Dendrochronological dating of the Warner House and barn (20LV334), Livingston County, Michigan, USA

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ABSTRACT

The Timothy and Lucretia (Jones) Warner Homestead is located in Brighton, Michigan. For over eight years, a descendant of the Warner family has been excavating the site and restoring the Greek Revival house located on the property. Although already listed on the National Register of Historic Places (NRHP), a dendrochronological study of the property provides independent scientific evidence to verify the dating of the house and present a possible construction timeline for the homestead. A total of 13 timber samples, 10 from the Warner House and three saved from a previously destroyed barn, were sent to us for dendrochronological dating. Eight of the samples, six from the house and two from the barn, cross-dated statistically with each other and were used to build a floating 1818-year tree-ring chronology. Using a white oak (Quercus alba L.) reference chronology (Cranbrook Institute in Michigan, MI005.crn) available from the International Tree-Ring Data Bank, we absolutely dated the tree-ring chronology from the Warner House and barn to the period 1718–1898 (r = 0.45, n = 181 years, t = 6.74, p < 0.0001). The two cross-dated white oak samples from the barn indicated harvest between fall 1876 and spring 1877. Five samples from the Warner House indicated tree harvesting occurred between fall 1853 and spring 1855, which corroborates the year of construction (1855) determined by documentary analysis for the NRHP. Findings also support one phase of construction for the house, rather than multiple phases, which had originally been postulated based on architectural details. One sample that dated to 1899 also suggests a later renovation with the erection of a dividing wall. The two samples from the barn post-date the construction of the house, supporting the progressive farm model that suggests that large barns were built only after a timber frame home was erected. The dates returned for the barn support the WPA Rural Property Inventory that states the barn was built around 1880. Even with relatively few samples, this study demonstrated how tree-ring dating can corroborate and elaborate on documentary evidence of construction dates of multiple structures at one historic site.

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1. Introduction

Independent confirmation of the construction dates for log and timber frame structures is a crucial element in the consideration of structures for nomination and inclusion in the National Register of Historic Places (NRHP) (McClelland and Keller, 1999). The authentication of construction dates is also important to stakeholders because it can aid in the restoration/rehabilitation of historic structures to a certain architectural period, or in a way that does not diminish the historical significance of the structure. Dendroarchaeology, the study of historic structures or objects using tree-ring science, can be used to statistically verify the date(s) of the construction or manufacture of objects made from wood (Grissino-Mayer, 2009). In the United States (U.S.), many dendroarchaeological studies have been conducted in the Southeast (Grissino-Mayer et al., 2009; Henderson et al., 2009; Stachowiak et al., 2014, 2016), in the Southwest (Towner, 2002; Bekker and Heath, 2007; Towner et al., 2009; de Graauw et al., 2014), and in the Northeast and mid-Atlantic regions (Heikkenen and Edwards, 1983; Bonzani et al., 1991; Langley, 2000; Flynn, 2009; Worthington and Seiter, 2013; Barclay and Rayburn, 2014). However, relatively few have been conducted in the Midwest. Within the region sur-

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ranging the historic structures analyzed in this report, one similar study was performed for a historic structure (Lund-Spathelf House) in nearby Ann Arbor, Michigan (Harley et al., 2011). The Timothy and Lucretia (Jones) Warner Homestead (henceforth Warner Homestead) is located at 4001 West Buno Road in Brighton, Michigan. The Warners purchased the property in 1841. According to family history (Warner-Chase, 1997), the Warners originally lived in a log cabin on the same property, but it burned down, forcing the family to live in a barn on the property. While the family lived in this temporary structure, at around 1855, the timber frame house (Fig. 1), a Greek Revival-style home, was constructed (Warner-Chase, 1997). According to Warner-Chase (1997), “Grandpa George told me that he carried nails for the carpenters when he was seven years old,” referring to the construction of the house. George Warner, second generation owner of the Warner Homestead, was born in 1848. Warner-Chase also noted in a family genealogy scrapbook that “after purchasing the N.E. corner of Sec. 27, he [Timothy Warner] built a log cabin on W. side of present driveway at 4001 Pl. Valley & Buno Rds. In 1855 he built the large frame home on E. side of driveway.” During archaeological work near the house, dark, plowscars-like stains running north/south at the topsoil/subsoil interface were identified that may support the burning of a structure near where the house is located today. Other archaeological findings, including ceramics and other artifacts such as buttons, support an 1840s cabin, but this association is currently inconclusive.

