PLANT REMAINS FROM FLOTATION SAMPLES AT EAGLE BLUFF (41ME147) AND SITE 41ME160, MEDINA COUNTY, TEXAS

May 2011

Prepared for:
Tom Hester, Principal Investigator

Members of the
Texas Archeological Society

and

William Calvert, landowner
Hondo, Texas

Prepared by:
Leslie L. Bush, Ph.D., R.P.A.
Macrobotanical Analysis
12308 Twin Creeks Rd., B-106
Manchaca, TX 78652

This report details plant remains recovered in eight flotation samples from the Eagle Bluff Site (41ME147) and one from Site 41ME160. Four of the samples from Eagle Bluff were collected during South Texas Archeological Association (STAA) excavations in March 2007, one was collected by the author and the landowner in February 2010, and the final three samples were taken during Texas Archeological Society (TAS) investigations in June 2010. Additional samples from Eagle Bluff are available for analysis; they are currently housed at the Texas Archeological Research Laboratory in Austin. The sample from 41ME160 was collected during the 2010 TAS Field School survey of that site by Logan McNatt and Ron Ralph.

The Eagle Bluff Site is located on a high terrace above Hondo Creek in northern Medina County, Texas. Originally interpreted as a Middle to Late Archaic burned rock midden (Texas Historical Commission electronic site file 5/22/05), TAS investigations found a significant Toyah Phase occupation as well. Samples from Area 4 reported here are from the Toyah Phase while Creekbank samples are Archaic in age. Site 41ME160 is located slightly less than a kilometer southwest of Eagle Bluff, on the bank of Turkey Hollow Creek, a tributary of Hondo Creek. The site is described as a burned rock midden and lithic scatter, age unknown (Texas Historical Commission electronic site file 7/18/10).

The sites are situated near the southern edge of the Edwards Plateau where it begins to give way to the South Texas Plains (Riskind and Diamond 1988). Mean annual precipitation is approximately 28.5 inches and the average last and first frosts occur on March 6 and November 24, respectively (NFIC 1987:347). Vegetation in the southeastern Edwards Plateau today ranges from grasslands and savannas to woodlands and forests (van Auken 1988). Deciduous forests are typically found in riparian areas or on north-facing slopes, while evergreen woodlands dominated by juniper (*Juniperus ashei*) are common in upland areas. Although Ashe juniper has long been present in central Texas, frequent fires probably restricted it to rocky ridges and slopes in the past (van Auken 1988:53). Plateau live oak (*Quercus fusiformis*) occurs in evergreen woodlands and also in most deciduous forest situations. Eagle Bluff today is notable for the many large Texas persimmon trees (*Diospyros texana*) that grow along with oaks, junipers, mesquite (*Prosopis glandulosa*), red buckeye (*Aesculus pavia*) , Mexican buckeye (*Ungnadia speciosa*), and other woody species.

Methods

Flotation processing. Flotation samples were processed by manual (bucket) flotation, with light fractions skimmed off using a mesh strainer with square openings of 0.3 mm (LB and STAA samples) or decanted into mesh with openings of the same size (TAS samples). Baking soda was used as a deflocculant. Material that remained in the bottom of the flotation bucket ("heavy fraction") was poured through mesh with openings of 0.9 mm (LB and STAA samples) or 1.0 mm (TAS samples).

Recovery tests. During processing of TAS samples, 100 charred poppy seeds were added to samples selected at random to test recovery of small seeds (Wagner 1982). Three of the samples selected for analysis here contained poppy seeds. Recovery averaged 97% (Table 2). Comparable recovery rates are usually associated with Flote-Tech machines using 0.6 mm bottom mesh rather than manual systems with 1.0 mm bottom mesh (Wagner 1982; Bush 2004:60). Rates in the 80-90% range are typical for machine-assisted flotation or better manual flotation. Manual flotation at Spiro, where volunteer personnel used 1.6 mm heavy fraction mesh, averaged 49% recovery (Fritz 1989). The high recovery rate achieved in these samples is likely due not only to the excellence of the flotation crew but also the introduction of dry poppy seeds immediately prior to processing. Stirring poppy seeds into the samples and allowing them to absorb soil moisture for several hours would provide a more rigorous test. Nonetheless, the results indicate good to excellent recovery of small, carbonized botanical remains was achieved by the TAS flotation crew.

