SHOOFLY CHAPTER
ARIZONA ARCHAEOLOGICAL SOCIETY
P. O. BOX 1613
PAYSON, AZ 85547-1613

ARCHAEOBOTANY AT SHOOFLY

A Preliminary Study

by
JoAnne Miller

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PURPOSE AND METHODOLOGY

This study utilizes archaeobotanical data from the first summer field session at Shoofly Village 1) to investigate prehistoric plant use in selected proveniences and 2) to evaluate the use of 1-liter flotation samples for archaeological plant retrieval at this site. Flotation samples from Phase I test pits from three separate proveniences were examined. In addition, handpicked macrobotanicals and an accompanying flotation sample from an extention in one provenience, plus handpicked macrobotanicals only from one test pit level in a fourth provenience were examined.

All flotation samples were processed one liter at a time, using the flotation device designed and made by a member of the Mesa Museum Archaeological Society. Both the light and heavy fractions as well as the macrobotanical remains were examined microscopically. The floral remains in the heavy fraction are included in this study; the lithic and faunal remains are available for further examination.

Table I presents the botanical remains per provenience level per liter examined, identifies plant by taxa and whether charred or uncharred. Abbreviations as to plant part other than seed is listed. Numbers of taxa per liter and per two liters are totalled. Additionally, numbers of seeds/plant parts are also presented, reflecting abundance within the respective levels. Charcoal is listed but not identified by taxon.

RESULTS AND DISCUSSION

It is assumed for purposes of this study that uncharred botanical material is modern and that charred material is likely to have been modified by human agency (Keepax 1977). Acknowledgement is made of the possibility of charred recent contaminants confusing the archaeological record (Asch, Ford and Asch 1972; Minnis 1983). Uncharred material is considered in order to broaden understanding of background contamination, of subsurface disturbance processes and in monitoring excavation and flotation techniques.

Uncharred seeds and plant parts are present in all levels in proveniences 59-123, 98-125 and 134-114, with the exception of level 4 in 134-114 (neither in locus 0 nor in locus 3); however, one modern seed is found in level 5. This occurrence may be excavator-introduced or explained through bioturbation processes as indicated by snail and insect remains found in the flotation samples. The excavation notes indicate small to moderate root disturbance as well. Although the excavation summary mentions pot-hunting in this provenience, the plant remains in the test pit suggest that it was not the location of such disturbance.

The near-surface levels and presence of bioturbation factors offer probable explanations for the occurrence of uncharred seed and plant parts in 59-123 and 98-125. Both diversity and density of uncharred taxa decrease with depth. Juniperus and Arctostaphylos occur within 100 m. of the site; opportunistic

forbs such as Cheno-ams and Portulaca occur commonly in disturbed soil and do grow on the site (see vegetation survey).

When comparing charred taxa contained in the flotation samples from three levels in 59-123 (acurvilinear room), charcoal and maize occur consistently throughout, although level 3 contains roughly twice as many maize fragments as either level 2 or level 4. No other charred taxa occur in this unit, suggesting that activities producing the maize and charcoal remain constant throughout the depositional history of the unit. Excavation notes describe ephemeral hard-packed surfaces and suggest that several living surfaces existed. Comparison of pit and posthole contents (found in level 4) with each other and with botanical remains per level might provide further information about plant use in this unit since such features may contain more and/or different plant remains than floor surfaces or fill.

Numbers of seeds recovered in archaeological sites pose problems for interpretation; Hubbard states categorically that "numerical composition of samples of carbonized grains and charcoal is largely accidental and usually meaningless"(1976:60). Factors which influence abundance include the numbers of seeds which a particular plant produces (some produce thousands, others produce one), inherent properties within the seed which affect preservation and recovery (Renfrew 1973; Stewart and Robinson 1971), the number of uses which a plant has within

the group in question, along with their food processing techniques (Katz et al 1974). Conditions of preservation in the soil, vagaries in excavation and flotation techniques (Pendleton 1983) as well as the effect of sample size (Leonard 1985) affect archaeological recovery and interpretation.

Presence-abence data is generally considered to provide more reliable indication of use (Hubbard 1976; Gasser 1979). Donaldson suggests a ubiquity measure: "the percentage of samples containing a given taxon, regardless of quantity it is found in" (1981:12). Combining ubiquity measures with abundance of seeds within a taxon is useful in evaluating trends and suggestions of change in use of the taxon and in comparison between proveniences and levels and should be used in conjunction with other considerations of recovery and context in order to provide reliable inferences.

