Deciphering Prehistoric Plant Use at the Mazatzal Rest Area in the Upper Tonto Basin of Eastern Arizona

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Introduction
When the Arizona Department of Transportation decided to construct the Mazatzal Rest Area at the junction of the Phoenix to Payson highway and the road to Roosevelt Lake (State Routes 87 and 188), the subsequent procedures included approving a preliminary work plan for the excavation of archaeological features that might be affected by the proposed construction. Archaeological excavation procedure called for the collection of sediment samples that potentially retain small bits of plant material from occupational contexts. The deciphering of prehistoric plant use from the samples obtained proved far from routine. The following narrative chronicles my adventure.

Deep brown botanical crumbs bulged within the neatly labeled plastic zip-lock bags from the three archaeological sites of Broken Hardt (AZ O:15:110), Partition House (AZ O:15:111), and Slope House (AZ O:15:112). Archaeologist Mathew Bilsbarrow had probed the prehistoric features well, providing me with 36 sediment samples from floors and other locations. Each sample had been scattered on water to separate the buoyant fraction containing minced vegetal remains from the heavier sediments. The organic fraction had been dried and poured into plastic bags. Hopefully there would be carbonized and uncarbonized seeds, and other plant parts that might help restore the fragmentary pieces of a prehistoric puzzle.

According to Bilsbarrow et al. 1996, the Hohokam houses under investigation are called field houses (Figure 1, page 4), structures that are of maximum utility when settlements are aggregated and resources (or fields) are dispersed. The field houses were occupied at various times between 1250 A.D. and 1450 A.D. The big question centered around the nature of resources or crops that encouraged field house construction in the Mazatzal Rest Area.

Each clear plastic sack was emptied into the coarsest and topmost series of five interlocking screens whose mesh was graduated in size. Starting with the content of the coarsest screen, I laid out the samples in small increments a single layer deep for examination under magnifications from 8x to 32x, and worked my way down until the material remaining in the smallest screen was examined. By grading the sample as to size, the microscope focus required little adjustment. I removed plant reproductive parts and unfamiliar objects such as fragments of resin, to a box with a duplicate label for further classification and study.

Before long dark irregular nodules of what appeared to be very hard soil, smaller than a pea, began to attract my attention in every sample. I worked my way through samples from the Broken Hardt site, samples from Partition House and finally samples from Slope House, recovering these puzzling nodules all the while. Eventually I saw a few with a concave surface. My final sample from Slope House did not conform to my expectations, for no nodules were present. Mathew Bilsbarrow's notes indicated that the sample came from beside a row of large cobbles, possibly the remains of a windbreak near the house.

