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Palisades were an architectural form used by Mississippian people in the Eastern Woodlands, especially the Midwestern and Southeastern United States (Griffin 1967; Lafferty 1973; Milner 1999, 2000, 2007; Milner et al. 2013), and widespread throughout the eleventh to sixteenth centuries A.D. (Milner 1999, 2000). They are defined as either single-post or wall trench structures that surrounded settlements, sometimes with gates or externally projecting bastions that could be used to inflict flanking fire on attackers (Keeley et al. 2007:67).

Globally, palisades with a regular bastion spacing of 25–40 m correlate with the use of the bow and arrow as the main projectile weapons; presumably spacing at that interval provided an optimal defensive range (Keeley et al. 2007:70–72). Likewise, Mississippian bastion spacing varies from 21–44 m (Milner 2000:58), indicating that the most likely function of Mississippian palisades with regularly spaced bastions was as structures for organized defensive combat (Keeley et al. 2007; Milner 1999, 2000). These bastions were generally large enough to hold one or more defenders that could inflict fire onto closely approaching attackers (Keeley et al. 2007; Milner 1999, 2000, 2007) and likely increased the line of sight for defending archers while shielding their visibility (Keeley 1996:56).

Archaeologists have identified bastioned palisades at 33 Mississippian sites and estimated their ages through various dating techniques. Drawn from Milner’s database (1999, 2000, 2007; Milner et al. 2013), Table 1 summarizes the results of...
## Table 1. Chronological Information for Mississippian Bastioned Palisades Prior to This Study.

<table>
<thead>
<tr>
<th>Site</th>
<th>State</th>
<th>Cultural Affiliation</th>
<th>Radiocarbon dating of palisade contexts?</th>
<th>Time range for when palisades may have existed</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gunter’s Landing (1MS39)</td>
<td>AL</td>
<td>Langston</td>
<td>No</td>
<td>A.D. 1000–1200</td>
<td>Walthall &amp; Webb &amp; Wilder 1951:41</td>
</tr>
<tr>
<td>Lubub Creek SI (1PI83)</td>
<td>AL</td>
<td>Summerville I</td>
<td>No</td>
<td>A.D. 1000–1200</td>
<td>Blitz &amp; Albright 1983:140–196</td>
</tr>
<tr>
<td>Moundville</td>
<td>AL</td>
<td>Moundville I, Moundville II</td>
<td>Yes</td>
<td>A.D. 1200–1300</td>
<td>Knight 2010; Knight &amp; Steponaitis 1998:15; Scarry 1998; Vogel &amp; Allan 1985</td>
</tr>
<tr>
<td>Etowah (9BR1)</td>
<td>GA</td>
<td>Late Wilbanks</td>
<td>Yes</td>
<td>A.D. 1325–1375</td>
<td>Bigman et al. 2011; King 2003</td>
</tr>
<tr>
<td>King (9FL5)</td>
<td>GA</td>
<td>Wilbanks</td>
<td>No</td>
<td>A.D. 1200–1350</td>
<td>Hally 1988:5–10; Smith 1987:46, 94</td>
</tr>
<tr>
<td>Lake Acworth (9CO45)</td>
<td>GA</td>
<td></td>
<td>No</td>
<td>A.D. 1200–1350</td>
<td>Cable 1994:26, 77, 174</td>
</tr>
<tr>
<td>Kincaid</td>
<td>IL</td>
<td>Kincaid</td>
<td>Yes</td>
<td>A.D. 1200–1400</td>
<td>Butler et al. 2011; Cole 1951</td>
</tr>
<tr>
<td>Olin (11MS133)</td>
<td>IL</td>
<td></td>
<td>No</td>
<td>A.D. 1100–1325</td>
<td>Baltus 2014; Woods &amp; Holley 1991:51</td>
</tr>
<tr>
<td>Southwind (12PO265)</td>
<td>IN</td>
<td></td>
<td>Yes</td>
<td>A.D. 1150–1450</td>
<td>Hilgemon 2000; Munson 1994; Striker 2009</td>
</tr>
<tr>
<td>Hovey Lake</td>
<td>IN</td>
<td>Caborn-Welborn</td>
<td>No</td>
<td>A.D. 1400–1450</td>
<td>Munson 1997; Pollack 2004</td>
</tr>
<tr>
<td>Annis Mound and Village (15BT20)</td>
<td>KY</td>
<td>Middle Mississippian</td>
<td>Yes</td>
<td>A.D. 1250–1450</td>
<td>Hammerstedt 2005, 2007</td>
</tr>
<tr>
<td>Corbin (15AD4)</td>
<td>KY</td>
<td>Mississippian</td>
<td>No</td>
<td>A.D. 1000–1200</td>
<td>Lewis 1990</td>
</tr>
<tr>
<td>Jonathan Creek F14 (14ML4)</td>
<td>KY</td>
<td>Jonathan Creek</td>
<td>Yes</td>
<td>A.D. 1160–1290</td>
<td>Schroeder 2006; Webb 1952</td>
</tr>
<tr>
<td>Snodgrass (23BU21B)</td>
<td>MO</td>
<td>Powers</td>
<td>No</td>
<td>A.D. 1275–1350</td>
<td>Morse &amp; Morse 1983; Price &amp; Griffin 1979:3</td>
</tr>
<tr>
<td>Towosahgy (Beckwith’s Fort) B (23M12)</td>
<td>MO</td>
<td>Middle Mississippian</td>
<td>No</td>
<td>A.D. 1050–1350</td>
<td>Chapman et al. 1977:244–255; Morse &amp; Morse 1983:263</td>
</tr>
<tr>
<td>Pharr Village</td>
<td>MS</td>
<td>Middle Mississippian</td>
<td>No</td>
<td>A.D. 1050–1550</td>
<td>Futato 1989:117; Karwedsky 1980:46</td>
</tr>
<tr>
<td>Garden Creek</td>
<td>NC</td>
<td>Pisgah</td>
<td>No</td>
<td>A.D. 1250–1450</td>
<td>Dickens 1976:14, 86</td>
</tr>
<tr>
<td>Brown-Pack (Osborn's Place) (40CH1)</td>
<td>TN</td>
<td>Mound Bottom</td>
<td>No</td>
<td>A.D. 1200–1500</td>
<td>O’Brien 1977</td>
</tr>
<tr>
<td>Castalian Springs (40SU14)</td>
<td>TN</td>
<td>Middle Cumberland</td>
<td>Yes</td>
<td>A.D. 1250–1450</td>
<td>Smith 1975:34; Thurston 1897:34</td>
</tr>
<tr>
<td>Gordontown (40DV6)</td>
<td>TN</td>
<td>Late Mississippian</td>
<td>No</td>
<td>A.D. 1200–1500</td>
<td>Autry 1983:39; Smith 1994:110</td>
</tr>
<tr>
<td>Moss-Wright Park (40SU61)</td>
<td>TN</td>
<td>Middle Cumberland, Dowd</td>
<td>No</td>
<td>A.D. 1050–1200</td>
<td>Martinez 2008:59; Moore &amp; Smith 2001:233</td>
</tr>
<tr>
<td>Rutherford-Kiser (40SU15)</td>
<td>TN</td>
<td>Middle Cumberland, Thurston</td>
<td>No</td>
<td>A.D. 1280–1480</td>
<td>Moore &amp; Smith 2001; Smith 1994:110; Thurston 1897:32–33</td>
</tr>
<tr>
<td>Savannah</td>
<td>TN</td>
<td>Mississippian</td>
<td>No</td>
<td>A.D. 1200–1400</td>
<td>Welch 1998</td>
</tr>
<tr>
<td>Sellars (40WL1)</td>
<td>TN</td>
<td>Middle Cumberland</td>
<td>No</td>
<td>A.D. 1200–1400</td>
<td>Butler 1981:42–44, 56</td>
</tr>
<tr>
<td>Shiloh</td>
<td>TN</td>
<td>Mississippian</td>
<td>No</td>
<td>A.D. 1100–1300</td>
<td>Welch 2006</td>
</tr>
<tr>
<td>Toqua P-B (40MR6)</td>
<td>TN</td>
<td>Dallas</td>
<td>No</td>
<td>A.D. 1300–1600</td>
<td>Polhemus 1987:216, 653, 1217</td>
</tr>
<tr>
<td>Aztlalan</td>
<td>WI</td>
<td>Middle Mississippian</td>
<td>Yes</td>
<td>A.D. 1000–1200</td>
<td>Barrett 1933; Birmingham &amp; Goldstein 2005; Richards 2007; Richards &amp; Jeske 2002</td>
</tr>
</tbody>
</table>

Note: Data from an updated version of the database described in Milner (1999, 2000, 2007) and Milner et al. (2013).
these studies. Previous studies suggest that bastioned palisades were constructed and used from A.D. 1000–1500, with about half built prior to A.D. 1200. Recently, however, Milner (2007; Milner et al. 2013) has argued that the majority of Mississippian palisades post-date A.D. 1200. The precision of the time ranges for bastioned palisades provided in previous studies tends to be broad, often spanning hundreds of years and corresponding largely to established chronologies for ceramic phases (Table 1). But dating a Mississippian palisade from diagnostic pottery found in palisade trench fill is problematic because of discrepancies between the time of ceramic creation, its incorporation into palisade trench fill, and the specific association with the ceramic and the corresponding palisade context. Thus, a precise chronology for the appearance and spread of palisades, our strongest evidence for the militarization of Mississippian centers, has eluded us.

Ideally, palisade construction chronologies should be based on scientific dating of construction materials. Unfortunately, due to the lack of preserved construction materials and the high cost

Figure 1. Map of Mississippian sites with bastioned palisades that have been subject to scientific dating.
of palisade excavations, there are only nine Mississippian sites with bastioned palisades that have been subject to scientific dating (Figure 1; Table 1). These dates generally come from either the remnants of charred palisade posts or organic material from palisade wall trench fills; occasionally, dates from contexts with stratigraphic relationships to palisade features are also available (Supplemental Material, Appendix A).

This paper applies a Bayesian methodology (Bronk Ramsey 2009a) to date the construction and use of the nine Mississippian bastioned palisades subject to scientific dating. Six of these sites (Angel Mounds, Aztalan, Cahokia, Etowah, Kincaid, Moundville) were some of the largest and most culturally influential (Figure 1). Using a Bayesian framework, the chronology of palisade construction can be estimated not only by radiocarbon dating, but also by using the relative dating information provided by stratigraphy, feature groupings, and other dated activity.

Methodology

The dataset used in this study includes all of the available dates from the nine sites in the sample. Dates from palisade construction materials provide direct dates for the construction and/or use of palisades, while dates from non-palisade contexts bring added clarity to palisade chronologies through stratigraphic relationships or from broad contemporaneity. This dataset consists of 367 radiocarbon measurements, 14 from new measurements and 353 from the published literature. Eight of the new samples were obtained from curated archival materials in museum collections, and six of the new samples were recently excavated from Angel Mounds in Indiana (Appendix A). Samples were selected for new dating only if their context was securely associated with curatorial and excavation records. Of the 367 radiocarbon measurements, 53 were made on short-lived plant remains, 36 on wood, 205 on wood charcoal, 12 on animal bone, two on articulated human bone, one on mussel shell, nine on soot adhering to pottery, one on carbonized food residue adhering to pottery, three on bulk samples of mixed material, and 45 on unknown material.

The radiocarbon measurements are presented in Appendix A, where they are quoted in accordance with the Trondheim Convention (Stuiver and Kra 1986) as conventional radiocarbon ages (Stuiver and Polach 1977). Contextual and descriptive details for these samples are also provided in Appendix A. Calibrated date ranges were calculated using IntCal13 (Reimer et al. 2013) and OxCal v4.2 (Bronk Ramsey 2009a). They are cited in the text as 95-percent confidence intervals, with the end points rounded outwards to 10 years.

The technique used for Bayesian chronological modeling is a form of Markov Chain Monte Carlo sampling (Bronk Ramsey 2009a) and has been applied using the program OxCal v4.2 (http://c14.arch.ox.ac.uk/). The fit between the OxCal model and data is gauged with the Amodel agreement index, and values higher than 60 indicate good agreement between the model parameters and the dates (Bronk Ramsey 2009a). Resulting posterior density estimates from OxCal are calendar years and presented in italics as probability ranges with end points rounded to the nearest five years. The algorithms used in the models can be derived from the context matrices and the OxCal code (in Supplemental Materials Appendices B and C, respectively). Note that the posterior density estimates produced by modeling are not absolute. They are interpretative estimates, which can and will change as new data become available and as other researchers choose to model the existing data from different perspectives.

Results

Chronological models were constructed and run in OxCal, one for each site in the sample. The structure of each model is presented in the site context matrices (Appendix B) and the model code (Appendix C).

Appendix A includes an evaluation of the security of the context for each radiocarbon date through categorical rankings, an approach similar to Nolan (2012) and informed by studies on the critical evaluation of the suitability of samples and their taphonomy for radiocarbon dating (Ashmore 1999; Bayliss 1999; Bonsall et al. 2002; Fitzpatrick 2006; Taché and Hart 2013). The rankings are based on the published descriptions of the sampled material, context, and taphonomy. In many instances, the radiocarbon laboratories that processed the samples and/or the submitters provided additional information not included in the
published description. Some information was impossible to obtain, especially for radiocarbon samples submitted more than 20 years ago, due to the loss of records, the death of the responsible project personnel, and the closure of several radiocarbon laboratories used to process the samples.

The following criteria were used to score the security of context for each radiocarbon date:

(4) There is good evidence indicating that the sampled material was deposited fresh during the formation of the context from which it was recovered, such as wood charcoal from a hearth. Other examples include a bone from an articulated skeleton, or wood from a palisade post. A “4” is the top ranking in this scale.

(3) There is little evidence provided that the sampled material was deposited during the use of the context from which it was recovered. Generally, radiocarbon dates ranked “3” have vague descriptions for the relationship between the sampled material and context, such as “unidentified charcoal from a pit” or “nutshell from a house floor.” For samples ranked “3,” it is feasible that the sampled material may be residual, but it is also feasible that the sampled material dates the function of its context. These samples are given the benefit of the doubt and included in modeling as dating their corresponding context because this is how they are interpreted in previous chronological studies. A ranking was reduced from (4) to (3) if the sampled material was potentially long-lived wood, such as a fragment of oak heartwood or soot that may have been derived from old wood (Bonsall et al. 2002:54).

(2) The sampled material likely predates the context from which it was recovered and is modeled as a terminus post quem (TPQ). For example, unidentified wood charcoal from within a sod block in mound fill is a TPQ for when the sod block was placed into the mound, because the wood charcoal is likely from an older context from which the sod block was removed. Likewise, most of the scattered small materials in a Mississippian palisade trench are modeled as TPQ because much of this material may have been in a different context prior to palisade construction and deposited into the trench during rapid backfilling in the initial construction stages.

(1) The lowest ranking. Either the sampled material, its relationship to the context, or the taphonomy is not entirely clear. For example, a sample with this ranking might have only a short context description such as “unidentified charcoal from Feature 777,” yet “Feature 777” is not described. In several instances, the contexts are loosely described as coming from a house, but a more specific context within the house (such as wall trench, floor, pit within the house, etc.) is lacking. Likewise, the sampled material might also be labeled as “charcoal” with no further description. In several instances, sampled materials are not described at all in the published description. These samples are also given the benefit of the doubt and included in modeling as dating their corresponding context because this is how they are interpreted in previous chronological studies. However, it is entirely justified to model these samples as TPQ or to exclude them from modeling because the descriptive information needed for their evaluation is not included in the published description. Additionally, a ranking was reduced to (1) if the measurement was not corrected for fractionation and derived from either maize or an aquatic organism.

The Bayesian chronological models use charcoal outlier modeling as a strategy for accounting for the unknown inherent age offset in wood charcoal and soot samples (Bronk Ramsey 2009b). These models assume an exponential distribution, with an exponential constant $\tau$ of 1 taken over the range -10 to 0, of the charcoal dates (following Bronk Ramsey 2009b). The shifts are then scaled by a common scaling factor that can lie anywhere between $10^0$ and $10^3$ years.

The algorithms used for these models can be directly derived from the model structure shown in Appendices B and C. The models show good overall agreement between the radiocarbon dates and the assumptions of the models (Supplemental Materials Appendix D). Detailed results for these models are summarized in Table 2 and Figures 2–3. Models for Annis Village and Jonathan Creek are not presented because the radiocarbon data from these two sites are not robust enough to construct meaningful chronological models for palisade construction and use. Appendices A and D review the radiocarbon data from these two sites.

Alternative versions of each model were created as a sensitivity analysis by slightly modifying the primary models. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ,
Table 2. Comparison of Bayesian Modeling Probability Ranges to Previous Estimates on Mississippian Bastioned Palisades.

<table>
<thead>
<tr>
<th>Event dated</th>
<th>Best approximate time ranges provided in previous studies</th>
<th>Primary model (95.4% probability)</th>
<th>Primary model (68.2% probability)</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use life of Angel Mounds palisade</td>
<td>No estimate provided.</td>
<td>50–195 years</td>
<td>85–165 years</td>
<td>Helgemon 2000; Peterson 2010:316–317</td>
</tr>
<tr>
<td>Use life of Aztecan palisade</td>
<td>No estimate provided.</td>
<td>1–130 years</td>
<td>1–60 years</td>
<td>Helgemon 2000; Peterson 2010:316–317</td>
</tr>
<tr>
<td>Use life of Cahokia Mounds palisade</td>
<td>80–200 yearsb</td>
<td>20–195 years</td>
<td>55–150 years</td>
<td>Iseminger 1990:35</td>
</tr>
<tr>
<td>Use life of Etowah palisade</td>
<td>14–28 yearsc</td>
<td>1–320 years</td>
<td>1–160 years</td>
<td>Bigman et al. 2011</td>
</tr>
<tr>
<td>Use life of Kincaid palisade</td>
<td>No estimate provided.</td>
<td>60–240 years</td>
<td>105–200 years</td>
<td>Butler et al. 2011</td>
</tr>
<tr>
<td>Use life of Moundville palisade</td>
<td>30–60 yearsd</td>
<td>100–360 years</td>
<td>145–280 years</td>
<td>Scarry 1998:82</td>
</tr>
<tr>
<td>Use life of Southwind palisade</td>
<td>20–60 yearsf</td>
<td>65–320 years</td>
<td>115–260 years</td>
<td>Munson 1994:3–4</td>
</tr>
</tbody>
</table>

aThe Bayesian model used for Angel Mounds (described in Appendices B–D) is an updated version of the one used in Krus et al. (2013) and Monaghan et al. (2013).
bIseminger (1990:35) estimated that a single one of Cahokia’s palisade walls would have stood for 20–50 years and Cahokia’s palisade appears to have been rebuilt three times.
cBigman et al. (2011:14) estimated that a single one of Etowah’s palisade walls would have stood for 20–50 years and Etowah’s palisade appears to have been rebuilt once.
dThe dated palisade sections come from the ECB Tract, as do four other dated features (Feature 34, Feature 19, Burial 8, Burial 9) (Scarry 1995). The primary chronological model for Moundville cannot reliably estimate the timing of palisade construction because there are no direct dates from the palisade or its use. Instead, the model provides an estimate for the beginning, ending, and span of activity for the ECB Tract.
eScarry (1998:82) estimated that a single one of Moundville’s palisade walls would have stood for 10–20 years and Moundville’s palisade appears to have been rebuilt two times in the excavated ECB Tract area (Scarry 1995).
fMunson (1994:3–4) estimated that the entire duration of Southwind’s occupation lasted 20–60 years.
and charcoal outlier modeling was not used. The alternative models show good overall agreement between the radiocarbon dates and the assumptions of the models (Supplemental Materials Appendix E). Overall, the posterior probabilities for the alternative models are mostly identical to the primary models, although a few are slightly older than the primary model counterparts, which was expected because the alternative models do not use charcoal outlier modeling and are thus much more sensitive to radiocarbon measurements from old wood. The results from the primary models are preferred because they account for the unknown inherent age offset in wood charcoal and soot samples with charcoal outlier modeling (Bronk Ramsey 2009b).

**Discussion**

The chronologies created with Bayesian modeling are more useful than previous palisade chronologies (Tables 1 and 2) because they provide an explicit chronological framework for the timing of palisades that is independent from relative artifact chronologies. Further, there is ample evidence that Bayesian posterior probabilities often provide much more definitive and precise estimates for the timing of past activity than interpretations from diagnostic horizon markers and unmodeled scientific dates (Bayliss et al. 2007; Bayliss et al. 2011; Bayliss 2009, 2015; Hamilton et al. 2015).

Here, Bayesian modeling provides posterior probabilities for the start of palisade construction, the end of palisade use, and the span of palisade use (Figures 2–3; Table 2). Appendix D describes the full details of these posterior probabilities; they generally estimate palisades as being used for longer amounts of time and later in time than previously believed.

Aztalan’s palisade is clearly earlier than the others and it could be the first Mississippian palisade with bastions (Figure 2; Table 2). Modeling estimates that this palisade was constructed in cal A.D. 1045–1230 (95-percent probability; Figure 2; Aztalan: start palisade), probably in cal A.D. 1080–1180 (68-percent probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1075–1315 (95-percent probability; Figure 2; Aztalan: end palisade), probably in cal A.D. 1120–1230 (68-percent probability). This was not a surprise because palisades believed to date to the A.D. 1100s have been noted at settlements in Wisconsin and other northern Mississippian areas (Delaney-Rivera 2004; Finney 2000; Finney and Stoltman 1991; Milner 1999; Milner et al. 2013:Figure 2). Additionally, these posterior probabilities closely match previous interpretations for the timing of palisade use at Aztalan (Birmingham and Goldstein 2005; Richards 2007; Richards and Jeske 2002) and provide even greater certainty for these previous conclusions.