Laboratory procedures. Flotation samples were sorted according to standard procedures at the Macrobotanical Analysis laboratory in Manchaca, Texas (Pearsall 2000). Heavy fractions were examined for any carbonized plant material under a stereoscopic microscope at 7-28 X. Any such material was added to the light fraction, which was then weighed on an Ohaus Scout II 200 x 0.01 g electronic balance prior to size-sorting through a stack of graduated geologic mesh. Materials that did not pass through the No. 10 mesh (2 mm square openings) were completely sorted, and all carbonized botanical remains were counted, weighed, recorded, and labeled. Uncarbonized hackberry seeds larger than 2 mm were also counted, weighed, recorded and labeled. Uncarbonized rootlets and non-botanical material larger than 2 mm was weighed, recorded, and labeled as “contamination”. In these samples, contamination consisted of rootlets, gastropods, bivalves, caliche, and an occasional chert fragment. Materials that fell through the 2 mm mesh (“residue”) were examined under a stereoscopic microscope at 7-45 X magnification for carbonized botanical remains.

In standard macrobotanical analysis, wood charcoal fragments that fall through a 2 mm square mesh are not usually examined, since identification of such small fragments is difficult and larger fragments are usually present. This was not the case in three of the samples reported here. For these samples, identification was attempted for all wood charcoal fragments that could be snapped to reveal a clean transverse section. In the remaining samples, twenty wood charcoal fragments larger than 2 mm were selected at random for identification. Wood charcoal fragments were snapped to reveal a clean transverse section and examined under a stereoscopic microscope at 28-180 X magnification. When necessary, tangential sections were examined to confirm identification.

Botanical materials were identified to the lowest possible taxonomic level by comparison to materials in the Macrobotanical Analysis comparative collection and through the use of standard reference works (e.g., Core et al. 1979; Davis 1993; Hoadley 1990; Martin and Barkley 1961; Musil 1963; Panshin and de Zeeuw 1980). Plant nomenclature follows that of the PLANTS Database (USDA, NRCS 2010).

Results and Discussion

Uncarbonized (modern) and semi-carbonized plant material

By weight, most uncarbonized plant remains at Eagle Bluff and Site 41ME160 are roots and rootlets that are clearly modern and are not discussed further here. Uncarbonized seeds are a common occurrence on most archeological sites, but they usually represent seed rain associated with current vegetation in the site area (Bryant 1985:51-52; Keepax 1977; Miksicek 1987:231-232). In all except the driest areas of North America, uncarbonized plant material on open-air sites can be assumed to be of modern origin unless compelling evidence suggests otherwise (Lopinot and Brussell 1982; Miksicek 1987:231). In addition to the theoretical reasons for interpreting uncarbonized plant parts as modern, the taxa composition at both sites and vertical distribution of seeds at Eagle Bluff also indicate a modern origin. As shown in Tables 1 and 5, most seeds recovered in flotation samples are weedy annuals such as woodsorrel, grasses, and flatsedge. Further, the samples with the most types of seeds (6-18 taxa) were those closest to the surface; the four deeply buried samples from the creekbank averaged only two taxa each.

The semi-carbonized plant material, recovered only in samples from Area 4 at Eagle Bluff, is more difficult to interpret. Semi-carbonized material consisted of wood- and nutshell, consistent with material recovered in carbonized form. Due to the relatively recent date of the deposits in that area, archeological material may possibly have survived in semi-carbonized form. The materials are also consistent with current vegetation in the area, especially in the presence of juniper wood, and the deposits are relatively shallow (Levels 2 and 3). Semi-carbonized plant material resulting from recent fires in the area cannot be ruled out.

Carbonized plant material – Eagle Bluff

Wood charcoal. Wood was the most common plant material recovered in carbonized form with 935 fragments weighing 10.08 g recovered (Tables 2 and 3). Of the 127 specimens examined for species identification, 119 (94%) were live oak or some other oak species. Live and other oak trees are common in many situations on the Edwards Plateau, and oak is typically the most common wood in burned rock features in central Texas (Mehalchick et al. 2004). Oaks are among the most dense of all North American hardwoods, with a specific gravity ranging from 0.63 to 0.88 depending on the species (Hoadley 1990; USDA, FS 2008). Oaks produce fires of very high heat with few sparks and excellent coals. Fires made exclusively of oaks can be difficult to start, however.

Since live and other oak trees were clearly available to prehistoric inhabitants at Eagle Bluff, it is worth noting other potential uses of this plant. Acorns from live oak trees require processing to remove tannins before they are edible, but the resulting flour contains important nutrients. In many ways, acorns are nutritionally intermediate between

grains and other tree nuts. Table 4 compares proximate analyses for acorn flour, hickory nuts and yellow corn flour. Pollen tassels of live oak trees will provide a green or light brown dye (Tull 1999:362). Live oak leaves fall in great quantities during the early spring; these leaf masses are known to have been used as bedding both ethnographically and archeologically (Dering 1979; Moerman 1998:466).

