction

The data derived from large block surveys are well suited to studies of site distribution and patterning, and the current survey was the largest and the most comprehensive block survey to be conducted in the Recreation Area and the Monument.

The total area of the survey was 4,043 acres. These included all 1,079 acres of Alibates Flint Quarries National Monument and 2,964 adjoining acres of Lake Meredith National Recreation Area. Five adjacent creek drainages were investigated, from their mouths at the Canadian River valley back into their drainage basins. Topographically, the survey extended from stream channels and terraces up to the top of the Canadian River escarpment and the interfluvial uplands of the various drainages.

Seventy-five sites were located and a complete data record established for each one. Of these, 39 were recorded for the first time and 36 were revisits of previously recorded sites. Enough specific data was collected on each of the 75 recorded sites to allow us to refine the existing site typology. Fourteen types of sites, grouped into six categories, were defined in the previous section. This section looks at the way each site relates to others within its type and how different types of sites relate to each other in space, time, and content.

We had the most success with spatial distribution. A site is firmly assigned to a particular category and type based on multiple attributes. A spatial analysis is thus working with known quantities of data and can proceed to the level of interpretation without much hesitation. It is more problematical to make interpretations based on cultural data such as artifacts, assemblage characteristics, or features. They are just not available on the surface in any significant numbers after more than 70 years of intensive local collecting and periodic archaeological survey, testing, and excavation.

Site distribution is discussed in terms of geographic preference by drainage system, landform, and elevation. Site content follows, including a discussion of the size of sites, their assemblages, and any identified features. Last, the sites are considered according to a general chronological sequence.

The site and feature recording forms, designed to cover many individual site attributes, were reorganized into more general categories to make them more manageable. For example, the 14 landform categories were collapsed into five units, and elevations were rounded to the nearest ten feet.

Since the Monument is an area of intense lithic resource exploitation, it seems best to consider the sites in two groups: those that are tied directly to a resource, such as a surface gravel quarry or pit quarry, and those that are less resource dependent. Sites tied to a resource must be situated at that source, regardless of where it occurs. The elements of landform, location, size, function, or any other aspect are governed by the resource. At sites not so closely tied to a resource, the element of choice of landform, size, etc. is much greater. Sites in this group are, not surprisingly, preferentially located on flat places close to water. But how far or how high the site is placed above water, its size, the placement of its features, and its proximity to other sites and resources are more meaningful cultural and economic decisions.

Site Location

Figure 1 provides the reader with the topography of the survey area. Site locations are not provided, as this paper is open source.

Distribution - Even though most sites are associated with watercourses, more sites, and more types of sites, are clustered in and around Alibates Creek than at any of the other four drainages in the survey area. Alibates Creek seems to have been a center of settled domestic life, since it includes subhomesteads, hamlets, and villages. This also means more architectural variety than is found elsewhere in the project area. This creek valley also contains the largest and richest surface gravel quarries. Lithic scatters are also common, with Type II scatters inside the drainage and Type I lithic scatters forming a border around the valley.

Quarry Creek presents a very different picture. This drainage was used exclusively for lithic resource exploitation. From Site LAMR 100 to the river, every site is devoted to this one activity. Lithic scatters surround the north and east sides of Site LAMR 100, extending right up to the boundary of the outcrop . Type II lithic scatters, which may represent the exploitation of quarry debris or tailings, occur in a large arc around Site LAMR 100, close to but still outside the outcrop area. Why would there not be habitation closer to the quarry? Among the possible reasons are: a lack of ample space for settlements, steeper terrain, shallower soils, and more difficult assess to water. Another possibility is that the quarry was considered a universal resource, open to all people who wished to use it. The concept of a prehistoric free trade zone is one that should be investigated.

Bates Creek is another single activity drainage, with only surface gravel quarries lining its valley walls. The quarries on the western side (i.e., not shared with Alibates Creek) were not used as exhaustively as the ones forming the interfluvial divide with Alibates Creek. The lithic assemblage at each Bates Creek surface gravel quarry is in the 1000s rather than the 10,000s.

Turkey and Short Creeks are similar to each other and more like other drainage systems in the Recreation Area than they are to Alibates Creek. In each case, a hamlet was established at the juncture of the creek and the Canadian River valley. By siting structures in this way, inhabitants had easy access to sweet water from the creek and to both riverine and upland resources. Hamlets, not only on Turkey and Short Creeks but throughout the project area, have two other consistent associations: 1) They are proximate to a surface gravel quarry; and 2) almost all of them have rock art in the form of a boulder with cupules pecked into it.

Site LAMR 67, a stratified lithic scatter at the mouth of Short Creek, is a unique site in the project area.

The sites on canyon rims at a distance from the five major creek valleys are consistently of the surface gravel quarry type, i.e., a fixed resource. Small exposures of Potter gravels uncovered by erosion have been exploited for nodules of Alibates chert, Potter chert, quartzite and sandstone throughout the Recreation Area and the Monument.

The pattern that has developed over time is one of intense lithic procurement activities and more permanent settlements in Alibates and Quarry Creeks, surrounded by less concentrated, more normal activity in Bates, Turkey, and Short Creeks. The less concentrated use and apparently more limited settlement patterns seen in these three creek systems is much closer to the patterns identified on Blue, Evans, and Martins Creeks, Coronado Cove and Fritch Canyon, Bugbee Creek) and South Canyon. The distinctive cultural patterns characterizing Alibates and Quarry Creeks can only be attributed to the natural blessing of the outcrop quarry and the better-than-average surface gravel exposures.

Landform - There is a definite preference for placing sites on high points, regardless of absolute elevation. Twenty-five are on lower landforms (floodplain (10), terrace (15)), whereas twice as many sites (50) are on high landforms (ridge (13), canyon rim (24), summit (13)).

The sites on the higher landforms include many of the quarry types, hamlets, both villages, the petroglyphs, and some Type I and all Type II lithic scatters. The most popular single site location is the canyon rim (n=24.), with a variety of types including habitations (villages and hamlets), surface gravel quarries, and the rock art and cairn sites.

The lower landforms include most of the lithic scatters, the historic sites, the isolated cist, subhomesteads, a few surface gravel and stream quarries, and several hamlets. The low elevation hamlets are located just slightly higher than the subhomesteads on terraces and benches lining the creeks. They are still very close to their water source but are safe from most flooding.

The historic structures and prehistoric subhomesteads form an interesting parallel. The historic settlers found that living close to water was more important than the threat of flooding or the voracious insects. The small, isolated prehistoric structures may have been located with the same needs in mind. Ranchers raised some crops for their personal use, and some may have farmed as well. Could the same be said for the prehistoric occupants of the subhomesteads?

Elevation - Sites in the survey area range from 2900 to 3200 feet elevation. There is no strong preference for site occurrence by elevation: 26 are in the 2900s, 25 in the 3000s and 22 in the 3100s. There are just two sites in the 3200 group, but these two are located in the far southeastern corner of the project area, well out on the broad and high interfluve between Alibates and South Turkey Creeks.

Once again, the fixed nature of important resources determined the relationship between elevation and site type. The lowest site, LAMR 444, at 2900' is a prehistoric surface gravel quarry ; the highest site, LAMR 450, at 3240' is also a prehistoric surface gravel quarry. Since surface exposures of Potter gravels occur at all elevations, so do the surface gravel quarry sites.

The elevation of petroglyph sites is similarly resource-bound. Multi-panel petroglyphs are applied where a suitable rock ledge exists, i.e., they are at the elevation where the ledge of Alibates dolomite is exposed. This ledge is exposed in many parts of the Recreation Area and the Monument, so the choice of embellishing the stone with petroglyphs at any particular place is still a cultural one.

Another example is the Type I lithic scatter. All of these sites are situated close to some type of quarry, and, like the quarries, their elevation is dependent on the location of the resource.

Type II lithic scatters, with the exception of one site in the bottomlands (LAMR 443), are all medium to high sites. These scatters are not as closely associated with a range of lithic sources as the Type I scatters. Rather, they tend to surround Site LAMR 100, the quarry pit site, and may be relying on the cultural tailings rather natural outcrops and exposures.

Structure site elevation follows the pattern described by Lintz (1986) and utilized in the site type definitions in the previous section. Subhomesteads are closest to the river; hamlets occur primarily in the middle to high elevations away from the river but close to springs and creeks; and villages are on the rim above the canyon at the heads of creeks and springs.

Site Content

Size - The quarry sites in the Recreation Area are huge, but other sites are much more modest in size. Sites that tend to be in the small category (up to 2,000 m^2) include historic homesteads, prehistoric subhomesteads, petroglyphs, cairns, and Type II lithic scatters. Larger sites (2,000-50,000 m^2) include hamlets, the two villages, and Type I lithic scatters. Largest of all (>50,000 m^2) are most of the surface gravel quarries.

At structure sites, site size probably reflects the size of the population: a family unit in a prehistoric subhomestead or historic dugout house; multifamily or extended units at hamlets; and larger social or economic groups at the villages. Type I lithic scatters certainly accommodated more than a single, or even an extended, family. Type II lithic scatters are much smaller, and the flake concentrations are usually in a cluster, suggesting comparably smaller exploitative social units.

Artifacts - Regardless of site type, the prehistoric artifact assemblages at the Monument have commonalities: lithic debris, burned rock, expedient tools, and very few shaped tools. Almost half the sites had fewer than 10 shaped tools, and only nine sites had shaped tools in the 10s. Excluding the two villages (LAMR 52 and 54), no site surface exhibited more than this number. With so much redundancy and so little variety, not very much information can be gleaned from examining their distribution.

Nevertheless, there are a few well-shaped and diagnostic tools that provide some distributional data. Late Archaic period projectile points are the best example. All but one of the points of this age were found in the uplands between Alibates and Quarry Creek. We cannot help wondering if there was an Archaic site here that was obliterated by later Plains Village period occupations. There was one Late Archaic point at the river bluff base in the bottomlands.

The distribution of Late Archaic points found elsewhere in the Recreation Area supports the pattern of the points found in the Monument. Eleven points have been recorded around upland springs, and two more were located in the bottomlands. Since both valley bottom components were buried, it is fortunate that we have any data regarding the Late Archaic use of the bottomlands at all.

Other distinctive artifacts are consistently associated with certain site types. Late Prehistoric ceramics are found at 11 sites; nine of these are structure sites, and the others are very close to structures. Obsidian occurs at only two sites, both Antelope Creek phase hamlets. Small triangular projectile points (*Washita* and *Fresno* types were observed at 12 sites. Most of these are hamlets and the villages, but two were at a lithic scatters and one at a surface gravel quarry. Guitar pick scrapers are only found at hamlets and the villages.

Assemblage Size - As with site size, prehistoric assemblage size, as judged by the amount of lithic debris, is most often rather modest. Only Site LAMR 100, the outcrop quarry, has greater than one million pieces. Nine sites have artifacts in the 10,000s. This group represents a range of site types, including four surface gravel quarries, a hamlet, a lithic scatter, an outcrop quarry, and the two villages. More typical are the sites with assemblages of surface artifacts in the 100s (n=23) or 1000s (n=27), although there is no apparent relationship between these assemblage size groups and the types of sites at which they are associated. Both assemblage size groups have been recorded at hamlets, petroglyphs, surface gravel quarries, and lithic scatters. At the small end, one site, a petroglyph, has artifacts in the 1s, and two more (one of the cairns and the isolated cist) have no associated artifacts whatever.

The number of artifacts displayed on the surface of historic sites is also very small. One historic house and one dugout have none; one house has fewer than 10; and the other has artifacts in the 10s.

If there had been ground cover at the time of survey, it is possible that some of the 12 sites with small (fewer than 100) surface assemblages would have been overlooked. It is also possible that heavy grass cover would have obscured Type II lithic scatters and some of the stone alignments. In other words, although we cannot always say very much about assemblage size, the Palo Duro Fire has at least allowed us to say something.

Features - One hundred and eighty-two features were recorded at 31 sites. The feature types include artifact concentration, historic grave, burned rock cluster, cairn, depression, dugout, historic foundation, isolated room, petroglyph, roomblock, slabs, undefined rock alignment, and wall. The number of features per site ranges from 1 (at 13 sites) to 62 (at LAMR 52). The sites with the greatest number of features include the two village sites (LAMR 52 and 54) and a Type II lithic scatter with 30 individual flake concentrations (LAMR 448). An historic house, LAMR 381, contained 10 features, and LAMR 51, close to the two villages, contained nine. The remaining sites had fewer numbers of the same types of features.

Chronology

The entire chronological sequence for the Canadian River valley in Texas is shown in Table 4.

Table 4. Chronological Sequence for the Canadian River Valley.

STAGE	PERIOD	PHASE OR COMPLEX	CLIMATIC REGIME	EVENTS
CONTACT A.D. 1450-1875	Ranching	Post-A.D. 1875	Little Ice Age A.D. 1300-1850	Many bison
	Historic Tribal	Various tribes A.D. 1700-1875		
	Protohistoric	Tierra Blanca A.D. 1450-1650		
LATE PREHISTORIC A.D. 450-1450	Late Plains Village	Late Antelope Creek A.D. 1300-1450		
	Early Plains Village	Early Antelope Creek A.D. 1150-1300	Century-long drought?	Bison off plains ca.A.D. 1200 Heavy reliance on deer
	Woodland	Lake Creek ca. A.D. 450-1050	Medieval Warm Period (A.D. 800-1200)	Increasing use of deer, fewer bison
	Terminal Archaic	Little Sunday A.D. 1-A.D. 450	Moderate, continental climate similar to today	Bison is major prey species throughout most of Terminal Archaic

STAGE	PERIOD	PHASE OR COMPLEX	CLIMATIC REGIME	EVENTS
ARCHAIC 6000 B.C.–A.D. 450	Late Archaic	none identified 2000 B.C.-A.D. 1	Conditions ameliorate	Lt. Archaic begins as climate improves and bison return
	Middle Archaic	none identified 5000-2000 B.C	Hypsithermal Hot and dry	Little evidence of human occupation on margins of Llano Estacado; none on Llano.
	Early Archaic	none identified 6000-5000 B.C	Hot and dry; probable periods of drought	Few, if any bison, and increasing use of vegetable foods and smaller animals.
PALEOINDIAN 9500-6000 B.C.	Late Paleoindian	Various 8000-6000 B.C.	Warm and dry	*Bison antiquus* replaced by modern form, *Bison bison*.
	Middle Paleoindian	Folsom 8900-8200 B.C.	Less stable; seasonal differences; summer monsoon pattern	Many Late Pleistocene megafauna gone; hunting focused on *Bison antiquus*.
	Early Paleoindian	Clovis 9500-9000 B.C.	Moist, cool, equable	Pleistocene megafauna

Paleoindian Stage through Middle Archaic Period - The evidence for occupation of the project area prior to the Late Archaic period is slight, but the evidence for use of the area is great. Ranchers have found Paleoindian points in the immediate area outside the Monument boundary, and it is likely that Paleoindians and early Archaic peoples passed through the area to exploit the lithic resources. Rather than dig at the outcrop quarry, these peoples probably have used the resources of a surface gravel, boulder, or stream quarry. We have been unable to identify any sites of these periods, but there is the potential of identifying occupations through the study of lithic debris.

Late and Terminal Archaic Periods - There are several projectile points that indicate the Late to Terminal Archaic use of the localitys riverine and upland resources. At other locations in the

Recreation Area, we have recorded sites with large numbers of hearths and boiling stones, as well as artifacts made from quartzite, Potter chert, and Alibates chert. We suspect that these are Archaic camping sites.

We considered the possibility that mortar holes might be an Archaic feature. Although mortar holes were not identified in the Monument, the NPS site file and base map show several mortar hole sites. Mortar holes are located at the very edge of the Canadian River trench, and all of these occur at a tributary mouth. The relatively few mortar holes that are beyond the river valley are also at tributaries, i.e., Spring, Blue, Bugby, Coetas Creeks. Possibly, the material being ground in the mortar was a plant that only grows in bottomland environments. We then examined the location of the Archaic projectile points to see if there was a strong association with the mortar holes, but the data did not support this hypothesis.

Late Prehistoric Stage - Only one site, LAMR 271, has a Woodland-appearing sherd. This is a thick, quartzite-tempered sherd with a fiber-roughened surface treatment. This site also has pipe fragments and a Late Archaic projectile point base.

Most sites of Antelope Creek age cannot yet be sorted into the early and late phases on the basis of surface characteristics. We have developed the following model, but it is not yet tested.

The early Antelope Creek settlements, probably characterized by subhomestead and hamlet-sized structure units, are dispersed throughout the project area. Their location, low down and tucked into the sides of stream channels, is well positioned for deer and small mammal hunting as well as floodplain terrace gardening. The proximity of these sites to surface gravel quarries is, we think, no accident.

By A.D. 1300 we see major settlement and subsistence changes occurring in the project area. The bison have returned to the High Plains in significant numbers, responding to climatic changes which elsewhere is known as the Little Ice Age. During the late Antelope Creek phase, the previously dispersed resident population coalesces into a larger settlement unit, the village. This permits a increased labor force to develop the quarry pit ‘industry’ at sites like LAMR 100, generating quantities of high quality Alibates material for bison hunting tool production. There is evidence that these finished tools are made in the nearby villages, perhaps by craft specialists. More and larger bone tools resulting from the increased bison hunting activity are put to good use in the horticultural pursuits necessitated by the greater population density. Bone hoes and digging tools are as much a characteristic of the village assemblage as are the bison hunting chipped stone knives and scrapers.

Protohistoric Period - The millions of quarry debris flakes associated with Site LAMR 100 provided a ready source of raw material for the mobile Protohistoric bison hunters who succeeded the Antelope Creek people in the project area. We postulate that many, perhaps most, of the Type II lithic scatters are the camp and workshop sites of these hunters. The assemblage at these scatters is primarily tertiary flakes in tight concentrations, just what would be produced by small groups of individual flintknappers reducing large, cortex-free flakes. The location of these lithic scatters surrounds the LAMR 100 outcrop quarry.

Ranching Period - There are very few remains from this period in the project area, but even these provide a vague pattern. The two dugouts, LAMR 260 and 269, are located in the Alibates Creek valley, while the remains of the two ranch houses, LAMR 380 and 381, are in the Turkey Creek valley. The distribution of historic structures has more to do with land acquisitions and transactions than with resource procurement, as is the case with the prehistoric periods. This period in the culture history of the project area still remains to be synthesized.

Significance

Each of the 75 sites recorded by this survey was analyzed for its scientific potential according to the criteria established by the National Park Service (1983, 1988). Looking at the sites in each category that have the highest scientific potential, and are therefore most eligible for listing on the National Register of Historic Places, we see the following picture. A majority of the quarry sites have little or no potential, but those that do are of two types: the outcrop quarries with intentionally dug pits, and the very large surface gravel quarries which have internal lithic scatters and workshops associated with them. Likewise, the lithic scatter sites exhibit a range of potential, but those with the highest ranking are the Type II and the largest of the Type I scatters. All the structure sites, and the petroglyphs, have high scientific potential.

Looking across types of sites at those with the highest potential, a clear pattern emerges. The outcrop and large surface gravel quarries, the largest structure sites, the petroglyphs, and the specialized lithic scatters are tightly clustered in and around the Alibates Creek drainage. In one form or another, all these sites have something to do with the exploitation of the unique Alibates chert resource. In contrast, the more 'normal' settlement and activity pattern in the project area, which is also characteristic of the rest of the locality, is one of small to medium-sized dispersed sites exploiting the lithic resources of the surface gravel quarries and subsisting on the resources of the Canadian River valley and it many drainages. These two patterns are irrespective of time.

For this reason, we recommend that the entire Alibates Flint Quarries National Monument be elevated to the status of a district listed on the National Register of Historic Places. It exemplifies the exploitation of a unique natural resource, through time, in a contiguous space. Every prehistoric site has some relationship with this theme, providing the classic definition of an historic context.

Postscript

The report of the Palo Duro Fire survey which I have just summarized has not been published. A draft report was submitted at the end of a fiscal year, and no funds were reallocated to finalize the report. One copy is on file at Park Service headquarters in Fritch, Texas. This includes maps of the locations of the 75 sites , as well as individual descriptions of each site (Katz and Katz 2003).

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A Shot in the Dark: Exploring the Nature and Origin of Prehistoric Anthrosols on the Southwestern Margin of the Llano Estacado

Charles D.Frederick, August Costa, and Joeri Kaal

Abstract

All archaeologists are familiar with middens, dark colored soils containing artifacts typically associated with refuse. Such soils are but one version of human modified soils called anthrosols. Upon discovering that carbon can be sequestered in soils for thousands of years, the geochemical community has performed a tremendous amount of research on such dark earth soils in the name of understanding biochar as a means of carbon sequestration. This paper discusses some recent investigations of midden soils in the landscape southwest of the Llano Estacado that specifically targeted dark earth soils discovered in various contexts. The investigations draw upon traditional geoarchaeological analyses, as well as examination of the molecular composition of the organic matter as determined by analytical pyrolysis techniques. A gas chromatograph and a mass spectrometer are used in order to see if this approach may provide a better understanding of the materials contributed to such soils by ancient inhabitants of the landscape in the distant past.

METHANE GONE WILD: A LONG VIEW OF HERBIVORES ON THE GREAT PLAINS OF NORTH AMERICA

Richard W. Todd, Heidi M. Waldrip, Byeng R. Min, David B. Parker, and David K. Brauer

Abstract

The central grasslands of North America have supported herbivores for millions of years. Humans used herbivores for food since the end of the Pleistocene epoch. Although the grasslands and species that inhabit them have changed, a web of timeless relationships has remained the same. Grasses and other green plants harvest solar energy. Grazing animals harvest plant energy. Humans harvest grazers. Large grazing animals like bison and cattle produce the greenhouse gas methane. A tension exists between the need to reduce greenhouse gas emissions to mitigate accelerating climate change, and how and where we produce food, especially animal protein. We explored this complexity through the case of methane emissions of the pre-European settlement bison herd on the Great Plains of North America. We reviewed estimates of methane emissions by wild and farmed ruminants, with emphasis on the relationship between bison and cattle. We compared the methane produced by bison and other wild ruminants that used to live on the Great Plains with methane produced by cattle currently on the rangelands of the Great Plains. We found that 30 million bison and 36 million cattle produced the same amount of methane. The challenge for citizens and policy makers is to balance the need to reduce methane to help lessen global warming with the essential ecological relationships of grassland, grazer, and human.

Introduction

The Clovis Point

Figure 1. Clovis points from North American sites. (Source: O'Brien et al. 2015:Figure 9; photo by Charlotte D. Pevny, Department of the Interior, 10.1007/978-4-431-55363-2_9.)

The detail is exquisite. The 20 cm-long, 2.5 cm-thin, elegant lance-shaped projectile point is bifacially flaked, meaning the edge was alternately chipped from both sides. The base is fluted, forming a concave channel that let the knapper haft the point to a spear shaft or knife handle. The Clovis point I am looking at was skillfully crafted from 12,800 to 13,500 years ago (Justice 1995), and more than 10,000 examples of it have been found at 1500 locations in North America (Mann 2013) (Figure 1). The ubiquity of the Clovis point attests to a Paleoindian culture that was well-equipped to hunt the fauna of a continent coming out of an ice age. Whether Paleoindian hunters were megafaunal specialists or opportunistic generalists is debated (Grayson and Meltzer 2002), but clearly large mammals, the megaherbivores of the late Pleistocene, were often prey. Hunting sites with strong evidence of the genera mammoth (*Mammathus*), mastodon (*Mammut*), bison (*Bison*), camel

(*Camelops*), and horse (*Equus*) were predominantly found on what we now call the Great Plains of North America (Figure 2).

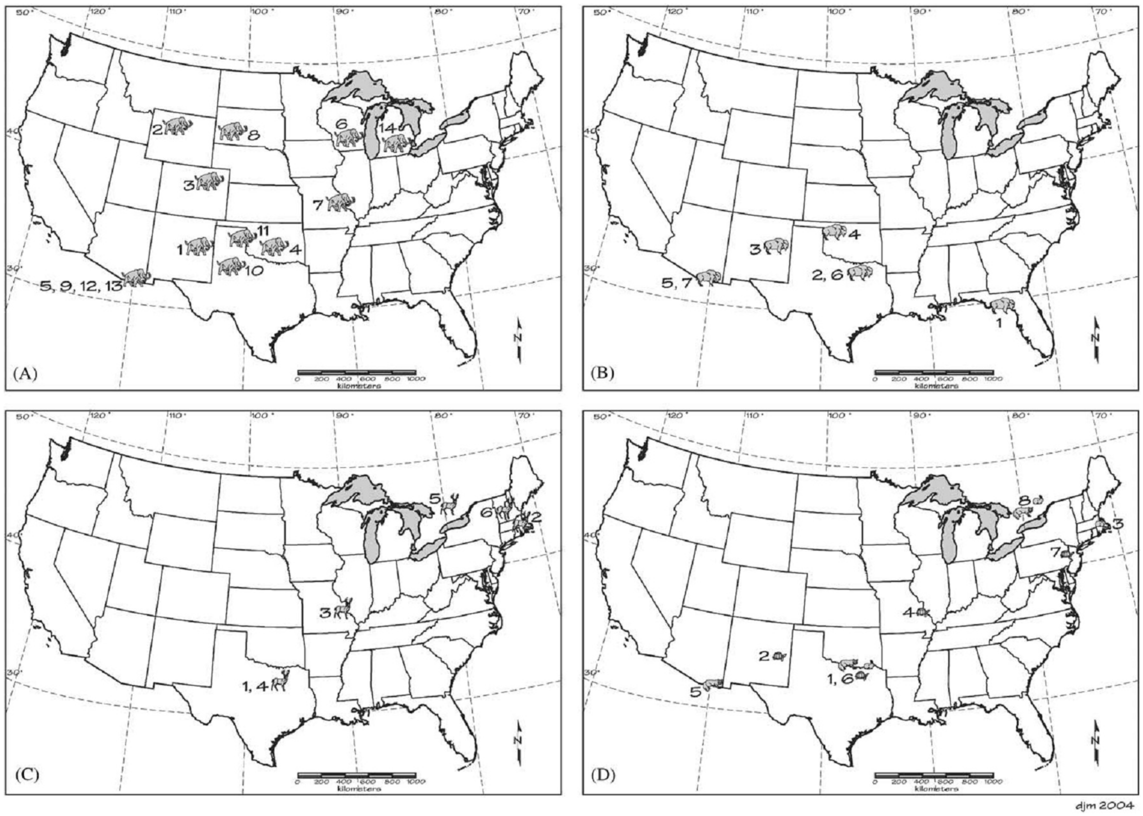

Figure 2. Locations of sites with strong evidence of early Paleoindian subsistence use of vertebrates. Panel A, mammoth and mastodon; Panel B, bison, camel, and horse; Panel C, deer and caribou; and Panel D, carnivores, leporids, rodents, birds, reptiles, amphibians, and fish. (Source: Cannon and Meltzer 2004:Figure 2.)

Thirty-seven genera of megafauna disappeared in a massive extinction at the end of the Pleistocene that still invokes debate over its causes (Faith and Surovell 2009; Gill et al. 2009; Koch and Barnosky 2006; Lyons et al. 2004; Zazula et al. 2014). Gone were the large equid, camelid, and probiscidean herbivores like the wooly mammoth. The winners in the evolutionary lottery were a much smaller (in taxa and size) group of herbivores that included bison (*Bison bison*), wapiti (North American elk; *Cervus canadensis*), pronghorn antelope (*Antilocapra americana*) and deer (*Odocoileus* sp.). But the story of the great North American central grasslands goes back even farther, long before the ice and humans appeared on the continent.

Savanna and Grassland Appear in the Miocene

As the ice of the last glaciers retreated and the climate grew warmer and drier, the surviving grazing mammals ranged over a North American grassland that had developed and evolved over the previous

18 million years, beginning in the mid-Miocene. Woodland savanna dominated that world, with about three dozen genera of large browsers and a few genera of mixed browsers and grazers (Janis et al. 2002). As the climate became warmer and drier, habitats became increasingly open. This landscape was most likely a mix of semi-open woodland with grass openings and savannah-like grasslands, diverse in vegetation and herbivores. The fossil record shows an assorted mix of browsers (brachydonts), mixed feeders (mesodonts) and grazers (hypsodonts). However, large herbivore diversity began to decrease, with the greatest losses in the brachydont and mesodont communities.

Grasses during the Early and Late Miocene used the C3 photosynthetic pathway, and these grasses favored equid and probiscidean hindgut fermenters, herbivores with simple stomachs where microbial fermentation occurs in the large intestine and cecum (Janus et al. 2002). However, a major evolutionary change in grasses would alter the direction of herbivore evolution. About 30–35 million years ago, grasses that use the C4 photosynthetic pathway appeared, originating in moist tropical and subtropical regions. The C4 grasses greatly diversified and their distribution exploded about 9 million years ago as atmospheric carbon dioxide (CO2) decreased, climate became drier and more seasonal, and fire frequency increased (Anderson 2006; Kelley and Rundel 2005; Kellog 2013; Sage and Stata 2015). Key features of C4 grasses included a more efficient way to fix carbon, greater heat tolerance, and greater water use efficiency (Kellog 2013). The C4 grasses dominated the warm temperate grasslands and savannahs. These grass evolutionary innovations were exemplified in the evolutionary changes observed in horses. They developed hypsodont cheek teeth, high-crowned molars and pre-molars that were adapted to eating the more abrasive C4 grasses (from silica in plant tissue or surface dust). They also developed longer legs that indicated running or jumping behavior for more open habitats.

The Miocene savannah and grasslands and their assemblages of herbivores were not to last. With the onset of the Pleistocene, ice advanced across North America. Near the continental glaciers, grasslands converted to tundra; farther south, boreal forest was established on the northern plains (Axelrod 1985). It was not until after the final Wisconsinan glacier receded about 11,000 years ago and the climate warmed that the central North American grasslands were reestablished, with spruce forest replaced by grassland spreading from the south and southwest.

The new grasslands established after the ice were not static, instead they shrank or expanded as the postglacial climate varied. Four factors interacted to provide the conditions that maintained the great central grasslands and continue today (Axelrod 1985): 1) a continental climate characterized by periodic dry seasons or droughts; 2) flat or gently rolling topography; 3) abundant grazing animals, from arthropods to large mammals that use the energy captured by the grassland vegetation; and 4) relatively frequent natural or anthropogenic fire.

Ruminants and Methane

Ruminants were the large herbivores that ruled North America's great post-glacial central grasslands. They evolved a specialized mode of digestion, a compartmented stomach that used fermentation by a microbial ecosystem able to break down molecularly complex plant material to simpler molecules (Johnson and Johnson 1995). The site of this fermentation is the first chamber in the four-chambered stomach – the rumen. In the rumen, microbial hydrolyzers convert complex polymers (cellulose, hemicellulose, starches, and proteins) to simpler monomers like glucose, and microbial fermenters convert the simpler monomers to an accessible energy source, volatile fatty acids, along with the reaction by-products CO2 and hydrogen (H2). However, H2 inhibits microbial fermentation. To counter this, another group of microbes, methanogenic Archaea, combine the excess H2 with CO2 to form methane (CH4). Although some CH4 in ruminants is produced in the hindgut and exits the animal's rear end, most (more than 95%) is eructated (belched) from the rumen or exits through the lungs and breath.

For millennia, ruminants were a natural source of CH4 to the atmosphere, along with wetlands, termites, and geological processes like volcanism. The concentration of CH4 in the atmosphere has varied over a relatively narrow range, between 400 and 800 ppbv (parts per billion, volume basis) over the past 800,000 years (IPCC 2013). However, atmospheric CH4 has increased greatly since the beginning of the Industrial Age, reaching 1866 ppbv in 2019 (Dlugokenchy 2019). A growing global population dependent on rice cultivation, the population increase of cattle and other domestic ruminants, expanding landfills, and aggressive fossil fuel extraction that results in CH4 leaks and emissions have all contributed to the increase of this greenhouse gas (IPCC 2013; Howarth 2019).

Methane is a powerful greenhouse gas, second to CO2 in its effect on global warming. Methane was 16% of global greenhouse gas emissions and 10% of the U.S. inventory in 2017 (USEPA 2019). Methane from enteric fermentation, predominantly from farmed ruminants, made up 40% of global agricultural greenhouse gas emissions in 2011 and totaled 82.8 Tg yr-1, with 45.5 Tg yr-1 (55%) produced by non-dairy cattle (Tubiello et al. 2014). The special report of the Intergovernmental Panel on Climate Change on the impact of land and food systems on climate change examined the role of enteric methane (IPCC 2019). The contribution of ruminants to the emission of CH4 was highlighted, noting that a transition to more plant-based foods and less meat (especially ruminant meat) can have a highly significant impact on per capita emissions and was associated with increased human health and lower greenhouse gas emissions and energy, land, and water use. Mitigation practices to reduce livestock greenhouse gas emissions included reducing enteric CH4, managing manure to reduce N2O, sequestering carbon in pastures, improved animal husbandry and management, and other land practices that sequester carbon. The potential of grasslands, especially degraded grasslands, to sequester carbon was noted.

In tension with these challenges are the value of inedible plant resources transformed into nutritionally dense food, the critical ecological services that grasslands provide, the social and economic role of livestock in traditional societies, and ecological realities that inform the bioregional expressions of the land. We aim to explore this complexity by considering the case of enteric CH4 emissions of the historical (pre-European settlement) presence of bison and other mammals on the great central grasslands of North America. We will bring together and review the various estimates of CH4 emission by wild and farmed ruminants, with emphasis on the relationship between cattle and bison; , and use the results to consider the nature and fate of the Great Plains as global warming and a destabilized climate accelerate.

The Role of Wild Ruminants in the CH4 Budget

Several studies have examined the role of wild ruminants in the CH4 budget. Crutzen et al. (1986) estimated global CH4 production of domestic and wild animals. They used a method based on CH4 yield as a fraction of diet gross energy intake. Methane yield is called Ym in current literature and is a key parameter in enteric CH4 calculations used for national and global inventories (IPCC 2006). They estimated that total annual CH4 production was 78 Tg, with most CH4 produced by cattle and buffalo (95%); wild ruminants added from 2 to 6 Tg.

Galbraith et al. (1998) focused on CH4 production by bison, wapiti, and white-tailed deer (*Odocoileus virginianus*). These three species represented roughage/grass eaters, intermediate/mixed feeders, and browse/concentrate selectors, respectively (Hoffman 1989). They found that values of Ym for bison, wapiti, and deer were 6.6%, 5.2%, and 3.3%, respectively. However, the animals in these experiments were fed alfalfa pellets, a higher quality diet not typical for wild ruminants, so that Ym was most likely underestimated.

Kelliher and Clark (2010) provided one of the more comprehensive studies that estimated wild CH4 emissions from the iconic North American bison. They innovatively described bison herd demographics, disaggregating the herd into sex and age classes, and assessed historic herd size based on the work of Flores (1991). They used Galbraith et al.'s (1998) Ym value of 6.6%, and modified Galbraith's estimates of metabolizable energy for maintenance by accounting for the energy that bison required for food gathering, growth, pregnancy, and lactation. Annual CH4 emission of the historic 30 million head bison herd was estimated to be 2.2 Tg, the same as their estimate for contemporary grazing cattle occupying the same area.

Hristov (2012) examined the historical and contemporary CH4 emissions of wild ruminants (bison, wapiti, and deer) and domestic ruminants (beef and dairy cattle, sheep, and goats). Emission factors for bison were taken from Kelliher and Clark (2010), and for wapiti and deer from Galbraith et al. (1998). Hristov (2012) concluded that pre-settlement (before the 15th century) CH4 emissions from 50 million bison, 10 million wapiti, and 43 million deer were 86% of CH4 emissions from contemporary domestic ruminants (6.39 Tg yr-1); bison emissions comprised 90% of the 5.46 Tg of CH4 produced annually by wild ruminants.