When comparing the charred plant taxa contained in the flotation samples from four levels in 134-124 (a rectangular core room), maize and charcoal occur from level 3 through level 5. Carbonized cheno-am seeds occur in the same three levels, although in small numbers. Cheno-am is an artificial category which includes several species of Chenopodium and Amaranthus seeds which are difficult to identify with any certainty. These small seeds are produced in copious quantities by opportunistic plants which flourish in disturbed soil such as archaeological and building sites, roadways and cultivated land.

Cheno-ams and Portulaca are ethnographically documented to have provided both greens and seeds (Fewkes 1896:18; Neithammer 1974; Russell 1908; Whiting 1939). The presence of charred Cheno-ams throughout levels 2-5 in 134-114 is suggestive of prehistoric use, but may equally well be explained as accidental inclusions due to the large numbers of such seeds which occur in disturbed soil.

Charred walnut shell fragments occur in levels 4 and 5 in 134-114 and in level 4 in 113-124. Arizona walnut trees occur throughout the state at elevations of 3500-7000 ft., growing along streams; the nuts commonly used by Indians (Kearney and Peebles 1960:214). Walnut remains have been documented archaeologically at and near Point of Pines (Bohrer 1973; Wendorf 1950), in the Chevelon Survey (Bruier 1976), at Hidden House (Dixon 1956), at Canyon Creek and Tonto National Monument (Bohrer 1962).

The charred nutshell fragments at Shoofly occur in association with maize, beans, squash and cotton in 113-124 (a catastrophically burned rectangular core room). No whole nuts or caches have been found so that no case for actual storage can be made. Their fragmented condition and small numbers may indicate that they were snack foods. In any case, walnuts were seasonably available in the area and would have made a contribution to the nutritional requirements of the villagers. All five taxa mature in the autumn; their occurrence together in what is thought to be rooffall in this provenience may indicate a recent harvest, perhaps with simultaneous

processing for consumption or storage. Attention to horizontal as well as vertical contexts may offer further insights about plant useage in this room.

Charred walnut shell remains and bean fragments occur in 4-0 and 4-3 and in 5-0 in Unit 134-114. At least part of the room was burned, but the depositional history is not straightforward. Level 5 was thought to be floor in the test pit, but the floor was ephemeral both in locus 0 and in the remainder of the room. Level 4 in locus 3 was first thought to be floor, then thought to be mixed rooffall and wallfall which contained maize kernels, cob fragments and cupules and a nearly whole maize cob, along with charred and uncharred faunal remains. These remains may be interpreted as deposition of trash; however, the presence of the nearly complete cob may represent inclusion during burning of a room, whether from being hung upon the wall, or due to processing of maize within the room, or rooffall, relecting processing, for consumption or storage, upon the roof.

The maize cob found in 4-3 was 12-rowed, measuring 51 mm. in length and 13.5 mm. in diameter. The cupules and kernels were not measured; however, the latter were large and globular in shape, with little evidence of denting. Traditionally, measurements of cupules, kernels and cobs have been made and maize racial assignments made; however, Gasser's 1981 study of modern Hopi maize characteristics indicates that the genetic

and morphological variability inherent in assemblages of maize makes separation into races problematic (p. 58). Gasser contends that such measurements serve solely descriptive purposes (personal communication,May 1985). Such measurements will be deferred until more maize remains are available.

Botanical remains can offer corroborative evidence for room function. Artifacts present within a provenience must be considered in conjunction with the botanical material before functional assignments can be made. Ground stone artifacts, including several manos and a very large metate were present in Unit 134-114, suggesting that the room was used in preparation of food, either for consumption or storage. Ceramic data is lacking at this time, but several whole "projectile" points were found in locus 3; their presence casts further doubt upon an interpretation of trash deposition in level 3 since discard of numbers of such useable whole tools seems unlikely. A more probable explanation is that the points were used in food preparation, possibly of both floral and faunal resources, and were present either in the room or ~~or~~ on the roof at the time of the conflagration. Horizontal control during further excavation of this room may allow for more reliable interpretation of depositional history and probable archaeological activities.

A layer of flat-lying charred pine (cf) needles was found in 4-0 in Room 134-114. Bohrer suggests that pine needles were used as matting for beans, walnuts and jars, as well as on storage room floors at Point of Pines (1973:426).

