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# **THE ARCHEOLOGY AND THE GEOARCHEOLOGY OF THE ARMADILLO SITE (41TR219), TARRANT COUNTY, TEXAS**

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## **INTRODUCTION**

During October 2007, AR Consultants, Inc. conducted a pedestrian survey of a section of the pipeline study corridor north of Glade Road and west of West Airfield Drive in Tarrant County, Texas under Texas Antiquities Permit Number 4491. A prehistoric site, 41TR219, was recorded in the pipeline study corridor south of pad site BN and north of Glade Road on the west side of Dallas-Fort Worth (DFW) Airport. Chesapeake Energy proposed to bore under the prehistoric site, yet due to the potential for the occurrence of hydraulic fracturing within the site boundaries during the bore process, further testing was recommended under permit 4773 in order to determine if the site was eligible for inclusion on the National Register of Historic Properties or as a State Archeological Landmark (Shelton and Todd 2007).

## **NATURAL ENVIRONMENT**

The (DFW) Airport property straddles the Blackland Prairie/Eastern Cross Timbers biotic zones. These two distinct biotic zones are defined by the underlying geological strata and the overlying soils and sediments (Diggs, Lipscomb, and O'Kennon 1999). The natural divide between these two geological formations is east of Big Bear Creek which runs from the northwest to the southeast through airport property and joins with Little Bear Creek to form Bear Creek to the south.

The Armadillo site location is in a natural swale of deep Silawa fine sandy loam and Whitesboro loam adjacent to the floodplain of the unnamed perennial creek tributary (Ressel 1981:Sheet 20). Red to yellowish red sandy clay of the B horizon for the Silawa fine sandy loam is described as first beginning at 6 inches and extending to 46 inches below ground surface (Ressel 1981:50). From the site, the topography rises to the east then drops off to relatively level pastureland. To the west, the terrain is a gradual slope downward to Big Bear Creek, and then rises up on the west side of the creek. The Eastern Cross Timbers biotic zone contains dense oak woodlands in the bottomlands and covering the uplands (Prikryl 1990:12-13). The western edge of the airport and along Bear Creek has diverse vegetation with open savannahs, dense brush, and various woody species (Diggs et al. 1999:46). This diverse biotic zone is attractive to a variety of mammals such as deer, coyote and badgers as well as quail, dove and songbirds (Ressel 1981).

## **PREVIOUS INVESTIGATIONS**

Although the Armadillo site is not unique, few terrace sites in similar settings have been excavated within or adjacent to the airport property. Between 1972 and 1973, the proposed route for the extension of SH 360 was surveyed for archaeological sites.

Two prehistoric sites were recorded during the survey. Site 41TR63 was located northwest of confluence of Little Bear and Big Bear Creek on the western edge of airport property. A total of 1,487 artifacts were collected from the surface; these artifacts included twenty-seven stemmed and unstemmed Archaic bifaces. In the 23 test units, 414 artifacts were recorded; cores, flakes, chips and charcoal were recovered in the top six inches of soil (Lorrain 1973a:3).

Northwest of the Armadillo site on DFW property, Ferring (1992:9) tested site 41TR21 which is a Late Archaic to Late Prehistoric buried site deposit. The site contained chert and quartzite lithics. The site is located in two geological contexts: shallow deposits in Area A on a sandy terrace 1.5 – 2 m above the Big Bear Creek floodplain and stratified deposits in Area B in the colluvium/alluvium at the terrace-floodplain margin (Ferring 1992:13). Fifteen test units were excavated with lithics being the primary artifacts class present; additional artifacts included a ceramic pipe fragment and isolated burned bone fragments which were recorded in area B. Over 1,400 artifacts were recovered during testing. Late Archaic and Late Prehistoric diagnostic projectile points were recorded on the surface, and one Late Prehistoric Washita point was recovered in Area B at 30 cm below surface.

## RESULTS

Site 41TR219 was identified during survey, and thirty shovel tests were placed along parallel transects within the eastern half of the pipeline study corridor to define the boundaries. Ultimately, testing determined the site was approximately 3,253 square meters. In the fourteen positive shovel tests artifacts were sparse, with 1-4 artifacts per shovel tests except for three shovel tests which had 8-30 artifacts per shovel tests. Based on these results, a 15 x 20 m area of “artifact concentration” appeared to be near the center of the site (Figure 1).

### Trenches

Eight backhoe trenches were placed within or adjacent to the site boundaries to gain a better understanding of the underlying geology and to determine if there were any features present within the site boundaries. A composite profile using information from backhoe trenches 1, 5, 8, and 3 illustrates the location of the trenches (Figure 2).

Shovel testing, augering, test units, and trenching revealed that the A horizon contained cultural material that extended to a depth of no more than 130 cm within the area of artifact concentration; the A horizon outside the artifact concentration was significantly thinner. This thin A horizon was exposed outside the site boundaries in ten shovel tests (ST 1, 2, 35-38, and 47-50) placed in the pipeline study corridor north of the site. Strong brown (7.5YR4/6) clay was encountered between 5 and 40 cm below the ground surface. The data from the eight backhoe trenches supported the shovel tests results in that the A horizon was much shallower outside of the artifact concentration as illustrated in Figure 2 of the profile of BHT1, 5, 8, and 3. The A horizon continues to become shallower upslope from the site into the pipeline study corridor and construction area as seen in Backhoe Trench (BHT)1, BHT2, BHT5, and BHT6. To the west, Whitesboro floodplain soils were encountered at the end of BHT3.

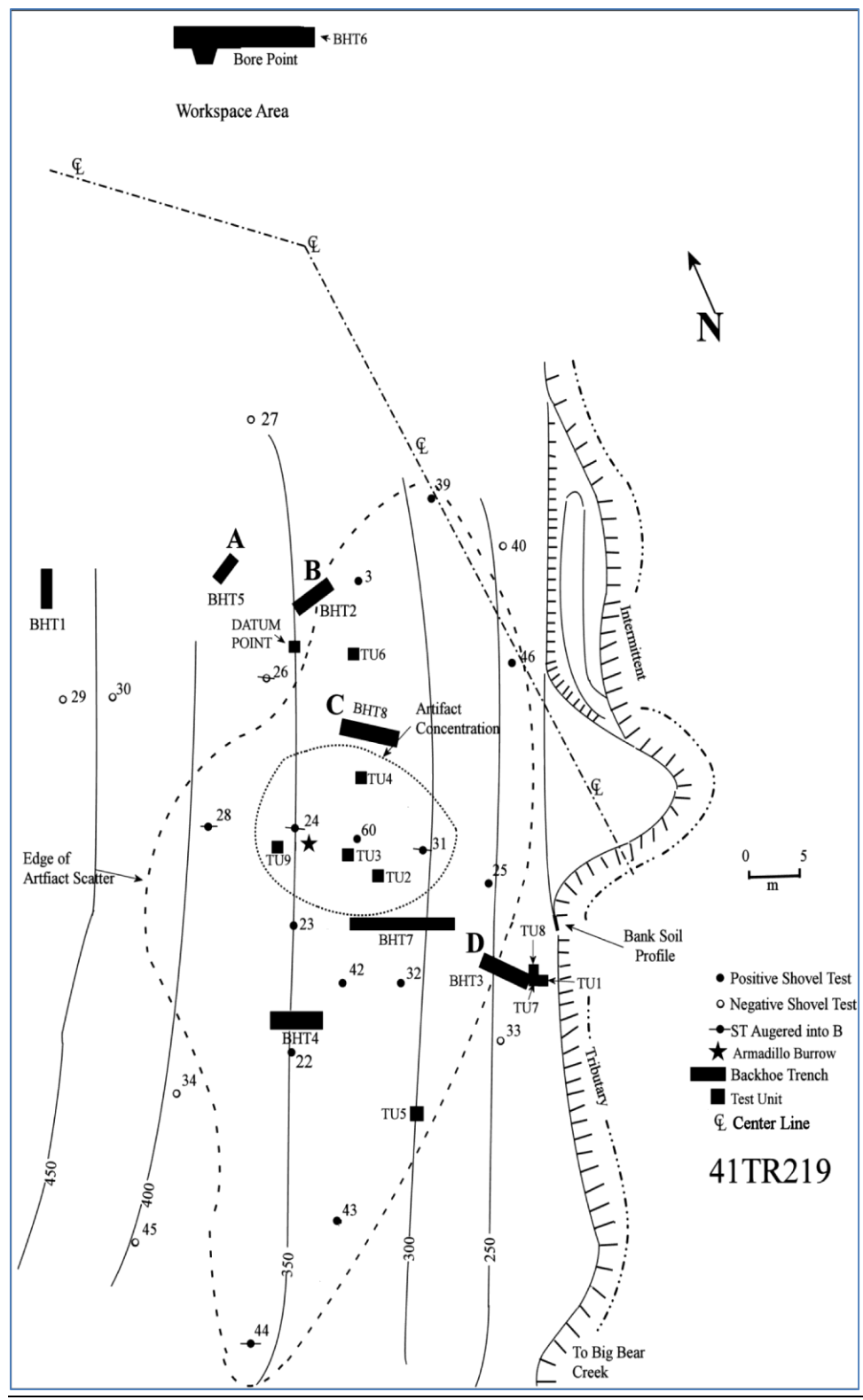


Figure 1. Plan map of 41TR219 with shovel tests, backhoe trenches, and test units mapped in relation to the pipeline study corridor centerline.

