Dendrochronology at Tonto National Monument

FACT SHEET

Dendrochronology, or tree-ring dating, has assisted archeologists in assigning calendar dates to archeological sites since the early twentieth century. This dating method has played a large and yet disappointing role in determining the dates of occupation at the Upper and Lower cliff dwellings at Tonto National Monument. Archeologists have cored the majority of the prehistoric wood located in the two primary cliff dwellings for dendrochronological investigations, but only four dates have been acquired from the wood samples. This low number of tree-ring dates obtained from the ruins is mostly due to the use of non-datable wood, such as sycamore, in the original construction of the cliff dwellings (Dean 2005).

Sampling the Ruins

Tonto National Monument is located in central Arizona about two miles southeast of the modern town of Roosevelt. The Monument protects numerous small archeological sites, but is best-known for the Upper and Lower cliff dwellings, both relatively large masonry and adobe sites dated by ceramic artifacts to a period between A.D. 1300 and A.D. 1450, a broad time frame far too long for either site (most cliff dwellings were occupied for only a few generations, at most).

In attempts to refine the dating of both sites, ten different tree-ring sample collection events have been conducted at Tonto National Monument, beginning with investigations by famous Southwest archeologist Emil Haury in 1935. Haury's project collected 15 samples of wood, and only 17 more were collected between 1935 and the 1990s (Table 1). However, in 1995, NPS initiated a dendrochronological study of the Upper and Lower ruins, which resulted in the collection of just over 50 additional samples, and more recently, in 2006, Thomas Windes cored almost all the prehistoric woods elements observed in the Lower and Upper dwellings. During the latter two projects, new samples were taken from both ruins and previously collected samples were re-analyzed to both establish provenience for some of the older samples and to check the accuracy of earlier studies.

Table 1. Tree-ring sample collection events at Tonto.

Date	Collector	Sample Numbers
May 23, 1935	E. W. Haury and E.B. Sayles	GP 771-785
1937	Duffen	TON 1-8
1950	Lloyd Pierson	TON 9-12
May 13, 1958	John C. McGregor	TON 13-14
April 25, 1961	Bryant Bannister	TON 15-16
Unknown Date	National Park Service	TON 17
May 22, 1995	Laboratory of Tree-Ring Research (LTRR)	TON 18-67
Feb. 21, 1995	LTRR	TON 68-69
1998	Greg Fox, NPS	TON 70-85
July, 2007	Tom Windes	TON 86-158 (No TON 111)

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Roof beams in the Lower Cliff Dwelling at Tonto National Monument.

The Lower Cliff Dwelling

As of 2006, essentially every wood element within the Lower Cliff Dwelling had been sampled for tree-ring dating, but as of yet, only one tree-ring date has been produced for the site, and this at least 150 years too early to represent actual construction and use (Dean 2005).

The dated sample (GP-771) was originally collected by Haury and Sayles in 1935, but did not produce a date until the 1960s, when it was re-analyzed by the Laboratory of Tree Ring Research. The date, A.D. 1109vv (the "vv" indicates that there is no way to identify how close the date provided is to the actual cutting or death date of the tree), was later verified during resampling in 1995 (when TON-68 was collected). Unfortunately, the date is far too early, suggesting the sampled

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beam was likely "old wood" collected for use in the Lower Cliff Dwelling some 150 years after the tree died (Dean 2005).

The Upper Cliff Dwelling

Tree-ring dating of the Upper Cliff Dwelling has had somewhat greater success, although the results are still disappointing given the number of samples overall (Table 3).

The first date produced for the Upper Cliff Dwelling via dendrochronology was A.D. 1346, a date derived from Haury's 1935 sample GP-782 (Haury 1938). This date was corrected in 1995, when the GP-782 sample location was relocated and resampled as TON-40, which produced a date of 1290vv, some 50 years earlier than the original published date (Dean 2005).

GP-785 was also re-analyzed in 1995, producing a date of 1303v (the "v" indicates a date reasonably assumed to be within a few years of the cutting/death date for the tree), and in 2006, a third date was acquired from sample TON-137, taken from a pinyon beam in Room 40 (Windes 2007). This sample produced a date of A.D. 1342r (the "r" indicates that most of the outer ring is present, and therefore, that the date reasonably reflects a cutting/death date of the tree), the most accurate date obtained for the Upper Cliff Dwelling thus far.

Conclusion

In spite of the more than 150 tree-ring samples taken from the Upper and Lower Cliff Dwellings at Tonto National Monument, only four valid dates have so far been produced: one for the Lower Cliff Dwelling and three for the Upper Cliff Dwelling. Unfortunately, the date for the Lower ruin is perhaps as much as 150 years too early to represent construction and occupation of the site, leaving archeologists reliant on other dating means. Dendrochronological dating of the Upper Cliff Dwelling has had only slightly more success, placing construction of the site between A.D. 1290 and 1343. These dates are none-the-less important, refining the otherwise broad temporal range assignable using ceramics alone and placing the construction and use of the Tonto cliff dwellings more firmly in time.

Literature Cited

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Table 2. Dated tree-ring samples from the Lower Cliff Dwelling.

Collection/ Analysis Date	Sample Number	Room Number	Sample Date	Species	Comments
1935 (C)/ 1960s (A)	GP-771	10	1109vv	Douglas-fir, upright post	Date obtained during re-analysis by LTRR in the 1960s (Bannister and Robinson (1971:11).
1995 (C/A)	Ton-68	(previously Room 5)	1109vv		Confirmation of date from GP-771 (Dean 2005).

Table 3. Dated tree-ring samples from the Upper Cliff Dwelling.

Collection/ Analysis Date	Sample Number	Room Number	Sample Date	Species	Comments
1935 (C)	GP-782	19	1346	Pinyon, loose lintel	Haury (May, 1935 SW Monument Report, pp. 255) thought this was "not a particularly strong date," but published it regardless (Haury 1938).
1935 (C)/ 1995 (A)	GP-785	Unknown	1303v	Pinyon, unknown	Date obtained during re-analysis by LTRR in 1995 (Dean 2005).
1995 (C/A)	TON-40	19	1290vv	Pinyon, loose lintel	Re-analysis/resampling of GP-782 (Dean 2005).
2006 (C/A)	TON-137	40	1342r	Pinyon, roof beam	The most accurate date produced for the Upper Cliff Dwelling (Windes 2007).