Aztalan is possibly the only Mississippian site with bastioned palisades between A.D. 1050–1150; however, from A.D. 1200–1300 bastioned palisades were in use at every other site in this study at 68-percent probability (Figure 2; Table 2). The order of palisade construction at these individual sites is difficult to decipher due to overlapping posterior probabilities, likely due to a calibration curve wiggle from A.D. 1290–1410 and older radiocarbon measurements with large standard errors (Appendix A; Krus et al. 2015). Regardless, it is clear that the dated bastioned palisades are present mainly from A.D. 1200–1400 (Figure 2; Table 2).

These results suggest that from A.D. 1200–1400 bastioned palisades defined large Mississippian towns and were an in vogue architectural style that displayed defensive military power. They marked a Mississippian landscape of political instability characterized by dramatic social changes in the A.D. 1200s and A.D. 1300s (Clay 2006; Cobb and Butler 2002, 2006; Cobb and Giles 2009; Dye 2008; Trubitt 2003). This finding dovetails with the conclusions of Milner (2007; Milner et al. 2013) that Mississippian palisades were broadly predominant post-A.D. 1200 largely due to intergroup tensions enhanced by the end of the Medieval Warm Period. This broad trend is also suggested by the posterior probabilities of this study (Figure 2), which are later than many of the chronologies for bastioned palisades not subjected to scientific dating (Table 1). Descriptions of Native American bastioned palisades by early American explorers and settlers (Clayton et al. 1995; Fundaburk 1996; Hudson 1997; Jenkins 2009; Lafferty 1973; Lee 2004) indicate that these structures continued to be built by historic-era Native American groups.
Probability densities for the estimated spans of palisades also tend to be longer than previous estimates (Figure 3; Table 2). For example, Kincaid, Cahokia, and Angel Mounds have the most robust collection of radiocarbon dates from palisade contexts and provide the best estimate for palisade spans. At 68-percent probability these spans vary from 105–200 years (68-percent probability; Figure 3; Kincaid: palisade span), 55–150 years (Figure 3; Cahokia: palisade span), and 85–165 years (Figure 3; Angel Mounds: palisade span). These results indicate that bastioned palisades were maintained for multiple generations, possibly well over a century, whereas most previous estimates for the use life of bastioned palisades are around 100 years or less (Table 2).

Previous estimates for the use life of palisades were created primarily from considering the rate of wood decay (Table 1); however, the true use life of a palisade is only partially contingent on the durability of its construction materials. The archaeological and chronological evidence make
clear that long-term palisade use involved repairs and expansions, sometimes of massive character. Many Mississippian palisades have repair posts and trenches, as well as rebuilds and expansions of substantial proportions, which sometimes eclipse the labor involved in initial palisade construction (Allan 1984; Blitz 2008; Butler et al. 2011; Chapman et al. 1977; Cole and Albright 1983; Goldstein and Richards 1991; Hammerstedt 2005; Holley et al. 1990; Iseminger et al. 1990; Krus 2011, 2013; Lafferty 1973; Munson 1994; Peterson 2010; Santure 1981; Scarry 1998; Schroeder 2006, 2009; Trubitt 2003; Vogel and Allan 1985; Webb and Wilder 1951; Worne 2011). This archaeological evidence suggests that Mississippian people repaired and rebuilt palisade walls when needed, potentially leading to lengthy use lives. Importantly, a palisade may be dismantled from an attack or as part of a ritual (Pauketat et al. 2013), further complicating estimates for palisade use life. Likewise, experimental reconstructions of palisade walls to determine use life are somewhat marred for these reasons and because the full range of construction materials and finer architectural details are simply not known. The posterior span probabilities (Figure 3; Table 2) provide the best and most transparent estimates for the duration of use and continuous maintenance for these structures because they are produced by chronological frameworks that account for maintenance, rebuildings, and dismantlement.

This analysis suggests that the periodicity of warfare was at chronic levels in many Mississippian areas from A.D. 1200–1400, a conclusion reached by recent syntheses on Mississippian warfare (Cobb and Giles 2009; Dye 2008; Emerson 2007; Milner 1999, 2000, 2007; Milner et al. 2013; Wilson 2012). The Bayesian modeling results for palisade timing and duration supports this notion. Fine-grain analyses and comparisons are still needed to understand the historical nuances of how these individual past conflicts unfolded and how the different pulses and levels of inter-group violence played out in different parts and times of the Mississippian world.

Figure 3. Posterior probability densities for the estimated spans of the palisades at Angel Mounds, Aztalan, Cahokia, Etowah, Kincaid, Moundville, and Southwind.
Conclusions

The Bayesian modeling frameworks presented here for Mississippian sites with scientifically dated bastioned palisades provide high-resolution estimates for the timing and use life of these structures. It suggests that bastioned palisades were generally built later than estimates provided by earlier studies, primarily after A.D. 1200. This analysis also suggests that bastioned palisades were generally used and maintained continuously for around a century or more, which is longer than most previous estimates. This strengthens the claim that many Mississippian societies shifted to greater militarization in the early A.D. 1200s. The regional trends were observed by covering a rather large geographic area and would have been missed by focusing on a single site or area. While the discussion of the results mainly covered broad regional interpretations, some of the individual results are interesting, for example, the posterior probabilities for Cahokia’s palisade indicate that it was likely first built about a century later than previously believed.

The archaeological and radiocarbon data used in this study have taken about a century to amass and have allowed for the development of a robust chronology for bastioned palisades in the U.S. Midwest and Southeast. This study demonstrates the potential that scientific dating and Bayesian modeling have for revealing more precise chronologies. Archaeologists should exploit this potential to better tease out and refine their chronologies.

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Supplemental Materials. Appendices A–E are accessible as supplemental materials linked to the online version of the paper, which is accessible via the SAA member login at www.saa.org/members-login.
Appendix A. Radiocarbon data.
Appendix B. Context matrices showing the treatment of radiocarbon measurements in the primary Bayesian models.
Appendix C. Code for OxCal models.
Appendix D. Description of Bayesian models and results.
Appendix E. Description of alternative Bayesian models and results.

Data Availability Statement. This article is based on materials housed at the Glenn A. Black Laboratory of Archaeology, the Milwaukee Public Museum, and data from published sources.

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## Appendix A. Radiocarbon Data

<table>
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<th>Calibration (95% confidence)</th>
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<td>DIC-1024</td>
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<td>Fill of a 0.7m pit (F24B-1/Q-08-C).</td>
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<td>840 ± 80</td>
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<td>Hilgeman 2000:Appendix B; Monaghan et al. 2013:Table 1</td>
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<td>Fill from a stratum (F9/O13D) in Mound I.</td>
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<td>Turf block from the upper platform (south) of Mound A.</td>
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<td>Mounds</td>
<td>base of the inner palisade trench (M13D/5R3).</td>
<td>(Fraxinus sp.)</td>
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<td>-25.4</td>
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<td>Interior surface of pottery vessel (Unit K).</td>
<td>Residue</td>
<td>4</td>
<td>-17.9</td>
<td>1180 ± 40</td>
<td>cal A.D. 720–970</td>
<td>Reber et al. 2015</td>
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<td>Beta-234736</td>
<td>Angel Mounds</td>
<td>Pit (Unit M).</td>
<td>Unidentified charred cane</td>
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<td>700 ± 40</td>
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<td>Beta-234737</td>
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<td>From deposit near fireclay basin (Unit H).</td>
<td>Unidentified nutshell</td>
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<td>-28.1</td>
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<td>Pit (Unit F/Feature 14a) in floor of a structure.</td>
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<td>Beta-234743</td>
<td>Angel Mounds</td>
<td>Unit A. Central habitation area feature.</td>
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<td>Beta-237767</td>
<td>Angel Mounds</td>
<td>Unidentified burnt feature in the Mound A conical offset. Sample retrieved through coring.</td>
<td>Charred rush (juncaceae)</td>
<td>4</td>
<td>-10.1</td>
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<td>Beta-241192</td>
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<td>Unit A. Structural feature.</td>
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<td>3</td>
<td>-23.7</td>
<td>660 ± 40</td>
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<td>McGill 2013:553; Peebles and Monaghan 2011; Peterson 2010</td>
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<td>Beta-241193</td>
<td>Angel Mounds</td>
<td>Palisade trench fill (U-9-A, possible Heavy Trench).</td>
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<td>2</td>
<td>-</td>
<td>720 ± 40</td>
<td>cal A.D. 1220–1390</td>
<td>Bush 2010; Krus 2013; Peterson 2010:Appendix 3; This paper</td>
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## Appendix A. Radiocarbon Data

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<td>Southern outer palisade bastion posthole (O-7-C).</td>
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<td>Angel Mounds</td>
<td>Base of Unit A domestic features.</td>
<td>Charred wood (<em>Gleditsia triacanthos</em>)</td>
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<td>Beta-252377</td>
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<td>Roof of structure near conical offset (MA/F2).</td>
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<td>3 -24.7</td>
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<td>Thatch from the roof of a structure in the inner mound layer of Mound F.</td>
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<td>-24.4</td>
<td>670 ± 40</td>
<td>cal A.D. 1260–1400</td>
<td>Horton 2010; Krus 2013; This paper</td>
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<tr>
<td>Beta-284696</td>
<td>Angel Mounds</td>
<td>Palisade trench fill (Inner Palisade, Q-9-A).</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-25.5</td>
<td>1160 ± 40</td>
<td>cal A.D. 770–980</td>
<td>Horton 2010; Krus 2013; This paper</td>
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<tr>
<td>Beta-284697</td>
<td>Angel Mounds</td>
<td>Wall trench fill superimposing a palisade trench (East Village Heavy Trench, W-10-D).</td>
<td>Wood charcoal (Acer sp.)</td>
<td>2</td>
<td>-26</td>
<td>550 ± 40</td>
<td>cal A.D. 1300–1440</td>
<td>Horton 2010; Krus 2013; This paper</td>
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<tr>
<td>Beta-286636</td>
<td>Angel Mounds</td>
<td>Palisade trench fill (Northern Outer Palisade, K-11-B).</td>
<td>Wood charcoal (Quercus sp.)</td>
<td>2</td>
<td>-</td>
<td>1090 ± 40</td>
<td>cal A.D. 780–1030</td>
<td>Horton 2010; Krus 2013; This paper</td>
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<tr>
<td>Beta-309045</td>
<td>Angel Mounds</td>
<td>A stratum with burned materials superimposed by the palisade trench (East Village Outer Palisade, W-10-D).</td>
<td>Charred cane (Arundinaria gigantea)</td>
<td>4</td>
<td>-25.9</td>
<td>790 ± 30</td>
<td>cal A.D. 1190–1280</td>
<td>Bush 2011; Krus 2013; This paper</td>
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<tr>
<td>Beta-309046</td>
<td>Angel Mounds</td>
<td>Palisade posthole (East Village Heavy Trench, W-10-D).</td>
<td>Unidentified bark</td>
<td>4</td>
<td>-26.9</td>
<td>770 ± 30</td>
<td>cal A.D. 1210–1290</td>
<td>Bush 2011; Krus 2013; This paper</td>
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<tr>
<td>Beta-309052</td>
<td>Angel Mounds</td>
<td>Fill of House Pit #1 (S-11-D).</td>
<td>Maize</td>
<td>3</td>
<td>-</td>
<td>630 ± 30</td>
<td>cal A.D. 1280–1400</td>
<td>McGill 2013:541</td>
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<tr>
<td>Beta-313068</td>
<td>Angel Mounds</td>
<td>Associated parallel wood strips, wood charcoal, river cane, and four complete ceramic vessels (X-7-D/Feature 3) on the 3rd Terrace.</td>
<td>Cane (Arundinaria gigantea)</td>
<td>3</td>
<td>-</td>
<td>690 ± 30</td>
<td>cal A.D. 1260–1390</td>
<td>Pike 2012:93, 106; Matthew Pike, personal communication 2014</td>
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<tr>
<td>Beta-181397</td>
<td>Annis</td>
<td>Palisade trench fill (Feature 64C-middle palisade).</td>
<td>Unidentified charred nutshell</td>
<td>2</td>
<td>-</td>
<td>710 ± 30</td>
<td>cal A.D. 1250–1390</td>
<td>Hammerstedt 2005:335</td>
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## Appendix A. Radiocarbon Data

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<th>Laboratory ID</th>
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<th>Date B.P.</th>
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<tr>
<td>Beta-310904</td>
<td>Aztalan</td>
<td>Preserved post bottom from a bastion (Tower B in I,4). Catalogue #39922/39923 Accession #10779.</td>
<td>Wood (<em>Quercus alba.</em>)</td>
<td>3</td>
<td>-27.5</td>
<td>940 ± 30</td>
<td>cal A.D. 1020–1160</td>
<td>Barrett 1933:102; Bush 2011; Krus 2013; This paper</td>
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<tr>
<td>Beta-310903</td>
<td>Aztalan</td>
<td>Preserved post bottom from a bastion (Tower B in I,4). Catalogue #39921 Accession #10779.</td>
<td>Wood (<em>Quercus</em>)</td>
<td>3</td>
<td>-26.4</td>
<td>910 ± 30</td>
<td>cal A.D. 1030–1210</td>
<td>Barrett 1933:Plate 17, fig. 2; Bush 2011; Krus 2013; This paper</td>
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<tr>
<td>M-1037</td>
<td>Aztalan</td>
<td>Posthole fill of rectangular structure located in riverbank enclosure.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>1200 ± 75</td>
<td>cal A.D. 670–980</td>
<td>Crane and Griffin 1962:187; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>DIC-3135</td>
<td>Aztalan</td>
<td>Ash dump feature (Feature 6, Str. 11).</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>1130 ± 55</td>
<td>cal A.D. 770–1020</td>
<td>Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>DIC-3133</td>
<td>Aztalan</td>
<td>Concentration of mussel shells (Feature 20, Str. 5).</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>950 ± 65</td>
<td>cal A.D. 980–1230</td>
<td>Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>Beta-47JE1/6</td>
<td>Aztalan</td>
<td>Charred bulrush matting from charnel house in NW mound.</td>
<td>Unidentified charred bulrush</td>
<td>4</td>
<td>-</td>
<td>940 ± 60</td>
<td>cal A.D. 990–1220</td>
<td>Richards et al. 1998:88; Johnson 2003:55; Richards and Jeske 2002:Table 1</td>
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<td>WIS-191</td>
<td>Aztalan</td>
<td>A possible pit (Feature 30) superimposed by two episodes of riverbank palisade construction.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>920 ± 55</td>
<td>cal A.D. 1010–1230</td>
<td>Bender et al. 1967:535; Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>DIC-3044</td>
<td>Aztalan</td>
<td>Shallow pit (Feature 5) containing grit-tempered pottery in plaza area.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>870 ± 50</td>
<td>cal A.D. 1030–1260</td>
<td>Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>WIS-68</td>
<td>Aztalan</td>
<td>A pit (Feature 17a) east of NE mound in riverbank enclosure. Pit contains corn, shell and grit tempered pottery.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>850 ± 80</td>
<td>cal A.D. 1020–1280</td>
<td>Bender et al. 1968:528; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>DIC-3134</td>
<td>Aztalan</td>
<td>Str. 1110 domestic features.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>850 ± 45</td>
<td>cal A.D. 1040–1270</td>
<td>Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>DIC-3136</td>
<td>Aztalan</td>
<td>Str. 1110 domestic feature (Feature 10).</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>850 ± 50</td>
<td>cal A.D. 1040–1270</td>
<td>Richards 1985:97; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>WIS-160</td>
<td>Aztalan</td>
<td>Recovered by Barrett 13 feet below surface of SW mound</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-</td>
<td>840 ± 70</td>
<td>cal A.D. 1030–1280</td>
<td>Bender et al. 1967:535; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>WIS-73</td>
<td>Aztalan</td>
<td>Str. 1110 domestic features.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>820 ± 60</td>
<td>cal A.D. 1040–1290</td>
<td>Bender et al. 1966:527; Richards and Jeske 2002:Table 1</td>
</tr>
<tr>
<td>WIS-63</td>
<td>Aztalan</td>
<td>Ash layer in pit (Feature 1) in riverbank</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>820 ± 80</td>
<td>cal A.D.</td>
<td>Bender et al. 1966:527;</td>
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</table>
## Appendix A. Radiocarbon Data