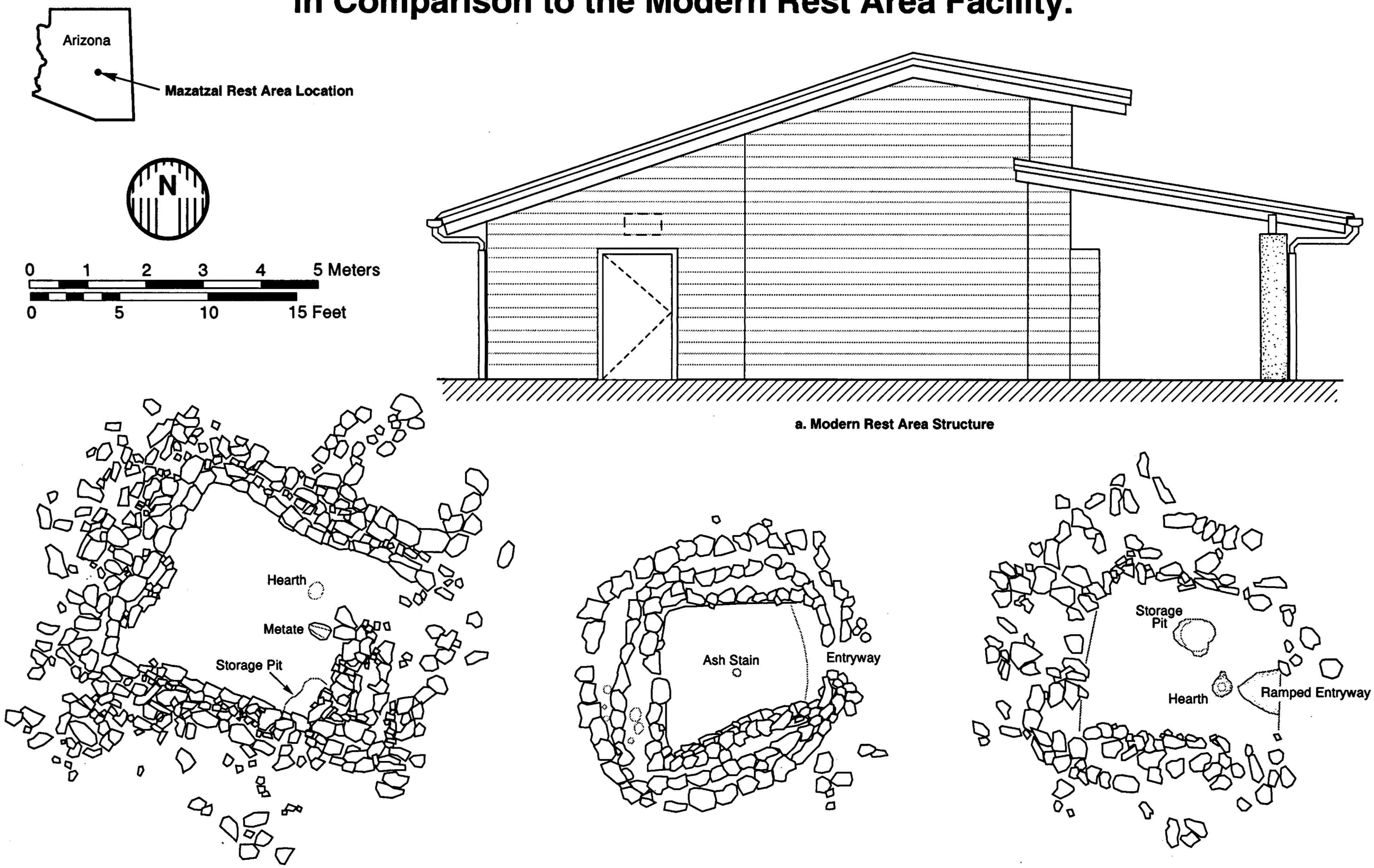
I had previously encountered hard baked soil nodules in flotation from baking pits where a layer of earth held the steam within the oven. The heat was so intense sometimes that the baked earth would not dissolve in the water used in flotation. That I should find similar material scattered about a room floor, in hearths, and in floor pits was not making much sense, until I milled over the windbreak sample. It was unlikely that the windbreak had a roof. Possibly these nodules came from soil used as a final layer on the roofs of the houses. But had all these structures burned? I found it difficult to believe, for though I saw flecks of ash now and then, charcoal was extremely rare. Still, the smooth concavities could be accounted for by moist soil initially topping a layer of brush or branches used on the roof. Then I reflected upon the burned fecal pellets of termites (Adams 1984). Since termites invade wood, if the wood burned, so would the residue from termite infestations.

I began to examine my notes for the distribution of termite pellets. Unlike the soil nodules, they were far from ubiquitous. Two samples from different floor levels at Partition House caught my attention. The two floor levels were created as a new dirt floor was laid on top of the old by the most recent occupants. The lower floor level had burned termite pellets and the upper level did not.

Apparently people did not just reoccupy Partition House, lay, a clean layer of soil on the floor and begin housekeeping under the old roof. It seemed to me that the field house might have been last occupied by people who had to rebuild the roof. It looked as if the first roof must have been intact a long time and must have deteriorated slowly enough for termites to become established. Then at some point the roof caught fire. The roof evidently burned rapidly with plenty of oxygen, so that what fell and collapsed failed to suffocate the burning wood and leave charcoal. Maybe some of the main beams had fallen earlier and portions of the roof skeleton

Figure 1.

Relative Size of Archaeological Structures at Three Sites in Comparison to the Modern Rest Area Facility.



a. Modern Rest Area Structure

b. Feature 1 at the Broken Hardt Site (A.D. 1250-1450) (Site AZ O:15:110 ASM)

c. Feature 1 at Partition House (A.D. 1330-1450) (Site AZ O:15:111 ASM)

d. Feature 1 at Slope House (A.D. 1250-1450) (Site AZ O:15:112 ASM) were open to the sky. The fate of the second roof must have been different because there was no evidence of termites. Different rooms at the Broken Hardt site had a diverse history – some roofs were infested with termites when they burned, and some were not.

