



Notes from the ...Field

The Ice Age Lion of the Southern High Plains

John A. Moretti, Research Assistant and Senior Crew Chief

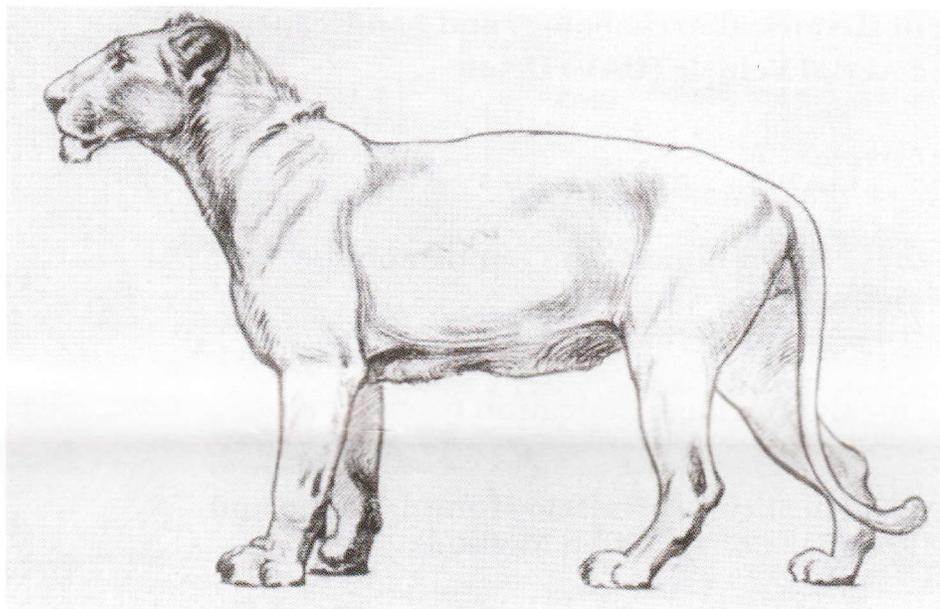


Figure 1. A reconstruction of the American lion based on remains from Rancho La Brea, California (reproduced from: Thone, Frank 1933 Great Lion of La Brea. *The Science NewsLetter*, 23 (622):150-151)

Annual excavations resumed at Macy Locality 100, in the Landmark's Post research area, during the summer 2016 field season. The research team had been exploring the extensive stream, marsh, and pond deposits at Macy Locality 100 for the past seven years. These investigations produced a wealth of evidence of the environment, landscape, and animals from approximately 11,000-12,000 years ago, in the late Pleistocene. During the Pleistocene, more commonly known as the Ice Age, North America was populated with a variety of giant animals, many modern species arose, and humans first entered into this continent. At the end of the Pleistocene, the enormous Ice Age glaciers broke apart and melted, climate was changing, and the exotic, giant megafauna animals became extinct. Places such as Macy Locality 100 offered windows into the past through which this critical time period can be understood. Animal bones recovered from Macy Locality 100 document a wide range of animal life. This terminal Pleistocene diversity includes sparrows, shrews, snakes, hawks, giant extinct tortoises, ancient bison, extinct horse, extinct camel, dire wolf, and Columbian mammoth. In total, Macy Locality 100 has produced one of the most complete assemblages of late Pleistocene animal life from the Southern High Plains. Yet annual field work continues to turn up bones that represent new additions to this ancient animal community. Such is the case with the summer 2016 fieldwork, producing the most exciting find yet from Macy Locality 100, the extinct American lion!

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The American lion lived throughout North America during the Pleistocene. Analysis of ancient DNA has demonstrated that the American lion (scientific name *Panthera atrox*), the extinct Eurasian cave lion (*Panthera spelaea*), and the modern lion (*Panthera leo*) are each other's closest relatives. While closely related to these two sister lion species, the American lion was physically distinct. This big cat was larger than the modern African lion (larger even than modern tiger) with longer legs and a larger nose (Figure 1). The long legs, big nose, and a long tail were adaptations for speed, making this lion expertly suited for chasing down big herbivore prey across the expanses of the Great Plains. The form of this lion was a contrast to the shorter, stockier, and robustly muscular body of the saber-tooth cat *Smilodon* that was built to ambush, not chase. American lions were up to 3.9 feet tall and have been estimated to weigh between 500 to 1,000 pounds. These enormous proportions made the lion larger than the Pleistocene jaguar, puma, cheetah-like cat, and saber-toothed cats of North America. Only the grizzly bear (an omnivore) and extinct short-faced bear (a master scavenger) were larger. The American lion was truly the dominant predator of the North American grasslands.



The fossil record of the American lion is relatively sparse. The range of the American lion is known from fewer than 30 finds spanning from Alaska into southern Mexico from around 200,000 to 11,000 years ago. Typically, each of these occurrences have produced only a few bones of the American lion. Only the Natural Trap Cave in Wyoming and the famed asphalt deposits of Rancho La Brea in Los Angeles have produced a substantial number of American lion bones. Even at Rancho La Brea, however, saber-toothed cat bones outnumber those of American lion by over 30 to 1. The scarcity of American lion in the fossil record may be a result of its dominant status among Pleistocene predators. A top tier predator requires a large territory with great numbers of potential prey, resulting in their population being spread thinly over vast areas.

The fossil record does not reveal if the American lion lived in prides or if males had manes (Figure 2), as with the modern African lion. Judging from brain casts, the American lion should have had the mental capacity for such social networking. Late Pleistocene cave paintings in

France depicting small groups of lions have been interpreted as suggesting social behavior in the Eurasian cave lion. Also, all of the cave lions are depicted without manes. Either males did not have manes or only females have been drawn (seems unlikely).

