Tree-Ring Dating of the Hollingsworth House Site at Elk Landing, Cecil County, Maryland

By

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Introduction

The Hollingsworth House site is located just outside of Elkton, Maryland, at Elk Landing, off Route 40 on Landing Drive. The site lies at the convergence of Little Elk and Big Elk Creeks, and was an early transportation hub.

There are two primary historic structures, the Hollingsworth House (more modern and not directly subjected to the dendrochronological study, see results section) and the so-called Jon Hans Steelman Tavern (known herein as the "Stone House"), as well as multiple associated outbuildings of varying ages. The property is supervised and maintained by the Historic Elk Landing Foundation. The earlier of the two structures is currently in a state of high disrepair: the walls remain standing, although the entire interior of the house has collapsed. The younger Hollingsworth House building is undergoing renovation and restoration.

Through an agreement with architect James T. Wollon, Jr. representing the Elk Landing Foundation, Dr. Edward R. Cook and Mr. William J. Callahan performed a dendrochronological analysis of the site over the period January through June 2001. The purpose of the study was to identify the construction date(s) of the older dwelling. A total of 21 wood samples extracted from loose timbers (gathered for the most part from the collapsed interior of the older structure) were selected for analysis in the laboratory. Of the 21 collected samples, 15 were dated, a relatively high rate of success given the circumstances of the study. The determination of provenience and utility of the sampled timbers was done by Mr. Wollon.

Methods

Dendrochronology is the science of dating and analyzing annual growth rings in trees. Its first significant application was in the archaeological dating of the ancient Indian pueblos of the southwestern United States (Douglass 1921, 1929). Andrew E. Douglass is considered the "father" of dendrochronology, and his numerous early publications concentrated on the application of tree-ring data for archaeological dating. Douglass established the connection between annual ring width variability and annual climate variability, which is responsible for the establishment of precisely dated wood material (Douglass 1909, 1920, 1928; Stokes and Smiley, 1968; Fritts, 1976; Cook and Kariukstis, 1990). Since 1921, dendrochronological methods, first developed by Douglass, have been perfected and employed throughout North America, Europe, and much of the temperate forest zones of the globe (Edwards 1982; Heikkenen and Edwards 1983; Holmes, 1983; Stahle and Wolfman 1985). In Europe, where the dating of buildings and artifacts is as much a professional support service as a science, the efficacious utilization of tree-ring dating on historical objects is extensive (Baillie, 1982; Eckstein, 1978; Eckstein, 1984).

On 29 January, 2001, William Callahan extracted a total of 21 wood samples from loose timbers representing elements of the two primary structures, including 16 from the ruined interior of the older "Stone House/Tavern" building, 2 from the exterior wall of the Stone House, and 3 from the porch of the building known as the "Hollingsworth House". Other than 1 piece of tulip poplar (which proved undateable), the samples were exclusively oak (Liriodendron sp., Quercus sp.).

The wood core samples were processed following well-established methods of dendrochronology. They were taken to the Lamont-Doherty Tree-Ring Lab in Nyack, NY, where they were carefully glued onto grooved mounting blocks. The wood cores were sanded to a high polish to reveal the annual tree rings, and the rings were measured to a precision of ±0.001

mm. The crossdating procedures involved the use of the COFECHA computer program (Holmes, 1983), which employs a sliding correlation method to identify probable crossdates between tree-ring series. Experience has demonstrated that this method of crossdating is superior for trees growing in the northeastern United States to that based on the skeleton plot method (Stokes and Smiley, 1968). COFECHA is also very similar to the highly successful CROS program used by Irish dendrochronologists to cross-date European oak tree-ring series (Baillie, 1982).

COFECHA was employed to first establish internal or relative crossdating among the individual timbers. This step is critically important because it locks in the relative positions of the timbers with each other and indicates whether or not the dates of those specimens with outer or bark rings are consistent. Upon completion of this stage, the internally crossdated series were compared with independently established historical dating masters developed from a series of historical structures located in regions of Virginia, Maryland and Pennsylvania not far from the Elk Landing site. These historical oak chronologies were previously dated independently against existing long "modern" tree-ring chronologies based on living trees from Virginia and Pennsylvania.

Results

Figure 1 illustrates the comparison of the Elk Landing site internal oak chronologies against two historical dating masters. In each case, the Elk Landing chronologies correlate statistically significantly ($p<0.001$) with the historical dating masters. This means that there is far less than one chance in 1000 that the overall dating of the samples is spurious.

The dating of the individual samples is shown in Table 1. As stated above, of the 21 samples taken, 15 had a sufficient number of rings and were of sufficient physical condition to establish crossdating. This is a relatively high success rate given the circumstances of the investigation, i.e. samples not *in situ*. The 4 sampled oak timbers that did not crossdate had either too few rings to establish reliable crossdating, behaved in a statistically anomalous fashion, and/or were physically degraded by wood-rot or insect damage. The tulip poplar sample had an insufficient number of rings to allow statistically significant crossdating.