Not only termites, but rodents leave their fecal calling cards on the floors of abandoned houses. They may have also left caches of seed or seed processing residues. Harvester ants had their day. Given the above described roof scenario, weeds might grow in the earth of the old roof and in odd places in the room. And if some of the weed seeds were first carbonized in the roof fire, or even caches of rodent food, might I not be hoodwinked into thinking humans parched the seed when living in the house? The problem seemed real all right, for I was finding burned fecal pellets from rodents. I had to figure some way to separate seeds burned following abandonment from carbonized ones used by the human occupants.

The unburned seeds and plant fragments did not stir my imagination at first, for I thought they had been introduced following the human occupation of the sites, period. Seasonal rains and occasional snows form part of Arizona upland weather. Bottoms of wooden fence posts rot, regardless of their desert location. Organic matter usually fails to accumulate in appreciable amounts due to degradation. I found the shells of small snails in samples from floors and in pits where they once thrived, living on decayed organic matter in episodes of mild, moist weather. I reasoned that anything organic left by the inhabitants would not be preserved unless perchance it was carbonized.

But upon reflection, the unburned seeds and plant fragments had their own tale to tell. For one might well ask how the unburned fragments got into the site. If rodents or ants introduced them in recent times, might not their ancestors also have played the same role in prehistoric times? Surely some of these plant materials might accidentally carbonize when the roof went up in flames. And what about the human introductions? If only humans brought in fresh plant material and carbonized some fortuitously in the process of food preparation, no more introductions of the same plant material in the unburned state might be expected after they departed.

Maybe such a dichotomous scheme of animal vs. human vectors really was too good to be true, but I thought it worth laying the data out in a table to study the results (Table 1). Juniper branchlets, spurge seeds, and spiny, woody calyxes of borage known only as *Harpagonella* existed predominantly in the unburned condition. All three were likely nonhuman introductions. Manzanita, prickly pear, and sunflower seeds were more equivocal, as the actual numbers of burned and unburned seeds were few and composed part of both human and rodent diets. But a number of plant remains were predominantly, if not entirely, in the burned state: a festucoid grass grain, sleepy catchfly seed (*Silene antirrhina* type), miner's lettuce seed (*Claytonia perfoliata*), crucifixion thorn (*Canotia holocantha*) floral parts, fibers from members of

Table 1. Comparison of Presence Values and Condition of Plant Part

Taxon and part If not a seed	Number of Features Present	Presence Value (%)	Number Burned	Number Unburned
Festucoid grass	12	60	217*	0
Catchfly	9	45	9*	2
Spurge	6	30	10*	20
Miner's lettuce	5	25	10*	1
Crucifixion thorn				
Floral parts	9	45	326*	0
Goosefoot	4	20	5*	0
Cheno-ams	4	20	4*	0
Harpagonella calyx	3	15	8	47
Juniper branchlets	13	65	27	109
Mallow	4	20	1	3
Manzanita	3	15	1	5
Prickly pear	10	50	2	5+
Sunflower	2	10	1	1
Wheelscale fruit	1	5	1	2

Based on a total of 20 features in which carbonized seeds were recovered.
*strong probability of human usage

the Agave family, goosefoot (*Chenopodium*), cheno-am seed (either *Chenopodium* or *Amaranthus*), and sliced pieces of root. These carbonized survivors are the ones that seemed worthy of nomination for a role in human activity in prehistory.

Most of the identifications are not as precise as miner's lettuce and crucifixion thorn which are each represented in Arizona by a single species of a genus. The seeds of certain species, sometimes in different genera, resemble each other, especially when distorted by carbonization. Problematic identifications of either *Chenopodium or Amaranthus* are named "cheno-ams". The festucoid grass grain could be one of a number of genera, such *as Agropyron*, *Elymus*, *Festuca*, *Mellica*, or *Sitanion*. The same type of grain seems represented wherever it was recovered in all three sites. The sausage shaped grain measures 0.7 x 3.5 mm. A single raised line traverses the length of the grain whose surface is covered by minute pitting. Every one of the broken grains is hollow, leading me to believe the appearance has been greatly modified by parching.

Leaf fibers of agave, sotol, and yucca closely resemble each other, and the three genera can be best distinguished when preservation is extremely good (Bell and King 1944). At the Broken Hardt Site roasting pit, I identified marginal and apical leaf spines and a vascular fiber to the genus *Agave*. The inability to identify to species is disappointing, since we now know that several species of agave were once cultivated by the Hohokam, including one limited to the upper Tonto Basin (*Agave delamateri, back cover*).