Nutshell. Three fragments of carbonized nutshell could be identified only to the botanical family Juglandaceae, which in central Texas includes pecan (*Carya illinoinensis*), black hickory (*C. texana*), Arizona walnut (*Juglans major*), little walnut (*J. microcarpa*), and black walnut *(J. nigra*). All nuts in this family are high in fat, with between 59 and 72 g fat per 100 g edible nuts (USDA, ARS 2009). Grant Hall points out that the fat in nuts may have been critical to hunter-gatherers who relied on lean meat for a portion of the year (Hall 2000:109-110).

Bulb scale. One small fragment of a carbonized bulb scale was recovered n the Sheriff's Trench sample. From diagnostic epidermal tissue, this fragment was identified as a species of the genus *Allium*, commonly called wild onion or garlic.

Seed. The only ancient seed recovered was a single burned stick-tight seed from Area 4. Stick-tight fruits are burs that cling to human clothing and animal fur. It is likely the burned seed here represents a nuisance bur that was disposed of in a convenient fire.

Carbonized plant material – Site 41ME160

Wood charcoal was the only ancient plant part found in the sample from Site 41ME160, with a total of 453 wood charcoal fragments weighing 4.24 g recovered. All 20 fragments selected for identification are Plateau live oak *(Quercus fusiformis)*. As noted above oak is typically the most common wood in burned rock features in central Texas (Mehalchick et al. 2004), and it was the most common wood charcoal type recovered at Eagle Bluff.

Summary

Ancient plant material recovered in samples from Eagle Bluff consisted of wood charcoal, nutshell, an onion bulb, and a stick-tight bur. The wood charcoal, interpreted here as the remains of fuel wood, is composed primarily of oaks, especially live oak, that are especially suited to methods of cooking such as earth ovens that require long-lasting coals. Wood charcoal was the only ancient plant type recovered from Site 41ME160, and all of it was live oak. An onion bulb fragment recovered at Eagle Bluff hints at the types of plants that may have been cooked there, and nutshell fragments suggest additional food resources. A stick-tight seed is interpreted as disposal of a nuisance bur in Area 4 at Eagle Bluff.

References cited

Bryant, John A.
1985 *Seed Physiology*. The Institute of Biology's Studies in Biology No. 165. Edward Arnold, Ltd., London.

Bush, Leslie L.
2004 *Boundary Conditions: Macrobotanical Remains and the Oliver Phase of Central Indiana, A.D. 1200-1450*. The University of Alabama Press, Tuscaloosa, Alabama.

Core, H. A., W. A. Cote and A. C. Day
1979 *Wood Structure and Identification*. 2nd ed. Syracuse University Press, Syracuse, NY.

Davis, Linda W.
1993 *Weed Seeds of the Great Plains: A Handbook for Identification*. University Press of Kansas, Lawrence.

Dering, J. Philip
1979 *Pollen and Plant Macrofossil Vegetation Record Recovered from Hinds Cave, Val Verde County, Texas.* M.S. thesis, Department of Anthropology, Texas A&M University, College Station, Texas.

Fritz, Gayle J.
1989 Evidence of Plant Use from Copple Mound at the Spiro Site. In *Contributions to Spiro Archaeology: Mound Excavations and Regional Perspectives*, edited by J. Daniel Rogers, Don G. Wyckoff, and Dennis A. Peterson, pp. 65-87. Studies in Oklahoma's Past, Volume 16. Oklahoma Archaeological Survey, Norman, Oklahoma.

Hall, Grant D.
2000 Pecan Food Potential in Prehistoric North America. *Economic Botany* 54: 103–112.

Hoadley, R. Bruce
1990 *Identifying Wood: Accurate Results with Simple Tools*. The Taunton Press, Newtown, Connecticut.

Keepax, Carole
1977 Contamination of archaeological deposits by seeds of modern origin with particular reference to the use of flotation machines. *Journal of Archaeological Science* 4:221-229.

Lopinot, Neal H. and David Eric Brussell
1982 Assessing Uncarbonized Seeds from Open-air Sites in Mesic Environments: An Example from Southern Illinois. *Journal of Archaeological Science* 9:95-108.

Martin, Alexander C. and William D. Barkley
1961 *Seed Identification Manual*. University of California Press, Berkeley.