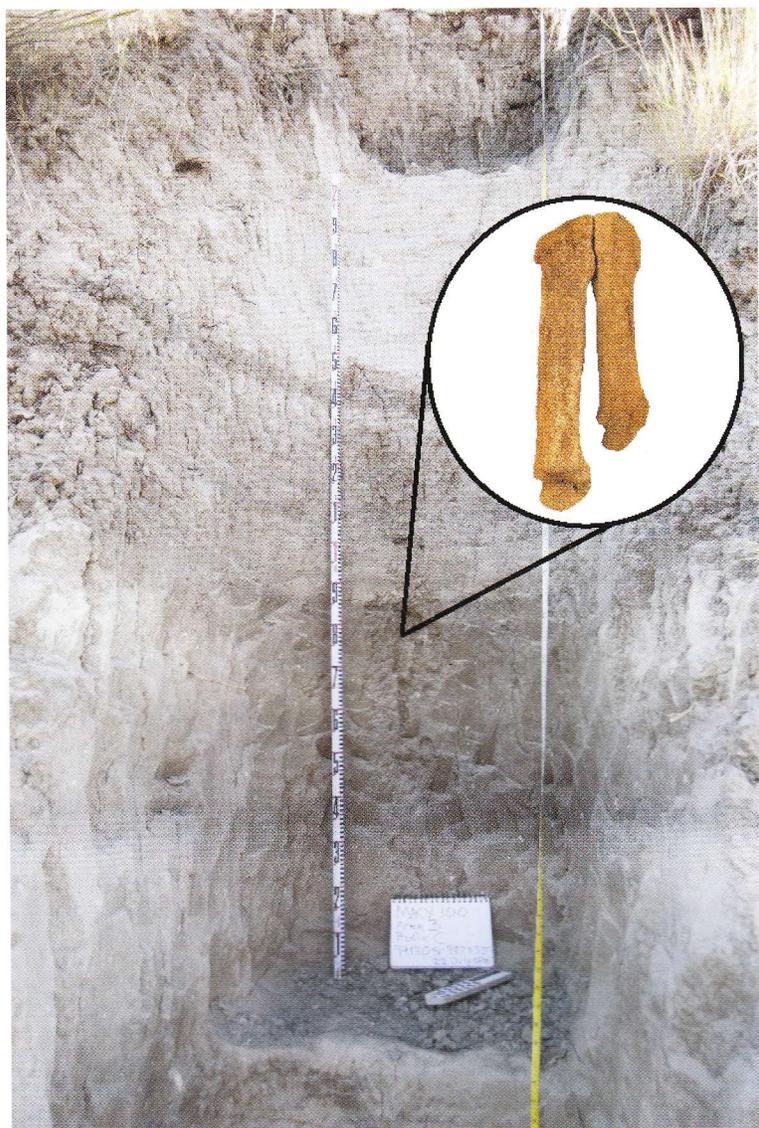


Figure 3. A section of late Pleistocene deposits at Macy Locality 100 with the two American lion metacarpals (inset) and the layer of grey sediment from which it originated.

The lion remains found at Macy Locality 100 are two metacarpals (Figure 3) from the front left paw of a single individual. They come from just beyond the excavation block, in a relatively unexplored area, and were discovered eroding out of a bank of the same deposits. The lion bones are associated with a grey layer of sediment estimated to be about 11,000 years old (Figure 3). Organic sediment samples from this layer have been sent to the Arizona AMS lab for radiocarbon dating.

These metacarpals represent the first record of American lion from the Southern High Plains. As the dominant predator of late Pleistocene North America, the American lion is a critical, although elusive, animal that contributes an important element to understanding the dynamics of the ancient animal community of the Southern High Plains. The American lion from Macy Locality 100 facilitates understanding the food web and other ecological dynamics of the time.

As Dr. Johnson notes, she's been chasing that lion for over 40 years, and we've finally caught him!

Buffalo Hunter's Knife - 41Lu1 Area 8

Dallas C. Ward, Research Aide and Crew Chief



Buffalo Hunter's skinning knife; note the blade has worn down from excessive use and sharpening.

During the 1996 field season, a surface survey in Area 8 at the Lubbock Lake Landmark focused on locating historic items present on the landscape. A buffalo hunter's skinning knife was recovered that provided evidence of buffalo hunters at the Landmark and reflected regional buffalo hunting activities. Tanning technology had made it profitable to process buffalo hides; whereas before only winter hides were economically viable to be sold as robes or blankets. The new tanning techniques would allow summer hides (with less fur) to be processed into leather which was consumed *en masse* by the rapidly industrializing western world in the form of leather belts used in machinery as well as other commercialized leather goods. This demand opened a market that was filled by opportunistic entrepreneurs who secured investors, equipped and assembled crews, and headed for the buffalo range. An estimated 10 to 15 million bison were killed between 1871-1879 on the plains of western Kansas, the Panhandle, and the northwestern plains of Texas.

Buffalo hunting crews employed a number of individuals each with specialized tasks, such as the hunters, a cook, gun loaders, hide peggers, hide haulers, and skinners to harvest hides while the hunters continued to kill more animals in an attempt to maximize efficiency and profits. Wagons were also needed in order to haul supplies out to the hunting outfits as well as being necessary for hauling as much hides and meat back to camp and onto market as possible. Wagons were also utilized in the field for processing as they were a tool used by the skinner to aide in the pulling free of the newly harvested hides by securing ropes to the hides and wagon and then turning the carcass and pulling the skin free as the skinner worked. Hunting crews often used grinders and butcher's steels to keep these blades sharp. The blades commonly wore down after repeated use as can be seen with the Landmark's knife (Figure). A skilled skinner could process 150 to 200 bison in a day, that made a sharp blade an imperative.

3D Modeling of Historical Archaeology and Landscapes with an Unmanned Aerial Vehicle (UAV) Drone.

Stance Hurst, Regional Research Field Manager

Advances in 3D modeling techniques are rapidly changing the fields of Cultural Heritage and Archaeology. Multi-image photogrammetry is a process of capturing three-dimensional points from overlapping images taken by a camera and is based on trigonometry. This technique for digitizing cultural heritage is increasingly being adopted due to its versatility, low cost, and high accuracy.

Photogrammetry often takes place on the ground, and is suitable for small areas of interest and objects that researchers can encompass successfully with overlapping photographs. For larger historical objects, such as historical buildings, and for larger areas of interest, such as fence lines and examining historical objects within a greater landscape context, aerial images are needed. Unmanned aerial vehicles (UAV) commonly referred to as drones are a light aerial platform that can take images from the sky with a consumer grade digital camera.

This past year, the Landmark research team received funding from the Texas Tech Scholarship Catalyst Program to acquire a UAV. A *Dji inspire* UAV with a 12mp camera was purchased for aerial photogrammetry survey (Figure 1). The UAV was used during the 2016 field season to document several historical structures and landscapes at the Post research area.



Figure 1. The Dji Inspire Unmanned Aerial Vehicle (UAV).

UAV 3D Model Methodology

Five steps are used to produce accurate 3D models using multi-image photogrammetry.

Step 1: Acquire overlapping images from a digital camera with a fixed lens.

Step 2: Camera orientation. Images are loaded into photogrammetry software to calculate a matching point cloud by finding common points between images.

Step 3: Dense model creation. Using the matching point cloud, the software reanalyzes the images to produce a dense model that can consist of millions of 3D data points.

Step 4: Mesh creation. A mesh or surface model is created based upon the 3D points.

Step 5: Texture model. From the color information that is associated with each point, a realistic textured surface is created of the model and overlaid on top of the mesh created in Step 4.

Agisoft's Photoscan photogrammetry software was used for this project. Aerial images obtained from flyovers from the UAV were georeferenced automatically based on the *Dji Inspire* GPS

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3D Modeling continued from page 6.

Spring Creek and Maxey Homestead Research

The Landmark research crew has been conducting survey and excavation along Spring Creek in the Post research area since 2009. Several late Pleistocene to early Holocene faunal localities and hunter-gatherer occupations and objects dating ~11,500-8,500 years ago have been documented. Notable faunal finds include the remains of an ancient camel, and this past summer two metacarpals of extinct American lion. The oldest hunter-gatherer object found thus far is a Clovis projectile point dating to ~11,500-11,000 years old.

The Landmark field crew began documenting the Maxey homestead within the Post research area in 2013. Brothers S.F. Maxey and J.F. Maxey acquired two sections of land from the State of Texas to develop into a homestead in 1902. J.F. Maxey and family remained on the property to subsistence farm until they sold their property to the Slaughters in 1914. F. Maxey and his family then moved their wood framed house to a new location ~9km (5.5 miles) to the north near Spring Creek. The construction of the wood-framed house was notable by the inclusion of local Ogallala Formation gravels embedded on the exterior walls.