Allometry is the study of how an organism's body shape, anatomy, physiology, or behavior scale with body size. Smith et al. (2010) used allometric body scaling to estimate the CH4 production of 114 herbivorous species that went extinct at the end of the Pleistocene epoch. Smith et al. (2015) compiled a database of 42 empirical studies that measured body mass (BM) and enteric CH4 emission and fitted improved scaling equations that defined CH4 emission as a power function of BM. Separate equations were derived for ruminant and hindgut fermenters. Smith et al. (2016) emphasized the importance of large enteric CH4 producers by looking at three great ecosystem unravelings that resulted in significant losses of large CH_4-producing herbivores: the late Pleistocene megafauna extinction, the 19th century Great Plains bison kill-off, and the late 19th century African Rinderpest epizootic.

Franz et al. (2010) explored the allometric relationship between animal BM and CH_4 production. Methane production was a strong function of BM for both ruminants and hindgut fermenters. They also discovered relationships between CH_4 production and dry matter intake or fraction of gross energy intake lost as CH_4 (Ym). They found that mammals as different in size as guinea pig and horse had the same scaling relationship of CH_4 production as a power function of BM.

Bison Herd Population and Demographics

Central to the studies on wild ruminant CH_4 emissions, and particularly relevant to the North American Great Plains, is the bison. Coming out of a Pleistocene depleted of megaherbivores, a smaller, more fertile species of bison exploited the newly vacant grassland niches and greatly expanded its range and numbers. Flores (1991) described bison as a "weed species that had proliferated as a result of a major disturbance". The forces that shaped the adaptation, spread, and near-demise of the bison included the Pleistocene extinctions, drought cycles, arrival of Europeans, the introduction of horses, and market economy forces (Flores 1991). Holt (2018) posited that disease (anthrax and Texas tick fever) and habitat degradation were the tipping point factors that contributed to the bison population collapse in the mid-19th century. Additionally, Holt (2018) hypothesized that the "loss of intelligent human management", that is, the loss of active management of bison herd behavior by Native Americans that were ravaged by European diseases, also contributed to the bison population crash.

What was the population from which the bison fell so precipitously? One of the first to estimate the historical bison population was William T. Hornaday, chief taxidermist of the U.S. National Museum, director of the Bronx Zoo, and advocate for bison conservation. Hornaday's (1889) collection of anecdotal accounts, calculations, and map of the original and shrinking bison ranges and ultimate near extinction was the definitive word on the 19th century bison collapse and influenced later estimates (Figure 3). Still in memory were the descriptions of incredulous plains travelers who reported near endless herds of bison with millions of animals (Hornaday 1889; Roe 1970; Shaw 1995). Hart (2001) compiled historical accounts of bison distribution across the Great Plains during the 19th century that showed bison in large numbers, but also sometimes sparse when near Native American villages or army outposts. Hart (2001) also noted "From 1804 to 1834, observations suggest a progressive decrease in buffalo on the middle Missouri River", suggesting that forces of extirpation were already at work. Flores (1991) speculated that a network of no man's lands between rival tribal spheres of influence could have concentrated bison herds in lightly hunted redoubts, leaving large, more heavily hunted areas lightly populated.

Persistent drought, fire, and grazing have always caused changes in vegetation (Truett 2003), herbivores (Lohse et al. 2014), and human habitation (Ritterbush 2002) on the Great Plains. These factors undoubtedly caused deep fluctuations in the bison population and contraction and expansion

Figure 3. William T. Hornaday's (1889) map of the North American original bison range (red line), dates of local extirpation, the range in 1870 (blue lines), the range in 1880 (green lines) and numbers of the survivors of the near-extinction of the bison.

of the bison range (Shaw 1995). A recent example is the drought of 2011–2013 on the southern Great Plains (Rippey 2015). In 2011, the first year of the drought, the decrease in livestock inventory in New Mexico, Oklahoma, and Texas ranged from 13 to 15%. For the duration of the drought, Oklahoma and Texas cattle inventories declined by 24 and 16%, respectively, a decrease of 3.5 million head. We agree with Flores (1991) that bison population figures in popular literature "have been much overstated". We also agree with Shaw (1995) that based on a careful reading of the historical accounts, economic analyses, carrying capacity estimates, and the population of cattle that the region currently supports, the best estimate of the Great Plains bison population was "millions, probably in the tens of millions. Any greater accuracy seems unlikely."

Bison Body Mass

Halloran (1960) reported on bison herd BM distribution at Wichita Mountains Wildlife Refuge in Oklahoma, where the age and sex weighted mean BM of the herd was 426 kg. The bulls averaged 447 kg and cows averaged 386 kg. Breeding cows (from 2 to 18 years old) comprised 35% of the herd; no calf weights were recorded. Only 11% of the herd weighed more than 600 kg, all bulls more than six years old. The BM of the bison herd at Konza Prairie Biological Station in the tallgrass prairie region of eastern Kansas from 1994 to 2018 averaged 334 kg, with weighted mean cow BM of 338 kg and weighted mean bull BM of 328 kg (Briggs 2018). However, because of the herd management strategy, the herd was heavily skewed toward calves less than two years old (46%) and females (62%). Kelliher and Clark (2010) used age-weight relationships for males and females applied to estimates of the age distribution of males and females to disaggregate BM in the herd by age and sex; their weighted mean herd BM was 411 kg. Breeding age females (from 2 to 16 years old) comprised 43% of the herd, and calves comprised 13% of the herd. Smith et al. (2003) listed a bison BM of 579 kg in their database of mammalian BM, while Hristov (2012) used 638 kg. There is considerable variability in BM both within and between contemporary bison herds, and BM depends on factors such as age, sex, season, population density, nutrition, weather, reproductive effort, and inbreeding (Berger and Peacock 1988). Human predation undoubtedly impacted herd demographics, depending on the style of hunting (e.g., traps or jumps, surrounds, on foot, or horse-mounted), the season of hunting (Speth 2013), and harvesting that preferred two–five year old cows for their superior meat, hides, and robes (Flores 1991). Like historical bison populations, bison BM depended on multiple factors that dynamically varied over time and space.

Materials and Methods

We focused on four approaches to estimate CH_4 emission from the historical bison herd: Kelliher and Clark (2010) with a revised Ym of 7.7%; Hristov (2012) with a revised bison BM of 500 kg; Smith et al. (2015; 2016) with a revised scaling equation; and the allometric BM equations of Franz et al. (2011). We chose 30 million as most likely representing the upper limit of Great Plains bison population. This value has the comparative utility of being within about 20% of the contemporary Great Plains cattle population, it is the same population used by Kelliher and Clark (2010), and it is the low estimate of Hristov (2012). Contemporary cattle population information was compiled from the 2017 cattle inventory (USEPA 2018). We calculated the population of beef cattle on the ten Great Plains states (Montana, North Dakota, Wyoming, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas); and for comparative purposes, the population of all U.S. beef cattle. We took the populations that Hristov (2012) used as reasonable estimates for the pre-European settlement North American populations of wapiti, whitetail deer, and mule deer (10, 30, and 13 million, respectively). For applying the allometric BM equations of Franz et al. (2011) and Smith et al. (2015), we chose a mean herd-weighted bison BM of 500 kg as a reasonable mid-range value. Body masses for the various classes of beef cattle (cow, replacement heifer, stocker heifer, stocker steer, bull, and calves) were taken from Table A-161 of the USEPA (2018) greenhouse gas inventory. Finally, for comparative purposes, we included the enteric CH4 emission estimate for the U.S. beef herd (USEPA 2018). Body masses for other mammals were taken from the database of Smith et al. (2003).

Results and Discussion

Enteric Methane Emissions from Bison and Beef Cattle

Methane emissions for a 30-million head historical bison herd on the Great Plains ranged from 1.97 to 2.52 Tg yr-1. Averaging the Kelliher/Clark, Hristov, Smith, and Franz estimates yielded a mean CH4 emission of 2.25±0.23 Tg yr-1 as a best estimate of the annual CH4 emission from a population of 30 million bison on the Great Plains (Figure 4). The 2017 population of beef cattle on the Great Plains, excluding feedlot cattle, was 36.5 million, composed of 44% breeding cows, 7% replacement heifers, 9% stocker heifers, 14% stocker steers, 3% bulls, and 23% calves.20 (USEPA, 2018). Estimated CH4 emissions from this herd varied from 1.93 to 2.59 Tg yr-1 and averaged 2.23±0.28 Tg yr-1 (Figure 4). The CH4 emission of the contemporary herd of 36.5 million beef cattle on the Great Plains was the same as CH4 emissions from an historical bison herd of 30 million. The 67.2 million-head U.S. grazing beef herd in 2017 (minus feedlot cattle) emitted an average 4.18±0.52 Tg yr-1 of enteric CH4 (Figure 4). Total CH4 emission from all anthropogenic sources in the U.S. was 26.25 Tg yr-1 in 2017202017 (USEPA, 20128), so that enteric CH4 emissions from grazing beef cattle contributed 15.9% to total U.S. CH4 emissions.

Methane Emissions from Other Great Plains Mammals

We calculated the annual CH4 emissions of major ruminant species that inhabited the Great Plains alongside the bison; : pronghorn antelope, wapiti, whitetail deer, and mule deer *(Odocoileus hemionus*). The black-tailed prairie dog (*Cynomys ludovicianus*) was an important component of the historical Great Plains ecosystem, so we included it, along with another overlooked CH4 source, the North American beaver (*Castor canadensis*). The beaver, like the bison, is a species that was hunted to near extinction but has undergone a surge in population to about 30 million, half of its historical numbers (Lazar et al. 2014). Prairie dog and beaver are hindgut fermenters, so we used the appropriate scaling equations from Franz et al. (2011) and Smith et al. (2015). Population estimates are for all North America because there was no reasonable way to assign Great Plains populations, except for the black-tailed prairie dog, whose range closely matched the Great Plains and followed

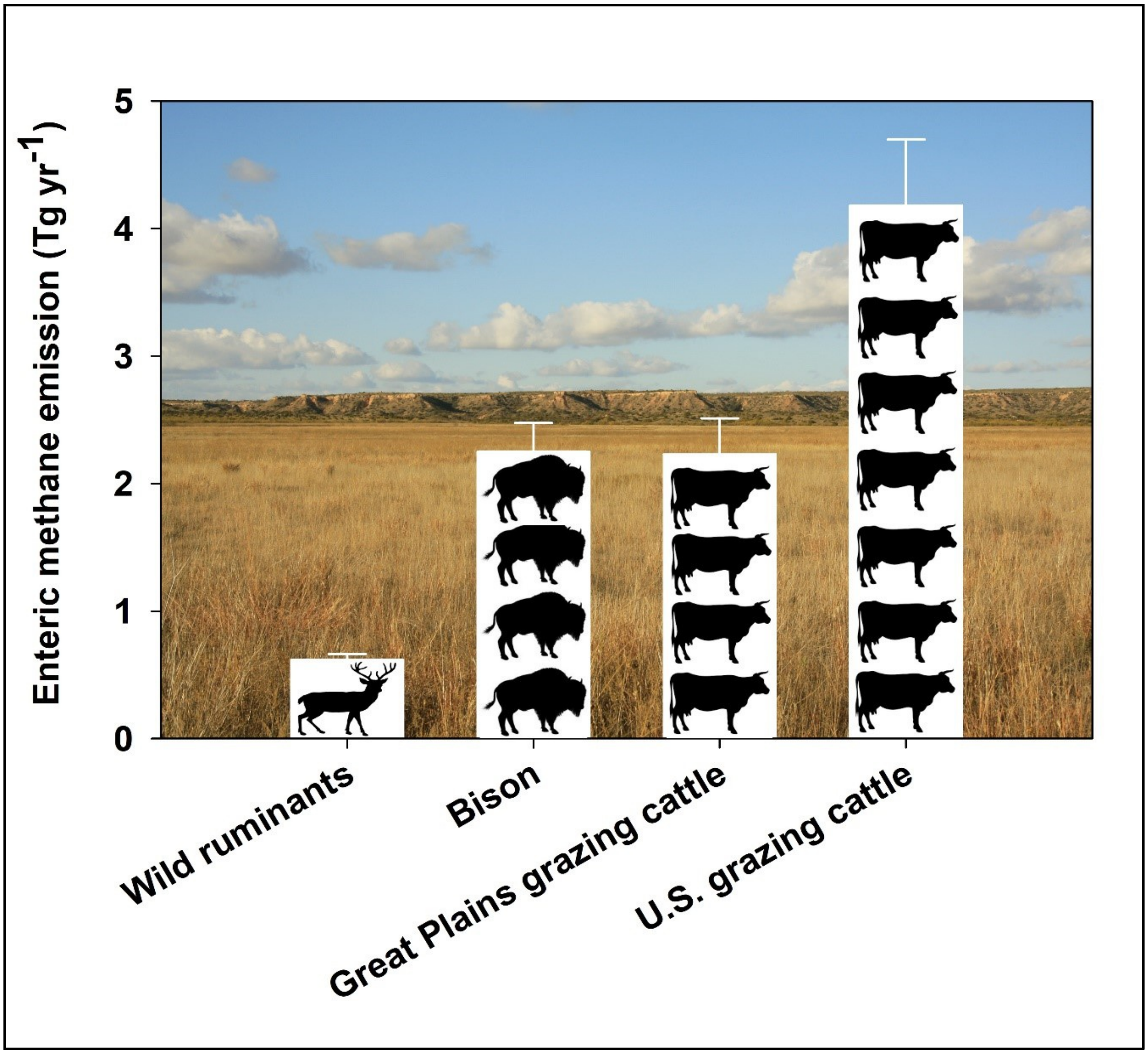

Figure 4. Mean enteric methane emissions of grazing herbivores. The wild ruminants (wapiti, pronghorn antelope, whitetail deer, and mule deer) and bison estimates are for the historic (pre-European settlement) populations. The grazing cattle estimates are for contemporary cattle herds on the ten Great Plains states and for the entire U.S; they do not include cattle in feedlots. Error bars indicate the standard deviation of the mean.

the dynamically changing boundaries of the shortgrass steppe (Truett 2003). Body masses were taken from Smith et al. (2003) except for those used by Hristov (2012).

Methane emissions calculated by the various methods for each species were similar. A notable exception was the prairie dog, where population emission varied by an order of magnitude between the Franz and Smith predictions. Prairie dog BM was outside the range of BM used to derive the

Smith et al. (2015) scaling equation. Franz et al. (2011) included rabbit and guinea pig in their scaling equation, so maybe it was better able to predict prairie dog emission. Methane emission from the four ruminant species totaled 0.63 Tg yr-1, with wapiti emission comprising almost half (Figure 4). Enteric CH_4 emissions of beaver, a hindgut fermenter, were small compared to the ruminant species, ranging from 0.01 to 0.05 Tg yr-1. However, beaver were, and still are, a major creator and shaper of wetland habitats. Whitfield et al. (2015) estimated that CH_4 emitted from beaver-mediated ponds and wetlands in North America was from 0.18 to 0.8 Tg yr-1 from the activity of about 30 million beavers, making the beaver a significant contributor to the historical CH_4 budget.

Conclusions

The central grasslands of North America have supported herbivores for millions of years. Humans have used herbivores for food since they arrived on the continent at the end of the Pleistocene epoch 15–25 thousand years ago. A complex interaction of climate, land, atmosphere, herbivores, and human food acquisition has played out since. The diverse herbivorous megafauna of the early Holocene changed from mammoth and mastodon, horse and camel to more restricted ruminant taxa of bison, wapiti, pronghorn antelope, and deer that dominated the Great Plains until the European conquest. This grassland assemblage gave way to a contemporary pastoral or industrial food production system based on domesticated livestock. However, a web of timeless relationships on the grassland biome has remained the same. Grasses and other green plants photosynthetically harvest solar energy, that energy is harvested by herbivores that evolution has equipped to digest fibrous plant material composed of complex carbohydrates, and humans harvest the herbivores for animal protein. This is the essential ecological expression of the Great Plains grasslands.

We return to the image of the Clovis point, seeing in it a metaphor for the technical, biological, and cultural impact humans have imposed on grassland ecosystems. With the techniques of stone flaking and fire setting, exotic diseases, extermination, extinction, genocide, plows and fences, and fossil fuels, humans have shaped the grasslands, dictated its inhabitants, and reworked its ecosystems. Looking with discernment, we can see a dynamic underlying pattern that weaves its way from the Miocene, through the Ice Ages, the late Pleistocene arrival of humans, the great extinctions and extirpations, up to the present moment.

A question looms like a summertime High Plains thunderhead: How will we use the great grasslands of central North America? The context of the question and its multi-faceted answers are now defined by the most pressing ecological, social, and political challenge of our time. The planet is heating up, heading into fever territory. The climate is changing, becoming more weird and unpredictable. We are entering the danger zone for human thriving. Our answer to the question of what the Great Plains will be affects not only the Great Plains, but also an overheated planet in great transition. Consider this challenge by Mahli et al. (2016): "More philosophically, the Pleistocene and early Holocene megafaunal extinctions can stimulate us to reevaluate what is natural in the world and what sort of natures we seek to conserve or restore". We would add to that the more recent near-extinction of the great North American bison herds and the human transformation of the prairies and plains. The choice of "what sort of natures we seek to conserve or restore" is not binary. Our options span a spectrum that includes, but is not limited to, abandonment of the land, Pleistocene rewilding, Buffalo Commons, enlightened pastoralism, business as usual, and more intensive industrial food production. What has remained unchanged for millennia, though expressed in myriad forms, are the intimate interactions among grass, grazer, and human. How we choose to define this essential original language of the great grasslands of North America will be a critical element in meeting the challenges of a precipitously changing climate and a world transformed by human agency.

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SURVEYORS PROVIDE CLUES IN ARCHAEOLOGICAL RESEARCH

Marisue Potts

Abstract

Early Texas surveyors were trailblazers into wilderness lands of which little was known. Their observations of the land, the types of soil and terrain, the plants and animals, as well as clashes with Indigenous tribes, recorded valuable information that was utilized in settlement under various Land Acts. With a state mandate to locate land scrip in undeveloped areas, surveyors often provided names for unmapped landmarks or rivers in the Caprock and Llano Estacado regions.

Members of the Canyonlands Archaeological Society have successfully utilized surveyors' field notes, diaries, maps, and observations to gain valuable supporting information for several archaeological investigations. In addition, the Texas General Land Office Land Patent Searches, abstracts, and first-hand accounts by Texas surveyors (Daniell 1973) provided examples that are listed in an appendix at the end of this paper. In Motley County these included, but are not limited to the Mackenzie Trail, Connellee Peak, Old Lyman Post Office, Mott Line Camp, James Field's Dugout, and the Matador Land and Cattle Company.

Early Surveyor Names Pease River

Surveying parties were operating in the Texas Panhandle and Rolling Plains as early as 1856 when Jacob de Cordova explored the Salt Fork of the Brazos, the Caprock breaks, and the Big Wichita River. Upon finding an unmapped tributary, he named it the Pease River for his mentor, Texas Governor Elisha Pease (Day 1973). While facing severe threats from Indian attacks, illness, volatile weather, adverse terrain, and wild animals, Cordova and other trailblazers established survey lines, locating State of Texas Patents and land certificates for sections benefitting schools, railroads, organizations, and individuals. The Texas General Land Office Patent Search by name, abstract, or title, can provide surveyors' field notes and other documents to clarify historical data for historical or archaeological projects. An understanding of who these surveyor trailblazers were, what their goals were, and how they operated can facilitate the use of their information for researchers in the Southwest Federation of Archaeological Societies.

Crews Members Forge Ahead

A small surveying party typically consisted of a chief, a transit man, two chainmen, two flagmen, a corner builder, two chain carriers, and a cook (Lee 1973). The multi-tasking cook might take on the role of ax man or a digger, since earthen mounds were often used to mark the line of the survey. To protect the men occupied in sighting and recording, larger parties hired guards and/or gun holders equipped with .44 Winchesters and a generous supply of ammunition.

Chain carrier J.C. Tolman recorded his experiences on a pioneer surveying crew (Tolman 1973), without noting roads, railroads or fences. Outside of Tascosa and Fort Elliott in the Panhandle, he recorded only 36 houses, while booming Mobeetie had a gathering of some 350 buffalo hunters and merchants.

Experiencing the ever-changing weather in the Panhandle, Tolman and crew once suffered a ‘yellow norther' with its skin-penetrating ice needles. The blinding white-out panicked the wagon mules so, that despite the driver's efforts, they ran unseeingly and out of control. Quite suddenly, the team halted abruptly. The edge of the precipice of Palo Duro Canyon loomed menacingly. The crew members, who either by wagon or horseback had followed the helter-skelter runaways, also stopped just in time and then sought shelter down slope on a protected ledge. There the outfit torched dead cedars on the canyon wall above their precarious camp and celebrated Christmas by reading an Irish romance novel. They bedded down in sheltered comfort as the storm passed overhead (Tolman 1973).

Because of the vast canyon's chasm, the transit operator triangulated across the breach that was one-half mile wide, 500 feet deep, and five miles long. Meanwhile, the crew completed what they could and then took the wagon around the north rim. A mirage that projected an image of the canyon upside down awed Tolman, and he reported other mirages that distorted distances and objects. Other natural wonders seen in the vicinity were bear, turkey, mustang, antelope, and copious buffalo bones from the recent slaughter by hunters for the buffalo hides.

Starting before sunrise to avoid a refraction distortion, the transit man took the first sighting of the day at the last sod marker by using his transit and solar compass. The front flagman then loped out ½ mile where a digger placed a mound of sod to mark the spot. The horse rider took a back sighting, then loped to the next half mile, while the second flagman took his place. The chainmen, walking every step of the way, stretched out their Gunter chain of 100 links that measured 66 feet. It took 80 chains to make a mile, equivalent to one of four survey lines for a square section of 640 acres. The lowly chain carriers' work was so crucial in measurement that they had to sign the final surveyors' report submitted to the Deputy Surveyor, who submitted his work to the Texas General Land Office Commissioner.

Tolman made the claim that his chaining crew averaged over seven carefully measured miles, seven days a week for seven years, without making appreciable errors. Inaccuracies or survey mistakes discovered later are attributed to the land boom and its haste to get the public domain land into the people's hands, while reaping a harvest for the State of Texas, land speculators such as John Gibson, and railroads such as the Texas and Pacific Railway. The sparsely populated state was in dire need of revenue to pay for building the capitol in Austin; dredging the Sabine, Trinity, and other rivers; buying steam ships; building the Central National Road, ship channels, and irrigation canals; and paying surveyors for their work.

Mackenzie's Trail Noted

In 1873 surveyor W. S. Mabry took on 45 workers in three different surveying parties. George Spiller, who had moved to Graham in 1872 and formed the surveying team of Graham, Hillard, and Spiller, headed up one party. Later Spiller was elected as District Surveyor of Young County and then the first surveyor under the Constitution of 1876 (Minor 1996). His group left from Phantom Hill. Their route led to the Double Mountain Fork and the Salt Fork of the Brazos and up to Blanco Canyon where they camped on the military trace known as the Mackenzie Trail.

After they surveyed at the head of Duck Creek, Spiller's group headed toward the mouth of Blanco Canyon to start a traverse line all the way to the Canadian River. Unidentified Native Americans were spotted and invited into camp, but they refused to come unless the crew disarmed, which they refused to do. The survey party, after crossing the dry, sandy Red River that was ½ mile wide, meandered along various tributaries, just as Jacob de Cordova had some twenty years before.

While Spiller was Deputy Surveyor of Jack County, he approved many surveys in Motley County, including Land Scrip and Headright for J. R. Beauchamp (Spiller 1880), a soldier who served in the Texas Revolutionary War against Mexico. Spiller gave this description in his survey of the land grant: "Beginning 4 miles West of the S.W. corner of E. L&RR Co. survey 57, a stake in the prairie, which is also 1 mile North of the N.W. corner of survey no. 1 in the name of Indianaola Ry. Co. Thence North 1900 vrs (varas) to small pipe (pile) of round stone in prairie; Thence East at 180 vrs McKinzie Trail 1900 vrs to pile of stone." (Land Scrip #16/219, Indianaola Railway, Motley County Field Notes, Survey 3, June 29, 1880, Archives and Records, Texas General Land Office, Austin.) The pinpointing of the military trail of the U. S. Army's Fourth Cavalry was utilized in Rick Day's 2019 SWFAS paper, "Colonel Mackenzie on the Middle Pease" (Day and Potts 2019).

Land Certificates Located

With the state mandate to locate land scrip in undeveloped areas, engineer Charles Ulrich Connellee partnered with J. S. Daugherty to buy property, survey, and record deeds for the surveyors' frontier headquarters that would later become Eastland, Texas. From there Connellee started out with a crew of eight in 1875 to lay a line to the New Mexico border. At Fort Griffin, described as the worst place he was ever in, the surveyor met Hank Smith, who operated an eating establishment. Smith had a mail run to Blanco Canyon, where he later settled along the government road known as the Mackenzie Trail, which then turned west to Fort Sumner, New Mexico.

Connellee located land on the Geneva Fork of the Wichita River. Then his party went north to the Pease River where they surveyed land on a little creek that he named after his brother Autumn. Going west they noted a creek that he named Sodosa to honor his father, although settlers afterwards dubbed it TeePee (sic) Creek for Indian tipi poles abandoned on its banks. Sixteen years before Motley County's organization in 1891, Connellee surveyed the John Gibson block for R. G. Armstrong, on what was otherwise a blank map of unclaimed land. At the foot of the plains, he recorded that the good grass was covered by buffalo, timber wolves ran in packs, and panthers

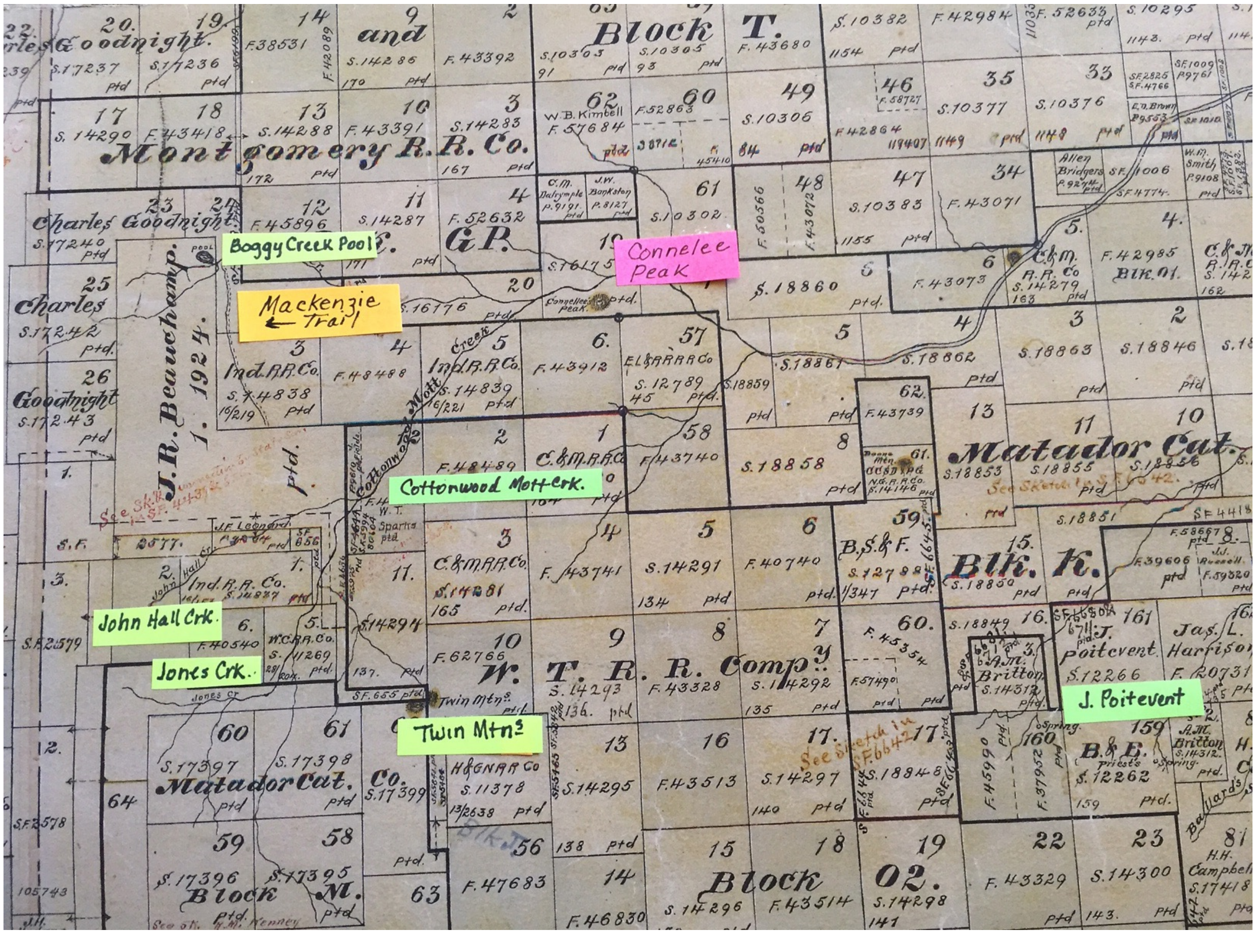

Figure 1. 1903 map of Motley County. This map provided many useful details noted by early surveyors about trails, creeks, and landmarks known by early names, and blocks of land that the State of Texas paid in compensation to soldiers, railroads, dredging companies, surveyors, and others for their services. (Source: Texas General Land Office)

screamed. The crew turned south to the headwaters of the Pease and located land certificates where big springs flowed out from under the plains at the head of the Pease River (Connellee 1973). This site was later known as Roaring Springs.

Surveyor's field notes, preserved in Motley County records of a Texas General Land Office Patent of a 19 June 1880 survey for Coggins, Parks & Davis, describe the landmark butte as "a high rock-capped peak in edge of a valley," designated, recorded, and mapped Connellee Peak. This information provided the original spelling of the Native American hilltop site for an analysis of Connellee Peak pottery, as prepared by investigator Chris Lintz, member of both Canyonlands and Panhandle Archaeological Societies (Lintz and Cason 2018).

Between 1875 and 1883, Connellee made numerous trips west and made the first surveys in Lamb, Bailey, and Hale Counties. At the center of Hale County, he located the Bottle Corner, what was to be a future reference corner for all the surveys in that section of the country (Connellee 1973). However, when O. W. Williams later searched for the illusive bottle used as a marker, he found none.

To facilitate the demand for unlocated public domain lands, the firm of Daugherty, Connellee & Ammerman of Dallas sent out O. W. Williams and a crew with chain and transit toward the Llano Estacado. Williams' field notes mentioned in detail the Colorado Cattle Trail, Dewey's Lake, Tasker's Ranch at Canon Blanco, the Mackenzie Trail Northwest, Rath City, Fort Griffin, and the arresting sight of a thousand buffalo in mating season. The crew camped at a spring, where water dripped from a rock ledge and where Comanche tipi poles were still standing. Williams named it Jessiemine Springs, but the name that stuck was Roaring Springs, given by cowboy Frank Collinson. The surveyors noted maidenhair ferns, grapes, wild currants, plums, and black walnuts near the waterfall (Williams 1973).

No More Vacant Land Available

The Law of 1836 promoted a land boom designed to dispose of Texas public domain to repay debts, both monetary and gratuities received for service, and to attract settlers to build wealth by commerce and taxation. Surveyors given the task by the land office commissioner located tracts for certificates of "unappropriated lands" of the state's public domain. In 1898 no more vacant or unappropriated land was available in Texas.

By 1900 all School Lands were sold. Ranches, such as the Matador Land and Cattle Co., Ltd. which was established in 1882, began selling land that had been purchased for as little as $1 an acre. In 1910 the Matadors offered 60,000 acres of "mesquite land" for sale at $10 to $25 an acre, something they would value at $7.25 in 1947. In 1951 the ranch sold 800,000 acres in two divisions (1,200 square miles) for approximately $18,960,000 (Holden 1964). Fifteen different corporations formed to offer opportunities for land purchases. The land rush on the historic Scottish-owned Matador Land & Cattle Co. was over, but many family-sized ranches were carved out of the vast acreages, creating a new need for surveyors to correct past inaccuracies and to document unsurveyed or unclaimed land, a legality the ranch had to correct before the sale. The surveyors' notes and records, as well as land abstracts, offer many clues for archaeological research on historic trails and abandoned sites.

Appendix: Land Certificates

The Texas General Land Office Land Patent searches, field notes, maps, abstracts, and Texas Surveyors Association's accounts provided examples (noted by *) of various types of land certificates issued for Motley County.

1. **Land scrip for military service** (1836)
Payment for service in the Mexican War was paid with 320 acres for three months to a maximum of 1,280 acres, with provisions for other service.
* J. R. Beauchamp, 2,875.9 acres, 1880. Surveyors' notes and abstracts pinpoint the Mackenzie Trail.

2. **Headright on any unappropriated, vacant land** (1837)
Three years occupancy with improvements required.
* Matador Cattle Co., Connellee Peak on Jones River, so named in 1882; James Fields, 1895.

3. **Patent from State of Texas**
Four Section law required a checkerboard pattern.
* Charles Goodnight and Matador Land & Cattle Co.

4. **Railroad Construction (**1872–1881)
Railroads received 16 sections per one mile of track laid.
* Texas & Pacific Railroad located a large block in Motley County and received twelve million acres statewide for 972 miles of track laid.

5. **Permanent School Fund for support of Public Schools** (1882)
Sections located did not have to support schools in the county surveyed.
* Blanco School Land in Motley County was surveyed by C. U. Connellee, who claimed its well-watered sections in payment for surveying. He also named streams and a landmark butte after family members.

6. **Debtors, Surveyors, Contractors Improvement Scrip**
Sections or Blocks were compensation for building the Capitol; establishing the Central National Road to the Trinity River; river dredging; purchasing steam ships; creating ship channels and irrigation canals; and surveying. Specific projects include:

Improve navigation of the Sabine, Neches, and Angelina Rivers
* S.J. Arnold and Angelina Barrett, contractors, received at least 640 acres of unappropriated land in 1874 for clearing the Angelina River.

Surveying unappropriated land
* John Gibson block in Motley County was located by C. U. Connellee with certificates gained by Gibson's surveying, but they were held by speculator R. G. Armstrong.

Navigation scrip (1879)
Scrip earned by clearing waterways of obstructions and dredging ship channels netted 320 land certificates x 640 acres for 204,800 acres.
* J. Pointevent received a block of sections in Motley County for 898 surveys within Texas. Beaty, Seale, and Forwood cleared snags from the Sabine River for large blocks in Motley County.

7. **Land Companies or Speculators**
Purchased certificates for location of land ranged from \$2–\$3 up to \$40–\$50 per mile, and sometimes later sold for \$160 a section (640 acres).
* Matador Land & Cattle Co.'s sale of dry pastureland, valued at 25¢ an acre or \$160 a section.

8. **Vacancy: Strips of Land, Survey Mistakes** (1877–1900)
Early surveyors often made errors due to haste, lack of correct data points, or difficult terrain. Later surveys produced odd shapes among the section blocks.
* James Fields, J. F. Leonard, and T. G. Duncan proved up narrow strips along Cottonwood Mott Creek, located next to the J. R. Beauchamp Headright. All three properties of these ranch employees ended up in the hands of the Matador Land & Cattle Co., aka, the Matador Ranch.

