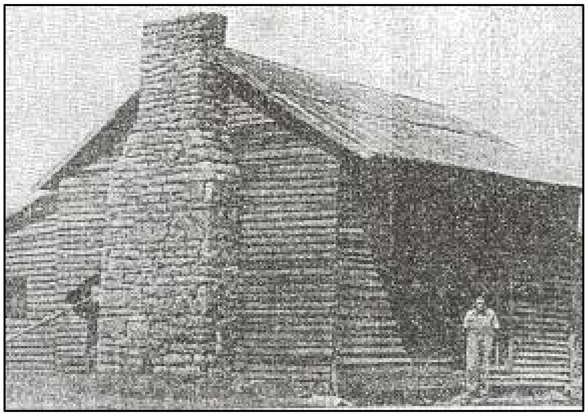
The Historical Dendroarchaeology of Two Log Structures at the Marble Springs Historic Site, Knox County, Tennessee



Jessica D. Brogden [1]
Maggie R. Stevens [1]
Henri D. Grissino-Mayer [1]
Charles H. Faulkner [2]

[1] Laboratory of Tree-Ring Science
Department of Geography
1000 Phillip Fulmer Way
The University of Tennessee
Knoxville, Tennessee 37996-0925

[2] Department of Anthropology
The University of Tennessee
Knoxville, Tennessee, 37996 USA

Final Report Submitted to the
Tennessee Historical Commission

April 25, 2007

The Historical Dendroarchaeology of Two Log Structures at the Marble Springs Historic Site, Knox County, Tennessee

Table of Contents

ABSTRACT

The Marble Springs homestead in south Knox County serves as a significant heritage site for the state of Tennessee because it was the final home of one of nation's most important founding statesmen and first governor of Tennessee (1796 to 1801, 1803 to 1809), John Sevier. Recent archaeological and historical research had called into question the authenticity of the original John Sevier cabin located at the Marble Springs homestead. We used tree-ring dating to determine the year(s) of construction of the Governor John Sevier cabin and the adjacent Walker Springs cabin (which had been relocated to the site later and has no ties to Gov. John Sevier) by first extracting cores from all accessible logs in the cabins and then evaluating the cutting dates of these logs. A nearby reference chronology at Norris Dam anchored the Gov. John Sevier cabin chronology from 1720 to 1834 and the Walker Springs cabin chronology from 1675 to 1826. The cutting dates obtained from six logs in the Gov. John Sevier cabin suggest construction of the cabin was completed sometime between late 1835 and early 1836. We were able to date cores from 29 logs from the Walker Springs cabin, which strongly support final construction between late 1827 to early 1828. Our dendrochronological analyses suggest that the cabin at Marble Springs long thought to be the original cabin occupied by Gov. John Sevier was instead likely built during the occupancy of the property by a later tenant, George Kirby, in the early to mid-1830s, well after the death of Sevier in 1815.

Keywords: tree rings, historical dendroarchaeology, Governor John Sevier, Marble Springs, Tennessee

INTRODUCTION

The study of dendroarchaeology uses tree-ring dating techniques to determine when a tree was harvested in order to derive the year or years of construction for a structure composed of wood or with wood incorporated (Bannister 1962; Dean 1978). The information from this type of analysis allows agencies charged with the care of historical structures to authenticate the historical significance and authenticity of a structure. These tree-ring dating techniques are increasingly being used in the Southeastern U.S. to date the construction of historic structures (Bowers and Grashot 1976, Stahle 1979, Bortolot *et al.* 2001, Mann 2002, Reding 2002, Wight and Grissino-Mayer 2004, Lewis *et al*. 2006, Grissino-Mayer and van de Gevel 2007). Such structures can be accurately dated with existing reference tree-ring chronologies that have been developed previously in the Southeast and housed in the International Tree-Ring Data Bank at the National Climatic Data Center in Asheville, North Carolina. In some cases, these studies have proven that accepted construction dates based on documentary evidence and oral tradition as inaccurate (Mann 2002, Grissino-Mayer and van de Gevel 2007).

The tree-ring records from such structures are also valuable for extending existing chronologies further back in time to the 16th and 17th centuries or perhaps earlier. This is accomplished by crossdating where matching, overlapping patterns of narrow and wide rings from living trees are compared against progressively older pieces of wood (Fritts 1976; Baillie 1982). The unique temporal patterns of wide and narrow rings are essential for crossdating the samples of wood. The variability in ring widths is caused by changes in regional climate on a year-to-year basis so that the patterns are recorded in a similar pattern in the ring widths (Fritts

1976). Other sets of tree rings can then be dated by comparing them to the established reference chronology.

The cabin located at the Marble Springs Historic Site (Figure 1) is believed to be the home of Tennessee's first governor, John Sevier. Sevier was the first and only governor of the short-lived State of Franklin (1785–1788), served as brigadier general of militia for the Washington District of the Territory South of the River Ohio (as Tennessee was known then), and then served as governor of Tennessee from 1796 to 1801, and again from 1803 to 1809. Governor John Sevier is thought to have acquired the Marble Springs property via a North Carolina land grant sometime around 1796 when he began to live there part-time. He named the site "Marble Springs" for the two year-round flowing springs on the property (Miller 2000, Barber 2005). Over the years, several buildings were located at the site, including the main cabin attached to a kitchen by a dogtrot, a springhouse, a barn and crib, an ash hopper, a smokehouse, and four or five other cabins. Sevier himself is believed to have made improvements to structures on the site during the years he spent at Marble Springs (Sevier 1790–1815).

Local lore has recently questioned the legitimacy of the main structure at the Marble Springs homestead dating to the period of occupancy by Governor John Sevier. Although archaeological testing around the John Sevier cabin produced numerous artifacts that dated to the late 1700s, the cabin has tolerated "…a persistent rumor that the present building was not his [John Sevier's] home at Marble Springs" (Faberson and Faulkner 2005). Sevier himself never mentioned building the cabin (Barber 2005) and, for someone of Sevier's national stature, the cabin is rather small and simplistic, even by the standards of 1800. Furthermore, Ramsey's famous 1853 description of the "secluded spot" where "stood the cabin of Governor Sevier"

(Ramsey 1853: 710) is actually describing a location far from the current Marble Springs homestead (Faberson and Faulkner 2005).

To help settle this controversy, our goal was to determine the year(s) of construction for Gov. John Sevier's cabin at the Marble Springs homestead to verify whether or not this cabin could indeed have been the home of Governor John Sevier. We used a well-established reference tree-ring chronology that exists for the east Tennessee region to date the Gov. John Sevier cabin, but also took advantage of the tree-ring record in the well-preserved oak logs found in another cabin located on the Marble Springs property. Called the Walker Springs cabin (Figure 2), this two-story structure was originally located in the western area of the city of Knoxville, Tennessee, near Walker Springs Road (Faulkner 1991). It was moved to its current location at Marble Springs in March 1987 (John Rehder, *personal communication*), and has no ties whatsoever to Gov. John Sevier. The logs in this cabin consist of oak trees exclusively, many containing well over 100 tree rings.