The UAV was used this past summer to document the landscape at Spring Creek and the historical structures and surrounding landscape at the 1914 F. Maxey homestead. An important research objective at Spring Creek was to examine the spatial relationships of sediments and soils to the faunal and archaeological localities by creating a 3D model. The research objective at the Maxey homestead was to develop a complete 3D model of the house, cellar, and surrounding area for analysis (Figure 2).

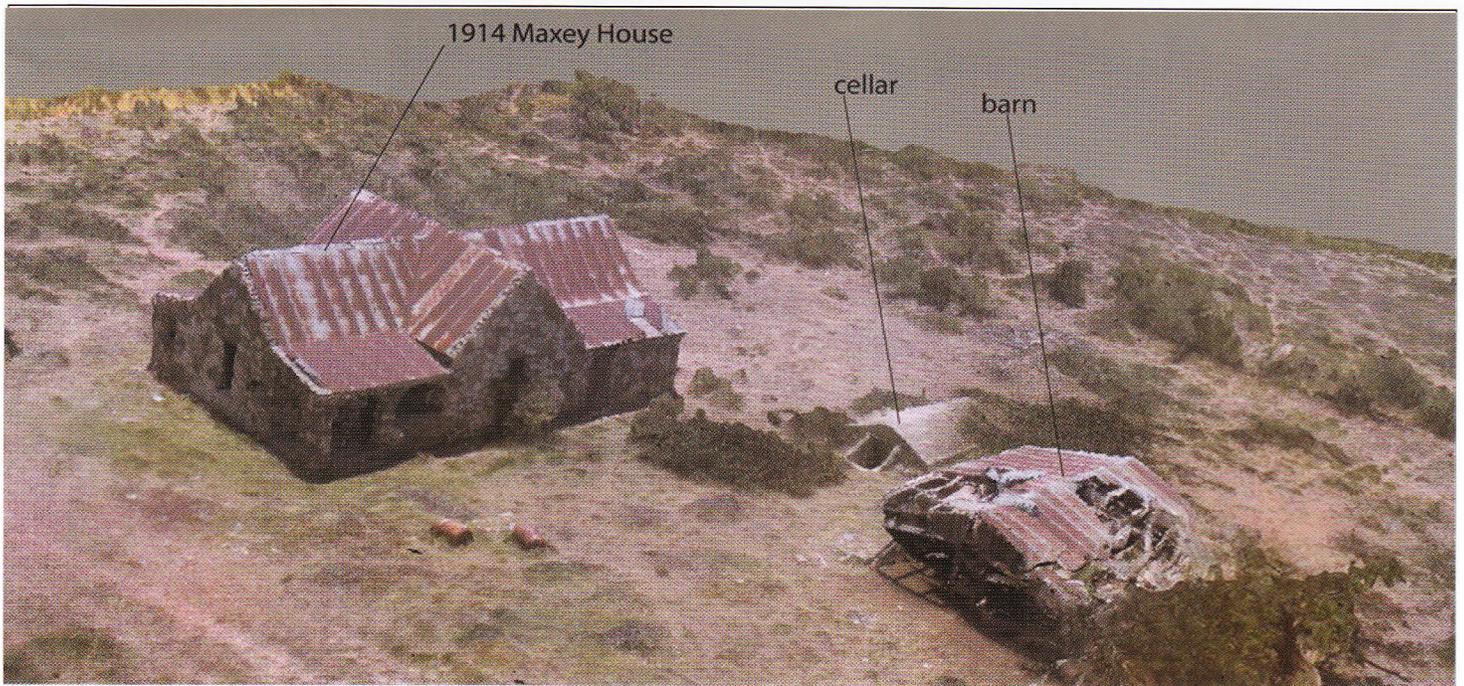


Figure 2. Maxey 1914 Homestead 3D Model.

Continued on page 8.

3D Models of Spring Creek and Maxey Homestead

Two UAV flights were used to capture a total of 170 images at Spring Creek. From these images, a total of 16,882,676 points were generated to create the 3D model (Figures 3, 4). Results of the model clearly show the location of previous work in Spring Creek as well as geological formations and local sediments.

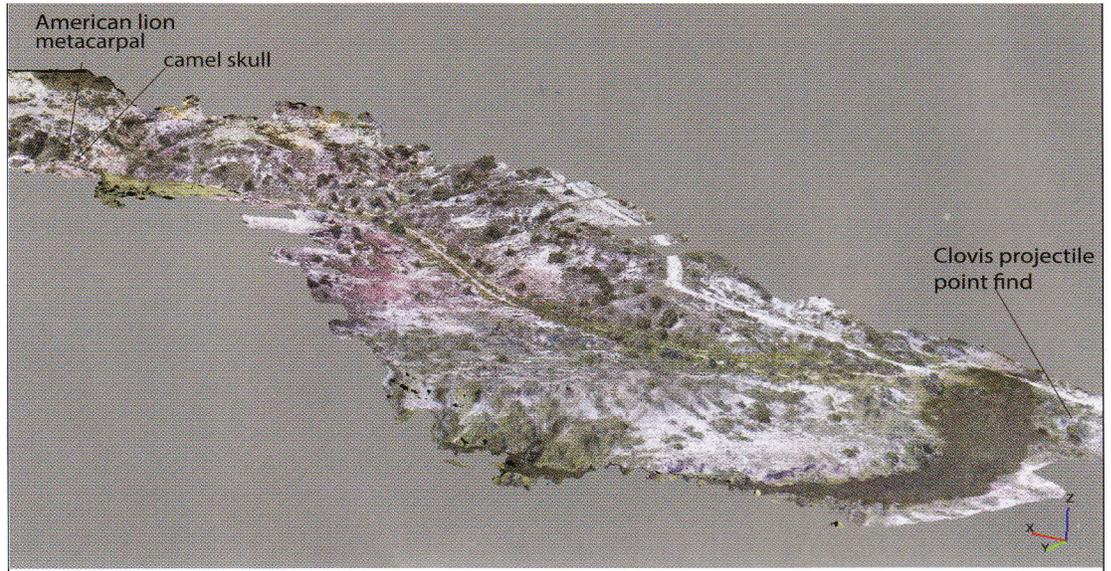


Figure 3. 3D Model of Spring Creek and locations of important faunal finds and Clovis projectile point.

Two UAV flights were used to capture a total of 70 images at the Maxey homestead. From these images, a total of 14,737,977 points were generated to create the 3D model of the homestead. Results of the model captured the house, cellar, and surrounding area of the 1914 Maxey homestead area.

