1 INTRODUCTION

2 Every human society, past or present, has used wood or woody plants. Even those
3 societies in treeless environments, such as the Arctic, extreme elevations, or vast deserts have
4 used wood resources. Exploitation of such forest resources has left significant evidence on the
5 landscape, but this important source of archaeological and anthropological data has been little
6 used by archaeologists. This paper shows the utility of exploiting this “arboreal” archaeological
7 record to explicate early Navajo land-use histories in northwestern New Mexico and suggests it
8 may provide valuable data in other areas as well.

9 Arboreal archaeology, broadly defined, is the study of past human use of trees—living or
10 dead—on the landscape. It differs from “dendroarchaeology” which examines wood from
11 archaeological contexts, although there is certainly overlap between the two approaches.
12 Sometimes referred to as Culturally Modified Trees (CMTs), the database of arboreal
13 archaeology is incredibly varied. CMTs may include trees peeled of their cambial layer for food,
14 medicine, or sweets, (Prince 2001; Towner and Galassini 2013; Swetnam 1984); trees where
15 pieces of xylem (wood) have been removed to make artifacts, such as bow staves, cradle boards,
16 or dance paddles (Jett 2005; Towner and Johnson 1998; Towner et al. 1998; Turner et al. 2009;
17 Wilke 1988,); trees that may have been manipulated into specific growth configurations as trail
18 markers (Downes 2011); witness trees that have been “blazed” for property boundaries or land
19 survey lines (Thomas-Van Gunday and Strager 2012); and trees and stumps that simply retain
20 evidence of wood harvesting for construction, artifact manufacture, and fuel. It is the latter
21 group, ax-cut limbs and stumps, that provide most of the data for this project. Arboreal
22 archaeology can make significant contributions to understanding land-use histories of historic,
23 protohistoric, and even pre-Columbian groups. Samples from the arboreal archaeological record
24 are often “non-site features” on a landscape, and often provide the only means of deriving

precise dates for their associated archaeological sites. Determining whether a CMT is part of a site, or a non-site feature, is determined by proximity to architectural features or artifacts. In this research, such a determination was determined qualitatively by the original site surveyors; if they determined a CMT was within site boundaries, I include it in interpreting the site occupation. If a CMT is not within site boundaries, it is used to delineate temporal parameters of general land use. This research illuminates the utility of CMTs for illuminating aspects of early Navajo land use in northwestern New Mexico. The methods and theory of arboreal archaeology, however, are broadly applicable wherever wood use, tree age, and preservation permits its application.

2.0 Early Navajo Archaeology

The Navajo entry into and occupation of the Southwest have been discussed by anthropologists and archaeologists for more than a century. The routes and timing of the Athapaskan migration have long been debated (Seymour 2013; Towner 2003; Wilcox 1981), but the earliest archaeological evidence of Navajos in the Southwest is found in the ancestral Navajo homeland of Dinétah in northwestern New Mexico (Figure 1). Thousands of tree-ring samples have been collected from Navajo sites stretching from Dinétah in the east to Black Mesa and the Grand Canyon in the west (Begay and Warburton 1998; Kemrer 1974). Of concern here are those samples collected in the eastern area simply because that is where CMT sampling has been concentrated in the last two decades.

Pre-1864 Navajo archaeology has been divided into three phases: Dinétah, Gobernador, and Cabezon. The Dinétah phase of Navajo history is the earliest identified Navajo manifestation, and is dated from approximately A.D. 1500 (possibly earlier) to A.D. 1625 (Brown 1996; Dykeman 2003). Dinétah phase sites are concentrated in the Largo-Gobernador area, but may include sites farther north near the Colorado-New Mexico border. Dinétah phase

Navajos constructed wooden structures, such as forked-pole hogans, sweatlodges, and ramadas, practiced corn-bean-squash agriculture, made grayware ceramics, and lived in nuclear or extended-family groups; it is uncertain whether or not the Navajo possessed many domestic animals at this time.