No ethnographic accounts have been found to document either useage, although the suggestion has intuitive appeal. Flat-lying pine needles were found in rooms at Chavez Pass (N. Coinman, personal communication). Douglas fir needles are used in religious contexts by the Hopi (Whiting 1939) and were found in religious storage rooms at Walpi (Gasser:209). The Zuni hung pieces of pinyon wood on room walls for use as firewood (Cushing 1979:283). The presence of pine needles may represent prehistoric plant useage of either religious or practical nature, since several uses of pine nuts and gum have been documented ethnographically (Whiting 1939:63). No hearth has yet been found in Unit 134-114 so the firewood explanation is less plausible than even accidental inclusion.

Pinus edulis and Pinus monophylla (pinyon pine) are widely distributed in central Arizona in elevations ranging from 4000 to 7000 ft. Pinus edulis occurs within 15 ft of the site and P. monophylla occurs within 1/2 mile.

Beans are seldom found in archaeological contexts, probably due to methods of preparation for consumption (boiling seeds in their entirety); however, beans were found in two proveniences at Shoofly. The remains of beans in Room 134-114 occurred mainly as seed halves with seed coats and hilum degraded by carbonization, while beans retrieved from Unit 113-124 occurred as both halves of dicots and as whole beans. Size and morphology varied, resulting in species differentiation into Phaseolus vulgarus (common bean) and P. lunatus (lima bean).

Common beans were first found in the Mogollon area (Ford 1981: 14), and according to Kaplan, the probable source of contemporary Hopi beans was the Verde Valley (1956:224). Lima beans have been in use in the Southwest since about AD 1000 (Ford:22) and were found at Tonto National Monument (Bohrer 1962:104) and at Montezuma's Castle (Cutler and Kaplan 1956:99).

One carbonized squash seed was found in 113-124; its surface and margins were degraded by carbonization so that determination of species is not possible. Cucurbita pepo, C. moschata and C. mixta were raised prehistorically in the Southwest by AD 900 (Ford:14).

One carbonized cotton seed was found, also in 113-124 in the same level with maize, beans and squash. Cotton was cultivated in southern Arizona by AD 100-300 (Bohrer 1970) and was probably grown at Point of Pines and at Red Bow Cliff (Bohrer 1973:426). Gossypium hopi, a variant of the modern cultigen G. hirsutum, requires 84-100 days to mature (Lewton 1912:7-8); its cultivation at Shoofly is possible. Considerably more evidence would be necessary to make such an interpretation, preferably including in addition to seeds, other parts of Gossypium. ~~The presence of~~ One seed could have been introduced on a visitor's clothing or through exchange of raw material.

The presence of the triology of maize, beans and squash at Shoofly suggest that considerable effort was

expended in the cultivation of crops. The remains of wild walnuts indicates that the prehistoric inhabitants were exploiting wild plant resources. Further ethnobotanical exploration should broaden the picture of economic plant use at Shoofly Village.

RETRIEVAL OF PLANT REMAINS

Comparison of 1-liter and 2-liter flotation samples in Units 59-123 and 98-125 reveal little diversity in charred taxa; that is, only one taxon (maize) is present throughout, with a single cactus tip (cf) appearing in level 2. The diversity of uncharred taxa varies most in surface levels, remaining constant in lower levels and serves to indicate natural transformation and depositional processes.

In Unit 134-114, levels 2 and 5 have only one liter floated; in level 3, the addition of the second liter increases diversity in both charred and uncharred taxa and increases density in maize. The numbers involved in both density and diversity are too small to serve as indicators. In level 4, the addition of the second liter increases diversity from three taxa to six, and increases density in maize. Increasing the volume of soil from one to two liters in a provenience which contained a number of preserved plant taxa resulted in retrieval of more diverse taxa of probable economic use.

The archaeobotanical assemblage in this study is dominated by larger plant remains; smaller seeds seem to be under-represented. This may be due to bias introduced by the selection of these proveniences and levels which contain observable macrobotanical remains, by prehistoric plant useage in these proveniences or by recovery techniques. Perhaps retrieving 2-liter samples in structures where food-related activities may have occurred and examination of more samples may change this. Addition of charred poppy seeds during the

flotation process (Wagner 1982) may help to determine whether small seed absence may be due to recovery factors.

On the basis of this study, 2-liter flotation samples should be collected to increase the probability of obtaining a broader picture of economic plant use at Shoofly Village. Emphasis should be placed on areas which probably contain plant material, such as rooms, hearths, floor features and other living surfaces. Samples should also be collected from areas such as trash middens. Samples should also be collected to achieve vertical and horizontal control so that more reliable interpretations can be made, that is, taken from roof and wall fall, post occupational fill and from horizontal units of a determined size (perhaps 1 or 2 meters square) taken per stratigraphic level.