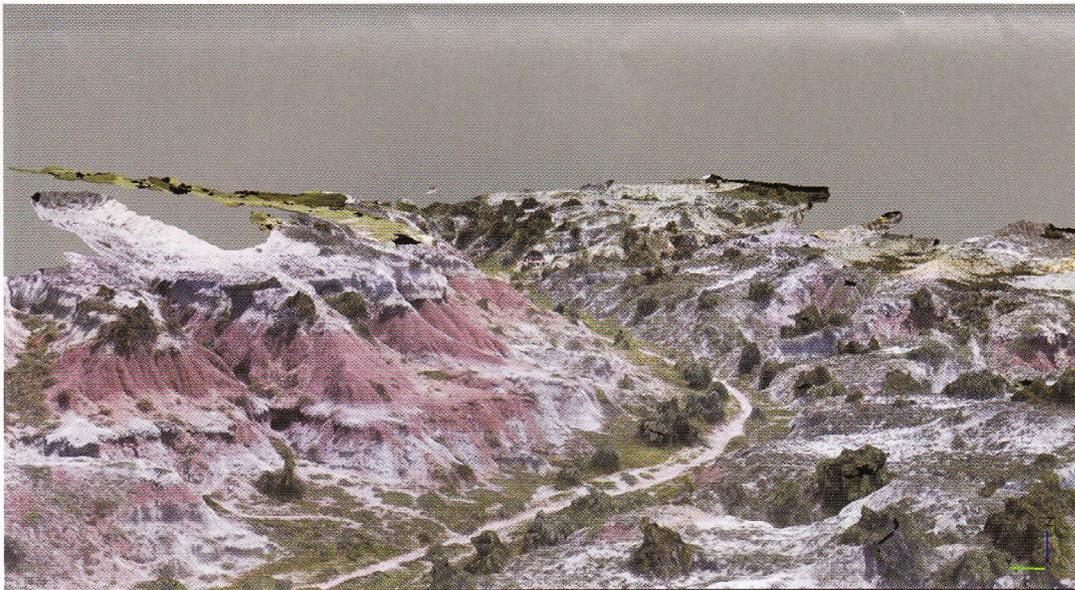


Figure 4. Close-up view of Spring Creek 3D model.

Implications of 3D modeling

The results of incorporating UAV photogrammetry into research is very encouraging. Both of these 3D models are highly detailed and contain important information about the surrounding landscape and cultural features. The 3D model of Spring Creek holds a considerable amount of GPS information that normally would take weeks to accumulate from the ground, but instead was obtained within only a few hours. The detailed resolution of the model holds great potential

for mapping the stratigraphy in relationship to the faunal and cultural objects found within Spring Creek. In future work, even more images will be taken for a more close-up view of the Spring Creek landscape to determine if UAV can be used to locate bones or artifacts on the surface that are more difficult to view from the ground.

The Maxey homestead 3D model has captured all of the historical buildings and the surrounding area. This detailed record of the Maxey homestead in a sense preserves the cultural heritage of this site "as is" for research today and the future. An important part of these 3D models is that it is documenting and preserving information that can be used by future researchers to view these records in their original contexts before natural erosion or people impacts their records further.

Dog, Wolf or Coyote?

Lila Jones, Research Aide



Figure 1. Sample of the canid astragalus used for analysis. From left to right: *Canis familiaris* (dog; right side), *Canis latrans* (coyote; right side), *Canis spp.* (unknown canid; right side) and *Canis lupus* (wolf; left side).

Plains, but they became extirpated in the early 20th century due to government and private control efforts. Their presence would indicate that during the mid-18th century, Grey wolf was inhabiting the area. As for coyote, other coyote bones at this site have been much smaller than the group of bones in question. If the unknown canid (*Canis spp.*) specimens are coyote, it would raise further questions, such as, why the wide range in size of the coyotes present at the site?

In order to determine the species of the unknown canid, 3D modeling and statistics are being used as tools to compare subtle similarities and differences between the specimens recovered in the field and a sample of the three possible canids from the Landmark's comparative collection. Multi-image photogrammetry is being used to create a 3D model of the ankle bone (astragalus) of the canid recovered from Whiskey Flats. The overlapping photographs of each one of the bones, done with a digital camera is uploaded Agisoft Photoscan 3D modeling software to complete the model (Figure 2).

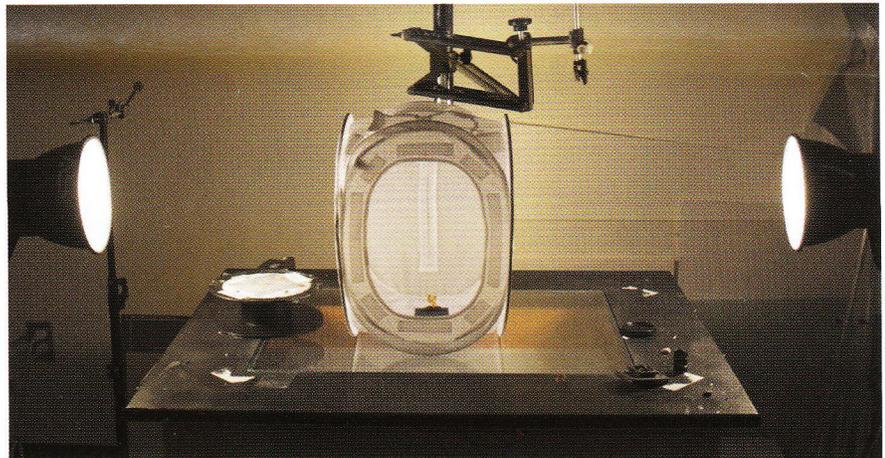


Figure 2. Photograph session of a *Canis latrans* astragalus for 3D modeling in the Digital Heritage Research Lab of Texas Tech University.

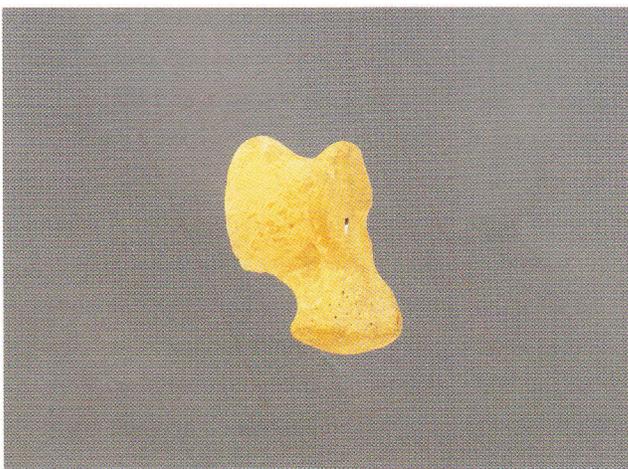


Figure 3. Completed 3D model of the *Canis spp.* astragalus in Agisoft Photoscan.

During recent excavations at Whiskey Flats, at the Stanton research area, a group of canid bones were recovered that represent a challenge in terms of identification. Canid (short for Canidae) is the taxonomic family that includes wolves, coyotes, foxes, jackals, and domestic dogs. The canids present near Whiskey Flats during site occupation are the Grey wolf (*Canis lupus*), coyote (*Canis latrans*), and probably domestic dog (*Canis familiaris*). Identifying the species of these specimens has been challenging because among canids, the general shape of their bones can be very similar and, in this case, all three can overlap in size (Figure 1).