METHODS

Field Methods

Although both pine and oak logs were available to core in the Gov. John Sevier cabin , we concentrated our sampling on the oak logs because (1) oak was more commonly used by early settlers to build log structures than was pine, and (2) no pine reference chronologies exist for the central and eastern Tennessee region. The cabin today consists largely of pine logs. We extracted 0.5" diameter cores from 12 oak logs in the cabin with a specially designed hollow, cylindrical drill bit attached to a hand drill (Figure 3). To assist the crossdating process, we also cored logs from all four walls and both levels of the Walker Springs cabin. Sample identifications were assigned to the cores which consisted of an abbreviation for the building ("JS" or "WS"), the cardinal direction of orientation of the wall (N, S, E, or W), the log number (beginning with the bottom log = "01"), and sequential letters for each core extracted from the log (A through D). Each side of the cabin was sketched and all sampled locations indicated on the sketch.

Whenever possible, each log was sampled both at the basal (bottom location on the tree trunk) and distal (upper location of the tree trunk) ends at a location with a smooth, intact, curved surface where the outermost rings were most likely to be preserved. At least two cores per log were taken to minimize the expected effects of intra-ring variability and also for replication should internal defects occur in one of the cores. Before coring, the outer surface of the target area was marked with permanent ink to verify that the outer rings had remained intact after coring. An appropriate angle and depth for coring was estimated by examining the end of the log and locating the tree pith. After the appropriate depth was reached, the core was extracted by dislodging the attached end of the core with a hooked, thin steel rod designed for that purpose. The extracted cores were then immediately glued onto wooden core mounts with the cells aligned vertically so that the wood surface could be sanded on a transverse plane. All relevant information about each sample was written on the core mount.

Laboratory Methods

The cores were sanded using progressively finer sandpaper, beginning with ISO P40-grit (425–500 μm) and ending with ANSI 400-grit (20.6–36.0 μm) (Orvis and Grissino-Mayer 2002).

The sanding process produced a surface on the wood that allowed the cellular structure of the tree rings to be visible under standard 10X magnification. All tree rings on each core were then marked by decades starting from the innermost complete ring (complete earlywood and latewood = ring number “1”) to help with the measuring and crossdating procedures. Each 10th ring was marked with a single dot, every 50th ring with two dots, and every hundredth ring with three dots (Stoke and Smiley 1968). The ring widths of each core then were measured to the nearest 0.001 mm using a Velmex measuring system and Measure J2X software. The measurement files created by this process were used for statistical crossdating.

Crossdating

The ring-width measurements for each core were then statistically crossdated to reference oak tree-ring chronologies that existed already within the region. These chronologies were obtained from the International Tree-Ring Data Bank (IGBP PAGES/World Data Center for Paleoclimatology) in Asheville, North Carolina. We used the Norris Dam State Park and Piney Creek Pocket Wilderness reference chronologies from eastern Tennessee to anchor the measurement series from the two structures in time. The Norris Dam and Piney Creek chronologies are both white oak (*Quercus alba* L.) chronologies (Duvick 1981, 1983). The Norris Dam chronology spans 1633 to 1980, while the Piney Creek chronology spans 1651 to 1982. Of these three chronologies, the Norris Dam chronology proved the most useful. The chronology consists of 71 dated series with an excellent average interseries correlation of 0.61 and an average mean sensitivity of 0.20.

The undated measurements were compared one at a time to these reference chronologies using the computer program COFECHA (Holmes 1983, Grissino-Mayer 2001). COFECHA first removes age-related and other low-frequency trends through a three-step iterative process to ensure the year-to-year (i.e., high-frequency) trends are emphasized as these are necessary for successful crossdating. COFECHA then uses segmented time series correlation techniques to crossdate the undated series against the reference chronologies. We tested 40-year segments of each measurement series lagged 20 years. Correlation coefficients were calculated for each segment as a measure of the strength of the relationship that segment has with other 40-year segments throughout the reference chronologies. For an undated series to be considered dated, the temporal placements suggested by COFECHA had to be systematic for all or most of the tested 40-year segments, i.e. most segments had to have the same date adjustment (such as "+1727"). The correlation coefficients also had to be statistically significant ($p \geq 0.37$, $p < 0.01$), although some erratic ring patterns caused the correlations for certain segments to fall below this critical threshold, which is common in dendrochronology, especially for eastern tree species. Notable marker rings were then identified and recorded to assist in the crossdating of other series via the list method (Phipps 1985; Yamaguchi 1991). The final placement of a series in time had to be both visually and statistically convincing (Grissino-Mayer 2001).

Once dated against the reference chronologies, all series were combined into one measurement file and again tested using COFECHA to ensure crossdating accuracy internally among the series. COFECHA flagged low correlations ($r < 0.37$, $p > 0.01$) that required re-inspection. If the alternate position suggested by COFECHA was unrealistic (for example, a "+9" adjustment when both 40-year segments on either side were dated correctly) or displayed a statistically significant correlation, the segment was kept at its original placement. Series that did not crossdate convincingly against either of the reference chronologies or with the crossdated individual series were temporarily put aside. We later attempted to crossdate them with the final crossdated tree-ring chronology created from for each cabin.

Two statistical descriptors were used to assess the quality of the crossdating. First, the average interseries correlation calculated by COFECHA is an average of the correlation coefficients for each measurement series when correlated against the master chronology created from all the other dated series (Grissino-Mayer 2001). In general, an interseries correlation of 0.40 or higher is desirable for consideration as a correctly dated series. Second, we used the average mean sensitivity, a measure of year-to-year variability, for all dated series. Because crossdating is a high-frequency process, high mean sensitivities (generally above 0.20 for southeastern tree species) facilitate the crossdating process. Low mean sensitivities result when the tree-ring series exhibit very little year-to-year variability. This lower amount of variability, known as complacency, occurs when trees experience little environmental stress. Mean sensitivity values around 0.20 are common for oak tree-ring patterns from the southeastern U.S. (DeWitt and Ames 1978).

Establishing Cutting Dates for Logs

We examined the outermost dated ring on each core at high magnification and then assigned a symbol to determine the likely period of cutting (Bannister 1962, Nash 1999):

B: bark is present, indicating the outer ring is fully intact (certainly a cutting date);

r: outermost ring is continuous and intact around a smooth surface, but no bark is present (considered a cutting date);

v: the date is within a few years of the cutting date, based on presence of sapwood;

vv: impossible to determine how far the outer ring is from the true outer surface (no sapwood present and rings in the heartwood are likely missing).

++: a ring count was necessary for the outermost core section on a core with two sections separated by decay.