The subsequent Gobernador phase (A.D. 1625-1765) was a time of tremendous change in Navajo culture. For decades, these changes have been attributed to a massive influx of Puebloan refugees following the Spaniards' 1692 reconquest of New Mexico (Brugge 1963; Kidder 1920; Keur 1944; Hester 1962). More recently, Hogan (1991) and Towner (2003) have argued that puebloan influence on Navajo culture during the Gobernador phase has been overstated. Gobernador phase Navajos continued to build forked-pole hogans and sweatlodges, but also built masonry-based hogans and masonry "pueblitos" –multi-room structures on mesa rims, boulder tops, and in other defensible locations (Carlson 1965; Marshall 1991, 1995). It is the pueblitos that have attracted most of the attention of archaeologists over the years and pueblito roof beams that have been the most heavily tree-ring sampled (Towner 1997, 2003). Reed and Reed (1996) suggest an "early" Gobernador phase (1625-1690) that included polychrome pottery but no pueblitos, and a "late" Gobernador phase that included both. Traditionally, the end of the Gobernador phase has been associated with the depopulation of Dinétah, and a migration of Navajo people to the south and west (Hester 1962). There are a few Gobernador phase sites in the Chaco Canyon area (McKenna and Windes, n.d.; Vivian 1960) and west of the Chuska Mountains (Gilpin 1996; Kemrer 1974), but their paucity may be more a result of survey coverage, site recording and sampling techniques than past population movements (Begay and Roberts 1996; Warburton and Begay 2005). Although the 1748 drought may have induced some

Navajos to migrate (Reeve 1959), increased intensity and severity of Ute and Comanche raiding in the Dinétah forced the depopulation of the area in the 1750s (Towner 2008).

After the Gobernador phase, Navajo culture history is divided into eastern and western sections that supposedly reflect different destinations of Dinétah emigrants. In the east, Hester (1962) suggests that the Cabezon phase (A.D. 1770-1863) was typified by an increasing reliance on pastoralism, a concurrent increase in weaving, the adoption of western style dress, and the decline of native skills such as stone tool, ceramic, and basketry production. Cabezon phase sites are found south of the Dinétah heartland, mostly in the Rio Puerco Valley, but research in other areas has been limited. Brugge (1963) suggested a nativistic revitalization movement that developed with the depopulation of Dinétah elevated Blessingway to its preeminent position in Navajo theology and generated taboos against foreign activities, such as stone construction and painted pottery. After 1800, it is clear that the Navajo economy shifted towards a pastoral sheep herding regime with high mobility and more seasonal permanent architecture (Bailey and Bailey 1986; Brugge 1985; Jett and Spencer 1981). Different types of hogans continued to be built (Warburton 1985), and the types of wooden structures expanded dramatically with the shift to a pastoral economy (Dean and Russell 1985; Oswald 1983; Rocek 1995). Unfortunately, tree-ring sampling of CMTs was little used during the Black Mesa Project (Rocek 1985; Dean and Russell 1985), perhaps because the plethora of wood structures and different research questions precluded CMT sampling. Thus, comparable data from the western Navajo area are lacking.

Project Background, Research Areas and Methods

Eight areas of early Navajo occupation in the eastern area provide the data for this research. From north to south (Figure 2), they include Cabresto Mesa, Frances Mesa, the Morris 1 area, San Rafael Canyon, Cho'oli', Overlook, and McKean Mesa in the Dinétah heartland, and

La Ventana Mesa farther south in the Rio Puerco Valley. All of these areas, except the Overlook area, have been documented via intensive (100%) pedestrian surveys, and all have been subsequently tree-ring sampled.

For the most part, the initial surveys (Dykeman 2003; Loebig and Walley 2004; Towner and Heckman 2006; Towner and Johnson 1998; Wilshusen et al. 2002) recorded sites, features, and isolated occurrences and were not concerned with tree-ring sampling. Their survey methods, as is typical of the area, were pedestrian surveys with transects spaced no farther than 10 meters apart. Sampling of architectural timbers at most sites (mostly pueblito roof timbers) in these areas occurred as parts of other research projects (e.g. Towner 1997, 2003), and CMT sampling was conducted later in coordination with the archeologists and using their site maps and definitions.