In addition to the log cabin and the Greek-Revival house, other outbuildings once stood on the Warner Homestead property, including two chicken sheds, wood shed, smithy, milk house, gambrel barn, outhouse, pig barn, and two barns (22′ × 28′ and 28′ × 80′), evidenced mainly by photographs and personal notes, although a boulder foundation for the smithy remains. All of these structures were previously destroyed/dismantled, and timbers from only the large barn (28′ × 80′) were saved. We analyzed these in addition to samples from the timber frame house. Historical research, particularly pioneer accounts noted in the 1891 Portrait and Biographical Album of Ingham and Livingston Counties and the 1880 History of Livingston County, Michigan, suggests that several early settlers built large barns before they built frame houses (Chapman Brothers, 1891; Everts and Abbot, 1880). Whether or not this is the case for the large barn at the Warner Homestead is still unclear. According to the progressive farm model (McMurry, 1997; Sayers and Nassaney, 1999), the family would first build a log cabin, then a small barn, followed by the timber frame house, and lastly a larger barn. The large barn on the property, therefore, could either predate or postdate the timber-frame house and may or may not have been used as a temporary dwelling after the burning of the family cabin.

Descendants of the Warner family have been excavating the site and restoring the Greek Revival home (Fig. 1) with the help of a historic home restoration specialist. The Greek Revival style is one example of the Romantic-Style homes that were popular in the United States in the decades before 1860 (McAlester, 2015). The Greek Revival style was most commonly adopted for homes during the period 1830–1850 but lasted into the 1860s in some regions, especially the south (McAlester, 2015). In southern Michigan, a
majority of Greek Revival homes date to the period 1830–1860 (McLennan, 1987). The Warner House is currently listed on the NRHP (listed 8 September, 2011), but the site project coordinator deemed that a dendrochronological study of timbers from the house and barn was necessary to scientifically verify the dating of both structures. Such a study also would present a possible construction timeline for the homestead to provide a clearer picture of how it developed over time. The first goal of our study was to determine the construction dates for the house and the barn and clarify which of the two was built first. A second goal of this dendrochronological study was to investigate the construction sequence of portions of the Warner House itself. During the preparation of documentation for NRHP consideration, minor differences in architecture, such as ceiling height and trim application, between the two-story section of the house and the “L”-shaped south wing, were noted, which suggests that the south wing addition may have been added at a later date. Dendrochronological analysis of timbers from the proposed original part of the Warner House (two-story) and the south wing will help evaluate this architectural interpretation. A construction chronology for the homestead will also aid in the interpretation of other archaeological features and artifacts unearthed at the site, such as ceramics and subsurface site features, including a dry-set stone wall and a brick-lined cistern. The current owner wishes to turn the Warner House into a museum that will house the many archaeological artifacts found at

Table 1: Locations from where the 13 original samples were extracted from the Warner House and barn. Samples in boldface are those that were dated by this study.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Collection Date</th>
<th>Genus</th>
<th>Structure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WH03</td>
<td>10.02.2010</td>
<td>Ash</td>
<td>Barn</td>
<td>Quarter sawn beam, possibly sawn with circular saw blade.</td>
</tr>
<tr>
<td>WH04</td>
<td>10.02.2010</td>
<td>Oak</td>
<td>Barn</td>
<td>Log beam 61 cm circumference.</td>
</tr>
<tr>
<td>WH08</td>
<td>10.02.2010</td>
<td>Oak</td>
<td>Barn</td>
<td>Rough sawn plank 30 cm wide.</td>
</tr>
<tr>
<td>WH09</td>
<td>10.02.2010</td>
<td>Oak</td>
<td>House</td>
<td>Main house, roof deck plant inside attic at L juncture.</td>
</tr>
<tr>
<td>WH10</td>
<td>22.05.2015</td>
<td>Oak</td>
<td>House</td>
<td>South wing, window support, west wall</td>
</tr>
<tr>
<td>WH11</td>
<td>22.05.2015</td>
<td>Oak</td>
<td>House</td>
<td>South wing, window support, south wall</td>
</tr>
<tr>
<td>WH12</td>
<td>22.05.2015</td>
<td>Oak</td>
<td>House</td>
<td>South wing, support, south wall</td>
</tr>
<tr>
<td>WH13</td>
<td>08.05.2015</td>
<td>Oak</td>
<td>House</td>
<td>South wing, member/stud, southwest corner, south wall.</td>
</tr>
<tr>
<td>WH14</td>
<td>09.06.2015</td>
<td>Oak</td>
<td>House</td>
<td>Main house, NW corner, adjacent to beam on west wall.</td>
</tr>
<tr>
<td>WH15</td>
<td>17.06.2015</td>
<td>Oak</td>
<td>House</td>
<td>Main house, NW corner, adjacent to WH14.</td>
</tr>
<tr>
<td>WH16</td>
<td>20.07.2015</td>
<td>Oak</td>
<td>House</td>
<td>Main house, support at east gable return on south side.</td>
</tr>
<tr>
<td>WH17</td>
<td>20.07.2015</td>
<td>Oak</td>
<td>House</td>
<td>Main house, support at east gable return on south side.</td>
</tr>
<tr>
<td>WH18</td>
<td>20.07.2015</td>
<td>Oak</td>
<td>House</td>
<td>Main house, support at east gable return on south side.</td>
</tr>
</tbody>
</table>