Mehalchick, Gemma, Douglas K. Boyd, Karl W. Kibler and Christopher W. Ringstaff
2004 *Shifting Sands and Geophytes: Geoarcheological Investigations at Paluxy Sites on Fort Hood, Texas*. United States Army Fort Hood Archeological Resource Management Series, Research Report No. 48.

Miksicek, Charles H.
1987 Formation Processes of the Archaeobotanical Record. In *Advances in Archaeological Method and Theory, Vol. 10*, edited by Michael B. Schiffer, pp. 211-247. Academic Press, Inc., New York.

Moerman, Daniel E.
1998 *Native American Ethnobotany*. Timber Press, Portland, Oregon.

Musil, Albina F.
1963 *Identification of Crop and Weed Seeds* Agriculture Handbook No. 219. United States Department of Agriculture, Washington, D.C.

NFIC, (Natural Fibers Information Center)
1987 *The Climates of Texas Counties*. Natural Fibers Information Center, The University of Texas at Austin, in cooperation with the Office of the State Climatologist, Texas A&M University, Austin.

Panshin, A. J. and Carol de Zeeuw
1980 *Textbook of Wood Technology: Structure, Identification, Properties, and Uses of the Commercial Woods of the United States and Canada*. 4th ed. McGraw-Hill Book Company, New York.

Pearsall, Deborah M.
2000 *Paleoethnobotany: A Handbook of Procedures*. 2nd ed. Academic Press, San Diego.

Riskind, David H. and David D. Diamond
1988 An Introduction to Environments and Vegetation. In *Edwards Plateau Vegetation: Plant Ecological Studies in Central Texas*, edited by Bonnie B. Amos and Frederick R. Gehlbach, pp. 1-15. Baylor University Press, Waco, Texas.

Tull, Delena
1999 *Edible and Useful Plants of Texas and the Southwest*. University of Texas Press, Austin.

USDA, ARS (United States Department of Agriculture, Agricultural Research Service)
2006 USDA National Nutrient Database for Standard Reference. Release 19. http://www.nal.usda.gov/fnic/foodcomp/search/. Accessed August 20, 2008.

USDA, FS (United States Department of Agriculture-Forest Service)
2008 Technology Transfer Fact Sheet. United States Department of Agriculture, Forest Service, Center for Wood Anatomy Research. http://www2.fpl.fs.fed.us/TechSheets/HardwoodNA/htmlDocs/quercussp.html . Accessed April 20, 2008.

USDA, NRCS (United States Department of Agriculture, Natural Resources Conservation Service)
2010 The PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service. http://plants.usda.gov. Accessed April 5, 2010.

van Auken, O. W.
1988 Woody Vegetation of the Southeastern Escarpment and Plateau. In *Edwards Plateau Vegetation: Plant Ecological Studies in Central Texas*, edited by Bonnie B. Amos and Frederick R. Gehlbach, pp. 43-55. Baylor University Press, Waco, Texas.

Wagner, Gail E.
1982 Testing Flotation Recovery Rates. *American Antiquity* 47: 127–132.

Table 1: Uncarbonized Seeds from Flotation Samples at the Eagle Bluff Site (41ME147)
X=present

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4	
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank	
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74	**Number of**
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd	**occurrences**
Flotation volume	6.5	3	5	3.5	0.8	1.25	0.6	1.8	
Hackberry *(Celtis* sp.)	X	X	X	X	X	X	X	X	8
Woodsorrel *(Oxalis* sp.)	X	X	X	X					4
Grass family (Poaceae)	X	X				X	X		4
Flatsedge *(Cyperus* sp.)	X	X	X						3
Panicoid grass (Panicodae)	X	X	X						3
Coneflower *(Rudbeckia/Echinacea* spp.)	X	X	X						3
Catchfly *(Silene* sp.)		X	X	X					3
Beggarticks *(Bidens* sp.)	X		X						2
Sandmat *(Chamaesyce sp.)*	X		X						2
Goosefoot *(Chenopodium* sp.)						X	X		2
Unknown	X	X							2
Velvetleaf *(Abutilon* sp.)	X								1
Croton *(Croton* sp.)	X								1
Snow-on-the-Mountain *(Euphorbia marginata)*	X								1
Spurge family (Euphorbiaceae)	X								1
Privet *(Ligustrum* sp.)				X					1

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4	
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank	
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74	**Number of**
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd	**occurrences**
Lily family (Liliaceae)	X								1
Bur clover *(Medicago polymorpha)*				X					1
Fiddleleaf tobacco *(Nicotiana repanda)*	X								1
Prickly pear *(Opuntia* sp.)	X								1
Pokeweed *(Phytolacca americana)*	X								1
Buttercup *(Ranunculus* sp.)				X					1
Vervain *(Verbena* sp.)	X								1
Number of taxa	18	8	8	6	1	3	3	1	