9. **Act for the Benefit of Actual Occupants of Public Lands**
This act favored squatters and lease holders of four sections or less, but required improvements, proving up, or occupancy for three years, and paying a filing fee up to $2 an acre.
* T. K. Sparks, 1882; J. F. Leonard, 3 Oct, 1894; James Fields, 1895, (proving up land as employees of Matador Ranch for its benefit).

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WHY IS OBSIDIAN FROM DIVERSE SOURCES FOUND SO WIDESPREAD ACROSS THE SOUTHERN PLAINS?

Christopher Lintz

Abstract

Obsidian is an unusual, volcanic glass that does not outcrop in the Texas, Oklahoma, or Kansas (TOK) area of the Southern Plains. More than 119 kinds of chert and quartzite toolstones are used as sources for making prehistoric lithic implements, and yet obsidian, from 34 different volcanic sources extending from northern California and west-central Idaho to central Mexico, occurs with some frequency across the Southern Plains region. Maximum prehistoric transport of obsidian from California, Mexico, and the northwestern Plains to TOK sites is 1,250 to 1, 370 miles. Long distance transport of obsidian shows considerable time depth.

A total of 1,153 source-identified pieces of obsidian from TOK is used to discuss patterns of obsidian occurrence across space and time. Most obsidian from TOK is from New Mexico, but about 10% from sites in all three Southern Plains states is from Idaho and Wyoming.

Traditional technological studies provide no explanation for long distance transport, but hypotheses related to animate powers of obsidian based on its distinctive properties potentially provides an interpretative framework. The hypothesis of inherent obsidian powers is examined on the relatively high incidence of points (killing implements) among tools, and the recognition of obsidian pendants and effigy amulets.

NEW INSIGHTS CONCERNING THE DISTRIBUTION, VARIABILITY, CHRONOLOGY, ORIGIN, AND MEANING OF LUNATE STONES OF THE SOUTHERN HIGH PLAINS AND ADJACENT REGIONS

Richard Walter

Abstract

Lunate stones are semi-elliptic-shaped ground and polished objects commonly made of exotic 'greenstone', as well as a lesser number of other rock types of local origin. These objects exhibit a series of notches along the crest, and they often exhibit a centralized notch that is slight compared to others. Although lunate stones have been found on the surface as isolates and on open campsites, they are better known in mortuary contexts as single mortuary offerings or among mortuary assemblages often containing exotic marine shell ornaments. This presentation provides an overview and update of an ongoing study concerning the distribution of lunate stones, the variability of lunate stone morphology, and raw material types and sources used to fashion lunate stones. More focus is given to those lunate stones in mortuary contexts, and data is provided that include the variability in burial construction, placement of offerings, and certain osteological features. A multi-disciplinary case study of a lunate stone burial at the Lane site (41GR58) is highlighted, where the results and implications of AMS radiocarbon dating, stable carbon and nitrogen isotope values, osteological and pathological observations, XRF and LA-ICP-MS, and attribute analyses are discussed.

LITHIC PROCUREMENT SITES IN THE CAPRICORN RIDGE WIND PROJECT AREA, COKE AND STERLING COUNTIES

Rebecca Shelton

Introduction

During intensive pedestrian survey for the Capricorn Ridge Wind Project Area (WPA) in Coke and Sterling Counties (Figure 1), a series of bedrock lithic procurement areas were identified at the northwestern edge of the Edwards Plateau (Chapman and Skinner 2007; Shelton, Skinner, and Craver 2007; Shelton and Skinner 2007; Shelton 2008).

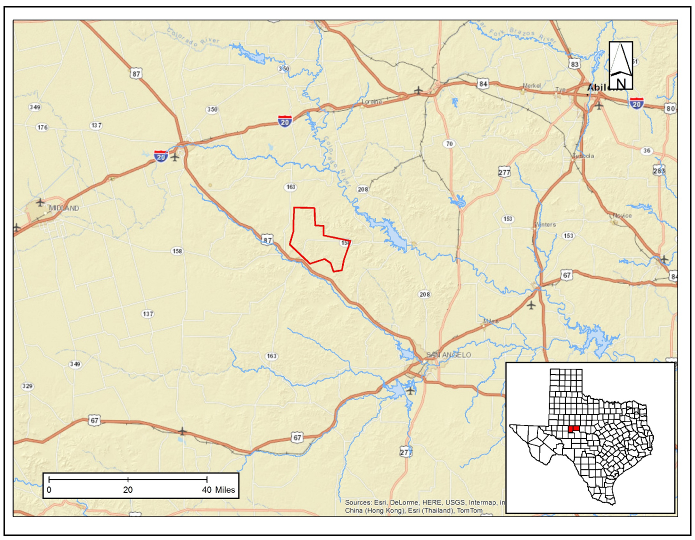

Figure 1. Capricorn Ridge Wind Project Area in Coke and Sterling Counties.

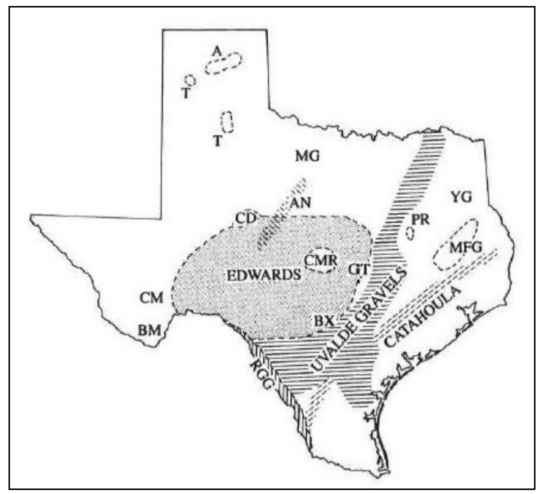

Figure 2. Lithic resources in Texas. (Turner et al. 2011:Figure 2-4; reprinted by permission of the publisher.)

The Edwards Plateau (Figure 2) in central Texas is a massive formation (Eifler et al. 1994; Groat 1976) that is recognized as an excellent resource of chert utilized in making stone tools (Banks 1990:59; Turner et al. 2011: Figure 2-4). However, lithic resources within this broad region are much more discontinuous than Turner's map indicates. A detailed, composite map of physiographic regions, including the Edwards Plateau, Callahan Divide, and Llano Estacado, was compiled during archeological investigations of lithic resources at Fort Hood (Figure 3). It shows a wide range of Texas' lithic resource areas (Frederick and Ringstaff 1994: Figure 6.1). The Capricorn Ridge project area is south of the Callahan Divide, on the upland ridges between the Concho and Colorado Rivers. As early as the Paleoindian period, Native Americans were collecting material and manufacturing stone tools from this formation (Bever and Meltzer 2007; Mallouf 1989). Lithic procurement sites have been recorded as unique locals in Texas as early as 1929 (Sayles 1999:27 [1929]).

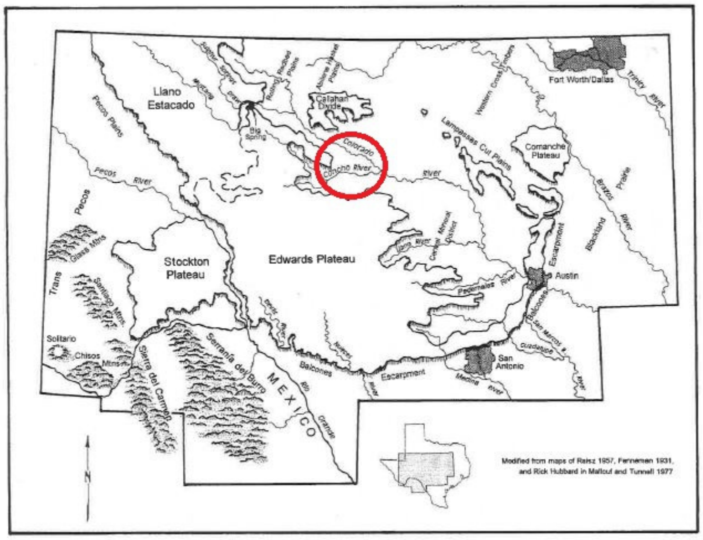

Figure 3. Physiographic regions of Texas. (Modified from Frederick and Ringstaff 1994:Figure 6.1; reprinted by permission of the authors.)

The intensive survey was conducted on two large tracts of privately owned ranch land northeast of Sterling City. Within the 146 square mile study area, approximately 4,300 acres were surveyed. Surveys focused on the access roads, collector lines, transmission lines corridors, and 576 two-acre turbine pad sites. These turbines were oriented in linear ‘strings' across the landscape, which provided an excellent cross-sectional view of the terrain. Although the land was relatively undeveloped before the installation of the wind turbines and supporting infrastructure, the ranches had been subjected to extensive brush clearing programs in the 1960s and 1970s (Horwood, personal correspondence 2006). Invasive plants such as mesquite, juniper and prickly pear were removed with the use of bulldozers and chains, which not only disturbed the topsoil, but also impacted the exposed chert and limestone outcrops on the ridge tops and slopes. Bedrock was exposed on the surface throughout the area, and thin clay loams are in the uplands away from the ridge edges. Gravelly loam was the dominant soil on the ridge tops (Blum 1977:13). The A-horizon was almost completely eroded along the benches, ridge edges, and slopes and in much of the uplands along the ridges.

As a result of these surveys, thirty-four sites were recorded; twenty-six were lithic procurement sites in a 146 square mile area (Table 1; Figure 4). The procurement sites were located on ridge tops, slopes within the headwaters of valleys, and draws in the upland divide between the Colorado and North Concho Rivers.

Edwards chert occurs in three forms: 1) flat disc shaped nodules (most common); 2) irregular nodules that cut across bedding planes; and 3) continuous beds (least common) which may be up to 50 cm thick (Banks 1990:60). At Capricorn Ridge, chert exposures were bedded or nodular, with the bedded chert more prevalent on the slopes and nodular chert on the ridge tops. (Figures 5, 6, 7). Due to their location in the contiguous geological formation, the chert outcrops were found between elevations of 2500 ft and 2600 ft above sea level. Chert was throughout the survey area, but it was readily apparent after the initial surveys that outcrops and exposures that contained higher quality, fine-grained chert were selected for procurement activities.

Table 1. Lithic procurement sites identified in the Capricorn Ridge WPA.

Site	Total Area (m^2)	Location	Elevation	Artifact Density	Bifaces Recorded
41ST138	4,324	Ridge crest east of Cox Hollow	2560’	300	No
41ST139	1,000	Ridge between McKenzie Draw and Cox Hollow	2567’	300	No
41ST140	1,500	Headwater, downslope	2595’	200+	Yes
41ST141	8,000	Ridge edge	2590’	200+	Yes
41ST142	10,000	Ridge edge overlooking Cox Hollow	2587’	300+	Yes
41ST143	20,000	Slope of ridge	2580-2600’	2000+	Yes
41ST144	3,000	Slope edge of ridge	2576-2600’	1000+	Yes
41ST145	65	Edge of ridge overlooking S. Gasconades Creek	2540’	Not recorded	No
41ST146	600	Ridge top	2501’	Not recorded	Yes
41ST147	900	Slope edge	2600’	Not recorded	Unknown
41ST150	2,400	Ridge top east of Renbrook Creek	2621’	200+	No
41ST151	58,740	Ridge top	2579-2584’	100,000+	Yes
41ST152	1,600	Slope on southeast side of ridge	2609-2621’	200+	Yes
41ST153	32,123	Ridge top	2586-2600’	2,000+	30+
41ST158	10,000	Ridge top	2625’	Not recorded	Yes
41ST159	18,000	Ridge northwest of Willow Creek	2595’	Not recorded	Yes
41ST160	90,000	East slope of ridge	2560-2580’	Hundreds	Yes
41ST164	5,000	Slope overlooking MacKenzie Draw	2585-2600’	1,000+	Yes
41ST167	37,500	Ridge edge	2605’	2,000+	Yes
41CK262	3000	Ridge top	2553’	1,000+	Unknown
41CK263	750	Western slope of a ridge between two tributaries to Walnut Creek	2516’	500+	No
41CK264	3000	Narrow ridge overlooking unnamed tributary of Walnut Creek	2525’	300	No
41CK265	18,750	Top of ridge saddle west of Walnut Creek	2491’	1,000+	Yes
41CK266	181,700	North side of ridge and downslope	2528’	10,000	Yes
41CK267	900	Ridge top	2562’	>100	Yes
41CK268	38,400	Headwater of Walnut Creek	2576’	Not recorded	Yes

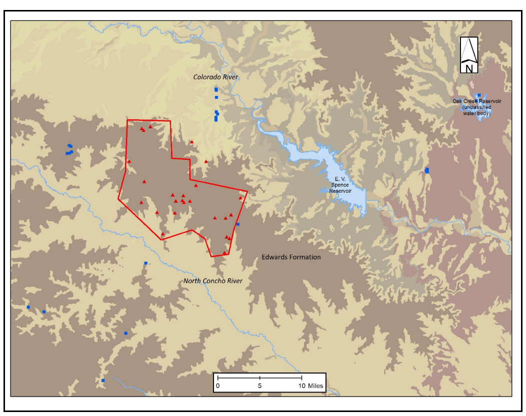

Figure 4. Geological map of Capricorn Ridge WPA; previously recorded lithic procurement sites marked blue, lithic procurement areas recorded during the present study marked red.


Figure 5. Ridges dissecting the upland divide at Capricorn Ridge WPA. (Photograph courtesy of Alan Skinner.)

Figure 6. Nodular chert exposed on ridge top surfaces. (Photograph courtesy of Alan Skinner.)

Figure 7. Bedded chert exposures on slopes within the study area. (Photograph courtesy of Alan Skinner.)

Approximately 35 sites were recorded in 1999 during survey by Texas Historical Commission stewards and members of the Concho Valley Archeological Society in the Walnut Creek valley due east of the Capricorn Ridge study area (Dan Potter, personal correspondence 2006; Texas Archeological Sites Atlas 2007). In the north central region of Coke County, 124 prehistoric sites were recorded during a four-stage salvage project at the E. V. Spence Reservoir, (formerly known as Robert Lee Reservoir (Shafer 1967, 1969, 1971). Site types were primarily campsites, middens, rock shelters, and procurement sites. These sites were located on terraces at the confluence of the Colorado River and its tributaries as well as on bluffs, ridges, knolls, and in alluvial deposits.

Previous Investigations

Within Coke and Sterling Counties, multiple surveys identified a variety of archeologist sites, including procurement sites, campsites, cairn burials, and lithic production areas. One of the earliest large-scale surveys near the study area was conducted by Mary Lee Douthit in the 1970s. Douthit recorded 61 prehistoric sites within the uplands, along ridge edges, terrace, and floodplains of the North Concho River and at the confluence of Sterling Creek (1978).

Darrell Creel (1986) conducted excavations in west central Texas, which included survey and mitigation of burned rock middens. In the 1990s' Mariah Associates conducted survey, then limited testing and monitoring, at several procurement sites along the O.H. Ivie Pipeline route in Sterling, Concho, Tom Green, Glasscock and Midland Counties. The testing efforts provided great insight into the procurement activities and identified localized knapping stations at several sites (Lintz et al. 1994; Treece et al. 1992).

At Camp Barkeley, a large lithic procurement site and three campsites were documented on the Callahan Divide in Taylor County (Thoms 2000). The procurement site was within the Edwards chert outcrops and located between 2,330 and 2,390 ft above sea level. The dates from the points identified were from the Late Paleoindian to the Late Prehistoric periods.

Production and Manufacturing

To stay consistent with regional terminology, we used the same lithic technology typology used in the investigations at E.V. Spence Reservoir in Coke County (Shafer 1969). There are a variety of ways to manufacture stone tools, from direct to indirect percussion (Turner et al. 2011). Hammerstones are typically of harder material, such as quartzite, and were used to work the chert. Additionally, such as seen with modern knappers, part of the knapper's tool kit would include antlers to finish the fine edges of points and other tools.

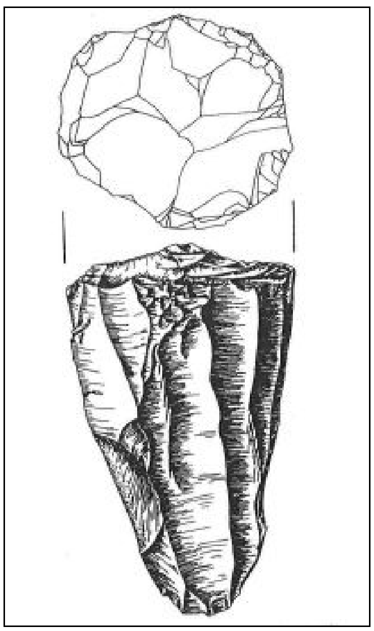

Figure 8. Clovis blade core. (Source: Turner et al. 2011:Figure 2-22); reprinted by permission of the publisher.)

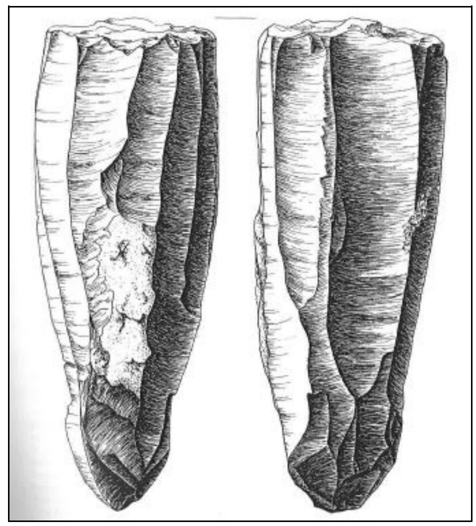

Figure 9. Clovis polyhedral blade core and outline of top striking platform. (Source: Turner et al. 2011:Figure 2-23); reprinted by permission of the publisher.)

While very few diagnostic points are found at lithic procurement sites, which was what we also discovered during our investigations, there are clues in the core technology that help identify time periods. In order to create large, fluted points such as Clovis points, the production process had to start with a large, thin flake. These polyhedral blade cores are temporarily distinctive (Figures 8, 9). Other artifacts that make up a procurement site assemblage are flakes, shatter, and discarded cores. The majority of an assemblage will be primary flakes, with some secondary, and few, if any tertiary. The smaller, interior flakes associated with thinning bifaces or retouching points are found at campsites, where the finer stages of production usually occurs. Artifact assemblages from the Capricorn Ridge procurement sites included various stages of cores; thick, thinned, and broken bifaces in a wide range of sizes; cortex-covered lithic debris; and occasionally chipped stone unifacial tools.

Most of the chert was similar in color and composition to the Edwards Plateau chert found along bluffs of the Concho River, northwest of San Angelo and southwest of the study area (Banks 1990:123).

The colors ranged from light gray, gray, brown, very dark gray, dark gray, or grayish brown. Occasionally there was light brownish yellow, yellowish brown, or very pale brown. One striking outcrop at the northwestern most procurement site (41ST151) was ‘pink' or light reddish brown and reddish brown (Figure 10). Cyrus Ray also recorded similar pink chert in a mountain outcrop in neighboring Taylor County (Ray 1947:28). Some of the chert was flecked with white or light gray spots, and a few examples recorded were banded; yet the majority was solid in color and semi-translucent (Figure 11). Chert throughout the area appeared to represent a large variability in quality. Variability in discernment of selection was noticeable by the absence of worked material in many chert outcrops versus chert outcrops that had high densities of tested cobbles, flakes, and bifaces. Therefore, a distinction was made during survey of the quality of chert in the terms of ‘knappability' with identifiers of good, fair, or poor.

Figure 10. Pink to light reddish-brown chert at Site 41ST151. (Photograph courtesy of Alan Skinner.)

Figure 11. Examples of semi-translucent dark gray chert bifaces found within the study area. (Photograph courtesy of Alan Skinner.)

Since we were making visual inspection in the field, the best description to qualify these distinctions was in the observable texture, such as fine versus coarse. Poor quality chert was very porous and has flaws or inclusions. These types of flaws are not conducive to tool manufacture, and examples of tested, and discarded, cores or bifaces from numerous stages of reduction were observed by field staff where the material had shattered along fracture lines. In fact, selective use of chert is apparent at the Capricorn Ridge lithic procurement area, where we discovered numerous outcrops of poor-quality chert that were apparently passed over for the locations containing good quality chert. Good quality chert locations then were heavily tested and flawed pieces were abandoned.

Within the 26 procurement sites recorded, there was abundance of bifaces (Figure 4). In an attempt to quantify what was identified in the field, we used the biface Thick I and II or Thin I and II typology following the definitions used for the investigations at O.H. Ivie Reservoir in Concho, Coleman, and Runnels Counties (Trierweiler et al. 1993). There was a broad range in site size, and as shown in Table 1, the sites ranged from less than 100 to 181,700 square meters.

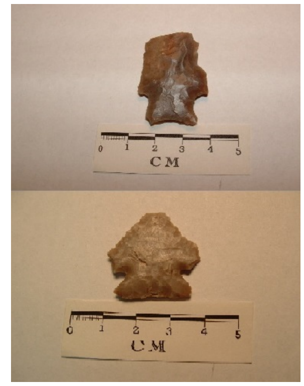

Figure 12. Gower (top) and Marshall (bottom) dart points recorded during the survey. (Photograph courtesy of Alan Skinner.)

Artifact density at the sites also ranged widely, and estimates provided in Table 1 were based on observations recorded in the surveyor's field notes. Belatedly, and due to the author's limited experience with lithic procurement sites at the time, we realized the significance of these sites within the region after the majority of the sites had been recorded. The presence (or absence) of bifaces is significant, as we will discuss later within this paper. This data enables us to estimate the amount of material procured at each site by the extent of discard at each site. Despite the number of sites recorded during the study and the extensive amount of ground covered, only two broken diagnostic points, a Gower and a Marshall, were recorded (Figure 12).

Regional Comparisons

When these procurement site locales were compared with others similar sites previously recorded between, and within, the two river valleys, a clear pattern of site distribution within the geological formation emerged. The procurement sites are interrelated by geology, yet they are also within the same advantageous resource area readily accessible from two major river drainages on the Edwards Plateau and the Rolling Plains ecotone. The upland divide between these two rivers is heavily dissected by tributaries, which have formed ridges that trend to the north and south. Many are spring-fed.

Despite this being a due diligence survey, due to the density of procurement sites recorded, limited testing was conducted in one-meter areas at two sites: 41ST151 and 41CK266 (Shelton et al. 2007:33-34). The artifact counts suggest that the density per square meter was much higher than those accounted for during surface observation at other sites identified during our survey. In the Callahan Divide, approximately 70 miles northwest of the Capricorn Ridge, Alston Thoms and crew conducted several tests at 41TA181 where they counted lithic debris at this large procurement site in an attempt to characterize the material "left behind" versus what was collected and modified (Thoms 2000:67).

When we compared the cultural material recorded at the Capricorn Ridge sites to Thoms' results, it is easy to suggest that hundreds of thousands of artifacts, primarily lithic debris from the initial stages of lithic procurement process, were identified during the survey. Thoms succinctly states that it is difficult to determine the material removed from the region versus the amount of material "left behind" when analyzing these sites alone. Even a broader regional comparison of material deposited at campsites along the Concho and Colorado Rivers provides only a glimpse of the chert removed from the procurement sites. The studies on the Callahan Divide clearly demonstrated that the best example of the amount of material quarried is to take into account the time span of diagnostic artifacts identified to attempt to qualify the number of artifacts discarded at the sites themselves. The lithic procurement site near the Callahan Divide appeared to have been quarried for at least 9,000 years. Thoms' study, and our sample counts taken at 41ST151 and 41CK266, suggest that hundreds of thousands of artifacts could be present at each of these procurement sites, and that possibly millions of pieces of worked material have been removed.

The lack of diagnostics recorded during survey was not surprising, as artifact assemblages from lithic procurement sites do not typically contain diagnostic artifacts. Yet, since campsites were recorded in the drainage valleys, one would anticipate dart or arrow points to be present within the landscape. Three lines of reasoning can be suggested. First, the landscape was used for hunting activities and the collection of chert, and permanent campsites where the final stages of tool production occurred were along the North Concho and the Colorado Rivers. Second, the area has been heavily collected since the mid-19th century. Or, as Lintz, (personal communication 2022) has suggested, chert procurement was an imbedded strategy during hunting forays.

Conclusions

The Capricorn Ridge archaeological surveys have resulted in the definition of an extensive chert resource (Figure 4). When placed in a regional framework, the Capricorn Ridge lithic procurement resource area is similar to the large quarry site recorded at the Callahan Divide. It is apparent from Thom's (2000) data that these chert sources were procured over long periods of time, most likely from the Paleoindian to the Late Prehistoric periods, and the material was transported over long distances.

Based on occupation evidence from previous investigations conducted on those watersheds, and the limited testing conducted at campsites in the North Concho and the Colorado River valleys (Shafer 1969, 1971), there is strong evidence of intensive occupation during the Archaic and Late Prehistoric periods in the region. In addition to lithic procurement activities, lithic production and hunting and food processing was occurring within the river valleys and in the spring-fed draws.

Previous researchers have suggested that exploitation of lithic resources within the Llano Estacado (on the northwestern edge of the Edwards Plateau) occurred within 25 to 220 miles of campsites or settlement sites (Hester and Grady 1977:90). The variation in distance was attributed to procurement during different time periods, with further distances being attributed to the Folsom period. High quality lithic resources are limited in the Llano Estacado, and Johnson and Holliday assert the model that that this type of resource was imported from greater distances, particularly from the Central Texas Edwards chert formation, than other resources such as food and water. Therefore, Edwards chert played a major role in the adaptive strategies utilized on the Southern High Plains (1995:532). The sites identified during the large area surveys discussed in this paper support this model of procurement and distribution. In addition, lithic resources were imported from the Edwards chert formation in central Texas to the southern High Plains. Caches of Edwards chert bifaces have been recorded throughout the Southern Texas Plains (Hester n.d.; Kilby 2008) and the Rolling Plains (Tunnell 1989:370) and as far north as southeastern Colorado (Owens 2015). In addition to these lines of evidence, Lintz (personal communication 2022) has documented over 300 caches and traced possible trade routes that stem from sites recorded in this formation. Future investigations, including chert-sourcing studies, will continue to contribute to a better understanding of the breadth of distribution and trade of stone tools from this large natural resource within the Edwards Formation.

Acknowledgments

This publication would not be possible without the support and encouragement provided by Dr. Alan Skinner, AR Consultants. Dr. Skinner provided me with an opportunity early in my career to lead the surveys over these large, remote tracts of land. Since 2007–2008, I've often thought about the larger, regional implications of these lithic procurement sites. After I became a regional archeologist for the Texas Historical Commission, the significance of the sites recorded became readily apparent. This manuscript was compiled from the due diligence cultural resource management reports provided to the client and presented at the April, 2022 SWFAS Symposium and made available on the Texas Archeological Sites Atlas. The many miles of survey were conducted by Dr. Skinner, myself, and the amazing crew: Ryan Byerly, Jeff Craver, Cody Davis, Iasa Duffy, Allison Holyfield, Brett Lang, Gonzalo Pleitez, Bill Stivers, and Sonny Wheeler III.

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PRELIMINARY COMPARISON OF ALIBATES CHERT PROCUREMENT NORTH AND SOUTH OF THE CANADIAN RIVER

Christopher Lintz, Paul Katz, Andy Burcham, Veronica Arias, and Miranda Bible

Abstract

The Alibates Chert/Flint Quarries have been revered as the source of colorfully banded toolstone that was made into implements found across the Southern Plains region. Much of what we know about this chert source is derived from the quarries in Alibates National Monument on the south side of the Canadian River. Until recently, few people have been able to access other Alibates quarries on private lands north of the Canadian River. On December 6, 2021, a one-day, landowner-guided reconnaissance of a few northern Alibates chert quarries was conducted. The brief visit observed quarry patterns that contrast with those in the National Monument.

This paper discusses the distribution of the Alibates member of the Quartermaster Formation, and the origin, formation, and characteristics of Alibates chert as background to discussing the prehistoric chert procurement activities. The known locations of the quarry pits are more confined than the surface occurrence of Alibates bedrock. Comparisons are then drawn between the National Monument and first impressions of the Plum Creek quarry areas in the occurrence of bedrock boulders, variety of quarry pits, and the contents of the pits. The structure of an excavated quarry pit in the Monument, and possible digging implements, are also presented.

CAMP VAN CAMP, WEST TEXAS: THE PECOS EXPEDITION

Tom Ashmore and C.A. Maedgen

Figure 1. The location of Camp Van Camp, Pecos County, Texas. (Photograph courtesy of C.A. Maedgen.)

Abstract

Camp Van Camp was an 1859 United States military expeditionary camp located outside what is currently Fort Stockton, Texas. The mission of the Pecos Expedition was to explore the unknown territory and to interdict Comanche and Apache Indians whose attacks on westward emigrants, settlers, freighters, and stagecoaches were increasing in the West Texas region. At the time there was little-to-no defense where expansion was occurring. The westward traffic was taking place on two main roads: the Butterfield Road/Upper Emigrant Road and the San Antonio to El Paso Road Lower Emigrant Road. These roads were increasingly filled with mail coaches, freighters, and emigrants that ran right across the Comanche War Trail and into hostile Apache territory. Camp Stockton and Camp Van Camp's Pecos Expedition were an attempt to interdict the Indians and establish a new the line of defense further west.

This was the first archeological investigation to forensically determine the full layout of an 1850/60s expeditionary encampment within the western United States. We were able to determine the exact layout of the encampment that included an infantry company that constructed, maintained, and guarded the camp, and two cavalry companies that used the camp as their base of operations for the patrols up and down the Comanche War Trail. Through extensive research of military documents and four site visits to this previously untouched camp, we were able to fully reconstruct the entire site layout as well as the daily routines of this four and a half month expedition into the stark expanse of the Pecos River region and far West Texas.

Historical Documentation

Camp Van Camp was an 1859 United States military expeditionary camp located outside what is currently Fort Stockton, in Pecos County, Texas (Figure 1). The camp location was listed in official military documents as "at Horsehead Crossing on the Rio Pecos, Comanche Trail" (Smith et al. 2007:184; U.S. Congress 1859–1860). Although more than 20 miles from Horsehead Crossing, it was probably listed as this location because at the time there were only two locations on the military map for the entire area. One was Comanche Springs where Camp Stockton was being constructed, and the other was Horsehead Crossing (Figure 2).

This camp has mistakenly been misidentified in some historical references to be an outpost of Fort Belknap in northern Texas, possibly from the assumption the cavalry officer it was named after was a company commander in an expedition out of Belknap who lost his life in a famous 1858 battle with the Comanche. But there are no military records that support that location and many that support only the location outside of Fort Stockton. The actual original location for Camp Van Camp, provided in a first-hand account by Major General Zenas Randall Bliss, was near the battle site in Oklahoma, but the name was quickly changed for that location through official channels to become Fort Cobb, established in October, 1859 (Norris 2009; Smith et al. 2007:144).

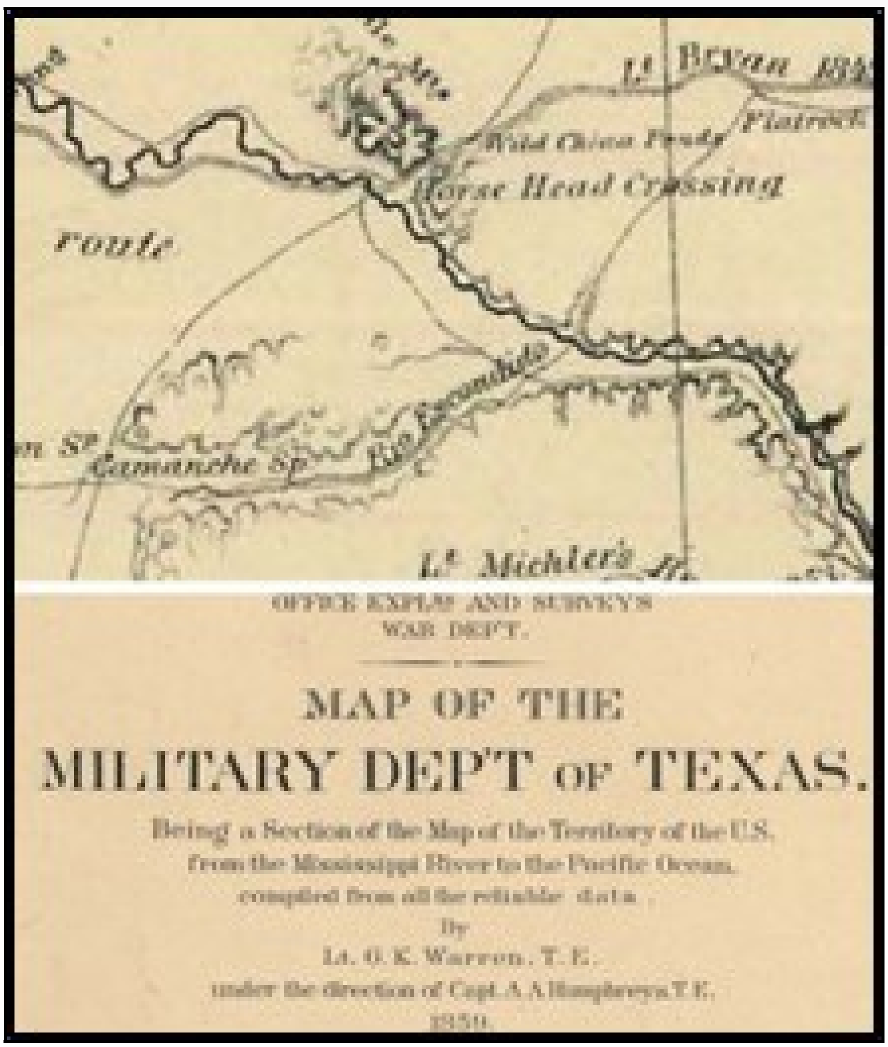
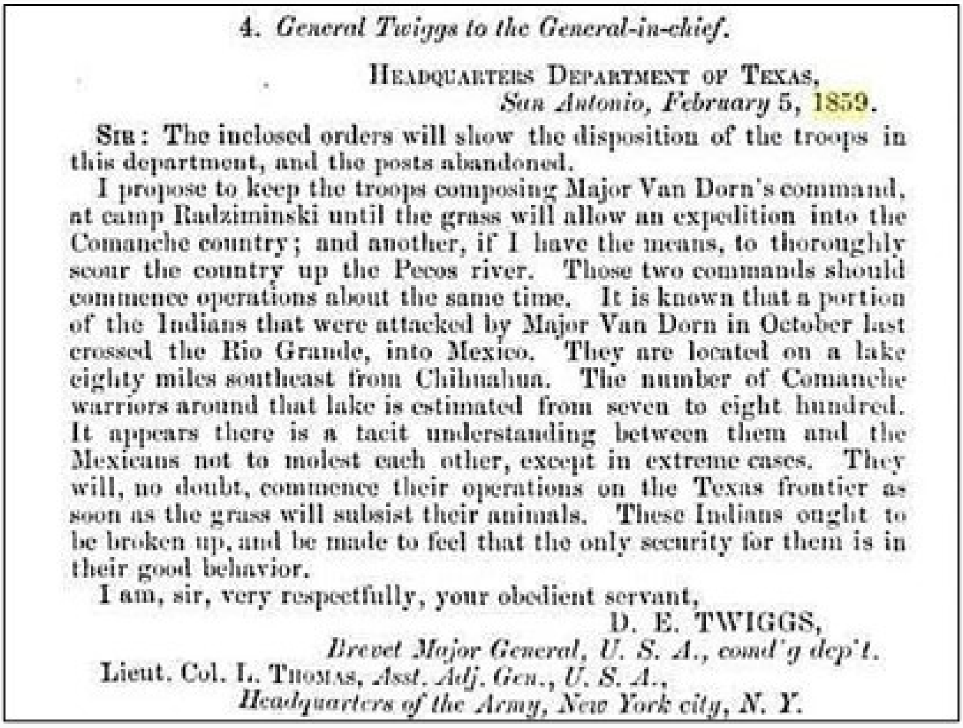


Figure 2. The location of Comanche Springs and Horsehead Crossing.