We carefully inspected the completeness of the outermost ring by looking for complete formation of earlywood vessels in the oaks followed by complete formation of latewood with no earlywood vessels formed in the following year. The latewood and earlywood of prior rings guided us in assessing whether the outermost ring appeared completely formed. If a ring was completely formed, the tree was most likely cut during the tree's dormant period after that year, a period spanning several months from the fall of one calendar year to the spring of the next. Because of the possibility of the tree having been cut in either of the two years in the cases of fully-formed outer rings, we assigned the cutting date based on the year of the complete outer ring although the tree may have been cut the following year before growth resumed.

Cores taken from dry seasoned wood is often brittle and the sapwood can be decayed considerably or riddled with insect galleries, causing the cores to be missing rings between core sections. We crossdated the rings on each core up to the gap of missing rings, and then counted the number of rings in the outermost detached section of the core (which included the outermost ring and therefore the cutting date of the log) and added this ring number to the outermost crossdated ring on the innermost core section. For these cores, the outermost date was a *terminus post quem*, i.e. a year after which the log had been harvested for inclusion in the structure (Baillie 1995).

RESULTS

We extracted 31 cores from 11 oak logs in the John Sevier cabin, while 53 cores representing 31 oak logs were extracted from the Walker Springs cabin. We consider the oak logs in the John Sevier cabin to represent the original logs used in the construction of the cabin. The remaining 48 logs were pine and we consider these to be likely replacement logs. The final chronology for the John Sevier cabin consisted of 16 cores representing 6 logs (Table 1). For Walker Springs, 48 cores were used to develop the final tree-ring chronology, representing 29 logs (Table 2).

Descriptive Statistics

For the John Sevier cabin, the average interseries correlation was 0.64 (lowest r = 0.40 for core JSE01B, n = 96 yrs; highest r = 0.81 for core JSW04B, n = 93 yrs; Table 1). For the Walker Springs cabin, the average interseries correlation was 0.61 (lowest r = 0.37 for core WSW10B, n = 75; highest r = 0.76 for core WSN07A, n = 119 yrs; Table 2). Both values are well above the minimum 0.40 we require as a sign of the quality of internal crossdating for a set of site measurements. Both values are also comparable to the average interseries correlations for the Norris Dam and Piney Creek reference chronologies (0.61 and 0.58, respectively).

For the John Sevier cabin, the average mean sensitivity was 0.22 (lowest = 0.18 for four cores; highest = 0.27 for core JSN03B; Table 1). For the Walker Springs cabin, the average mean sensitivity was also 0.22 (lowest = 0.14 for core WSE03A; highest = 0.31 for core WSW04B; Table 2). These values are higher than the average reported for 16 other white oak chronologies in the eastern and central U.S. (average = 0.16, with upper 95% confidence limit of 0.20; DeWitt and Ames 1978), and are slightly higher than the values for the reference tree-ring chronologies used to crossdate our series (Norris Dam = 0.20, Piney Creek = 0.20).

Crossdating

For the 16 cores from the John Sevier cabin, COFECHA tested 61 40-yr segments for crossdating accuracy and flagged only five (8.2%) as possibly being misdated. Four of these flags occurred on the two cores from one tree, JSN09 (Table 3), although the overall interseries correlations for these two cores were acceptable (JSN09C = 0.45 and JSN09D = 0.52). For the 48 cores from the Walker Springs cabin, COFECHA tested 244 40-year segments and flagged only seven (2.9%) as being possibly misdated. The rings in all 12 flagged segments for both structures were inspected and found to be correctly placed in time. Rather than being possibly misdated, these segments contained erratic rings or ring patterns (e.g., the extremely wide ring for 1816 on core JSN09C) that significantly lowered the correlations for these ring segments. These erratic patterns were likely caused by local disturbances, such as windthrow or wildfire, that masked the stronger climate factor that causes the common patterns necessary for successful crossdating.

The final John Sevier RESIDUAL chronology had a highly significant correlation of 0.47 ($t = 5.71$, $p < 0.0001$, $n = 115$ years) with the Norris Dam RESIDUAL tree-ring chronology from 1720 to 1834 (Figure 4). The final Walker Springs RESIDUAL chronology had a lower but still statistically significant correlation of 0.34 (t = 4.49, $p < 0.0001$, n = 152 years) with the Norris Dam RESIDUAL tree-ring chronology from 1675 to 1826 (Figure 5). Together, the John Sevier chronology and the Walker Springs chronology displayed a very high correlation with each other of 0.56 (t = 6.90, $p < 0.0001$, n = 107 years) (Figure 6), confirming the crossdating of the two chronologies.

Cores from two logs on the John Sevier cabin could not be dated with the Norris Dam reference chronology, but dated significantly against the Piney Creek Pocket Wilderness reference chronology, bringing the total number of dated logs to 8 (Table 5). Cores JSE07A and JSN06A displayed statistically significant correlations with this chronology of 0.41 (t = 4.56, $p < 0.0001$, n = 105 years) and 0.46 (t = 5.05, $p < 0.0001$, n = 97 years), respectively. Core JSE07A had an outermost ring of 1879. Core JSN06A had an outermost measured ring of 1868, but had 11 rings (unmeasured) in the outer segment of the sapwood, which would make the outermost ring for the core 1879 as well. These two logs were clearly replacement logs taken from a structure created from trees that once grew more towards east-central Tennessee rather than eastern Tennessee based on the strength of correlations with the Piney Creek chronology. We observed that log JSE07 consisted of two sections, an oak section on its northern end and a pine section for the remainder.

Cutting Dates

The cutting dates for logs used in the John Sevier cabin clustered in the middle 1830s, although one log had a cutting date of 1830 (JSS01) (Table 5). Two logs (JSN03 and JSW04) had 1834 cutting dates while another log (JSS03) had a cutting date of 1835. Two logs had outermost dates of 1832 (JSE01 and JSN09) based on ring counts on the separated core sections in the sapwood, but these dates nonetheless support tree harvesting in the middle 1830s. The clustering of outermost dates on these five oak logs suggest a construction of the cabin in the period 1834–1835. Ideally, we would have preferred a minimum of 10 logs with a clear clustering of outermost dates in a one to two year period before inferring a possible year of construction, but the degraded condition of the logs in this cabin hindered this assessment.

The cutting dates for logs used in the Walker Springs cabin (Table 6) provide a stark contrast. Our success in crossdating the rings in these logs and the clear clustering of outermost rings likely was due to the protective covering of clapboard siding installed on the house for much of its existence. Virtually all logs (29) support cutting dates in the period 1827–1828, making this cabin one of the most reliably dated historic structures in the Southeastern U.S. Many logs (*e.g.*, WSE03, WSN03, WSN04, WSN05, WSN10, WSW04, and WSW08) had an outermost ring of 1827 that had only earlywood vessels present, suggesting that the trees were harvested soon after the trees had broken dormancy in the spring of 1827. Other logs (*e.g.*, WSE05, WSN11, WSN12, WSS04, WSS05, and WSW12) had more complete latewood for the year 1827, suggesting that these trees were harvested later in the growing season, perhaps in late summer of fall of 1827. However, these rings may have formed completely by the time the trees were cut, suggesting harvesting ay time from fall of 1827 to late winter 1828.