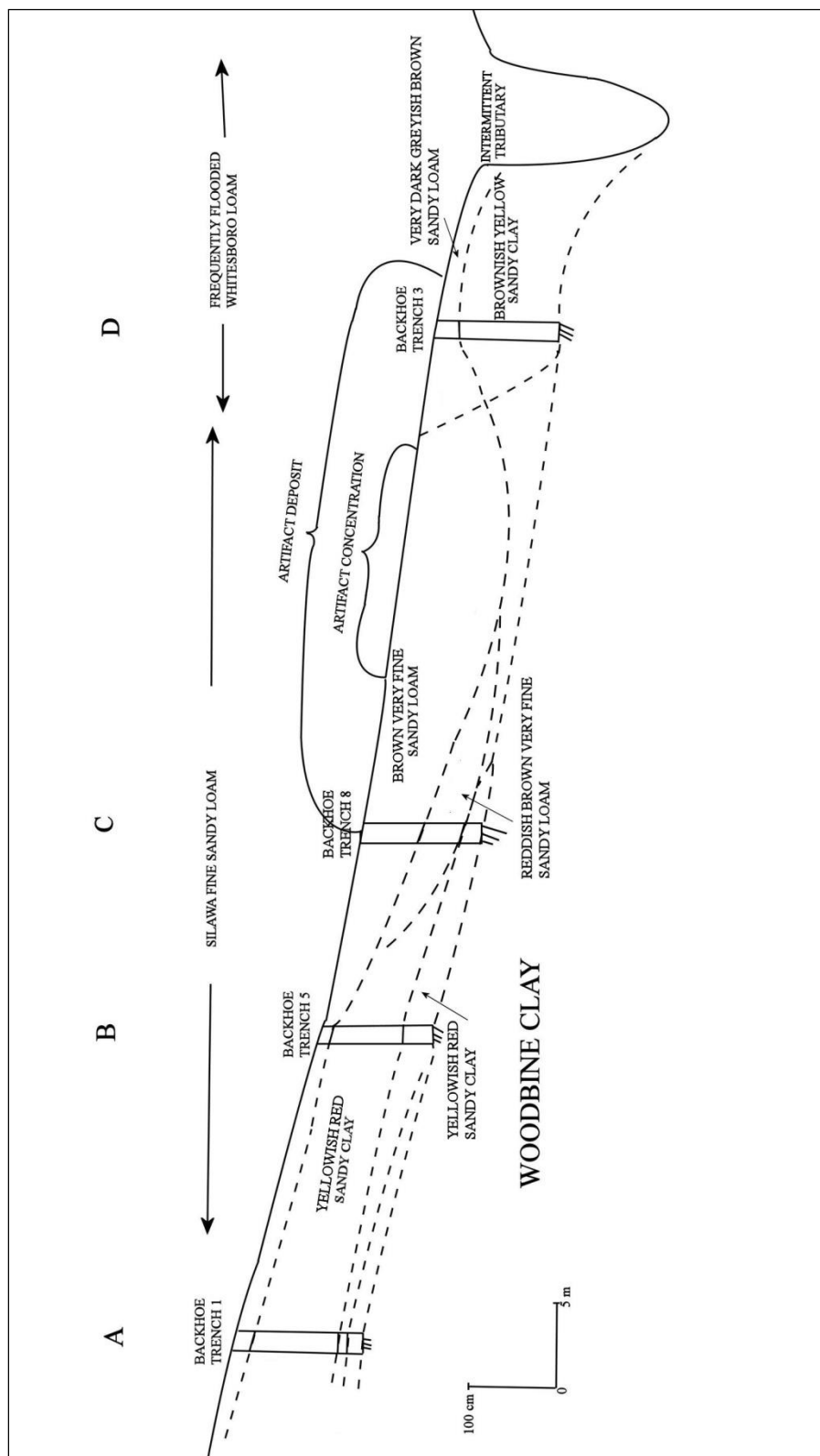


Figure 2. Trench profile of BHT 1, BHT 5, BHT 8 and BHT3.

## Test Units

Nine test units were placed inside the site boundaries. Three units were placed near the burned rock concentration uncovered in BHT3, followed by four units which were placed inside the artifact concentration, and two test units were placed outside the concentration but inside the site boundary as control units.

Test units (TU) 1, 7, and 8 were placed at the east end of BHT3 where a cluster of burned quartzite rocks was uncovered 40 cm below surface by the trench. TU1 was placed east of the burned rock cluster to determine if cultural material was closer to the bank. Three levels were excavated to 30 cm below surface, and the western half of level four was excavated to 40 cm. This matrix consisted of sandy floodplain clay. No cultural material was recovered. Two additional test units, TU7 and TU8, were placed west and northwest of TU1 to determine if the burned rock concentration extended east of the initial concentration uncovered at the end of BHT3. Between levels 4 and 6 of TU7 and TU8, an 80 x 35 cm concentration of burned quartzite cobbles and sandstone rocks was uncovered. The burned rock concentration was labeled Feature 1.

Feature 1 was situated in a thin layer of sand below the Whitesboro clay approximately three m from the tributary bank. It consisted of a relatively level burned rock concentration that contained 20 fragments of fire-cracked quartzite cobbles and 79 pieces of burned sandstone (Figure 3). A widely dispersed scatter (less than 10 percent density) of charcoal surrounded the burned rock concentration. Soil samples were collected from the charcoal scatter surrounding the burned rock concentration and from the center of Feature 1. TU7 was excavated to level six and then augered to 20 cm below the concentration, yet no additional cultural material was present. At the east end of the backhoe trench, there were sandstone and quartzite fire-cracked rocks approximately 40 cm below the surface. These fire-cracked rocks were immediately west of Feature 1 and most likely associated with the burned rock concentration identified as Feature 1 in TU7 and TU8.

Since no other features were identified during trenching, four test units (TU2, 3, 4 and 9) were placed within the artifact concentration near the site center to determine if there was any vertical stratigraphy present. Artifacts were concentrated between 30 and 60 cm below the surface and fire-cracked rock was present in levels four through twelve of the test units. A soil profile of test units 2, 3, and 9 was constructed to identify the depth of the A horizon that contained the lithic scatter within the artifact concentration (Figure 4).

Two Gary points were found within the artifact concentration; the first in TU4 between 10-20 cm and the second in TU9 between 20-30 cm. Test unit three contained the highest density of artifacts (195) and included fire-cracked rock, lithic debris, biface fragments and one biface. In TU9, two bifaces fragments were located in level seven.

Test units TU5 and TU6 were placed north and south of the artifact concentration as control units to compare artifact density within the site. The artifact density in TU5 was very low, with a total of six lithic artifacts recovered between levels three and six. Sandy clay was encountered at 50 cm. The second control unit, TU6, had a total of 27 lithic artifacts between levels two and five, with sterile clay being encountered at 70 cm. No diagnostics were located in either test unit. The soil of these two test units, compared to the soil profile for TU4 located within the concentration, emphasized how the A horizon is shallower outside the area of artifact concentration (Figure 5).

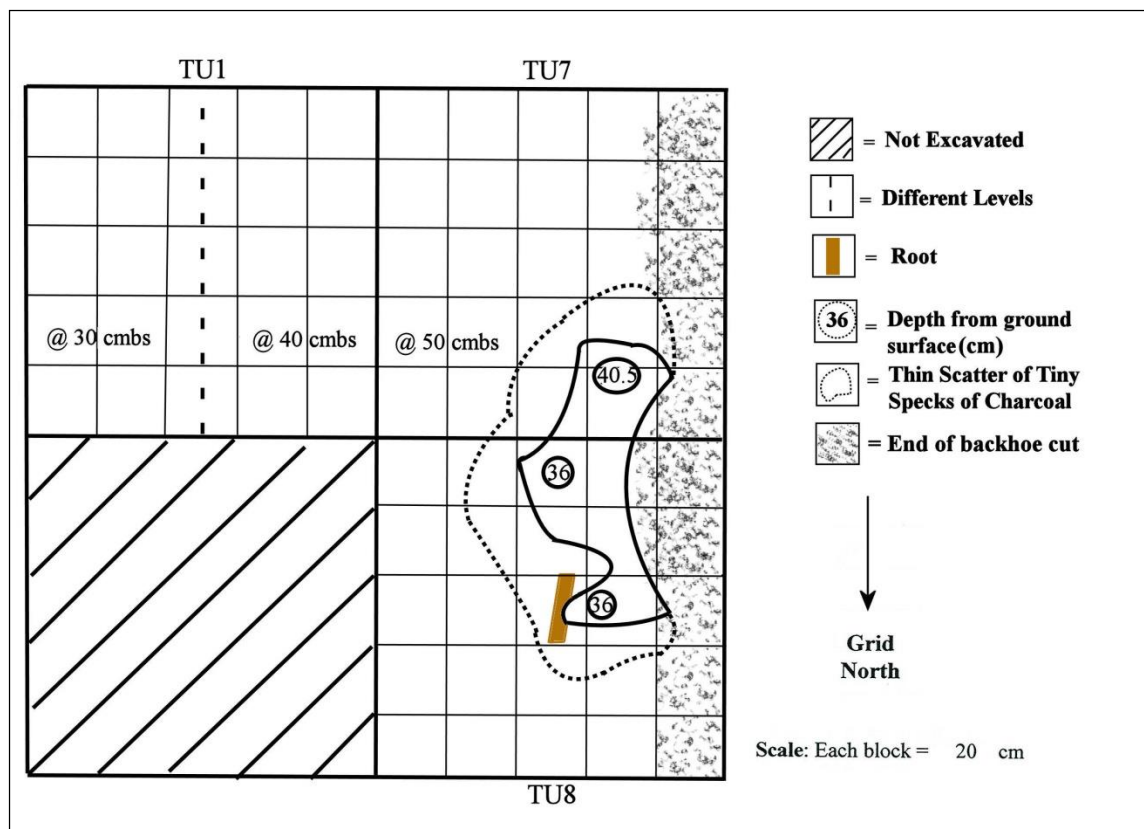


Figure 3. Feature 1 mapped in plan view of TU1, TU7 and TU8.