The presence of any of the three species could change the interpretation of the site. If identified as domestic dog, it would indicate that the people who occupied the site (Comanche and possibly Apache) traveled with domestic dog. Grey wolf used to roam most of the Great

The astragalus of several wolves, coyotes, and domestic dogs are being 3D modeled and compared to the unknown canid specimen using a statistical software package called Rstudio. The results may indicate which of the three canids share the most similarities with the whiskey flats specimen. This research is still in progress and the species of the canid from Whiskey Flats remains unknown. After concluding this test using the astragalus, the same method will be applied to more of the *Canis spp.* bones in search of a definitive identification (Figure 3).

How Old are These Bison Bones?

The Importance of Radiocarbon Dating Bone

Stance Hurst, Regional Research Manager

Bison was the only large mammal to survive climate change at the end of the Late Pleistocene ~ 11,000 years ago. Large grassland animals such as camels, horses, and mammoths disappeared from the landscape. Modern bison (*Bison bison*) evolved from the ancient bison *Bison antiquus*. In comparison to modern bison, these ancient bison were approximately 30% larger in size and had horns that projected more to the side rather than curving up towards the top of the head.

Ancient bison were adapted to cool season grasslands and likely lived in smaller sized herds. The changeover from the ancient to modern forms occurred sometime between 8,000-6,500 years ago, and, most likely, around 7,000 years ago. Modern bison along with pronghorn and deer adapted to the early Holocene expansion of short-grasses, changing environment, and emergence of the continental climate ~4,500 years ago.

Hunting bison has been an integral part of how hunter-gatherers adapted to the Southern Plains region. Bison, whether ancient or modern, has been a primary food resource, and their skin, ligaments, hooves, and fat used to make such things as clothing, glue, and shelter. The discovery of places where past people killed, butchered, and processed bison are important types of archaeological sites found on the Southern Plains.

The Landmark research crew was involved in the excavation of two localities with the remains of bison this past field season at the Post research area along the Southern High Plains eastern escarpment. At Macy Locality 349, the research team continued uncovering the bones of ancient bison to document their distribution and to find an associated projectile point or

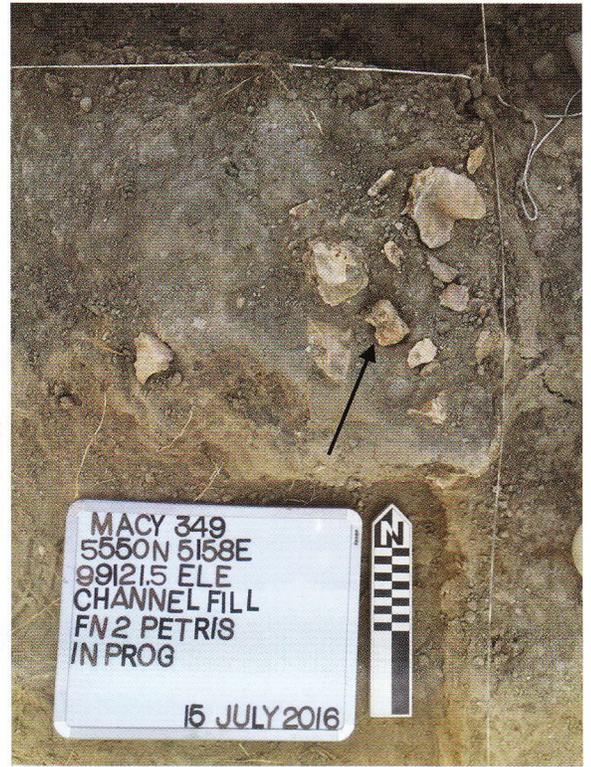


Figure 1. Discovery of an ancient bison petrosal among other skull fragments at Macy Locality 349; arrow denotes location of the petrosal.

flaked knife to confirm these bison bones represent a kill site and not a place of natural death (Figure 1). No cut marks or other types of cultural modification had been found on the bones. A piece of flaked stone recovered at the site suggested it was a kill locality. Organic sediment below the bison bones was radiocarbon dated to ~10,000 years ago. This radiocarbon date and the remains of ancient bison suggested this site dates sometime between ~10,000 - 8,000 years ago.

The remains of modern bison also were documented at Macy Locality 357, a new find this field season. Bison bone were found along the edge of an eroding remnant gully (Figure 2). The bones were encased in reworked Ogallala Formation sediment, and it was unclear the age of the bones due to the absence of stratigraphy within the gully fill. No evidence of human related artifacts were found at this locality thus far.



Figure 2. Excavation of modern bison remains at Macy Locality 357.

Continued on page 11.

How old are these Bison Bones continued from page 10.

A mystery at both Macy Locality 349 and 357 are the exact ages of when these bison died in the past. Radiocarbon dating the bone directly can provide an answer to this mystery. Bone dates, however, often have been problematic in the past, with more recent carbon infiltrating the bones and providing ages that are too young. A way to work around this problem is to date the petrosal (ear bone) found within the bison's skull. The petrosal is the most dense bone in the body and can provide a more accurate radiocarbon age of when the bison died.

The big discoveries at Macy Locality 349 and 357 this field season were finding petrosal bones at both localities (Figure 3). Two petrosal bones were found at Macy Locality 349 and one at 357. The petrosal bones in both cases were found as isolated elements and this situation indicates the bison skulls at both localities had weathered and fallen apart. Radiocarbon dating the petrosal bones will narrow the age of when the bison were killed at each locality. Before dating the petrosal bones, the radiocarbon lab will use either an ultrafiltration or molecular weight separation method to isolate parts of the collagen within the bone to remove possible modern carbon contamination. The samples have been sent off and now the Landmark research team eagerly awaits the results.

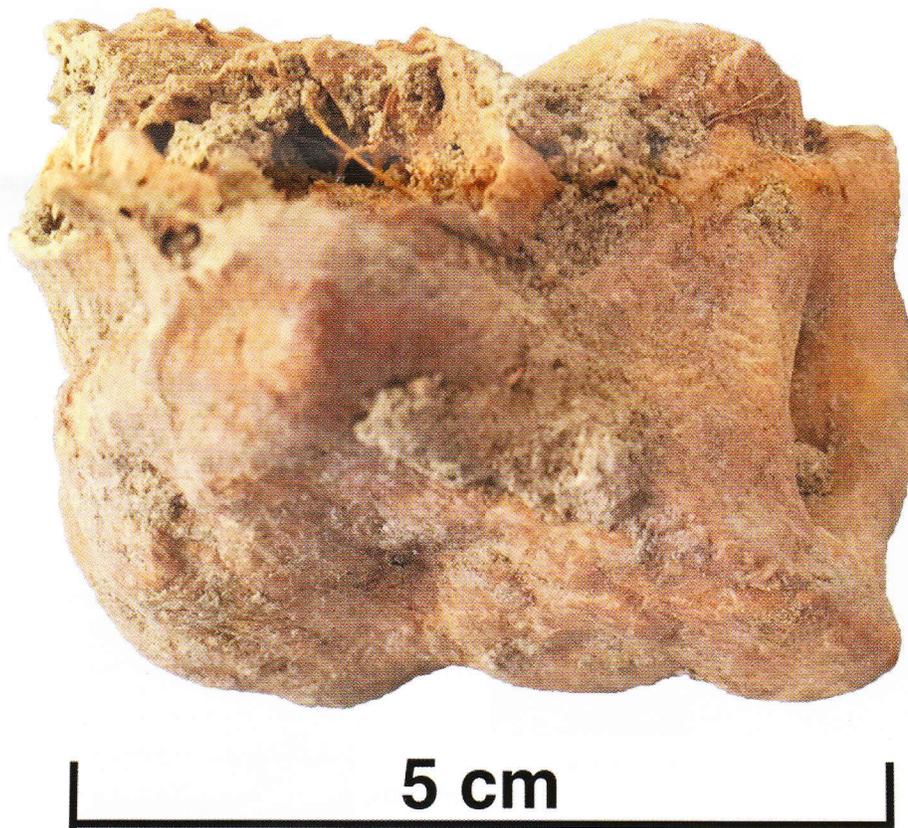


Figure 3. Petrosal recovered from Macy Locality 349.