All of these areas share some characteristics. All are relatively isolated tracts of BLM or USFS land in the pinyon-juniper forest. A small oil boom in the 1950s provided some roads, but since the Hispanic occupation of the area ended in the 1920s, use of the area was limited to hunters and other recreationalists. The pinyon-juniper forest provided little incentive for commercial logging, and even family scale firewood cutting was generally limited to those areas with easy access. Thus, evidence of stone or metal-ax use for tree harvesting in these surveyed areas dates almost exclusively to the early Navajo occupation with only a few exceptions. The presence of CMTs like ax-cut stumps (Figure 3), ax-cut limbs (Figure 4), and bow-stave trees (Figure 5), combined with limited access made CMT sampling an ideal approach for investigating early Navajo land use beyond sites and structures.

Research Methods

Architectural samples collected from structural elements are typically collected as cores using a specially designed drill bit that resembles an elongated hole saw (Towner 2015) in order to minimize the visual impact of sampling. Some arboreal samples, particularly those collected from “slab procurement” trees, were also collected with the specialized drill bit. Samples from metal ax-cut stumps or branches were most often collected as cross or partial sections. All samples were transported to the LTRR in Tucson, sanded with increasingly fine grits of sand paper to make rings visible under the microscope, and crossdated using the Douglass method of skeleton plotting (Dean 1978; Stokes and Smiley 1996).

Interpreting the dates is more complex and is somewhat dependent on sample context and date type, but generally follow the principles delineated by Haury (1935), Bannister (1962), Dean (1978), Ahlstrom (1985), and Towner (2002). Cutting dates, those dated samples that retain the last ring grown by the tree, are noted by the presence of bark (B), beetle galleries (G), patina (L), and other attributes (c,r,v); noncutting dates are samples that may or may not have suffered exterior ring loss due to erosion (vv), or require long ring counts (++) beyond a certain dated ring; near cutting dates (+B, +G, +L, +r, +c, +v) retain the final exterior ring, but require a short ring count beyond the last dated ring; for a complete description of date symbols, see Robinson et al. (1974) and (Nash 2000). Structures in the research areas are dated by clusters of cutting dates, or in some instances, tight clusters of noncutting dates (Towner 1997, 2003). CMTs that yielded cutting or near cutting dates indicate the procurement date, or within a year or two of the harvesting date. Noncutting dates that have suffered exterior ring loss provide only a *terminus post quem* date, that is, a date before which harvesting could not have occurred. Such dates may still provide important information, however. For example, if a noncutting date postdates a dated structure, it can indicate land use after the structure was constructed; if a

noncutting date significantly predates a structure, however, it may have been cut at the same time as other trees, and has simply suffered more exterior ring loss. Noncutting dates that are a result of a long ring count (“++” dates) are typically indicative of dead wood harvesting (Ahlstrom 1985), so may or may not be relevant to site occupations or land use patterns.

4.0 Results

The Frances Mesa Alternative Treatment Project (Wilshusen et al. 2000) surveyed 2927 acres on top of Frances Mesa, a sandstone erosional remnant that separates Frances Creek and Gobernador Canyon (Figure 2) immediately north of, and adjacent to, the Morris 1 Project area. The Frances Mesa project recorded 401 sites and 375 isolated occurrences, the vast majority of which are early Navajo.

Wilshusen et al. (2000) collected 163 tree-ring samples from Navajo sites and site areas, not including the 52 samples previously collected from Frances Canyon Ruin by Towner (1997). The samples included 75 from architectural contexts such as multiple hogan clusters and single hogan habitations, and 88 samples from the arboreal archaeological record, e.g. ax-cut limbs and stumps.

The architectural samples range 1523vv-1747+vv, but only three (1739+v, 1743v, 1743v) are cutting or near cutting dates. The dated architectural samples suggest the most intensive use of the mesa was in the 1720s-late-1740s, which varies slightly from the 1710-late-1740s range of cutting date clusters from the Frances Canyon Ruin, a pueblito (Towner 1997, 2003). The dated CMT samples (n=36) range 1631vv-1749+B, and include 13 cutting or near cutting dates. The cutting/near cutting dates indicate tree harvesting in the 1640s, 1650s, 1660s, 1710, 1720s, and 1740s.