Table 2: Carbonized and Semi-carbonized Plant Remains from Flotation Samples at the Eagle Bluff Site (41ME147) Counts

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd
Flotation volume	6.5	3	5	3.5	0.8	1.25	0.6	1.8
Wood charcoal								
Plateau live oak (*Quercus fusiformis*)	20	17	15	14	5	20	20	4
White group oak *(Quercus* subg. *Quercus)*			2	1				
Red group oak (*Quercus* subg. *Lobatae)*			1					
Legume			1	1				
Anacua *(Ehretia anacua)*				4				
Diffuse porous hardwood	1							
Hardwood			1					
Not examined for species	139		79	67		284	239	
Carbonized nutshell								
Hickory/walnut family (Juglandaceae)	2	1						
Carbonized bulb fragments								
Wild garlic *(Allium* sp.)	1							

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd
Carbonized seeds								
Stick-tight *(Galium* sp.)			1					
Carbonized, indeterminable botanical	4		7					
Semi-carbonized wood								
Juniper *(Juniperus* sp.)			7					
Legume Fabaceae			8					
Plateau live oak *(Quercus fusiformis)*			2					
Hardwood			4					
Not examined			15					
Semi-carbonized nutshell								
Hickory/walnut family (Juglandaceae)				3				
Carbonized (introduced) poppy seeds		100	96	95				

Table 3: Carbonized and Semi-carbonized Plant Remains from Flotation Samples at the Eagle Bluff Site (41ME147)
Weight in grams

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd
Flotation volume	6.5	3	5	3.5	0.8	1.25	0.6	1.8
Wood charcoal								
Plateau live oak (*Quercus fusiformis*)	0.19	0.09	0.21	0.16	0.01	0.23	0.23	0.01
White group oak *(Quercus* subg. *Quercus)*			0.07	0.01				
Red group oak (*Quercus* subg. *Lobatae)*			0.02					
Legume			0.01	0.02				
Anacua *(Ehretia anacua)*				0.04				
Diffuse porous hardwood	0.01							
Hardwood			0.07					
Not examined for species	0.23		0.30	0.67		2.56	4.94	
Carbonized nutshell								
Hickory/walnut family (Juglandaceae)	0.01	0.01						
Carbonized bulb fragments								
Wild garlic *(Allium* sp.)	0.01							

Lot	LLB F-1	TAS-104	TAS-93	TAS-108	STAA F-1	STAA F-2	STAA F-3	STAA F-4
Area	Sheriff's Trench	2	4	4	Creekbank	Creekbank	Creekbank	Creekbank
Unit		N898 E684	N808 E630	N808 E630	27	34	71	74
Depth	40-60 cmbs	Level 7	Level 2	Level 3	115-116 cmbd	124-129 cmbd	130-135 cmbd	138-144 cmbd
Carbonized seeds								
Stick-tight *(Galium* sp.)			<0.01					
Carbonized, indeterminable botanical	0.02		0.04					
Semi-carbonized wood								
Juniper *(Juniperus* sp.)			0.07					
Legume Fabaceae			0.10					
Plateau live oak *(Quercus fusiformis)*			0.01					
Hardwood			0.01					
Not examined			0.14					
Semi-carbonized nutshell								
Hickory/walnut family (Juglandaceae)				0.04				

Table 4: Proximate analysis of three plant foods per 100 g dry weight (USDA, NDSR 2008)

	Whole grain yellow corn flour	Hickory nutmeats, dried	Acorn flour
Fat (g)	4	64	30
Protein (g)	7	13	8
Carbohydrate (g)	77	18	55
Water (g)	11	2	6
Energy (kcal)	361	657	501

Table 5: Plant Remains from a Flotation Sample at Site 41ME60
Counts (Weight in grams)

Lot	429
Unit	ST1
Levels	1-3
Depth	0-30 cmbs
Flotation volume	3.0
Wood charcoal	
Plateau live oak (*Quercus fusiformis*)	20 (0.34)
Not examined for species	433 (3.90)
Uncarbonized (modern) seeds	
Juniper *(Juniperus* sp.)	X
Hackberry *(Celtis* sp.)	X
Yellow, lenticular legume (Fabaceae 1)	X
Brown, reniform legume (Fabaceae 2)	X
Goosefoot *(Chenopodium* sp.)	X