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<th>Date B.P.</th>
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<tr>
<td>WIS-162</td>
<td>Aztalan</td>
<td>Wooden post from structure on SW mound.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>810 ± 60</td>
<td>cal A.D. 1040–1290</td>
<td>Bender et al. 1967:535; Richards and Jeske 2002:Table 1</td>
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<td>WIS-74</td>
<td>Aztalan</td>
<td>Pit (Feature 42) in center of riverbank enclosure.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>730 ± 80</td>
<td>cal A.D. 1050–1410</td>
<td>Bender et al. 1966:527; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>M-1214</td>
<td>Aztalan</td>
<td>Pit 10 in NE quadrant of site.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>580 ± 100</td>
<td>cal A.D. 1220–1620</td>
<td>Ritzenthaler 1963:180; Richards and Jeske 2002:Table 1</td>
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<tr>
<td>M-642</td>
<td>Aztalan</td>
<td>NW mound charnel house.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>320 ± 100</td>
<td>cal A.D. 1410–...</td>
<td>Crane and Griffin 1959:179; Richards and Jeske 2002:Table 1</td>
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<td>A-1159</td>
<td>Cahokia Mounds</td>
<td>Sod Block (144.3 m asl) from Monks Mound east slope.</td>
<td>Unidentified grass-like stems and leaves</td>
<td>4</td>
<td>-14</td>
<td>955 ± 15</td>
<td>cal A.D. 1020–1160</td>
<td>Schilling 2010</td>
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<td>Beta-241384</td>
<td>Cahokia Mounds</td>
<td>2007 Monks Mound East Slope repairs; Sod Block (144.3 m asl)</td>
<td>Unidentified grass-like stems and leaves</td>
<td>4</td>
<td>-25.1</td>
<td>770 ± 40</td>
<td>cal A.D. 1180–1290</td>
<td>Schilling 2010</td>
</tr>
<tr>
<td>Beta-241385</td>
<td>Cahokia Mounds</td>
<td>2007 Monks Mound East Slope repairs; Feature 1. Mound fill, log associated with limestone and log feature on east slope.</td>
<td>Wood (Taxodium)</td>
<td>2</td>
<td>-22.9</td>
<td>960 ± 40</td>
<td>cal A.D. 990–1170</td>
<td>Schilling 2010</td>
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<tr>
<td>Beta-207044</td>
<td>Cahokia Mounds</td>
<td>Sub-east slump of Monks Mound. Submound feature. Material retrieved through coring (Core 4).</td>
<td>Tiny fragments of unidentified deciduous wood and bark</td>
<td>2</td>
<td>-14.1</td>
<td>900 ± 40</td>
<td>cal A.D. 1030–1220</td>
<td>Hajic 2005:Table X; Schilling 2010</td>
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<td>WIS-587</td>
<td>Cahokia Mounds</td>
<td>East lobes (N150-152) of Monks Mound. Burnt thatch layer (Feature 284) of a house in submound.</td>
<td>Unidentified burnt thatch</td>
<td>4</td>
<td>-12.6</td>
<td>925 ± 60</td>
<td>cal A.D. 990–1230</td>
<td>Bender et al. 1973b; Fowler 1997:212; Williams 1975:24</td>
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<tr>
<td>Beta-207041</td>
<td>Cahokia Mounds</td>
<td>Sub-west slump of Monks Mound. Submound feature. Material retrieved through coring (Core 3).</td>
<td>Charred organic material: acorn shell, grass stems; maygrass &amp; knotweed seeds; maize</td>
<td>2</td>
<td>-25.1</td>
<td>950 ± 40</td>
<td>cal A.D. 1010–1190</td>
<td>Hajic 2005:Table X; Schilling 2010</td>
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<tr>
<td>Beta-207040</td>
<td>Cahokia Mounds</td>
<td>Sub-west slump of Monks Mound.</td>
<td>Unidentified burnt thatch</td>
<td>4</td>
<td>-27.4</td>
<td>960 ± 60</td>
<td>cal A.D.</td>
<td>Hajic 2005:Table X; Schilling 2010</td>
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<tr>
<td>Mounds</td>
<td>Submound feature. Material retrieved through coring (Core 1).</td>
<td>Betula)</td>
<td></td>
<td></td>
<td></td>
<td>980–1220</td>
<td></td>
<td>2010</td>
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<td>Beta-207039</td>
<td>Cahokia Mounds</td>
<td>Sub-west slump of Monks Mound. Submound feature. Material retrieved through coring (Core 1).</td>
<td>Herbaceous grass</td>
<td>2</td>
<td>-9.9</td>
<td>980 ± 40</td>
<td>cal A.D. 990–1160</td>
<td>Hajic 2005:Table X; Schilling 2010</td>
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<tr>
<td>Beta-207042</td>
<td>Cahokia Mounds</td>
<td>Sub-west slump of Monks Mound. Submound feature. Material retrieved through coring (Core 3).</td>
<td>Unidentified deciduous wood and bark</td>
<td>2</td>
<td>-27.4</td>
<td>1010 ± 40</td>
<td>cal A.D. 900–1160</td>
<td>Hajic 2005:Table X; Schilling 2010</td>
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<tr>
<td>I-2309</td>
<td>Cahokia Mounds</td>
<td>Feature below Monks Mound. Material retrieved through coring (ISM Core).</td>
<td>Unidentified wood</td>
<td>2</td>
<td>-</td>
<td>1110 ± 70</td>
<td>cal A.D. 710–1040</td>
<td>Fowler 1997; Reed et al. 1968; Schilling 2013</td>
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<td>ISGS-1252</td>
<td>Cahokia Mounds</td>
<td>Feature at the base of Monks Mound. From a core sample located in the center of the 4th terrace.</td>
<td>Unidentified diffuse charcoal (species not listed)</td>
<td>2</td>
<td>-</td>
<td>1190 ± 70</td>
<td>cal A.D. 680–990</td>
<td>McGimsey and Wiant 1984:viii, 34</td>
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<td>M-1636</td>
<td>Cahokia Mounds</td>
<td>Monks Mound fill. Reed's Level L surface. From fourth terrace.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>2</td>
<td>-</td>
<td>840 ± 150</td>
<td>cal A.D. 890–1410</td>
<td>Crane and Griffin 1966; Fischer 1972:19; Reed et al. 1968</td>
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<td>I-2308</td>
<td>Cahokia Mounds</td>
<td>Feature from an apparent living surface 29 ft above base of Monks Mound. From a core sample (ISM Core) on 3rd terrace. Coring at depth 68 ft. Taken from a large section of potentially redeposited wood.</td>
<td>Unidentified wood</td>
<td>2</td>
<td>-</td>
<td>1020 ± 100</td>
<td>cal A.D. 770–1220</td>
<td>Buckley et al. 1968:281; McGimsey and Wiant 1984:34; Reed et al. 1968</td>
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<td>WIS-525</td>
<td>Cahokia Mounds</td>
<td>Monks Mound Summit. Fourth terrace. Sample from post (Feature 1B) fragments.</td>
<td>Charred wood (Carya)</td>
<td>3</td>
<td>-28.4</td>
<td>870 ± 55</td>
<td>cal A.D. 1030–1260</td>
<td>Bender et al. 1973a; Reed 2009:35</td>
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<tr>
<td>WIS-527</td>
<td>Cahokia Mounds</td>
<td>Monks Mound Summit. Fourth terrace. Sample from post (Feature 1H) fragments.</td>
<td>Charred wood (Carya)</td>
<td>3</td>
<td>-26.5</td>
<td>890 ± 60</td>
<td>cal A.D. 1020–1260</td>
<td>Bender et al. 1973a; Reed 2009:35</td>
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<tr>
<td>WIS-546</td>
<td>Cahokia Mounds</td>
<td>Sample from a log (log 24) lying on the floor (Feature 113) of a large burned building under the first terrace of Monks Mound.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>805 ± 60</td>
<td>cal A.D. 1040–1290</td>
<td>Benchley 1975; Bender et al. 1973b</td>
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<tr>
<td>WIS-547</td>
<td>Cahokia Mounds</td>
<td>Sample from a log (log 1) lying on the floor (Feature 114) of a small burned building under the first terrace of Monks Mound.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>825 ± 60</td>
<td>cal A.D. 1040–1290</td>
<td>Benchley 1975; Bender et al. 1973b</td>
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<td>WIS-365</td>
<td>Cahokia Mounds</td>
<td>From a post (post 2) in a burned structure (Feature 114) below a small mound on SW corner of the 1st terrace of Monk's Mound. Post 2 was standing upright in wall trench and had broken off when structure (Feature 114) collapsed. The structure predates &quot;primary&quot; mound and post dates series of unburned living surfaces and possible post pit.</td>
<td>Wood charcoal (likely Quercus)</td>
<td>3</td>
<td>-</td>
<td>840 ± 55</td>
<td>cal A.D. 1040–1280</td>
<td>Benchley 1975; Bender et al. 1970a</td>
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<tr>
<td>M-982</td>
<td>Cahokia Mounds</td>
<td>Sample from a 0.5 in. layer of charcoal 8-10 in. above a burnt sand floor and about 6 ft below Monks Mound’s 1st terrace.</td>
<td>Unidentified carbonized wood</td>
<td>3</td>
<td>-</td>
<td>850 ± 100</td>
<td>cal A.D. 980–1380</td>
<td>Benchley 1975; Crane and Griffin 1968; Schilling 2013:Table 1</td>
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<td>WIS-443</td>
<td>Cahokia Mounds</td>
<td>Monks Mound. First terrace, Feature 113, Post 1, N/72.23 E103.19. Below platform mound.</td>
<td>Unidentified carbonized wood</td>
<td>3</td>
<td>-</td>
<td>670 ± 55</td>
<td>cal A.D. 1260–1410</td>
<td>Benchley 1975; Bender et al. 1971; Schilling 2013:Table 1</td>
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<tr>
<td>WIS-362</td>
<td>Cahokia Mounds</td>
<td>From a burned clay floor (Feature 104) underneath a small mound on SW corner of 1st terrace of Monk's Mound.</td>
<td>Unidentified carbonized wood</td>
<td>3</td>
<td>-</td>
<td>690 ± 50</td>
<td>cal A.D. 1220–1400</td>
<td>Benchley 1975; Bender et al. 1970a; Schilling 2013:Table 1</td>
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<tr>
<td>WIS-549</td>
<td>Cahokia Mounds</td>
<td>From burned wood in an ash concentration from burned basin (Feature 149, N78-80 E100-101) below primary mound in Monk’s Mound 1st terrace.</td>
<td>Unidentified burned wood</td>
<td>3</td>
<td>-</td>
<td>720 ± 55</td>
<td>cal A.D. 1190–1400</td>
<td>Benchley 1975; Bender et al. 1973b</td>
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<tr>
<td>WIS-545</td>
<td>Cahokia Mounds</td>
<td>From a burned post from a burned building (Feature 139) on top of Monks Mound 1st terrace.</td>
<td>Carbonized wood (possibly Quercus)</td>
<td>3</td>
<td>-26.4</td>
<td>740 ± 55</td>
<td>cal A.D. 1160–1390</td>
<td>Benchley 1975; Bender et al. 1973b; Schilling 2013:Table 1</td>
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<td>I-2947</td>
<td>Cahokia Mounds</td>
<td>From a pit (pit 137) on Monks Mound 1st terrace primary mound.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>760 ± 95</td>
<td>cal A.D. 1040–1400</td>
<td>Benchley 1975; Buckley and Willis 1969; Fowler 1997:212; Hajic 2005:Table X</td>
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<td>WIS-586</td>
<td>Cahokia Mounds</td>
<td>From a pre-ramp surface associated with a wide area of scattered burned clay and twigs or small logs in Monks Mound east lobes (N168.9).</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-</td>
<td>640 ± 55</td>
<td>cal A.D. 1270–1410</td>
<td>Bender et al. 1973b; Williams 1975</td>
</tr>
<tr>
<td>M-1637</td>
<td>Cahokia Mounds</td>
<td>From a burned floor of a house (Feature 4) on slope on the southwest edge of Monks Mound.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>670 ± 100</td>
<td>cal A.D. 1160–1440</td>
<td>Crane and Griffin 1966; Reed et al. 1968</td>
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</tbody>
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## Appendix A. Radiocarbon Data

<table>
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<tr>
<th>Laboratory ID</th>
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<tbody>
<tr>
<td>M-1293</td>
<td>Cahokia Mounds</td>
<td>Fire basin (Fea 227) in center of House 15 in the Powell Tract.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1190 ± 75</td>
<td>cal A.D. 670–990</td>
<td>Crane and Griffin 1963:236; Fowler 1963:50</td>
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<tr>
<td>WIS-58</td>
<td>Cahokia Mounds</td>
<td>Repeat of M-1293.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>-</td>
<td>-</td>
<td>1000 ± 65</td>
<td>cal A.D. 890–1190</td>
<td>Bender et al. 1966:533</td>
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<tr>
<td>M-1294</td>
<td>Cahokia Mounds</td>
<td>From floor of House 21 (Fea 217) in the Powell Tract.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1125 ± 75</td>
<td>cal A.D. 690–1030</td>
<td>Crane and Griffin 1963:236; Fowler 1963:50</td>
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<tr>
<td>M-1292</td>
<td>Cahokia Mounds</td>
<td>Charred layer of floor (Fea 234) of House 26 in Powell Tract.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1055 ± 75</td>
<td>cal A.D. 770–1160</td>
<td>Crane and Griffin 1963:236; Fowler 1963:49</td>
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<tr>
<td>ISGS-140</td>
<td>Cahokia Mounds</td>
<td>Pit (Fea 331) in Powell Tract.</td>
<td>Squash seeds</td>
<td>3</td>
<td>-</td>
<td>1000 ± 75</td>
<td>cal A.D. 880–1210</td>
<td>Coleman 1974:115</td>
</tr>
<tr>
<td>ISGS-130</td>
<td>Cahokia Mounds</td>
<td>Pit (Fea 331) in Powell Tract.</td>
<td>Nut shells (Carya)</td>
<td>3</td>
<td>-</td>
<td>950 ± 75</td>
<td>cal A.D. 900–1260</td>
<td>Coleman 1974:115</td>
</tr>
<tr>
<td>M-1332</td>
<td>Cahokia Mounds</td>
<td>From charred timbers on floor of House 43 in Tract 15B.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>515 ± 100</td>
<td>cal A.D. 1270–1640</td>
<td>Crane and Griffin 1964:5; Fowler 1963:53</td>
</tr>
<tr>
<td>ISGS-3831</td>
<td>Cahokia Mounds</td>
<td>Tract 15B. House 43. Carbonized wood from log associated with burned house.</td>
<td>Wood (Quercus, Erythrobalanus)</td>
<td>3</td>
<td>-26.3</td>
<td>590 ± 70</td>
<td>cal A.D. 1280–1440</td>
<td>Kelly 1997</td>
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<tr>
<td>M-1333</td>
<td>Cahokia Mounds</td>
<td>Sample from central floor area of House 44 in Tract 15B.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>825 ± 100</td>
<td>cal A.D. 1010–1390</td>
<td>Crane and Griffin 1964:5; Fowler 1963:53</td>
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<tr>
<td>M-1336</td>
<td>Cahokia Mounds</td>
<td>Sample from House 113 in Tract 15B.</td>
<td>Unidentified wood charcoal</td>
<td>1</td>
<td>-</td>
<td>885 ± 200</td>
<td>cal A.D. 690–1420</td>
<td>Crane and Griffin 1964:5</td>
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<tr>
<td>ISGS-3832</td>
<td>Cahokia Mounds</td>
<td>Tract 15B. House 43. Carbonized wood from log associated with burned house.</td>
<td>Wood (Quercus, Erythrobalanus)</td>
<td>3</td>
<td>-25.7</td>
<td>600 ± 70</td>
<td>cal A.D. 1270–1440</td>
<td>Kelly 1997</td>
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<tr>
<td>A-1523</td>
<td>Cahokia Mounds</td>
<td>Tract 15B. Burial 2.</td>
<td>Articulated human bone</td>
<td>4</td>
<td>-10.4</td>
<td>655 ± 15</td>
<td>cal A.D. 1020–1160</td>
<td>Carbaugh et al. 2013: Table 5.1</td>
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<tr>
<td>A-1525</td>
<td>Cahokia Mounds</td>
<td>Tract 15B. Burial 4.</td>
<td>Articulated human</td>
<td>4</td>
<td>-20.5</td>
<td>945 ± 15</td>
<td>cal A.D.</td>
<td>Carbaugh et al. 2013: Table 5.1</td>
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<tr>
<td>ISGS-3826</td>
<td>Cahokia Mounds</td>
<td>Merrell Tract. Large refuse pit (F341).</td>
<td>Nut shell fragment (Carya)</td>
<td>3</td>
<td>-26.1</td>
<td>530 ± 70</td>
<td>cal A.D. 1280–1480</td>
<td>Kelly 1997</td>
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<tr>
<td>ISGS-276</td>
<td>Cahokia Mounds</td>
<td>From garbage layer (Feature 306) in fill of house basin in Merrell Tract.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>860 ± 80</td>
<td>cal A.D. 1020–1280</td>
<td>Liu et al. 1986:79; Fowler 1997:213</td>
</tr>
<tr>
<td>ISGS-3823</td>
<td>Cahokia Mounds</td>
<td>Merrell Tract. Large refuse pit (F341).</td>
<td>Nut shell fragment (Carya)</td>
<td>3</td>
<td>-25.8</td>
<td>610 ± 70</td>
<td>cal A.D. 1270–1440</td>
<td>Kelly 1997</td>
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<tr>
<td>ISGS-3824</td>
<td>Cahokia Mounds</td>
<td>Merrell Tract. Large refuse pit (F341).</td>
<td>Nut shell fragment (Carya)</td>
<td>3</td>
<td>-26.1</td>
<td>600 ± 70</td>
<td>cal A.D. 1270–1440</td>
<td>Kelly 1997</td>
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<tr>
<td>ISGS-3829</td>
<td>Cahokia Mounds</td>
<td>Merrell Tract. Smudge pit (F349).</td>
<td>Maize</td>
<td>4</td>
<td>-10.2</td>
<td>560 ± 70</td>
<td>cal A.D. 1280–1450</td>
<td>Kelly 1997</td>
</tr>
<tr>
<td>ISGS-3830</td>
<td>Cahokia Mounds</td>
<td>Merrell Tract. Smudge pit (F370).</td>
<td>Maize</td>
<td>4</td>
<td>-11.6</td>
<td>650 ± 70</td>
<td>cal A.D. 1250–1430</td>
<td>Kelly 1997</td>
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<tr>
<td>ISGS-281</td>
<td>Cahokia Mounds</td>
<td>From concentration of organic material on floor of old house (Feature 319) in the Merrell Tract.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1080 ± 80</td>
<td>cal A.D. 720–1160</td>
<td>Liu et al. 1986:79</td>
</tr>
<tr>
<td>ISGS-283</td>
<td>Cahokia Mounds</td>
<td>From concentration of organic material on floor of old house (Feature 319) in the Merrell Tract.</td>
<td>Unidentified organic material (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1220 ± 80</td>
<td>cal A.D. 660–980</td>
<td>Liu et al. 1986:79</td>
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<tr>
<td>ISGS-280</td>
<td>Cahokia Mounds</td>
<td>From concentration of organic material on floor of old house (Feature 319) in the Merrell Tract.</td>
<td>Unidentified organic material (species not listed)</td>
<td>1</td>
<td>-</td>
<td>1050 ± 80</td>
<td>cal A.D. 770–1160</td>
<td>Liu et al. 1986:79</td>
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<tr>
<td>WIS-444</td>
<td>Cahokia Mounds</td>
<td>Upright burned post (Feature 28) in Palisade IV trench in Ramey Field.</td>
<td>Unidentified burnt wood</td>
<td>3</td>
<td>-</td>
<td>750 ± 55</td>
<td>cal A.D. 1160–1390</td>
<td>Bender et al. 1971:475; Schilling 2010:258</td>
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<tr>
<td>WIS-495</td>
<td>Cahokia Mounds</td>
<td>Ramey Field. Timber on floor of House 4, House 4 is below palisade.</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-</td>
<td>850 ± 50</td>
<td>cal A.D. 1040–1270</td>
<td>Bender et al. 1973a:230; Schilling 2010:258</td>
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</tbody>
</table>
## Appendix A. Radiocarbon Data