Wendy Hodgson of the Desert Botanical Garden in Phoenix, Arizona, discovered the formerly cultivated Tonto Basin agave (*Agave delamateri*) growing within a short distance of the Mazatzal Rest Area. The plants may be regarded as living archaeological assemblages that document the nature of past environments (Hodgson and Slauson 1995). Typically agaves are harvested just as the central bud of the emerging flower stalk becomes obvious, which for the Tonto Basin agave might be as early as May and extend into June. All but the leaf bases are cut off and the center or heart roasted overnight in a pit. The younger vegetative offshoots could be transplanted or left to mature.

Spring is also the time that sleepy catchfly and miner's lettuce produces edible greens. Sleepy catchfly and miner's lettuce mature between February and May (Figures 2 and 3, page 7). It seems unlikely that the seeds were collected, but it might be that seeds were dropped when greens were added to the pot. Five of the ten miner's lettuce seeds were recovered from a thermal feature at the Broken Hardt Site and another one came from beside the windbreak near Slope House, evidently an area where fires were built. The prehistoric seed of the plant has been recovered from excavations at Mesa Verde, Colorado.

Crucifixion thorn flowers begin blooming in May and can be found later in the summer as well (Figure 4, page 8). Almost all the crucifixion thorn flowers and buds derive from thermal features of one sort or another, such as fire-altered rock clusters or apparent refuse from roasting pits in all three sites. The buds and flowers defied identification until a sample of 295 from a cluster of fire cracked rock in Partition House showed sufficient preservation to count petals, stamens, etc. Their identification puzzled me until I learned the wood itself is hard and makes good fuel (Dayton 1931:116)) and that the green branches of crucifixion thorn burn readily as if resinous (Kearney and Peebles 1942:551). Their recovery in fire pits started to make sense.

The festucoid grass must have been a very common grass whose grain was easily collected under optimal growing conditions. Perhaps windy weather necessitated that parching be conducted indoors at Partition House. The upper floor of Partition House exceeded all other locations in preserving a total of 128 festucoid grass grains. The remaining 89 grains are distributed widely in a variety of locations. The appearance of carbonized crucifixion thorn buds in tandem with the next highest concentration of festucoid grass grains (14) beside the windbreak at Slope House suggested this was an area where grain was parched. Without having a better identification of the festucoid grass, speculation on the season the grass might have been collected lacks foundation. We might better understand the nature of the desert grassland that once thrived here if we were to know its identity.

The lack of precision in identification creates frayed and incomplete edges to some pieces of our puzzle that are now recognizable. Thanks to the pollen analytical work of Jannifer Gish, maize pollen is documented on the house floors in all three sites. Since many other pieces of our puzzle may be lost, and only a few dovetail with one another, the following reconstruction may be incomplete.

The people living in the area farmed crops such as maize that grew as easily on the edge of success as they did on the edge of failure. Tonto Basin agave were transplanted into convenient locations in the desert grasslands. At least one field house served as the focus of agave harvest and roasting. A firm knowledge of useful desert plants, where they grow and under what conditions they mature provided traditional life insurance in times of crop failure. The margins of nearby creeks, seeps or springs were combed for edible greens like miner's lettuce and sleepy catchfly in the spring. Plants still unknown to us, with sturdy tap roots were roasted and dried for future use. Certain unknown wild grass grain was harvested from the vicinity, and the field houses served as a comfortable central location for processing the grain. Although the field houses fell into long periods of disrepair, it was practical to renovate and re-use them when growing conditions held promise.

Figure 2. Catchfly (*Silene antirrhina*)