Whenever possible, samples were obtained from timbers with clear bark or supposed bark edges. However, it was not always possible to recover complete sapwood, including the bark ring, due to degradation in the sapwood and/or mechanical shaping of the timbers. Therefore, the outer dates of the timbers must be carefully interpreted in context. Table 1 contains a column with the heading "BARK (Y/N)". Only those timbers with a "Y" have outer dates that may be interpreted as probable cutting or near-cutting dates of the timbers.

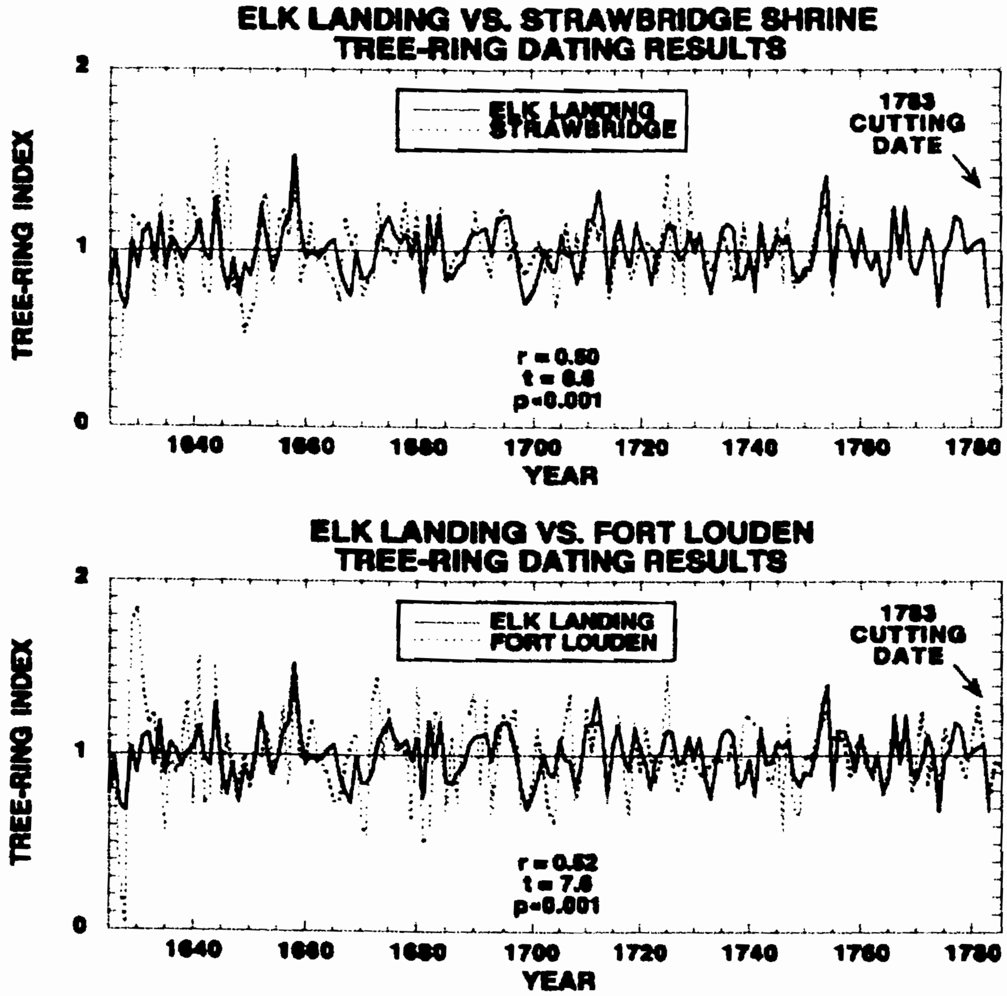

Figure 1. Comparison of the compiled Elk Landing oak tree-ring chronologies with independently dated historical oak chronologies.

Table 1. Tree-ring dates of the individual sampled timbers from Elk Landing. The "CORRELATION" of each series refers to how well that series correlates with the average of all the others in its group. As such, it is a measure of crossdating between timbers, which comes directly from COFECHA. The majority of the correlations are above 0.50, indicating that the crossdating among the timbers in each group is very strong. The "BARK (Y/N)" column indicates, as best as can be determined, if the bark edge was present (Y) or absent (N). Only those timbers with a "Y" can be used to determine absolutely the likely construction date of the structures of the Elk Landing site from which the sample was taken. Small differences between "LAST YEAR" dates of those timbers marked "Y" may be due to the loss of the outermost ring during sampling.