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<tr>
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<tbody>
<tr>
<td>WIS-359</td>
<td>Cahokia Mounds</td>
<td>Sample from stockade log associated with Palisade IV wall trench in Ramey Field.</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-</td>
<td>690 ± 55 cal A.D.1220–1400</td>
<td>Bender et al. 1970a:339; Schilling 2010:258</td>
<td></td>
</tr>
<tr>
<td>Beta-148269</td>
<td>Cahokia Mounds</td>
<td>Large trash-filled refuse basin (F-60) in west palisade excavation area with large potsherds, animal bone, lithic debris, and pieces of burned clay.</td>
<td>soil sample</td>
<td>3</td>
<td>-</td>
<td>1120 ± 70 cal A.D.710–1030</td>
<td>Trubitt 2001; Mary Beth Trubitt personal communication 2015</td>
<td></td>
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<tr>
<td>Beta-150315</td>
<td>Cahokia Mounds</td>
<td>West palisade wall trench (F-43).</td>
<td>charcoal (species not listed)</td>
<td>2</td>
<td>-</td>
<td>960 ± 70 cal A.D.900–1230</td>
<td>Trubitt 2001; Mary Beth Trubitt personal communication 2015</td>
<td></td>
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<tr>
<td>Beta-148266</td>
<td>Cahokia Mounds</td>
<td>Midden layer (F-34) containing a dense concentration of animal bone part of ridge that is superimposed by west palisade.</td>
<td>charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>950 ± 40 cal A.D.1010–1190</td>
<td>Trubitt 2001; Trubitt and Kelly 2012; Mary Beth Trubitt personal communication 2015</td>
<td></td>
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<tr>
<td>Beta-148263</td>
<td>Cahokia Mounds</td>
<td>Burned area in west palisade wall trench (F-42).</td>
<td>charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>880 ± 40 cal A.D.1030–1250</td>
<td>Trubitt 2001; Mary Beth Trubitt personal communication 2015</td>
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<tr>
<td>Beta-148265</td>
<td>Cahokia Mounds</td>
<td>F-39 post in west palisade wall trench (F-33). Sample Lot No. 99-242</td>
<td>charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>780 ± 70 cal A.D.1040–1390</td>
<td>Trubitt 2001; Mary Beth Trubitt personal communication 2015</td>
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<tr>
<td>M-636</td>
<td>Cahokia Mounds</td>
<td>From lowest level of a refuse pit in Mound 34.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-</td>
<td>660 ± 200 cal A.D.900–1670</td>
<td>Crane and Griffin 1959:181</td>
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<td>M-635</td>
<td>Cahokia Mounds</td>
<td>From &quot;ceremonial fire&quot; next to ramp on west side of Mound 34.</td>
<td>Wood charcoal (Quercus and Carya)</td>
<td>3</td>
<td>-</td>
<td>670 ± 200 cal A.D.890–1660</td>
<td>Crane and Griffin 1959:181</td>
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<tr>
<td>M-33A</td>
<td>Cahokia Mounds</td>
<td>From a pit underneath the slope of Mound 34. Same as M-33B.</td>
<td>Unidentified charred miscellaneous plant material</td>
<td>1</td>
<td>-</td>
<td>700 ± 300 cal A.D.670–...</td>
<td>Crane 1956:666</td>
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<tr>
<td>M-33B</td>
<td>Cahokia Mounds</td>
<td>From a pit underneath the slope of Mound 34. Same as M-33A.</td>
<td>Unidentified charred miscellaneous plant</td>
<td>1</td>
<td>-</td>
<td>900 ± 300 cal A.D.530–1650</td>
<td>Crane 1956:666</td>
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<td>M-672</td>
<td>Cahokia Mounds</td>
<td>From a basin in clay floor of Mound 34. burned house; same house dated by M-670.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
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<td>480 ± 100</td>
<td>cal A.D. 1290–1640</td>
<td>Crane and Griffin 1959:182</td>
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<td>A-1447</td>
<td>Cahokia Mounds</td>
<td>Pre-mound &quot;refuse pit&quot; (Feature 3) below Mound 34.</td>
<td>Deer humerus</td>
<td>2</td>
<td>-</td>
<td>870 ± 15</td>
<td>cal A.D. 1150–1220</td>
<td>Kelly and Brown 2010:Table 1; Schilling 2010</td>
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<tr>
<td>A-1448</td>
<td>Cahokia Mounds</td>
<td>Pit feature (75) w/in Mound 34 copper workshop house (Feature 82)</td>
<td>Deer rib</td>
<td>2</td>
<td>-</td>
<td>640 ± 15</td>
<td>cal A.D. 1280–1390</td>
<td>Kelly and Brown 2010:Table 1; Schilling 2010</td>
</tr>
<tr>
<td>A-1449</td>
<td>Cahokia Mounds</td>
<td>Pit feature (74) w/in Mound 34 copper workshop house (Feature 82)</td>
<td>Deer sternum fragment</td>
<td>2</td>
<td>-</td>
<td>630 ± 20</td>
<td>cal A.D. 1290–1400</td>
<td>Kelly and Brown 2010:Table 1; Schilling 2010</td>
</tr>
<tr>
<td>A-1450</td>
<td>Cahokia Mounds</td>
<td>Pit feature (75) w/in Mound 34 copper workshop house (Feature 82)</td>
<td>Deer innominate (pubis)</td>
<td>2</td>
<td>-</td>
<td>645 ± 15</td>
<td>cal A.D. 1280–1390</td>
<td>Kelly and Brown 2010:Table 1; Schilling 2010</td>
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<tr>
<td>M-1341</td>
<td>Cahokia Mounds</td>
<td>Sample from fill of Feature 174 and 369 (post pits) part of post circle No. 3 in Tract 15A.</td>
<td>Combined sample of unidentified charred wood and unidentified wood fragments</td>
<td>3</td>
<td>-</td>
<td>905 ± 120</td>
<td>cal A.D. 880–1380</td>
<td>Crane and Griffin 1964:5; Fowler 1963:54, 1997:213; Wittry 1973:45</td>
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<tr>
<td>M-1340</td>
<td>Cahokia Mounds</td>
<td>Floor of house 74 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
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<td>1025 ± 110</td>
<td>cal A.D. 720–1250</td>
<td>Crane and Griffin 1964:5; Fowler 1963:54</td>
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<td>I-2014</td>
<td>Cahokia Mounds</td>
<td>Refuse pit (Feature 289) in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>1000 ± 100</td>
<td>cal A.D. 770–1250</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1</td>
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<td>I-2070</td>
<td>Cahokia Mounds</td>
<td>Refuse pit (Feature 368) in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>990 ± 135</td>
<td>cal A.D. 720–1280</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1</td>
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<tr>
<td>I-2016</td>
<td>Cahokia Mounds</td>
<td>Refuse pit (Feature 338) inside post circle 2 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>980 ± 90</td>
<td>cal A.D. 880–1260</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1</td>
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<tr>
<td>I-2012</td>
<td>Cahokia Mounds</td>
<td>Woodland refuse pit Southeast of Circle 2 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>910 ± 100</td>
<td>cal A.D. 900–1290</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1</td>
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<td>I-9458</td>
<td>Cahokia Mounds</td>
<td>House 205 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>1</td>
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<td>940 ± 75</td>
<td>cal A.D. 970–1260</td>
<td>Pauketat 1998:Table 5.1</td>
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<tr>
<td>M-1337</td>
<td>Cahokia Mounds</td>
<td>From burned posts in wall trench of House 2 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>805 ± 100</td>
<td>cal A.D. 1020–1390</td>
<td>Crane and Griffin 1964:5; Fowler 1963:53</td>
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<td>I-2071</td>
<td>Cahokia Mounds</td>
<td>From Mississippian refuse pits (Features 371 and 369) in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>890 ± 135</td>
<td>cal A.D. 770–1400</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1</td>
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<td>M-1338</td>
<td>Cahokia Tract 15A.</td>
<td>House 32 east of Circle 2.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-</td>
<td>725 ± 100</td>
<td>cal A.D.</td>
<td>Crane and Griffin 1964:5;</td>
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<tbody>
<tr>
<td>Mounds</td>
<td></td>
<td>Sample from 0.2 feet above floor, 1.7 feet below surface. Intrudes into Circle 1 post pit 112.</td>
<td>charcoal</td>
<td></td>
<td></td>
<td></td>
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<td>1040–1420</td>
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<td>I-2013</td>
<td>Cahokia Mounds</td>
<td>Pit Feature 297 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>920 ± 100</td>
<td>cal A.D. 900–1280</td>
<td>Fowler 1997:213; Pauketat 1998:Table 5.1, Table 6.7</td>
</tr>
<tr>
<td>I-9459</td>
<td>Cahokia Mounds</td>
<td>Pit Feature 401 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>990 ± 75</td>
<td>cal A.D. 890–1220</td>
<td>Pauketat 1998:Table 5.1, Table 6.7</td>
</tr>
<tr>
<td>I-9460</td>
<td>Cahokia Mounds</td>
<td>House 209 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>1</td>
<td>-</td>
<td>980 ± 75</td>
<td>cal A.D. 890–1220</td>
<td>Pauketat 1998:Table 5.1</td>
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<tr>
<td>GX-926</td>
<td>Cahokia Mounds</td>
<td>Pit Feature 311 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>1135 ± 80</td>
<td>cal A.D. 680–1030</td>
<td>Pauketat 1998:Table 5.1, Table 6.7</td>
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<tr>
<td>I-9457</td>
<td>Cahokia Mounds</td>
<td>House 407 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>1</td>
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<td>880 ± 75</td>
<td>cal A.D. 1020–1270</td>
<td>Pauketat 1998:Table 5.1</td>
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<tr>
<td>WIS-1136</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 618) of Circle No. 2 in Tract 15A. Same sample as WIS-1133.</td>
<td>Outer rings of wood (Juniperus) post</td>
<td>3</td>
<td>-27</td>
<td>990 ± 60</td>
<td>cal A.D. 890–1190</td>
<td>Bender et al. 1981:146</td>
</tr>
<tr>
<td>WIS-1133</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 618) of Circle No. 2 in Tract 15A. Same sample as WIS-1136.</td>
<td>Outer rings of wood (Juniperus) post</td>
<td>3</td>
<td>-26.6</td>
<td>890 ± 60</td>
<td>cal A.D. 1020–1260</td>
<td>Bender et al. 1981:146</td>
</tr>
<tr>
<td>M-1339</td>
<td>Cahokia Mounds</td>
<td>Sample from 0.3 feet above floor of House 35 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
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<td>685 ± 100</td>
<td>cal A.D. 1050–1440</td>
<td>Crane and Griffin 1964:5; Fowler 1963:54</td>
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<tr>
<td>WIS-1130</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 601) of Circle No. 2 in Tract 15A. Same as WIS-1128.</td>
<td>Outer rings of wood (Juniperus) post</td>
<td>3</td>
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<td>920 ± 60</td>
<td>cal A.D. 1010–1250</td>
<td>Bender et al. 1981:145</td>
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<td>WIS-1128</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 601) of Circle No. 2 in Tract 15A. Same as WIS-1128.</td>
<td>Outer rings of wood (Juniperus) post</td>
<td>3</td>
<td>-27.3</td>
<td>940 ± 60</td>
<td>cal A.D. 990–1220</td>
<td>Bender et al. 1981:145</td>
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<td>I-9464</td>
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<td>House 212 in Tract 15A.</td>
<td>Unidentified wood charcoal</td>
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<td>-</td>
<td>440 ± 75</td>
<td>cal A.D. 1320–1650</td>
<td>Pauketat 1998:Table 5.1</td>
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<td>WIS-948</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 548) of Woodhenge Circle No. 2.</td>
<td>Wood (Juniperus) fragments</td>
<td>3</td>
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<td>1085 ± 55</td>
<td>cal A.D. 770–1030</td>
<td>Bender et al. 1979:121</td>
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<tr>
<td>WIS-969</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 548) of Woodhenge Circle No. 2.</td>
<td>Wood (Juniperus) fragments</td>
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<td>-27.2</td>
<td>1060 ± 55</td>
<td>cal A.D. 770–1150</td>
<td>Bender et al. 1979:121</td>
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<td>WIS-976</td>
<td>Cahokia Mounds</td>
<td>Large pit (Feature 340) of Woodhenge Circle 3, possibly associated with winter solstice sunrise post.</td>
<td>Unidentified charred wood</td>
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<td>-25.8</td>
<td>760 ± 55</td>
<td>cal A.D. 1150–1390</td>
<td>Bender et al. 1979:121</td>
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<td>WIS-984</td>
<td>Cahokia Mounds</td>
<td>Post pit (Feature 506) of Circle No. 3. Pit,</td>
<td>Unidentified charred</td>
<td>3</td>
<td>-26.9</td>
<td>685 ± 55</td>
<td>cal A.D.</td>
<td>Bender et al. 1979:121</td>
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### Appendix A. Radiocarbon Data

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<td></td>
<td>Mounds</td>
<td>superimposed by wall trench of House 302.</td>
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<td>WIS-988</td>
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<td>Large pit (Feature 539) part of Circle No. 4, believed to represent winter solstice.</td>
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<td>Bender et al. 1979:121</td>
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<td>Beta-19474</td>
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<td>Feature 79 (Zone A) in Interpretive Center Tract II.</td>
<td>Wood charcoal (mixed Pinophyta wood)</td>
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<td>cal A.D. 970–1220</td>
<td>Holley 1989:456-457</td>
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<td>Beta-19486</td>
<td>Cahokia Mounds</td>
<td>Feature 304 (Zone A) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Pinophyta and Quercus)</td>
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<td>cal A.D. 570–890</td>
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<td>Beta-19492</td>
<td>Cahokia Mounds</td>
<td>Feature 455 (Zone A) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Pinophyta and Carya)</td>
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<td>cal A.D. 770–1160</td>
<td>Holley 1989:456-457</td>
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<tr>
<td>Beta-19487</td>
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<td>Feature 320 (Zone A) in Interpretive Center Tract II.</td>
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<td>Beta-19475</td>
<td>Cahokia Mounds</td>
<td>Zone B of structure (Feature 92) in Interpretive Center Tract II.</td>
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<td>1100 ± 70</td>
<td>cal A.D. 720–1120</td>
<td>Holley 1989:456-457</td>
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<tr>
<td>Beta-19485</td>
<td>Cahokia Mounds</td>
<td>Zone B of structure (Feature 287) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Pinophyta)</td>
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<td>cal A.D. 980–1220</td>
<td>Holley 1989:456-457</td>
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<tr>
<td>Beta-19473</td>
<td>Cahokia Mounds</td>
<td>Feature 17 (Zone A) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Quercus)</td>
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<td>960 ± 100</td>
<td>cal A.D. 880–1270</td>
<td>Holley 1989:456-457</td>
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<td>Beta-19480</td>
<td>Cahokia Mounds</td>
<td>Zone A/floor of burned structure (Feature 178) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Pinophyta)</td>
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<td>-</td>
<td>950 ± 60</td>
<td>cal A.D. 980–1220</td>
<td>Holley 1989:456-457</td>
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<tr>
<td>Beta-19478</td>
<td>Cahokia Mounds</td>
<td>Zone A/floor of burned structure (Feature 178) in Interpretive Center Tract II.</td>
<td>Charcoal seeds (Diospyros)</td>
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<td>940 ± 80</td>
<td>cal A.D. 960–1260</td>
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<td>Beta-19484</td>
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<td>Feature 242 (Zone A) in Interpretive Center Tract II.</td>
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<td>Holley 1989:456-457</td>
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<td>Beta-19491</td>
<td>Cahokia Mounds</td>
<td>Feature 379 (Zone A) in Interpretive Center Tract II. A123.</td>
<td>Unidentified charred thatch</td>
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<td>800 ± 80</td>
<td>cal A.D. 1030–1390</td>
<td>Holley 1989:456-457</td>
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<tr>
<td>Beta-19479</td>
<td>Cahokia Mounds</td>
<td>Log found on floor of burned structure (Feature 178) in Interpretive Center Tract II.</td>
<td>Wood charcoal (Taxodium distichum)</td>
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<td>1030 ± 70</td>
<td>cal A.D. 770–1170</td>
<td>Holley 1989:456-457</td>
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<td>GX-950</td>
<td>Cahokia Mounds</td>
<td>Stratum F of Mound 51.</td>
<td>Unidentified charred thatch</td>
<td>2</td>
<td>-</td>
<td>1145 ± 65</td>
<td>cal A.D. 710–1020</td>
<td>Fowler 1997:214</td>
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</table>
### Appendix A. Radiocarbon Data