Brevet Major General Twiggs, commander of military forces in Texas, showed his intent for the spring of 1859 in the following letter to the Chief of Staff (Figure 3):



4. *General Twiggs to the General-in-chief.*

HEADQUARTERS DEPARTMENT OF TEXAS,
San Antonio, February 5, 1859.

SIR: The inclosed orders will show the disposition of the troops in this department, and the posts abandoned.

I propose to keep the troops composing Major Van Dorn's command, at camp Radziminski until the grass will allow an expedition into the Comanche country; and another, if I have the means, to thoroughly scour the country up the Pecos river. Those two commands should commence operations about the same time. It is known that a portion of the Indians that were attacked by Major Van Dorn in October last crossed the Rio Grande, into Mexico. They are located on a lake eighty miles southeast from Chihuahua. The number of Comanche warriors around that lake is estimated from seven to eight hundred. It appears there is a tacit understanding between them and the Mexicans not to molest each other, except in extreme cases. They will, no doubt, commence their operations on the Texas frontier as soon as the grass will subsist their animals. These Indians ought to be broken up, and be made to feel that the only security for them is in their good behavior.

I am, sir, very respectfully, your obedient servant,

D. E. TWIGGS,
Brevet Major General, U. S. A., comd'g dep't.

Lieut. Col. L. THOMAS, *Asst. Adj. Gen., U. S. A.,*
Headquarters of the Army, New York city, N. Y.

Figure 3. General Twiggs' letter.

Camp Radziminski, referred to in the Twiggs memo, was established on September 23, 1858, during an expedition of the 2nd Cavalry under the command of Major Earl Van Dorn. It was located in Oklahoma Territory on the south bank of Otter Creek as a provision depot on one of his Indian campaigns. It was maintained as an outpost of Fort Belknap in Young County, Texas. The post contained no permanent structures and was moved twice to obtain better forage and a more sheltered site on the right bank of Otter Creek near present Mountain Park in Kiowa County. The camp was also known as Camp Otter Creek and Otter Creek Station (PocketSights 2019).

The reference in the correspondence to "Comanche country" is pointing to the Oklahoma Territory where hostile Comanche were basing out of for their raids. The reference to "…and another, if I have the means, to thoroughly scour up the Pecos river" is referring to finding more companies for the planned Pecos Expedition that ended up being based out of Camp Van Camp.

Company E, 2nd Cavalry Regiment, led by Captain Stoneman out of Camp Colorado, Coleman County, Texas, departed sometime in April, probably the 16th, as the lead unit to scout out the camp location (Bossange 2019:113; Texas Almanac 1860:194). At the same time Company I, 2nd Cavalry Regiment, led by Captain Brackett, left Camp Hudson on a patrol down the Comanche War Trail to the Rio Grande River and was then to return to the new Camp Van Camp. He passed through Camp Lancaster and Camp Stockton before heading south into the Big Bend region (Figure 4). They apparently went beyond the Rio Grande into Mexico hunting and engaging Comanche and Apache. Their report indicates they also assisted Mexican civilians to retrieve stolen cattle before crossing back into U.S. territory. After resting at Fort Davis, they arrived at Camp Van Camp on May 21.

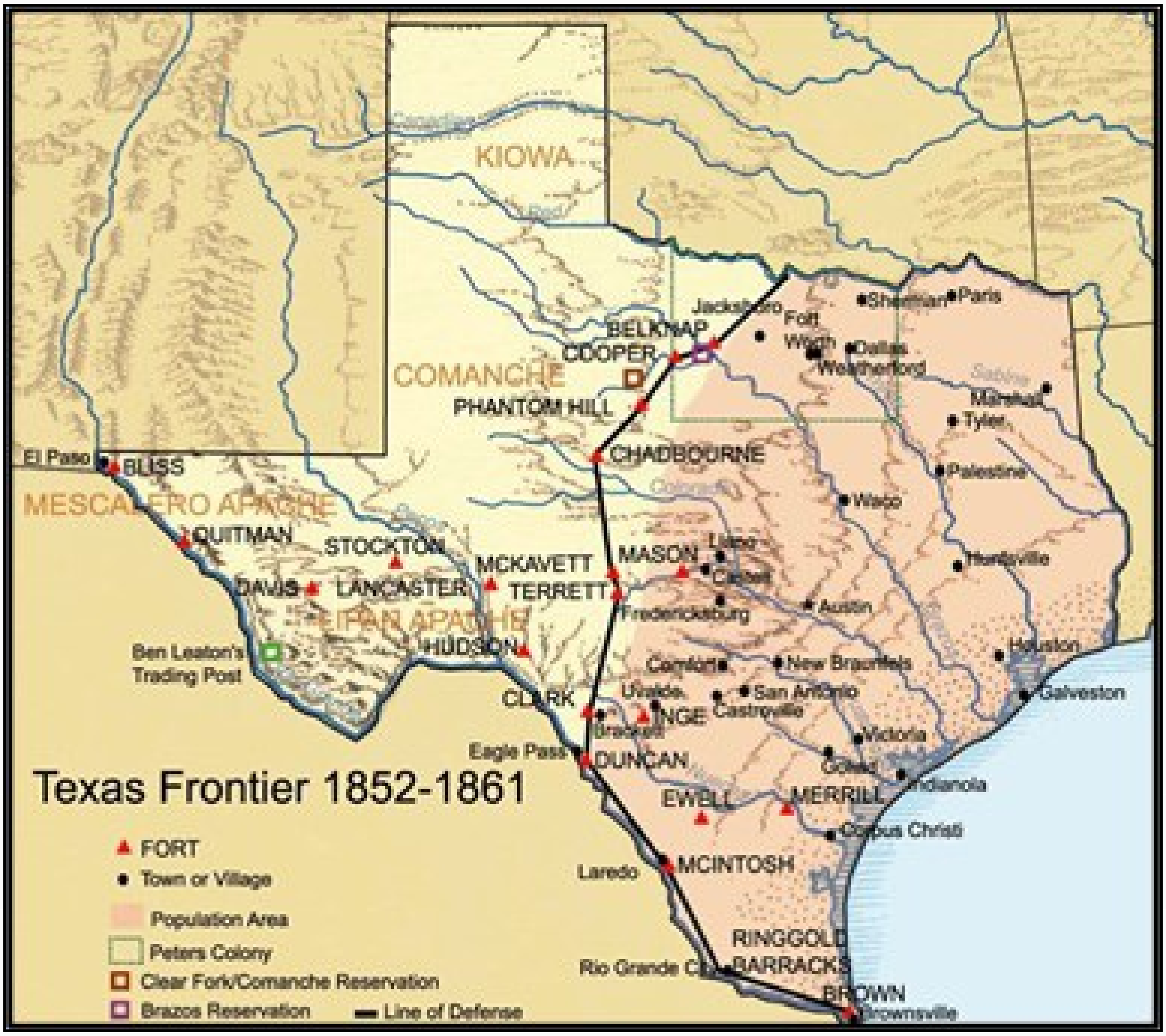


Figure 4. Map showing forts mentioned in the text.

Company D, 1st Infantry Regiment (see Appendix C), was also dispatched from Camp Hudson on April 16 to move to the new location and construct the camp (National Archives and Records Service 1968; Texas Almanac 1860:194). At the time Camp Hudson was in charge of defending the San Antonio to El Paso road (also known as the Lower Emigrant Road) and was located on the Devils River between Camp Lancaster and San Antonio. The journey to the new location for the infantry company took a total of 22 days, with a stop at Fort Lancaster. They arrived at the chosen location on May 7, 1859, which is probably when formal construction began (National Archives and Records Service 1968).

The infantry company's mission was to construct, maintain, and protect the camp. At the same time Company H, 1st Infantry Regiment out of Fort Lancaster, was constructing the new Camp Stockton 11 miles away. One historical author's account references three cavalry companies from the 1st Cavalry Regiment joining the expedition at some point. However, there were no 1st Regiment Cavalry units in Texas in 1859 or under Twiggs' command. All were up in Arkansas and Kansas. The two 2nd Regiment cavalry companies were given the mission of exploring the Comanche War Trail, hunting Indians in the West Texas area, and was designated 'The Pecos Expedition.' The expedition lasted about four months.

Figure 5. Lieutenant Henry Clay Wood.

What is impressive is that although the infantry company was supposed to be led by a captain, along with a 1st and 2nd lieutenant, it turned out the entire unit was led by only a young 2nd lieutenant, Henry Clay Wood (see Appendix B). Both other officers were put on sick leave just before the unit departed and were not replaced. It is no surprise that Henry Clay Wood later became a Medal of Honor recipient during the Civil War, retiring as a full colonel and given the retirement rank of brigadier general. He was truly an extraordinary soldier and proved his mettle as a young lieutenant when put into a ridiculously difficult situation.

In June the two cavalry companies moved out together and headed up the Pecos to the Guadalupe Mountains and then into New Mexico, arriving at Fort Stanton, north of what is now Ruidoso. After their stay there they returned to Camp Van Camp in mid-August. No Indian engagements were reported. The date for the end of the expedition can be identified as August 27th, when the infantry Company D was reported as "enroute" back to Camp Hudson (National Archives and Records Service 1968). Company I was subsequently assigned to create Camp Ives south of what is now Kerrville, and Company E was assigned to Camp Hudson (Price 1883:82).

Unit Structure

During this period of time a cavalry regiment consisted of around 10 companies. The troops could be spread out over several forts and camps as determined by the regimental or overall commander. The command structure was based on districts or 'Department', which could encompass multiple states. However, Texas was so large it was considered its own department. Within the Department of Texas, the regimental companies were spread out in the many camps and forts that defined the western defensive line of Texas settlement. They were spread thin in their attempt to protect the settlers and travelers from Indian depredations.

A standard full strength company was designated on paper to be approximately 95 soldiers. The following is a close approximation of a typical full strength company of the time:

> HQ Section: 1 x captain, 1 x 1st sergeant, 1 x sergeant/standard bearer, 2 x trumpeter, 2 x orderly, 1 x farrier/vet, 1 x blacksmith, 1 x saddler, 1 x hospital orderly, 2 x teamsters, 1 x waggoneer — total = 15

> Two platoons, each with 1 x lieutenant, 2 sergeants, 2 corporals, 35 privates — total = 80

Field units were never at full strength. A report from Captain Brackett of Company I, 2nd Cavalry indicated he had only 66 men (Price 1883:78). The May, 1859 monthly return for Company D, 1st Infantry at Camp Van Camp shows a total of 81 men. This is as large as any of the infantry companies at the forts throughout West Texas and shows the significance the military gave to this expedition. Using this information, it is likely the total strength of two cavalry and one infantry company at Camp Van Camp was somewhere around 215 men, with probably around 150 horses and mules.

Strategic Location

The mission of the Pecos Expedition was to explore the unknown territory and to interdict Comanche and Apache Indians whose attacks on westward emigrants, settlers, freighters, and stagecoaches were increasing in the West Texas region. At the time there was little-to-no defense where expansion was occurring. The westward traffic was taking place on two main roads: the Butterfield Road to El Paso (Upper Emigrant Road) and the San Antonio to El Paso Road (Lower Emigrant Road). These roads were increasingly filled with mail coaches, freighters, and emigrants that ran right across the Comanche War Trail and into hostile Apache territory. Camp Stockton and Camp Van Camp's Pecos Expedition were an attempt to interdict the Indians and establish a new the line of defense further west. This is evident from General Twiggs' last sentence in his correspondence: "These Indians ought to be broken up, and made to feel that the only security for them is in their good behavior" (Smith et al. 2007).

Camp Van Camp was chosen for its strategic location near the infamous Comanche War Trail, which can still be seen today in satellite imagery due to the wide swath made by the many war parties returning from Mexico with large herds of horses. The camp sits slightly over two miles from a major convergence of the war trail as it heads south from Horsehead Crossing (Figure 6). The vegetation after growth on the old War Trail is over 130 feet wide in many spots along the trail. One early explorer counted over 25 separate side-by-side trails when encountering this trail in 1849 (Figure 7). The main trail continues to the southwest to Comanche Springs, where Camp Stockton was established to protect westbound travelers through that area.

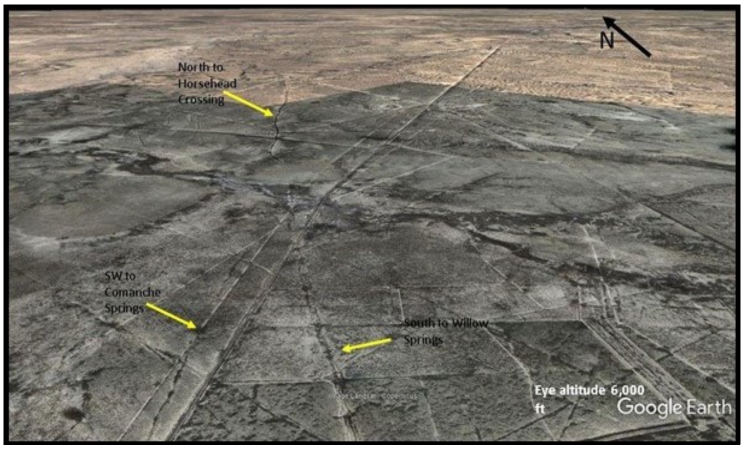


Figure 6. The Comanche War Trail splits.

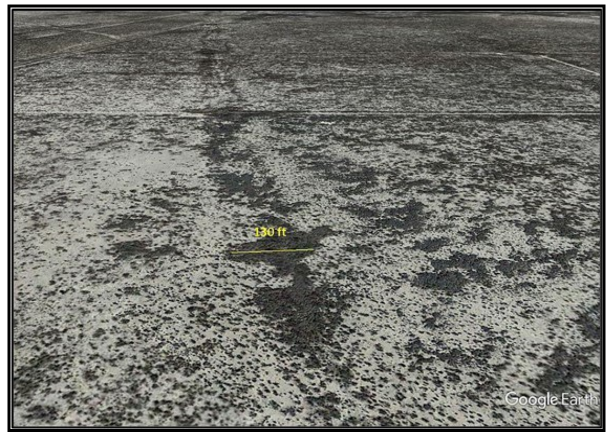


Figure 7. Comanche War Trail width made by numerous paths of stolen horse herds.

The other section of the trail heads due south, heading to a spring east of Marathon, Texas, now called Camp Pena Colorado or Pena Colorado Spring, and then continues from there through the Big Bend area (Figure 8) to two separate Rio Grande crossings into Mexico. Both crossing were well known as Comanche crossings. One was at Lajitas and the other was called Chisos Crossing, just south of the Chisos Mountains (National Park Service 2020).

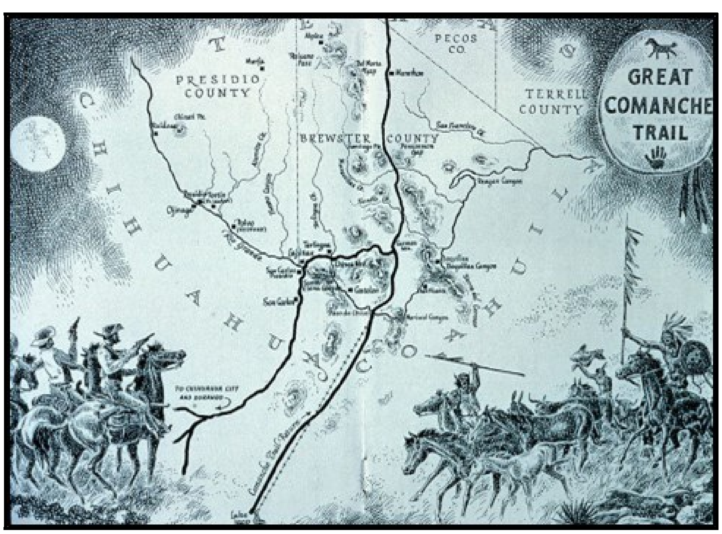


Figure 8. The Comanche War Trail through the Big Bend region (Graphic courtesy of the National Park Service 2020.)

In addition to the site's location for strategic purposes, it was also likely chosen for its proximity to the new Camp Stockton. They had a mere 11 miles to reach another military post and thus the military communication and logistical lines to the intermediate forts and San Antonio. At the time Camp Stockton was reported to be purchasing corn at $1.48 per bushel and hay at $15 per ton (Mansfield 2001). Corn and prairie hay were the primary requirement for the horses in the West and would have been so for the Pecos Expedition. Cavalry mounts were provided with a daily ration of corn to supplement the hay. This was considered the best thing for strength and stamina. Oats were only considered for the northern temperate states (Lowe 1991:153–154).

It stands to reason the Pecos Expedition would have been using the same purchase connections for their camp. Even if they were not in the possession of actual funds, a government purchase promissory note should have been enough for the local contractors to accept. All other provisions could probably be ordered from Fort Lancaster or Fort Clark, the main supply depot for the Lower Emigrant Road (Pingenot 2020).

Site Description

Camp Van Camp needed to be not only at a strategic location to base out of for their patrols, but it had to be a convenient location to support two companies of cavalry and the supporting infantry company. It had to have good water for the men, water for the animals, some level of natural forage for the horses, support from the military logistics chain for both men and horses, and it had to provide a tactically defensive location. In the military a tactically defensive position is some kind of high ground. The site was chosen to match all these requirements.


Figure 9. Dry spring source.

The site covers four promontories overlooking a creek about 50 feet below that runs along a dividing line between the lower flood plain and the caliche and limestone uplands. Each promontory is divided by a sharp gully and had a fairly sharp drop-off as it looked down on the creek bed. The camp is essentially made up of four areas: infantry, cavalry, horse corral, and a horse maintenance/grooming area. The total camp area is 14 acres. The infantry area takes up about eight acres, cavalry four acres, and horse corral and stalls maintenance areas two acres. The creek is currently dry, but it is known to have provided water for farming irrigation as recently as the 1930s through 1950s. At the time, this running creek would have been sufficient to provide water for the many horses of the units. Additionally, a natural spring flowed into one of the central gullies and would have provided clean water for the soldiers. The now dry spring source can still be seen today (Figure 9).

To conserve their spring water, the soldiers built two rock dams in the spring-fed gully (Figures 10, 11). These rock dams were packed with local caliche limestone mud to ensure they held the water. It can be speculated that the reason for the two dams was to keep one for clean drinking water and the other for all other purpose (i.e., clothes washing and bathing).


Figure 10. Remnants of Dam #1.


Figure 11. Remnants of Dam #2.

The promontories have several guard post redoubts on the edges overlooking the creek bed (Figure 12). Redoubts are generally set up in a horseshoe shape with loose rock walls (Figure 13). The redoubts are overlooking the creek west and north. This would be the logical route if Indians were to attack, following the creek down from the north. Behind the camp, in the direction of the Comanche War Trail, it is open table top prairie in which a group of approaching horses would be kicking up dirt that could be seen for many miles. Even so, this area was protected by four guard post redoubts facing the prairie.

Figure 12. Guard posts overlooking the creek.

Figure 13. The remains of a guard post redoubt on the edge of a promontory.

Behind the guard post redoubts are scattered tent site square pads, some with large rocks, probably used to assist in holding the tents in high winds. Twenty-three tent pad areas of various sizes could be identified from overhead drone and satellite imagery either by clusters of trash or ditching techniques. Tent pad sites ranged from 10 feet x 10 feet to one large pad measuring 80 feet x 80 feet. Additionally, a stone platform with a probable rock wall was built down below at the creek edge with a wagon road leading down to it. This appears to have been a guard post to protect the horses being kept in the creek bed area, probably in a large corral. With this guard post they had both overlook of the creek area and beyond as well as close-in guards for their horses and mules.

The cavalry camp area to the rear of the infantry area is laid out in a grid pattern (Figure 14). These were probably created by the infantry unit using wagons. There appears to be two rows of major grid squares. Wagon tracks can be still seen from overhead satellite images that appear to have made the original tracks. The main perimeter wagon road runs behind the rear squares area. After mapping artifacts on the ground it appears the tracks were not only to define the two cavalry company areas, but also to deliver supplies by wagon to the widespread camp sites. Although there was no particular pattern to the campsite layout, the sites all appear to be close to one of the internal tracks made by the wagons, which would aid in the delivery of supplies.

Spreading out the sites was probably a defensive strategy. An attack on the camp would not catch all the soldiers bunched together, giving them a better chance to mutually support each other. Additionally, the most developed pads sat squarely in the middle of the company areas and were probably the company commander's site.

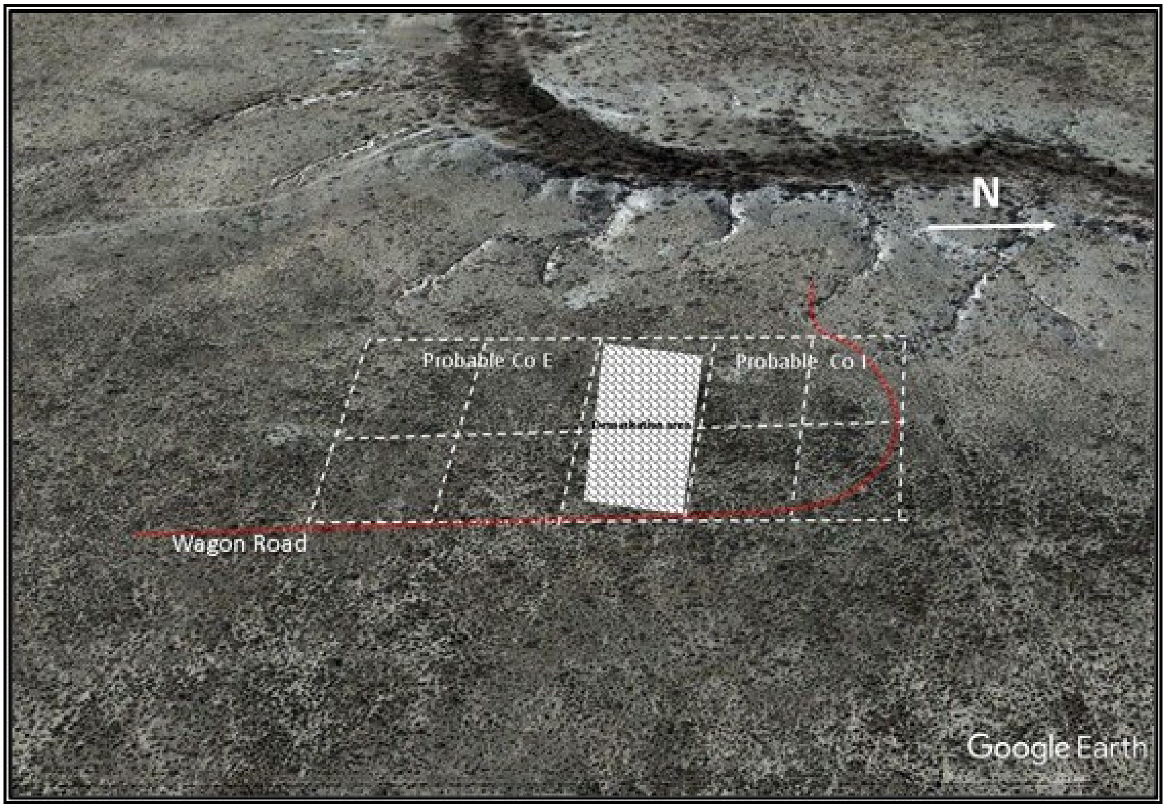


Figure 14. The layout of the cavalry camp.

The company area to the south has the greatest amount of trash. Company E was probably the unit to find this site (around beginning of May) and had at least three weeks on site before Company I arrived on May 21. Additionally, this area has three guard posts facing the southern and eastern areas that are not defended by the forward infantry units. The other company area has possibly only one that we could find. This leads to the assumption Company E was the southern area and Company I the northern area (Figure 15).

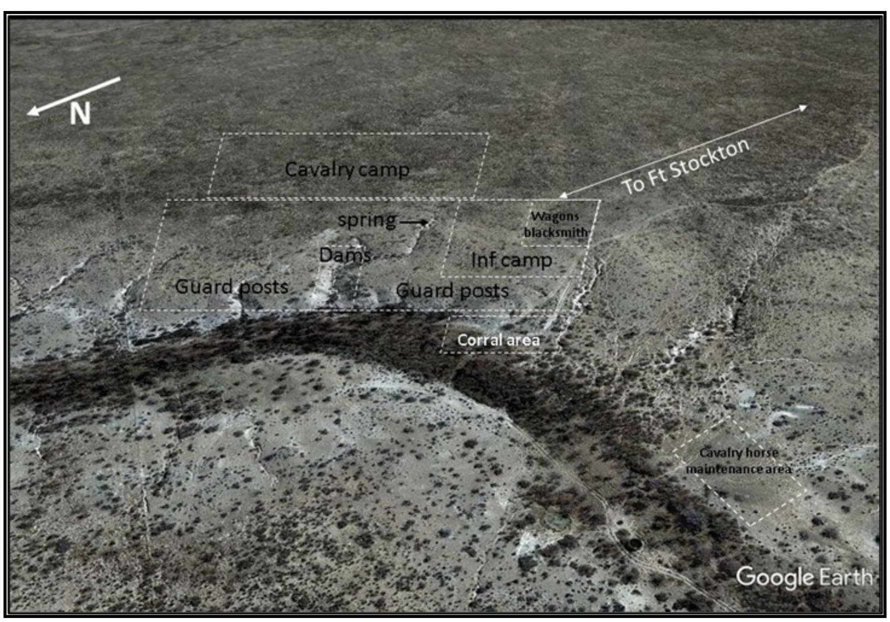


Figure 15. The layout of the entire camp.

Figure 16. Examples of private's and a sergeant's tent.

Field tents for privates were the standard small single-man A-frame tent, called a 'dog tent.' Sergeants and possibly corporals had a larger A-frame, and officers had wall tents (Figures 16, 17).

Figure 17. Example of an officer's tent.

An old wagon road can be seen running behind the entire camp, down around the end of the promontories to the least steep pathway to the creek (Figures 18, 19, 20). It ends in a location where a platform of rock was built, probably with a stone redoubt wall on top of it. The wall rocks are now strewn around the platform (Figures 21, 22). This had to have been a guard post where the horses were being corralled. The wagon was probably in constant use, taking the cavalry soldiers and feed up and down the hill to take care for their horses. The cavalry soldier's main duty, above and beyond themselves, was to take care of their horses. The infantry duties were to construct, maintain, and protect the camp.

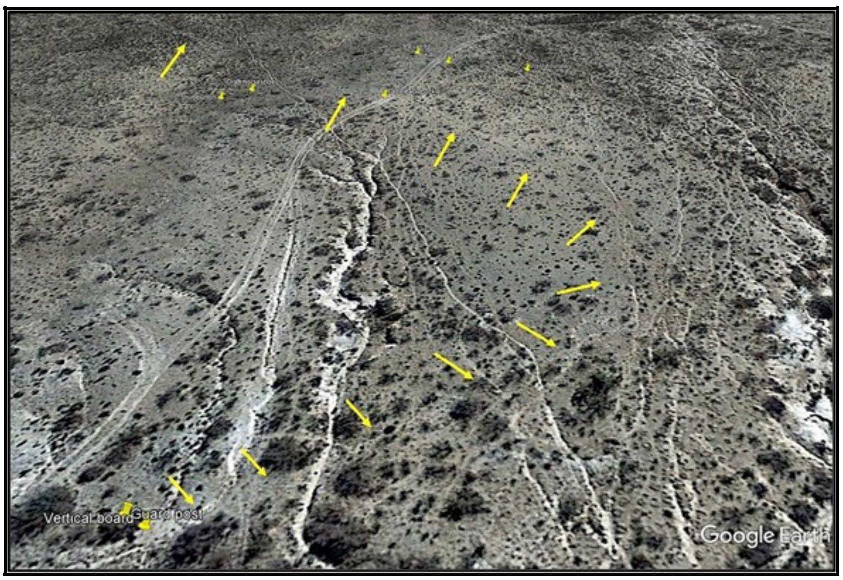


Figure 18. The wagon road to the corral.

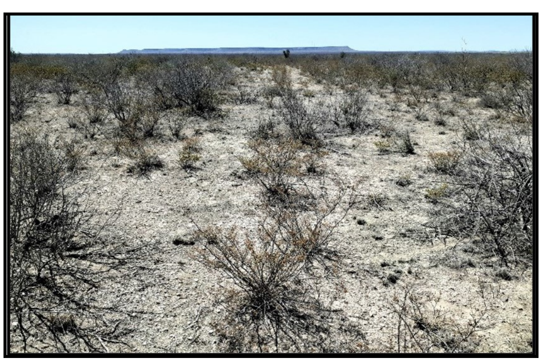


Figure 19. Ground level photograph of the old wagon road running behind the cavalry camp.

Figure 20. Overhead drone image of the old wagon road running behind the cavalry camp.

Figure 21. Constructed wall for the stone guard post platform.

Figure 22. Constructed wall for the stone guard post platform.

The stone platform sits approximately 150 feet from the creek. It was built up to provide a level redoubt and is filled in the center with smaller stones to provide a flooring for the occupant to be out of the mud if it rained. Within 30 feet of the guard post platform is a very old 2 foot x 6 foot board planted in the ground with three holes drilled horizontally in it (Figures 23, 24)). It is unknown what this was for, but as there is no other old or modern ranching features in this area, this suggests it had some use with this corral area. Additionally, the wagon road leads right to this location. It can be speculated that this board had something to do with the corralling of the horses, possibly a gate area. The probable corral is estimated to cover an area of ~ 10,000 square feet.

Figure 23. Board near the stone guard post platform.

Figure 24. Stone platform currently covered with mesquite. The top of the hill is in the distance.

A large pasture-like area is located 500 feet from the probable corral. It sits between the creek and the upland and is an area of soft earth rather than the rocky caliche ground surrounding it. Satellite imagery shows multiple unnatural squares in the earth, side by side and in rows (Figure 25). Each square is approximately 10 feet x 10 feet. This may have been set up as individual grooming and care areas used by the cavalry soldiers. They are the correct size of a stall. These were probably temporary stall-like enclosures made of cedar and/or mesquite posts tied with rope for the individual horses. The wear on the ground from the horses must have made the squares that can still be seen in the imagery. There appears to be at least six rows of squares, with ten squares per row, and two rows set perpendicular at five squares per row. Another guard post redoubt sits at the corner of this area, facing the creek. This would have only been manned when the cavalry were in camp and conducting grooming and care maintenance of their mounts.

Figure 25. Satellite image overlain with ground squares indicating temporary grooming stalls.

The cavalry soldier's life was completely centered on the care and grooming of their horses. Each trooper was required to take care of his own mount daily. They would have had to remove them from the corral in order to properly take care of them in a controlled area. The grooming/care area is 75 feet x 125 feet.

The wagon road that heads down the hill to the corral guard post splits half way down the hill and crosses the gully to go over to this field (Figure 26). Several barrel hoop straps along with the typical broken bottle glass and tin ration supply cans were found on the edge of this area and at the crossing (Figure 27). Although there is no way to be sure, the barrel straps were likely for dry corn bushel barrels purchased in the Camp Stockton area (Figure 28). These type of containers would have been considered disposable when the unit departed. These barrel straps were only found where the wagons unloaded supplies at the wagon muster area and the edge of the pasture. A metal underclothes button was also found at this unloading area.

Figure 26. Wagon crossing.

Figure 27. Trash and a broken hub strap at the wagon crossing.

Figure 28. Example of a dry bushel barrel.

Where the wagon crossed the gully to reach the horse maintenance area there was an abundance of trash (ration tins, broken bottle glass, barrel band) and a heavy broken wagon wheel hub strap (Figures 29, 30). This was probably the inner strap. The strap must have been broken going through the gully. The strap size indicates the hub was a very large one. The only wagon with this size strap we could find through research was a large hay wagon (Figure 31).

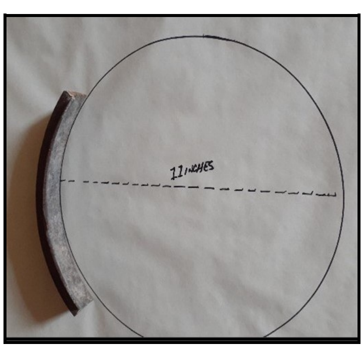


Figure 29. Broken hub strap.

Figure 30. Example of wagon hub straps.

Figure 31. Example of a large hay wagon.

Artifacts and Area Mapping

Infantry area

It is likely that the main infantry company area occupied not only the guard post redoubts, but the area closest to the wagon road as it headed down to the creek bed. Within this area and closest to the wagon road is what appears to have been a wagon muster area and supply unloading area. Several artifacts were found in a portion of this area that point to maintenance and support activity. The first is a broken hand-forged mule shoe (Figure 32). The mules would not be with a cavalry company. The second is a small leather strap buckle that washed down a gully from this area (Figure 33). These items indicate this was probably the blacksmith/farrier/saddler area with the infantry company. The buckle could be used for various items, but it is most likely a harness buckle. This area is also littered with box bands and box nails from supplies being unloaded and boxes opened (Figure 34). And, of course the area is also littered with the typical broken bottle glass (Figure 35) and ration supply tins. Two buttons were also found (Figure 36). One is a metal underclothes button and the other is a small work shirt button called a China button. China buttons were sturdy and made for frequently worn clothing like men's work shirts. These were manufactured from 1840 to the 1930s. They were mainly white, and some had what looked like a stenciled pattern on them. They came in all shapes and sizes and were made to complement patterned textiles made during that time. They were popular and not overly expensive. These are all sew through buttons, and many had stencil-like patterns or colored decals on them. They have a smooth porcelain feel to them (Brock 2022).

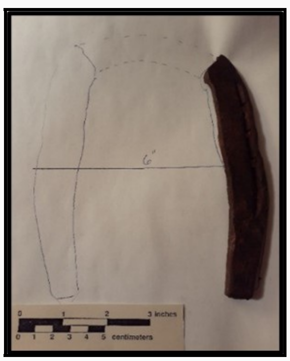


Figure 32. Broken hand-forged mule shoe.

Figure 33. Leather strap buckle.

Figure 34. Supply box strapping with square nail.

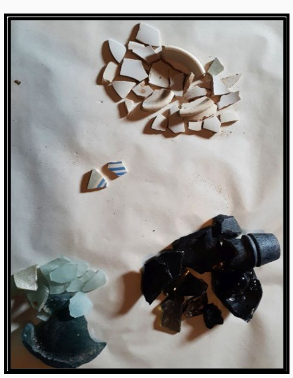


Figure 35. Bottle glass and whiteware.

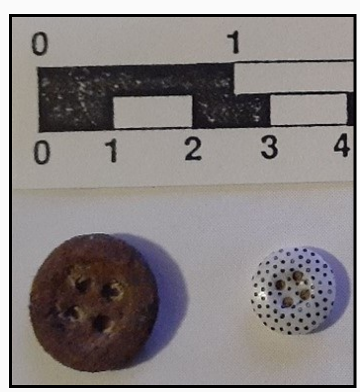


Figure 36. Metal and china buttons.