Discussion

The quality of crossdating and the statistics of the resulting tree-ring chronologies from both cabins were comparable to previously created oak reference chronologies in the region.

The high interseries correlations between ring patterns from the John Sevier cabin, the Walker Springs cabin, and the Norris Dam living trees (as well as the trees used to create the Piney Creek reference chronology) demonstrate the regional climatic signal for eastern Tennessee common in all data sets. Ideally, we would have liked additional trees to strengthen the sample size in the John Sevier cabin, but we nonetheless feel strongly that the statistically significant correlation calculated between the chronology from this cabin and the Norris Dam chronology indicates that the John Sevier cabin is correctly and convincingly placed in time. Such a high correlation would not have occurred had the individual ring series not been correctly crossdated. Marker rings such as 1755, 1762, 1774, and 1813 are all clearly present in both the John Sevier cabin cores and the Norris Dam reference chronology. In some years, the two chronologies clearly did not correspond (such as the years 1732, 1736, 1753, and 1807) but these discrepancies are likely because of either differences in local climate patterns or influences of local disturbances, and do not override the overall regional climate signal shared between these two chronologies.

Asynchrony could have occurred because trees may have been affected by stand-specific local disturbances common in eastern U.S. forests, especially gap formation caused by windthrow or expected tree mortality (Runkle 1982, Orwig and Abrams 1995, Frelich 2002, Cseke 2003). The tree rings in such segments often display lower correlations because the segment had a weaker relationship to climate during the period of influence by these disturbances. Still, we point out that the series or portions of series with lower correlations still always had positive correlations (rather than near zero or negative correlations) compared to segments from other series, suggesting that some signal was present despite the added noise.

As expected after our initial visual inspection, we were unable to conclusively date some of the cores collected from oak logs in the John Sevier cabin. In general, the logs (both oak and pine) in the John Sevier cabin are in poor condition, and the cores taken from this cabin were also in poor condition. On most cores, the sapwood was heavily decayed causing a gap of missing rings between the sapwood and heartwood, although occasionally we found that we had all the rings despite this gap. Sapwood is especially vulnerable to insect infestation (resulting the ubiquitous beetle galleries) and decay caused by moisture, in addition to its susceptibility to removal during the log hewing process (Baillie 1982, Mann 2002). Occasionally, cores were too short due to internal decay, causing too few rings for accurate crossdating. In contrast, the logs in the Walker Springs cabin were all in excellent condition, likely because the structure was covered for most of its existence by protective clapboard siding when it was located in west Knoxville, Tennessee (John B. Rehder, *personal communication*). As a result, we were able to develop a new high quality, well replicated, reference tree-ring chronology for eastern Tennessee from this one structure.

In the John Sevier cabin, the logs with series that could be crossdated had smooth intact outer surfaces with outermost ring dates ranging from the early to mid-1830s. Two of these logs (as well as seven in the Walker Springs cabin) had outermost sections of cores that had separated from the main portion of the core. The rings in these separated section were not measured but could be visually compared to rings in the sapwood on complete cores to visually match the ring patterns and come up with an estimated outermost ring date. Two logs that we sampled on the John Sevier cabin were obvious replacement logs from another structure as these had much later outermost dates (1879) than the other six logs.

Most logs that currently make up the John Sevier cabin are actually pine logs. The oak logs sampled for this study are found along the bottom areas of each of the four walls and are clearly visually distinct in size and condition from the smaller and more decayed pine logs. In general, the early settlers used oak and tulip poplar trees exclusively in log cabin construction because these genera of trees have wood that is resistant to decay and is denser than conifer wood, ensuring greater longevity of the structure. Pine wood would occasionally be used in smaller outbuildings (such as smokehouses, small barns, and corn cribs) that did not require the longevity of home dwellings. Pine wood, however, is less resistant to decay, especially the very porous sapwood that is prone to rapid decay and insect damage. We strongly believe that the pine logs in the John Sevier cabin are logs that replaced original oak logs that had either decayed (less likely) or become unstable and dilapidated, thus compromising the integrity of the structure. Many of the pine logs currently in the John Sevier cabin are themselves in need of replacement. It is still possible that the *location* of the current cabin was indeed the site of the original John Sevier cabin because previous archaeological research has uncovered numerous artifacts that strongly suggest an initial occupation of the site in the late 1700s (Faberson and Faulkner 2005).

The John Sevier cabin was likely completed shortly after the last of the trees was felled, putting the time of completion somewhere between the summer of 1835 to the early spring of 1836. These cutting dates make the inhabitance of this cabin by Governor John Sevier impossible because these logs were felled well after his death in 1815. This would place the time of construction during the period of ownership (1818–1847) by James Dardis, but historians are unclear who actually lived at Marble Springs during this interval (Faberson 2005). In 1818, the

Sevier heirs sold the property to James Dardis who continued to own the land until 1847, when the property was bought by George Kirby (Barber 2005). It is unlikely that Dardis ever lived at Marble Springs because he was a wealthy attorney and the property was simply one of his investments. Instead, the property was likely occupied by tenants at this time, the Kirby family (Faberson 2005). George Kirby is found on the 1840 census living in the Marble Springs area. Because Kirby had a son who was then 7 years old, he must have been married by at least 1832, placing him in time to the harvest dates of logs for the now John Sevier cabin. We believe that Kirby probably built the cabin shortly before or when he got married, not uncommon in those days. Interestingly, few historical artifacts that dated between 1820 and the 1840s–1850s were uncovered in previous archaeological investigations. It is very possible that no one lived permanently at the Marble Springs Historic Site until after 1830 when Dardis moved to Winchester, Tennessee, and George Kirby began living there as a caretaker. Kirby eventually purchased part of the original Sevier tract when Dardis died in 1847.

ACKNOWLEDGEMENTS

We are indebted to the Tennessee Historical Commission which continues to recognize the value of dendroarchaeological dating and interpretation of historic sites in Tennessee. Steve Rogers of the THC especially should be commended for his logistical support and encouragement throughout the project. We wish to thank Tracy Caskey, the former Director of the Marble Springs Historic Site, and David Daily, the current Site Manager, for help in allowing us unfettered access to the two historic log houses. We were greatly aided by numerous students of the Department of Geography who graciously took time off from their

own busy schedules to help us collect the core samples: Christopher Underwood, Saskia van de Gevel, Lisa LaForest, Georgina DeWeese, Tim Green, Brian Watson, and Philip White. Dr. John Rehder of the Department of Geography accompanied us on several trips to Marble Springs and provided valuable input on the history of the two log structures on the farmstead.

REFERENCES

Baillie, M. G. L.

1982 *Tree-Ring Dating and Archaeology*. The University of Chicago Press, Chicago.

Baillie, M. G. L.

1995 *A Slice Through Time: Dendrochronology and Precision Dating*. B.T. Batsford, London.

Bannister, B.

1962 The interpretation of tree-ring dates. *American Antiquity* 27: 508–514.

Barber, J. L.