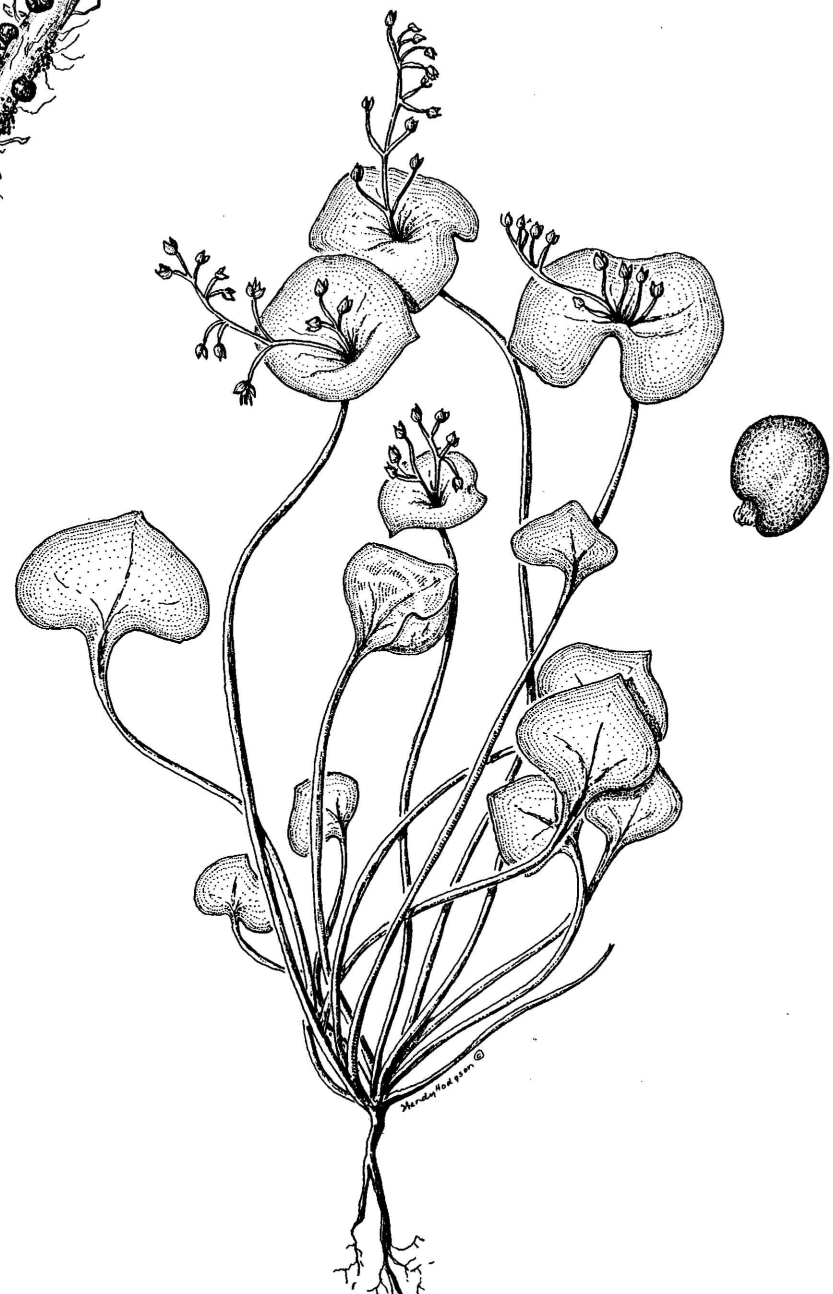


Figure 3. Miner's Lettuce (*Claytonia perfoliata*)