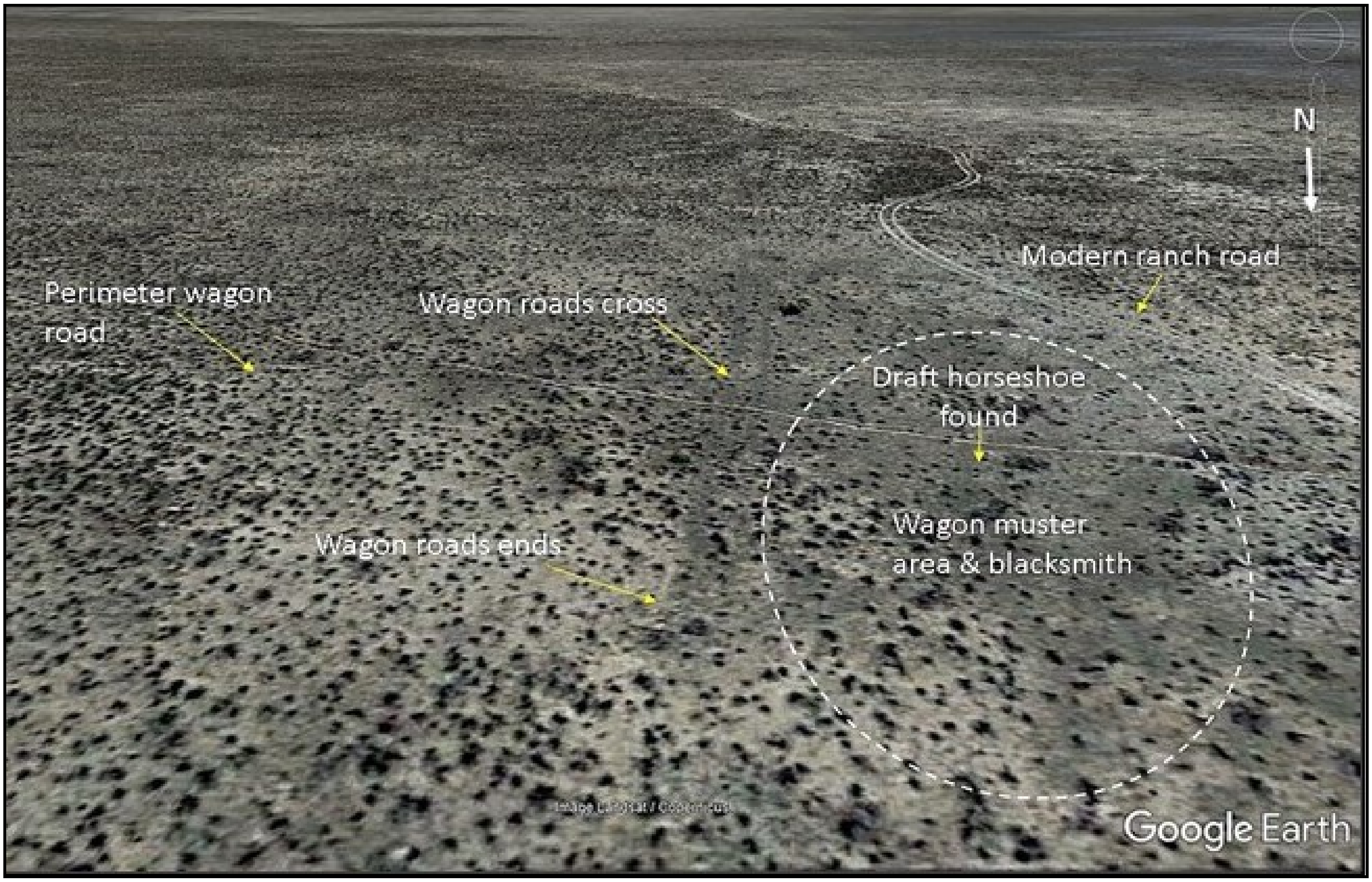


Figure 37. Wagon road from the south to the wagon muster area.

A second wagon road can be seen coming from due south to this muster and supply area and then stopping (Figure 37). This road was probably the supply road to Camp Stockton, and the location where it stops indicates it is probably the wagon muster and supply location. Three worn ground features observable in satellite imagery look like parking locations, indicating this company had at least three wagons to support it.

There are two large square ditched tent areas and several smaller tent squares that are scattered around the areas of the promontories. The two large squares measure 80 feet x 80 feet and 40 feet x 40 feet. The smaller squares range from 10 feet x 10 feet, 15 feet x 15 feet and 30 feet x 30 feet. The smaller ones are close to the forward guard posts. The dimensions of the smaller pads are probably based on the number of men needed for one or two redoubt guard positions. The guard posts would have had to be manned 24 hours per day. Tents being approximately five-foot in width probably indicates six men per position for a 24 hour period. Four-hour guard shifts is a military norm to keep attentiveness in a mostly boring duty. With all the gullies and drop-offs, it was probably too dangerous to allow the men assigned to those positions to wander around in the dark. So, it would make sense that they were permanently camped close by their duty stations. The larger tent area was probably for all the other infantry solders. The 40 foot x 40 foot-area would likely have been a separate area for officer's tents and a hospital tent. This area had the most broken whiteware, usually reserved for officers and senior NCOs. The rear area to the south of the infantry would have been for the cavalry companies, physically separated from the infantry.

Figure 38. Hole-in-cap solder-sealed food can.

Other artifacts found in the infantry areas include metal square nails and accompanying metal strap bands for boxes, sardine cans, marked meat biscuit tin cans, a small buckle, miscellaneous tin cans (Figure 38), various types of bottle glass, and personal tin cups (Figure 39). Personal tin cups can be determined by the solder points for the handles. All these cups were missing the handles, indicating the solder connections were very poor for the handles. A standard horseshoe was found down by the spring-fed gully. One extra-large personal tin can had the initials WMD scratched into it. This was most likely a private listed as William Daily (see Appendix A). All these are common military items and appropriate to the time. Similar items were found in other military archeological excavations such as Fort Chadbourne and other forts of this period.

Figure 39. Personal tin cup with solder points.

Three .54 caliber Minie balls were found within feet of either an infantry guard post or the tent site supporting the guard post (Figure 40). Additionally, two .58 Minie balls were found, one near a guard post and one on the outer perimeter wagon road (Figure 41). It may have also been from a guard post while cavalry were occupying their designated area, or it could have fallen from a wagon on the road.

There are two likely firearms used by the U.S. infantry during this period. They are the 1855 Springfield rifle-musket (Figure 42), which fired the .58 Minie, and the Pedersoli 1841 Mississippi rifle-musket (Figure 43), which fired the .54 caliber Minie; this was manufactured at Harpers Ferry from 1846 to 1861. This rifle was later bored out to fire the .58 Minie.

Figure 40. .54 Minie bullets.

Figure 41. .58 Minie bullets.

Figure 42. 1855 Springfield rifle-musket.

Figure 43. 1841 Mississippi rifle-musket,

Figure 44. Percussion caps tin lid.

The entire infantry area is littered with percussion cap tin lids (Figure 44). The Springfield rifle-musket and the Mississippi rifle-muskets both required a percussion cap to fire. One percussion cap tin found has just enough of the green label to determine the manufacturer, J. Goldmark of New York (Figure 45). They were in business from 1859 to 1881 and are best known for their foil-lined percussion caps (Hildebrand 2008). Each tin would hold 100 percussion caps.

Figure 45. Example of a percussion caps tin lid.

Finding nine percussion cap tin lids in the infantry area indicated to us that there must have been a target practice range somewhere nearby. So the search for the target practice range was added to our list of camp areas to find. On our last visit we found it on the other side of the creek. An embankment approximately 15 feet in height was the backstop (Figure 46). The embankment was filled with lead, much of it fragmented from impacting on rock. We extracted two good samples, one being a still fully formed .58 Minie ball and the other a large impacted fragment (Figure 47, center and right). We also found large embedded staples that were probably used to hold targets.

Figure 46. Target embankment.

Thirty-five yards from the target embankment we found a dropped/tossed malformed .54 Minie ball (Figure 47, left). This gave us the distance and angle the soldiers were firing. Thirty-five yards may not sound like very far for percussion muskets, but it is documented that the men did not receive a lot of opportunities to fire their weapons. Proper loading and firing the weapon was probably the primary focus, and 35 yards was close enough to not waste ammunition on stray shots at long distances.

Figure 47. .54 Minie ball dropped at the firing line (left); impacted .58 Minie ball (center); fragmented Minie ball (right).

These two sizes again support the fact both the 1841 Mississippi rifle-musket and 1855 Springfield rifle-musket were both being used by the 1st Infantry Regiment, Company D at the time.

Bottoms of medicine bottles were found in both the infantry and cavalry areas. These bottles were identified as a B. Fosgates Anodyne Cordial bottle, used for stomach ailments. It was popular in the 1850s and during the Civil War (Figures 48, 49, 50).

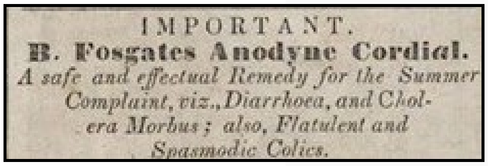

IMPORTANT.
B. Fosgates Anodyne Cordial.
A safe and effectual Remedy for the Summer Complaint, viz., Diarrhoea, and Cholera Morbus; also, Flatulent and Spasmodic Colics.

Figure 48. Medicine bottle label.

Figure 49. Bottom of a medicine bottle.

Figure 50. Example of an Anodyne bottle.

Additionally, we found one impacted .44 caliber conical bullet fired from an 1847 Walker Colt Revolver (Figure 51). Rather than the round ball, the conical bullet, called the ‘Picket Bullet’, was commonly used by cavalry soldiers that had the Walker Colt (Figure 52). One thousand Walker Colts were released to the U.S. Army in Texas and federalized Texas Rangers after the Mexican-American War in 1848 (Truth About Guns 2011). Although the bullet is impacted, the circular end matches the .44 caliber Picket Bullet. The Walker Colt was a saddle gun, weighing too much for a holster revolver, which is why it was a cavalry weapon. The bullet may have ended up in the infantry area from an accidental discharge out of the cavalry area. This was a known issue with this gun if it was not uncapped during non-firing handling.

Figure 51. .44 caliber impacted Picket bullet from a Walker Colt.

Figure 52. Advertisement for the Picket bullet for the Walker Colt.

A meat biscuit can lid was one of the more interesting trash items (Figure 53). The meat biscuit was developed by the Gail Borden Company, the same company that first produced condensed milk in a can. Meat biscuit was first patented in1850. Imprinted on the lid is: **MB E IPL55**.

MB stands for Meat Biscuit; IPL is a government term that breaks out as Initial Provisioning List; and 55 is the date it was canned, 1855. These were hard biscuits that were mixed into a soup (Figure 54). It was described as "preserving the concentrated nutritious properties of flesh meat of any kind, combining it with flour and baking it into biscuits. For making soup of the meat biscuit, a batter is first made of the pulverized biscuit and cold water—this is stirred into boiling water—the boiling is continued some ten or twenty minutes—salt, pepper, and other condiments are added to suit the taste (Borden 1850).

Figure 53. Meat biscuit tin can lid.

Figure 54. Example of meat biscuit.

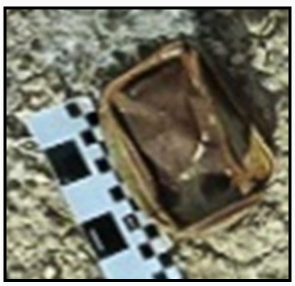


Figure 55. Sardine can.

Another notable trash item was the great number of sardine cans (Figure 55). Just about every campsite had them. In 1859 sardines in a can were a French import item (Jarvis 1943). The number found indicates these were military provision items. At the time the military was having a hard time keeping their soldiers healthy and were searching for any way to add vitamins to their diet. Sardines in a can were long lasting, easily transportable, and became a staple of the military ration supply from this time throughout the Civil War and beyond.

The infantry company maintaining this camp was Company D, 1st Infantry Regiment. We found a cap pin for the regiment near one of the tent pads (Figure 56). A forage cap strap buckle was also found (Figures 57, 58).

Figure 56. 1st Infantry Regiment cap pin.

Figure 57. Hat buckle.

Figure 58. Example of an 1859 forage cap.

Cavalry Area

Artifacts found in the cavalry areas include many of the same metal and glass bottle trash items found in the infantry area. Other than the center-most pad, likely being the company commander, it appears that the location of the rest of the sites were in no particular pattern, but rather spread out and along the internal wagon tracks. The box bands at many of the widespread sites indicate each site was probably the site of one squad. At the time a cavalry squad reportedly consisted of eight soldiers (Volo n.d.). Supply boxes of ration tins were likely set up for squad-size elements.

One unique piece is a broken tobacco pipe found at one of the camp sites (Figures 59, 60). However, this is no ordinary pipe. It is a specific type of German or Bavarian tobacco pipe (Figure 61). This is a reminder that the ranks of the soldiers were filled with many newly immigrated Europeans.

Figure 59. German pipe piece.

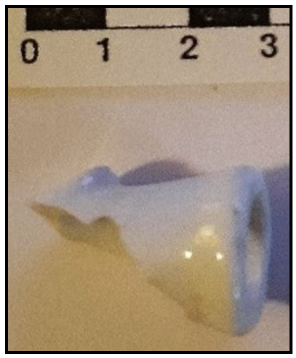


Figure 60. German pipe piece.

Figure 61. Examples of German tobacco pipes.

The most important artifact discovered was a hat pin that belonged to the cavalry Hardee hat being worn at the time (Figures 62, 63). This hat pin was found in between the corral area and the adjoining pasture, further validating this pasture's purpose of grooming and maintenance for the cavalry mounts (Figure 64).

Figure 62. Hardee hat pin.

Figure 63. Example of a Hardee hat pin.

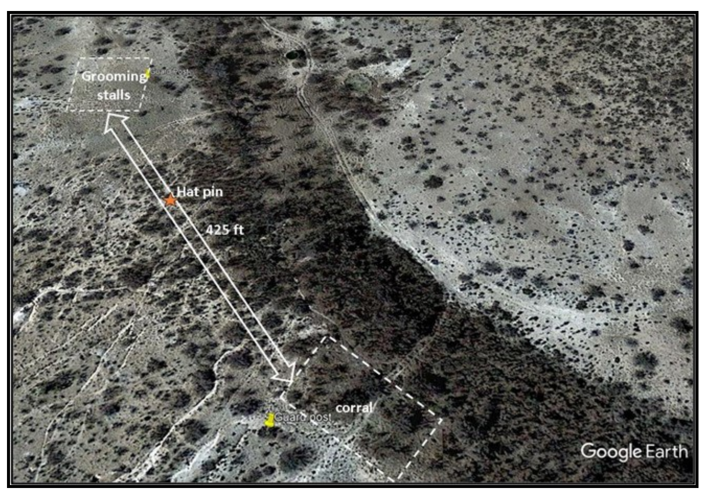


Figure 64. Location of the Hardee hat pin.

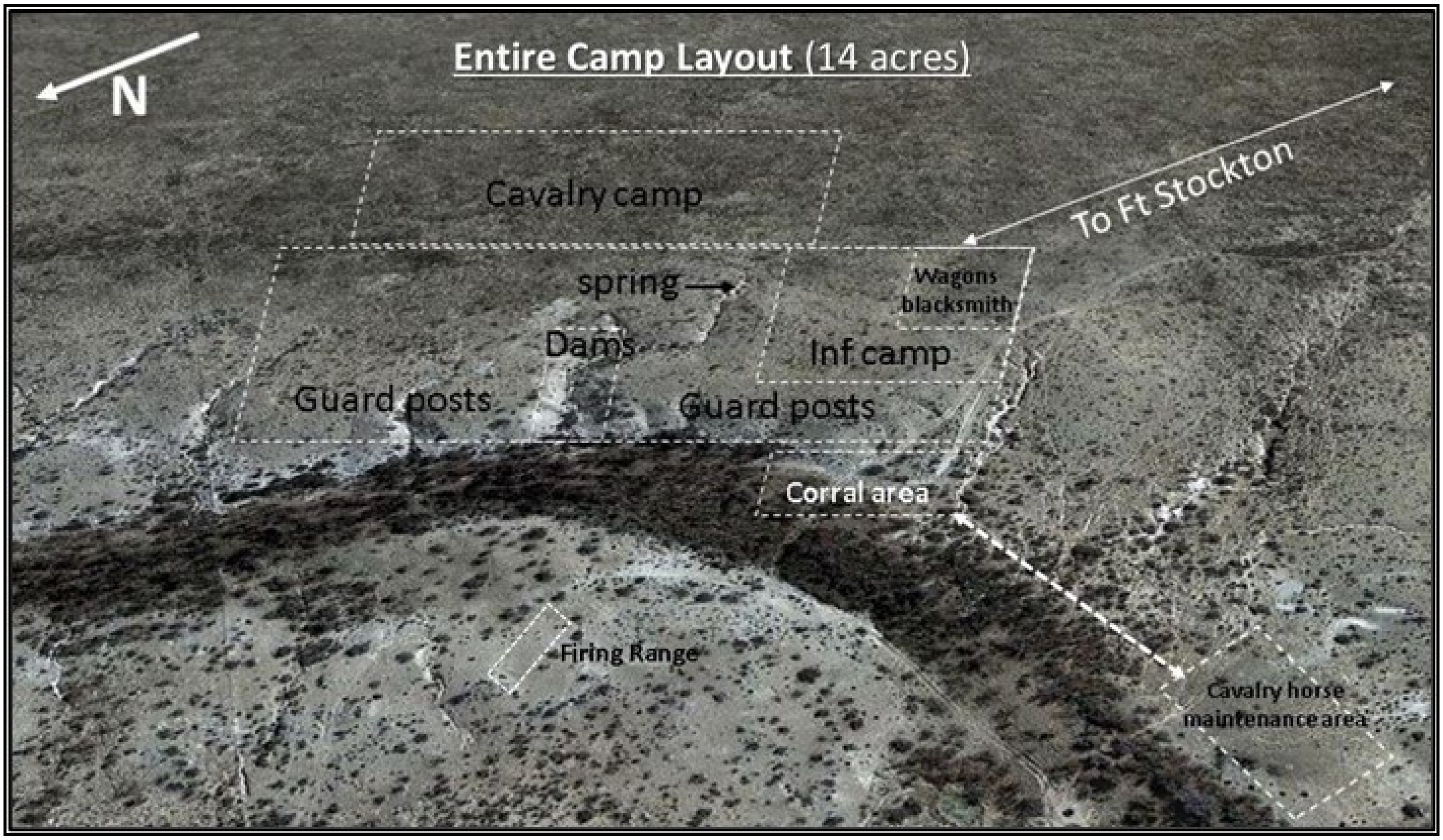


Figure 65. Layout of the entire camp.

Conclusion

This was the first archeological investigation to forensically determine the full layout of an 1850s expeditionary encampment within the western United States (Figure 65). With the mission of finding and interdicting Indian raiders, the Pecos Expedition was unsuccessful. However, this was not due to the soldiers dispatched for this mission. What was unknown at the time was that the Indians traveled down the Comanche Trail in the fall. These men were sent in the spring and stayed into the late summer. This was the very first attempt to interdict Indians prior to their raiding rather than follow their trail after a raid. It was proactive instead of reactive. Lessons needed to be learned. And the unknown area needed to be explored. The units were sent out to an unknown land with sparse natural resources to help maintain a large patrolling force with a sizable encampment and an extremely thin logistics support lifeline. Any Indians would have no problems slipping by such an encumbered force, and the results show this by the fact that not a single engagement was reported throughout the expedition's active time. As an exploratory expedition, however, it could be considered a success. Their ability to survive and defend against an attack to their own forces at the camp with no loss of horses—the prize of the Comanche raiders— shows that they were well trained in tactical survival skills in a harsh environment. Given the landscape, the site chosen by the scouting cavalry company was excellent. The infantry company's camp design and defenses were also well thought out. This camp site gives good insight into the methods of field camp design for this time period in far West Texas (Figure 65). The mobile cavalry was still in its infancy. It shows how the expeditionary force always requires and depends on a good base of operations and a good plan, considering every possible requirement. Without this a mobile force and with little logistical support, it will not only fail, but could devolve into a deadly situation. These lessons were carried on and expanded on right up to today's mobile cavalry forces. Today's Second Cavalry and First Infantry Regiments are still considered premier expeditionary forces throughout the world.

Table 1. Significant site/artifact counts.

	Infantry Area	Cavalry Area	Horse corral/stalls	Total
Guard Posts	6	4	2	12
Tent Pads	23	13	0	36
Percussion cap tins	7	2	0	9
Remains of ration boxes	11	5	0	16

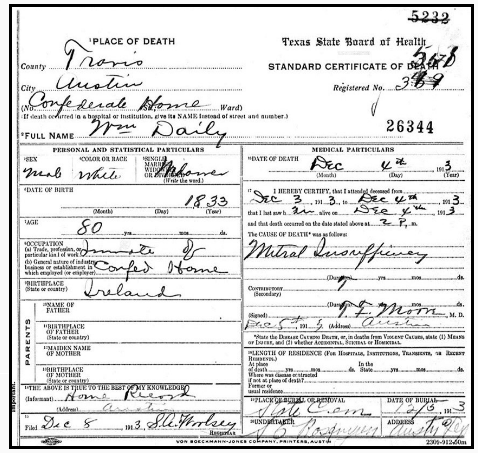
Notes on Imagery Interpretation

Satellite and high altitude aerial imagery interpretation has been a skill set taught in military intelligence since World War II. It only came available to the general public when Google Earth appeared in the 1990s, and it has only been used in archaeological studies for the past 15–20 years and most of that within the last 10 years. What cannot be seen on the ground can often be seen from high altitude when the ground surface has been heavily modified but then abandoned. Essentially, the surface retains the lines of man-made features, whether they be wagon roads, buildings, or even corrals and heavily used animal trails. The vegetation never grows back in the same way and tends to follow the shapes that were forced on it over long periods of time. Learning to understand how to properly interpret these changes takes many years of imagery study. To assist in the interpretation, Google Earth provides multiple years of imagery on the same location, and the images can be manipulated to various altitudes and angles that make some features even more visible. For verification, the interpreted features must be confirmed through a ground reconnaissance, including the identification and mapping of artifacts, to be sure that the features being interpreted are correct.

Appendix A. Private William Daily

Figure 66. Appendix A cup.

Figure 67. Appendix A cup, detail.



~~5232~~

PLACE OF DEATH

County Travis

City Austin

(No. Confederate Home Ward)

(If death occurred in a hospital or institution, give its NAME instead of street and number.)

FULL NAME Wm Daily

Texas State Board of Health

STANDARD CERTIFICATE OF DEATH

Registered No. 369

26344

PERSONAL AND STATISTICAL PARTICULARS

SEX Male | COLOR OR RACE White | SINGLE, MARRIED, WIDOWED OR DIVORCED (Write the word.) Widower

DATE OF BIRTH (Month) (Day) 1833 (Year)

AGE 80 yrs. mos. ds.

OCCUPATION (a) Trade, profession, or particular kind of work Inmate of (b) General nature of industry, business or establishment in which employed (or employer) Confed Home

BIRTHPLACE (State or country) Ireland

PARENTS: NAME OF FATHER; BIRTHPLACE OF FATHER (State or country); MAIDEN NAME OF MOTHER; BIRTHPLACE OF MOTHER (State or country)

THE ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE (Informant) Home Record (Address) Austin

Filed Dec 8, 1913. S. A. Woolsey, Registrar

MEDICAL PARTICULARS

DATE OF DEATH Dec 4th, 1913

I HEREBY CERTIFY, that I attended deceased from Dec 3, 1913, to Dec 4th, 1913, that I last saw him alive on Dec 4th, 1913 and that death occurred on the date stated above at 2 P. m.

The CAUSE OF DEATH* was as follows: Mitral Insufficiency

(Duration) yrs. mos. ds.

Contributory (Secondary) (Duration) yrs. mos. ds.

(Signed) T. F. Moore, M. D.

Dec 5th, 1913 (Address) Austin

*State the Disease Causing Death, or, in deaths from Violent Causes, state (1) Means of Injury, and (2) whether Accidental, Suicidal or Homicidal.

LENGTH OF RESIDENCE (For Hospitals, Institutions, Transients, or Recent Residents.) At place of death yrs. mos. ds. In the State yrs. mos. ds. Where was disease contracted if not at place of death? Former or usual residence

PLACE OF BURIAL OR REMOVAL State Cem | DATE OF BURIAL 12/5, 1913

UNDERTAKER | ADDRESS Austin

VON BOECKMANN-JONES COMPANY, PRINTERS, AUSTIN 2309-912-50m

Figure 68. William Daily death certificate.

Although much of this story will not be in the report, we decided to follow a side thread that provides a human side to this story. We found that some of the discarded tin items were actual personal tin cups that originally had a soldered handle on them. It appears the solder seal for the handle was not very good, and the handles tended to break off. We can assume that when they left, they figured they could get new ones later and so discarded these cups.

One particularly large personal cup had the soldier's initials scratched into it. He really did not want anyone else using his cup. The initials were WMD (Figures 66, 67). We began a research quest to see if we could find out who WMD was. We spent many hours on the Internet looking through military personnel records for the infantry company. On Ancestry.com in the military section we were able to find a roster of men in the company, and sure enough, we found one man named William Daily. We then went looking to see if we could find more on him. We thought it would be William M. Daily, but we could find nothing that matched what should have been a reasonable birth date for an army private in 1859. But looking under just the name William Daily, we stumbled across a grave in the Confederate section of the state cemetery in Austin, Texas. Everything seemed to match, and we started to research him more.

We know from his military record that William Daily enlisted in January, 1858 and was sent from San Antonio's main depot to Camp Hudson, where he joined the 1st Infantry Regiment, Company D, which was the unit that was dispatched to Camp Van Camp. The grave stone stated that William Daily was an Irish immigrant who came to Texas in 1857 and that his birth date was 1833. He served in the Texas Confederacy, and his occupation was listed as "Wagoning."

In other records we found he lived out the end of his life in a Confederate Home in Austin, Texas and died in 1913. His immigrant record show he came to the U.S. in 1851 from Ireland and was listed in the September, 1855 Massachusetts census as 22 years old. That would have made him 24 years old in January, 1858. In the 1910 census he was listed at the Confederate Home as a widower. And the final kicker is that the doctor put on his death certificate "Wm Daily" (Figure 68). “Wm” was an accepted abbreviation at the time for William. As another aside, the name Daily comes from the Irish name O'Dalaigh.

We know that the military units in Texas were disbanded in 1861 at the beginning of the Civil War. Everyone was given the opportunity to either stay with the units that were to head east to join the Union Army or stay in Texas, in which case they would have been conscripted into the Confederacy. Our assumption is that when the unit was disbanded, William Daily chose to stay in Texas and ended up as a wagoner for the First Texas Artillery. He was probably also a wagoner when he was with the First Infantry Regiment at Camp Van Camp in 1859 and inscribed his initials on that personal tin cup. The cup was found in the 80 foot x 80 foot tent pad section that was probably for all other soldiers that were not holding down guard duty.

Henry Clay Wood 2Lt………1st Infantry Regiment Co. D. History of Postings

		1856 Post		1857 Post		1858 Post		1859 Post		
Jan				Fort Chadbourne		Camp Hudson		Fort McIntosh		1*
Feb				Phantom Hill		Camp Hudson		Fort McIntosh		
Mar				Camp Cooper		Camp Hudson		Camp Hudson		12*
					9*	Fort Lancaster				
Apr				Camp Cooper		Camp Hudson		Camp Hudson	depart April 16 '59	11*
								Camp Van Camp		
May				Camp Cooper		Camp Hudson		Camp Van Camp	May 1 Rio Pecos	2*
									May 7 Van Camp	2*
Jun	7*	commisioned 2Lt		Camp Cooper		Fort Clark		Camp Van Camp		
Jul				Camp Cooper		Fort Clark		Camp Van Camp		
Aug				Camp Cooper		Fort Clark		Camp Van Camp		
								Camp on Rio Pecos		4*
Sep			10*	Camp Cooper		Fort McIntosh		Camp Hudson		13*
				Sycamore Creek				Near San Antonio		5*
Oct			10*	Camp Hudson		Fort McIntosh		Buffalo Creek		3*
Nov				Camp Hudson		Fort McIntosh		Fort Cobb		12*
Dec	8*	Ft. Chadbourne		Camp Hudson		Fort McIntosh		on leave Nov 24, '59		6*

See notes below for further clarification of postings.

1* Post Return of the 1st Regiment of Infantry for the month of January '59
"Fort McIntosh, Texas. Relieved in command of company Jan 15, '59 by Capt. Huston"

2* Post Return of the First Regiment of Infantry, Army of the United States, (Colonel Joseph Plympton for the month of May 1859
"Company D left camp on the Rio Pecos, May 1, 59. Arrived and took post at Camp Van Camp, Texas, May 7, 59".

3* Post Return of the 1st Regiment of Infantry for the month of October '59
"Camp on Buffalo Creek en route to Fort Cobb" Commanding Comapany

4* Post Return of the 1st Regiment of Infantry for the month of August '59
"Camp on the Rio Pecos, Texas" Commanding Company.

5* Post Return of the 1st Regiment of Infantry for the month of September '59
"Camp near San Antonio, Texas" commanding Company

6* Post Return of the 1st Regiment of Infantry for the month of March 1860
"On leave of absence for 2 months since Dec 1, 59 from D.S.O. A 89 of Oct 4 59. Extended 6 months from S.O.No 9
W.D. A. G.O. of Jan 16 '60. Absent from Reg. since Nov 24, 59".

7*	Post Return of the 1st Regiment of Infantry for the month of September '56
	Joined by appointment and assigned to Co per G.O No 10 (A.G.O) Sept 1 56. Authorized to delay proceeding to join unit until
	1 Nov 56 S.O No 61 Hq. D.A. Aug 4 '56.
8*	Post Return of the 1st Regiment of Infantry for the month of December '56
	Joined company Dec. 12. '56 Fort Chadbourne ….sick
9*	Post Return of the 1st Regiment of Infantry at Fort Lancaster for the month of March 58
	Member of a General Court Martial
10*	1st Infantry Regiment post return for the month of September, 1857
	Marched from Camp Cooper, Texas Sept 2nd, 1857 and arrived at Camp Hudson, Texas Oct 3rd, 1857
	At camp on Sycamore Creek, Texas
11*	Post return for Camp Hudson for the month of April '59
	2nd Cav Capt. Albert Brackett along with 1st Infantry Co. D. 2Lt. Wood to Camp Van Camp, Texas
12*	Annual return for 1st Inf Reg. for the year of 1859.
	Co. D left Fort McIntosh, Texas March 3rd '59 arrived at Camp Hudson March 17, '59 left Camp Hudson April 12, '59
	arrived at Camp Van Camp, Texas May 7 '59 left Camp Van Camp Aug 27 '59 en route to Camp Hudson. Left Camp Hudson
	Sept 16 '59 . Arrived took post at Fort Cobb.W.C. Nov 3. '59.
13*	Post Return for Camp Hudson Sept. '59
	The Pecos Expedition under the command of Capt. George Stoneman 2nd Cav, consisting of Company "E" and "I" 2nd Cav
	and Company D 1st Infantry arrived at Camp Hudson September 7th. Copany "I" left for Camp Verde on the 11th. Company D
	left for the Wichita on the 16th of Sept and Company E on scout on the 28th Inst:

Henry Clay Wood		
birth		deceased
5/26/1832		August 30, 1918

Appendix C. 1st Infantry, Company D

1st Infantry Company D ………time perion Jan '57 to Jan '60							
name	rank	status			when	where	Supporting document id
Huston, Daniel Jr.	Capt.					on recruiting leave	31637_218242-00053 March '57 ****
Holabind, Samuel B.	1Lt					Fort Mckavett	
Wood, Henry Clay	2Lt	commanding Co D			Jan 15th '57	Fort Chadbourne	31637_218242-00049 Jan '57
	2Lt	commanding Co D			March '57	Camp Cooper	31637_218242-00053 March '57 ****
	2Lt	commanding Co D			Oct '57	Camp Hudson	31637_218242-00068 Oct '57 **
	2Lt	commanding Co D			June '58	Fort Clark	31637_218242-00090 June'58 *
	2Lt	commanding Co D			Sept '58	Fort McIntosh	31637_218242-00096 Sept '58 **
	2Lt	commanding Co D			May '59	Camp Van Camp	32169_126179-00059 April '59
	2Lt	commanding Co D			Nov '59	Fort Cobb	31637_218242-00124 Oct'59 ***d
Banett, Marten	pvt	discharge			Aug 10th '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Baynham, Joseph	pvt	joined		deserted	Oct 4th '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Beck, William G	pvt			deserted	23 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Bernhardy	pvt	discharge			25 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****
Binder, George	musician	discharge			9 May 1858	expiration of service	9 May 1858 1 Sep '58 Fort Clark
Bliss, William	pvt	joined		deserted	Oct 1 '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Bolton, Cornelius	pvt	joined			Jan 29 '58	Camp Hudson	31637_218242-00078 Jan '58 ##****
Boyle, Owen	Corpl	discharge			Sept 14th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Brady, Thomas	pvt	joined			Jan 29 '58	Camp Hudson	31637_218242-00078 Jan '58 ##****
Brandes, August	pvt			deserted	unknown	Camp Cooper	31637_218242-00055 April '57 ****
Brockeister, Peter	pvt			deserted	I July '58	Fort Clark	31637_218242-00092 July '58
Brown, A	pvt	disability			Oct 30th, '56	Fort Chadbourne	31637_218242-00041 Oct '56
Brown, Robert	pvt	died			Oct 28th '58	Fort McIntosh	31637_218242-00098 Oct'58 **
Burkhardt, Faederick	pvt	discharge			Sept 7th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Callaghan, Edward	pvt			deserted	Sept 24th, '56	Fort Chadbourne	31637_218242-00039 Sept '56
Casey, Peter	pvt			deserted	July 9th 1858	Kentucky	31637_218242-00100 Nov '58 *
Chronelly, Lawrence	pvt	re-enlist			9 Apr '57	Camp Cooper, Tx	31637_218242-00055 April '57 ****
Collahn, James	hosp steward	transferred			9 Dec '56	Fort Chadbourne	31637_218242-00049 Jan '57
Conroy, James	pvt	discharge			Sept 13th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Cowan, David	pvt	died			Feb 14 '59	Fort McIntosh	31637_218242-00108 Feb '59
Daily, William	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Dalrymple, Thomas	Sgt	killed **			4 July '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Daly, Michael F	pvt	discharge			Aug 11th '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Dare, Henry	pvt	discharge			Sept 19th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Dempsey, Patrick	pvt	disability			Sept 24th, '56	Fort Chadbourne	31637_218242-00039 Sept '56
Donald, Martin	pvt	discharge			Sept 19th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Dougherty, John	pvt			deserted	oct 30th '57	Fort Mason, Tx	31637_218242-00068 Oct '57 **
Doyce, John	pvt	discharge			Aug 28th '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Duffy, Patrick	pvt	discharge			Aug 23rd '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Farrell, John		enlisted	Jan 15, 59 at Fort McIntosh, TX	deserted	Oct 4th '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Fife, John	pvt			deserted	20 Sep '57	Cold Springs, Tx	31637_218242-00066 Sept '57 **
Finnigan, Dennis	pvt	re-enlist			17 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****
Ford, John	Sgt	re-enlist			20 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****
Forest, Michael B		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Fryer, John	pvt			deserted	Sept 29th '59	Castroville	31637_218242-00122 Sept'59 *****
Gayer, John		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Glass, Henry	pvt	joined			Jany 29 '58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Gordon, Samuel	Corpl	re-enlist	21 Feb 57 Camp Cooper	deserted**	9 Sep '57	Camp Verde	31637_218242-00066 Sept '57 **
Grenfield, J E Creveriston	Sgt	discharge			Aug 23rd '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Hache, John C	pvt			deserted	10 May 1858	Camp Hudson	31637_218242-00088 May '58 *
Hansen, Frederick	pvt	re-enlistment			12 Jul '59	San Antonioi	31637_218242-00118 copy
Henry, William	pvt	joined			Jan 29,'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Hester, James	pvt			deserted	2 mar 1858	Newport, Ky	31637_218242-00088 May '58
Hester, James	pvt			deserted	23 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Huber, Anton	pvt			deserted	13 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****
Johnson, Jesse	pvt	transfer			23 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****