<table>
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<tr>
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<tr>
<td>M-1784</td>
<td>Cahokia Mounds</td>
<td>Water laid material outside pit found below base of Mound 51.</td>
<td>Unidentified charred thatch (burned twigs and grass)</td>
<td>1</td>
<td>-</td>
<td>910 ± 110</td>
<td>cal A.D. 890–1290</td>
<td>Crane and Griffin 1972:208-209; Fowler 1997:214</td>
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<tr>
<td>ISGS-2573</td>
<td>Cahokia Mounds</td>
<td>Stratum F of Mound 51.</td>
<td>Unidentified charred thatch</td>
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<td>760 ± 95</td>
<td>cal A.D. 1040–1400</td>
<td>Fowler 1997:214</td>
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<tr>
<td>WIS-298</td>
<td>Cahokia Mounds</td>
<td>Cribbing Log A from bottom of post pit (Feature 1) in Mound 72.</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-</td>
<td>1020 ± 55</td>
<td>cal A.D. 890–1160</td>
<td>Bender et al. 1969:230; Schilling 2010</td>
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<tr>
<td>WIS-447</td>
<td>Cahokia Mounds</td>
<td>North midden (Feature 205) in Mound 72. Later used for burial of 22 individuals.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
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<td>1015 ± 60</td>
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<td>Bender et al. 1971:476; Schilling 2010:Table 35</td>
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<td>WIS-575</td>
<td>Cahokia Mounds</td>
<td>Portion of cedar litter pole from burial #210 (Feature 229) in Mound 72.</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-23.7</td>
<td>920 ± 60</td>
<td>cal A.D. 1010–1250</td>
<td>Bender et al. 1973b:612; Schilling 2010:Table 35</td>
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<td>WIS-492</td>
<td>Cahokia Mounds</td>
<td>Central midden (Feature 227) in Mound 72.</td>
<td>Unidentified charcoal (species not listed)</td>
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<td>cal.A.D. 1020–1250</td>
<td>Bender et al. 1973a:229; Schilling 2010:Table 35</td>
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</table>
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<td>WIS-293</td>
<td>Cahokia Mounds</td>
<td>Cribbing Log B materials from bottom of post pit (Feature 1) in Mound 72</td>
<td>Unidentified wood</td>
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<td>-</td>
<td>970 ± 50</td>
<td>cal A.D. 980–1190</td>
<td>Bender et al. 1969:230; Schilling 2010</td>
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<td>M-1290</td>
<td>Cahokia Mounds</td>
<td>Sample taken from post molds of a round structure in Village Level V of Mound 55. Later believed to be debris washed down from last &quot;temple&quot; on mound.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>2</td>
<td>-</td>
<td>600 ± 75</td>
<td>cal A.D. 1270–1440</td>
<td>Crane and Griffin 1963:236; Fowler 1997:214</td>
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<td>M-1297</td>
<td>Cahokia Mounds</td>
<td>From refuse pit (Feature 1) with Sand Prairie ceramics in airport area.</td>
<td>Unidentified charcoal (species not listed) and charred maize</td>
<td>1</td>
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<td>675 ± 75</td>
<td>cal A.D. 1210–1420</td>
<td>Crane and Griffin 1963:237; Fowler 1963:50, 1997:215</td>
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<tr>
<td>M-1296</td>
<td>Cahokia Mounds</td>
<td>Top of wall trench (west) fill of House 3 in airport area.</td>
<td>Unidentified charred wood</td>
<td>2</td>
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<td>725 ± 75</td>
<td>cal A.D. 1150–1410</td>
<td>Crane and Griffin 1963:237; Fowler 1963:50</td>
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<td>M-402</td>
<td>Etowah</td>
<td>Timber in a collapsed log tomb of Burial 38 of Mound C.</td>
<td>Unidentified wood</td>
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<td>725 ± 200</td>
<td>cal A.D. 880–1640</td>
<td>Crane and Griffin 1959:188</td>
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<tr>
<td>M-542</td>
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<td>Timber in a collapsed log tomb of Burial 57 of Mound C.</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-</td>
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<td>Crane and Griffin 1959:188</td>
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<td>M-543</td>
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<td>Shell beads from under the shoulders of Burial 57 of Mound C.</td>
<td>Unidentified shell</td>
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<td>Crane and Griffin 1959:188</td>
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<td>M-1060</td>
<td>Etowah</td>
<td>Burnt vegetable material (cat. 748) from surface of mantle no. 2 directly beneath the final mantle at Mound C.</td>
<td>Unidentified burnt vegetable material</td>
<td>2</td>
<td>-</td>
<td>225 ± 150</td>
<td>cal A.D. 1450–....</td>
<td>Crane and Griffin 1962:189</td>
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<td>M-1061</td>
<td>Etowah</td>
<td>Charcoal from Burial no. 155, Mound C.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
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<td>670 ± 200</td>
<td>cal A.D. 890–1660</td>
<td>Crane and Griffin 1962:189</td>
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<td>M-1062</td>
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<td>Charred wood (cat. 2025) from Burial no. 164, Mound C.</td>
<td>Unidentified wood charcoal</td>
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<td>450 ± 200</td>
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<td>Crane and Griffin 1962:190</td>
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<td>Large midden filled pit (Feature 19), Mound C.</td>
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<td>Beta-144161</td>
<td>Etowah</td>
<td>Fill of saucer 1 (below structure 1). Soot removed from sherds</td>
<td>Soot removed from sherds</td>
<td>3</td>
<td>-24.3</td>
<td>990 ± 40</td>
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<td>King 2001:Table 16, 2003:Table 8</td>
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<td>King 2001:Table 16, 2003:Table 8</td>
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<td>Beta-144162</td>
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<td>Fill of saucer 2 (below western edge of Mound B). Soot removed from sherds</td>
<td>Soot removed from sherds</td>
<td>3</td>
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<td>830 ± 40</td>
<td>cal A.D. 1050–1280</td>
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<td>Etowah</td>
<td>Fill of saucer 3. Soot removed from sherds</td>
<td>Soot removed from sherds</td>
<td>3</td>
<td>-25.6</td>
<td>810 ± 40</td>
<td>cal A.D. 1160–1280</td>
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<td>Etowah</td>
<td>Fill of saucer 3. Soot removed from sherds</td>
<td>Soot removed from sherds</td>
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<td>-22.8</td>
<td>900 ± 40</td>
<td>cal A.D. 1030–1220</td>
<td>King 2001:Table 16, 2003:Table 8</td>
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<td>Beta-144163</td>
<td>Etowah</td>
<td>Fill of saucer 4. Soot removed from</td>
<td>Soot removed from</td>
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<td>-24.1</td>
<td>850 ± 40</td>
<td>cal A.D.</td>
<td>King 2001:Table 16,</td>
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<td>Beta-145490</td>
<td>Etowah</td>
<td>Fill of saucer 4.</td>
<td>Soot removed from sherds</td>
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<td>1080 ± 40</td>
<td>King 2001:Table 16, 2003:Table 8</td>
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<td>Beta-144811</td>
<td>Etowah</td>
<td>Fill of Black Midden (300R200).</td>
<td>Soot removed from sherds</td>
<td>3</td>
<td>-25</td>
<td>820 ± 40</td>
<td>King 2001:Table 16, 2003:Table 8</td>
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<td>Beta-145488</td>
<td>Etowah</td>
<td>Soot removed from the surface of an Early Wilbanks sherd recovered from a midden associated with a rectangular building (Structure 1).</td>
<td>Soot removed from sherds</td>
<td>3</td>
<td>-24.4</td>
<td>1540 ± 50</td>
<td>King 2003:Table 10, 2007</td>
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<td>Beta-67942</td>
<td>Etowah</td>
<td>Fill of a small platform (Orange Layer, Feature 64A) adjacent to Mound B.</td>
<td>Maize</td>
<td>2</td>
<td>-9.3</td>
<td>740 ± 70</td>
<td>King 2001:Table 18, 2003:Table 10, 2007</td>
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<td>Beta-67943</td>
<td>Etowah</td>
<td>Fill of a small platform (Orange Layer, Feature 64A) adjacent to Mound B.</td>
<td>Unidentified wood</td>
<td>2</td>
<td>-25 ± 2.5</td>
<td>680 ± 70</td>
<td>King 2001:Table 18, 2003:Table 10, 2007</td>
</tr>
<tr>
<td>Beta-67944</td>
<td>Etowah</td>
<td>Fill of a small platform (Orange Layer, Feature 64B) adjacent to Mound B.</td>
<td>Maize</td>
<td>2</td>
<td>-11.6</td>
<td>560 ± 50</td>
<td>King 2001:Table 18, 2003:Table 10, 2007</td>
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<tr>
<td>Beta-134792</td>
<td>Etowah</td>
<td>Post (different from Beta-134793) from palisade trench.</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-25.7</td>
<td>748 ± 60</td>
<td>Bigman et al. 2011</td>
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<tr>
<td>Beta-134793</td>
<td>Etowah</td>
<td>Palisade post (different from Beta-134792) from palisade trench.</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-27.5</td>
<td>879 ± 70</td>
<td>Bigman et al. 2011</td>
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<tr>
<td>Beta-180074</td>
<td>Jonathan Creek</td>
<td>From a small pit feature associated with a structure (Feature 13) that overlies a palisade (Feature 15) and underlies a palisade (Feature 6).</td>
<td>Maize kernel</td>
<td>3</td>
<td>-</td>
<td>790 ± 40</td>
<td>Schroeder 2006</td>
</tr>
<tr>
<td>Beta-180075</td>
<td>Jonathan Creek</td>
<td>Within a structure (Feature 31) atop a small mound that overlies a palisade (Feature 7).</td>
<td>Outer rings of a piece of unidentified charred wood</td>
<td>1</td>
<td>-</td>
<td>780 ± 40</td>
<td>Schroeder 2006, 2007:144</td>
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<tr>
<td>Beta-180076</td>
<td>Jonathan Creek</td>
<td>From a midden (Feature 38)</td>
<td>Unidentified charred material (species not listed)</td>
<td>1</td>
<td>-</td>
<td>820 ± 40</td>
<td>Schroeder 2006</td>
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<tr>
<td>Beta-180077</td>
<td>Jonathan Creek</td>
<td>House Feature 44.</td>
<td>Unidentified charred material (species not listed)</td>
<td>1</td>
<td>-</td>
<td>800 ± 40</td>
<td>Schroeder 2006</td>
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<tr>
<td>M-888</td>
<td>Kincaid</td>
<td>Burial Mound Pp°2, log tomb associated with the surface of three successive mound stages</td>
<td>Unidentified wood</td>
<td>3</td>
<td>-</td>
<td>675 ± 75</td>
<td>Crane and Griffin 1960:35</td>
</tr>
<tr>
<td>DIC-393</td>
<td>Kincaid</td>
<td>Timber from burned structure in the lowest level of Mx°1A-41.</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-</td>
<td>630 ± 65</td>
<td>Butler 1991:270</td>
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<tr>
<td>DIC-904</td>
<td>Kincaid</td>
<td>Charred remains of a house (Feature 8) on the last construction phase of Mx°10.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
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<td>660 ± 55</td>
<td>cal A.D. 1260–1410</td>
<td>Butler 1991:270; Santeford 1982</td>
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<td>UGa-3457</td>
<td>Kincaid</td>
<td>Dendro sample from premound level of Mx°4.</td>
<td>Unidentified wood</td>
<td>2</td>
<td>-</td>
<td>950 ± 70</td>
<td>cal A.D. 970–1250</td>
<td>Butler 1991:270</td>
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<tr>
<td>Beta-178763</td>
<td>Kincaid</td>
<td>From Feature XII, House III in Mx°4.</td>
<td>Maize</td>
<td>3</td>
<td>-8.6</td>
<td>780 ± 40</td>
<td>cal A.D. 1160–1290</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-191044a</td>
<td>Kincaid</td>
<td>Large basin (Feature 10) in Mx°2 area.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-25.1</td>
<td>1050 ± 50</td>
<td>cal A.D. 880–1160</td>
<td>Butler and Welch 2005:Table 1; Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-191044b</td>
<td>Kincaid</td>
<td>Large basin (Feature 10) in Mx°2 area. Repeat of Beta-191044a.</td>
<td>Unidentified wood charcoal</td>
<td>-</td>
<td>-26.1</td>
<td>920 ± 40</td>
<td>cal A.D. 1020–1210</td>
<td>Butler and Welch 2005:Table 1; Butler et al. 2011:Table 1</td>
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<tr>
<td>UGAMS-4695</td>
<td>Kincaid</td>
<td>Structure, Feature 6</td>
<td>Unidentified thatch</td>
<td>3</td>
<td>-24.42</td>
<td>870 ± 25</td>
<td>cal A.D. 1040–1250</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>UGAMS-4606</td>
<td>Kincaid</td>
<td>Palisade post from wall trench of western-most palisade.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-24.42</td>
<td>870 ± 25</td>
<td>cal A.D. 1040–1250</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-221835</td>
<td>Kincaid</td>
<td>Palisade post from wall trench of north palisade.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-23.4</td>
<td>810 ± 60</td>
<td>cal A.D. 1040–1290</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-216287</td>
<td>Kincaid</td>
<td>From the submound of the West Mound.</td>
<td>Unidentified thatch</td>
<td>2</td>
<td>-13</td>
<td>800 ± 40</td>
<td>cal A.D. 1160–1280</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-216288</td>
<td>Kincaid</td>
<td>From charred debris of a thatch roof (Feature 9) in the upper level of the West Mound.</td>
<td>Unidentified thatch and small support sticks</td>
<td>4</td>
<td>-27.7</td>
<td>600 ± 40</td>
<td>cal A.D. 1290–1420</td>
<td>Butler et al. 2011:Table 1; Paul Welch, personal communication 2014</td>
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<tr>
<td>Beta-216289</td>
<td>Kincaid</td>
<td>Fragments of log or post from Structure 1 in the West Mound area.</td>
<td>Wood (Carya)</td>
<td>3</td>
<td>-26.9</td>
<td>780 ± 40</td>
<td>cal A.D. 1160–1290</td>
<td>Butler et al. 2011:Table 1; Paul Welch, personal communication 2014</td>
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<tr>
<td>Beta-216290</td>
<td>Kincaid</td>
<td>Partially burnt fragments of log or post from Structure 2 in the West Mound area.</td>
<td>Burnt wood (Diospyros)</td>
<td>3</td>
<td>-24.2</td>
<td>740 ± 50</td>
<td>cal A.D. 1180–1390</td>
<td>Butler et al. 2011:Table 1; Paul Welch, personal communication 2014</td>
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<tr>
<td>Beta-221833</td>
<td>Kincaid</td>
<td>Palisade post from the wall trench of the western palisade.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-23.8</td>
<td>610 ± 50</td>
<td>cal A.D. 1280–1420</td>
<td>Butler et al. 2011:Table 1</td>
</tr>
<tr>
<td>Beta-221834</td>
<td>Kincaid</td>
<td>Palisade post from the wall trench of the western palisade.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-24.6</td>
<td>680 ± 70</td>
<td>cal A.D. 1220–1420</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-237479</td>
<td>Kincaid</td>
<td>Post in wall trench of large circular structure (Feature 3) on Mx°8.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-25.1</td>
<td>650 ± 40</td>
<td>cal A.D. 1270–1400</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Beta-261304</td>
<td>Kincaid</td>
<td>Central post pit (Feature 4) of large circular structure on Mx°8.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-25.5</td>
<td>610 ± 60</td>
<td>cal A.D. 1280–1430</td>
<td>Butler et al. 2011:Table 1</td>
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<td>UGAMS-4607</td>
<td>Kincaid</td>
<td>Wall post (Feature 1) of house on main plaza.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-23.52</td>
<td>620 ± 25</td>
<td>cal A.D. 1290–1400</td>
<td>Butler et al. 2011:Table 1</td>
</tr>
<tr>
<td>UGAMS-6685</td>
<td>Kincaid</td>
<td>Large pit with abundant maize on Mx°1E.</td>
<td>Maize</td>
<td>4</td>
<td>-10.9</td>
<td>810 ± 25</td>
<td>cal A.D. 1180–1270</td>
<td>Butler et al. 2011:Table 1</td>
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<tr>
<td>Uga-1662</td>
<td>Moundville</td>
<td>Posthole associated with Structure 17, 436 RW and 435 RW</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-</td>
<td>485 ± 160</td>
<td>cal A.D. 1190–...</td>
<td>Walthall and Wimberly 1978</td>
</tr>
<tr>
<td>Uga-1661</td>
<td>Moundville</td>
<td>Cache of burned botanical material from Square 105R3-R4 in Mound W (40in bs)</td>
<td>Unidentified charred cane</td>
<td>4</td>
<td>-</td>
<td>690 ± 85</td>
<td>cal A.D. 1160–1420</td>
<td>Walthall and Wimberly 1978</td>
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<tr>
<td>DIC-1243</td>
<td>Moundville</td>
<td>From fallen wall debris in daub layer shown in profile (point B, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-</td>
<td>690 ± 60</td>
<td>cal A.D. 1220–1400</td>
<td>Steponaitis 1983:Table 23; Scarry 1986</td>
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<tr>
<td>DIC-1241</td>
<td>Moundville</td>
<td>From fallen wall debris in daub layer shown in profile (point A, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>120 ± 60</td>
<td>cal A.D. 1660–1950</td>
<td>Steponaitis 1983:Table 23; Scarry 1986</td>
</tr>
<tr>
<td>DIC-1242</td>
<td>Moundville</td>
<td>Hearth like feature in Level 4, unit 6N2W</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>110 ± 50</td>
<td>cal A.D. 1670–1950</td>
<td>Steponaitis 1983:126; Knight et al. 1999</td>
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<tr>
<td>Beta-1289</td>
<td>Moundville</td>
<td>Midden shown in profile (point C, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-26.6</td>
<td>665 ± 65</td>
<td>cal A.D. 1240–1420</td>
<td>Scarry 1986</td>
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<tr>
<td>Beta-1106</td>
<td>Moundville</td>
<td>Floor layer shown in profile (point D, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-26.67</td>
<td>1010 ± 80</td>
<td>cal A.D. 770–1220</td>
<td>Scarry 1986</td>
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<tr>
<td>Beta-1290</td>
<td>Moundville</td>
<td>Either base of midden or top of pit house fill shown in profile (point E, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-26.74</td>
<td>930 ± 80</td>
<td>cal A.D. 980–1270</td>
<td>Scarry 1986</td>
</tr>
<tr>
<td>Beta-1105</td>
<td>Moundville</td>
<td>Either base of midden or top of pit house fill shown in profile (point F, Scarry 1986:Figure 5:5) of NR 6N2W South Wall.</td>
<td>Maize and wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-25.47</td>
<td>1130 ± 105</td>
<td>cal A.D. 660–1150</td>
<td>Scarry 1986</td>
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<tr>
<td>Beta-1485</td>
<td>Moundville</td>
<td>Pit house floor shown in profile (point G,</td>
<td>Wood charcoal</td>
<td>3</td>
<td>-</td>
<td>990 ± 65</td>
<td>cal A.D.</td>
<td>Scarry 1986</td>
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<tr>
<td>Beta-1107</td>
<td>Moundville</td>
<td>SCB deposit, base of the midden zone.</td>
<td>Wood charcoal (Pinaceae)</td>
<td>3</td>
<td>-</td>
<td>875 ± 80</td>
<td>cal A.D. 1020–1280</td>
<td>Scarry 1986:163-164</td>
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<tr>
<td>Beta-44466</td>
<td>Moundville</td>
<td>Mound Q, 43R23, Cut 3, north flank, Midden Level 4</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>510 ± 60</td>
<td>cal A.D. 1290–1490</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-44472</td>
<td>Moundville</td>
<td>Mound Q, 43R23, Cut 3, north flank, Midden Level 4</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>530 ± 60</td>
<td>cal A.D. 1290–1460</td>
<td>Knight 2010:Table 4.13</td>
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<td>Beta-44467</td>
<td>Moundville</td>
<td>Mound Q, 43R23, Cut 3, north flank, Midden Level 4</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>770 ± 70</td>
<td>cal A.D. 1040–1390</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-79972</td>
<td>Moundville</td>
<td>Mound Q, 41R23, Cut 13, north flank, Middle Level 1</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-26.9</td>
<td>550 ± 60</td>
<td>cal A.D. 1290–1450</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
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<td>Beta-79973</td>
<td>Moundville</td>
<td>Mound Q, 41R23, Cut 12, north flank, Middle Level 1</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-27.5</td>
<td>570 ± 50</td>
<td>cal A.D. 1290–1440</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
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<tr>
<td>Beta-44471</td>
<td>Moundville</td>
<td>Mound Q, 26R14, control trench, P-4, west flank, Stage IV midden</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
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<td>650 ± 60</td>
<td>cal A.D. 1260–1420</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-44469</td>
<td>Moundville</td>
<td>Mound Q, 26R14, control trench, P-4, west flank, Stage IV midden</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
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<td>720 ± 70</td>
<td>cal A.D. 1160–1400</td>
<td>Knight 2010:Table 4.13</td>
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<td>Beta-44470</td>
<td>Moundville</td>
<td>Mound Q, 26R14, control trench, P-4, west flank, Stage IV midden</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>850 ± 70</td>
<td>cal A.D. 1030–1280</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-44468</td>
<td>Moundville</td>
<td>Mound Q, 26R14, control trench, P-6, west flank, Stage III midden</td>
<td>Composite sample of unidentified wood charcoal</td>
<td>3</td>
<td>-</td>
<td>760 ± 80</td>
<td>cal A.D. 1040–1400</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-44473</td>
<td>Moundville</td>
<td>Mound Q, 24R20, Cut 3, summit, Stage IIIA</td>
<td>Composite sample of unidentified wood charcoal</td>
<td>2</td>
<td>-</td>
<td>790 ± 60</td>
<td>cal A.D. 1040–1380</td>
<td>Knight 2010:Table 4.13</td>
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<tr>
<td>Beta-79971</td>
<td>Moundville</td>
<td>A wall trench (Feature 77) associated with Structure 2 on the Mound Q summit, Stage II.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-27.7</td>
<td>450 ± 60</td>
<td>cal A.D. 1320–1640</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
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<td>Beta-86993</td>
<td>Moundville</td>
<td>A wall trench (Feature 23) associated with Structure 1 on the Mound Q summit, Stage II.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-28.3</td>
<td>480 ± 80</td>
<td>cal A.D. 1290–1640</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
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<td>Beta-82816</td>
<td>Moundville</td>
<td>A wall trench (Feature 34) associated with Structure 4 on the Mound Q summit, Stage II.</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-26.2</td>
<td>640 ± 70</td>
<td>cal A.D. 1260–1430</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
</tr>
<tr>
<td>Beta-86994</td>
<td>Moundville</td>
<td>A partially preserved hearth (Feature 128) possibly associated with Structure 3 on</td>
<td>Composite sample of unidentified wood</td>
<td>3</td>
<td>-24.6</td>
<td>850 ± 130</td>
<td>cal A.D. 890–1400</td>
<td>Knight 2010:Table 4.13; Knight et al. 1999:Table 3</td>
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<tr>
<td>Beta-115826</td>
<td>Moundville</td>
<td>Mound E, Feature 2, outer rings of charred log in daub concentration, Stage IIIA, Structure I</td>
<td>Unidentified charred wood</td>
<td>3</td>
<td>-27.6</td>
<td>320 ± 60</td>
<td>cal A.D. 1440–1800</td>
<td>Knight 2010:Table 5.7; Knight et al. 1999:Table 5</td>
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<tr>
<td>Beta-79966</td>
<td>Moundville</td>
<td>Mound E, Feature 2, daub concentration, Stage IIIA, Structure I</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-26.7</td>
<td>360 ± 50</td>
<td>cal A.D. 1440–1640</td>
<td>Knight 2010:Table 5.7; Knight et al. 1999:Table 5</td>
</tr>
<tr>
<td>Beta-79965</td>
<td>Moundville</td>
<td>Mound E, Feature 8, post pit, Stage IIIA</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-27.7</td>
<td>590 ± 80</td>
<td>cal A.D. 1270–1450</td>
<td>Knight 2010:Table 5.7; Knight et al. 1999:Table 5</td>
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<td>-26</td>
<td>470 ± 40</td>
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<td>900 ± 60</td>
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<td>310 ± 70</td>
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<td>4</td>
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<td>340 ± 80</td>
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<td>Knight 2010:Table 5.7; Knight et al. 1999:Table 3; Vernon Knight, personal communication 2014</td>
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<td>Sample taken from erosional sand wash (Feature 34) at the toe of Stage I in the south flank trench of Mound E.</td>
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<td>700 ± 70</td>
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<td>Beta-137378</td>
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<td>From a log retrieved through core sample 3-3-4, Stage I of Mound E.</td>
<td>Wood charcoal (Pinaceae)</td>
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<td>840 ± 60</td>
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<td>500 ± 60</td>
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<td>-28.3</td>
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<td>cal A.D. 640–1160</td>
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<td>1040 ± 80</td>
<td>cal A.D. 770–1170</td>
<td>Knight 2010:Table 6.6</td>
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## Appendix A. Radiocarbon Data

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<th>Laboratory ID</th>
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<th>Calibration (95% confidence)</th>
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<td>cal A.D. 1290–1440</td>
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<td>Moundville</td>
<td>ECB Tract. Palisade trench fill (Southern palisade; Feature 29).</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-27.4</td>
<td>650 ± 60</td>
<td>cal A.D. 1260–1420</td>
<td>Knight et al. 1999: Table 2; Scarry 1995: Table 22, 1998:70</td>
</tr>
<tr>
<td>Beta-53389</td>
<td>Moundville</td>
<td>ECB Tract Pit (Feature 45) intruding palisade trench.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-26.8</td>
<td>880 ± 70</td>
<td>cal A.D. 1020–1270</td>
<td>Knight et al. 1999: Table 2; Scarry 1995: Table 22</td>
</tr>
<tr>
<td>Beta-53388</td>
<td>Moundville</td>
<td>ECB Tract. Pit (Feature 45) intruding palisade trench.</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-27.6</td>
<td>670 ± 80</td>
<td>cal A.D. 1210–1430</td>
<td>Knight et al. 1999: Table 2; Scarry 1995: Table 22</td>
</tr>
<tr>
<td>Beta-53382</td>
<td>Moundville</td>
<td>ECB Tract. Structure 4. Pit (Feature 19) within structure.</td>
<td>Material not listed</td>
<td>3</td>
<td>-30.6</td>
<td>720 ± 120</td>
<td>cal A.D. 1040–1430</td>
<td>Knight et al. 1999: Table 2; Scarry 1995:154, Table 22</td>
</tr>
<tr>
<td>Beta-53390</td>
<td>Moundville</td>
<td>ECB Tract. Structure 6. Pit (Feature 66) within structure.</td>
<td>Unidentified material part of tree disturbance</td>
<td>3</td>
<td>-25.2</td>
<td>3400 ± 70</td>
<td>1890–1520 cal B.C.</td>
<td>Knight et al. 1999: Table 2; Scarry 1995:156, Table 22</td>
</tr>
<tr>
<td>Beta-53383</td>
<td>Moundville</td>
<td>ECB Tract. Burial 8. Burial pit (Feature 26). In pit that cuts through wall trenches associated with Structure 5 and Structure 6.</td>
<td>Unidentified matting from around the head of burial</td>
<td>4</td>
<td>-</td>
<td>640 ± 90</td>
<td>cal A.D. 1220–1440</td>
<td>Scarry 1995:200-205, Table 22</td>
</tr>
<tr>
<td>Beta-53766</td>
<td>Moundville</td>
<td>ECB Tract. Burial 8. Burial pit (Feature 26). In pit that cuts through wall trenches associated with Structure 5 and Structure 6.</td>
<td>Unidentified matting from around the head of burial</td>
<td>4</td>
<td>-</td>
<td>770 ± 60</td>
<td>cal A.D. 1050–1390</td>
<td>Scarry 1995:200-205, Table 22</td>
</tr>
<tr>
<td>Beta-53391</td>
<td>Moundville</td>
<td>ECB Tract. Burial 9. Burial pit (Feature 73). In pit that cuts through wall trenches associated with Structure 5 and Structure 6.</td>
<td>Unidentified matting from around the head of burial</td>
<td>4</td>
<td>-</td>
<td>490 ± 80</td>
<td>cal A.D. 1290–1640</td>
<td>Scarry 1995:205-211, Table 22</td>
</tr>
<tr>
<td>Beta-537668</td>
<td>Moundville</td>
<td>PA Tract. Isolated midden-filled depression (Feature 5).</td>
<td>Material not listed</td>
<td>1</td>
<td>-</td>
<td>580 ± 70</td>
<td>cal A.D. 1280–1440</td>
<td>Scarry 1995:134, Table 22</td>
</tr>
<tr>
<td>Beta-53391</td>
<td>Moundville</td>
<td>ECB Tract. Burial 9. Burial pit (Feature 73). In pit that cuts through wall trenches associated with Structure 5 and Structure 6.</td>
<td>Unidentified matting from around the head of burial</td>
<td>4</td>
<td>-</td>
<td>490 ± 80</td>
<td>cal A.D. 1290–1640</td>
<td>Scarry 1995:205-211, Table 22</td>
</tr>
<tr>
<td>Beta-537668</td>
<td>Moundville</td>
<td>PA Tract. Isolated midden-filled depression (Feature 5).</td>
<td>Material not listed</td>
<td>1</td>
<td>-</td>
<td>580 ± 70</td>
<td>cal A.D. 1280–1440</td>
<td>Scarry 1995:134, Table 22</td>
</tr>
<tr>
<td>Beta-53391</td>
<td>Moundville</td>
<td>ECB Tract. Burial 9. Burial pit (Feature 73). In pit that cuts through wall trenches associated with Structure 5 and Structure 6.</td>
<td>Unidentified matting from around the head of burial</td>
<td>4</td>
<td>-</td>
<td>490 ± 80</td>
<td>cal A.D. 1290–1640</td>
<td>Scarry 1995:205-211, Table 22</td>
</tr>
<tr>
<td>Beta-537668</td>
<td>Moundville</td>
<td>PA Tract. Isolated midden-filled depression (Feature 5).</td>
<td>Material not listed</td>
<td>1</td>
<td>-</td>
<td>580 ± 70</td>
<td>cal A.D. 1280–1440</td>
<td>Scarry 1995:134, Table 22</td>
</tr>
</tbody>
</table>
## Appendix A. Radiocarbon Data