2005 Historical Background: John Sevier at Marble Springs. Pages 4–7 i*n* T.A. Faberson and C.H. Faulkner, editors, *Archaeological Excavations at Marble Springs: Summer, 2003*. Department of Anthropology, University of Tennessee, Knoxville.

Bortolot, Z. J., C. A. Copenheaver, R. L. Longe, and J. A. N. Van Aardt

2001 Development of a white oak chronology using live trees and a post-Civil War cabin in south-central Virginia. *Tree-Ring Research* 57(2): 197–203.

Bowers, L. J., and D. L. Grashot

1976 Results of the First Hermitage Dendrochronological Study. Pages 271–281 i*n* S.D. Smith, editor, *An Archaeological and Historical Assessment of the First Hermitage*. Division of Archaeology, Tennessee Department of Conservation, and The Ladies Hermitage Association, Nashville, Tennessee.

Cseke, J. J.

2003 A dendroecological approach for dating individual small-scale canopy disturbance events, Great Smoky Mountains National Park, Tennessee, USA. M.S. thesis, University of Tennessee, Knoxville.

Dean, J. S.

1978 Tree-ring dating in archaeology. In: J.D. Jennings, ed., Miscellaneous Collected Papers 19-24. University of Utah Anthropological Papers 99: 129-163.

DeWitt, E., and M. Ames

1978 *Tree Ring Chronologies of Eastern North America*. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Chronology Series IV, Volume 1.

Duvick, D. N.

1981 Norris Dam State Park, Tennessee, White Oak Chronology. IGBP Pages/World Data Center for Paleoclimatology Data Contribution Series # 03613–08405. NOAA/NCDC Paleoclimatology Program, Asheville, North Carolina, USA.

Duvick, D. N.

1983 Piney Creek Pocket Wilderness, Tennessee, White Oak Chronology. IGBP Pages/World Data Center for Paleoclimatology Data Contribution Series # 03542-08453. NOAA/NCDC Paleoclimatology Program, Asheville, North Carolina, USA.

Faberson, T. A.

2005 In the shadow of greatness : the archaeology of capitalism, agriculture, and the informal economy at Marble Springs, Knox County, Tennessee, 1847–1932. Ph.D. dissertation, The University of Tennessee, Knoxville.

Faberson, T. A., and C. H. Faulkner, editors

2005 *Archaeological Excavations at Marble Springs: Summer, 2003*. Department of Anthropology, University of Tennessee, Knoxville.

Faulkner, C. H.

1991 The walls can speak: A history of the William Walker house. *Tennessee Ancestors* 7(1): 42–48.

Frelich, L. E.

2002 *Forest Dynamics and Disturbance Regimes: Studies from Temperate Evergreen-Deciduous Forests*. Cambridge University Press, New York.

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

Grissino-Mayer, H. D.

2001 Evaluating crossdating accuracy: a manual and tutorial for the computer program COFECHA. *Tree-Ring Research* 57(2): 205–221.

Grissino-Mayer, H. D., and S. L. van de Gevel

2007 Tell-tale trees: The historical dendroarchaeology of log structures at Rocky Mount, Piney Flats, Tennessee. *Historical Archaeology* 41(4). (In press)

Holmes, R. L.

1983 Computer-assisted quality control in tree-ring dating and measurement. *Tree-Ring Bulletin* 43: 69–75.

Lewis, D. B., W. L. Kocis, H. D. Grissino-Mayer, and E. R. Cook

2006 Dendrochronological dating of eastern red cedar (*Juniperus virginiana* L.) logs from Alfred's Cabin, The Hermitage, Home of President Andrew Jackson. Final Report, The Ladies' Hermitage Association and the Tennessee Historical Commission, Hermitage, Tennessee.

Mann, D. F.

2002 The dendroarchaeology of the Swaggerty Blockhouse, Cocke County, Tennessee. Master's thesis, Department of Geography, University of Tennessee, Knoxville.

Miller, M.

2000 *A History of General John Sevier and his Last Known Home: Marble Springs*. Department of Anthropology, University of Tennessee, Knoxville.

Nash, S. E.

1999 *Time, Trees, and Prehistory: Tree-Ring Dating and the Development of North American Archaeology, 1914–1950*. University of Utah Press, Salt Lake City.

Orwig, D. A., and M. D. Abrams

1995 Dendroecological and ecophysiological analysis of gap environments in mixed-oak understorys of northern Virginia. *Functional Ecology* 9(6): 799–806.

Phipps, R. L.

1985 Collecting, preparing, crossdating, and measuring tree increment cores. US Geological Survey *Water Resources Investigations Report* 85-4148.

Ramsey, J. G. M.

1853 *The Annals of Tennessee*. Walker and Jones, Charleston, South Carolina.

Reding, W. M.

2002 Assessment of spatial and temporal patterns of log structures in east Tennessee. Master's thesis, Department of Geography, University of Tennessee, Knoxville.

Runkle, J. R.

1982 Patterns of disturbance in some old-growth mesic forests of eastern North America. *Ecology* 63: 1533–1546.

Sevier, J.

1790–1815 Journal of General John Sevier. Special Collections Library, University of Tennessee, Knoxville, and *Tennessee History Magazine*, Volumes 5 and 6.

Stahle, D. W.

1979 Tree-dating of historical buildings in Arkansas. *Tree-Ring Bulletin* 39: 1–28.

Wight, G. D., and H. D. Grissino-Mayer

2004 Dendrochronological dating of an Antebellum Period house, Forsyth County, Georgia, U.S.A. *Tree-Ring Research* 60(2): 91–99.

Yamaguchi, D. K.

1991 A simple method for cross-dating increment cores from living trees. *Canadian Journal of Forest Research* 21: 414–416.

TABLE 1: Statistics for Cores from the Governor John Sevier Cabin.

Series	Begin Year	End Year	Interseries Correlation	Mean Sensitivity
JSE01A	1739	1812	0.42	0.18
JSE01B	1718	1813	0.40	0.24
JSE01C	1734	1813	0.65	0.22
JSN03B	1740	1804	0.81	0.27
JSN03C	1738	1833	0.70	0.23
JSN03D	1744	1814	0.77	0.23
JSN09C	1766	1817	0.45	0.18
JSN09D	1759	1820	0.52	0.18
JSS01A	1723	1814	0.73	0.23
JSS01B	1745	1829	0.47	0.20
JSS03A	1746	1833	0.70	0.18
JSS03B	1725	1834	0.70	0.26
JSS03D	1751	1834	0.67	0.19
JSS03E	1747	1818	0.60	0.25
JSW04B	1740	1832	0.81	0.19
JSW04C	1747	1833	0.79	0.20
		Average	0.64	0.22

TABLE 2: Statistics for Cores from the Walker Springs Cabin.