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the site that date to the mid-19th century, as well as historic family items.

2. Methods

During renovation, timbers from the main house were exposed and sampled (Fig. 2) for dendrochronological examination under the guidance of a historic home restoration specialist. In addition, samples collected in 2010 from a now dismantled barn on the property were saved for analysis. We analyzed a total of 13 samples for this study, 10 from the house and three from the barn (Fig. 3, Table 1). We identified twelve of the samples as white oak and one sample from the barn as ash (Fraxinus spp.) (Hoadley, 1990). All samples were cross-sections. When necessary, we mounted some of the smaller and/or thinner sections on plywood for stability and preservation. We sanded each section to a fine polish with a tabletop sander using progressively finer sandpaper, beginning with ANSI 80-grit (170–210 μm) and ending with ANSI 400-grit (20.6–23.6 μm) (Orvis and Grissino-Mayer, 2002). This ensured maximum visibility of all rings and their cellular structure for accurate measurement of tree-ring widths. We next marked transects on all sections with a black marker to guide measuring and capture all complete rings, especially the very outermost rings on each sample that would provide the necessary cutting dates of the trees. We marked all tree rings using standard decadal dot notation (Stokes and Smiley, 1996; Speer, 2010) and measured each tree-ring width to 0.001 mm accuracy using a Velmex measuring system coupled with MeasureJ2X software. Measuring began with the innermost complete ring assigned to relative year ‘1’ and ended with the outermost complete ring.

2.1. Internal crossdating

We next used COFECHA to perform segmented time-series correlation analyses and suggest a possible temporal placement for each series in the data set relative to each other (Holmes, 1983; Grissino-Mayer, 2001). We began by entering all of the measurement series as undated. COFECHA then attempts to crossmatch each measurement series with all other measurement series. We designated a t-value threshold of 6.0 as used in previous studies, with a minimum 40-year overlap, to suggest that timbers came from the same tree (Grissino-Mayer et al., 2010) and used a t-value threshold of ≥3.5 to indicate statistical crossdating between different trees (Bailie, 1982; Holmes, 1983; Wigley et al., 1987; Laxton and Litton, 1989; Grissino-Mayer, 2001; Schaub et al., 2005). We did not identify any timbers from the same tree, so we did not pursue within-tree crossdating for this study. We used any measurement series that matched with a t-value of 3.5 or greater to first build a data set that crossdated with statistically significant correlations, and then added all other series one at a time against this initial data set. Each new series that crossdated with a high degree of statistical certainty was then added to the growing data set until all series that could be internally matched were either added to the final data set or discarded. The final result was a data set of series matched in time relative to each other, but not absolutely dated.
In each series, we evaluated 40-year ring segments lagged by 10 years to provide more in-depth diagnostics that helped ensure proper temporal alignment. COFECHA statistically compared each individual series with a master chronology created from all other series and calculated the interseries correlation coefficient, a statistical metric of how well the ring-width patterns from the series being tested matched the chronology created from all other series. Each series was considered crossdated with the others when its interseries correlation coefficient was ≥0.40. Lastly, we created a floating chronology from the series that were matched relative to each other using ARSTAN (Cook, 1985) and attempted to absolutely crossdate this chronology against an absolutely-dated chronology developed from living white oak trees (anchored) from the International Tree-Ring Data Bank (ITRDB) (Grissino-Mayer and Fritts, 1997).