<table>
<thead>
<tr>
<th>Laboratory ID</th>
<th>Site</th>
<th>Context</th>
<th>Material</th>
<th>Evaluation of context security</th>
<th>$\delta^{13}$C</th>
<th>Date B.P.</th>
<th>Calibration (95% confidence)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-53771</td>
<td>Moundville</td>
<td>PA Tract. Midden-filled depression (Feature 110) associated with Structure 5</td>
<td>Material not listed</td>
<td>1</td>
<td>-26.9</td>
<td>820 ± 80</td>
<td>cal A.D. 1030–1300</td>
<td>Knight et al. 1999:Table 2; Scarry 1995:117, Table 22</td>
</tr>
<tr>
<td>Beta-53770</td>
<td>Moundville</td>
<td>PA Tract. Pit (Feature 9) associated with Structures 1, 2, and 6</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-28.6</td>
<td>940 ± 90</td>
<td>cal A.D. 900–1270</td>
<td>Knight et al. 1999:Table 2; Scarry 1995:112, Table 22</td>
</tr>
<tr>
<td>Beta-53398</td>
<td>Moundville</td>
<td>PA Tract. Midden-filled depression (Feature 15) associated with Structures 1, 2, and 6</td>
<td>Unidentified charcoal (species not listed)</td>
<td>1</td>
<td>-27.3</td>
<td>940 ± 70</td>
<td>cal A.D. 980–1250</td>
<td>Knight et al. 1999:Table 2; Scarry 1995:112, Table 22</td>
</tr>
<tr>
<td>Beta-53400</td>
<td>Moundville</td>
<td>PA Tract. Structure 3. Floor of semi-subterranean structure.</td>
<td>Material not listed</td>
<td>1</td>
<td>-27</td>
<td>840 ± 70</td>
<td>cal A.D. 1030–1280</td>
<td>Knight et al. 1999:Table 2; Scarry 1995:112, Table 22</td>
</tr>
<tr>
<td>Beta-53401</td>
<td>Moundville</td>
<td>PA Tract. Structure 3. Floor of semi-subterranean structure.</td>
<td>Material not listed</td>
<td>1</td>
<td>-26.7</td>
<td>1100 ± 70</td>
<td>cal A.D. 720–1120</td>
<td>Knight et al. 1999:Table 2; Scarry 1995:113, Table 22</td>
</tr>
<tr>
<td>Beta-310905</td>
<td>Southwind</td>
<td>Post mold at the base of the stockade trench (Feature 01-1B, Cat003, FS 22)</td>
<td>Wood charcoal <em>(Gleditsia or Gymnocladus)</em></td>
<td>3</td>
<td>-27.5</td>
<td>520 ± 30</td>
<td>cal A.D. 1320–1450</td>
<td>Bush 2011; Krus 2013; Striker 2009; This paper</td>
</tr>
<tr>
<td>Beta-310906</td>
<td>Southwind</td>
<td>Post mold at the base of the stockade trench (Feature 01-1C, Cat005, FS 17)</td>
<td>Wood charcoal <em>(Diffuse porous hardwood)</em></td>
<td>3</td>
<td>-25.6</td>
<td>850 ± 30</td>
<td>cal A.D. 1050–1260</td>
<td>Bush 2011; Krus 2013; Striker 2009; This paper</td>
</tr>
<tr>
<td>Beta-248603</td>
<td>Southwind</td>
<td>Circular stain with burnt wood and daub fragments (Feature 04-1, FS 20)</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-27</td>
<td>350 ± 40</td>
<td>cal A.D. 1450–1640</td>
<td>Striker 2009</td>
</tr>
<tr>
<td>Beta-248604</td>
<td>Southwind</td>
<td>Pit feature superimposed by palisade trench (Feature 08-3, FS 23)</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-26.3</td>
<td>900 ± 40</td>
<td>cal A.D. 1030–1220</td>
<td>Striker 2009</td>
</tr>
<tr>
<td>Beta-248606</td>
<td>Southwind</td>
<td>Oblong soil stain with daub and charcoal fragments (Feature 05-9, FS 37)</td>
<td>Unidentified wood charcoal</td>
<td>3</td>
<td>-26.7</td>
<td>760 ± 40</td>
<td>cal.A.D. 1190–1300</td>
<td>Striker 2009</td>
</tr>
<tr>
<td>Beta-248608</td>
<td>Southwind</td>
<td>Large feature that may be the possible remnants of a rectangular structure (Feature 04-13, FS 62).</td>
<td>Unidentified wood charcoal</td>
<td>2</td>
<td>-25.6</td>
<td>760 ± 40</td>
<td>cal A.D. 1190–1300</td>
<td>Striker 2009</td>
</tr>
<tr>
<td>UGa-4715</td>
<td>Southwind</td>
<td>Smudge pit, Feature PH-WB-21</td>
<td>Carbonized maize fragments and minor amount of unidentified carbonized wood</td>
<td>3</td>
<td>-</td>
<td>890 ± 135</td>
<td>cal A.D. 770–1400</td>
<td>Munson 1994:Table 15.3</td>
</tr>
</tbody>
</table>

*The larger of the two sides of the unsymmetrical distributions was entered into OxCal as the 1 $\sigma$ error.*
Appendix B. Context matrices showing the treatment of radiocarbon measurements in the primary Bayesian models

Figure B.1. Angel Mounds context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

Figure B.2. Aztalan context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

References for Aztalan context matrix: Barrett 1933; Bender et al. 1966; Bender et al. 1967, 1968; Bush 2011; Crane and Griffin 1959, 1962; Johnson 2003; Krus 2013; Richards 1985; Richards and Jeske 2002; Richards et al. 1998; Ritzenthaler 1963
Figure B.3. Cahokia context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

Figure B.4. Etowah context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.


Figure B.5. Kincaid context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

References for Kincaid context matrix: Butler 1991; Butler et al. 2011; Cole 1951; Crane and Griffin 1960; Santeford 1982
Figure B.6. Moundville context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

Figure B.7. Southwind context matrix showing the treatment of radiocarbon measurements in the primary Bayesian model.

References for Southwind context matrix: Krus 2013; Munson 1994; Striker 2009
Appendix C. Code for OxCal models

Angel Mounds

Plot()
{
  Outlier_Model("Charcoal", Exp(1, -10, 0), U(0, 3), "t");
  Sequence()
  {
    Boundary("start Angel");
    Phase("Angel")
    {
      Sequence("Mound F")
      {
        Phase("under primary mound fill")
        {
          R_Date("Grass thatch from the roof of a structure in the inner mound layer of
          Mound F: Beta-264865", 910, 40);
          After("Deer bone under primary mound")
          {
            R_Date("Beta-271174", 760, 40);
          }
          R_Date("Post mold fill: Beta-264864", 760, 40)
          {
            Outlier("Charcoal", 1);
          }
        }
        Phase("Primary surface")
        {
          R_Date("Fill of a posthole in the corner of a wall trench building: DIC-2359", 90,
          110)
          {
            Outlier();
          }
          After("wall trench fill")
          {
            R_Date("DIC-2358", 630, 45)
            {
              Outlier("Charcoal", 1);
            }
          }
          Phase("pit fill (F12)")
          {
            R_Date("Beta-39233", 590, 60)
            {
              Outlier("Charcoal", 1);
            }
            R_Date("Beta-39232", 840, 80)
            {
              Outlier("Charcoal", 1);
            }
          }
        }
      }
    }
  }
}
After("fill in primary layer")
{
  R_Date("DIC-2357", 680, 50);
};
};

Sequence("Mound A")
{
  Phase("upper platform construction")
  {
    R_Date("Grass from turf block from the upper platform (south): Beta-232869", 890, 40);
    R_Date("Grass from turf block from the upper platform (south): Beta-232870", 900, 40);
    Phase(top of upper platform)
    {
      R_Date("Charred rush from burnt feature in the conical offset: Beta-237767", 890, 40);
      R_Date("Charred nutshell from roof of structure near conical offset (MA/F2): Beta-252377", 520, 50);
      R_Date("Base of post mold: Beta-252378", 750, 40);
      Outlier("Charcoal", 1);
      R_Date("Pit (MA/F3): Beta-252379", 690, 40);
      Outlier("Charcoal", 1);
    };
  };
  Phase("Palisade")
  {
    First("start palisade");
    sequence("East Village Palisade Sequence")
    {
      Phase("heavy trench")
      {
        After("heavy trench fill")
        {
          R_Date("Beta-278199", 790, 40)
          Outlier("Charcoal", 1);
        };
        R_Date("Bark from posthole: Beta-309046", 770, 30);
      };
      Phase()
After("Screen trench fill")
{
    R_Date("Beta-284695", 670, 40)
    {
        Outlier("Charcoal", 1);
    }
    After("EV palisade")
    {
        After("palisade trench fill")
        {
            R_Date("Beta-278197", 530, 40)
            {
                Outlier("Charcoal", 1);
            }
            After("palisade trench fill")
            {
                R_Date("Beta-278198", 790, 40)
                {
                    Outlier("Charcoal", 1);
                }
            }
        }
    }
    After("H-20-A; southwestern palisade trench fill")
}
{ R_Date("Beta-241194", 890, 40)
  {
    Outlier("Charcoal", 1);
  }
};
After("U-9-A palisade trench fill")
{ R_Date("Beta-241193", 720, 40)
  {
    Outlier("Charcoal", 1);
  }
};
R_Date("Southern outer palisade bastion posthole (O-7-C): Beta-241196", 630, 60)
{ Outlier("Charcoal", 1);
};
Phase("Northern outer palisade")
{ After("palisade trench fill")
  { R_Date("Beta-278196", 570, 40)
    { Outlier("Charcoal", 1);
    }
  }
};
After("palisade trench fill")
{ R_Date("Beta-286636", 1090, 40)
  { Outlier("Charcoal", 1);
  }
};
Last("end palisade"); Span("span palisade");
};
Sequence()
{
  Phase()
  { R_Date("Charred cane in burned soil layer: Beta-309045", 790, 30);
    R_Date("Nutshell from large pit (X-11-B, F37): Beta-234742", 850, 40);
  }
  Date("=EV palisade");
};
Sequence()
{
  Date("=heavy trench");
After("Wall trench fill (W-10-D)")
{
  R_Date("Beta-284697", 550, 40)
  {
    Outlier("Charcoal", 1);
  }
}

Phase("Mound I (O-13-D)")
{
  After("Possible pit (F23) below Mound I")
  {
    R_Date("Disarticulated deer bone: Beta-306318", 620, 30);
  }
  Phase("mound fill (F9)")
  {
    After()
    {
      R_Date("Beta-39234", 750, 50)
      {
        Outlier("Charcoal", 1);
      }
    }
    After()
    {
      R_Date("Beta-39235", 950, 80)
      {
        Outlier("Charcoal", 1);
      }
    }
  }
  After()
  {
    R_Date("Charred cane from domestic feature: Beta-264811", 760, 40);
    R_Date("daub feature in structure: Beta-234735", 910, 40)
    {
      Outlier("Charcoal", 1);
    }
    R_Date("Charred cane in Unit M pit: Beta-234736", 700, 40);
    R_Date("Feature 3, X-7-D, 3rd Terrace: Beta-313068", 690, 30)
    {
    }
    R_Date("Charred cane in Unit A posthole: Beta-246694", 690, 40)
    {
    }
    R_Date("Nutshell in Unit B small pit: Beta-234738", 660, 40);
  }
  Combine("S-11-D, base of pit (F5)")
  {
  
}
R_Date("Beta-44768", 600, 60)
{
    Outlier("Charcoal", 1);
};
R_Date("Beta-44769", 640, 60)
{
    Outlier("Charcoal", 1);
};
R_Date("Maize from S-11-D House Pit 1: Beta-309052", 630, 30)
{
};
R_Date("Nutshell in Unit G pit: Beta-234739", 610, 40);
R_Date("Nutshell from deposit near fireclay basin (Unit H): Beta-234737", 590, 40);
Combine("Base of House Pit 3, S-11-D (F6)"
{
    R_Date("Beta-44770", 530, 50)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Beta-44771", 570, 50)
    {
        Outlier("Charcoal", 1);
    }
};
Combine("Pit (Q-08-C, F24B-1)"
{
    R_Date("DIC-1024", 510, 50)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Beta-130353", 550, 50)
    {
        Outlier("Charcoal", 1);
    }
};
R_Date("Q-08-C, small pit, Feature 5: DIC-1023", 360, 50)
{
    Outlier();
};
R_Date("Unknown material from possible pit (Q-08-C, F32: Beta-130354", 560, 50);
Phase("Unit A, structure")
{
    R_Date("Midden (Unit AD): Beta-246696", 610, 40)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Cane in central habitation area feature: Beta-234743", 590, 40);
R_Date("Base of domestic feature: Beta-246695", 570, 40)
{
  Outlier("Charcoal", 1);
};
R_Date("Structural feature: Beta-241192", 660, 40)
{
  Outlier("Charcoal", 1);
};
R_Date("Nutshell in pit (Unit F, F14a): Beta-234740", 490, 40);
};
Boundary("end Angel");
};
Angel (Alternative model)

Plot()
{
  Sequence()
  {
    Boundary("start Angel");
    Phase("Angel")
    {
      Sequence("Mound F")
      {
        Phase("under primary mound fill")
        {
          R_Date("Grass thatch from the roof of a structure in the inner mound layer of Mound F: Beta-264865", 910, 40);
          After("Deer bone under primary mound")
          {
            R_Date("Beta-271174", 760, 40);
          }
          R_Date("Post mold fill: Beta-264864", 760, 40);
        }
        Phase("Primary surface")
        {
          R_Date("Fill of a posthole in the corner of a wall trench building: DIC-2359", 90, 110);
          Outlier();
        }
        After("wall trench fill")
        {
          R_Date("DIC-2358", 630, 45);
        }
        Phase("pit fill (F12")
        {
          R_Date("Beta-39233", 590, 60);
          R_Date("Beta-39232", 840, 80);
        }
        After("fill in primary layer")
        {
          R_Date("DIC-2357", 680, 50);
        }
      }
      Sequence("Mound A")
      {
        Phase("upper platform construction")
        {
          R_Date("Grass from turf block from the upper platform (south): Beta-232869", 890, 40);
          R_Date("Grass from turf block from the upper platform (south): Beta-232870", 890, 40);
        }
      }
    }
  }
}
Phase(top of upper platform)
{
  R_Date("Charred rush from burnt feature in the conical offset: Beta-237767", 890, 40);
  R_Date("Charred nutshell from roof of structure near conical offset (MA/F2): Beta-252377", 520, 50);
  R_Date("Base of post mold: Beta-252378", 750, 40);
  R_Date("Pit (MA/F3): Beta-252379", 690, 40);
}

Phase("Palisade")
{
  First("start palisade");
  sequence("East Village Palisade Sequence")
  {
    Phase("heavy trench")
    {
      After("heavy trench fill")
      {
        R_Date("Beta-278199", 790, 40);
      }
      R_Date("Bark from posthole: Beta-309046", 770, 30);
    }
    Phase()
    {
      After("Screen trench fill")
      {
        R_Date("Beta-284695", 670, 40);
      }
      Phase("EV palisade")
      {
        After("palisade trench fill")
        {
          R_Date("Beta-278197", 530, 40);
        }
        After("palisade trench fill")
        {
          R_Date("Beta-278198", 790, 40);
        }
      }
    }
    Phase("inner palisade")
    {
      R_Date("Likely charred post found at the base of the palisade trench: Beta-234734", 590, 40);
      After("Palisade trench fill")
      {
        R_Date("Charred post in the conical offset: Beta-237767", 890, 40);
      }
    }
  }
}
R_Date("Beta-241195", 740, 40);
};

After("Palisade trench fill")
{
  R_Date("Beta-284696", 1160, 40);
};

After("Palisade trench fill")
{
  R_Date("Beta-241194", 890, 40);
};

After("Palisade trench fill")
{
  R_Date("Beta-286636", 1090, 40);
};

R_Date("Southern outer palisade bastion posthole (O-7-C): Beta-241196", 630, 60);
Phase("Northern outer palisade")
{
  After("Palisade trench fill")
  {
    R_Date("Beta-278196", 570, 40);
  }
  After("Palisade trench fill")
  {
    R_Date("Beta-286636", 1090, 40);
  }
};

Last("end palisade");
Span("span palisade");
};
Sequence()
{
  Phase()
  {
    R_Date("Charred cane in burned soil layer: Beta-309045", 790, 30);
    R_Date("Nutshell from large pit (X-11-B, F37): Beta-234742", 850, 40);
  }
  Date("=EV palisade");
};
Sequence()
{
  Date("=heavy trench");
  After("Wall trench fill (W-10-D)")
  {
    R_Date("Beta-284697", 550, 40);
  }
};

Phase("Mound I (O-13-D)")
{
After("Possible pit (F23) below Mound I")
{
    R_Date("Disarticulated deer bone: Beta-306318", 620, 30);
};
Phase("mound fill (F9)")
{
    After()
    {
        R_Date("Beta-39234", 750, 50);
    };
    After()
    {
        R_Date("Beta-39235", 950, 80);
    };
}
Phase("Unit K, structure")
{
    R_Date("Charred cane from domestic feature: Beta-264811", 760, 40);
    R_Date("daub feature in structure: Beta-234735", 910, 40);
};
R_Date("Charred cane in Unit M pit: Beta-234736", 700, 40);
R_Date("Feature 3, X-7-D, 3rd Terrace: Beta-313068", 690, 30)
{
};
R_Date("Charred cane in Unit A posthole: Beta-246694", 690, 40)
{
};
R_Date("Nutshell in Unit B small pit: Beta-234738", 660, 40);
Combine("S-11-D, base of pit (F5)"
{
    R_Date("Beta-44768", 600, 60);
    R_Date("Beta-44769", 640, 60);
};
R_Date("Maize from S-11-D House Pit 1: Beta-309052", 630, 30)
{
};
R_Date("Nutshell in Unit G pit: Beta-234739", 610, 40);
R_Date("Nutshell from deposit near fireclay basin (Unit H): Beta-234737", 590, 40);
Combine("Base of House Pit 3, S-11-D (F6)"
{
    R_Date("Beta-44770", 530, 50);
    R_Date("Beta-44771", 570, 50);
};
Combine("Pit (Q-08-C, F24B-1)"
{
    R_Date("DIC-1024", 510, 50);
    R_Date("Beta-130353", 550, 50);
};
R_Date("Q-08-C, small pit, Feature 5: DIC-1023", 360, 50)
{
    Outlier();
};
    After()
{
    R_Date("Unknown material from possible pit (Q-08-C, F32: Beta-130354", 560, 50);
};
Phase("Unit A, structure")
{
    R_Date("Midden (Unit AD): Beta-246696", 610, 40);
    R_Date("Cane in central habitation area feature: Beta-234743", 590, 40);
    R_Date("Base of domestic feature: Beta-246695", 570, 40);
    R_Date("Structural feature: Beta-241192", 660, 40);
};
R_Date("Nutshell in pit (Unit F, F14a): Beta-234740", 490, 40);
};
    Boundary("end Angel");
};
Aztalan

Plot()
{
    Outlier_Model("Charcoal", Exp(1, -10, 0), U(0, 3), "t");
    Sequence()
    {
        Boundary("Start Aztalan");
        Phase("Aztalan")
        {
            Phase("Structure 11")
            {
                R_Date("Ash dump (F6): DIC-3135", 1130, 55)
                {
                    Outlier("Charcoal", 1);
                }
                R_Date("Domestic feature (F10): DIC-3136", 850, 50)
                {
                    Outlier("Charcoal", 1);
                }
            };
            R_Date("Rectangular structure posthole: M-1037", 1200, 75)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("Pit (F17a): WIS-68", 850, 80)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("Ash layer in pit (F1): WIS-63", 820, 80)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("Pit (F42): WIS-74", 730, 80)
            {
                Outlier("Charcoal", 1);
            }
        }
    }
    Phase("SW Mound")
    {
        After("13 feet below mound surface")
        {
            R_Date("WIS-160", 840, 70)
            {
                Outlier("Charcoal", 1);
            }
        }
        R_Date("Wooden post from structure on mound: WIS-162", 810, 60)
        {
            Outlier("Charcoal", 1);
        }
    }
}
Phase("NW mound charnel house")
{
  R_Date("Charred bulrush matting from charnel house: Beta-47JE1/6", 940, 60);
  R_Date("charnel house: M-642", 320, 100)
  {
    Outlier();
  };
  R_Date("Concentration of mussel shells associated with structure 5 (F20): DIC-3133", 950, 65)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("Shallow pit (F5): DIC-3044", 870, 50)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("Pit 10 in NE quadrant of site: M-1214", 580, 100)
  {
    Outlier("Charcoal", 1);
  };
  Phase("Str. 1110")
  {
    R_Date("Domestic feature: DIC-3134", 850, 45)
    {
      Outlier("Charcoal", 1);
    };
    R_Date("Domestic feature: WIS-73", 820, 60)
    {
      Outlier("Charcoal", 1);
    };
  };
  Sequence("palisade")
  {
    R_Date("Pit (F30): WIS-191", 920, 55)
    {
      Outlier("Charcoal", 1);
    };
    Phase("Palisades")
    {
      First("start palisade");
      R_Date("Preserved post bottom from a bastion (Tower B in I,4): Beta-310904", 940, 30)
      {
        Outlier("Charcoal", 1);
      };
      R_Date("Preserved post bottom from a bastion (Tower B in I,4): Beta-310903", 910, 30)
      {
      };
  };
}
Outlier("Charcoal", 1);
};
Last("end palisade");
Span("span palisade");
};
};
Boundary("End Aztalan");
};
};
Aztalan (Alternative model)