Series	Begin Year	End Year	Interseries Correlation	Mean Sensitivity
WSE01A	1728	1823	0.56	0.20
WSE01B	1719	1800	0.56	0.19
WSE02A	1739	1821	0.59	0.24
WSE02B	1747	1814	0.66	0.28
WSE03A	1721	1826	0.51	0.14
WSE03B	1694	1793	0.70	0.20
WSE05A	1726	1800	0.71	0.19
WSE05B	1717	1826	0.64	0.21
WSE11A	1699	1819	0.61	0.22
WSN02A	1714	1819	0.66	0.29
WSN03A	1754	1826	0.58	0.21
WSN03B	1774	1826	0.73	0.20
WSN04A	1704	1826	0.54	0.21
WSN04B	1687	1826	0.67	0.23
WSN05A	1745	1826	0.41	0.24
WSN05B	1734	1826	0.46	0.29
WSN07A	1700	1818	0.76	0.22
WSN07B	1717	1822	0.55	0.21
WSN07C	1699	1804	0.74	0.25
WSN08A	1718	1827	0.62	0.18
WSN08C	1713	1814	0.54	0.22
WSN09A	1735	1824	0.65	0.16
WSN09B	1721	1777	0.75	0.27
WSN10A	1736	1810	0.75	0.16
WSN11A	1749	1826	0.74	0.16
WSN11B	1740	1826	0.69	0.21
WSN12B	1715	1827	0.68	0.23
WSS02A	1715	1824	0.50	0.20
WSS03B	1722	1809	0.61	0.20
WSS04A	1742	1826	0.56	0.22
WSS04B	1729	1826	0.74	0.21
WSS05A	1711	1826	0.55	0.17
WSS05B	1706	1826	0.66	0.18
WSW02A	1704	1824	0.54	0.16
WSW02B	1672	1823	0.54	0.20

TABLE 2 (continued): Statistics for Cores from the Walker Springs Cabin.

Series	Begin Year	End Year	Interseries Correlation	Mean Sensitivity
WSW03A	1725	1825	0.64	0.25
WSW03B	1713	1825	0.72	0.26
WSW04A	1729	1826	0.66	0.22
WSW04B	1691	1826	0.56	0.31
WSW05A	1722	1825	0.60	0.16
WSW05B	1723	1824	0.55	0.20
WSW05C	1696	1825	0.65	0.19
WSW06B	1737	1825	0.55	0.26
WSW07B	1685	1802	0.57	0.24
WSW08B	1716	1809	0.70	0.30
WSW10B	1748	1822	0.36	0.25
WSW11B	1701	1817	0.55	0.20
WSW12B	1754	1827	0.64	0.17
		Average	0.61	0.22

TABLE 3: COFECHA Results: Correlation Testing for Cores from the John Sevier Cabin.

	40-Yr Segment Tested *				
Series	1720–1759	1740–1779	1760–1799	1780–1819	1800–1839
JSE01A	0.54	0.52	0.64	0.45	
JSE01B	0.27B	0.51	0.66	0.5	
JSE01C	0.75	0.78	0.73	0.56	
JSN03B		0.82	0.88	0.81	
JSN03C	0.72	0.72	0.74	0.69	0.63
JSN03D		0.78	0.84	0.76	
JSN09C			0.35A	0.26B	
JSN09D		0.54	0.55	.26B	0.27B
JSS01A	0.61	0.72	0.83	0.85	
JSS01B		0.45	0.79	0.66	0.5
JSS03A		0.74	0.7	0.73	0.64
JSS03B	0.78	0.79	0.82	0.63	0.58
JSS03D		0.66	0.77	0.76	0.67
JSS03E		0.64	0.7	0.56	
JSW04B		0.77	0.81	0.85	0.86
JSW04C		0.82	0.86	0.83	0.79
Average	0.61	0.68	0.73	0.63	0.62

* An A or B flag indicates segments that had (A) correlations below the 0.37 benchmark ($p > 0.01$) or (B) segments with correlations higher at an alternate position.

TABLE 4: COFECHA Results: Correlation Testing for Cores from the Walker Springs Cabin.

	40-Yr Segment Tested *						
Series	1680–1719	1700–1739	1720–1759	1740–1779	1760–1799	1780–1819	1800–1839
WSE01A			0.50	0.61	0.81	0.63	0.53
WSE01B		0.52	0.55	0.71	0.58	0.53	
WSE02A			0.66	0.65	0.68	0.52	0.51
WSE02B				0.71	0.72	0.65	
WSE03A			0.57	0.62	0.52	0.48	0.44
WSE03B	0.68	0.65	0.71	0.65	0.75		
WSE05A			0.80	0.86	0.67	0.63	
WSE05B		0.63	0.55	0.64	0.70	0.66	0.68
WSE11A	0.66	0.67	0.65	0.57	0.58	0.61	
WSN02A		0.73	0.67	0.58	0.61	0.62	
WSN03A				0.71	0.67	0.60	0.58
WSN03B					0.75	0.75	0.76
WSN04A		0.53	0.55	0.65	0.61	0.48	0.46
WSN04B	0.86	0.80	0.65	0.75	0.56	0.45	0.47
WSN05A				0.17B	0.51	0.62	0.61
WSN05B			0.37	0.37	0.60	0.52	0.56
WSN07A		0.83	0.82	0.75	0.79	0.70	
WSN07B		0.55	0.39	0.58	0.58	0.42	0.48
WSN07C	0.80	0.80	0.85	0.75	0.66	0.66	
WSN08A		0.48	0.55	0.77	0.82	0.64	0.63
WSN08C		0.26B	0.45	0.84	0.82	0.69	
WSN09A			0.75	0.81	0.75	0.52	0.54
WSN09B			0.76	0.81			
WSN10A			0.81	0.77	0.82	0.73	
WSN11A				0.81	0.84	0.68	0.66
WSN11B				0.76	0.85	0.62	0.57
WSN12B		0.59	0.62	0.75	0.86	0.74	0.68
WSS02A		0.29A	0.41	0.77	0.69	0.49	0.48
WSS03B			0.65	0.63	0.62	0.56	
WSS04A				0.66	0.57	0.51	0.42
WSS04B			0.73	0.76	0.87	0.80	0.74
WSS05A		0.52	0.67	0.73	0.70	0.39	.35A
WSS05B		0.64	0.73	0.80	0.75	0.52	0.47
WSW02A		0.65	0.75	0.63	0.53	0.41	0.34A
WSW02B	0.41	0.76	0.78	0.74	0.61	0.45	0.49

TABLE 4 (continued): COFECHA Results: Correlation Testing for Cores from the Walker Springs Cabin.