The large number of Frances Mesa sites, CMTs, tree-ring samples, and tree-ring dates provides an excellent opportunity to compare architectural and CMT dates in terms of their quality and quantity. Eleven sites (not including Frances Canyon Ruin) yielded dates only from architectural elements—forked poles or hogan leaners. The resulting 28 dates, all noncutting, range 1589vv-1747+vv; there are no date clusters and at only two sites (LA 113256 and LA 113393) do the noncutting dates actually estimate construction events. There are 19 sites that are dated only by associated CMT samples. These 40 dates span 1631vv-1746v, and include cutting dates of 1640v, 1742r, and 1746v. The distribution of these CMT dates indicates a Navajo use of the area spanning a little more than a century, 1640-1746. Sites that yielded dates from both architectural and arboreal contexts (n=12) include 46 architectural dates that span 1523vv-1747vv, and arboreal dates that span 1607vv-1749+B; the latter include cutting or near cutting dates of 1660v, 1717v, 1743r, 1746B, and 1749+B. CMT dates from eight of these 12 sites are more recent than the architectural dates, earlier at three sites, and the same at one site.

LA 78825, a Gobernador phase habitation, provides an excellent example of the utility of combining both architectural and arboreal tree-ring sampling. The site contains at least 12 unburned and burned hogans, and abundant Dinetah Gray and Gobernador polychrome sherds indicating an 18th century occupation (Hovezak et al. 2000:65-73). Twenty tree-ring dates were derived from 16 architectural and four CMT samples. Six forked-pole hogans (Features 2, 3, 6, 7, 11, 16) in close proximity to each other yielded dates. Architectural samples alone indicate construction of Feature 2 sometime after 1713, Feature 3 around 1746, Feature 6 sometime after 1650, Feature 7 sometime after 1723, Feature 11 more recently than 1599, and Feature 16 about 1746. CMT samples were associated with only two features, but place construction of Feature 6 solidly in 1746 and Feature 7 in the early 1740s. This combination allowed Hovezak et al.

(2000:73) to infer that “the partially standing and collapsed structures pretty clearly [were] occupied for a brief period in the 1740s.”

The Cabresto Mesa project collected 102 samples from nine previously identified and two newly recorded sites (Powers and Johnson 1987). Only the 58 samples relevant to early Navajo sites are considered here. The samples yielded 28 dates, but no cutting dates. Cabresto Mesa Tower, a 5-room pueblito, yielded a cluster of dates in 1713, and is the only structure that yielded a date cluster. Six CMT samples yielded five dates, four of which are either the only dates from sites, or strengthen site dates. For example, Site F yielded four noncutting architectural dates ranging from 1688vv – 1745vv; two CMTs adjacent to Hogan 1 also yielded 1745vv noncutting dates, suggesting the main site occupation was in the late 1740s. A single noncutting date of 1588+vv was derived from a hogan leaner at Site A, but a CMT near the hogan yielded a much more reasonable 1730+vv date for the occupation. The Cabresto Mesa area is the only one of the research areas where a CMT did not produce the latest date—a forked pole from a hogan at LA 144751 dated 1750vv

The Cho’oli Project (Loebig and Walley 2004) intensively surveyed 360 acres, recorded 15 Navajo sites, and 13 Navajo isolates. Subsequent tree-ring sampling in the area yielded 35 dates from 118 samples collected from 11 sites and spatially associated CMTs. The 16 dates from architectural elements range 1582++vv-1758+vv, but more relevant are the two cutting/near cutting dates—1732+v from a hogan fork at LA 99808 and 1742v from a hogan fork at LA 144420. These dates indicate use of this sacred area beginning in at least the 1730s and, when combined with the 1758++vv date from a hogan leaner at LA 127028, indicate use of the area through the late 1750s. The dates from CMTs range 1620vv-1754++vv. Only two CMT samples yielded cutting/near cutting dates, both from LA 99808—a 1748+rB inc date from an

206 ax-cut stump and a 1753B inc date from an ax-cut limb. In the Cho'oli' research area, the CMT
207 date distribution does not extend the date range beyond that of the dated architectural elements,
208 but is does significantly strengthen the identification of post-1750 use of the area. This is another
209 important piece of data indicating that the Navajo did not depopulate the Dinétah due to the
210 drought of 1748, as has been proposed in the past (Marshall 1995; Reeve 1959).