An Education for the Heritage Education Intern

Charlotte Lee-Stockton, Heritage Education Intern

I was born and raised on the prairie. I was thrilled for the opportunity to work here at the Landmark and learn more about the Southern High Plains. One of my favorite aspects is to share what I have learned with people who think Lubbock has nothing aesthetically to offer (Figure 1). As Heritage Education Intern, I have rediscovered my love of learning and have used this opportunity to learn more about the region, its environment, and people who have lived here before.

One of my responsibilities as intern is to give guided tours. Every tour is different, and often visitors ask questions that make me think of the Landmark in a new way that encourages me to learn more. For the past 12,000 years, people have called this place home. The Landmark provides so much information; there is so much more to discover. There is always new information to share with visitors and always something different to talk about.



Figure 1. The prairie is always changing - a storm rolling in during Night Hike.



Figure 2. Amazing Summer Adventures students take a break after a long hike.

kinds of learning experiences to get kids excited about nature! I was trying to take that excitement and wonder away. This day will always stand out to me and will force me to stay in the here and now which is what environmental education is all about (Figure 2).

My internship here at Lubbock Lake Landmark has enabled me to discover what a career in informal heritage education is all about and what it can offer me professionally. It has prepared me to work in a variety of situation; I am facing the future with confidence and a greater understanding of the world around me.

As an emerging informal educator, I have learned to be flexible; things do not always go as planned. I learned this lesson quite well during *Amazing Summer Adventures*. I need to be prepared and, like most of us, have things go as planned. I developed an activity that took several weeks to prepare, cutting plastic bottles, working with all the materials, everything needed to make it a success. On the day of the activity, the students and I set out on our hike. It was a beautiful day. A hawk was hunting, diving for prey in front of us and we saw several Texas horned lizards. Before I knew it, time had gotten away from us. We needed to turn back and get on with the activity. I heard a lot of moaning and groaning when I told the student we had to get back to the building to finish up our day. Some wanted to stay outside and finish the hike. We diplomatically voted; the hike won 20 to 1.

I was disappointed because I had put so much work into the activity. But then it hit me. This is why the Landmark offers these

Interpreting 4JK Locality 5, A Buffalo Hunting Camp and 19th Century Frontier Construction Methods

Dallas C. Ward, Research Aide and Crew Chief



Figure 1 John W. Woody, buffalo hunter (image courtesy of the Panhandle-Plains Historical Museum).

The 2016 field season's historic investigations returned to 4JK Locality 5 in the Post research area. The site sits at the base of the escarpment within the canyon breaks. This site is a buffalo hunters camp that was later repurposed as an early open-range ranching line camp. Based on archival and historical research, the Woody brothers were buffalo hunters in the research area from 1876-1877. John W. Woody (Figure 1) placed his camp in Garza County approximately six to 10 miles south of present-day Post, a distance similar to that of 4JK Locality 5. He recalled seven men on his crew along the breaks in present-day Garza County in 1876 and 1877 when his outfit reportedly killed 3,200 buffalo.

4JK Locality 5 has three distinctive sandstone features, with the focus of effort for the 2016 season on the west half-dugout (Figure 2). Excavations continued to search for the boundaries of the structure and the floor. In addition, site interpretation worked toward understanding the method of construction used to build the shelter. The dugout was built from rectangular sandstone blocks collected from local outcroppings within proximity of the site eroding from the Caprock. Each block was shaped into distinctive blocks requiring a fair amount of labor in their collection

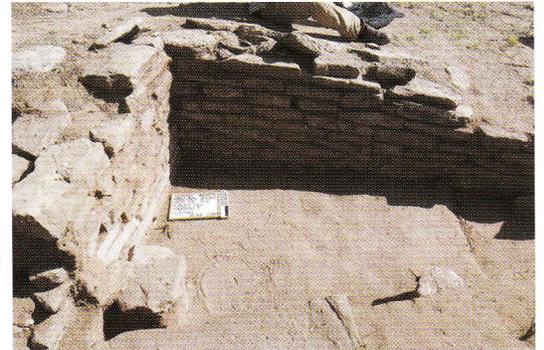


Figure 2. Exposed wall and floor of buffalo hunter half-dugout constructed of sandstone blocks.

and creation. It initially was thought that such a task would require a great deal of work, time, and effort to build the shelter.

During the 2013 field season, a metal detector survey of the area immediately surrounding the structure recovered an axe head (Figure 3) with distinctive use-wear marks on the back consistent with hammering. An experiment was conducted using a similar axe, a hammer, and some unmodified sandstone collected from the nearby outcropping (Figures 4). The results of the experiment produced nearly identical sandstone blocks with less effort than initially expected and provided a plausible method of sandstone block manufacture.

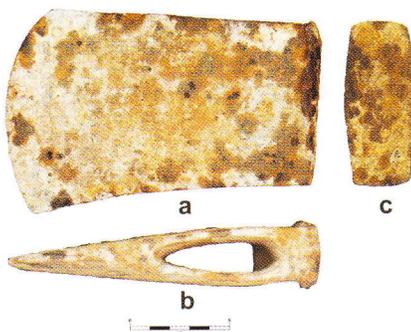


Figure 3. Axe head showing use-wear: a) side view; b) top view; and c) back view.



Figure 4. Demonstrating sandstone block manufacture hypothesis: a) axe and hammer method; b) final reproduction of sandstone block, (note the debris pieces from the shaping of the block).

Continued on page 14.

Construction of the two dugouts most likely was easier and quicker than originally thought. What appeared to be a refuse pile centrally located between the two dugouts (Figure 5) consists of multiple pieces of irregular shaped sandstone pieces. This feature became more understandable based on the experimental work, providing a plausible construction staging area for the shaping of blocks in the construction of the two structures. Regardless of the time it took to build the dugouts, infrastructure was being built for an extended stay or use. The hunters likely only abandoned the structures to follow the remnants of the southern bison herd farther to the south.



Figure 5. Construction staging area.

A New Camp and A Lot of Visitors for Roland Springs Ranch Research

John A. Moretti, Research Assistant and Senior Crew Chief



Figure 1. Two views of the newly refurbished RSR field camp.