	40-Yr Segment Tested *						
Series	1680–1719	1700–1739	1720–1759	1740–1779	1760–1799	1780–1819	1800–1839
WSW03A			0.50	0.64	0.78	0.72	0.68
WSW03B		0.77	0.70	0.74	0.71	0.68	0.66
WSW04A			0.64	0.72	0.77	0.70	0.63
WSW04B	0.24B	0.36A	0.64	0.77	0.76	0.62	0.65
WSW05A			0.66	0.49	0.56	0.72	0.64
WSW05B			0.61	0.77	0.79	0.55	0.45
WSW05C	0.70	0.71	0.81	0.78	0.70	0.54	0.40
WSW06B			0.49	0.53	0.59	0.66	0.57
WSW07B	0.52	0.64	0.71	0.83	0.53	0.46	
WSW08B		0.73	0.65	0.69	0.79	0.67	
WSW10B				0.37	0.40	0.42	0.44
WSW11B		0.50	0.61	0.60	0.61	0.46	
WSW12B				0.77	0.81	0.58	0.58
Average	0.61	0.60	0.64	0.68	0.68	0.58	0.55

* An A or B flag indicates segments that had (A) correlations below the 0.37 benchmark ($p > 0.01$) or (B) segments with correlations higher at an alternate position.

TABLE 5: Cutting Dates for Logs in the Governor John Sevier Cabin

Log	Outer Ring	Ring Type [1]	Comments	Inferred Period for Cutting
JSE01	1832	r ++	Crossdated to 1813, then 19 rings in outer section added	Tree likely cut sometime in 1830s
JSE07	1879	r	Dated against Piney Creek = replacement log;1879 ring appears complete	Tree cut anytime from late summer 1879 to spring 1880
JSN03	1834	r	Crossdated to 1833; 1834 earlywood present	Tree cut in spring 1834
JSN06	1879	r	Dated against Piney Creek = replacement log; 1879 ring appears complete	Tree cut anytime from late summer 1879 to spring 1880
JSN09	1832	r ++	Crossdated to 1817, then 15 rings in outer section added	Tree likely cut sometime in 1830s
JSS01	1830	r	Crossdated to 1829, but 1830 ring appears complete	Tree cut anytime from summer 1830 to spring 1831
JSS03	1835	r	Crossdated to 1834, but 1835 ring appears complete	Tree cut anytime from summer 1835 to spring 1836
JSW04	1834	r	Crossdated to 1833, but 1834 ring appears complete	Tree cut anytime from summer 1834 to spring 1835

[1] r : outermost ring is continuous and intact around a smooth surface, but no bark is present (considered a cutting date);

v : the date is within a few years of the cutting date, based on presence of sapwood (supports a later cutting date);

++ : a ring count was necessary for the outermost section on a core with two sections separated by decay.

TABLE 6: Cutting Dates for Logs in the Walker Springs Cabin.

Log	Outer Ring	Ring Type [1]	Comments	Inferred Period for Cutting
WSE01	1827	r ++	Measured to 1823, then +4 in outer section; 1827 ring appears to have partial latewood	Tree cut anytime from summer 1827 to late summer 1827
WSE02	1822	v	Sapwood present	Close to cutting date based on sapwood presence
WSE03	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSE05	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828
WSE11	1819	v	Sapwood present	Close to cutting date based on sapwood presence
WSN02	1820	v	Sapwood present	Close to cutting date based on sapwood presence
WSN03	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN04	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN05	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN07	1827	r ++	Measured to 1822, then +5 in outer section; 1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN08	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN09	1826	v	Sapwood present	Close to cutting date based on sapwood presence
WSN10	1827	r	Measured to 1810, outer rings matched visually; 1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSN11	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828

[1] r : outermost ring is continuous and intact around a smooth surface, but no bark is present (considered a cutting date);

v : the date is within a few years of the cutting date, based on presence of sapwood (supports a later cutting date);

++ : a ring count was necessary for the outermost section on a core with two sections separated by decay.

TABLE 6 (continued): Cutting Dates for Logs in the Walker Springs Cabin.

Log	**Outer Ring**	**Ring Type** [1]	**Comments**	**Inferred Period for Cutting**
WSN12	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828
WSS02	1825	v	Sapwood present	Close to cutting date based on sapwood presence
WSS03	1824	v ++	Measured to 1809, then ring counted in outer segment; sapwood present	Close to cutting date based on sapwood presence
WSS04	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828
WSS05	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828
WSW02	1825	v	Sapwood present	Close to cutting date based on sapwood presence
WSW03	1826	v	Sapwood present	Close to cutting date based on sapwood presence
WSW04	1827	r	1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSW05	1826	r	1826 appears complete	Tree cut anytime from summer 1826 to spring 1827
WSW06	1826	v	Sapwood present	Close to cutting date based on sapwood presence
WSW07	1825	v	Sapwood present	Close to cutting date based on sapwood presence
WSW08	1827	r	Measured to 1809, outer rings visually matched; 1827 earlywood vessels present, no latewood	Tree cut in spring 1827
WSW10	1827	r ++	Measured to 1822, then +5 in outer section; 1827 ring appears to have partial latewood	Tree cut anytime from summer 1827 to spring 1828
WSW11	1824	v ++	Measured to 1817, then +7 in outer section; sapwood present	Close to cutting date based on sapwood presence
WSW12	1827	r	1827 ring appears complete	Tree cut anytime from summer 1827 to spring 1828

[1] r : outermost ring is continuous and intact around a smooth surface, but no bark is present (considered a cutting date);

v : the date is within a few years of the cutting date, based on presence of sapwood (supports a later cutting date);

++ : a ring count was necessary for the outermost section on a core with two sections separated by decay.

Figure 1. The Governor John Sevier cabin (larger structure on the left), showing the doorway on the south entrance. The reconstructed kitchen is located to the right, separated from the main cabin by a narrow covered walkway.

Figure 2. The two-story Walker Springs cabin sits near the Governor John Sevier cabin, but was relocated to the Marble Springs Historic Site in 1988. View is of the north side. Note the differences in log sizes and their state of preservation in this cabin with logs in the Gov. John Sevier cabin (Figure 1).

Figure 3. Extracting a core from the Walker Springs cabin (east side, log WSE04, basal end) using an electric drill and the specially-designed hollow corer.