2.2. External crossdating

Absolute (external) crossdating is possible because trees that experience a common regional climate signal will show a common pattern of wide and narrow rings in tree growth. We used a living white oak chronology (Cranbrook Institute, MI005, 42.67° N 83.42°W, 1581–1983, white oak) created by Dr. Edward R. Cook of Columbia University as our reference data set. This reference chronology was also used by Harley et al. (2011) in the successful dating of the Lund-Spathelf House in Ann Arbor, Michigan. The Cranbrook reference chronology was developed from a site only 48 km from the Warner Homestead (Fig. 4) (Grissino-Mayer and Fritts, 1997). This reference chronology was selected because of close geographic proximity, its use by Harley et al. (2011) to date the nearby Lund-Spathelf House, and because it exhibited the appropriate temporal depth to ensure successful overlap with the pattern of ring widths from the undated sections. The chronology is one of only two white oak chronologies available from the ITRDB for Michigan and is the only archived white oak chronology within 100 km of the Warner Homestead.

We used the computer program COFECHA to statistically crossdate the undated series by entering the reference chronology as the dated data set and the file containing the temporally adjusted measurement series as the undated data set. We again tested 40-year segments in the undated series lagged by 10 years to maximize the number of segments tested and to develop useful diagnostics for evaluating problematic segments or series. Crossdating was achieved when COFECHA suggested a common temporal adjustment for all or most tested segments and these segments also displayed statistically significant (usually p<0.001) correlations against the reference chronology. Once crossdated, we used program EDRM (Edit Ring Measurement, Holmes, 1992) to adjust the arbitrary ring dates to their exact calendar years and created a chronology for the house and barn using the computer program ARSTAN (Cook, 1985). We graphically verified the crossdating by overlaying the Warner chronology along with the reference chronology (Grissino-Mayer, 2001).

2.3. Determining cutting dates

We carefully examined the terminal rings on cross-sections under high magnification to determine the cutting date for each timber. Terminal rings with bark, or curvature (considered outer rings), indicate the year in which the trees were harvested. Many samples (cores and cross-sections) taken from historic structures are missing bark and others may have the outermost rings lost to

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Table 2
COPECHA output showing correlations of 40-year segments (with 10-year overlap) for each of the eight series from the Warner House and barn when tested against a master reference chronology created from all other series for that segment.

<table>
<thead>
<tr>
<th>Series</th>
<th>First Year</th>
<th>Last Year</th>
<th>20–59</th>
<th>30–69</th>
<th>40–79</th>
<th>50–89</th>
<th>60–99</th>
<th>70–109</th>
<th>80–119</th>
<th>90–129</th>
<th>100–139</th>
<th>110–149</th>
<th>120–159</th>
</tr>
</thead>
<tbody>
<tr>
<td>WH004</td>
<td>113</td>
<td>158</td>
<td>0.48</td>
<td>0.53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH008</td>
<td>90</td>
<td>158</td>
<td>0.50</td>
<td>0.58</td>
<td>0.50</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH009</td>
<td>1</td>
<td>135</td>
<td>0.44</td>
<td>0.44</td>
<td>0.52</td>
<td>0.62</td>
<td>0.50</td>
<td>0.17</td>
<td>0.20</td>
<td>0.29</td>
<td>0.34</td>
<td>0.36</td>
<td>0.18</td>
</tr>
<tr>
<td>WH012</td>
<td>70</td>
<td>181</td>
<td>0.39</td>
<td>0.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH013</td>
<td>55</td>
<td>137</td>
<td>0.25</td>
<td>0.29</td>
<td>0.44</td>
<td>0.44</td>
<td>0.44</td>
<td>0.31</td>
<td>0.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH016</td>
<td>40</td>
<td>136</td>
<td>0.67</td>
<td>0.63</td>
<td>0.41</td>
<td>0.42</td>
<td>0.50</td>
<td>0.49</td>
<td>0.53</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH017</td>
<td>29</td>
<td>136</td>
<td>0.58</td>
<td>0.58</td>
<td>0.66</td>
<td>0.61</td>
<td>0.61</td>
<td>0.21</td>
<td>0.22</td>
<td>0.24</td>
<td>0.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH018</td>
<td>36</td>
<td>137</td>
<td>0.48</td>
<td>0.50</td>
<td>0.56</td>
<td>0.53</td>
<td>0.53</td>
<td>0.45</td>
<td>0.45</td>
<td>0.37</td>
<td>0.25</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.51</td>
<td>0.50</td>
<td>0.59</td>
<td>0.53</td>
<td>0.53</td>
<td>0.53</td>
<td>0.40</td>
<td>0.34</td>
<td>0.34</td>
<td>0.34</td>
<td>0.40</td>
<td>0.44</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* Indicates a segment that fell above the statistical threshold for significance at the 0.01 level. The rings in these segments were re-inspected and found to be correctly placed in time.