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Unit Number	Level	Liter	Carbonized: Cucurbitaceae	Cactus tip cf	Chenopodium	Juglans	Pinaceae cf	Zea	Cheno-am	Descurainia	Fiber	Charcoal	Unknown	Cossyphium	Uncarbonized: Rumex	Arctostaphylos	Brassica	Cheno-am	Mollugo	Juniperus	Portulaca	Unknown	Insect/snail/rodent	Taxa per liter*	Taxa per 2 liters*
59-123																									
	2	1						14				f					1	4	75	3	77	2	1	1^c 5^u	2^c 6^u
		2		1				37				f	1		2		2		102		65			2^c 4^u	
	3	1						45				f	1						5		7			1^c 2^u	1^c 2^u
		2						86				f	3						3		7		3	1^c 2^u	
	4	1						30				f	1						1		3		6	1^c 2^u	1^c 2^u
		2						44				f	2						2		1		3	1^c 2^u	
98-125																									
	2	1						5								2	3		1	6	66		3	1^c 5^u	1^c 6^u
		2						3									1	1	3	1	130			1^c 5^u	
134-114																									
	2	1											1								11	1		0^c 1^u	
	3	1						45	2			f									2		3	2^c 1^u	2^c 2^u
		2						90				f	2					2						1^c 1^u	
	4	1						10		1	5	f	3										5	3^c 0^u	5^c 0^u
		2				sh	n	31	4			f	1										7	4^c 0^u	
	5	1		1	2	sh		19	2			f	4				1					1	4	5^c 1^u	
	4-3	1			7	sh		23	1			f	3											4^c 0^u	
113-124 (handpicked)		1			1	sh		10				f		1										5^c 0^u	

*Excludes charcoal and unknowns sh=nutshell n=needles f=fragments c=charred u=uncharred cf=probable

TABLE 1

Scientific and Common Names of Plants Retrieved at Shoofly

SCIENTIFIC NAME	COMMON NAME
Arctostaphylos	Manzanita
Brassica	
Cheno-am	Catch-all for Chenopods and Amaranthus
Chenopodium	Goosefoot
Cucurbita mixta, C. moschata, C. pepo	Squash
Descurainia	Tansy-mustard
Gossypium	Cotton
Juglans	Walnut
Juniperus	Juniper
Mollugo	
Pinaceae	Pine
Portulaca	Purslane
Rumex	Dock
Zea mays	Corn, maize
(cf) Cactaceae or Acacia	(cf) Cactus tip or Bear's claw tip
Agave or Yucca or Sotol	Fiber

Table 2

	Plant	Common name	Family	Provenience	Comments
1.	*Bouteloua barbata* Lag.	six-weeks grama	Gramineae	Plateau W of site, near road; disturbed	Check species
2.	*Chrysothamnus greenei* (Gray) Greene	rabbit brush	Compositae	Plateau W of site, near road; disturbed	Check also genus *Baccharis*
3.	*Hilaria* sp.	galleta grass	Gramineae	Plateau W of site, near road; disturbed	Tentative ID; no florets present
4.	*Chenopodium* sp.?	lambsquarters ?	Chenopodiaceae	Plateau W of site, near road; disturbed	Check also genus *Atriplex*
5.	unknown			Plateau W of site, near road; disturbed	Check in herbarium
6.	*Aster riparius* H.B.K.	aster	Compositae	Plateau W of site, near road; disturbed	Check species
7.	*Panicum* sp.	panicum	Gramineae	Plateau W of site, near road; disturbed	Check also genus *Sporobolus*
8.	*Aster* sp.?	aster	Compositae	10 ft from road	Aster-like appearance
9.	*Aster* sp.?	aster	Compositae	10-15 ft from road	Aster-like appearance
10.	*Hilaria* sp.	galleta grass	Gramineae	10-15 ft from road	Check also genus *Elymus*
11.	*Medicago* sp.	medic	Leguminosae	10-20 ft W of road	Need fruit or flower for species
12.	*Euphorbia* sp.	euphorb	Euphorbiaceae	10-20 ft W of road	Too many sp. to key
13.	*Aster* sp.?	aster	Compositae	10-20 ft W of road	Aster-like appearance