### ANALYSIS

The artifacts recovered from the test units and shovel tests were chipped stone tools, bifaces and fragments, lithic debris, and fire-cracked rock. A total of 593 artifacts were recovered from the test units (Figure 6). The tools included two dart points, three dart point bases, three retouched flakes, two bifaces and six biface fragments. In addition, there were two cores, 384 pieces of unmodified lithic debris, and 192 pieces of fire-cracked rock. A total of seventy-five artifacts were recovered from the initial shovel tests. Soil samples were collected from the NW corner of the beginning of each level. Soil samples from TU3, TU6, and Feature 1 were analyzed for acidity levels, sand grain size, and then wet screened to determine if microlithics and organic materials were present.

Of the diagnostic lithics, two complete dart points and three dart point bases were recovered from the test units (Table 1, Figure 7). In addition, a broken arrow point was located in the armadillo burrow backdirt near ST 24. The first complete point was a Gary dart point made of chert which was found in TU4 at 10-20 cm. The second complete point was a quartzite Gary point and was recovered from TU9 at 20-30 cm (Figure 7). Gary points are Middle to Transitional Archaic in age and date between ca. 2500 B.C. – A.D. 800 (Turner and Hester 1999:123) and may extend into the Late Prehistoric (Anthony and Brown 1994:12). The base to a chert Yarbrough point was recovered from TU3 at a depth of 100-110 cm. Yarbrough dart points are Late Archaic in age and date between ca. 1500 B.C. and A.D. 700 (Prikrýl 1990:62). The broken arrow point is a quartzite Alba point, which is Late Prehistoric in age and dates ca. A.D.



800 - 1200 (Turner and Hester 1999:200). A Late Prehistoric biface was located at level 8 in TU3. These artifacts appear to be mixed, with later artifacts below earlier ones such as the Late Prehistoric biface at 80 cm, which was below the two Gary points at 20 and 30 cm respectively, while the Yarbrough base was at 110 cm below surface.

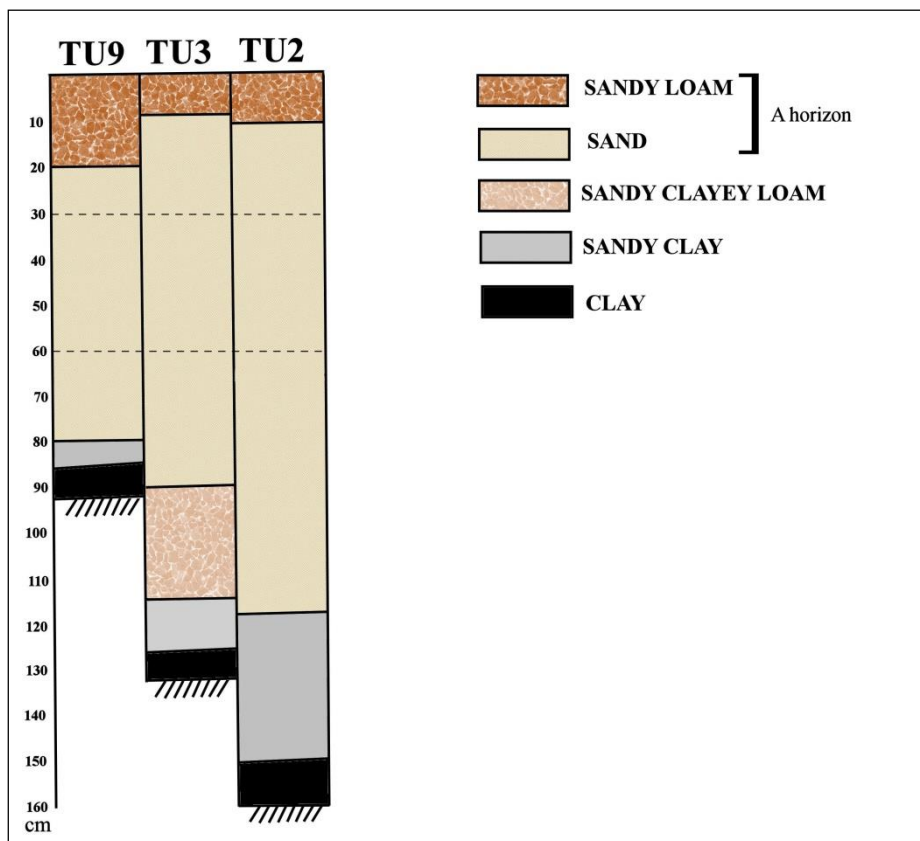


Figure 4. East to west soil profile of test units 9, 3, and 2. Lithic debris was concentrated between 30 and 60 cm.

Two modified chert flakes were recovered from TU2, one each from level six and eleven. One chert Late Prehistoric biface was located in level eight. Test unit three also contained four biface fragments; one quartzite midsection in level four, and three chert fragments in levels two, eight, and ten. Test unit three also had two chert modified flakes; one each from level two and five. In TU4, a quartzite biface was recovered in level 10 and a quartzite biface fragment was recovered in level eight. A fragment of a quartzite biface was recovered from TU9 in level seven. In the armadillo backdirt near ST32, a quartzite biface fragment was also recovered.

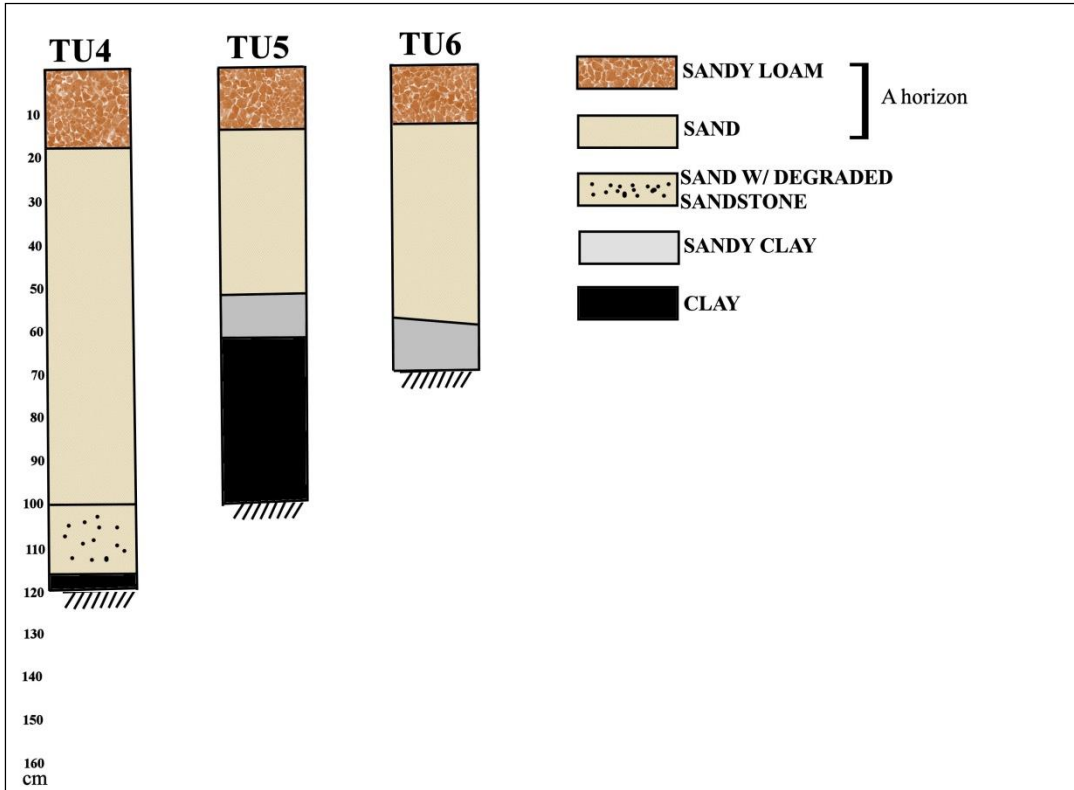


Figure 5. TU4 was within the artifact concentration, while TU5 and TU6 were outside the artifact concentration to the south and north, respectively.