3. Results

3.1. Final data set

Of the 13 samples processed for this study, we were only able to crossdate eight of the 12 white oak samples, six from the house (WH9, WH12, WH13, WH16, WH17, WH18) and two from the barn (WH04 and WH08) (Table 2). Sample WH03 was identified as ash (Fraxinus americana L) and did not crossdate with the white oak cross-sections. We attribute the lack of crossdating for samples WH10, WH11, WH14, and WH15 to complacent growth (sometimes suppressed throughout) and/or an insufficient number of rings (WH14 and WH15 had only 33 and 37 rings respectively). Some sections, such as WH10, had an adequate number of rings for crossdating to be achieved, but no statistically convincing match could be found. The average interseries correlation was 0.42 (p < 0.0001), which was above the critical threshold of 0.40 (ITRDB, 2016a) but below the average for white oak (0.65) (ITRDB, 2016b). The average mean sensitivity was 0.17, also below the aver-

Fig. 5. The oak tree-ring chronology for the Warner House and Barn (black line) displays a statistically significant correlation (r = 0.45, n = 181 years, t = 6.74, p < 0.00001) and similar growth patterns with the Cranbrook Institute reference chronology (M005) for the region (gray dashed line) over the period 1718–1898. Annual indices for both chronologies were converted to standard deviation units to facilitate comparisons.
Table 3  
Outermost ring dates and types for the six samples from the Warner House and two samples from the barn.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Oldest Ring</th>
<th>Youngest Ring</th>
<th>Ring Type&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Outer Ring</th>
<th>Felling Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>BARN 04</td>
<td>1830</td>
<td>1877</td>
<td>r</td>
<td>Partial</td>
<td>Spring 1877 or after</td>
</tr>
<tr>
<td>BARN 08</td>
<td>1807</td>
<td>1876</td>
<td>B</td>
<td>Complete</td>
<td>Fall 1876 to spring 1877</td>
</tr>
<tr>
<td>HOUSE 09</td>
<td>1718</td>
<td>1853</td>
<td>B</td>
<td>Complete</td>
<td>Fall 1853 to spring 1854</td>
</tr>
<tr>
<td>HOUSE 12</td>
<td>1804</td>
<td>1809</td>
<td>r</td>
<td>Complete</td>
<td>Fall 1899 to spring 1900</td>
</tr>
<tr>
<td>HOUSE 13</td>
<td>1772</td>
<td>1854</td>
<td>r</td>
<td>Complete</td>
<td>Fall 1854 to spring 1855</td>
</tr>
<tr>
<td>HOUSE 16</td>
<td>1757</td>
<td>1854</td>
<td>r</td>
<td>Complete</td>
<td>Fall 1854 to spring 1855</td>
</tr>
<tr>
<td>HOUSE 17</td>
<td>1746</td>
<td>1854</td>
<td>r</td>
<td>Complete</td>
<td>Fall 1854 to spring 1855</td>
</tr>
<tr>
<td>HOUSE 18</td>
<td>1753</td>
<td>1854</td>
<td>r</td>
<td>Complete</td>
<td>Fall 1854 to spring 1855</td>
</tr>
</tbody>
</table>

<sup>a</sup> See text for explanation.

age for white oak (0.22) ([TRDB, 2016b]), COFECHA flagged 16 of the 50, 40-year segments tested as being problematic (Table 2). However, all of the flagged segments had positive correlations of 0.17 or greater (Table 2). All flagged segments were carefully re-inspected and found to be correctly dated. The final data set resulted in a 181-year chronology floating in time, i.e. not absolutely anchored in time.