BOWMAN HOMESTEAD TREE-RING DATED PINE SAMPLES							
nr.	SAMPLE	DESCRIPTION	FIRST YEAR	LAST YEAR	YEARS	CORRELATION	BARK (Y/N)
1	ELMD01	Hollingsworth House, S porch floor, length beam	undated	undated	54	n/a	n/a
2	ELMD02	Hollingsworth House, S porch floor, intermediate length beam	undated	undated	73	n/a	n/a
3	ELMD03	Hollingsworth House, S porch floor, innermost length beam, REUSED TIMBER (old mortices)	1648	1783	136	0.461	?
4	ELMD04	Stone House, girder, 2nd floor, under roof ridge	1714	1783	70	0.443	Y
5	ELMD05	Stone House, girder, 1st floor	1690	1766	77	0.682	N
6	ELMD06	Stone House, 3rd floor, Liriodendron sp.	undated	undated	n/a	n/a	n/a
7	ELMD07	Stone House, girder, 2nd floor,	1704	1761	58	0.664	N
8	ELMD08	Stone House, joist, 1st floor	1683	1769	87	0.640	N
9	ELMD09	Stone House, girder, 1st floor	1714	1770	57	0.576	N
10	ELMD10	Stone House, joist, 1st floor, nailed to ELMD09	1710	1775	66	0.498	N
11	ELMD11	Stone House, plate? near hearth 2nd floor?	1641	1718	78	0.622	N
12	ELMD12	Stone House, joist, NOT 1st floor	1720	1782	63	0.285	Y
13	ELMD13	Stone House, joist, 1st floor	1598	1782	185	0.438	Y
14	ELMD14	Stone House, girder?, NOT 1st floor	1697	1773	77	0.624	N

15	ELMD15	Stone House, joist NOT 1st floor	1661	1782	122	0.435	Y
16	ELMD16	Stone House, joist, connected mortise & pinion to 2nd floor girder ELMD05	1664	1771	108	0.254	N
17	ELMD17	Stone House, joist, NOT 1st floor, chiseled "IV"	1678	1779	102	0.482	N
18	ELMD18	Stone House, joist, NOT 1st floor, 3rd floor likely, chiseled "II", heavily worked	1540	1682	143	0.343	N
19	ELMD19	discarded, too few rings	n/a	n/a	n/a	n/a	n/a
20	ELMD20	Stone House, exterior N wall, under collapsed porch, loose find, REUSED?	undated	n/a	n/a	n/a	n/a
21	ELMD21	Stone House, exterior N wall, center support under collapsed porch, REUSED?	undated	n/a	n/a	n/a	n/a

Based on the results of the study, as illustrated in Table 1, there is extremely strong dendrochronological evidence for the following construction periods in the sampled timbers:

a) Stone House/Jon Hans Steelman Tavern– 1782/1783
b) Hollingsworth House – unknown, but timbers cut in 1783 were utilized (likely reused material) in the construction of its South porch

References

Baillie, M.G.L. 1982. *Tree-Ring Dating and Archaeology*. Croom Helm, London and Canberra. 274 pp.

Cook, E.R. and L. Kariukstis, eds. 1990. *Methods of Dendrochronology: Applications in the Environmental Sciences*. Kulwer, The Netherlands.

Douglass, A.E. 1909. Weather cycles in the growth of big trees. *Monthly Weather Review* 37(5): 225-237

Douglass, A.E. 1920. Evidence of climate effects in the annual rings of trees. *Ecology* 1(1):24-32

Douglass, A.E. 1928. Climate and trees. *Nature Magazine* 12:51-53

Douglass, A.E. 1921. Dating our prehistoric ruins: how growth rings in trees aid in the establishing the relative ages of the ruined pueblos of the southwest. *Natural History* 21(1):27-30

Douglass, A.E. 1929. The secret of the southwest solved by talkative tree-rings. *National Geographic Magazine* 56(6):736-770.

Eckstein, D. 1978. Dendrochronological dating of the medieval settlement of Haithabu (Hedeby). In: *Dendrochronology in Europe*, (J. Fletcher, ed.) British Archaeological Reports International Series 51: 267-274

Eckstein, D. 1984. *Dendrochronological Dating (Handbooks for Archaeologists, 2)*. Strasbourg, European Science Foundation.

Edwards, M.R. 1982. Dating historic buildings in lower Maryland through dendrochronology. In: *Perspectives in Vernacular Architecture*. Vernacular Architecture Forum.

Fritts, H.C. 1976. *Tree Rings and Climate.* Academic Press, New York. 567 pp.

Heikkenen, H.J. and M.R. Edwards. 1983. The years of construction and alteration of two buildings, as derived by the key-year dendrochronology technique. In: *Conservation of Wooden Monuments*., (R.O. Byrne, J. Lemire, J. Oberlander, G. Sussman and M. Weaver eds.) ICOMOS Canada and the Heritage Foundation, Ottawa: 173-185.

Holmes, R.L. 1983. Computer assisted quality control in tree-ring dating and measurement. *Tree-Ring Bulletin* 43:69-78

Stahle, D.W. and D. Wolfman. 1985. The potential for archaeological tree-ring dating in eastern North America. *Advances in Archaeological Method and Theory* 8: 279-302.

Stokes, M.A. and T.L. Smiley. 1968. *An Introduction to Tree-Ring Dating*. University of Chicago Press, Chicago 110 pp.