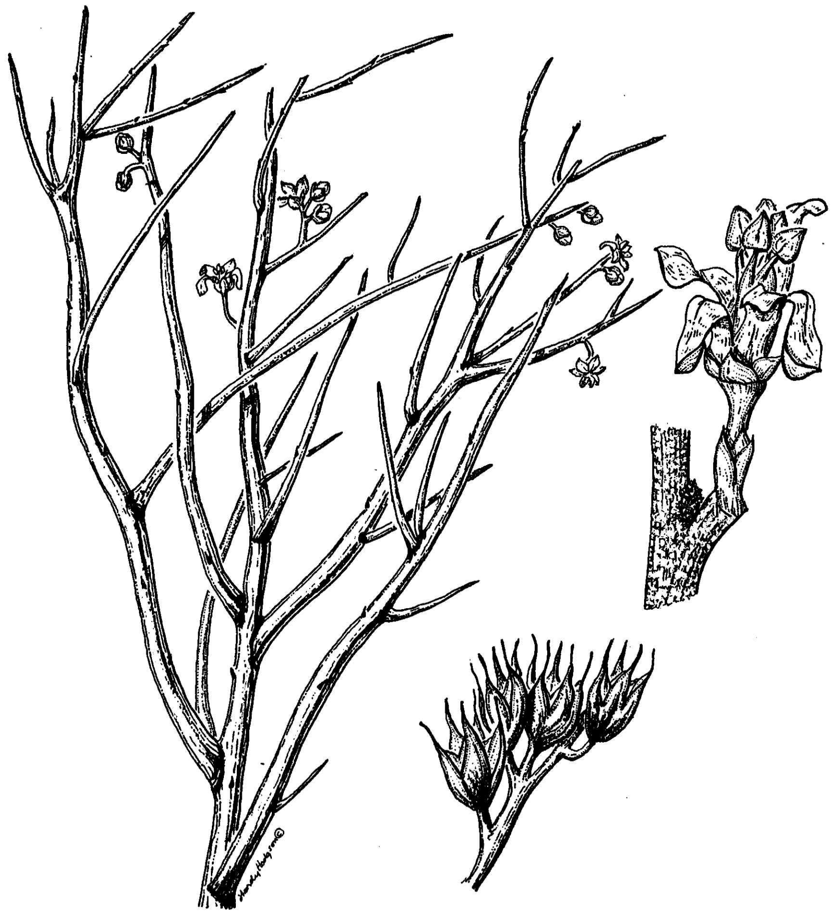


Figure 4. Crucifixion thorn (*Canotia holocantha*)

Plant remains from the three sites at the Mazatzal Rest Area gave us new information and insights. We did not know green crucifixion thorn branches were once a source of fuel. Their use suggests that little dead wood was lying about. If fallen wood was readily available for fuel, termites might easily have been introduced to the living areas, invalidating my hypothesis that the presence or absence of termite pellets reveals the different timing of roof destruction by fire following abandonment. Our understanding of field houses has expanded to discern the record of intermittent use with the aid of termite pellets. We now definitely know that field houses were not just built to oversee the growth of maize at distant locations, but agave too. The processing of agave hearts and the harvesting and parching of wild grass grains took place here. This latter observation is of particular interest when one considers how broadly distributed carbonized wild grass grains can be in archaeological sites, yet their numbers are relatively low in any one location in a residential complex. A reason for the rarity may not be lack of use, but because the parching of the grain (and parching accidents that preserved them) took place out of doors and/or at a considerable distance from where the grain was consumed. Finally, we had no prehistoric record of the consumption of miner's lettuce or use of crucifixion thorn in Arizona until the plant remains from this site were investigated.

Today

The more recent plant remains from the three sites have yet another tale to tell. Tokens of modern perennial vegetation take the form of stiff, dried oak leaves, manzanita nutlets, serviceberry, and scale leaves of juniper. Unburned pits of chokecherry and hackberry (*Celtis reticulata* type) indicate plants present in the historic past and perhaps victims of grazing pressure in times of drought (Dayton 1931:25, 68).

The presence of unburned pits of chokecherry and hackberry and an uncarbonized seed of miner's lettuce tells us that pockets of moisture loving plants grew within the territory of creatures who traversed the ruins in recent times. Even an ash tree and a lone pinyon can be seen growing today in a draw.

Almost every flotation sample contained grains or seeds from other countries. Recently introduced annual grasses like brome (*Bromus* spp.) have out-competed native annuals (such as little barley grass) and perennial grasses whose numbers had already dwindled through multiple effects of overgrazing. Burstwort (*Herniaria hirsuta*), a diminutive annual member of the pink family from southern Europe, exhibited pieces of the retrosely barbed spiny fruit bracts in most flotation samples and left seeds that mimicked *Amaranthus* all too well. No complete plant was available to permit identification until the research was about to close. The plant had escaped botanical observance in that part of Arizona.

Some of the genera of plant remains recovered here have an international reputation. A crop like maize is popular in many countries. Miner's lettuce has been taken to Europe where it is used both as a salad and pot herb (Clarke 1977:59-60). One occasionally sees it listed in this country in seed catalogs as winter purslane. Catchfly (*Silene* spp.) has a tradition of use as a cooked green in England and Iceland (Fernald and Kinsey 1958: 193-195). Agaves have been grown as ornamentals worldwide.

Today heavy traffic zooms in both directions between the high pine-clad country of the Mogollon Rim and the Phoenix desert basin. Many people will stop briefly at the Mazatzal Rest Area. While the Mazatzal Mountains and piedmont sloping into the Tonto Basin remain much the same, the history of grazing and suppression of fire is written in the shrub charged landscape. The story of the people who once came here to harvest wild grain, spring greens, and crops of cultivated agave or maize has remained well disguised until the priorities of another civilization uncovered it. Former traditions are easily buried by the drifts of time. It took the Arizona Department of Transportation working in conjunction with botanists and archaeologists to reveal customary plant use within the walls of three modest field houses now incorporated into the Mazatzal Rest Area.

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