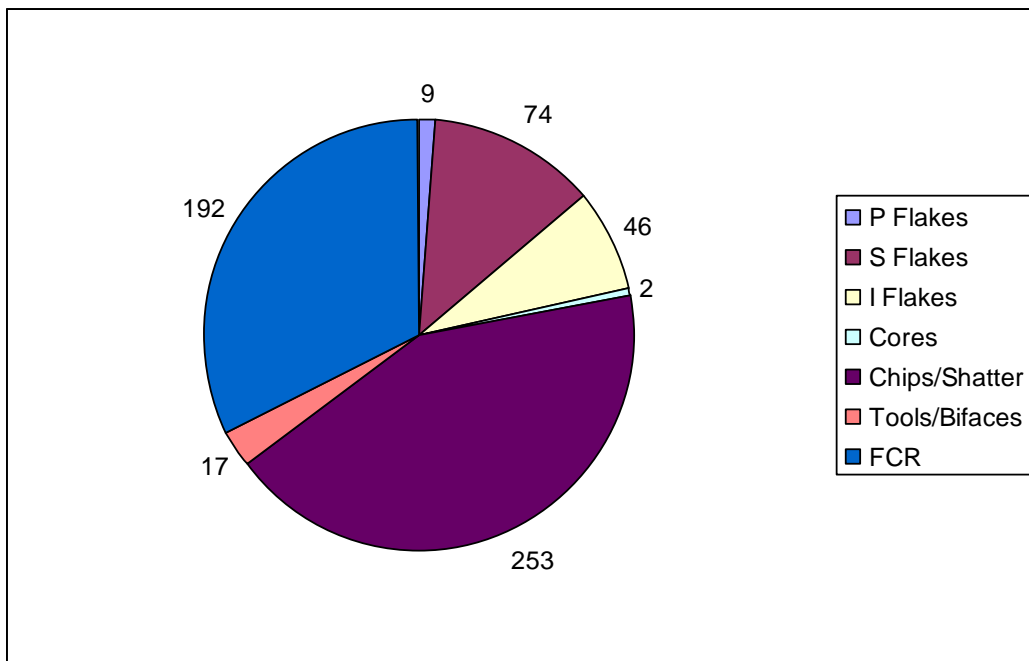


Figure 6. Pie chart shows distribution and quantity by artifact type in test units (N = 593).

Table 1. Measurements for tools and bifaces recovered from 41TR219.

Provenience	Type	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Surface	Alba*	19.5	6+	3.5	0.6+
TU3, L8	LP biface	30	18	5.5	3.3
TU3, L11	Yarbrough*	n/a	27+	10	4.4+
TU4, L2	Gary	42	18	6	3.9
TU4, L10	Biface	66	26	19.5	25.1
TU9, L3	Gary	43.5	17.5	5.5	3.7
TU3, L8	Biface base*	n/a	20+	5	1.2+
TU3, L2	Biface base*	n/a	21.5+	8	2.9+

\* broken tools, + incomplete measurement

Of the 384 pieces of lithic debris recovered from the nine test units, 69.09% were quartzite, 30.40% were chert, and 0.5% was quartz. Within the unmodified lithic debris, 18.59% were secondary flakes, while 11.30% were interior flakes. Only 2.26% were primary flakes, while 63.06% was categorized as primary, secondary, interior chips or lithic shatter. Within the assemblage, there were two cores, which were recovered from TU2 level seven, and TU3 level five.

Fire-cracked rock was recovered primarily from two locations; the first location was in Feature 1 which was in TU7 and TU8, and the second location was in TU3 (Table 2). There was also a thin scatter in TU2, TU4, and TU9. The 192 pieces of fire-cracked rock consisted primarily of sandstone (66.66%) with the remainder being quartzite cobbles (33.33%). In TU3, the fire-cracked rock was spread through levels four and twelve, and there was no clear surface or organic material associated with the fire-cracked rock. Bioturbation is the most likely factor for this distribution of fire-cracked rock in TU3; several pieces of quartzite fire-cracked rock were located on the surface adjacent to TU3 and TU2 in the back dirt of armadillo burrows. The total weight of the fire-cracked rock recorded in the test units was 5452.2 gm; 2925.7 gm were recovered from Feature 1, while 1965 gm were distributed throughout TU3.

Soil samples were collected at the beginning of each level from the NW corner for each test unit. Soil from TU3, TU6, and Feature 1 was examined for the sand grain size, the type and size of pebbles, the soil Ph was determined for each level, and the samples were wet screened for artifacts. In TU3 and 6, the soil was very fine sand throughout, while the upper three levels in TU3 contained some silt. The pebbles were primarily sandstone and hematite, with quartzite and quartz pebbles in the lower levels of the test units. Pebble size ranged from 0.5 to 4.0 cm. The very fine sand and small pebble size throughout all levels most likely contributed to the vertical movement of artifacts within the soil. When the Ph of the soil was measured in TU3, the soil was neutral in the upper two levels, then very slightly acidic between levels three and thirteen. In level fourteen, the soil became medium acidic. In TU6, the upper three levels were neutral, with levels four through six very slightly acidic, and level seven was very strongly acidic. The acidity to the soil is consistent with other terrace sites in sandy soils, and is not conducive to the preservation of organic material (Ferring 1992:14). During wet screening, two interior quartzite chips and one interior quartzite flake were located in levels four and eleven of TU3. These lithics were generally smaller than those recovered during dry screening in the field. Due to the similarity of soils between TU1-TU6 and TU9, and the paucity of artifacts located within the soil samples, the soil collected from the other test units was not analyzed. Vertical movement of the artifacts is due to several factors. The fine sandy loam allowed for the heavier artifacts to “settle”, while smaller, lighter artifacts remained in the upper levels.

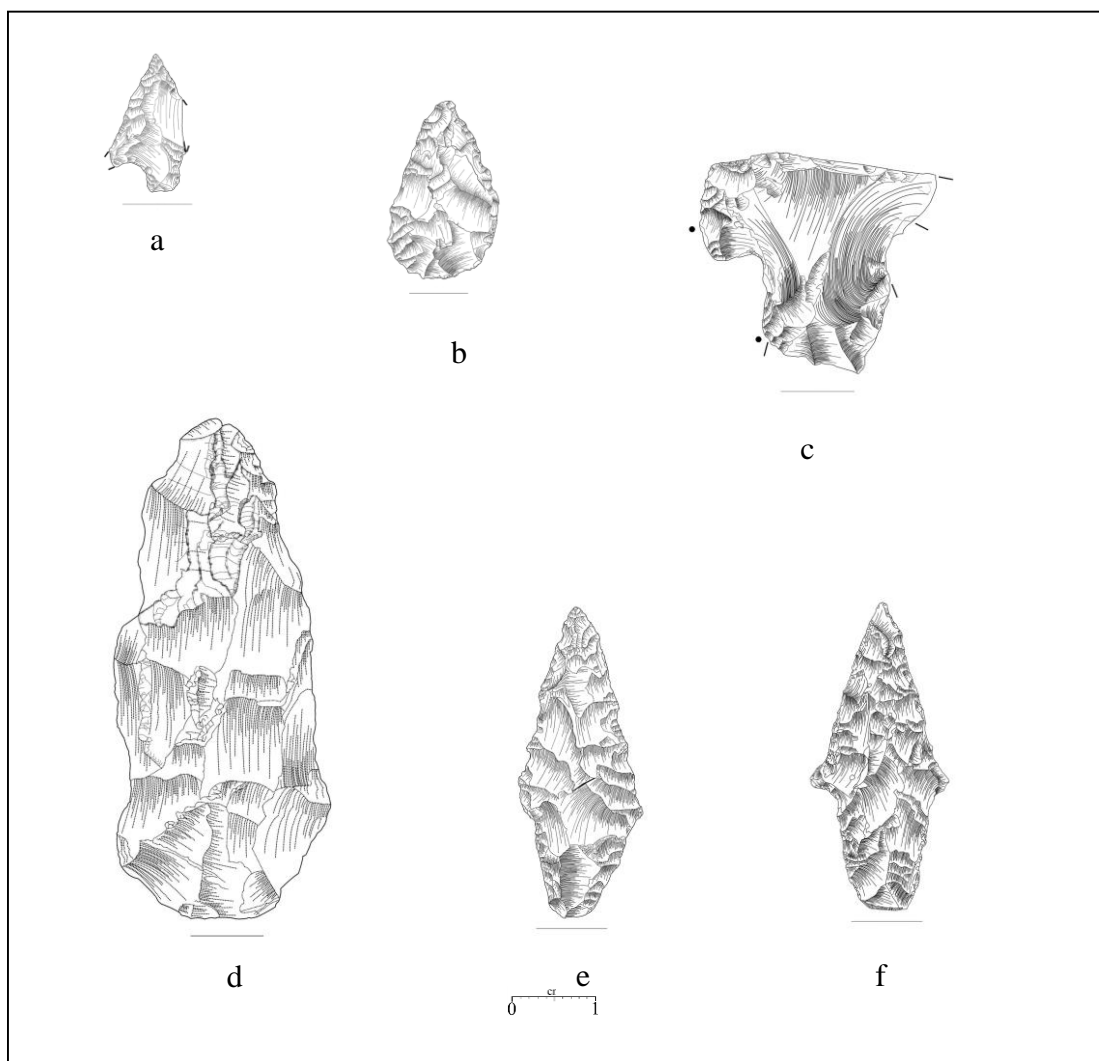


Figure 7. Tools, bases, and complete bifaces recorded at 41TR219; a) Alba on surface, b) Late Prehistoric biface in TU3, c) Yarbrough base in TU3, d) Archaic biface in TU4 e) Gary point in TU9 and f) Gary point in TU4. Illustrated by Lance K. Trask.

The soil collected from Feature 1 was floated to determine if there macrobotanical remains present. No seeds or other botanical remains floated, and less than 10 sand-grain size pieces of charcoal were located in the foam that floated. These pieces of charcoal were too small for radiocarbon testing.

Faunal remains were located in the upper levels of TU2, TU5, and TU6; in TU2 level three there was a small mammal vertebrae, in Level four there was half of a mandible to a Cotton Rat (*Sigmodon hispidus*); and the maxilla of a Virginia Possum (*Didelphis virginiana*) (Davis and Schmidly 1994) was discovered in TU 6, Level 1. In TU5 there was a right metacarpal of a cow (*Bos* sp. indet.) (Tawater, personal correspondence 2008). The faunal remains were determined to be modern since they were in the upper levels of loamy sand which has a neutral Ph.

Table 2. Weight\* of fire-cracked rock in each test unit (TU) and Feature 1 (F1).