Kantriner, Charles		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Kavanaugh, Richard	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Keerne, Daniel	pvt	died			27 Jan'57	Camp Cooper	31637_218242-00051 Feb '57*****
Keller, Joseph	pvt			deserted	25 Sep '57	Brandenburg, Texas	31637_218242-00066 Sept '57 **
Keller, Patrick	pvt	discharge			19 Apr '57	Camp Cooper	31637_218242-00055 April '57 ****
Kelly, Hugh	pvt	discharge			Sept 18th '59	Camp Hudson	31637_218242-00122 Sept'59 *****
Keough, John	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Kinney, Edward	pvt			deserted	unknown	Camp Cooper	31637_218242-00055 April '57 ****
Kinney, John	pvt	discharge			16 Apr '57	Camp Cooper	31637_218242-00055 April '57 ****
Knight, Francis W	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Kraft, Conrad		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Lacy, James	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Lowenstein, Herman	pvt	discharge			July 12, 1859	Camp Van Camp	31637_218242-00118 copy
Lynch, John	Ist Sgt	re-enlist			24 Feb '57	Camp Cooper	31637_218242-00051 Feb '57*****
Lynch, Thomas	pvt	discharge			1 Mar '57	Camp Cooper	31637_218242-00053 March '57 ****
Mack, John	pvt	discharge			3 Oct 1858	Fort McIntosh	31637_218242-00098 Oct'58 **
Malloy, Edward	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Martin, George	pvt	discharge			30 Mar '57	Camp Cooper	31637_218242-00053 March '57 ****
McCarthy, Michael	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
McClay, Joseph	pvt			deserted	24 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
McKenna, John	pvt	discharge			Aug 28th '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
McKnoker, Phillip	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
McLaughlin, John	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
McNally, Henry	pvt	joined		deserted	Oct 4th '59	near San Antonio	31637_218242-00124 Oct'59 ***d
McNeil, Jacob	pvt	joined		deserted	Oct 4th '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Morgan, John	pvt	discharge			3 Apr '57	Camp Cooper, Tx	31637_218242-00057 May '57 ***
Morgan, John	pvt			deserted	26 Jan '57	Camp Cooper, Tx	31637_218242-00053 March '57 ****
Mulhall, Stephen		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Mullins, Michael	pvt	discharge			Aug 9th '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Noonan, Stephen	pvt			deserted	28 Sep '57	Turkey Creek, Tx	31637_218242-00066 Sept '57 **
Nugent, John (James)	pvt	discharge			Aug 10th '59	Camp van Camp	31637_218242-00120 Aug'59 ****
O'Connell, John	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Oncile, Thomas	pvt	discharge			15 Mar '57	Camp Cooper	31637_218242-00053 March '57 ****
Partridge, Michael	pvt			Deserted	1 Mar '58	on furlough	31637_218242-00083 March '58
Pinkerton, James		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Quigley, Patrick	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Reilly, Michael	pvt			deserted *	23 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Reinhardt, John	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Rigney, Michael	pvt			deserted	23 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Roggers, Nicholas	pvt			deserted	23 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Rowley, William		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Ryan, Edward	pvt			deserted	2 Aug '57	Camp Cooper, Tx	31637_218242-00064 Aug. '57 ***
Scanlon, John	Cpl	discharge			Aug 21 '59	Camp Van Camp	31637_218242-00120 Aug'59 ****
Scott, Charles	pvt			deserted	24 July '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Skahan, Michael	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Smith, Frederick	pvt	joined			Jany 29'58	Camp Hudson	31637_218242-00077 Jan '58 ***####
Smith, James	pvt	discharge			Oct 1 '59	Camp Hudson	31637_218242-00124 Oct'59 ***d
Stafford, Charles	pvt	re-emlisted			23 Nov '56	Fort Chadbourne	31637_218242-00043 Nov ';56
Stafford, Joseph		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Stratton, Sanford E.	pvt	disability			Feb 26th '59	Fort McIntosh	31637_218242-00108 Feb '59
Sullivan, Patrick	pvt	joined		deserted	Oct 1st '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Vanhorn, George D.		enlisted			Jan 15th '59	Fort McIntosh	31637_218242-00106 Jan'59 ***
Verdan, Robert G.	pvt	joined		deserted	Oct 1st '59	near San Antonio	31637_218242-00124 Oct'59 ***d
Weaver, John	pvt	discharge			June 12, '59	Camp Van Camp	31637_218242-00116 copy
Weiser, Richard	pvt			deserted	29 Jul '57	Camp Cooper, Tx	31637_218242-00062 July '57 ****
Witz, Francis J	musician	discharge			9 May 1858		31637_218242-00088 May '58 *
	1st Sgt	1					
	Sgt	3					
	Corpl	3					
	died	3					
	kiilled	1					
	desertion	31					
	time	3 years					

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CORONADO'S WEATHER REPORT

Britt Bousman

Abstract

Coronado's entrada into the Southern High Plains in the early summer of 1541 is laced with high drama. One story involves the guide, the Turk, who joined the expedition at Pecos Pueblo to lead the Spanish to the fabled Quivera, a city of supposed great wealth and riches. It became clear after weeks of aimless wandering on the Plains that the Turk had hatched a scheme with the Pecos Indians to take the Spanish out on the Staked Plains and let them die of thirst. This grand plan did not work, and eventually the Spanish realized they had been tricked. They killed the Turk and made their way to the Wichita villages on the Great Bend of the Arkansas River in Central Kansas. Until now no one knew why this grand scheme did not work. Newly available tree-ring estimates of annual drought years demonstrates that there had been a series of wet years in the Southern Plains running up to and including 1541. In the early summer of that year there must have been many playas and draws with water, but Coronado's chroniclers did not realize how unusual such a string of wet years actually was.

FOLLOWING THE COMANCHE AND BUTTERFIELD TRAIL FROM SPACE

Tom Ashmore

Abstract

The Great Comanche Trail was the accumulation of 90 years of running well over a million horses from Mexico up to the Texas Panhandle and Oklahoma territory. It also became the main wagon and stagecoach road to Fort Stockton. Although we know the general route of the trail, there is currently only one place where the land scar is still visible, and that is between Horsehead Crossing on the Pecos River and Comanche Spring, Fort Stockton, Texas. This section has been only lightly affected by modern ranching, farming, oil drilling,and urbanization. The trail is so prominent that to this day if you know how to look for it you can see it in satellite imagery. This study not only examines the imagery, but includes original documents and maps as well as on-ground reconnaissance of the wagon road and the Butterfield Swing Station just off the wagon road on the way to Fort Stockton.

History

In order to understand how the Comanche Trail came to be, a brief history is required. The Comanche first moved into the plains of northern Texas around 1720 after acquiring herds of horses from the Utes, as well as their own raiding of the Spanish territory of New Mexico. Their herds grew and the raids continued, making horses their main commodity in trading with other Indian nations and the French to the east. Soon the raids reached into what is now central and southern Texas, then also controlled by the Spanish.

The Comanche nation grew with more and more raids until they were rich with horses. This and their buffalo hunting prowess from horseback were their main commodities for trading for supplies and guns to the north, west, and east of their controlled territory in northern Texas and western Oklahoma. However, in 1781 a wave of smallpox decimated the Comanche nation, losing half their population in one year. With this they decided to make peace with the Spanish. Treaties were signed in 1785 and 1786, the different dates being the eastern and western band's agreements.

With these treaties the Comanche agreed to stop their raiding and ally with the Spanish in their war against the Apache. The Spanish agreed to trade goods with the Comanche and also provide them with horses as a form of tribute. Trade instead of raids continued until the defeat of the Spanish by Mexico in 1821. At that point the Mexican government, being poor from the effects of the war, decided not to honor the former Spanish treaty (Smith 1985–1986:21). The Comanche did not understand this and considered it a betrayal, since much of their former trading was with both the Mexicans and Spanish that occupied the same territory. Thus, the raids resumed in full force, and this time they went all the way into Mexico, using the trail that had previously been used for trading and making it now the Comanche War Trail (Figure 1). This trail continued to be used for the next 50 years, making the entire period of use around 90 years. Some of the other important dates during this period are as follows:

Figure 1. Comanche Trail. (Source: *Texas Beyond History*)

1840 - Ambush of Comanche chiefs in San Antonio during treaty negotiations set off a bloody war with Texas
- Comanche raids became larger, more deadly, and penetrated deeply into Texas and Mexico

1846 - Forty-four raids of 200–400 warriors each sent into Mexico
- 2,649 dead and 852 captives (580 were redeemed)
- By one estimate, one million horses stolen over eight-year period (Burnett 2022)

1848 - End of the Mexican-American War
- Treaty pledged U.S. to patrol border to protect Mexico from raids
- Promised to return captives, goods to Mexico when obtained through interdiction efforts
- Raids continued deeper into Mexico, all the way to horse-rich Durango

1849 - Cholera epidemic devastates Comanche Nation

1850 - Severe drought impacts buffalo herds

Late 1850s–1861 - Military campaigns/forts create line of defense across Texas
- Raids continue but reduced

1861–1865 - Civil War reduces Texas defensive line
- Comanche raids increase

1866–1870 - Military returns to Texas, reoccupies defensive line and begins a campaign of offense

1870 - Last raid into Mexico by Comanche

1875 - Red River Wars brings end and surrender by Comanche/Kiowa

Satellite Imagery Interpretation of Historic Trails

Satellite imagery is a fairly new tool in the archeology tool set. This is now well known in the professional archeological community, but it is also available to avocational archeologists and trail followers. The reason an historic trail can be traced through satellite imagery is that satellite images can show slight differences in the vegetation caused by the years of constant use of the trail and then allowing the vegetation to grow back after the abandoning of the trail. The vegetation will generally grow back slightly different than the surrounding area due to the trail having become a depression which later attracts more soil and water runoff from rains. Bushes and grass tend to grow slightly healthier in the depressions. In most areas it can be so slight that casual observation on the ground or even from an aircraft cannot detect it. However, using satellite imagery, especially with multiple images of the same location using Google Earth's 'Historical Imagery' tool, a trained eye can find the trace of these vegetation changes in long wagon trail lines, and in this case the animal trails, across the terrain.

Using satellite imagery from an extreme oblique angle, which is what Google Earth allows, can reveal the slight difference in a much more striking contrast, and you can see the trail as it snakes across the countryside. However, another extremely important feature in Google Earth that is needed to follow the more difficult stretches of trail is the historical imagery capability. When looking at a location with the historical imagery capability you can move through the many years of images, looking at the exact same piece of earth from the exact same angle and find the one that will show the trace best for that piece of earth. Often the images are in different seasons, helping or hurting the visibility. I try to angle it out and go pretty far out so I get a long distance look. That is usually where I can see the faint trails best. The old trails tend to not follow existing boundaries or roads. When you see a faint trail crossing multiple properties, but in no logical relationship to modern boundaries, it is a good bet is it an old trail. They always followed the easiest terrain possible - no steep cuts or hills. If they had to go down a cut they would always find the easiest way possible. You have to look at the trails from all different angles to pick them out piece by piece. Sometimes I go backward as if I'm looking out the back of an airplane and sometime I go forward as if I'm looking out the front. I've even followed the trail sideways. It's a lot of trial and error. The final trick is to be able to move the image forward and backward or side-to-side. For some reason, this allows your eyes to pick up the hard-to-find trace line where they could not in a still picture. I've found that the best elevation is around 3,000 feet. I connect the pieces together using the Google Earth line drawing measuring tool to put a line down on top of it, and then I begin with the next piece from the end of the line. Most of the time the trail is darker rather than lighter. Sometimes it looks like a bunch of bushes in a row and sometimes it is just some dark splotching that ends up looking like a faint line.

The key to following historic trails through Google Earth is that you must know a starting and ending point. And, of course, the final validation of the trail needs to be on the ground at critical points along the way. In the case of a stagecoach road the obvious place is the station. In the case of this section of the Comanche Trail, it is very specific. We know it ran from Horsehead Crossing on the Pecos River to Comanche Spring, now Fort Stockton, Texas. And we know the stagecoach road appeared to follow it on its way to Camp Stockton, later to become Fort Stockton.

Comanche Trail Crossing of the Pecos

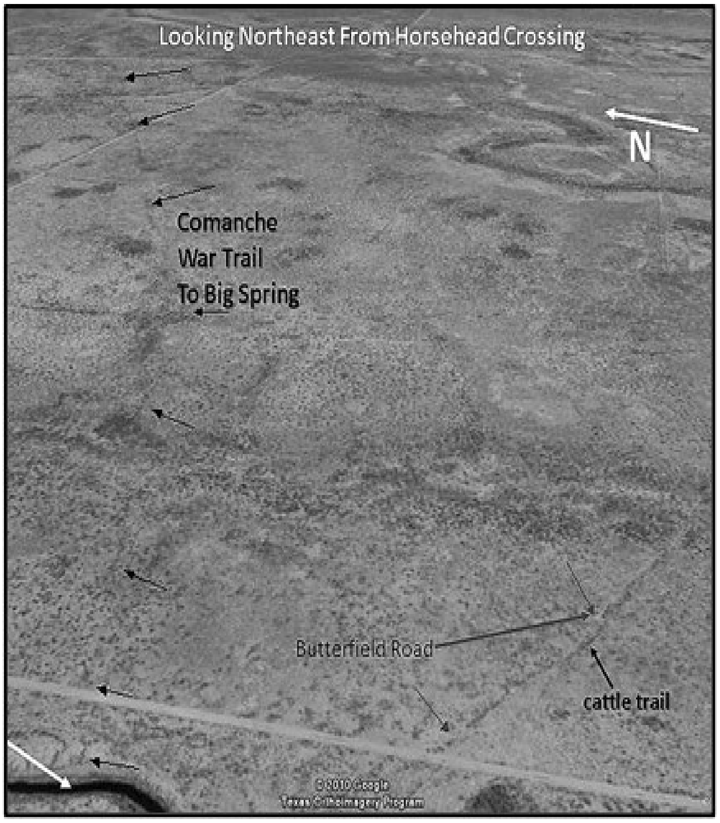

Figure 2. Horsehead Crossing looking northeast. (Source: Google Earth)

Horsehead Crossing was actually four different crossing points: the generally known wagon crossing point, a separate cattle crossing, the Comanche crossing, and the stagecoach skiff crossing point (Figure 2). These four crossing points were stretched over 350 yards and two bends of the river. The Comanche Trail crossing was a logical crossing point for heading north to Big Spring, whereas the stagecoach and cattle drive trails came from the east to follow the Middle Concho River. The stagecoach crossing was a straight stretch just around the bend from the Comanche Trail crossing. This is the farthest point from the main wagon crossing and in a totally different bend of the river. The Comanche Trail heading north is fainter than in the section to the southwest, but a faint trail can still be seen from above.

A first-hand historical account validates this Comanche Trail water crossing point in an unexpected way. The year was 1859 and the Butterfield Overland Mail route had been changed from continuing up the Pecos River and crossing the Guadalupe Mountains to a new southern route down to Camp Stockton and on to Fort Davis and El Paso. A westbound passenger noted after leaving from the west side of the river on the way to Camp Stockton that the coach crossed "eight beaten paths, side by side [which] indicated the frequency of their bloody raids into northern Mexico for cattle, horses, and children" (Dearen 1996:44).

It turns out that through Google Earth analysis of both trails the crossing point mentioned by the passenger can be found. Although the stagecoach/wagon road becomes one with the Comanche Trail just a little further to the west, the two trails diverged to their separate crossing points, making an X just before each reaches the water line (Figure 3).

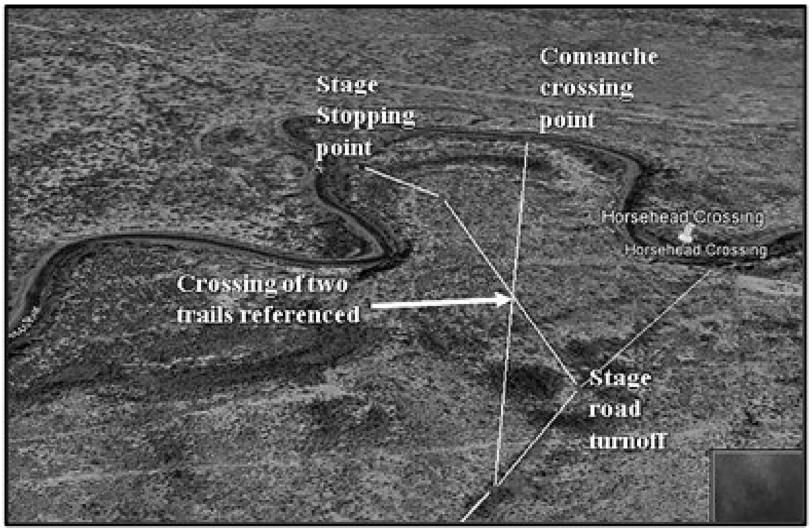

Figure 3. Butterfield Stagecoach and Comanche Trail Cross. (Source: Google Earth)

As you can see in Figure 4, the wagon road and the Comanche Trail merge into one soon after leaving Horsehead Crossing. In fact, the wagon road runs right down the middle of the Indian trail all the way to Fort Stockton. At the time I'm sure there was no brush growing up as it is today and it was the easiest ready-made road for the stagecoach and wagons. The road makes a straight line to a low plateau seven miles from the river. Although the wagon road is only about eight feet wide, the brush scar averages 35 feet wide all the way to the plateau.

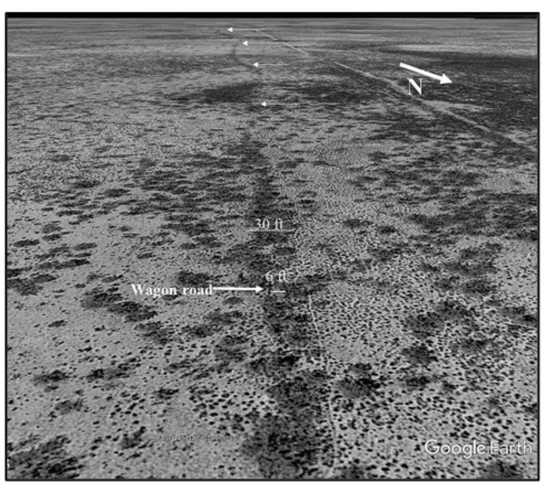

Figure 4. Trail leading away from Horsehead Crossing to the southwest. (Source: Google Earth)

Comanche Trail/Wagon Road To Fort Stockton

Earlier, in 1849 when the area was first being explored for a route from San Antonio to El Paso by the Lieutenant William Whiting and Smith Expedition, they came across the Comanche Trail while following the Pecos River on the west side. Their journal states they came across "a large Comanche war path which filled us with much astonishment. Close together, 25 deep worn and much used trails made a great road which told us this was a highway by which each year the Comanche of the north desolate Durango and Chihuahua" (Williams 1969:9).

By following their general path before coming across the trail, which was provided in some detail, it appears the party was already up on the plateau where the Comanche Trail is the widest when they came across it. This would explain their description of 25 deep worn trails[1]. At that point the trail is 80 feet wide. It also states they traveled on the trail for five miles to camp at Antelope Spring, which was the spring close to the later stagecoach station, addressed further on in this report. That again verifies the location of their intersecting the Comanche Trail up on the plateau and at its widest point. From Antelope Spring they followed the trail to what they described as southwest to a high table ridge which is now known as the southern point of 7-Mile Mesa, just before you enter Fort Stockton.

As the trail comes to the plateau seven miles from Horsehead Crossing it climbs a draw leading up to the flat. It makes two elevation changes of 60 feet each (Figure 5). This is the second piece of information that validates this as being trail and wagon road. In 1867 Brevet Lieutenant Colonel E. J. Strang conducted a large unit march from Fort Stockton to Fort Chadbourne, making a detailed topographical map along the way (Strang 1867) . He used the main wagon road, and as he came off the plateau heading to Horsehead Crossing his topographer annotated two elevation changes on his map that match the ones seen on Google Earth (Figure 6).

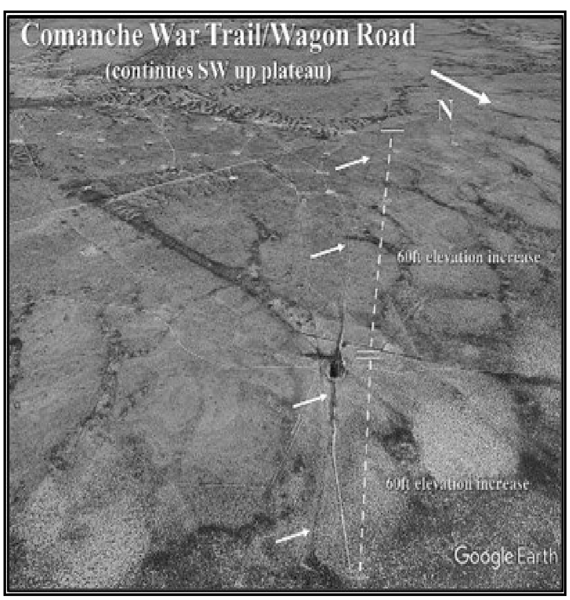

Figure 5. 60-foot elevation changes leading up to plateau. (Source: Google Earth)

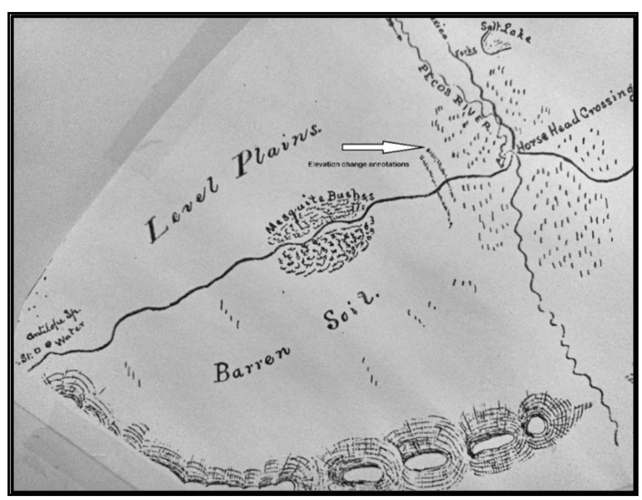

Figure 6. LTC Strang map with elevation change annotations. (Source: author's copy)

After the trail moves on the plateau proper it really becomes apparent from above. The trail becomes wider and the after-growth brush is thicker. The width ranges from 80 to 130 feet in this area and the scar is very distinct. In a close-up view you can also see the wagon road continuing down the middle of it (Figure 7).

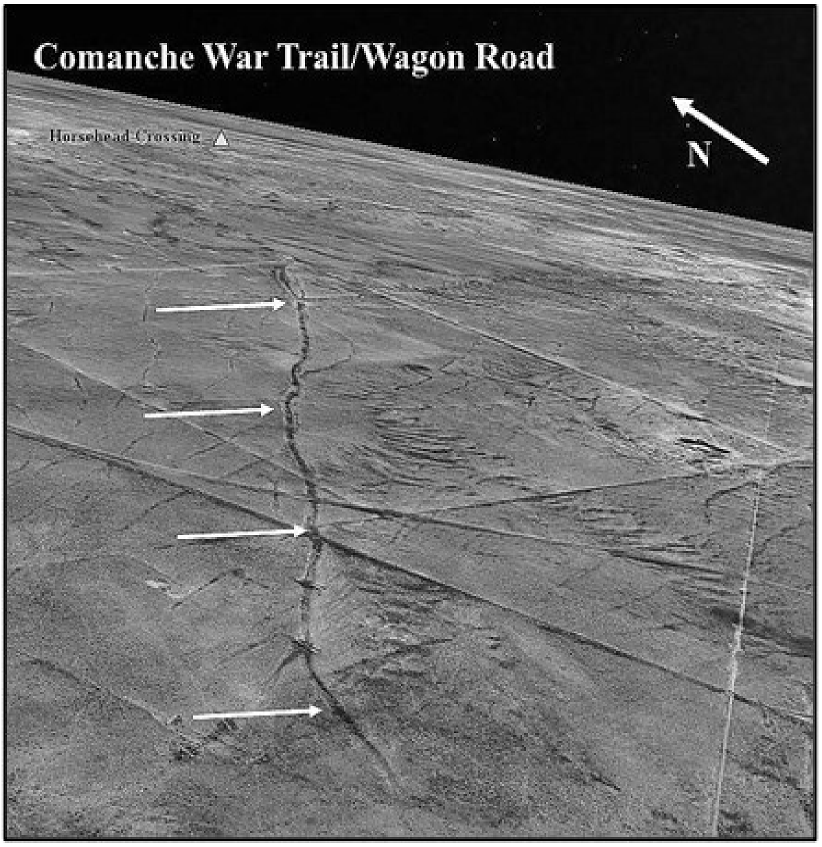

Figure 7. Comanche Trail looking northeast back to Horsehead Crossing. (Source: Google Earth)

As stated previously, one of the most important factors of validating a potential trail/wagon road is if a stagecoach station can be verified along the route. And in this case there was a stagecoach station located just off the main road running down the middle of the Comanche Trail. The station was addressed in Glen Ely's book on the Butterfield Overland Mail (Ely 2016:274–276, 288–289). By some accounts the station was either called Camp Pleasant or Antelope Spring Station. There is little documentation on this station since it was built so late in the period of the Butterfield Overland Mail operation due to the change of route in mid-1859 and the abandonment of the entire operation at the beginning of the Civil War in 1861. The station was needed because there was nothing on the west side of the Pecos at their turn-around point. Thus, the mule team was required to make a round trip. This was done in the middle of the night and very likely at a walking pace. The station was 23 miles from Horsehead Crossing, making this a 46 mile round trip with a long rest in the middle. This is doable for a mule team, but adding another 22 miles to make it to Camp Stockton Station was beyond the expectation of a mule team, easy pace or not.

We were lucky to visit the station site with the landowner, and we verified that it was very much the proper construct and layout of a typical Butterfield Stage Station. It was constructed much like the station at Fort Chadbourne, which we personally helped excavate in 2008 (Riemenschneider 2008). In fact, it was the exact same length, 81.3 feet, but 5 feet narrower, at 18.6 feet. This is obviously much larger than a stone-built homestead building. Although only the base of the walls remain, a large pile of wall stones were piled some 300 feet away and then abandoned at some time in the past (Figure 10).

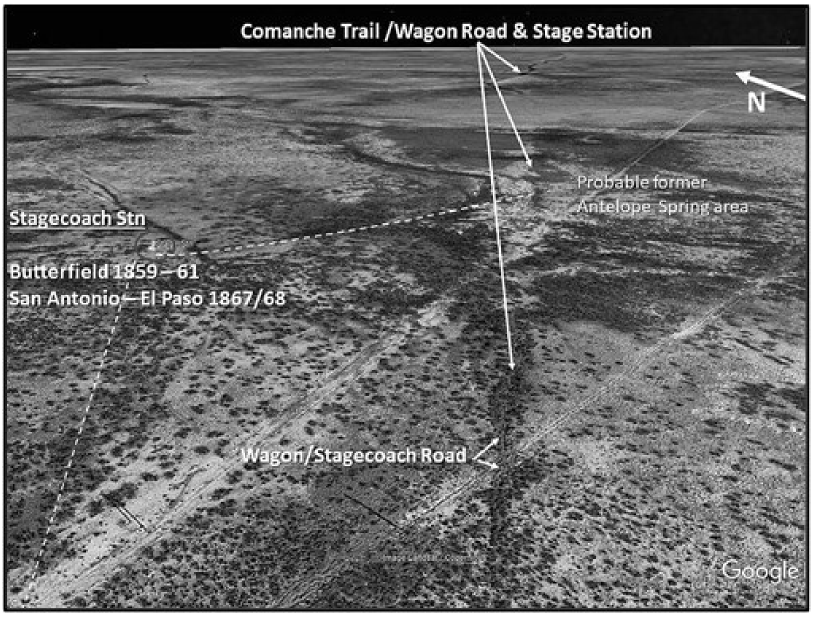

Figure 8. Comanche Trail/Wagon Road and Stagecoach Station Location. (Source: Google Earth)

The stagecoach station was accessed from the main road by a service road that angled off the main wagon road from both directions (Figure 8). The area was littered with dishware, much of it probably from a later period than the Butterfield Overland Mail due to the fancy designs and colored dishware (Figure 9). This analysis comes from the excavation of two previous Butterfield Stagecoach Stations in West Texas (Ashmore 2019:34, 72). However, this can be explained by the fact it is highly likely this station was reused after the Civil War by the San Antonio To El Paso Stage Line, also referred to as the Ben Ficklin Stage Line (Mullins and Mullins 2020). It is documented that this stage line used the same route to Fort Stockton for a short time beginning in March, 1868. The route was still being set up in July, 1867, which means this station was probably in the restoration stage at that time.

However, the Indian problems became so acute at Horsehead Crossing (and probably at this location) in the 1867-68 period that the commander at Fort Stockton ordered a new river crossing be found 35 miles further downstream. The alternate location became known as Camp Melvin/Pontoon Crossing (Smith 1995). The new stagecoach crossing point was just upriver at a site nicknamed Ficklin's Ferry in the fall of 1868 (Dearen 1996:71–73).

Figures 9 and 10. Camp Pleasant/Antelope Spring Stagecoach Station Ruins.
(Sources: author photo and Google Earth)

An example of the ambushes taking place regularly at Horsehead Crossing in that period is an account by Charles Goodnight of an entire cattle outfit that was set upon by a large band of Indians while grazing at Horsehead Crossing. Three men were killed, the entire herd was stolen, and the Indians laid siege for three days on the survivors who took refuge in the abandoned adobe Butterfield Station before another party, headed up by Colonel William Dalrymple, came upon them, causing the Indians to leave with their stolen herd to be bartered off in New Mexico, most likely to the Comancheros (Haley 2012:160) .

In addition to inspecting the stagecoach site, we walked the wagon road, finding it with the proper wagon rut depressions and wagon width. This road was used up to the early 1900s, and we found period tins and bottle trash from that era alongside the road. It was also very apparent the soil in this area is a very fine sand just beneath the surface. This is probably another reason the trail is more defined than other regions.

A close-up of the wagon road within the Comanche Trail can be seen in satellite imagery near the stagecoach station. A modern powerline road crosses this area, giving a good comparison of dimensions. The wheel tracks are six feet wide and rutted from the narrow, wooden wheels (Figure 11).

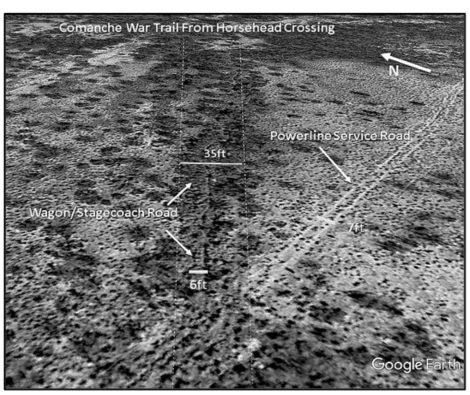

Figure 11. Wagon road within Comanche Trail after-growth brush. (Source: Google Earth)

One interesting fact has come out of this imagery analysis. The trail is so wide and deep in many places that modern ranchers have built earthen dams across the trail in order to capture any rain water that might accumulate from storms. In some locations they are set as close as every 300 feet and others as far apart as 700 feet. It also appears these earthen water containment dams were copied from other man-made modern ditches and roads, as can be seen here on the right side of Figure 12.

Figure 12. Modern water containment earthen dams created within the Comanche Trail. (Source: Google Earth)

From the stage station area the Comanche Trail/wagon road continues on to Fort Stockton, winding around the southern tip of 7-Mile Mesa, just as reported by Lt. William Whiting in his 1849 expedition (Figure 13).

Figure 13. Comanche Trail/Wagon Road Passing 7-Mile Mesa. (Source: Google Earth)

A Detour Trail

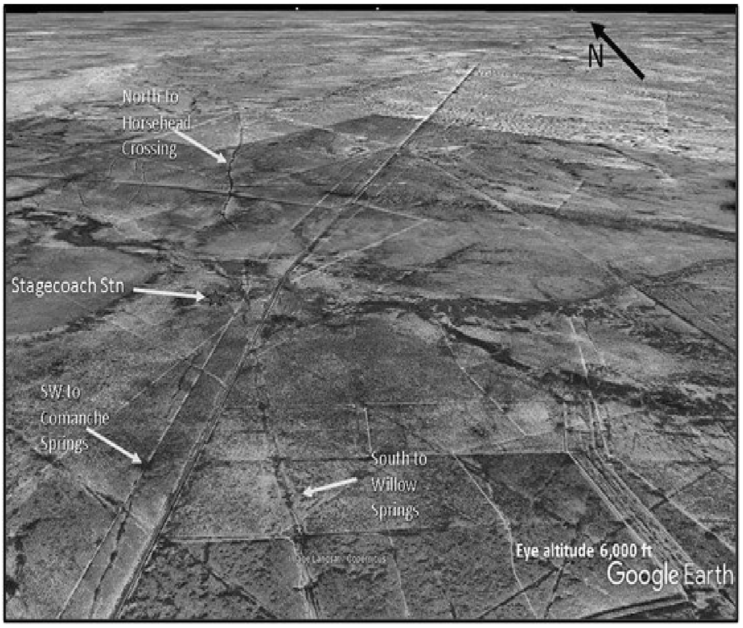

Figure 14. Comanche Trail Splits. (Source: Google Earth)

Although ranchers have taken on the idea of copying the ditching and earthen containment dams throughout the area, there is one particular trail of interest that comes off the main Comanche Trail close to where the stage station sits. This appears to be a detour trail to go around Fort Stockton and 7-Mile Mesa. It differs from the other modern ranch ditching in that is not a perfectly straight line, much like the main trail. I believe this was the detour the Comanche took to get around Camp Stockton that was built in 1859 to protect stagecoach passengers and travelers through the area (Figure 14).

Whether going through Comanche Spring or around the other side of 7-Mile Mesa, the route would end up taking the Comanche war parties to a spring south of today's Marathon, Texas, called Pena Colorado Spring (Brune 2002:89). It was turned into Camp Pena Colorado, a military outpost from 1879–1893, and is currently named Post Park (Thompson 2020). A look at the northern tip of 7-Mile Mesa shows the trail leading right to it. The likely last faint line of the trail appears just around the top of the northern tip of 7-Mile Mesa, disappearing just before reaching Interstate 10. Using a straight line projection to Pena Colorado Spring, it shows to be heading in the proper direction. The line to the right in this image is man-made ditching, traveling in a perfectly straight line for 14 miles and appears to be adjusted just as it reaches I-10, eliminating it as a possibility (Figure 15).