Another field season brought with it the annual six-week stay at Roland Springs Ranch (RSR), in Scurry County (Texas) in search of ancient animals and environments at RSR Locality 1 (RSR-1). Despite this being the 11th season for exploration in the early Pleistocene deposits of RSR-1, summer 2016 was an entirely unique outing. RSR always was a lively place, but big changes were afoot this summer in two areas: camp life and public outreach. Both aspects were representative of the generous community support that the Lubbock Lake research team has been so fortunate to receive over the past decade. On the camp front, Joey and Laurie Roland and family provided the field crew with new accommodations (Figure 1). Outreach efforts expanded into offering regular Saturday morning tours to the public. Ultimately, this kind of support, from landowners and the public, will make the extensive Lubbock Lake field research ongoing efforts possible. The Roland family has always supported investigations at RSR. Whether it was basic necessities like water and propane, or treats like watermelon and catfish, the Rolands have been a constant source of aid and encouragement.

This summer, Joey and Laurie Roland have gone above and beyond, and bought, moved, and refinished a house to serve as the Lubbock Lake field crew camp. The field crew has stayed in many sorts of housing since beginning explorations at RSR in 2005, but never quite like this. Needless to say, the field crew was thrilled! The new camp house was built in the 1930s in what is now the west end of Snyder. A modest, single-story plains-style farmhouse, the building was derelict for some time before Joey recognized its potential (Figure 1). The house was removed from its setting, loaded onto a flat-bed truck, and transported down Highway 180 out to RSR. There, it was placed onto a cinder block foundation and began its new life as a paleontological research camp. The purchase and transport of the house was, in itself, impressive and generous. This act was made all the more endearing by the involvement of seemingly every member of the extended Roland family in fixing the house up. The inside of the house was remodeled down to the studs. New appliances were installed and fixtures and decorations, many of which were refurbished objects from around the ranch, were applied (Figure 2).



Figure 2. The kitchen of the RSR research field camp, fully outfitted with appliances.

A new Camp continues from page 15.



Figure 3. The comfortable furnished living room of the RSR research field camp.

Remodeling extended far beyond the bare necessities (Figure 3). The beds were all made with spare sheets in each closet. Cupboards contained a full complement of dishes, silverware, pots and pans, all supplied and arranged by Laurie's mother and grandmother. The field crew was not used to such niceties. After spending the first week in sleeping bags, in an attempt to avoid disturbing the clean, freshly made beds, the crew was scolded: "get into those beds and use them!" A firm demand that was accommodated happily.

Laurie's dad, Tim, installed the electricity, with help from Joey and brother-in-law Tommy Pinkerton. Expertly done, the lights never even flickered and the A/C always blew cool. The Roland children helped too. Tayten Roland helped install the plumbing system by crawling through the undercarriage of the old house, laying pipe and stitching the system together.

Tayten was perfectly suited for navigating the crawl space beneath the house. Fortunate for Joey, but perhaps less than ideal for young Tayten! This family assembly worked long hours and until the last minute to prepare the house for the field crew. Most folks were still there when the field crew arrived in early June, tinkering and applying finishing touches. After weeks of work, by early June the empty old 1930s house from the west side of town had been transformed into a real home.



Figure 4. Visitors observing the RSR-1 excavation during one of four Saturday morning tours.

It was a good thing to have a relaxing home, because it was a busy season at RSR-1. Excavation annually produces new data on the environments and animals of early Pleistocene West Texas, and this season was no different. In addition to excavation, four Saturday morning tours were offered to the public this summer. These tours, made possible through a partnership with Scurry County Museum, were intended as a means to share RSR-1 research findings and introduce people to a live excavation and an aspect of shared heritage (Figure 4).

The tours turned out to be a great success, far exceeding expectations. Each tour was full to capacity, bringing in visitors of all ages and from all over West Texas. Each time, visitors were full of interest and questions. The Roland children operated a lemonade stand. Each tour gained its own character developed by the various people who attended. To have the level of community engagement as enjoyed by the RSR field crew this summer was a strong affirmation of the research efforts operated out of Lubbock Lake. Thank you all for your support, collaboration, encouragement, and excitement.

Discovery of Chupadero Black-on-White Ceramic Sherd at Tahoka Lake (41LY52) Site

Stance Hurst, Field Manager Lubbock Lake Landmark



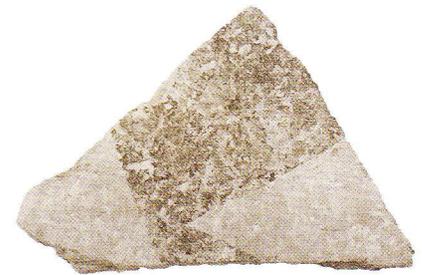
Figure 1. Local volunteers helping the Landmark research team excavate in Area 11 at Tahoka Lake.

Tahoka Lake is one of only 40 salinas on the Southern High Plains. The Landmark field crew since 2001 has recorded 24 archaeological areas within the overall large site 41LY52. For the past two field seasons, the field crew has focused on excavation at Area 11, located along the western side of Tahoka Lake, that contains a campsite occupation located on a terrace that overlooks the salina. Most of the objects found at Area 11 thus far has consisted of hearth-stones and hundreds of small flakes that resulted from the resharpening and maintenance of stone tools. The large number of objects found suggests the campsite was occupied by several hunter-gatherer families. The age of the site is unknown because no **diagnostic** objects had been found and no organic (e.g., charcoal, hearth fill) recovered for radiocarbon dating.

Diagnostic objects - artifacts that consist of different styles and are made only during particular time periods. Projectile points and ceramic sherds are common diagnostic objects.

This past summer, several local volunteers helped the Landmark team excavate at Area 11 in the second week of May (Figure 1). The field crew continued to work within four 1x1m² units that were established the previous field season. The big discovery this field season was unearthing a Chupadero Black-on-White ceramic sherd. This ceramic sherd type was commonly found in late Ceramic-age (~ 1,000 to 500 years ago) Southern High Plains sites. Pottery was made by Puebloan farmers in the Southwest and traded to Plains hunter-gatherers for such things as bison hides and meat.

This discovery of a Chupadero Black-on-White ceramic sherd marks only the third sherd found at Tahoka Lake since 2001 and the only one identified to type (Figure 2). Future work at Tahoka Lake will continue to focus on excavation at Area 11 to reveal more about this late Ceramic-age campsite.



5 cm

Figure 2. Chupadero Black-on-White ceramic sherd found at Tahoka Lake (41LY52) Area 11.

Engaging Folsom Hunter-Gatherers with 3D Technology

Jessica Stepp, Administration Intern

The Landmark opened a new exhibit on titled: *Engaging Folsom (10,800-10,200) Hunter-Gatherers with 3D Technologies*. This exhibit explores the technology of Folsom Hunter-Gatherers through modern 3D printing technology. Visitors are able to interact with the artifacts. Because these objects are printed in plastic, each visitor may touch, pick-up, hold, and closely examine each object instead of being restricted to only looking at objects behind a barrier. Within the gallery, visitors are able to interact with the 3D printed version of six different museum artifacts. Picking up the 3D object triggers a capacitive touch sensor that plays a recorded audio message about the object (figure 1). This touch and auditory component is powered by a Raspberry Pi, that is a mini-computer. This is the first time the Landmark has incorporated this type of technology in an exhibit space.