Level (cm)	TU1	TU2	TU3	TU4	TU5	TU6	F1 (TU7/8)	TU9
0-10	0	54.4	0	0	0	0	0	0
10-20	0	0	0	0	0	0	0	0
20-30	0	0	0	8.7	0	0	0	5
30-40	0	50.6	63.9	0	0	0	0	0
40-50	0	102.8	53.8	118.9	0	0	11.7	8.8
50-60	0	0	0	33.6	0	0	2914	0
60-70	0	95.7	58.6	0	0	0	0	17.6
70-80	0	0	47.9	0	0	0	0	0
80-90	0	0	1284.8	0	0	0	0	0
90-100	0	6.1	177.6	40.8	0	0	0	0
100-110	0	0	0	0	0	0	0	0
110-120	0	0	278.4	0	0	0	0	0
120-130	0	0	0	0	0	0	0	0
130-140	0	18.5	0	0	0	0	0	0
Totals	0	328.1	1965	202	0	0	2925.7	31.4

\* measured in grams

## CONCLUSIONS

Testing revealed a low density multi-component site which appeared to be sparsely occupied during the Late Archaic and Late Prehistoric. The lithic assemblage at site 41TR219 is most likely associated with a seasonal campsite located adjacent to the tributary stream; there were less than 700 artifacts in the shovel tests and test units and this is a low density per unit/level. No ground stone tools were in the assemblage, which indicates that plant processing was not occurring at the site. In addition, the majority of lithic debris consisted of secondary chips and flakes with only two cores and nine primary flakes, which suggests that unfinished tools were brought to the location but not manufactured from local sources (Skinner 1971:162). The tools recorded were a Late Prehistoric Alba point on the surface, a Gary point in level two of TU4, a Gary point in level three of TU9, and a Late Prehistoric biface in level eight of TU3, which are evidence that the site was occupied during the Late Archaic and Late Prehistoric, yet the points were mixed stratigraphically. Quartzite Ogallala gravels were identified on the south slope of the intermittent tributary during the initial survey, but it is not certain that these gravels were being quarried locally.

The site is located in alluvial/colluvial soils adjacent to an intermittent tributary of Big Bear Creek. Due to the vertical distribution of diagnostic lithics, and the lack of distinct features in the trenches and test units within the artifact concentration, it appears that the site center has been disturbed by bioturbation. This interpretation is further evidenced by the presence of rodent and armadillo burrows, and by the abundance of roots found.

No occupation surfaces were identified nor were significant organic materials recovered during testing and there was no bone associated with the artifacts, suggesting either that no hunting or animal cooking activities were occurring or that the soil was too acidic for organic preservation. In TU2 and TU3, the fire-cracked rock was widely distributed within the test units, which is further evidence of bioturbation. The Late Archaic Gary point and a Late Archaic Yarbrough base were widely spread in TU3, between 10 and 110 cm, while a Late Prehistoric biface was at 80 cm in TU3. The burned rock concentration (Feature 1) appears to have been an

isolated event, and contained no cultural material within which to identify the function of the concentration. Burned rocks in small concentrations such as in Feature 1 and scattered throughout TU3 could be the remains of stone boiling (Lorrain 1973b:2) or evidence of small hearths. The soil collected from Feature 1 contained no datable organic material or charcoal.

The Armadillo site is adjacent to a second-order tributary similar to Late Archaic/Late Prehistoric site distributions discussed by Prikryl (1990:74, 79) in the Lower Elm Fork drainage. Sixty-five percent of Late Archaic sites are situated on first-order tributaries, at their confluence with first- and second-order tributaries, or on second order tributaries (Prikryl 1990:74).

Late Archaic and Late Prehistoric site types and artifact densities are highly varied, yet on DFW airport property two previously recorded sites have comparable lithic densities to that found at the Armadillo site. The first site is a multicomponent Late Archaic and Late Prehistoric site (41TR21) which is located on a terrace above Big Bear Creek (Ferring 1992). The second site is an Archaic site (41TR63) which was recorded at the confluence of Little Bear and Big Bear creek (Lorrain 1973a).

Site 41TR21 had over 1,400 lithic artifacts recorded from fifteen test units placed in two areas (Ferring 1992). The lithic assemblage recovered from the test units in area B (N=700) were similar to 41TR219, in that the majority of the artifacts were quartzite, there were few cores or bifaces, few diagnostic tools, and a high percentage of interior and secondary flakes. The majority of artifacts collected from Area A were fire-cracked rock. Interestingly, the total weight of fire-cracked recorded at 41TR21 is less than the weight of fire-cracked rock recorded at 41TR219, which was 5452.2 g. The vertical stratigraphy appears to be better at 41TR21 and Ferring suggests that 41TR21 may have been intensively occupied or there were numerous occupation periods during the Late Archaic and the Late Prehistoric (1990:13). However the density is similar to that from Armadillo site.

Approximately 1,900 lithic artifacts were recorded at site 41TR63, which was located northwest of the confluence of Little Bear and Big Bear creeks. The majority of the artifacts were from the surface where a large number (27) of bifaces or biface fragments was collected. Several of the biface fragments appeared to be unfinished Late Archaic dart points. The number of bifaces is a much higher density than at 41TR219, yet a larger area was surveyed and tested at 41TR63. Quartzite was the predominant material, and the 414 artifacts recorded in the twenty-three 2 1/2' x 1 2/3' test units were interior flakes or secondary flakes. A thin lens of charcoal was present in the test units which were excavated to the red clay at less than a foot deep. This assemblage was similar to DFW as well, in that the majority of artifacts were quartzite and few cores were present. Fire-cracked rock was not weighed during these investigations.

Overall, the Late Archaic to Late Prehistoric sites recorded on DFW property appear to represent brief, small-group, reoccupations based on the low artifact densities recorded at sites 41TR21, 41TR63, and 41TR219 and on the retouched tool assemblages, the general absence of hearths or other features, and the gradual aggradations of the sandy matrices in which occupation surfaces have not been preserved. These sites are somewhat similar to floodplain sites recorded in the within the floodplain of the West Fork and Denton Creek but they appear to have functioned more as temporary camps where tools were manufactured rather than where hunting and processing of aquatic animals occurred. Further research needs to focus on the locating and thorough testing of these site types, which appear to be situated on terrace deposits along first- and second-order drainages located in the Eastern Cross Timbers.

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## **A BROKEN SLATE GORGET FROM THE SISTER GROVE CREEK SITE (41COL36), COLLIN COUNTY, TEXAS**

**Wilson W. Crook, III**

### **INTRODUCTION**

Part of a slate rounded bar gorget has been recovered in North Central Texas from the Sister Grove Creek (41COL36) site in Collin County. This marks the second known occurrence of a gorget constructed from slate from sites of the Late Prehistoric period along the East Fork of the Trinity and its tributaries. Origin of the slate material is from outside the region of the East Fork and as such, the artifact likely represents a valued trade item. Other parts of the gorget were searched for but not found. Based on the location of the find adjacent to the prominent rim-and-pit structure at the Sister Grove Creek site, the artifact was at one time probably associated with the burial of a high status individual. This paper describes the artifact in detail and puts on record further evidence of contact between the Late Prehistoric populations living along the East Fork and peoples outside of the region.

### **THE SISTER GROVE CREEK SITE (41COL36)**

The Sister Grove Creek site is located in central Collin County about 6.5 km (4 miles) west of the town of Farmersville. The site lies on a small rise immediately west of Sister Grove Creek, a tributary of the East Fork of the Trinity. The site was explored by members of the Dallas Archeological Society in the 1950's and 1960's but due to lack of cultivation over the site, few diagnostic artifacts were recovered. The site's archeological potential was reviewed during a survey of the area prior to the expansion of Lake Lavon (Lorrain 1965). Due to the presence of a large, undisturbed Wylie Phase "rim-and-pit structure", the site was designated for future excavation. This work was undertaken by Mark Lynott of SMU in the summer of 1974 (Lynott 1975a, 1975b). The primary focus of the excavation was on determining the purpose of the rim-and-pit structure but parts of the rest of the site were also tested. While Lynott did not unambiguously determine the purpose of the pit structure, he did excavate a number of burials and more importantly, obtained nine radiocarbon dates which greatly added to framing the occupational horizon of the Late Prehistoric along the East Fork and its tributaries (Lynott 1978). Enlargement of the Lavon Reservoir in 1979 inundated the site halting all archeological investigation.

The extended drought over the period of 2011-14 has significantly affected the lakes along the East Fork of the Trinity with both Lake Lavon (Collin County) and Lake Ray Hubbard (Rockwall and Dallas Counties) resulting in water levels being well below conservation levels (National Weather Service, 2014). As a result, most of the Sister Grove Creek site, including the area of the rim-and-pit structure, become re-exposed (Figure 1).



Figure 1. Prominent Rim-and-Pit Structure at the Sister Grove Creek (41COL36) Site, Collin County, Texas looking west. Colleague Mark Hughston is standing in the center of the pit depression with the remaining rim to the left. The gorget fragment was found on the surface immediately to the right of the photo adjacent to the pit structure.

Over 30 years of wave action had severely deflated the site including eroding the northern rim section of the rim-and-pit structure (see Figure 1). This erosion has exposed a large number of artifacts both around the edges of the pit as well as elsewhere throughout the site. From December of 2013 through August 2014, the authors periodically visited the site to make assessments of the cultural features still present and to photograph the rim-and-pit structure. The broken fragment of the slate gorget was found in the area adjacent to the eastern rim of the pit.