3.2. External (Absolute) crossdating

COFECHA found a common and systematic dating adjustment of “+1717” when testing the undated tree-ring chronology created from the sections collected from the Warner House and barn (7 of 15 segments with average interseries correlation of 0.57). Absolute crossdating in COFECHA statistically verified that the tree-ring chronology for the Warner House and barn begins in the year 1718 and ends in the year 1898 (r = 0.45, n = 181 years, t = 6.74, p < 0.00001). A graphical comparison supports this result (Fig. 5). The outermost ring on four of the sections with curvature was the year 1854 (WH13; WH16; WH17; WH18) (Table 3). Close examination of the terminal ring (Fig. 6) on these four samples, and comparison of their widths with previous rings, showed rings that appeared to be complete. This indicated that the trees cut for these timbers were harvested in the period between fall 1854 and spring 1855, or during the dormant season 1854–1855. One sample with bark, WH09, had a complete terminal ring of 1853, which indicated that it was cut between fall 1853 and spring 1854.

We were able to date two sections from the south wing of the house, considered to be a later addition. One of these sections, WH12 (Fig. 2), did in fact have a later terminal complete ring of 1899, which appeared complete, indicating harvest between fall 1899 and spring 1900. The other section, however, (WH13) had a terminal ring of 1854. The 1899–1900 date indicates a possible replacement, but the WH13 date of 1854 aligns with the dating found for the rest of the house. The two samples from the barn, WH04 and WH08, had terminal ring dates of 1877 and 1876 respectively. On one sample that had bark (WH08), the outermost ring appeared complete (Fig. 6), suggesting a harvest date between fall 1876 and spring 1877. The other sample (WH04) had curvature along a smooth and continuous surface and what appeared to be an incomplete terminal ring, indicating tree harvest in spring 1877. We concluded that the timbers for the Warner House were harvested between fall 1853 to spring 1855, but the period could be further constrained from spring 1854 to fall 1854. One sample from the house that dated to fall 1899–spring 1900 could represent a later renovation or replacement timber. Timbers for the barn were harvested during the period fall 1876 to spring 1877 (Table 3).

4. Discussion

We conclude that the Warner House was built with trees that were harvested as early as fall of 1853 and as late as spring of 1855 but the period for tree harvest could be as short as one calendar year, i.e. spring to fall of 1854. We further propose that the barn was built from trees harvested between fall 1876 and spring 1877. Our date for barn construction closely matches records noted in the 1938 Rural Property Inventory that listed an 1880 construction date for the large barn. These dates confirm that the barn was built after the house, making it unlikely that the barn was ever used as a dwelling as local historia once suggested. These dates instead support the progressive farm model, which suggests that large barns were built only after the timber frame home. Furthermore, we found no conclusive evidence to support the addition of the south wing to the house at a later date. We found one timber from the south wing with an 1854–1855 harvest date that would confirm construction of the south wing was contemporary with construction of the main house. We found one timber in the south wing, however, with a harvest date between fall 1899 and spring 1900 which suggests a later replacement timber, perhaps during a minor renovation. Newspaper fragments found on the wall from which this timber (WH12) was sampled support the 1899–1900 date in that they reference President McKinley and the Panama
Canal. Evidence that WH12 represents a renovation includes comparison of this timber to the other stumps along the same wall, as well as the shift from lathe and plaster to plank boards seen on each side (Fig. 2). The later date for WH12 may also indicate that the dividing wall that separates the southern rooms was installed around 1900 (Fig. 3). WH12 clearly stands out as being unique when visually compared to the other timbers along that wall (Fig. 2). These findings lead us to propose that the south wing was likely constructed at the same time as the main house, and that the dividing wall, or at least some renovation, in the south wing was completed soon after fall 1899 to spring 1900. Continued dendroarchaeological work on the Warner House would further support or refute this proposal but is also unlikely given that samples will cease to be exposed with continued renovation.

5. Conclusions

This research represents an example of successful dendrochronological dating of two timber frame structures in a largely understudied area, the Midwest U.S. Overall, the dates from five of the six sections from the Warner House corroborate the construction date of the home in 1855 based on family oral and written histories. Results from our study can be used in further efforts to preserve and/or restore the Warner House and the surrounding property and will assist in the interpretation of other artifacts, features, and structures discovered at the site. Furthermore, the series of specifically dated samples from different areas of the house has provided clearer insights on variations of Greek Revival architecture that were not previously well understood. Despite minor architectural differences between the south wing and the rest of the house, including ceiling height and trim application, dendrochronological analysis suggests the house was built during a single event rather than a series of expansion episodes. Therefore, assumptions of domicile expansion over time based largely on census records and minor architectural differences by house section may need to be reconsidered for other historic structures, particularly those lacking dendrochronological dating.

References


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