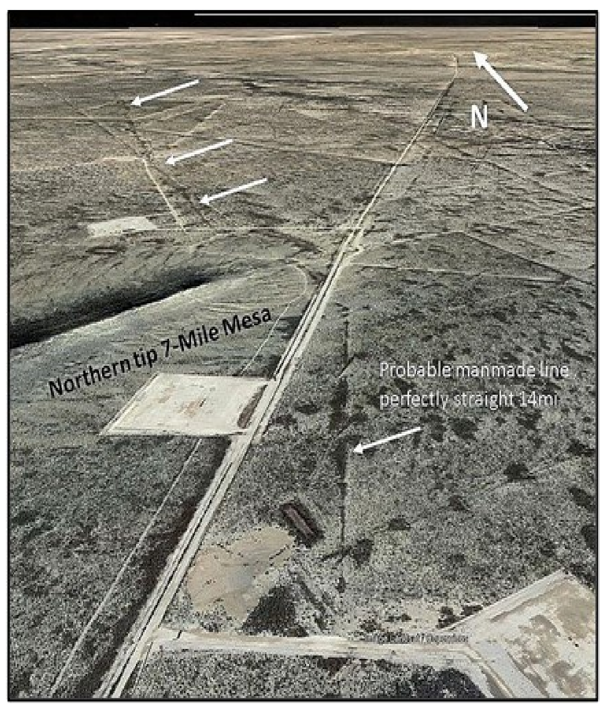

Figure 15. Secondary Trail To Northern Tip Of 7-Mile Mesa. (Source: Google Earth)

Conclusion

The Comanche Nation depended on a rich supply of horses as their main commodity of trade. Those horses also gave them the ability to successfully hunt the buffalo, their main source of food, clothing, and tools. And the buffalo was their second main source of trade goods. But their horse herds needed constant replenishment beyond the natural breeding process. When Mexico chose not to extend the previous treaty between the Spanish and Comanche it was deemed a betrayal by the Comanche, allowing for an all-out declaration of war. And warfare for the Comanche meant to them that anything and everything was legitimate. Horses were needed. Women and children were needed to replace the losses of the great smallpox epidemic. To them this was an absolute need for survival, and the stolen horse herds continued to be run up the trail for the next 50 years and for a total of around 90 years.

Over a million horses - possibly even double that number - were herded over this same trail year after year. By running the horses off to the side of each previous trail created a wider and wider swath. As the need came for a good wagon road from Horsehead Crossing to the newly created Camp Stockton and later Fort Stockton with its growing town, the already made trail was the easiest and straightest route. This wagon road becoming a major roadway and connection from all points east, which probably helped to keep this trail from being modified by ranchers until early in the 1900s. The soft, sandy soil under the hooves from over a million horses created a wide trail that can still be seen as a scar across the land, and shows up easily with our current technology in space-based imagery.

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Notes

1. After camping on the Pecos River, they headed a little south of west, passing Livingston Mesa, which is 6–8 miles west of the Pecos River and south of Highway 67. Using a straight line from an area between the river and mesa, it takes them up on the plateau and intersects the Comanche War Trail at its widest point.

CONTRIBUTORS

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Brendon Asher [brendon.asher@enmu.edu] is the Director of the Blackwater Draw National Historic Landmark and Museum in Portales, New Mexico, and an Assistant Professor at Eastern New Mexico University. With over 20 years of archaeological experience, primarily within the Great Plains region, his interests focus on land use studies of prehistoric groups revolving around lithic procurement practices and lithic transportation and use, as well as prehistoric subsistence strategies and butchering practices. As the director of the Clovis type site, he is also interested in discussions of the early peopling of the Americas and has worked at several pre-Clovis sites throughout the Plains region.

Tom Ashmore [tcashmo@gmail.com] spent 21 years in the Air Force as a special intelligence/cryptologic analyst. After retiring, he worked as a military contractor, teaching intelligence skills for 20 years for the Air Force and particularly the Air Force Intelligence School at Goodfellow AFB, Texas for 15 of those years. As a member and vice president of the Concho Valley Archeological Society, he headed up archeological investigations of Butterfield Overland Mail's Johnson's Station in Irion County, Grape Creek Station in Coke County, and Horsehead Crossing Station in Crane County. He also headed up investigations of Paint Rock 1800s historic camp sites in Concho County, Tower Hill Military Lookout in Sterling County, and rock shelters in the Lower Pecos region of Texas, working with both Concho Valley and the Iraan Archeological Societies. He completed a book in 2019 on his Butterfield Trail investigations, *The Butterfield Trail Through the Concho Valley and West Texas*. He is currently president of the West Texas Archeological Society.

Barth Robbins [robbibrr@gmail.com] first recognized his interest in archaeology when he studied the local history of Cahokia Mounds while attending college in southern Illinois. He continued his interest in archaeology and anthropology after moving to Texas by taking classes at UTPB and Midland College, along with workshops, field schools, and academies with the Texas Archeological Society. He is currently a member of the Midland Archeological Society, Texas Archeological Society, Midland Historical Society, and a Steward with the Texas Historical Commission. His current interest is Paleoindian of the Llano Estacado region.

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Britt Bousman [cb26@txstate.edu] is a 7th generation Texan, grew up in Abilene and Dallas, and studied Anthropology and Archaeology at the University of North Texas, SMU, and Cambridge. He has Bachelors and Masters degrees from SMU and Cambridge, and a Ph.D. in Anthropology from SMU. He has worked in the Southern Plains since 1973, when he undertook an evaluation of Lake Meredith and Alibates National Monument. That work became his Bachelors thesis at SMU. In 2004 he began a series of six archaeological field schools at the Cross Bar Ranch north of Amarillo, where 60 undergraduate and graduate students participated on the field projects. Those field school excavations were used by five graduate students for their Masters thesis research. He has also conducted research on Stone Age archaeology in Southern Africa since 1976, and recently started working in Senegal where he is beginning a project on chimpanzee archaeology and site formation processes. He has taught archaeology and anthropology undergraduate and graduate courses at Texas State University since 2000, where he is a professor and the founding director of the Center for Archaeological Studies and the founding curator of the Archaeological Curation Facility.

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Andy Burcham is a retired chemical engineer. After working 34 years in the petrochemical industry, he now enjoys archaeology as an avocation. He is an active member in the Panhandle Archaeological Society and the Texas Archeological Society. Andy is part of the Texas Historical Commission's Stewards Network, and he volunteers in the Archeology Department at the Panhandle-Plains Historical Museum in Canyon. When not traveling (which he does frequently), Andy and his wife, Rita, enjoy their home in Amarillo, Texas.

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Charles Frederick [Charlesthegeoarchaeologist@gmail.com] is a self-employed geoarchaeologist who lives and works in the countryside near Dublin, Texas. He obtained three degrees from the University of Texas at Austin, starting with a B.S. in geology. He then shifted to geography, where he obtained his M.A. and Ph.D. under Karl Butzer, who introduced him to the breadth and diversity of geoarchaeology. During the latter part of his graduate work, his research was centered in highland central Mexico, but his livelihood was in contract archaeology in Texas. Upon completion of his doctorate, he took a job teaching geoarchaeology in the Department of Archaeology and Prehistory at the University of Sheffield, in South Yorkshire, UK. He returned to Texas in 2003, and he is currently a research fellow in the Department of Geography and the Environment at the University of Texas at Austin and an Adjunct Graduate Faculty in the Department of Anthropology at Texas State University. Between academic research projects, Charles can be found working on CRM archaeology projects, either sweating in the field or in his lab torturing dirt in a myriad of different ways and writing reports.

Joeri Kaal obtained his M.Sc. in Earth Sciences at the University of Amsterdam and his Ph.D. at the Institute of Heritage Science in Santiago de Compostela, Spain. His doctoral research focused on molecular fingerprints of a peculiar soil type known as atlantic rankers, in an archaeological setting. These soils contain up to 2.5 m thick black soils that appeared to be due to fire residues, and may thus be labelled anthropogenic Atlantic Dark Earths. Between 2013 and 2018 he was active as a freelance scientist until he started his company, Pyrolyscience SLU, offering molecular characterization services in earth and heritage science.

Paul Katz [prkatz44@gmail.com] has a bachelor's degree in Art History from Swarthmore College and three graduate degrees in Anthropology [archaeology focus] from the University of Kansas. His background and experience is in both prehistoric archaeology and museums. A large part of his archaeological fieldwork has been conducted in the northern Chihuahuan Desert region of western Texas and southeastern New Mexico. Before moving to the Texas Panhandle in 1991, he was Director of the Kampsville Archaeological Museum, a component of the Center for American Archaeology in Kampsville, Illinois. Back in Texas, he was Director of the Carson County Square House Museum in Panhandle, a position he held for eight years. More recently he was the Curator of the Texas Pharmacy Museum, a part of the Texas Tech School of Pharmacy in Amarillo. Dr. Katz is a Registered Professional Archaeologist (RPA) and the Principal of PRIAM, a cultural and natural resources consulting firm started by his late wife Dr. Susana Katz. Before retiring from active fieldwork, he conducted small archaeological surveys for federal and state agencies, private companies, and non-profit organizations. He is a past president of the Panhandle Archaeological Society and of the Friends of Alibates Flint Quarries National Monument, where he is also a volunteer.

Chris Lintz [chrisirenelintz@gmail.com] received his B.A. in Anthropology from Arizona State University and M.A. and Ph.D. in Anthropology from the University of Oklahoma. His initial archaeological experience during the summers of 1963 through 1965 was with the Nevada State Museum at Tule Springs and the Pyramid Lake Paiute Reservation. As an undergraduate in Arizona, he participated on Classic Period Hohokam mound excavations at Las Colinas and Pueblo Grande in Phoenix and several Mogollon sites near Young. He conducted cultural resource management archaeology in 17 states and Puerto Rico over a 36-year career for various universities, state agencies, and private consulting firms. Between 2006 and 2016, he served as the first Cultural Resource Program Specialist for the Wildlife Division of the Texas Parks and Wildlife Department. In this capacity, he managed cultural resources on 51 Wildlife Management Areas encompassing some 1,200 square miles across Texas, and he coordinated cultural resource consultation for federal grants on private land habitat restoration projects. Since 1970, he has focused his geographical research interests on the Southern High Plains, with emphasis on the Late Prehistoric cultures. His research interests are decidedly oriented toward ecological anthropology and involve paleoenvironmental reconstruction, settlement/subsistence patterns, architectural and community patterns, manufacturing trends in lithic and ceramic technologies, and intergroup exchange/interaction.

C.A. Maedgen, III [camaedgen@gmail.com] is a military veteran, having served in Viet Nam at Da Nang in the U.S. Air Force in 1970. Prior to military service, C.A. graduated from SMU with a degree in Geology and then earned an M.F.A. in Communications. After military service, C.A. worked in Houston as a licensed real estate broker for 10 years, and in the last 30 years he worked for a national chemical manufacturer as a sales and service engineer. C.A. has many hours of volunteer archaeology service at the Fort Chadbourne and Fort Concho historic sites, Butterfield Trail station sites, Horsehead Crossing, and Lower Pecos rock art and archeological sites. He worked with Texas State University at Eagle Cave and assisted with archeological explorations for the Nature Conservancy at Independence Creek. C.A. served for over 10 years as the Region 10 Director of the Texas Archeology Society, four years as president of the Concho Valley Archeology Society, and is a past board member of the Southwestern Federation of Archaeological Societies. He is currently an active member of the West Texas Archeological Society and the Texas Archeological Society.

Byeng R. Min is a Research Animal Nutritionist at the Agricultural Research Service in Bushland, Texas and an Associate Professor in the Department of Agricultural and Environmental Sciences at Tuskegee University, Tuskegee, Alabama.

David B. Parker is an Associate Professor and Extension Specialist in Water Engineering in the College of Engineering at West Texas A&M University, Canyon, Texas.

Marisue Potts [marisuepotts@hotmail.com] was the chairman of the Motley County Historical Commission for several decades. She has served as president of the West Texas Historical Association and is a founding board member of the Canyonlands Archeological Society, the Motley County Historical Museum, and the Comanchero Canyons Museum. She researched several Texas Historical Commission markers for Motley County, as well as the Texan-Santa Fe Expedition of 1841 in Floyd County. Among her publications are *Motley County Roundup, Over 100 Years of Gathering*; *Ridgely Greathouse, Confederate, Conspirator, Convict & Capitalist*; *Cowgirls Don't Cry*; *Home on the Range Scottish Style*; *Texan-Santa Fe Expedition's Death Watch on the Quintufue*; *Death Rides the Range of the Matadors*, and many newspaper articles relating to the history of the area.

Becky Shelton [rebecca.shelton@ thc.texas.gov] received her M.A. in Anthropology from the University of Texas at Arlington. While completing her degree, she worked for AR Consultants in Dallas, Texas, conducting desktop evaluations, survey, and testing for projects in Texas, Oklahoma, Louisiana, and Arkansas. Before developing a passion for Texas archaeology, her background in fine art, art conservation, and collections management fostered an interest in Maya ceramics. In addition to her work in the states, from 2009–2013 she participated as the Lab Director/Ceramicist for the Caves Branch Archaeological Project field school in Belize, where she taught artifact identification and analysis. Since 2014, she has served as the North-Central Texas regional archeologist with the Texas Historical Commission. She provides technical reviews on state and federal undertakings related to the Antiquities Code of Texas and Section 106. She also works with landowners and consultants to preserve significant archeological sites and assists with providing protective designation. In addition, she handles public inquiries and requests concerning archeological issues and coordinates with regional archaeology societies. As part of public outreach, she delivers presentations, writes articles and web content, provides updates to electronic media, and conducts onsite training. She also participates in archeological investigations, conducts site evaluations and analysis, and prepares reports on the results of these investigations. Additional job responsibilities include serving as the Coordinator for the Texas Archeological Stewardship Network (TASN), a group of highly motivated avocational archeologists who assist the THC staff with the mission of the public archaeology program.

Richard Todd [rick@rwtodd.net] was Lead Scientist/Research Soil Scientist in the Livestock Nutrient Management Research Unit of the USDA-ARS Conservation and Production Research Laboratory, Bushland, Texas. His research focused on ammonia and greenhouse gas emissions from cattle production systems, micrometeorological methods to quantify fluxes of mass and energy, nitrogen dynamics of agroecosystems, and the environmental impacts of beef cattle feedyards on High Plains ecosystems.

Heidi M. Waldrip is a Research Soil Scientist and Chemist in Livestock Nutrient Management Research at the Agricultural Research Service in Bushland, Texas.

Richard Walter [rwalter@sulross.edu] is from Ralls, Texas and has been a professional archaeologist for over 30 years. He has worked all over Texas and New Mexico, as well as other areas of the American Southwest and northern Mexico. He was a field and research archaeologist at the Center for Big Bend Studies, Sul Ross State University for 16 years, retiring in 2020. He is now enjoying his second childhood without any supervision.

IN MEMORIAM

The following communication was sent to the member societies of the Federation in advance of the 56th Symposium:

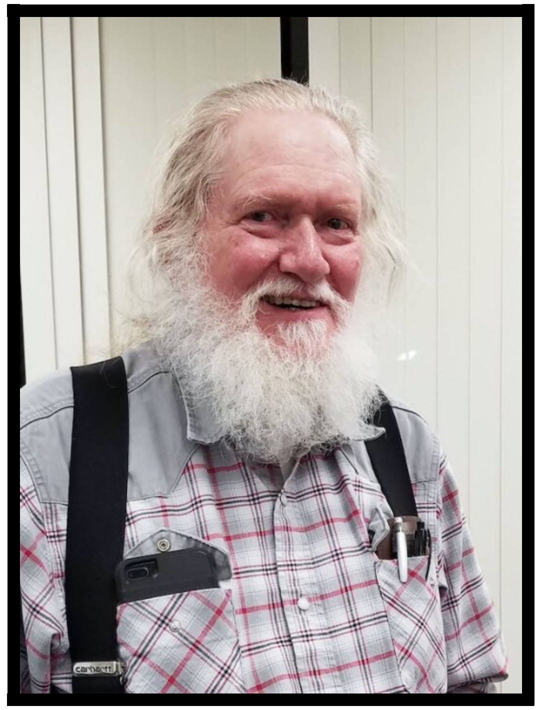
Since our last Symposium, and especially in the last several years, we have seen an unusual number of passings among the archeological community in our region. Some have been members of the Panhandle Archeological Society. Others have conducted research in the region and were close to many of our members, professionally and personally. We have counted 11 individuals. I am sure that your own societies have had a similar experiences, although hopefully not as many.

The organizers of the upcoming 56th Symposium would like to suggest that we devote one segment to recognizing and remembering these losses. We propose to put together a slide show of pictures of each of the departed. Members of their respective societies would either say a few words or read an obituary as the picture is shown on the screen. After all the deceased are recognized in this manner, we would have a minute or two of silence to show our respect. The pictures and obituaries would also be incorporated in the 56th *Transactions*.

What are your thoughts?

The following pages are the sad but gratifying results of this request.

Gerald Meeks Etchieson
December 30, 1951–September 20, 2021



Gerald Meeks Etchieson, 69, of Malvern, passed away Monday, September 20, 2021. He was born December 30, 1951, to the late Gerald D. Etchieson and Emma Ruth (Kelly) Etchieson in Arkadelphia. Meeks, as he is known to friends, grew up in Arkadelphia and received a B.A. degree in Anthropology from Memphis State University, now the University of Memphis, in 1973 and an M.A. in Anthropology from Northern Arizona University in Flagstaff in 1980. He worked as a project archeologist in the Contract Archeology program at West Texas State University from 1976–1979. He then became a staff archeologist in the Regional Office of the Southwest Region of the Bureau of Reclamation in Amarillo, Texas. He moved back to Arkansas in 1987 as forest archeologist for the Ouachita National Forest and retired as the Heritage Program manager for the ONF. Meeks was a past President of the Clark County Historical Association. He had a lifelong love for learning and teaching about archeology in Arkansas. [source: obituary]

Meeks worked as an archeologist at the Amarillo office of the Bureau of Reclamation along with Steve Ireland, Bobbie Ferguson, Doug Boyd, and Jim and Beverly Couzzourt. He was instrumental in Youth Conservation Corps archeological excavations at the South Ridge site, while other YCC excavations were conducted at the Ozier Ranch site. He worked with Jim Couzzourt on surveys and testing projects at Lake Meredith and conducted some of the earliest surveys on the Cross Bar Ranch Helium Plant lands. Meeks took a special interest in Lake Meredith sites and especially the WPA excavations at Antelope Creek and Alibates Ruins. Before the Bureau of Reclamation was abolished (and Meeks accepted a position with the US Forest Service in the Ouachita Mountains of SE Oklahoma and western Arkansas), he started a volunteer mapping program to develop a very large scale and detailed topographic map of all the houses at Alibates Ruin 28 using an old transit; the contours were about 25 cm intervals and the size of the map measured about 8x10 ft. The last time I saw this map, it covered the entire wall of his basement in Melvina, Arkansas; to my knowledge the project was never finished due to the closure of the BOR Amarillo office. He was a soft-spoken gentle giant of a guy who accentuated his lanky stature by wearing a ten-gallon hat. He loved getting out in the field, and he left exceptionally detailed notes and maps. He had a very keen eye for recognizing subtle archeological patterns. His Panhandle contributions, as well as his work at Truscott and Crowell Reservoirs in the Rolling Red Bed Plains, his work at Caprock Canyons State Park, and his careful work in the Caddo area of eastern Oklahoma and western Arkansas, constitute a lasting corpus of work. He will be missed. [source: Chris Lintz, friend and colleague]

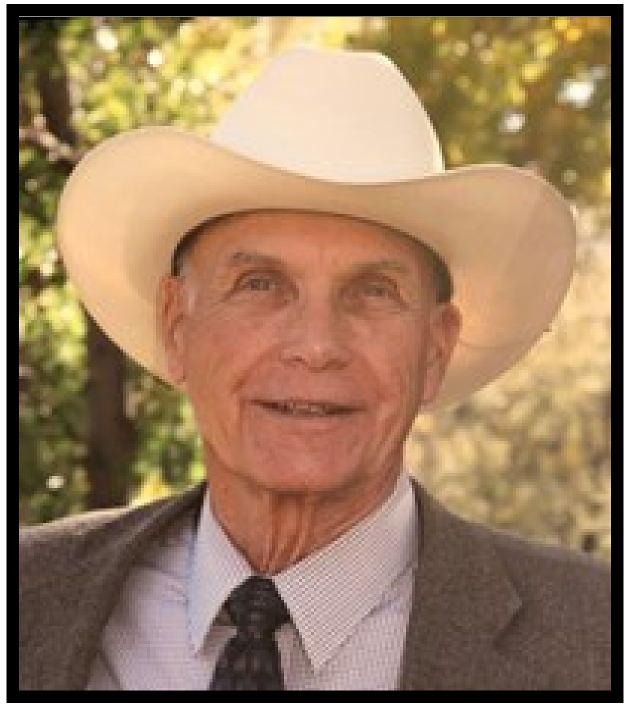
Melissa Ann "Mel" Griswold
June 11, 1965–September 3, 2021

The last email I received from Mel Griswold came on July 12, 2021. She had sent me a photograph of JA cowboys taken with Cornelia Adair in front of the JA headquarters on her last visit to the ranch in 1921. Mel knew I was working with the daughter of world champion roper Ike Rude—who had cowboyed for the JAs on two different stints in the teens—on a book about Ike. Her consuming curiosity piqued, Mel took it upon herself to explore the Ike Rude holdings at the historical museum in Mangum, Oklahoma and share her findings with me. She had worked with that museum previously when she helped immensely in researching men and women who had served in World War I for the 2017 exhibition at the Panhandle-Plains Historical Museum, "The Great War in the Panhandle-Plains Region." Despite a lack of support from much of the museum's staff and certainly its director, the exhibition turned into a smash, particularly because we included all the top 26 counties of the Texas Panhandle and the contiguous counties in the adjacent states of Oklahoma, Kansas, Colorado, and New Mexico; in other words, the true Panhandle-Plains region. Mel's ability to ferret out, chide, or cajole county officials into allowing her to dig into county records in rather remote locations for service records never failed to astound me. Perhaps her formidable force of will, perhaps her passion, perhaps her strength of character, and especially her commitment to a project, sets her apart from most academic historians and underscores the tremendous resource that is the lay historian. Without her tireless efforts, the World War I exhibition would not have come off like it did. Mel's passion really found its muse with the Hotel Herring. I was already giving tours of the 'old gal' when Mel and I connected. Her hours, days, weeks, months, years of unflagging research and discoveries on the Herring are unparalleled and absolutely vital. I hope her research is preserved somewhere safe. She and I partnered up on many Herring tours over the 20 years I did the Amarillo downtown walking tours. She always ensured there were pastries on the cold Saturday mornings in the grand lady of a hotel. Her love the Herring found an outlet with the last project we worked together on: "Cattle, Cowboys & Culture: Amarillo and Kansas City, Building an Urban West." When it was shown at the Kansas City Public Library from fall 2017 to spring 2018, it broke attendance records for their excellent facility. Mel took great pride in her work for that exhibition. and I did my utmost to ensure that her dedication showed in all three venues where the exhibition was held. I am sorry she won't be with us physically when the Herring is finally saved and preserved, much like its sister hotel in Kansas City has been. But she is in heaven digging through the musty archives up there for just the right tidbit to make the story even more compelling. Much obliged, Mel. *"Well done, good and faithful servant." Matthew 25:23.* You made a difference. [source: Michael Grauer, friend and colleague]

Jeff Indeck
April 22, 1956–October 4, 2020

Jeff was born in 1956 and passed away on October 4, 2020 in Albuquerque, New Mexico. He made it to New Mexico from Washington, D.C. where he served in the Department of Interior as the Museum Management Systems Specialist, keeping track of 200+ million artifacts, specimens, and archives nationwide. Prior to this, Jeff taught at various colleges and universities throughout the country; but of his many occupations, his favorite was as the Chief Curator and Curator of Archeology at the Panhandle-Plains Historical Museum in Canyon, Texas. At P-PHM, Jeff was very approachable. Visitors to the department were often treated with an impromptu tour of the archeological collection storage area or through *People of the Plains*, an exhibit he was instrumental in bringing to fruition. His love for paleontology provided visitors another Jeff tour through the impressive paleontology collection and exhibits. Colorado was a place that was near and dear to his heart. Jeff received his bachelor's at Colorado College in Colorado Springs and earned both his M.A. and Ph.D. at the University of Colorado at Boulder. His doctorate was duo-disciplined in Anthropology and Paleontology, with a dissertation that provided an extensive sediment analysis and of mammalian fauna at the Little Box Elder Cave in Wyoming. Between semesters, Jeff also conducted extensive surveys for the Colorado Department of Highways. Many of Jeff's friends were aware of his life-long battle with his health. Despite living with a chronic disease, Jeff decided early in his life that either the disease would take over or he would take control. He chose the latter, but sometimes to the extreme. There were times that he actually worked in the field with a heart monitor or even a 'PICC' line, a wire that literally went into his heart. Many were not aware that Jeff dealt with chronic pain on a daily basis, because his kind and generous demeanor never revealed that. His courage was immense. As part of his community outreach, Jeff often offered his P-PHM archeological department team and its resources for surveys and excavations. He enjoyed his memberships and projects with the Panhandle Archaeological Society, Texas Archeological Society, and Texas Historical Commission. Sometimes a spontaneous trip to a site occurred after a query by a property owner. Jeff's words typically began with, "Road trip!" Jeff is now on his final road trip. He was given a loving passage through an anointment ceremony by Jeff's dear friends, Bill Voelker and Troy from Sia, the Ethnological Ornithological Initiative. The Comanche Nation honored Jeff with a Pendleton blanket with which to wrap his body. Bill conducted a wa'atu (a ceremonial smoking), and Troy ended the ceremony sounding an eagle bone whistle as those in attendance turned to each of the four directions. All this was done to provide a peaceful passage to his new home. [sources: PAS *Pastimes* and Lisa Jackson, partner]

Alvin Ray Lynn
October 14, 1938–August 27, 2020



The third of nine children born to Lonzo Lacy and Elsie Mae Mohling Lynn, he was born October 14, 1938, at Four Corners, east of Whiteflat, Motley County, Texas. Alvin grew up on a farm just below the Caprock escarpment of the Staked Plains of Texas, the site his family chose when they left Oklahoma in 1937. Alvin worked on the family farm and roamed the hills, fields, and pastures of Motley County. Relics he discovered whetted his curiosity of earlier cultures and launched him on a lifelong pursuit of the people who were there before him—the pioneers, cowboys, buffalo hunters, Indians, and travelers. Alvin went to first and second grades at Whiteflat, where, in 1944, Brother A. E. Butterfield, a Methodist preacher to the Comanches, Kiowas, and Apaches in Oklahoma, gave a school program that fueled the little flame already burning within Alvin, and ever after, he was a student of history. When Whiteflat School closed in 1946, the students transferred to Matador where Alvin studied under some outstanding teachers. In 1961, Alvin graduated from West Texas State College in Canyon with a B.S. in Geology, and he earned an M.S. from there in 1975. With a major in geology, Alvin experienced what he knew—that geology is a fickle field—and those who choose it choose a life of booms and busts. His job offer in geology in 1963 was in Australia, and he chose to stay in Texas and marry his sweetheart, Nadyne Faulkenberry in 1964. Alvin returned to WT, earned a teaching certificate, and thus began his 33-year coaching-teaching career. Alvin spent over thirty years of his life teaching physical science to ninth grade students. Along the way, Alvin taught social studies, biology, geology, and anthropology and worked with older teenagers and college students; with them, as with ninth graders, his goal was always to give them tools to meet life's demands. One of Alvin's special gifts was paying attention to shy individuals, no matter what their age. Alvin was an avid researcher. He wrote numerous scientific papers and was a contributing author to *100 Moore Years: A History of Moore County, Texas*. He spent three years working on the Red River War Project. He located the trail taken by Kit Carson in 1864 on his winter campaign to fight the Kiowas and Comanches at Adobe Walls. In 2014, after researching for fifteen years, Texas Tech University Press published Alvin's award-winning book, *Kit Carson and the First Battle of Adobe Walls - A Tale of Two Journeys*." In 2005, Alvin began a long journey with carcinoid, a rare neuroendocrine cancer. While recovering from surgery in Ochsner Medical Center in Kenner, he dreamed of small pieces of paper drifting upward. Upon asking what they were, the answer came, "They are prayers for you ascending to heaven." Alvin and his wife appreciated the prayers of family and friends and the care of his local and New Orleans carcinoid doctors. [source: obituary]

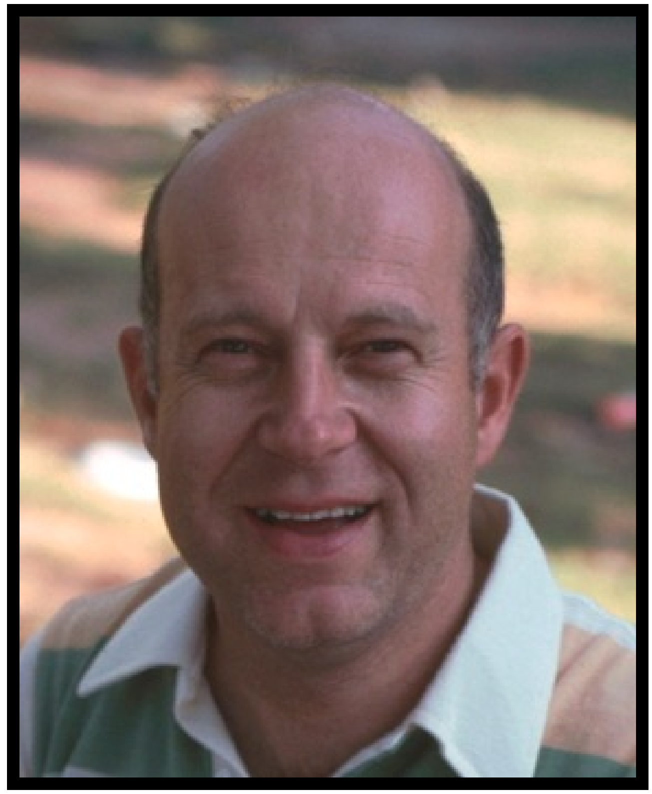
J. Michael Quigg
March 27, 1949–December 7, 2020

Archaeology lost an innovative professional member to cancer with the passing of Mike Quigg, age 71. Mike is best known for his carefully executed fieldwork, technological innovations, and his prolifically detailed reports. Mike was born in Pueblo, Colorado. After graduating from Centennial High School, he attended Northern Colorado University. Before finishing his B.A. degree from NCU, Mike took a field school teaching assistant position at Calgary University and soon became an archaeological crew chief. In the fall, 1971, Mike was the field director at Head-Smashed-In, a stratified bison jump site, and he enrolled in the graduate program at Calgary University. While in school, he joined the National Museum of Canada and became the osteology curator and collections manager, where he honed skills in recognizing fragmentary bones and identifying seasonality, aging, and sexual dimorphism characteristics of bison and other herbivores. Mike returned to the U.S. in 1985 and was a supervisory archeologist at Historical Research Associates in Missoula. Here he completed surveys of timbered lands on the Northern Cheyenne Reservation and investigated stone circle sites in Montana. By 1987 Mike was a staff archeologist for the Forest Service on the Clearwater National Forest in Idaho. Mike was enticed to move to Texas in 1987 to become a senior staff archeologist with Prewitt and Associates on an anticipated reservoir project in central Texas. While awaiting resolution of political problems on that job, he worked to complete six survey and mitigation projects for PAI between 1987 and 1989, the largest which was at the Justiceburg Reservoir south of Post. When the anticipated reservoir project collapsed, Mike directed fieldwork for a TARL project. He next was hired to work at Mariah/TRC. Between 1990 and 2016, Mike participated on some 80 Texas and New Mexico projects, resulting in some 115 completed studies. Mike's final affiliation was with the Gault School Archeological Program. Here he wrote and edited report chapters summarizing the Paleoindian and Older than Clovis (OTC) manifestations. He employed an ecological approach in studying past climatic conditions and human behavioral responses. He heavily relied on geomorphology for contexts and other specialists in the fields of radiocarbon, thermoluminescence burned rock integrity, fatty acid (lipid) residues, diatom and pollen studies, macrobotanical and starch identifications, petrography and neutron activation analysis for sourcing rocks and pottery, use-wear studies of stone tool edges, and carbon and nitrogen isotope studies for diet and environmental reconstructions. He has published more than a dozen Texas investigations in regional journals and has further disseminated information about Texas at some 39 conferences. The Texas Historical Commission has recognized Mike's contributions by presenting him an Award of Excellence in Archeology (2001) and an Award of Merit in Archeology (2003). For Mike's many contributions to advancing studies in Texas prehistory, he was honored as a Fellow in the Texas Archeological Society. [source: Chris Lintz, friend and colleague]

Louis Earl "Pinky" Robertson
January 1, 1929–December 24, 2020

Louis Earl "Pinky" Robertson was the first baby born in Dallas, Texas on New Year's Day, 1929. He passed away on Christmas Eve in 2020 at the age of 91. Pinky was the only child of Fletcher Robertson and Lois Brumme Kagy, and he lived in Dallas until moving to Andrews to teach in 1958. A member of Theta Chi fraternity and graduate of North Texas State University with bachelors' degrees in Art and History, he served in the U.S. Army during the Korean Conflict from 1951–1953, and when he returned, he finished his master's degrees in Art and History at North Texas. He taught elementary art for one year in Dallas before he headed west to Andrews, and it would be his home for 62 years. Pinky was an accomplished artist and a master teacher, teaching art, history, yearbook, math, and coaching at Andrews Middle School until 1967 when he moved to the art position at Andrews High School, where he taught several thousand students until he retired in 1991. Pinky's proms and home room window projects were legendary for their detail, wit, and artistic flair. A lover of Boy Scouts and archeology, Pinky and Barry Thompson (former chancellor of Texas A&M University) founded the local Archeology Explorer Post in 1958 and began the investigation of a pueblo site in Quemado, New Mexico on the Ball Ranch that would teach hundreds of young men and adults about archeology and the history of Pueblo Native Americans. For his sixty years of devotion and service to scouting, he received the District Award of Merit, Vigil Rank in Order of the Arrow, Founders' Award, Silver Beaver Leadership Award, Wood Badge, Award for Longest Continuous Registered Unit for Post 144, and he designed numerous award-winning patches for scouting. He was also an officer of the Texas Archeological Society and the New Mexico Archeological Society, and he authored a book about the details of the archeological dig on the Ball Ranch. He will be remembered by former students and colleagues as an outstanding mentor and teacher at Andrews Junior High and Andrews High School. Although his blood family was tiny, Pinky's chosen family spanned the world of scouting, archeology, and school. [source: obituary]