### **ENGRAVED SLATE GORGET**

The recovered artifact was carefully cleaned using water and a firm brush. A photograph of the artifact is shown below in Figure 2. The artifact is constructed of fine-grain slate and is dark gray (GLE Y1- 2.5/N) in color. It appears to have originally been ovoid in shape, but has been broken at least twice. The lower edge (see Figure 2) has been re-ground smooth. Length of the remaining fragment of the artifact is 55 mm along the lower edge by 52 mm in width, and ground and polished to form a thin edge (see upper part of the artifact in Figure 2). Maximum thickness is 6 mm near the center of the artifact; less than 4 mm at its edge. Weight is 14.2 grams. The gorget appears to have originally been more ovoid in shape with probably two perforations drilled along a centerline. Sometime during its lifetime, the artifact was broken and

re-smoothed along the break in order to maintain its usefulness. The perforation present may have been part of the original design or it could have been drilled post-breakage. Diameter of the perforation is approximately 3 mm and has clearly been drilled biconically.



Figure 2. Fragment of Slate Gorget from the Sister Grove Creek Site (41COL36).

There are a number of faint linear lines that occur parallel to each other across both the obverse and reverse faces of the gorget. It is unclear if these are intention or are simply small bedding planes within the slate itself. A summary of the physical measurements of the artifact is presented in Table 1.

Gorgetts are a rare but consistent component of the lithic assemblages from sites along the East Fork and its tributaries (Crook and Hughston 2008, 2015). In total 28 have been recorded including five gorgets from Butler Hole (41COL2), one from Branch (41COL9), 12 from Upper Farmersville (41COL34), two from Sister Grove Creek (41COL36), three from Upper Rockwall (41RW2), and five from Gilkey Hill (41KF42/41DL406) (Harris et al. 1948; Harris and Suhm 1963; Crook and Hughston 2009; Crook 2011). Without exception, these artifacts are ovoid in shape and have two drilled perforations; the latter are positioned either along a centerline or near

the top of the gorget. Both styles would have been worn horizontally across the chest. Lithic material varies from sandstone to limestone to banded limonite to slate. All are polished to one degree or another. Other than the two perforations, the only gorget with any markings on it was one found in 2013 from the Upper Rockwall site (Skinner et al. 2014).

Table 1. Measurements / Features of Upper Rockwall Engraved Slate Gorget

Major Features	Measurements / Observations
Shape	Ovoid; rounded bar gorget
Edges	Polished from center on both faces to create a thin edge
Length	55.0 mm
Width	52.0 mm
Thickness	6.0 mm (maximum); 4.0 at edge
Weight	14.2 gm
Color	Dark Gray (GLE Y1-2.5/N)
Diameter Perforation	3.0 mm
Decoration	Faint parallel lines running left-to-right across the face of the gorget; may represent bedding planes in the slate as opposed to purposefully engraved features

## CONCLUSIONS

As mentioned above, the Sister Grove Creek gorget fragment described herein is made of a fine-grained sandy-slate. The nearest outcrops of slate to the East Fork are the Central Mineral Region of Texas (Llano and Burnet Counties) and the Ouachita fold belt in eastern Oklahoma and western Arkansas. With regards to the former, much of the slate found in central Texas is really not true slate but rather siliceous argillite and/or graphitic schists that grade into slate (Sellards and Baker 1934). Conversely, in southeastern Oklahoma, Paleozoic shales (Silurian Missouri Mountain Formation) have been intensely folded and metamorphosed into fine-grained, high quality slates. This is especially true in east-central McCurtain County where slate outcrops up to 5 meters in thickness have been exploited both in Prehistoric and Historic times (Davis 1960). Distance from the slate outcrops to the Sister Grove Creek site is approximately 210 km (130 miles).

Lintz and Zahai (1985) in their study of ground stone gorgets in Oklahoma have noted a number of archeological occurrences, especially over the eastern part of the state. Gorgets have been found constructed from a number of raw materials, but slate and silicified shales seem to be preferred toolstone. In particular, there is some indication that a specific gorget manufacturing area may have existed in parts of McCurtain County (Don G. Wyckoff, personal communication, 2013; Wyckoff 1966). Typically a preform would be roughly shaped by percussion using a hammerstone and then finished by polishing and grinding (Lintz and Zahai 1985). Gorgets that were broken were commonly salvaged by retaining the larger remaining portion and adding new perforations as needed (Lintz and Zahai 1985). Similar slate gorgets have been found in a few Caddo sites in East Texas (Walters 2011).

A partial engraved slate gorget was recovered from the Upper Rockwall site in Rockwall County (Skinner et al. 2014). However, the material was of a much higher quality slate as opposed to the relatively high sand content in the material of the Sister Grove Creek artifact. Slates from southeastern Oklahoma do vary in terms of quality with the finer-grain material preferentially selected for use by aboriginal craftsmen (Don G. Wyckoff, personal communication, 2013).

Trade between the East Fork and the Caddo areas both to the east and southeast is well established (Lynott 1975; Crook and Hughston 2008, 2009, 2015). Likewise, trade between various Caddo areas as well as between Caddo areas and the Mississippian areas to the east is also well known (Brown, et. al. 1990; Perttula 1992; 2002). Objects of ornamentation and prestige such as beads, gorgets, etc. were major items of this trade (Perttula 2002; Schambach 1995; 2001; 2002).

Lastly, the presence of the gorget in the area adjacent to the rim-and-pit structure at the Sister Grove Creek site suggests that it could have been part of a burial complex. Crook and Hughston (2008, 2015) have shown that high status individuals were frequently buried within the rims of the pit structures along the East Fork. Contrary to what has been previously supposed about the Late Prehistoric of the East Fork (Stephenson 1952; Bruseth and Martin 1987), many of these burials do contain some grave furniture items. A high prestige item such as a gorget must have had considerable significance as an object of power and status, and as such, would have likely been buried with its owner upon his death.

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## **A LARGE SPINDLE WHORL FROM THE UPPER FARMERSVILLE SITE (41COL34), COLLIN COUNTY, TEXAS**

**Wilson W. Crook, III**

### **INTRODUCTION**

Recently the author, in conjunction with Mark D. Hughston, completed a detailed re-examination of the Late Prehistoric of the East Fork of the Trinity (Crook and Hughston 2015a). As a part of this study, we made repeated public requests to examine private collections from the area in order to have as complete an understanding of the East Fork artifact assemblage as possible. This request resulted in the families of several deceased local avocational archeologists offering their relatives' collections to us for purchase. After some discussion about this, we ultimately decided that it was better for the collections to remain together and studied than for them to be broken up and sold on the market. One such collection we acquired belonged to Mr. Raymond Gooch of Farmersville, Texas. Within this collection was a large, complete perforated circular ceramic sherd which was recognized as a spindle whorl. This marks the third such artifact recorded from the East Fork and the only one which is complete. This paper thus serves to describe the spindle whorl and compare it to similar ceramic artifacts recently reported from the Sister Grove Creek (41COL36) and Hogge Bridge (41COL1) sites (Crook 2014; Crook and Hughston 2015b).

### **THE UPPER FARMERSVILLE SITE (41COL34)**

One of the largest occupations along the East Fork of the Trinity River is at the Upper Farmersville site (41COL34). The site is also sometimes referred to as the "Dugger site" after its land owners. The Upper Farmersville site was initially described in a short paper by Harris in 1948. The site has been the subject of a number of subsequent excavations that typically have focused on one or more singular features (Hanna 1940; Harris 1945; 1947; 1948; Dawson and Sullivan 1973; Crook 1984a; 1984b; 1984c; Crook and Hughston, 1986; Crook 2009). A comprehensive site description was published by the authors in 2009 (Crook and Hughston 2009).

The Upper Farmersville site is located in northeastern Collin County, about 8 km (5 miles) northwest of the town of Farmersville. The site itself lies on either side of Farm Road 2756 immediately southwest of the confluence of Pilot Grove and Indian Creeks (Figure 1, Station 2). The site covers approximately 8 Ha (20 acres) on the floodplain 100-200 meters west of Pilot Grove Creek. The primary datum of the site is at an elevation of approximately 500 feet (152 meters) above sea level.