	Plant	Common name	Family	Provenience	Comments
14.	(cactus)				
15.	(fungus)				
16.	Quercus turbinella Greene	shrub live oak	Fagaceae	12 ft W of road; cluster of shrubs	Check species
17.	Rhus trilobata Nutt.	squaw bush	Anacardiaceae	12 ft W of road; cluster of shrubs	Good ID
18.	Arctostaphylos pugens H.B.K.	Mexican manzanita	Ericaceae	12 ft W of road; cluster of shrubs	Good ID
19.	Pinus edulis	Pine	Pinacea	15 ft W of road	Good ID
20.	Juniperus osteosperma (Torr.) Little	Utah juniper	Cupressaceae	10-20 ft W of road	Good ID
21.	Mimosa biuncifera (Benth.) B. & R.	cat's claw mimosa	Leguminosae	8-10 ft W of road	Need fruit or flower for better ID
22.	Juniperus sp.	juniper	Cuppresaceae	10-20 ft W of road	Anomalous fruits
23.	Aristada sp.	three awn	Gramineae	10-20 ft W of road	Specimen missing from folder
24.	Rhus trilobata Nutt.	squaw bush	Anacardiaceae	10-20 ft W of road	Same as #17
25.	Panicum sp. cf. Panicum obtusum H.B.K.	panicum	Gramineae	W off site, near road, disturbed	Need rhizome for better ID
26.	unknown (Cf. Polygonaceae: Rumex)		Polygonaceae?	W off site near road	Flowers too old and small to ID
27.	unknown Leguminosae		Leguminosae	near road, disturbed	Too many spp. to key
28.	unknown			W of site & 12-20 ft east of road; disturbed	Need flower for ID

	Plant	Common name	Family	Provenience	Comments
29.	Atriplex sp.?	salt bush	Chenopodiaceae	10-20 ft W of road	Need fruits and flowers for good ID
30.	Viola sp.?	violet	Violaceae	12-20 ft E of road;	Poor ID; fl. parts in 5's, zygomorphic corolla, very small stipules, 5 carpellate ovary (not Violaceae)
31.	Geranium sp.	wild geranium	Geraniaceae	20-30 ft E of road, on freshly burned area	Need flowers for species ID
32.	unknown			20-30 ft E of road, on burned area	Need flowers
33.	Erodium cicutarium L'Her	filaree	Geraniaceae	20-30 ft E of road, on burned area	Need fruit or flower for positive ID
34.	Verbascum thapsus L.	mullein	Scrophulariaceae	20-30 ft E of road, on burned area	need fruit or flower for positive ID
35.	(missing)				
36.	Quercus reticulata H. & B.	net-leaf oak	Fagaceae	on compound	Fruits appear problemmatical
37.	Sidalcea neomexicana Gray.	alkali pink	Malvaceae	near compound wall	Tentative; check in herbarium
38.	Bouteloua sp.?	grama grass	Gramineae	near compound wall	Poor ID
39.	Bromus rigidus Roth.	ripgut grass	Gramineae	near compound wall	Check in herbarium
40.	unknown		Compositae?	near compound wall; disturbed	need fruit or flower
41.	Datura meteloides D.C.	sacred datura	Solanaceae	on site	Good ID

	Plant	Common name	Family	Provenience	Comments
42.	Amaranthus albus L.	pigweed	Amaranthaceae	near compound wall	Check in herbarium
43.	unknown				Check in herbarium
44	(missing)				
45.	Bromus rigidus Roth.	ripgut grass	Gramineae	20-30 ft E of compound wall	Same as #39
46.	Chenopodium murale L.	nettleleaf goosefoot	Chenopodiaceae	20-30 ft E of compound wall	Hard to get good sp. ID out of herbarium
47.	Descurainia pinnata (Walt.) Britt.	tansy mustard	Cruciferae	20-30 ft E of compound wall	
48.	Lepidium sp.	pepper grass	Cruciferae	20-30 ft E of compound wall	Needs leaves for sp. ID
49.	unknown Gramineae		Gramineae	20-30 ft E of compound wall	Check in herbarium
50.	Amaranthus palmeri Wats.	Palmer amaranth	Amaranthaceae	25-35 ft E of compound	Good ID
51.	Sporobolus airoides Torr.	alkali sacaton	Gramineae	20-30 ft E of compound wall	Check in herbarium
52.	unknown			25-35 ft from compound wall	Need fruit/ flowers
53.	Sporobolus contractus Hitch.	spike dropseed	Gramineae	40-50 ft E of compound wall	Check in herbarium
54.	Portulaca oleracea L.	common purslane	Portulacaceae	40-50 ft E of compound wall	Fairly good ID
55.	Portulaca oleracea L.	common purslane	Portulacaceae	40-50 ft E of compound	Same as above
56.	Medicago sp.	medic	Leguminosae	40-50 ft E of compound	need fruit for better ID