211 Another large survey that provides data for this research is the Morris 1 project
212 (Dykeman 2002). The Morris 1 Project area included intensive pedestrian survey of 1477 acres
213 on the south flank of Frances Mesa overlooking Gobernador Canyon. The project recorded 155
214 archaeological sites and 137 isolated occurrences, the vast majority of which are early Navajo
215 cultural manifestations. The project used targeted excavations on 11 sites and collected 119 tree-
216 ring samples from sites, structures, and CMTs.

217 Twenty-three Navajo sites yielded tree-ring dates; 18 solely by associated CMTs, three
218 solely by architectural samples, and two by a combination of sample types. The dates from
219 architectural contexts only range 1604vv-1748+G, but all except the 1748+G date, are
220 noncutting dates that have suffered significant exterior ring loss. A cluster of noncutting dates
221 from roof beams at Romine Canyon Ruin (LA 55836) indicate construction of that pueblito
222 about 1723. The two sites that yielded dates from both sample types include a hogan at LA
223 105530 and Morris 1 pueblito (LA 83520). The single architectural date from LA 105530 is
224 1719vv, and the single CMT date is 1714vv; both samples retain some sapwood indicating
225 structure use in the 1720s. Nine architectural samples were dated from LA 83529; they range
226 1322+vv (all heartwood) to 1748+G. The single CMT date associated with the pueblito is also
227 1748+G and supports interpretations of a late 1740s occupation (Dykeman et al. 2002).

The 20 project area sites and isolated occurrences dated using only arboreal samples range 1605vv-1927rB, and include cutting dates of 1629v, 1629B, 1695v, 1695B, 1750B, 1915rB, and 1927rB. Most are single samples, so there are no date clusters. The CMT date range, specifically the cutting dates, expands the temporal range of occupation both earlier and later than the architectural samples. On the early end, the 1629 dates are some of the earliest dates in the area and solidify interpretations of early Navajo land use in Dinétah (Dykeman et al. 2002; Wilshusen et al. 2000). Other noncutting CMT dates support the idea of an early 18th century occupation, but also indicate land use in the 19th and even early 20th centuries. The 1915rB and 1927rB dates are probably not from Navajo activities, but interestingly, may date Earl Morris' activities when he was excavating Dinétah area sites (Carlson 1965)

San Rafael Canyon is a tributary drainage located on the south side of Gobernador Canyon directly south of the Morris 1 and Frances Mesa project areas. The canyon itself contains at least 10 pueblitos and an unknown number of forked-pole hogans, sweatlodges, and other features. A single intensive survey of 640 acres recorded 35 sites and 24 isolated occurrences of early Navajo affiliation. The San Rafael Canyon Survey and associated projects (Towner and Johnson 1998; Towner 2003) collected 167 tree-ring samples from structures, and 48 samples from CMTs in the project area. Only three of the structures yielded dates, and most dates came from the two large pueblitos LA 1869 and LA 1871. The pueblitos are discussed in detail elsewhere (Carlson 1965; Towner and Johnson 1998; Towner 2003); their tree-ring dates cluster in the 1710s-1730s (LA 1871) and late 1740s-1753 (LA 1869), and Towner (2003) suggests LA 1871 was abandoned and people moved to LA 1869 after a catastrophic event. The 48 CMT samples yielded 37 dates, and range from 1627vv to 1863+B. Two noncutting (vv) dates that do not contribute to understanding Navajo land use include the 1627vv date and a 1645vv date; both

predate site occupations and simply reflect exterior ring loss. Other CMTs provide significant information. Date clusters, including cutting dates provide solid evidence for dating LA 11093 and LA 104115 to 1720 and 1710, respectively. Samples from the two scarred trees (LA 104123 and LA 105417) yielded noncutting dates of 1755vv and 1756++vv, which are some of the latest early Navajo dates in Dinétah. The single pith date (1828p) from a tree growing on an earthen dam confirms that this is indeed a Navajo construct, one of the only such features ever documented. Finally, samples from LA 104121 indicate a later 19th century use of the area, possibly during or shortly after many Navajos were interred in the Ft. Sumner concentration camp in eastern New Mexico (1864-1868).