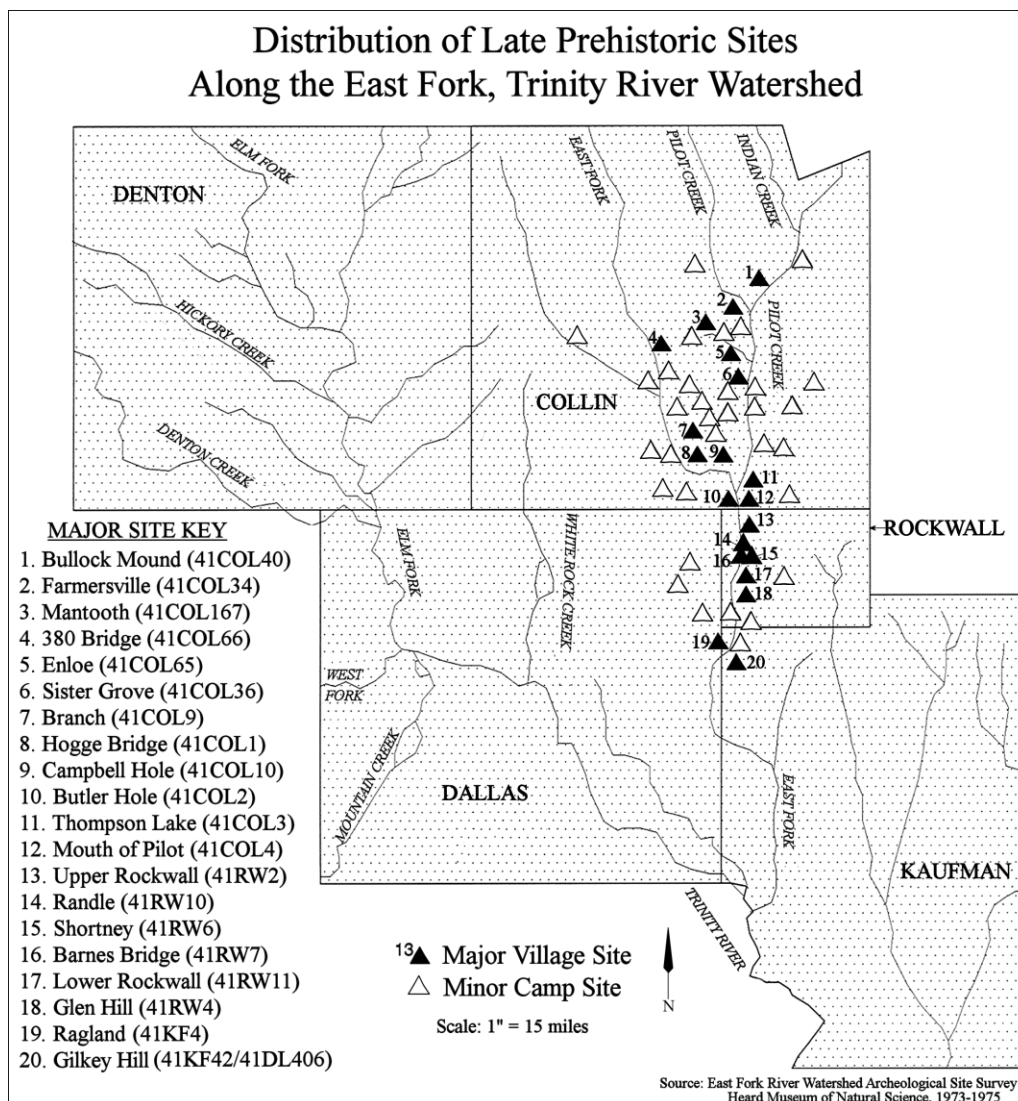


Figure 1. Distribution of the Late Prehistoric sites along the East Fork of the Trinity and its tributaries. Major sites are identified by solid black triangles and identified by name; minor seasonal campsites are shown as unfilled triangles.

The Upper Farmersville site is divided in half by Farm Road 2756. The original landowners, the Warren Dugger family, cultivated the section north of the road leaving the southern part of the site largely undisturbed. This untouched southern portion of the site contained remnants of a large, characteristic East Fork rim-and-pit structure. The author began a study of the site in 1971 and continued periodic work until the mid-1970's, with a special emphasis on the intact portion of the site south of Farm Road 2756. Enlargement of the Lavon Reservoir in 1979 resulted in the raising of Pilot Grove Creek and the inundation of part of the site. A major portion of the remaining southern portion of the site was removed as fill material for the construction of a new elevated portion of Farm Road 2756. The site is no longer available for further investigation.



## THE SPINDLE WHORL

The spindle whorl was carefully cleaned using water and a firm brush and then hardened in a bath of diluted muriatic acid. The artifact appears to have been constructed from the base of a flat-bottomed, grit-tempered vessel. Microscopic examination of the exterior of the sherd shows it to be constructed from a dark sandy paste, the “grit” being inherent to the clay matrix and not the product of a later temper addition. Minor shell is also present as temper. No decoration is present on the sherd and based on its overall thickness, color and composition, it is tentatively identified as an un-named shell-temper ceramic that is known to come from East Texas and southern Oklahoma along the Red River. Plain shell-tempered ceramics from Caddo sites along the Red River have generally not been named as most shell-tempered vessels are almost always decorated (Timothy K. Perttula, personal communication, 2014). Plain shell-tempered pottery from the Lake Texoma area (Haley’s Point site, 34MA15) have been described as Woodward Plain, *var. Haley’s Point* (Rohn 1998). The Woodward Plain type as defined is similar to the sherd described herein (Freeman and Buck 1960).

Color of the spindle whorl varies from dark blueish-gray (GLEY 2 4/1) on the obverse face to very pale brown (10YR 7/4) to reddish-brown (2.5YR 5/4) on the reverse face. Minor fire mottling from use as a cooking vessel is present on both faces. The sherd has been intentionally ground into a general circular shape with a single perforation drilled through its center. Dimensions of the artifact are 53.0 mm by 48.1 mm. Thickness is fairly uniform across the sherd at about 8.1 mm, indicating that it likely came from the base of a flat-bottomed vessel. Dimensions of the single perforation are 6.5 mm by 5.9 mm. The size and shape of the artifact is consistent with similar tools that have been identified as spindle whorls from Caddo sites across East Texas (Timothy K. Perttula, personal communication, 2014). It is impossible to determine if the spindle whorl was constructed at the Upper Farmersville site from a broken vessel or was an item of exchange. Photographs of both the obverse and reverse sides of the artifact are shown in Figures 2 and 3.

## CONCLUSIONS

Spindle whorls are a consistent, albeit minor artifact from many East Texas Caddo sites, especially those where a thousand or more ceramic sherds have been recovered (Timothy K. Perttula, personal communication, 2014). Webb (1959) reported a large number of spindle whorls from the Belcher Mound site in Caddo Parish, Louisiana. Most were constructed from lower side-wall or basal pottery sherds, and were typically 50-63 mm in diameter with a single central perforation. Similar artifacts were reported from the George C. Davis site (41CE19) in Cherokee County, Texas (Newall and Krieger 1949). The artifacts recovered from the Davis site varied from 50-70 mm in diameter. Perforated ceramic disks have also been reported from a number of sites throughout the Caddo occupational area (Perttula 1992, 2005; Perttula et al. 2011). The artifact described herein fits well within the observed dimensions of spindle whorls from East Texas Caddo sites.



Figure 2. Obverse face of the ceramic spindle whorl recovered from the Upper Farmersville site (41COL34), Collin County, Texas.



Figure 3. Reverse face of ceramic spindle whorl recovered from the Upper Farmersville site (41COL34), Collin County, Texas.

The Upper Farmersville spindle whorl described herein is roughly the same size as the one reported from the Hogge Bridge site (Crook and Hughston 2015b). The spindle whorl found at the Sister Grove Creek site was estimated to have been about 72-73 mm in diameter, about 35 percent larger than the one from Upper Farmersville.

Two radiocarbon dates of A.D. 1300 +/- 30 (Beta-376327) and A.D. 1370 +/- 30 (Beta-376328) have been obtained from features within the rim-and-pit structure at the Upper Farmersville site (Crook and Hughston 2015c). These dates are within the range of shell-tempered ceramics common in East Texas Caddo sites after A.D. 1300 and adds further evidence that the Late Prehistoric inhabitants of the East Fork were in contact with various Caddo groups to the east and northeast.

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# **X-RAY FLUORESCENCE RE-ANALYSIS OF FIVE OBSIDIAN ARROW POINTS FROM THE BRANCH SITE (41COL9), COLLIN COUNTY, TEXAS**

**Wilson W. Crook, III**

## **INTRODUCTION**

During the period of 2012-13 the author recovered a number of obsidian artifacts from the Late Prehistoric Branch site (41COL9) in central Collin County, Texas. Over the same period and into 2014, all 15 of these artifacts were subjected to and X-Ray Fluorescence (XRF) analysis in order to attempt to determine their most probable source area. Ten of these pieces were sourced to the Jemez Caldera area of North Central New Mexico (El Rechuelos, Valles Rhyolite, Cerro del Medio, Cerro Toledo) which is consistent with the majority of the Ancestral Puebloan ceramics recovered from the district as well as the probable source for three pieces of worked turquoise (Crook 2013, 2015). However, five arrow points found in a single cache near the southern rim of the pit structure at the Branch site yielded probable source areas in Oregon and Idaho – and from areas which had previously not been reported from Texas (Burns Butte, Chickahominy and Cougar Mountain, Oregon and Timber Butte, Idaho). As a result, Chris Lintz, who maintains an extensive database of over 1,500 obsidian artifacts from the Great Plains and Texas, requested that the five artifacts be re-analyzed and sourced by a firm with an extensive Pacific Northwest/West Coast obsidian database. This re-analysis was accomplished on November 10, 2015 in the laboratory of the Gault School of Archeological Research at Texas State University (Prehistory Project) and the raw data was then sent to Dr. Craig Skinner at the Northwest Research Obsidian Studies Laboratory in Corvallis, Oregon for sourcing. This paper thus serves to record the results of the analysis and the new sourcing study of the five obsidian arrow points.

## **ARTIFACT DESCRIPTION**

The five obsidian arrow points which are the subject of this study can be seen in Figure 1. Two of the points were found on the surface and almost in direct association with a cache of shell beads and two small turquoise beads. The other three arrow points were found on the surface within 30 cm of the cache. While not in direct association with the beads, their close proximity coupled with the fact that they were constructed from a toolstone not native to the area, strongly suggests that they were also originally part of the cache.

As can be seen in Figure 1, with the exception of one tri-notched triangular arrow point (a point type common to sites of the Pueblo II through Pueblo IV periods), the remaining four points are of types typical to North Central Texas (Alba, Catahoula). This suggests that the aboriginal inhabitants of the Branch site may have procured either unworked obsidian nodules or large flakes and subsequently manufactured the arrow points locally in styles they were familiar with as opposed to trading for completed points.