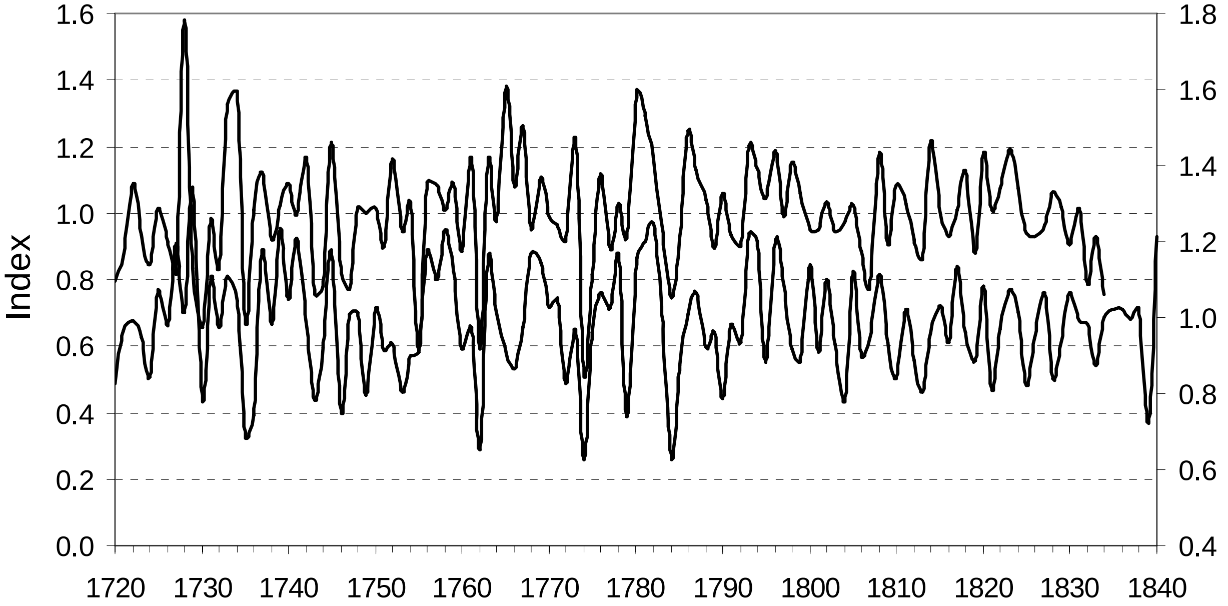


Figure 4. Crossdating between the John Sevier cabin RESIDUAL index chronology (upper) with the Norris Dam State Park RESIDUAL index chronology (bottom) from 1720 to 1834 (r = 0.47, t = 5.71, p < 0.0001, n = 115 years). The scales of the two y-axes are slightly different to visually highlight the crossdating.

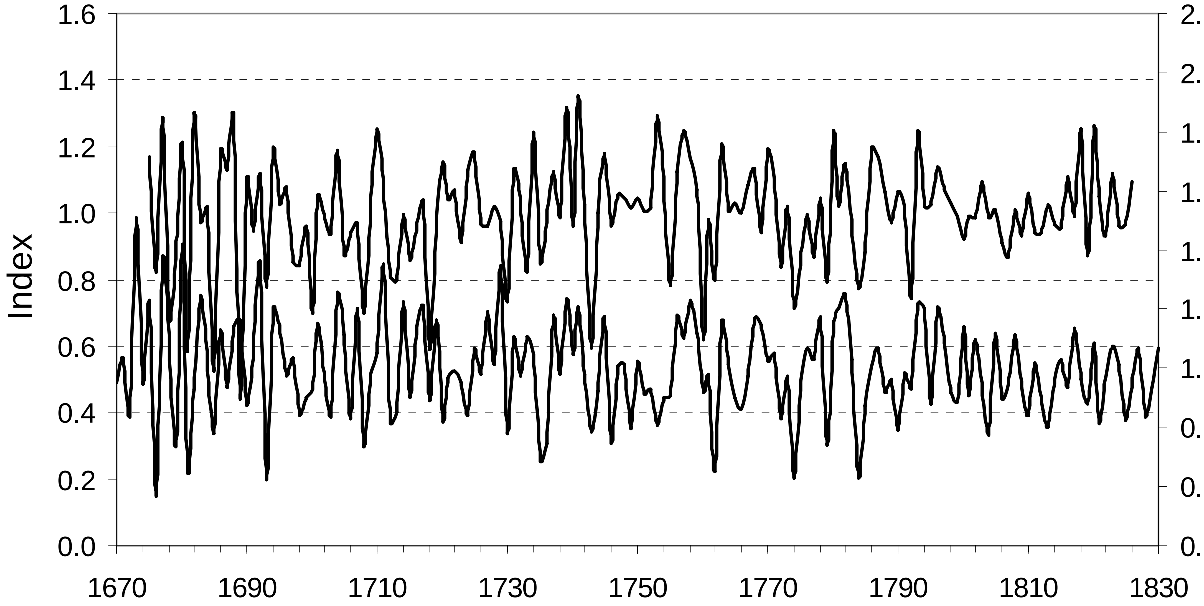


Figure 5. Crossdating between the Walker Springs cabin RESIDUAL index chronology (upper) with the Norris Dam State Park RESIDUAL index chronology (bottom) from 1675 to 1826 ($r = 0.34$, $t = 4.49$, $p < 0.0001$, $n = 152$ years). The scales of the two y-axes are slightly different to visually highlight the crossdating.

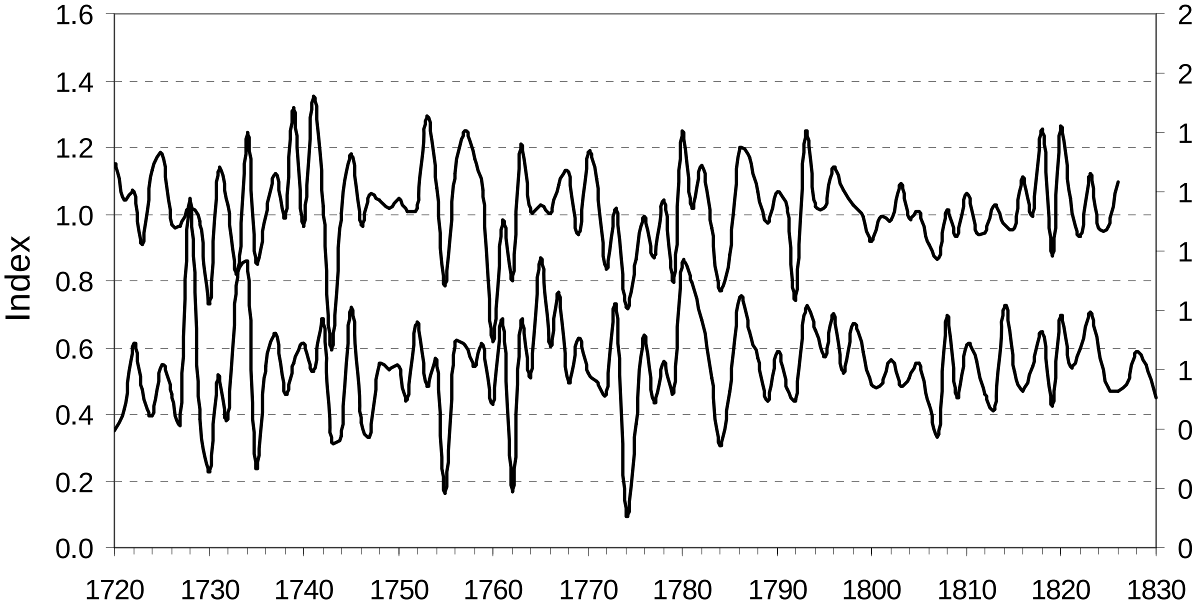


Figure 6. Crossdating between the Walker Springs cabin RESIDUAL index chronology (upper) with the John Sevier cabin RESIDUAL index chronology (bottom) from 1720 to 1826 (r = 0.56, t = 6.90, p < 0.0001, n = 107 years). The scales of the two y-axes are slightly different to visually highlight the crossdating.