The Mckean Mesa project was limited spatially to 200 acres on an isolated mesa overlooking Largo Canyon. It identified a total of 51 early Navajo sites and 58 isolates. Mckean pueblito (LA 112641) is a 13-room masonry structure atop a massive sandstone pinnacle in the middle of the mesa. Prior to the survey, Mckean pueblito had been sampled by Towner et al. (2001) who collected 24 tree-ring samples from roof beams at the pueblito and three samples from ax-cut stumps around the base of the pinnacle. Based on the provenience of the samples and date distribution, they (Towner et al. 2001:81–83) indicate that the pueblito was constructed in A.D. 1707–1708 and underwent major repairs in A.D. 1713. None of the original CMT samples dated. Subsequent sampling included loose pueblito roof beams that had fallen around the base of the pueblito pinnacle, architectural samples from hogans, sweatlodges, and a ground-level masonry room, and CMT samples. The subsequent research collected 78 additional tree-ring samples which yielded 20 dates. Preservation on the mesa is poor, and only 11 samples from four additional sites yielded dates. Architectural samples range from 1732+vv – 1892+vv and yielded only noncutting dates. Only two of the 13 CMT samples dated, but include an 1828v cutting and

1832vv noncutting date. Interestingly, all of the dates from wooden (non-pueblito) architecture or CMTs indicate a post-Gobernador or even Cabezon phase use of the area.

Samples from the Overlook area were not collected as part of any intensive survey project. The pueblito site (LA 10732) was initially recorded by Navajo Land Claim personnel in the 1950s, and officially recorded by Powers and Johnson (1987). The 4-room structure was subsequently tree-ring sampled (Towner 1997), but it was only in the fall of 2014 that a search for CMTs around the site was conducted.

Thirty-two samples, 23 from the pueblito and nine from associated forked-pole hogans, yielded 22 and four dates, respectively. The pueblito yielded a cluster of cutting dates that indicate construction in 1726 and remodeling in 1727 (Towner 1997). A single loose log, collected but not well provenienced by the NLC, yielded a 1731+vv noncutting date that may indicate at least a 4-5 year use of the site. A recent search of ca. 10 acres around the site (not a formal survey) resulted in the collection of 10 ax-cut limbs and stumps. These samples yielded five noncutting dates that range 1723vv-1744vv. They support the pueblito dating, but also indicate Navajo use of this isolated bench almost 20 years after pueblito construction.

La Ventana Mesa is a high sandstone mesa near the headwaters of the Rio Puerco of the East approximately 30km south of the Dinétah heartland. The mesa slopes gradually to the west and very abruptly to the east in a series of benches; the eastern benches step down to the Rio Puerco and the western slope is cut by arroyos that drain into Arroyo Piedra Lumbre. The immediate La Ventana Mesa area has been the subject of two intensive cultural resource surveys (Elyea 1994, 2003) which documented more than 50 sites, mostly affiliated with Anasazi and Gallina groups. Twelve early Navajo sites were recorded, including a sweatlodge, seven forked-pole hogan sites, three artifact scatters, and an eroded cache.

At La Ventana Mesa, architectural remains were typically collapsed forked-pole hogans or sweatlodges with very poor preservation. A total of 83 tree-ring samples was collected during the La Ventana Mesa project, 18 from architectural elements, and 65 from CMTs (Towner 2011). The samples from Navajo architectural elements yielded only three noncutting dates: 1587+vv and 1743vv from different hogans at LA 152235, and 1785vv from a hogan fork at LA 134789. Although the 1785vv date provides information relevant to the occupation, the other dates do not. Twenty-five of the CMT samples yielded dates, including four cutting or near cutting dates: 1767+B, 1781v, 1792v, 1792G. Noncutting dates also cluster in the early 1780s at LA 134794, which also contains the latest date from the mesa, 1805++vv. In short, without CMT dates, the temporal span of the La Ventana Mesa Navajo occupation would be poorly known; the CMTs indicate that six of the eight sampled sites were occupied in the 1780s or 1790s, and at least one site was used into the early 19th century.

5.0 Discussion

A total of 582 tree-ring samples were collected from the research areas, 218 from architectural contexts and 364 from arboreal contexts. The architectural samples yielded 84 dates (38.5%) and nine cutting or near cutting dates—10.7 percent of the dated samples. The arboreal samples yielded 193 dates (53.0 %), and 32 cutting or near cutting dates—16.5 percent of the dated samples. These data alone suggest that arboreal archaeology can make significant contributions to understanding early Navajo land use patterns.