In addition to the 3D models, the exhibit also incorporates braille labels. Braille is incorporated into each 3D printed object and is used on the large map of the Landmark's research sites (figure 2). The Landmark made a conscious decision to not only increase the accessibility of the objects by 3D printing them, but also to increase accessibility for those visitors with visual impairments. Enjoy this experience and Landmark staff wants to hear your opinion! Let us know what you think about the exhibit and the technology employed. Throughout 2017, the Landmark will host a number of free, public programs that highlight the exhibit, the creation of 3D models, and the process of 3D printing.

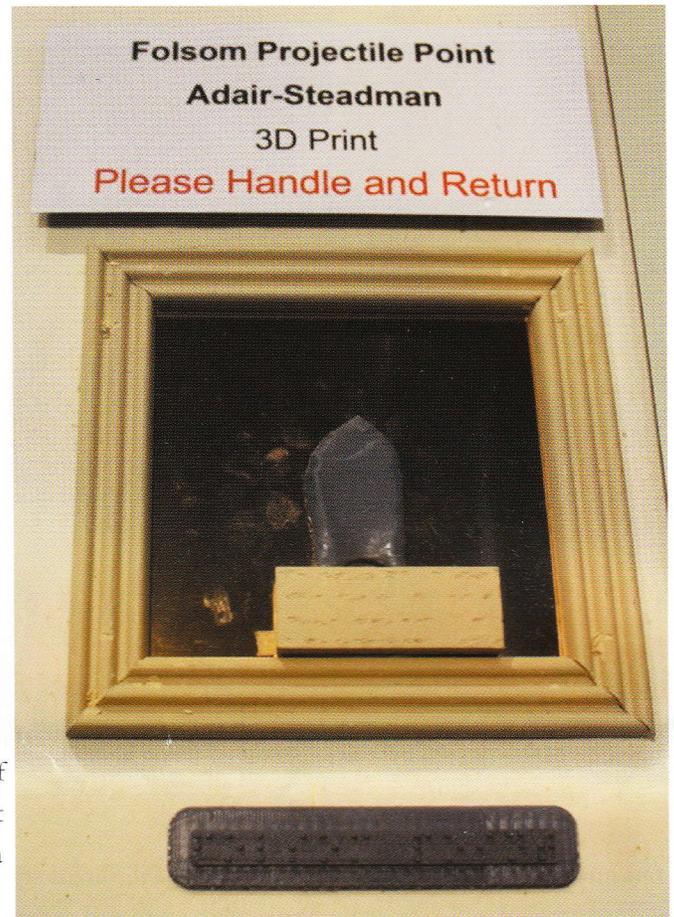


Figure 2. A capacitive touch sensor plays a recorded audio message of the 3D modeled projectile point.

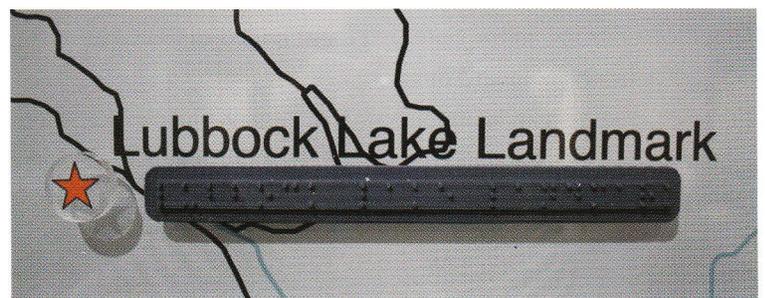
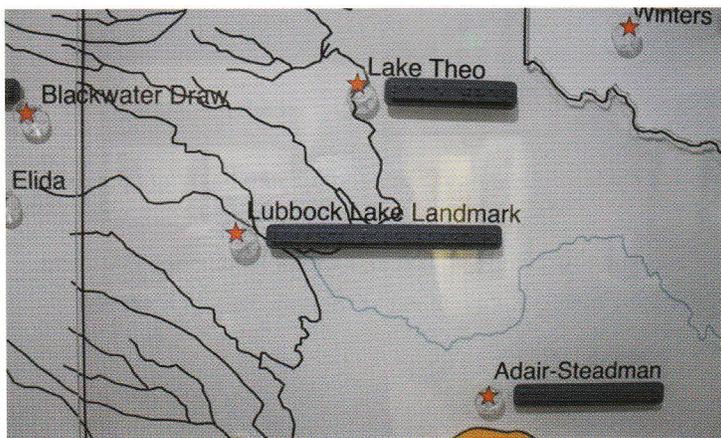


Figure 3. Braille is incorporated into each display and is used on the large map of regional Folsom sites.

Spring and Summer Calendar of Events

April

- | | |
|---|-------------------|
| 20 th 3D Workshop Part 1: Making 3D Models with a Digital Camera | 7:00 – 9:00 p.m. |
| 27 th 3D Workshop Part 2: Design Your World! Computer Aided Design and 3D Printing | 7:00 – 9:00 p.m. |
| 29 th Sensory Saturdays, for children on the Autism Spectrum | 10:00 a.m. – noon |

May

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|--|-------------------|
| 20 th Landmark after Dark: Night Hike sunset at 8:44 p.m. hike will begin 8:15 p.m. | |
| 27 th Growing Up Wild – 3 and 4 year olds | 10:00 a.m. – noon |

June

- | | |
|---|-------------------|
| 5 th – 9 th Amazing Summer Adventures 5-10 year olds | 10:00 a.m. – noon |
| 3D modeling in Archaeology 11-12 year olds | 1:00 – 3:00 p.m. |
| 13 th – 16 th Amazing Summer Adventures 5-10 year olds | 10:00 a.m. – noon |
| 3D modeling in Archaeology 11-12 year olds | 1:00 – 3:00 p.m. |
| 17 th Landmark after Dark: Night Hike sunset at 9:00 p.m. hike begins at 8:30 p.m. | |
| 20 th – 23 rd Amazing Summer Adventures 5-10 year olds | 10:00 a.m. – noon |
| 24 th Sensory Saturdays – for children on the Autism Spectrum | 10:00 a.m.– noon |
| 27 th – 30 th Amazing Summer Adventures 5-10 year olds | 10:00 a.m.– noon |

July

- | | |
|--|-----------------------|
| 11 th – 14 th Amazing Summer Adventures 5-10 year olds | 10:00 a.m.- noon |
| 15 th Growing Up Wild 3 and 4 year olds | 10:00 a.m. – noon |
| Landmark after Dark: Night Hike sunset at 8:59 p.m. hike begins at 8:30 p.m. | |
| 18 th – 21 st Amazing Summer Adventures 5-10 year olds | 10:00 a.m.- noon |
| 22 nd Archaeology in Action: Family Day | 9:00 a.m. – 3:00 p.m. |

August

- | | |
|---|-------------------|
| 19 th Landmark after Dark: Night Hike sunset at 8:30 p.m. hike begins at 8:00 p.m. | |
| 26 th Sensory Saturdays, for children on the Autism Spectrum | 10:00 a.m. – noon |