Plot()
{
  Sequence()
  {
    Boundary("Start Aztalan");
    Phase("Aztalan")
    {
      Phase("Structure 11")
      {
        R_Date("Ash dump (F6): DIC-3135", 1130, 55)
        {
        }
        R_Date("Domestic feature (F10): DIC-3136", 850, 50)
        {
        }
        R_Date("Rectangular structure posthole: M-1037", 1200, 75)
        {
        }
        R_Date("Pit (F17a): WIS-68", 850, 80)
        {
        }
        R_Date("Ash layer in pit (F1): WIS-63", 820, 80)
        {
        }
        R_Date("Pit (F42): WIS-74", 730, 80)
        {
        }
      }
      Phase("SW Mound")
      {
        After("13 feet below mound surface")
        {
          R_Date("WIS-160", 840, 70)
          {
          }
        }
        R_Date("Wooden post from structure on mound: WIS-162", 810, 60)
        {
        }
      }
    }
    Phase("NW mound charnel house")
    {
      R_Date("Charred bulrush matting from charnel house: Beta-47JE1/6", 940, 60);
      R_Date("charnel house: M-642", 320, 100)
      {
        Outlier();
      }
    }
  }
}
R_Date("Concentration of mussel shells associated with structure 5 (F20): DIC-3133", 950, 65)
{
};
R_Date("Shallow pit (F5): DIC-3044", 870, 50)
{
};
R_Date("Pit 10 in NE quadrant of site: M-1214", 580, 100)
{
};
Phase("Str. 1110")
{
  R_Date("Domestic feature: DIC-3134", 850, 45)
  {
  }
  R_Date("Domestic feature: WIS-73", 820, 60)
  {
  }
};
Sequence("palisade")
{
  R_Date("Pit (F30): WIS-191", 920, 55)
  {
  }
  Phase("Palisades")
  {
    First("start palisade");
    R_Date("Preserved post bottom from a bastion (Tower B in I,4): Beta-310904", 940, 30)
    {
    }
    R_Date("Preserved post bottom from a bastion (Tower B in I,4): Beta-310903", 910, 30)
    {
    }
    Last("end palisade");
    Span("span palisade");
  }
};
Boundary("End Aztalan");
};
Cahokia

Plot()
{
    Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
    Sequence()
    {
        Boundary("Start Cahokia");
        Phase("Cahokia")
        {
            Phase("Monks Mound")
            {
                Sequence("1st terrace")
                {
                    Phase("buildings under 1st terrace")
                    {
                        Phase("floor (F114) of small burned building")
                        {
                            R_Date("Post (post 2): WIS-365", 840, 55)
                            {
                                Outlier("Charcoal", 1);
                            }
                            R_Date("Log (log 1): WIS-547", 825, 60)
                            {
                                Outlier("Charcoal", 1);
                            }
                        }
                        R_Date("burned clay floor (F104): WIS-362", 690, 50)
                        {
                            Outlier("Charcoal", 1);
                        }
                        R_Date("burnt sand floor: M-982", 850, 100)
                        {
                            Outlier("Charcoal", 1);
                        }
                        R_Date("ash concentration from burned basin (F149): WIS-549", 720, 55)
                        {
                            Outlier("Charcoal", 1);
                        }
                    }
                }
            }
        }
    }
}
Phase("1st terrace surface")
{
  R_Date("burned building (F139) post: WIS-545", 740, 55)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("pit 137: I-2947", 760, 95)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("burned floor of a house (F4), SW edge of mound: M-1637", 670, 100)
  {  
    Outlier("Charcoal", 1);
  };
};
Sequence("2nd, 3rd, 4th terraces")
{
  Phase("pre-mound (2nd, 3rd, 4th terraces)")
  {  
    After("Feature below Monks Mound. Material retrieved through coring")
    {  
      R_Date("I-2309", 1110, 70)
      {  
        Outlier("Charcoal", 1);
      };
    };
    After("Submound feature. Material retrieved through coring (Core 4).")
    {  
      R_Date("Beta-207044", 900, 40)
      {  
        Outlier("Charcoal", 1);
      };
    };
    R_Date("Thatch from burnt thatch layer (F284) of a house: WIS-587", 925, 60);
    After("Submound feature. Material retrieved through coring (Core 4).")
    {  
      R_Date("Beta-207040", 960, 60)
      {  
        Outlier("Charcoal", 1);
      };
    };
    After("Submound feature. Material retrieved through coring (Core 3).")
    {  
      R_Date("Charred organic material: Beta-207041", 950, 40);
    };
    After("Submound feature. Material retrieved through coring (Core 4).")
    {  
      R_Date("Grass: Beta-207039", 980, 40);
    };
  };
}
After("Submound feature. Material retrieved through coring (Core 3).")
{
    R_Date("Beta-207042", 1010, 40)
    {
        Outlier("Charcoal", 1);
    }
};
After("Feature at the base of Monks Mound. Core sample in the 4th terrace center.")
{
    R_Date("Unidentified charcoal: ISGS-1252", 960, 40)
    {
    }
};
Phase("mound fill")
{
    After("Monks Mound fill. Reed's Level L surface. From fourth terrace.")
    {
        R_Date("Unidentified charcoal: M-1636", 840, 150)
        {
        }
    }
    After("Mound fill. Core sample from potentially redeposited wood.")
    {
        R_Date("I-2308", 1020, 100)
        {
            Outlier("Charcoal", 1);
        }
    }
    R_Date("grass from sod block: A-1159", 955, 15);
    R_Date("grass from sod block: Beta-241384", 770, 40);
    After("mound fill")
    {
        R_Date("grass: A-1160", 1030, 15);
        R_Date("log: Beta-241385", 960, 40)
        {
            Outlier("Charcoal", 1);
        }
    }
};
Phase()
{
    R_Date("surface deposit with burned material in east lobes: WIS-586", 640, 55)
    {
        Outlier("Charcoal", 1);
    }
};
Phase("4th terrace summit")
{
R_Date("post (F1B): WIS-525", 870, 55)
{
    Outlier("Charcoal", 1);
};
R_Date("post (F1H): WIS-527", 890, 60)
{
    Outlier("Charcoal", 1);
};
R_Date("post (Post 6, F26): WIS-528", 970, 65)
{
    Outlier("Charcoal", 1);
};
\}
\}
Combine("Powell Tract: Fire basin (F227) in center of House 15")
{
    R_Date("M-1293", 1190, 75)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Repeat of M-1293: WIS-58", 1000, 65)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Powell Tract: House 13 refuse pit: ISGS-163", 1170, 80)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Powell Tract: House 21 floor: M-1294", 1125, 75)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("Powell Tract: charred layer of floor (F234) of House 26: M-1292", 1055, 75)
    {
        Outlier("Charcoal", 1);
    }
\}
Phase("Powell Tract: Pit (F331)")
{
    R_Date("Maize: ISGS-141", 780, 150);
    R_Date("Squash seeds: ISGS-140", 1000, 75);
    R_Date("Nut shell: ISGS-130", 950, 75);
};
R_Date("Tract 15B (Burial 2): A-1523", 655, 15);
R_Date("Tract 15B (Burial 4): A-1525", 945, 15);
R_Date("Tract 15B: floor of House 77: M-1335", 765, 200)
{
Outlier("Charcoal", 1);
};

Phase("Tract 15B: floor of House 43")
{
  R_Date("M-1332", 515, 100)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("ISGS-3832", 600, 70)
  {
    Outlier("Charcoal", 1);
  };
};

R_Date("Tract 15B: log associated with burned House 48: ISGS-3831", 590, 70)
{
  Outlier("Charcoal", 1);
};

R_Date("Tract 15B: central floor area of House 44: M-1333", 825, 100)
{
  Outlier("Charcoal", 1);
};

R_Date("Tract 15B: House 113: M-1336", 885, 200)
{
  Outlier("Charcoal", 1);
};

Phase("Tract 15B: logs associated with burned House 59")
{
  R_Date("ISGS-3836", 630, 70)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("ISGS-3835", 670, 70)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("M-1334", 385, 90)
  {
    Outlier("Charcoal", 1);
  };
};

Phase("Merrell Tract: large refuse pit (F341)")
{
  R_Date("ISGS-3826", 530, 70)
  {
    Outlier("Charcoal", 1);
  };
  R_Date("ISGS-3823", 610, 70)
  {
    Outlier("Charcoal", 1);
  };
};
R_Date("ISGS-3824", 600, 70)
  {  
    Outlier("Charcoal", 1);
  }
R_Date("Merrell Tract: garbage layer (F306) in fill of house basin: ISGS-276", 860, 80)
  {  
    Outlier("Charcoal", 1);
  }
Phase("Merrell Tract: floor of old house (F319)")
  {
    R_Date("ISGS-281", 1080, 80)
    {  
      Outlier("Charcoal", 1);
    }
    R_Date("ISGS-283", 1220, 80)
    {  
      Outlier();
    }
    R_Date("unidentified organic material: ISGS-280", 1050, 80);
  }
Phase("Merrell Tract: smudge pit (F349)")
  {
    R_Date("maize: ISGS-3829", 560, 70);
    R_Date("maize: ISGS-3830", 650, 70);
    R_Date("maize: ISGS-3825", 420, 70);
  }
Sequence()
  {
    Phase("palisade sequence & Ramey Field structures")
    {
      Phase("House 4")
      {
        R_Date("support beam: WIS-493", 810, 45)
        {  
          Outlier("Charcoal", 1);
        }
        R_Date("timber on floor: WIS-495", 850, 50)
        {  
          Outlier("Charcoal", 1);
        }
      }
      R_Date("structural timber: WIS-494", 900, 55)
      {  
        Outlier("Charcoal", 1);
      }
      R_Date("unknown material from house feature: GX-859", 815, 85);
    }
    R_Date("Midden layer (F-34): Beta-148266", 950, 40)
  }
Phase("Palisade")
{
  First("start palisade");
  R_Date("upright burned post (F28) in Palisade IV trench: WIS-444", 750, 55)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("log associated with Palisade IV trench: WIS-359", 690, 55)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("post associated with south palisade: WIS-366", 890, 55)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("post in west palisade wall trench (F-33): Beta-148265", 780, 70)
  {
    Outlier("Charcoal", 1);
  }
  After("West palisade wall trench (F-43 & F-42)")
  {
    R_Date("Beta-150315", 960, 70)
    {
      Outlier("Charcoal", 1);
    }
    R_Date("Beta-148263", 880, 40)
    {
      Outlier("Charcoal", 1);
    }
  }
  Last("end palisade");
  Span("span palisade");
};
R_Date("refuse basin (F-60) in west palisade excavation area: Beta-148269", 1120, 70)
  {
    Outlier("Charcoal", 1);
  }
};
Phase("Mound 34")
{
  Phase("basin in clay floor of burned house")
  {
    R_Date("M-672", 480, 100)
    {
      Outlier("Charcoal", 1);
    }
  }
};
R_Date("M-670", 960, 250)
{
Outlier("Charcoal", 1);
};
};
R_Combine("pit underneath the slope of Mound 34")
{
R_Date("Unidentified charred miscellaneous plant material: M-33A", 700, 300);
R_Date("Repeat of M33A: M-33B", 900, 300);
};
R_Date("lowest level of refuse pit: M-636", 660, 200)
{
Outlier("Charcoal", 1);
};
R_Date("remnants of a ceremonial fire: M-635", 670, 200)
{
Outlier("Charcoal", 1);
};
After("Pre-mound "refuse pit" (F3) below Mound 34")
{
R_Date("deer humerus: A-1447", 870, 15);
};
Phase("copper workshop house (F82)"
{
After("pit (F75)"
{
R_Date("Disarticulated deer rib: A-1448", 640, 15);
R_Date("Disarticulated deer innominate (pubis): A-1450", 645, 15);
};
After("pit (F74)"
{
R_Date("Disarticulated deer sternum fragment: A-1449", 630, 20);
};
};
};
After("Tract 15A: House 32. Sample from 0.2 feet above floor, 1.7 feet below surface.")
{
R_Date("M-1338", 725, 100)
{
Outlier("Charcoal", 1);
};
};
Sequence("Tract 15A post circles")
{
Phase("Post Circle 2")
{
Combine("Post pit (F618)"
{
R_Date("outer rings of wood: WIS-1133", 890, 60)
{Outlier("Charcoal", 1);
};
R_Date("repeat of WIS-1133: WIS-1136", 990, 60)
{Outlier("Charcoal", 1);
};
};
Phase("Post pit (F548)")
{
R_Date("WIS-948", 1085, 55)
{Outlier("Charcoal", 1);
};
R_Date("WIS-969", 1060, 55)
{Outlier("Charcoal", 1);
};
};
Combine("Post pit (F601)")
{
R_Date("Outer rings of wood: WIS-1128", 940, 60)
{Outlier("Charcoal", 1);
};
R_Date("repeat of WIS-1128: WIS-1130", 920, 60)
{Outlier("Charcoal", 1);
};
};
Phase("Post Circle 3")
{
R_Date("large pit (F340): WIS-976", 760, 55)
{Outlier("Charcoal", 1);
};
R_Date("post pit (F506): WIS-984", 685, 55)
{Outlier("Charcoal", 1);
};
R_Date("from fill of post pits (F174 and F369): M-1341", 905, 120)
{Outlier("Charcoal", 1);
};
};
R_Date("Post Circle 4, large pit (F539): WIS-988", 1135, 55)
{Outlier("Charcoal", 1);
}
R_Date("Tract 15A: floor of house 74: M-1340", 1025, 110)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: refuse pit (F289): I-2014", 1000, 100)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: refuse pit (F368): I-2070", 990, 135)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: refuse pit (F338): I-2016", 980, 90)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: woodland refuse pit: I-2012", 910, 100)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: House 205: I-9458", 940, 75)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: burned posts in wall trench of House 2: M-1337", 805, 100)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: refuse pit (F153): I-2069", 875, 105)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: pit (F297): I-2013", 920, 100)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: pit (F401): I-9459", 990, 75)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: House 209: I-9460", 980, 75)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: pit (F311): GX-926", 1135, 80)
{
    Outlier("Charcoal", 1);
}
R_Date("Tract 15A: House 407: I-9457", 880, 75)
Outlier("Charcoal", 1);

R_Date("Tract 15A: House 212: I-9464", 440, 75)
{
  Outlier("Charcoal", 1);
};
R_Date("Tract 15A: wall trench structure (F108): I-2015", 1060, 90)
{
  Outlier("Charcoal", 1);
};
After("Tract 15A: Sample from 0.3 feet above floor of House 35")
{
  R_Date("M-1339", 685, 100)
};
R_Date("Interpretive Center Tract II: F79 (Zone A): Beta-19474", 970, 60)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: F304 (Zone A): Beta-19486", 1320, 80)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: F455 (Zone A): Beta-19492", 1050, 70)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: F320 (Zone A): Beta-19487", 1050, 70)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: F374 (Zone A): Beta-19490", 1010, 60)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: structure (F92, Zone B): Beta-19475", 1100, 70)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: structure (F287, Zone B): Beta-19485", 960, 60)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: F17 (Zone A): Beta-19473", 960, 100)
{
  Outlier("Charcoal", 1);

Phase("Interpretive Center Tract II: floor of burned structure (F178, Zone A)")
{
  R_Date("Beta-19480", 950, 60)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("Beta-19478", 940, 80)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("log found on floor: Beta-19479", 1030, 70)
  {
    Outlier("Charcoal", 1);
  }
};
R_Date("Interpretive Center Tract II: F242 (Zone A): Beta-19484", 930, 80)
{
  Outlier("Charcoal", 1);
};
R_Date("Interpretive Center Tract II: thatch from F379 (Zone A): Beta-19491", 880, 80);
Sequence("Mound 51")
{
  R_Date("thatch from water laid material outside pit found below base of mound: M-1784", 910, 110);
  Phase("mound fill")
  {
    After("stratum H fill")
    {
      R_Date("deer bone: WIS-352", 800, 65);
      R_Date("nut shell hull: WIS-389", 900, 50);
    }
    After("stratum G fill")
    {
      R_Date("nut shell hull: WIS-390", 890, 55);
      R_Date("deer bone: WIS-355", 680, 60);
    }
    After("stratum F fill")
    {
      R_Date("charred thatch: GX-950", 1145, 65);
      R_Date("deer bone: WIS-351", 780, 60);
      R_Date("charred thatch: ISGS-2573", 760, 95);
    }
    After("stratum E fill")
    {
      R_Date("deer bone: WIS-350", 750, 50);
    }
  }
  After("stratum D2 fill")
}
R_Date("deer bone: WIS-360", 815, 60);
R_Date("nut shell hull: WIS-391", 850, 65);
;
After("stratum D1 fill")
{
    R_Date("deer bone: WIS-356", 810, 50);
};
;
Phase("Mound 72")
{
    Phase("bottom of post pit (F1)")
    {
        R_Date("cribbing log A: WIS-298", 1020, 55)
        {
            Outlier("Charcoal", 1);
        }
        R_Date("cribbing log B: WIS-293", 970, 50)
        {
            Outlier("Charcoal", 1);
        }
    }
    R_Date("North midden (F205) in Mound 72: WIS-447", 1015, 60)
    {
    }
    R_Date("Pole from burial 210 (F229): WIS-575", 920, 60)
    {
        Outlier("Charcoal", 1);
    }
    R_Date("central midden (F227): WIS-492", 900, 55)
    {
        Outlier("Charcoal", 1);
    }
    After("potentially residual material in post molds of a structure in Village Level V of Mound 55.")
    {
        R_Date("unidentified charcoal and maize: M-1290", 600, 75)
        {
        }
    }
    After("Top of wall trench (west) fill of House 3 in airport area.")
    {
        R_Date("M-1296", 725, 75)
        {
            Outlier("Charcoal", 1);
        }
    }
    R_Date("pit (F1) in airport area: M-1297", 675, 75);
};
Boundary("End Cahokia");
};
};
Cahokia (Alternative model)

Plot()
{
  Sequence()
  {
    Boundary("Start Cahokia");
    Phase("Cahokia")
    {
      Phase("Monks Mound")
      {
        Sequence("1st terrace")
        {
          Phase("buildings under 1st terrace")
          {
            Phase("floor (F114) of small burned building")
            {
              R_Date("Post (post 2): WIS-365", 840, 55);
              R_Date("Log (log 1): WIS-547", 825, 60);
            }
            Phase("floor (F113) of large burned building")
            {
              R_Date("Log (log 24): WIS-546", 805, 60);
              R_Date("Post (post 1): WIS-443", 670, 55);
            }
            R_Date("burned clay floor (F104): WIS-362", 690, 50);
            R_Date("burnt sand floor: M-982", 850, 100);
            R_Date("ash concentration from burned basin (F149): WIS-549", 720, 55);
          }
          Phase("1st terrace surface")
          {
            R_Date("burned building (F139) post: WIS-545", 740, 55);
            R_Date("pit 137: I-2947", 760, 95);
          }
        }
        After()
        {
          R_Date("burned floor of a house (F4), SW edge of mound: M-1637", 670, 100);
        }
      }
      Sequence("2nd, 3rd, 4th terraces")
      {
        Phase("pre-mound (2nd, 3rd, 4th terraces)")
        {
          After("Feature below Monks Mound. Material retrieved through coring")
          {
            R_Date("I-2309", 1110, 70);
          }
          After("Submound feature. Material retrieved through coring (Core 4).")
          {
            R_Date("Beta-207044", 900, 40);
          }
        }
      }
    }
  }
}
R_Date("Thatch from burnt thatch layer (F284) of a house: WIS-587", 925, 60);
After("Submound feature. Material retrieved through coring (Core 1).")
{
  R_Date("Beta-207040", 960, 60);
};
After("Submound feature. Material retrieved through coring (Core 3).")
{
  R_Date("Charred organic material: Beta-207041", 950, 40);
};
After("Submound feature. Material retrieved through coring (Core 1).")
{
  R_Date("Grass: Beta-207039", 980, 40);
};
After("Submound feature. Material retrieved through coring (Core 3).")
{
};
After("Feature at the base of Monks Mound. Core sample in the 4th terrace center.")
{
  R_Date("Unidentified charcoal: ISGS-1252", 960, 40)
  {
  }
};
Phase("mound fill")
{
  After("Monks Mound fill. Reed's Level L surface. From fourth terrace.")
  {
    R_Date("Unidentified charcoal: M-1636", 840, 150)
    {
    }
  }
  After("Mound fill. Core sample from potentially redeposited wood.")
  {
    R_Date("I-2308", 1020, 100);
    
    R_Date("grass from sod block: A-1159", 955, 15);
    R_Date("grass from sod block: Beta-241384", 770, 40)
    {
      Outlier();
    }
  };
  After("mound fill")
  {
    R_Date("grass: A-1160", 1030, 15);
    R_Date("log: Beta-241385", 960, 40);
  }
};
Phase()
R_Date("surface deposit with burned material in east lobes: WIS-586", 640, 55);
Phase("4th terrace summit")
{
  R_Date("post (F1B): WIS-525", 870, 55);
  R_Date("post (F1H): WIS-527", 890, 60);
  R_Date("post (Post 6, F26): WIS-528", 970, 65);
};
}
;
;
;
;
After()
{
  Combine("Powell Tract: Fire basin (F227) in center of House 15")
  {
    R_Date("M-1293", 1190, 75);
    R_Date("Repeat of M-1293: WIS-58", 1000, 65);
  }
  R_Date("Powell Tract: House 13 refuse pit: ISGS-163", 1170, 80);
  After()
  {
    R_Date("Powell Tract: House 21 floor: M-1294", 1125, 75);
  }
  After()
  {
    R_Date("Powell Tract: charred layer of floor (F234) of House 26: M-1292", 1055, 75);
  }
};
Phase("Powell Tract: Pit (F331)"
  {
    After()
    {
      R_Date("Maize: ISGS-141", 780, 150);
    }
    R_Date("Squash seeds: ISGS-140", 1000, 75);
    R_Date("Nut shell: ISGS-130", 950, 75);
  }
};
R_Date("Tract 15B (Burial 2): A-1523", 655, 15);
R_Date("Tract 15B (Burial 4): A-1525", 945, 15);
R_Date("Tract 15B: floor of House 77: M-1335", 765, 200);
Phase("Tract 15B: floor of House 43")
  {
    R_Date("M-1332", 515, 100);
    R_Date("ISGS-3832", 600, 70);
  }
};
R_Date("Tract 15B: log associated with burned House 48: ISGS-3831", 590, 70);
R_Date("Tract 15B: central floor area of House 44: M-1333", 825, 100);
After()
  {
    R_Date("M-1336", 885, 200);
Phase(Tract 15B: logs associated with burned House 59)
{
  R_Date("ISGS-3836", 630, 70);
  R_Date("ISGS-3835", 670, 70);
  R_Date("M-1334", 385, 90);
};