The temporal distribution of the different sample types is also informative. Stem-and-leaf plots of dates from each context (Figures 6 and 7) both show high levels of activity during the 1710-1750s period—the most intensive period of pueblito construction (Towner 2003). The differences, however, are most illuminating. Architectural samples suggest tree harvesting in the

mid-1600s (1640-1660s), possibly in the 1680s, and in the late 18th century after the purported depopulation of Dinétah. The arboreal sample distribution, on the other hand, shows activity in the early 1600s (1600-1620s), the mid-1600s (1640-1670s), and during the late 18th century (1780-1800s). A long tail is also present, and indicates use of the area after the “depopulation”, including during the Ft. Sumner incarceration and Long Walk (Bailey 1964).

When compared to pueblito construction episodes from all of Dinétah (Figure 8), both the nonpueblito architectural elements and CMT samples indicate Navajo use of the landscape both before and after the main pueblito period. These are similar to thermoluminescence data from the Morris 1 project area (Dykeman et al. 2002) regarding the early occupation, but also show that Navajos continued to use the area long after the purported depopulation. This is significant as it shows that Navajo people returned to the area throughout the 19th century, although they did not live there in large numbers or for long periods of time. Whether these return visits were for ceremonial purposes involving sacred places, plant or mineral gathering expeditions, or hunting expeditions is unknown, but ultimately irrelevant. The people returned and continued to use the area, even as they do today.

6.0. Conclusions

Dendroarchaeological sampling of ax-cut stumps, limbs, slab-procurement trees, and other CMTs has contributed significantly to our understanding of early Navajo land use patterns. Such sampling has also contributed to understanding Ute cultural dynamics in western Colorado (Martin 2004), and more extensive studies in Canada and other boreal forest environments (Prince 2001; Turner et al. 2009) have illuminated many aspects of past human use of wood resources.

Arboreal archaeology can be an important tool for understanding past land use, but is not without limitations. Most importantly, people must have exploited forest resources. The arboreal record (trees) must also be preserved on the landscape. Preservation of such activities is enhanced in semi-arid environments, but the majority of such sites are actually in more mesic environments where there are more trees. Tree species and tree age can be critical factors. Some trees simply do not live long enough to retain records prior to European contact and can only contribute to understanding more recent events and processes. Nevertheless, it is incumbent upon archaeologists to recognize and record those past uses if we are to truly understand past landscape uses and adaptations.

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Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Decade	Year
152	3
***	*
156	69
***	*
158	2789
159	5
160	4
161	45
162	17
163	7
164	0 <u>4</u> 57
165	01224
166	<u>1</u> 4569
167	9
168	2236899
169	37
***	*
171	22 <u>6</u> 9
172	1266 <u>7</u> 9
173	<u>0</u> 01268
174	<u>2</u> 333356679
175	0148
176	448
177	12
178	15
179	27
***	*
188	6
189	245
***	*
193	<u>0</u>
194	5
195	<u>9</u>

Figure 6. Stem and leaf plot of all nonpueblito architectural tree-ring dates from the study areas (underline indicates cutting or near cutting date).

Decade	Year
155	1
***	*
159	4
160	5789
161	07
162	01222 <u>999</u>
163	116
164	<u>0</u> 11447789
165	00004458
166	0 <u>1</u> 1235667
167	144789
168	<u>4</u> 449
169	2455555889
170	0112579
171	<u>00</u> 112445556 <u>7</u> 8 <u>99</u>
172	<u>0000</u> 22335556666 <u>7</u> 788999
173	0001112233688
174	00111 <u>2</u> 344444555566667 <u>88</u>
175	<u>00</u> 111 <u>3</u> 45688
176	57999
177	157
178	000111235
179	0 <u>22</u> 9
180	057
***	*
182	<u>8</u>
183	2
184	0
185	9
186	37
***	*
188	39
189	5
190	02
191	5
192	<u>17</u>

Figure 7. Stem and leaf plot of all CMT tree-ring dates from the research areas (underline indicates cutting or near cutting date).

Figure 8

Figure 9. Graph of Dated pueblitos, Structural, and Arboreal tree-ring dates.