Gerald Edward Schultz
September 2, 1936–August 23, 2019



Gerald Edward Schultz, 82, of Amarillo passed away August 23, 2019. Gerry, the only child of Clara Shellhouse and Lionel Schultz, was born in Red Wing, Minnesota on September 2, 1936. Gerry attended Red Wing High School and graduated in 1954. He continued his formal education for the next 10 years, earning a B.S. and M.S. in Geology from the University of Minnesota, and then a Ph.D. in Geology and Vertebrate Paleontology from the University of Michigan. In 1964 he moved with his wife Lorna to the Texas Panhandle to join the faculty of WTAMU. Dr. Schultz loved teaching, and one of his great joys was reconnecting with the many former students he would encounter around town. He taught a diverse selection of courses, including Paleontology, Oceanography, Mineralogy, Earth Science, and Human Origins. He served as advisor to graduate geology students and always looked forward to his annual student field trip to Capulin Volcano in New Mexico. At his retirement in 2018 he was proud to hold the record for WTAMU's longest tenure, at 54 years. Dr. Schultz was also passionate about research. He took advantage of the Texas Panhandle's extensive ranch land to organize fossil digs, and he successfully discovered and pieced together skeletons of camels, three-toed horses, rhinos, saber-tooth cats, and mastodons. Many of these fossils can be seen on display at the Panhandle-Plains Historical Museum in Canyon. He authored many scientific papers, was co-author of the book entitled *Ice Age Mammals of Northwestern Texas*, and was a member of the Society of Vertebrate Paleontology and the Paleontological Society. In 1997 Dr. Schultz married his second wife, Joyce. Together they were active with church and Sunday school activities at Paramount Terrace Christian Church, where they first met, and later at First Baptist Church. They enjoyed taking trips to see national parks, attend school reunions, and visit friends and family members across the country. Gerry was a lover of the performing arts, attending concerts of the Amarillo Symphony and Harrington String Quartet and productions by Amarillo Opera and Amarillo Little Theater. He traded his role as audience member for that of performer by singing with the Amarillo Civic and Amarillo Opera Choruses and participating in various square dancing, clogging, and Norwegian folk dancing groups. He was an avid fan of old records and movies, and over the years he compiled comprehensive collections of opera and jazz recordings, serials, Westerns, and detective films. [source: obituary]

Rolla H. Shaller, Jr.
November 27, 1937–February 18, 2021

Our friend and mentor, researcher extraordinaire, Rolla H. Shaller, Jr. passed away on in Amarillo after a year-long battle with cancer. He was born in Canadian, Texas on November 27, 1937, the older of two sons of Rolla H. and Mildred Shaller. Upon graduating from high school in 1957, Rolla enlisted in the U.S. Army and was stationed in Germany. He moved to Canyon in 1964 to pursue a major in biology and a minor in anthropology at West Texas State University. He took classes and worked as a curatorial assistant at P-PHM under Jack T. Hughes. Under Hughes's direction, Rolla cataloged part of the museum's archeological collections and compiled a list of reported archeological sites in several counties. He also volunteered on a number of excavations at many significant sites. After he had received his B.S degree in 1969 and started to work full-time as P-PHM's Curator of Exhibits, he continued to take graduate anthropology classes to complement his training. In 1975, he left museum work to pursue a career in construction. By then, however, his love for history and archeology was deeply seated, and he eventually found his way back to employment at P-PHM, first as an Exhibit Specialist from 1992–1998 and then as the Assistant Curator of Archeology from 1998–2008. During his tenure at P-PHM, he installed several exhibitions, assisted in numerous field projects, participated in the earliest NAGPRA consultations, and mentored successive generations of curators. After retiring in 2008, he was appointed Adjunct Curator of Archeology, and he continued to work at the museum on a volunteer basis. Rolla joined the Texas Archeological Stewardship Network, a THC program, in 1993 and dutifully carried out those responsibilities until his death. In 2013, he received the THC's Jim Word Award for 20 years of service, and he also received the THC's Norman G. Flaigg Award for Outstanding Performance 11 out of the 15 years that it has been offered. Rolla was a member of the Texas Archeological Society for 54 years and was awarded their prestigious Fellow award in 2018. Retired State Archeologist Pat Mercado-Allinger recalls, "Rolla was one of those volunteers you could count on to assist with field investigations, lab work, and records research to ensure the success of your project. His memory for details, publications, and other facts relating to Panhandle archeology was remarkable and helpful to many professionals working in the Panhandle-Plains region." As remembered by friend and colleague, Christopher Lintz, "in a sense, Rolla carried forward a legacy of Panhandle archeology that stretches back more than a century…above all else, he was eager to serve and was always helpful in rooting out information and sharing it with others. Rolla was humble, big-hearted, always gracious, and jovial with a frequent, yet distinctive laugh that will be hard to forget." Rolla devoted his life to archeological practice and stewardship. One of his favorite quotes on the subject was "my vocation is my hobby and my hobby is my vocation. It doesn't get any better." He will be deeply missed. [source: Veronica M. Arias and Rebecca Shelton, friends and colleagues]

Gailya (Gay) Ferguson Smith
October 13, 1936–February 11, 2022

Gay Smith ended her earthly journey February 11, 2022. Gay was a member of the Texas Archeological Society and the Panhandle Archaeological Society for 51 years. Gay and her husband Robert (Bob) were very active members of both organizations for many years. My parents took me to my first field school at Kerrville in 1971. This started a childhood for me where our family vacations were wherever the TAS field schools were located. These are some of the best memories I have growing up. After that first field school, both of my parents became more involved in archaeology and TAS. That involvement included working with Billy Harrison at the Adobe Walls Site; two years as an adult leader for the summer youth program at Lake Meredith Recreation Area; excavation, curation, and report writeup of the Zollars site in Hutchinson County with my dad; and numerous other excavations throughout Texas and the Southwest. By the time I graduated high school, Mother had been on multiple committees and oversaw the youth program at the TAS Field School. I am not sure how many years she led the youth program, but she loved every minute of it. But I think my mother's favorite part of Field School was the nightly sing along. Mother loved music, and this was right up her alley. In 2006, she, along with Bill Parnell and Laurie Moseley, compiled the TAS Sing Along Songbook. I think that is the last compilation there is of those nightly get togethers. My mother taught school for years and believed education was one of the most important things that shaped your life. She not only believed that but lived it. She and my dad went to WTSU at night in the late 70's and obtained a degree in Anthropology while Dr. Jack Hughes was there. She then continued to attend WT while still teaching and obtained her Master of Education in 1985. As my parents got older and I started my own family, I wanted my daughters to have those same experiences I had as a child, so in 2003, my dad bought a 5th wheel and we headed to Menard. My two daughters were five and two at the time. I contacted Doug Boyd, who was the Youth Coordinator, and asked if my mother and I helped with the youth, could Margo, my older daughter, be a part of the youth group. Doug graciously said yes and thus started the third generation of Smith involvement with TAS. Mother loved helping with the sinking of the Titanic, and I have multiple pictures of her in her white pants (she was a multiple recipient of the Grant Hall Mr. Clean award) leading the youth group as they sang. We have since attended multiple field schools, and my daughters have great memories with their grandparents digging in the dirt. [source: her daughter Dierdre]

Kim Edgar Taylor
February 8, 1939 –March 3, 2022

Kim Edgar Taylor, 83, of Canyon, passed away on March 3, 2022. Kim was born February 8, 1939 in Pine Bluff, Arkansas to Hugh and Roma Taylor. During his childhood, he lived in many U.S. states and Canada while his father was a backhoe operator on cross-country pipelines. They returned to Arkansas often to be with family, and he eventually attended Pine Bluff High School. There he became devoted to band, classical music, and especially playing the bass trombone. This led to studying at the Philadelphia Conservatory of Music and a job touring with the Boston Pops Orchestra. Kim became interested in fencing at the Philadelphia YMCA, where he met his wife to be, Audrey Moyer. After a two-year hitch in the U.S. Army, he resumed his studies in Philadelphia. In 1966, he became part of a brass quintet under a federal program bringing music to schools around Fort Worth. In 1969, he and Audrey moved to Canyon to complete his college work at WTSU, and he played in the Amarillo Symphony for a number of years. While finishing his degree in history, he became the first Director of Education at the Panhandle-Plains Historical Museum. For close to fifty years, Kim was a member of the Canyon Rotary Club. He also belonged to the Panhandle Archaeological Society and the Pioneer Gun Collectors Club for many years. [source: obituary]

Audrey McAllister Moyer Taylor
August 12, 1938–April 17, 2022

Audrey Taylor, 83, of Canyon, passed away on Sunday, April 17, 2022. Audrey McAllister Moyer Taylor was born August 12, 1938 in Philadelphia, Pennsylvania. She grew up in suburban Philadelphia, graduating from Lansdowne High School in 1956. While working in downtown Philadelphia, she took up fencing at the YMCA and met the love of her life, Kim Taylor, whom she married in December, 1962. Audrey was an office secretary in Blue Ridge Summit, PA while her husband was in the U.S. Army. They came to Texas in 1967, first to Fort Worth, then Denton, and finally settled in Canyon in 1969. She finished a B.S. at West Texas State University and went on to receive a Master's in Speech. She then worked as a speech therapist, serving the Amarillo Independent School District for 30 years. She was a life-long Lutheran, enjoyed volunteering, family, old friends, old films, reading, walking, dogs and more. Audrey was a member of the American Association of University Women, Church Women United, Friends of Palo Duro, and the Panhandle Archaeological Society. [source: obituary]

Alston Vern Thoms
June 18, 1948–June 4, 2021

Alston Vern Thoms died peacefully on June 4, 2021. Alston was farm boy from the Texas Panhandle who became an internationally respected archaeologist and professor of anthropology at Texas A&M University. He was born in Canyon, Texas on June 18, 1948, to Walter Herman Thoms and Doris Katherine Thoms (nee Crumpacker). Much of his childhood was spent in White Deer, Texas, where his father farmed wheat and sorghum maize and raised Santa Gertrudis cattle, His mother taught third grade. Trekking across sections of land in the Texas Panhandle with Walter and his brother Byron turned up many archaeological discoveries. When they found arrowheads, they wondered how old they were and who made them. Those early finds made Alston protective of his Kiowa-Apache sister Ann because this was her homeland. These early encounters in archaeology led him to study history and anthropology at West Texas State University, where he earned his BA in 1970. There he started what would be a long career in 'contract archaeology', later known as Cultural Resource Management, directing research in advance of land transformation and impact (e.g., reservoirs, pipelines, and parking lots). Alston entered the graduate program in anthropology at Texas Tech University, where he was part of a lively cohort of young archaeologists who had one foot in the lofty academic world and the other in the CRM trenches. While some still view these as worlds apart, Alston realized that modern American archaeology required both academic rigor and the hard-won data wrung from CRM dirt. After several years of directing archaeological projects and conducting large river basin surveys in the southeast, Alston was accepted into the Ph.D. program at Washington State University. In 1990 Dr. Thoms returned to Texas and began working for Texas A&M University, hired as assistant director in the anthropology department's Archaeological Research Laboratory and to direct the Applewhite Reservoir archaeological project on the Medina River, near San Antonio. When Texas A&M eventually abandoned its CRM program, Alston began teaching full time and continued his research, funded through grants and field schools instead of contracts. He went on to become director of the Center for Ecological Archaeology and a full professor. He taught a range of graduate and undergraduate courses, from Peoples and Cultures of the World to Hunter-Gatherer Archaeology to Indians of Texas to Cultural Resource Management and beyond. You could not spend time around Alston without learning—he challenged you to question assumptions and think critically about the status quo. Alston was a force of nature, passionate about everything he set out to do. He will be remembered as a strong, kind, loving, and generous man whom you could always count on. He is survived by a legion of friends, colleagues, collaborators, and students. [source: obituary]

Evans Turpin Jr.
December 19, 1934–March 20, 2020

Evans Turpin Jr. passed away unexpectedly on March 20, 2020 at the age of 85. He was born in Bastrop, Louisiana on December 19, 1934. He graduated from the University of Houston in 1959 with a degree in Petroleum Engineering. Evans lived in Iraan, Texas, where he worked for Maraton Oil for 30 years. He served as mayor for four years and as a city councilman for four years. He served on the Iraan School Board for five years. He was a long-time member of the Chamber of Commerce and served two years as its president. He was on the Board of Managers for the Pecos County Hospitals for six years. He represented Iraan as a director on the Middle Pecos Groundwater Conservation District for nine years. He was an active member of the Iraan Lions Club for 42 years. He was a member of the Texas Archeological Society for 32 years, and he was a charter member of the Iraan Archeological Society, which he helped found in 1964. [source: obituary]

I met Evans through the Iraan Archeological Society. Had he not helped get the Iraan Archeological Society started in 1964, my grandmother would not have become a member. And my father would not have taken me on countless archeological trips at a young age and helped grow my interest. The last several years before Evans passed, he was the only thing keeping the IAS going. He scheduled the meetings, arranged the programs, wrote the newsletters, and paid the bills. He literally did it all. My favorite thing about Evans was the way he greeted you. When you walked into a room, he greeted you in such a way that made you feel like he was just so happy to see you. Even if he just saw you yesterday. He would also greet everyone else walking in behind you the same way, but it still made you feel like YOU brightened his world. And that feeling always brightened MY world. I am proud to say he was a great mentor to me and an even greater friend. I miss you, Evans.
[source: James Michael Collett, friend and colleague]

54TH SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES SYMPOSIUM

April 21, 2018
Iraan, Texas

Minutes of the Annual Business Meeting

Chairman Tom Ashmore, CVAS, called the meeting to order at 12:35 p.m. in the Iraan Community Building. Societies present included Midland, Concho Valley, Canyonlands, Iraan, and Panhandle.

The Chairman asked the members to introduce themselves.

The Chairman read the Federation minutes of the April 9, 2017 annual meeting at Fort Chadbourne, Texas, hosted by the Concho Valley Archeological Society. One representative, Richard Rose, was listed as attending, and the correction was made. Jeff Peters made a motion to accept the minutes as corrected; Evans Turpin seconded the motion; the motion passed.

Treasurer Jack Lowder reported a previous balance of $3,298.09. With income of $800.00 and expenses of $750.00, the balance as of April 21, 2018 was $3,348.09. Rolla Shaller made a motion to accept the Treasurer's report; Jeff Peters seconded the motion; the motion passed. The Treasurer reported that the SENM Society had donated the printing of the last two Federation volumes.

The Chairman reminded the members that there was an item from the 2017 annual meeting that needed to be considered at this meeting. There is one article that is not included in the Bylaws as presented in 2017:

Article IX, Amendments

> Section 1. These Bylaws may be amended or repealed by the affirmative vote of two-thirds of the Executive Committee at any meeting, if the proposed text of such amendment is contained in the notice of such meeting.
>
> Section 2. Proxy voting by telephone, mail, or email will be allowed for the purpose of amending the Bylaws, if a member society's representative to the Executive Committee is not able to attend the business meeting in person.

Rolla Shaller made a motion to accept the Bylaws with the addition of the Article IX; Rick Day seconded the motion; the motion passed.

The Chairman explained the problems he had with the 2017 Federation volume with the system he was using (Adobe Acrobat). There were also problems with photographs and the cost of colored photographs. Discussing the necessity of guidelines for the authors and editors would help this problem. Concho Valley AS recommended setting to price of the 2018 *Transactions* at their cost of $12.00 each. So approved by an affirmative vote of the Board.

The 2019 host for the Federation meeting, the Midland Archeological Society, will see about arrangements for a meeting in Midland and will let the societies know if they were successful. One suggestion was to skip 2019. No action was taken. We will wait and see if Midland AS can make arrangements for the 2019 Symposium.

The Chairman adjourned the meeting at 1:40 p.m.

– Teddy Stickney, Recording Secretary

55TH SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES SYMPOSIUM

March 30, 2019
Midland, Texas

Minutes of the Annual Business Meeting

Iraan Archeological Society President Jeff Peters called the Board of Directors Business Meeting for the 55th Federation meeting to order at 12:25 pm in the Midland College cafeteria in Midland, Texas on March 30, 2019.

A discussion ensued that the minutes from the previous year's Board Meeting should not be printed in the Federation bulletin until those minutes have been approved by the Federation board.

Rolla Shaller made a motion to 1) dispense with the reading of 2018 Board Meeting minutes since those minutes were not available, and 2) e-mail the minutes from the 2018 meeting to the Board members attending the 55th annual meeting. The motion was seconded by Callan Clark, and the motion passed.

Treasurer Jack Lowder distributed the Treasurer's report to the Board members. The SWFAS has a balance of $3,425.09 as of March 30, 2019. Marisue Potts seconded the Treasurer's report, and the Treasurer's report was approved. Jack Lowder discussed various options on the distribution of the balance in the Federation checking account. No decision was reached on this matter at this time.

Evans Turpin made a motion that the 2018 Federation bulletin be sold for $10.00 per bulletin. The motion was seconded by Callan Clark, and the motion passed.

Rolla Shaller extended an invitation to the Board that the Panhandle Archaeological Society would host the 56th meeting in 2020. Marisue Potts made a motion to accept the invitation by the Panhandle Archaeological Society to host the 2020 meeting. The motion was seconded by Evans Turpin, and the motion passed.

The meeting was adjourned at 1:05 pm.

– Teddy Stickney, Recording Secretary

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES

December 17, 2020
Virtual meeting via Zoom

Minutes of the Annual Business Meeting

Chairman Barth Robbins called the meeting to order at 7:44 pm. Meeting attendees introduced themselves. The following persons were present:

- Rick Day — Canyonlands Archeological Society
- Tom Ashmore — Iraan Archeological Society
- Barth Robbins — Midland Archeological Society
- Jack Lowder — Midland Archeological Society
- Paul Katz — Panhandle Archeological Society
- Rolla Shaller — Panhandle Archeological Society
- Andy Burcham — PAS (non-Board Member, serving as Recording Secretary)

Reading of previous minutes from 2018 and 2019 was waived. Rolla Shaller moved that the 2018 minutes be approved, and that was seconded by Tom Ashmore. The motion passed by unanimous vote. Rolla Shaller then moved that the 2019 minutes be approved, and that was seconded by Paul Katz. The motion passed by unanimous vote.

Tom Ashmore mentioned that he had not seen the latest Bylaws changes. PAS Representatives stated that the latest approved version of the Bylaws would be included in the next SWFAS *Transactions* publication.

Treasurer Jack Lowder presented four pages of detailed SWFAS financial statements. For the year from March 30, 2019 to March 18, 2020 summary information is: Beginning Balance $3425.09, Revenue $550.00, Expenses $391.60, Ending Balance $3583.49. Rick Day moved that the Financial Report be accepted; Rolla Shaller seconded the motion; the item was approved by unanimous vote.

<u>Old Business</u>

The passing of long time SWFAS member Evans Turpin (March 2020) was recognized. Members took a few minutes to recount several personal stories in remembrance of Evans. Also noted in remembrance were the recent passing of Alvin Lynn (August 2020) and Jeff Indeck (October 2020). Paul Katz stated that memorials to Evans Turpin, Alvin Lynn, and Jeff Indeck would be included in the next publication of the SWFAS *Transactions*.

Rescheduling of the cancelled 2020 SWFAS Symposium was then discussed. The 2020 event was to have been hosted by PAS. Several possible options for the timing and format of the next Symposium were considered. A significant sentiment was expressed in favor of the traditional face-to-face type of meeting, since the social aspect is highly valued. The final consensus was that the responsibility for scheduling the next Symposium (timing and format) would remain with the Panhandle Archeological Society.

New Business

Rolla Shaller gave a presentation about the possibility of digitizing the entire collection of SWFAS *Transactions*. As background information, the Texas Archeological Society has chosen to use the Portal to Texas History as the digital repository for its entire collection of 90+ years of BTAS publications. Curation of the Portal to Texas History is administered by the University of North Texas Libraries. Rolla had contacted UNT Library personnel regarding a possible digitization project. Pricing for a project depends upon the number of volumes to be digitized and the total page count. The Board members were shown a spreadsheet made by Rolla, which tabulated 55 published editions of SWFAS *Transactions* and an Index volume, with a total page count of 6,278 pages. Then a Draft Quote from UNT Libraries was shown, which estimated a project cost of $2,993.10 to digitize the SWFAS collection based upon 56 volumes and 6,278 total pages. The Board was favorable towards doing the digitization project and discussed several options for proceeding. Paul Katz moved that $1,500 of SWFAS funds be spent to get the project started (and approximately halfway complete). The motion was seconded by Tom Ashmore and approved by unanimous vote. There was further brainstorming about how to raise additional outside funding to carry the project to completion. It was left for members to pursue fundraising opportunities within their respective home regions. Rolla mentioned that UNT Digitization Project procedures require sign-off from the client organization by an officer with sufficient authority to represent the entire organization. Paul Katz moved that Jack Lowder, as SWFAS Treasurer, be authorized to sign as the SWFAS Representative. This was seconded by Tom Ashmore and approved by unanimous vote. Rolla was directed to proceed with the Digitization Project.

The last item of New Business was a consensus to defer the issue of who will host the 2022 Symposium until a later date.

Chairman Barth Robbins adjourned the meeting at 9:35 pm.

– Andy Burcham, Recording Secretary

56TH SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES SYMPOSIUM

April 9, 2022
Canyon, Texas

Minutes of the Annual Business Meeting

Chairman Barth Robbins called the meeting to order at 12:30 pm. Meeting attendees introduced themselves. The following persons were present:

·	Rick Day	Canyonlands Archeological Society
·	Callan Clark	Concho Valley Archeological Society
·	Tom Ashmore	Iraan Archeological Society
·	Barth Robbins	Midland Archeological Society
·	Jack Lowder	Midland Archeological Society
·	Paul Katz	Panhandle Archeological Society
·	Andy Burcham	Panhandle Archaeological Society, serving as Recording Secretary

Reading of previous minutes from the virtual meeting on December 17, 2021 were waived. Paul Katz moved that the 2021 minutes be approved; seconded by Tom Ashmore; passed by unanimous vote.

Treasurer Jack Lowder presented SWFAS Annual Financial Statements for the past three years (3/30/19–3/22/20, 3/22/20–4/3/21, and 4/3/21–4/7/22). In addition, he presented an Historical Financial Summary from 1995–2022 and also a 2009–2021 Summary of Dues Paid and *Transactions* copy payments for member societies. Due to Covid-19, there was no SWFAS financial activity at all for the most recent year from 4/3/21 to 4/7/22. Beginning and ending balances for this period were the same: $3,627.04. Rick Day moved to accept the Treasurer's report; Callan Clark seconded; the motion passed by unanimous vote.

<u>Old Business</u>

Andy Burcham presented an update on the project to digitize the publications of SWFAS, which includes *Transactions* Volumes 1–55. The project premises are to use the services of the University of North Texas Libraries to scan all printed pages of *Transactions* Volumes 1–55, digitize the scanned information, and permanently post it online for public access in the Portal to Texas History. Future volumes of *Transactions* would be added to the online collection, as available. Andy presented an updated price quote from UNT reflecting a revised count of 6,233 pages to be scanned, and the incorporation of a 128-page digital Index to Volumes 1–55, recently created by Paul Katz. The 3/28/22 revised project cost quote was for $2,972.85 vs. a previous quote of $2,993.10 from 12/17/20. Also presented were copies of UNT's Project Agreement and Digital Rights Agreement forms, which will require sign-off by a SWFAS Board Officer. Jack Lowder was authorized as the

SWFAS Representative Officer in the previous Board Meeting. Jack Lowder mentioned that *Transactions* Volume 55 was available in digital form and could be submitted digitally to UNT. This would save approximately $43 in scanning cost. After a brief discussion, the SWFAS Board expressed continued support for the project and the previously approved $1,500 from the SWFAS Treasury. Donations of outside funding will still be sought to cover the balance of the project cost.

New Business

Jack Lowder raised the recent issue of providing satisfactory information to Wells Fargo regarding SWFAS business status and the designation of a person with SWFAS banking authority. All attending SWFAS Board Members signed a document affirming that Jack Lowder had banking authority for the Southwest Federation of Archaeological Societies.

The last item of New Business was the designation of Canyonlands Archeological Society as the host for 57th Annual Symposium of the SWFAS in the Spring of 2023.

Chairman Barth Robbins adjourned the meeting at 1:15 pm.

– Andy Burcham, Recording Secretary

FINANCIAL REPORTS

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES

Financial Statement for March 22, 2020

Balance as of March 30, 2019. . . . . $3,425.09

Revenue

Book Sales $500.00

Dues $50.00

Total Revenue $550.00

Expenses

Printing Bulletin #54. . . . . $391.60

Treasurer Expenses $0.00

Secretary Expenses $0.00

Sales Tax, Postage, Table Rent, and Supplies $0.00

Total Expenses $391.60

Balance as of March 22, 2020. . . . . $3,583.49

Financial Statement for April 03, 2021

Balance as of March 22, 2020	**$3,583.49**
Revenue	
Book Sales	$550.00
Dues	$50.00
Postage Reinbursement - Canyonlands	$10.00
Total Revenue	$610.00
Expenses	
Printing Bulletin #55	$529.20
Treasurer Expenses	$0.00
Secretary Expenses	$0.00
Sales Tax, Postage, Table Rent, and Supplies	$37.25
Total Expenses	$566.45
Balance as of April 03, 2021	**$3,627.04**

Financial Statement for April 07, 2022

Balance as of April 03, 2021	**$3,627.04**
Revenue	
Book Sales	$0.00
Dues	$0.00
Total Revenue	$0.00
Expenses	
Printing Bulletin	$0.00
Treasurer Expenses	$0.00
Secretary Expenses	$0.00
Sales Tax, Postage, Table Rent, and Supplies	$0.00
Total Expenses	$0.00
Balance as of April 07, 2022	**$3,627.04**

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES
Dues and Transactions Paid

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES

Dues Paid

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Canyonlands	-	-	-	-	-	-	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	-
Concho Valley	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	-
Iraan	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	-
Lea County	$10.00	-	-	-	-	-	-	-	-	-	-	-	-
Midland	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	-
Panhandle	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	-
South Plains	-	-	-	-	-	-	-	-	-	-	-	-	-
SENM	-	$10.00	-	$10.00	-	$10.00	$10.00	-	-	-	-	-	-
Total	$50.00	$50.00	$40.00	$50.00	$40.00	$50.00	$60.00	$50.00	$50.00	$50.00	$50.00	$50.00	$0.00

Payment for 10 copies of Transactions

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Canyonlands	-	-	-	-	-	-	$150.00	$150.00	$150.00	$120.00	$100.00	$110.00	-
Concho Valley	$80.00	$45.00	$120.00	$120.00	$150.00	$30.00	$150.00	$150.00	$150.00	$120.00	$100.00	$110.00	-
Iraan	$80.00	$90.00	$120.00	$120.00	$150.00	$30.00	$150.00	$150.00	$150.00	$120.00	$100.00	$110.00	-
Lea County*	-	-	-	-	-	-	-	-	-	-	-	-	-
Midland	$80.00	$90.00	$120.00	$120.00	$150.00	$30.00	$150.00	$150.00	$150.00	$120.00	$100.00	$110.00	-
Panhandle	$80.00	$135.00	$180.00	$120.00	$150.00	$30.00	$150.00	$150.00	$150.00	$120.00	$100.00	$110.00	-
South Plains	-	-	-	-	-	-	-	-	-	-	-	-	-
SENM**	-	$45.00	-	-	-	$30.00	$150.00	-	-	-	-	-	-
Total	$320.00	$405.00	$540.00	$480.00	$600.00	$150.00	$900.00	$750.00	$750.00	$600.00	$500.00	$550.00	$0.00

* Exempt from payment of 10 copies of transactions in exchange for editing/compiling of transactions through 2010.
** Exempt from payment of 10 copies of transactions during 2011 and 2012 in exchange for publishing transactions in 2011 and 2012.

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES
Historical Financial Summary

SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES									
Statement Year	Book Sales	Dues	Total Revenue	Bulletin Printing	Treasurer Expenses	Secretary Expenses	Misc.* Expenses	Total Expenses	Ending Balance
1995									2126.44
1996	621.67	50.00	671.67	922.73	0.00	9.62	223.80	1156.15	1641.96
1997	697.90	130.00	827.90	1210.90	0.00	74.16	163.70	1448.76	1021.10
1998	1026.53	10.00	1036.53	0.00	0.00	12.80	96.37	109.17	1948.46
1999	306.44	30.00	336.44	1250.00	6.40	19.20	97.08	1372.68	912.22
2000	758.55	70.00	828.55	1015.00	0.00	0.00	0.00	1015.00	725.77
2001	720.50	40.00	760.50	500.00	0.00	0.00	0.00	500.00	986.27
2002	553.20	50.00	603.20	0.00	0.00	0.00	0.00	0.00	1589.47
2003	711.00	60.00	771.00	625.00	0.00	0.00	20.00	645.00	1715.47
2004	581.00	50.00	631.00	781.25	0.00	0.00	24.29	805.54	1540.93
2005	290.00	70.00	360.00	425.00	0.00	0.00	0.00	425.00	1475.93
2006	506.26	50.00	556.26	870.00	0.00	0.00	0.00	870.00	1162.19
2007	316.00	40.00	356.00	475.00	0.00	26.85	0.00	501.85	1016.34
2008	232.00	40.00	272.00	375.00	0.00	0.00	0.00	375.00	913.34
2009	413.00	70.00	483.00	520.00	0.00	0.00	0.00	520.00	876.34
2010	508.00	50.00	558.00	700.00	0.00	0.00	0.00	700.00	734.34
2011	500.75	50.00	550.75	400.00	0.00	0.00	0.00	400.00	885.09
2012	642.00	40.00	682.00	0.00	0.00	0.00	0.00	0.00	1567.09
2013	545.00	50.00	595.00	0.00	0.00	0.00	0.00	0.00	2162.09
2014	600.00	40.00	640.00	420.00	0.00	0.00	0.00	420.00	2382.09
2015	156.00	50.00	206.00	150.00	0.00	0.00	0.00	150.00	2438.09
2016	900.00	60.00	960.00	900.00	0.00	0.00	0.00	900.00	2498.09
2017	750.00	50.00	800.00	0.00	0.00	0.00	0.00	0.00	3298.09
2018	750.00	50.00	800.00	750.00	0.00	0.00	0.00	750.00	3348.09
2019	627.00	50.00	677.00	600.00	0.00	0.00	0.00	600.00	3425.09
2020	500.00	50.00	550.00	391.60	0.00	0.00	0.00	391.60	3583.49
2021	550.00	50.00	600.00	529.20	0.00	0.00	27.25	556.45	3627.04
2022	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3627.04

* Miscellaneous Expenses includes Sales Tax, Postage, Table Rent, and Supplies.

BYLAWS OF THE SOUTHWESTERN FEDERATION OF ARCHAEOLOGICAL SOCIETIES

Article I

Name

This organization shall be known as the Southwestern Federation of Archaeological Societies (SWFAS). It is hereinafter referred to as the "Federation."

Article II

Object

The Federation shall operate as a non-profit organization for the purpose of providing a regional cooperative arrangement among archaeological societies for the education and scientific advancement of avocational archaeology, with particular emphasis on the archaeology of Western Texas and Southeastern New Mexico. Wherever practicable, the Federation shall cooperate toward these ends with professional archaeologists.

Article III

Organization

Section 1. The Federation shall be operated and controlled by an Executive Committee, which shall be responsible for the transaction of all Federation business. The Executive Committee shall be composed of one representative and one alternate representative from each member society, who shall be duly chosen and accredited from its members. A chairman, vice chairman, secretary, and treasurer will be elected from the membership of one of the affiliated societies. The Executive Committee shall include, ex officio, the immediate past chairman. Voting shall be restricted to representatives. In the absence of a representative, the alternate for the society shall be eligible to vote.

Section 2. Each member society shall notify the Executive Committee of the selection of its new representative and alternate representative. Alternate representatives shall, whenever possible, be given priority considerations for selection as representative, in order to facilitate the continuity of the work of the Executive Committee. A newly selected representative shall assume the duties of the precedent representative.

Section 3. Normal business matters of the Executive Committee shall be determined by majority vote of a quorum of the representatives present, subject to any exceptions hereinafter set forth. For business purposes a quorum shall consist of two-thirds of the Executive Committee. Timely notice shall be given by the Chairman in advance of each meeting.

Section 4. Nothing in these bylaws shall be construed as infringing in any way upon the normal prerogatives of each member society as regards internal administration, operations, and policy. Each member society may act independently of the Federation whenever it desires to do so.

Section 5. The Federation shall not carry out any propaganda, or attempt to influence legislation or participate in or intervene in publishing or distribution of statements of any political campaign of a candidate for public office.

Article IV

Meetings

Section 1. A principal purpose of this Federation shall be to hold an Annual Symposium for the presentation and discussion of reports of research, having to do with the archaeology of the Federation region. Whenever possible, preference shall be given to papers prepared by the non-professional and student archaeologist. The time and place of these meetings shall be determined by the Executive Committee, which shall give due consideration to promoting maximum attendance and encouraging the offering of regional papers by Federation authors.

Section 2. The place of meeting shall be rotated among metropolitan centers in the Federation area deemed capable of meeting convention requirements. Responsibility for each meeting shall be delegated to a member society, or to member societies acting jointly by the Executive Committee.

Section 3. The Chairman for each executive meeting shall be a member of the society hosting the last Annual Federation Meeting. An Acting Secretary will be provided by the current host society.

Section 4. A special meeting may be called by the Chairman of the Executive Committee with 10 days' notice.

Article V

Publications

The Federation shall publish or assist in the publishing of the annual symposium presentations of the archeology of the Federation region or reports that are determined important to the Federation region.

Article VI

Funds

Section 1. The Federation shall finance its activities through the sale of the bulletins published annually of the archaeological reports given at the annual meeting.

Section 2. $10.00 shall be collected from each member society at each Annual meeting.

Section 3. The funds of the Federation shall be disbursed by the Treasurer under the supervision and guidance of the Executive Committee. All policy matters affecting such disbursement for other than operating expenses shall require the two-thirds approval of a quorum of the Executive Committee. No part of the funds will be disbursed to the benefit of members, trustees, or Executive Committee members except for compensation of services rendered to the Federation.

Article VII

Membership

Section 1. Archaeological societies in Western Texas and Southeastern New Mexico are eligible for membership in the Federation upon ratification of these Bylaws. The Charter Membership defined the geographical boundaries of the Federation, as follows: The Federation area shall be a circle drawn, using Hobbs, New Mexico as the hub, of approximately 300 miles in any direction.

Section 2. Archaeological Societies desiring to join the Federation may petition to do so following ratification of these Bylaws by the society membership. Acceptance or rejection of such new society members shall be determined by three- fourths vote of the quorum of the Executive Committee.

Section 3. Any member society may terminate its membership upon written notification to the Executive Committee.

Section 4. Any member society may be expelled from the Federation by a three-fourths majority of the Executive Committee. Each society will send at least one representative to annual meetings. If no representative from a society is present at an annual meeting for two consecutive years, that society will no longer be considered a member of the Federation. The purpose is to create stability for the member societies so that the Federation will remain active and vital. A society can be reinstated if so desired by a three-fourths majority of the Executive Committee.

Article VIII

Dissolution

Upon the dissolution of the Federation, the inventory of bulletins and cash funds will be equally distributed among the society members in good standing.

Article IX

Amendments

Section 1. These Bylaws may be amended or repealed by the affirmative vote of two-thirds of the Executive Committee at any meeting, if the proposed text of such amendment is contained in the notice of such meeting. These Bylaws may be amended or repealed by the affirmative vote of two-thirds of the Executive Committee at any meeting, if the proposed text of such amendment is contained in the notice of such meeting.

Section 2. Proxy voting by telephone, mail, or email will be allowed for the purpose of amending the Bylaws, if a member society's representative to the Executive Committee is not able to attend the business meeting in person. Proxy voting by telephone, mail, or email will be allowed for the purpose of amending the Bylaws, if a member society's representative to the Executive Committee is not able to attend the business meeting in person.

Proposed Bylaw changes presented at the April 25, 2015 Federation Meeting.

2nd presentation at the April 9, 2016 Federation Meeting.

3rd presentation by email distribution to the Executive Committee in October, 2016.

4th presentation at April 1, 2017 Federation Meeting.

5th amendment to Section IX at April 21, 2018 Federation Meeting.

Adopted at April 21, 2018 Federation Meeting.