Figure 1. Branch site obsidian artifacts (Top Row, right; Middle Row, all 5 points; Bottom Row, all 3 worked flakes). The five points which are the subject of this study are Top Row, far right (41COL9-4); Middle Row – first four points (Left-to-Right: 41COL9-1, 41COL9-3, 41COL9-2, 41COL9-5). The first three points on the Top Row are from the Upper Farmersville site (41COL34).

### X-RAY FLUORESCENCE ANALYSIS

The five obsidian arrow points were subjected to a trace element geochemical analysis using a portable X-Ray Fluorescence spectrometer (pXRF) in order to attempt to determine their provenance. The analysis was conducted using a Bruker Tracer III-SD handheld energy-dispersive X-Ray Fluorescence spectrometer equipped with a rhodium target X-Ray tube and a silicon drift detector with a resolution of ca. 145 eV FWHM (Full Width at Half Maximum) at 100,000 cps over an area of 10 mm<sup>2</sup>. Data was collected using a suite of Bruker pXRF software and processed running Bruker's empirical calibration software add-on. Analyses were conducted on November 10 of 2015 at the laboratory of the Gault School of Archeological Research (Prehistory Project) located at Texas State University in San Marcos.

The obsidian artifacts were measured at 40keV, 36.2μA, using a 0.3 mm aluminum/0.15 copper filter (0.02 titanium filter for turquoise) in the X-Ray path, and a 300 second live-count time. Two measurements were taken from each artifacts and averaged. Peak intensities for K $\alpha$  peaks of manganese (Mn), iron (Fe), zinc (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Zr), and niobium (Nb) and the La peak for thorium (Th) were calculated as ratios to the Compton peak of rhodium and converted to parts-per-million (ppm). The raw data, as collected in parts-per-million, were then sent to Dr. Craig Skinner of the Northwest Research Obsidian

Studies Laboratory and matched against his extensive obsidian trace element database for Oregon, Idaho, Wyoming, Utah, Nevada and Northern California.

XRF analyses of the nine obsidian arrow points from the Branch site are presented in Table 1. The five points are listed as 41COL9 – 1 through 5. The probable source areas are those matched by Dr. Craig Skinner of the Northwest Research Obsidian Studies Lab. Matches for points 41COL9-1, 41COL9-2, 41COL9-4 and 41COL9-5 have a high of certainty with regards to the source area. The suggested match for point 41COL9-3 (Owyhee, Idaho) can only be listed as “probable” as the match is not as clear as the other four points.

Table 1. X-Ray Fluorescence Trace Element Re-Analysis of Five Obsidian Arrow Points from the Branch Site (41COL9), Collin County, Texas

Artifact	Mn (ppm)	Fe (ppm)	Rb (ppm)	Sr (ppm)	Y (ppm)	Zr (ppm)	Nb (ppm)	Probable Source
41COL9-1 Alba-like point	265	16,555	223	45	67	433	48	Browns Bench, Idaho-Nevada-Utah
41COL9-2 Catahoula-like point	168	7,442	218	26	29	109	11	Owyhee (Toy Pass), Idaho
41COL9-3 Alba-like point	953	18,291	261	1	85	670	44	Massacre Lake/Guano Valley, Oregon
41COL9-4 Side-Notched Triangle-like point	1,130	4,004	199	17	45	61	33	Timber Butte, Idaho
41COL9-5 Catahoula-like point	265	14,587	217	48	55	417	50	Browns Bench, Idaho-Nevada-Utah

The five points from the general area of the southern pit rim all have a fairly similar trace element geochemical signature, characterized by high levels of rubidium and zirconium and generally high levels of manganese and iron. Based on reference samples in the Northwest Research Obsidian Studies Laboratory database, the closest matches all lie in southwestern Idaho (Timber Butte, Owyhee), southwestern Idaho-northwestern Utah-northeastern Nevada (Brown Bench) and southeastern Oregon (Massacre Lake / Guano Valley). These sources are slightly different than those originally proposed as source matches by Crook (2015) and Crook and Hughston (2015) from a much more limited reference database but are from the same general geographic area. Table 2 shows the originally proposed source areas and the current probable source area based on the analytical results presented above. While these areas represent an extremely long distance from North Central Texas, similar occurrences of Pacific Northwest

obsidian have been found in the Great Plains (Hoard et al. 2008), north central New Mexico (Shackley 2005), and Texas (Chris Lintz, personal communication 2015).

Table 2. Changes in Probable Source Areas of Five Obsidian Arrow Points from the Branch Site (41COL9), Collin County, Texas

Artifact	Original Probable Source Area	Current Probable Source Area
41COL9-1 Alba-like point	Burns Butte, Oregon	Browns Bench, Idaho-Nevada-Utah
41COL9-2 Catahoula-like point	Cougar Mountain, Oregon	Owyhee (Toy Pass), Idaho
41COL9-3 Alba-like point	Chickahominy, Oregon	Massacre Lake/Guano Valley, Oregon (possible source)
41COL9-4 Side-Notched Triangle-like point	Timber Butte, Idaho	Timber Butte, Idaho
41COL9-5 Catahoula-like point	Burns Butte, Oregon	Browns Bench, Idaho-Nevada-Utah

Browns Bench obsidian is found as a vitrophyre outcrop along a bench on the west side of the Salmon Falls Reservoir in Twin Falls and Cassia counties, Idaho. The source is believed to be derived from the Bruneau / Jarbidge volcanic field (Moore 2009). Owyhee (Toy Pass) obsidian is found as pebble-sized nodules that occurs as float throughout northern Owyhee County, Idaho (Moore 2009). This location is less than 100 kilometers west of Browns Bench. Timber Butte obsidian is located in southern Boise County, Idaho, again less than 100 milometers from the Browns Bench and Owyhee localities. Obsidian occurs as a band of vitrophyre cropping out and as float in Squaw Creek Valley (Moore 2009).

## DISCUSSION

Obsidian in archeological contexts in the Southern Great Plains and Texas has been documented from a number of sources including the Jemez Caldera of North Central New Mexico (Valles Rhyolite, Cerro del Medio, Cerro Toledo, El Rechuelos (“Polvadera Peak”), Rabbit Mountain); other New Mexico sources identified include Red Hill, Mule Creek, Grant Pass, Mount Taylor and No Agua. Arizona obsidians found in Texas archeological contexts include Cow Canyon and Government Mountain. There are no fewer than 10 sources from Old Mexico; three from Utah (Mineral Mountain, Black Rock Desert and Wild Horse Canyon), three from Wyoming (Teton Pass, Obsidian Cliffs and Fish Creek), and four from Idaho (Bear Gulch, Malad, Owyhee and Wright Creek) (Lintz and Prikryl 2015; Chris Lintz, personal communication 2015). In addition, recently some worked obsidian has been found in McClain County, Oklahoma which may source from a new location in Northern California (Chris Lintz, personal communication, 2015). The addition of Timber Butte and Browns Bench for three of



the five obsidian arrow points found at the Branch site adds two additional sources, albeit not very far from known Idaho locations such as Owyhee and Malad.

The presence of exotic materials in East Fork sites has been well-documented by Crook (1985, 2013, 2014a, 2014b, 2014c, 2015), Crook and Hughston (2008, 2015), Lorrain and Hoffrichter (1968), Skinner et. al (2014) and others. An established trade between the Puebloan Southwest and East Texas has long been recognized (Krieger 1946). Evidence of this trade has also been recorded from several Caddo sites in East Texas and Arkansas (Housewright 1946; Hayes 1955; Prikryl 1990; Journey and Young 1996; Early 1978; Perttula 2002) and from Toyah sites in Central Texas (Speth and Newlander 2012). These include items such as turquoise beads and pendants, worked flakes of obsidian, and various Ancestral Puebloan ceramics.

The artifacts found at the Branch site indicates that exchange items included ceramics, completed beads and pendants, exotic toolstone (both potentially as completed points and as raw toolstone), and possibly raw material for beads including turquoise, red coral and *Olivella* shell (Crook 1985, 2013). XRF analysis shows that all of the worked flakes of obsidian and four of the arrow points originate from sources in and around the Jemez Caldera in north central New Mexico. The other five arrow points are made from obsidian that comes from the Pacific Northwest (southwestern Idaho, northeastern Nevada, northwestern Utah and possibly eastern Oregon). While this seems like an extremely long distance for trade to have occurred, Pacific Northwest obsidian has been found in both north central New Mexico, the Great Plains (Duff et al. 2012; Hoard et al. 2008; Lintz and Prikryl 2015) and in Texas (Lintz and Prikryl 2015). Obsidian from Choke Canyon (Texas) and Oklahoma has also been sourced to Idaho (Baugh 1998).

Journey (1995) postulates that one reason North Central and East Texas may have been a destination for trade with the Puebloan Southwest is the presence of bois d'arc. Native bois d'arc stands are prominent within the range of the Late Prehistoric of the East Fork and its tributaries, being widespread in the northern part of the region and gradually thinning toward the south (Bush 2014). The southernmost sites along the East Fork are near the southern end of this stand, almost as if the presence of bois d'arc delineated the Late Prehistoric occupation (Journey 1995; Crook and Hughston 2008, 2015).

Crook and Hughston (2007, 2008, 2015) have demonstrated that the inhabitants of the East Fork made extensive use of bois d'arc, even to the extent of crafting a specialized stone tool (the "East Fork Biface") for working the hard wood. It is therefore plausible that some of the production of either bois d'arc bows and/or staves could have been used in periodic trade in addition to local use. As such, it is likely that the Branch site represents a major entrepot for trade into the region.

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