Phase("Merrell Tract: large refuse pit (F341)"
{
  R_Date("ISGS-3826", 530, 70);
  R_Date("ISGS-3823", 610, 70);
  R_Date("ISGS-3824", 600, 70);
};

After()
{
  R_Date("Merrell Tract: garbage layer (F306) in fill of house basin: ISGS-276", 860, 80);
};

After("Merrell Tract: floor of old house (F319)"
{
  R_Date("ISGS-281", 1080, 80);
  R_Date("ISGS-283", 1220, 80);
  R_Date("unidentified organic material: ISGS-280", 1050, 80);
};

Phase("Merrell Tract: smudge pit (F349)"
{
  R_Date("maize: ISGS-3829", 560, 70);
  R_Date("maize: ISGS-3830", 650, 70);
  R_Date("maize: ISGS-3825", 420, 70);
};

Sequence()
{
  Phase("palisade sequence & Ramey Field structures")
  {
    Phase("House 4")
    {
      R_Date("support beam: WIS-493", 810, 45);
      R_Date("timber on floor: WIS-495", 850, 50);
    };;
    R_Date("structural timber: WIS-494", 900, 55);
    After()
    {
      R_Date("unknown material from house feature: GX-859", 815, 85);
    };;
    After()
    {
      R_Date("Midden layer (F-34): Beta-148266", 950, 40);
    };;
  }
};

Phase("Palisade")
First("start palisade");
R_Date("upright burned post (F28) in Palisade IV trench: WIS-444", 750, 55);
R_Date("log associated with Palisade IV trench: WIS-359", 690, 55);
R_Date("post associated with south palisade: WIS-366", 890, 55);
After()
  {
    R_Date("post in west palisade wall trench (F-33): Beta-148265", 780, 70);
  }
After("West palisade wall trench (F-43 & F-42)"
  {
    R_Date("Beta-150315", 960, 70);
    R_Date("Beta-148263", 880, 40);
  });
Last("end palisade");
Span("span palisade");
R_Date("refuse basin (F-60) in west palisade excavation area: Beta-148269", 1120, 70);
Phase("Mound 34")
  {
    Phase("basin in clay floor of burned house")
    {
      After()
      {
        R_Date("M-672", 480, 100);
      }
      R_Date("M-670", 960, 250);
    }
    After()
    {
      R_Combine("pit underneath the slope of Mound 34")
      {
        R_Date("Unidentified charred miscellaneous plant material: M-33A", 700, 300);
        R_Date("Repeat of M33A: M-33B", 900, 300);
      }
    }
    After()
    {
      R_Date("lowest level of refuse pit: M-636", 660, 200);
    }
    R_Date("remnants of a ceremonial fire: M-635", 670, 200);
    After("Pre-mound "refuse pit" (F3) below Mound 34")
    {
      R_Date("deer humerus: A-1447", 870, 15);
    }
    Phase("copper workshop house (F82)"
    {
      After("pit (F75)")
After("pit (F74)"
{
  R_Date("Disarticulated deer sternum fragment: A-1449", 630, 20);
}"
);

After("Tract 15A: House 32. Sample from 0.2 feet above floor, 1.7 feet below surface.")
{
  R_Date("M-1338", 725, 100);
}"
);

Sequence("Tract 15A post circles")
{
  Phase("Post Circle 2")
  {
    Combine("Post pit (F618)"
    {
      R_Date("outer rings of wood: WIS-1133", 890, 60);
      R_Date("repeat of WIS-1133: WIS-1136", 990, 60);
    }"
    );
    Phase("Post pit (F548)"
    {
      R_Date("WIS-948", 1085, 55);
      R_Date("WIS-969", 1060, 55);
    }"
    );
    Combine("Post pit (F601)"
    {
      R_Date("Outer rings of wood: WIS-1128", 940, 60);
      R_Date("repeat of WIS-1128: WIS-1130", 920, 60);
    }"
    );
  }"
  );
  Phase("Post Circle 3")
  {
    R_Date("large pit (F340): WIS-976", 760, 55);
    R_Date("post pit (F506): WIS-984", 685, 55);
    R_Date("from fill of post pits (F174 and F369): M-1341", 905, 120);
  }"
  );
  R_Date("Post Circle 4, large pit (F539): WIS-988", 1135, 55)
  {
    Outlier();
  }"
  );

  R_Date("Tract 15A: floor of house 74: M-1340", 1025, 110);
  R_Date("Tract 15A: refuse pit (F289): I-2014", 1000, 100);
  R_Date("Tract 15A: refuse pit (F368): I-2070", 990, 135);
  R_Date("Tract 15A: refuse pit (F338): I-2016", 980, 90);
R_Date("Tract 15A: woodland refuse pit: I-2012", 910, 100);
After()
{
   R_Date("Tract 15A: House 205: I-9458", 940, 75);
};
R_Date("Tract 15A: burned posts in wall trench of House 2: M-1337", 805, 100);
R_Date("Tract 15A: refuse pit (F153): I-2069", 875, 105);
R_Date("Tract 15A: pit (F297): I-2013", 920, 100);
R_Date("Tract 15A: pit (F401): I-9459", 990, 75);
After()
{
   R_Date("Tract 15A: House 209: I-9460", 980, 75);
};
R_Date("Tract 15A: pit (F311): GX-926", 1135, 80);
After()
{
   R_Date("Tract 15A: House 407: I-9457", 880, 75);
};
After()
{
   R_Date("Tract 15A: House 212: I-9464", 440, 75);
};
After()
{
   R_Date("Tract 15A: wall trench structure (F108): I-2015", 1060, 90);
};
After("Tract 15A: Sample from 0.3 feet above floor of House 35")
{
   R_Date("M-1339", 685, 100)
   {
   }
};
After()
{
   R_Date("Interpretive Center Tract II: F79 (Zone A): Beta-19474", 970, 60);
};
After()
{
   R_Date("Interpretive Center Tract II: F304 (Zone A): Beta-19486", 1320, 80);
};
After()
{
   R_Date("Interpretive Center Tract II: F455 (Zone A): Beta-19492", 1050, 70);
};
After()
{
   R_Date("Interpretive Center Tract II: F320 (Zone A): Beta-19487", 1050, 70);
};
After()
R_Date("Interpretive Center Tract II: F374 (Zone A): Beta-19490", 1010, 60);
After()
{
  R_Date("Interpretive Center Tract II: structure (F92, Zone B): Beta-19475", 1100, 70);
};
After()
{
  R_Date("Interpretive Center Tract II: structure (F287, Zone B): Beta-19485", 960, 60);
};
After()
{
  R_Date("Interpretive Center Tract II: F17 (Zone A): Beta-19473", 960, 100);
};
Phase("Interpretive Center Tract II: floor of burned structure (F178, Zone A)"
{
  R_Date("Beta-19480", 950, 60);
  R_Date("Beta-19478", 940, 80);
  R_Date("log found on floor: Beta-19479", 1030, 70);
};
After()
{
  R_Date("Interpretive Center Tract II: F242 (Zone A): Beta-19484", 930, 80);
};
After()
{
  R_Date("Interpretive Center Tract II: thatch from F379 (Zone A): Beta-19491", 880, 80);
};
Sequence("Mound 51")
{
  After()
  {
    R_Date("thatch from water laid material outside pit found below base of mound: M-1784", 910, 110);
  }
  Phase("mound fill")
  {
    After("stratum H fill")
    {
      R_Date("deer bone: WIS-352", 800, 65);
      R_Date("nut shell hull: WIS-389", 900, 50);
    }
    After("stratum G fill")
    {
      R_Date("nut shell hull: WIS-390", 890, 55);
      R_Date("deer bone: WIS-355", 680, 60);
    }
  }
After("stratum F fill")
{
    R_Date("charred thatch: GX-950", 1145, 65);
    R_Date("deer bone: WIS-351", 780, 60);
    R_Date("charred thatch: ISGS-2573", 760, 95);
};

After("stratum E fill")
{
    R_Date("deer bone: WIS-350", 750, 50);
};

After("stratum D2 fill")
{
    R_Date("deer bone: WIS-360", 815, 60);
    R_Date("nut shell hull: WIS-391", 850, 65);
};

After("stratum D1 fill")
{
    R_Date("deer bone: WIS-356", 810, 50);
};

Phase("Mound 72")
{
    Phase("bottom of post pit (F1)"
    {
        R_Date("cribbing log A: WIS-298", 1020, 55);
        R_Date("cribbing log B: WIS-293", 970, 50);
    });
    After()
    {
        R_Date("North midden (F205) in Mound 72: WIS-447", 1015, 60)
        {
        }
    };  
    R_Date("Pole from burial 210 (F229): WIS-575", 920, 60);
    After()
    {
        R_Date("central midden (F227): WIS-492", 900, 55);
    };
    After("potentially residual material in post molds of a structure in Village Level V of Mound 55.")
    {
        R_Date("unidentified charcoal and maize: M-1290", 600, 75)
        {
        }
    };
    After("Top of wall trench (west) fill of House 3 in airport area.")
    {
        R_Date("M-1296", 725, 75);
    };

};

After()
{
  R_Date("pit (F1) in airport area: M-1297", 675, 75);
};

};

Boundary("End Cahokia");
};
Etowah

Plot()
{
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
}
Sequence()
{
  Boundary("Start Etowah");
  Phase()
  {
    Sequence("Mound C")
    {
      R_Date("Unidentified charcoal from large midden filled pit (F19): M-1064", 850, 150);
      Phase("Mound C burials")
      {
        R_Date("timber in a collapsed log tomb of Burial 38: M-402", 725, 200)
        {
          Outlier("Charcoal", 1);
        }
      }
      Phase("Burial 57")
      {
        R_Date("timber in a collapsed log tomb: M-542", 910, 200)
        {
          Outlier("Charcoal", 1);
        }
        R_Date("shell from under the shoulders of Burial 57: M-543", 500, 250);
      }
      R_Date("Unidentified charcoal from Burial no. 155: M-1061", 670, 200)
      {
      }
      R_Date("Charred wood from Burial no. 164: M-1062", 450, 200)
      {
        Outlier("Charcoal", 1);
      }
    }
    After("surface of mantle no. 2")
    {
      R_Date("Unidentified burnt vegetable material: M-1060", 225, 150)
      {
      }
    }
  }
  Phase("Saucer 1 fill")
  {
    R_Date("Soot removed from sherds: Beta-144161", 990, 40)
    {
      Outlier("Charcoal", 1);
    }
    R_Date("Soot removed from sherds: Beta-145489", 1000, 40)
  }
}
R_Date("Saucer 2 fill: Soot removed from sherds: Beta-144162", 830, 40)
{  
  Outlier("Charcoal", 1);
};

Phase("Saucer 3 fill")
{  
  R_Date("Soot removed from sherds: Beta-144164", 810, 40)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("Soot removed from sherds: Beta-145491", 900, 40)
  {  
    Outlier("Charcoal", 1);
  };
}

Phase("Saucer 4 fill")
{  
  R_Date("Soot removed from sherds: Beta-144163", 850, 40)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("Soot removed from sherds: Beta-145490", 1080, 40)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("Black Midden fill: Soot removed from sherds: Beta-144811", 1080, 40)
  {  
    Outlier("Charcoal", 1);
  };
  R_Date("Soot removed from the surface of a sherd from a midden associated with Structure 1: Beta-145488", 1540, 50)
  {  
    Outlier("Charcoal", 1);
  };
}

Phase("Fill of a small platform (Orange Layer, F64A)")
{  
  After()
  {  
    R_Date("maize: Beta-67942", 740, 70);
  };
  After()
  {  
    R_Date("Beta-67943", 680, 70)
    {  
      Outlier("Charcoal", 1);
    };
  };
}
After("Fill of a small platform (Orange Layer, F64B)"
{
    R_Date("maize: Beta-67944", 560, 50);
};
Phase("Palisade"
{
    First("start palisade");
    R_Date("Post (different from Beta-134793) from palisade trench: Beta-134792", 748, 60)
    {
        Outlier("Charcoal", 1);
    });
    R_Date("Palisade post (different from Beta-134792) from palisade trench: Beta-134793", 879, 70)
    {
        Outlier("Charcoal", 1);
    }; Last("end palisade");
    Span("palisade span");
};
});
Boundary("End Etowah");
};
Etowah (Alternative model)

Plot()
{
  Sequence()
  {
    Boundary("Start Etowah");
    Phase()
    {
      Sequence("Mound C")
      {
        After()
        {
          R_Date("Unidentified charcoal from large midden filled pit (F19): M-1064", 850, 150);
        }
      }
      After()
      {
        R_Date("Unidentified charcoal from Burial no. 155: M-1061", 670, 200);
      }
      R_Date("Charred wood from Burial no. 164: M-1062", 450, 200);
      After("surface of mantle no. 2")
      {
        R_Date("Unidentified burnt vegetable material: M-1060", 225, 150)
      }
    }
    Phase("Mound C burials")
    {
      R_Date("timber in a collapsed log tomb of Burial 38: M-402", 725, 200);
      Phase("Burial 57")
      {
        R_Date("timber in a collapsed log tomb: M-542", 910, 200);
        After()
        {
          R_Date("shell from under the shoulders of Burial 57: M-543", 500, 250);
        }
      };
      After()
      {
        R_Date("Unidentified charcoal from Burial no. 155: M-1061", 670, 200)
      }
    };
    R_Date("Charred wood from Burial no. 164: M-1062", 450, 200);
    After("surface of mantle no. 2")
    {
      R_Date("Unidentified burnt vegetable material: M-1060", 225, 150)
    }
  }
  Phase("Saucer 1 fill")
  {
    R_Date("Soot removed from sherds: Beta-144161", 990, 40);
    R_Date("Soot removed from sherds: Beta-145489", 1000, 40);
  };
  R_Date("Saucer 2 fill: Soot removed from sherds: Beta-144162", 830, 40);
  Phase("Saucer 3 fill")
  {
R_Date("Soot removed from sherds: Beta-144164", 810, 40);
R_Date("Soot removed from sherds: Beta-145491", 900, 40);
};
Phase("Saucer 4 fill")
{
    R_Date("Soot removed from sherds: Beta-144163", 850, 40);
    R_Date("Soot removed from sherds: Beta-145490", 1080, 40);
};
R_Date("Black Midden fill: Soot removed from sherds: Beta-144811", 1080, 40);
R_Date("Soot removed from the surface of a sherd from a midden associated with Structure 1: Beta-145488", 1540, 50);
Phase("Fill of a small platform (Orange Layer, F64A)")
{
    After()
    {
        R_Date("maize: Beta-67942", 740, 70);
    }
    After()
    {
        R_Date("Beta-67943", 680, 70);
    }
    After("Fill of a small platform (Orange Layer, F64B)")
    {
        R_Date("maize: Beta-67944", 560, 50);
    }
    Phase("Palisade")
    {
        First("start palisade");
        R_Date("Post (different from Beta-134793) from palisade trench: Beta-134792", 748, 60);
        R_Date("Palisade post (different from Beta-134792) from palisade trench: Beta-134793", 879, 70);
        Last("end palisade");
        Span("palisade span");
    }
    Boundary("End Etowah");
}
Kincaid

Plot()
{
    Outlier_Model("Charcoal", Exp(1,-10,0), U(0,3), "t");
    Sequence("Mississippian Occupation")
    {
        Boundary("Start Kincaid");
        Phase(Kincaid village)
        {
            Sequence("Mx°4")
            {
                After("premound level, context not provided")
                {
                    Combine("dendro sample")
                    {
                        R_Date("UGa-3455", 850, 65)
                        {
                            Outlier("Charcoal", 1);
                        }
                        R_Date("UGa-3456", 890, 65)
                        {
                            Outlier("Charcoal", 1);
                        }
                        R_Date("UGa-3457", 950, 70)
                        {
                            Outlier("Charcoal", 1);
                        }
                    }
                    Phase("houses")
                    {
                        R_Date("maize from House III (FXIII): Beta-178763", 780, 40);
                        R_Date("House 1 (F7), occupation level 4: DIC-903", 1110, 65)
                        {
                            Outlier("Charcoal", 1);
                        }
                    }
                    After("Mx°2, large basin (F10)")
                    {
                        Combine()
                        {
                            R_Date("Beta-191044a", 1060, 50)
                            {
                                Outlier("Charcoal", 1);
                            }
                            R_Date("Beta-191044b", 910, 40)
                            {
                                Outlier("Charcoal", 1);
                            }
                        }
                    }
                }
            }
        }
    }
}
R_Date("thatch from structure (F6): UGAMS-4695", 870, 25);
Sequence("West Mound")
{
After("submound deposit")
{
R_Date("thatch: Beta-216287", 800, 40);
};
Phase()
{
R_Date("charred debris of a thatch roof (F9) in the upper level of the mound:
Beta-216288", 600, 40)
{
};
R_Date("fragments of log or post from structure 1 in the mound area: Beta-
216289", 780, 40)
{
   Outlier("Charcoal", 1);
};
R_Date("fragments of log or post from structure 2 in the mound area: Beta-
216290", 740, 50)
{
   Outlier("Charcoal", 1);
};
};
Phase("Mx°8 circular structure")
{
R_Date("post in wall trench: Beta-237479", 650, 40)
{
   Outlier("Charcoal", 1);
};
R_Date("central post pit (F4): Beta-261304", 610, 60)
{
   Outlier("Charcoal", 1);
};
R_Date("wall post (F1) of house on main plaza: UGAMS-4607", 620, 25)
{
   Outlier("Charcoal", 1);
};
R_Date("charred remains of a house (F8) on the last construction phase of mound
(Mx°10): DIC-904", 660, 55)
{
   Outlier("Charcoal", 1);
};
R_Date("log tomb in Burial Mound (Pp°2): M-888", 675, 75)
{
Outlier("Charcoal", 1);
};
R_Date("timber from burned structure in the lowest level of mound (Mx°1A-41): DIC-393", 630, 65)
{
    Outlier("Charcoal", 1);
};
R_Date("maize from large pit with abundant maize on mound (Mx°1E): UGAMS-6685", 810, 25);
Phase("palisades")
{
    First("start palisade");
    R_Date("palisade post from trench of north palisade: Beta-221835", 810, 60)
    {
        Outlier("Charcoal", 1);
    };
    R_Date("palisade post from trench of western-most palisade: UGAMS-4606", 870, 25)
    {
        Outlier("Charcoal", 1);
    };
    Phase("Western palisade")
    {
        R_Date("palisade post from palisade trench: Beta-221833", 610, 50)
        {
            Outlier("Charcoal", 1);
        };
        R_Date("palisade post from palisade trench: Beta-221834", 680, 70)
        {
            Outlier("Charcoal", 1);
        };
    };
    Last("end palisade");
    Span("span palisades");
};
};
Boundary("End Kincaid");
};
Kincaid (Alternative model)

Plot()
{
 Sequence("Mississippian Occupation")
 {
 Boundary("Start Kincaid");
 Phase(Kincaid village)
 {
 Sequence("Mx°4")
 {
  After("premound level, context not provided")
  {
   Combine("dendro sample")
   {
    R_Date("UGa-3455", 850, 65);
    R_Date("UGa-3456", 890, 65);
    R_Date("UGa-3457", 950, 70);
   };
  };
  Phase("houses")
  {
   R_Date("maize from House III (FXIII): Beta-178763", 780, 40);
   R_Date("House 1 (F7), occupation level 4: DIC-903", 1110, 65)
   {
    Outlier();
   };
  };
  After("Mx°2, large basin (F10)")
  {
   Combine()
   {
    R_Date("Beta-191044a", 1060, 50);
    R_Date("Beta-191044b", 910, 40);
   };
   R_Date("thatch from structure (F6): UGAMS-4695", 870, 25);
  };
  Sequence("West Mound")
  {
   After("submound deposit")
   {
    R_Date("thatch: Beta-216287", 800, 40);
   };
   Phase()
   {
    R_Date("charred debris of a thatch roof (F9) in the upper level of the mound: Beta-216288", 600, 40)
   {
   };
  };
}
R_Date("fragments of log or post from structure 1 in the mound area: Beta-216289", 780, 40);
R_Date("fragments of log or post from structure 2 in the mound area: Beta-216290", 740, 50);
}
};
Phase("Mx°8 circular structure")
{
R_Date("post in wall trench: Beta-237479", 650, 40);
R_Date("central post pit (F4): Beta-261304", 610, 60);
};
R_Date("wall post (F1) of house on main plaza: UGAMS-4607", 620, 25);
After()
{
R_Date("charred remains of a house (F8) on the last construction phase of mound (Mx°10): DIC-904", 660, 55);
};
R_Date("log tomb in Burial Mound (Pp°2): M-888", 675, 75);
R_Date("timber from burned structure in the lowest level of mound (Mx°1A-41): DIC-393", 630, 65);
R_Date("maize from large pit with abundant maize on mound (Mx°1E): UGAMS-6685", 810, 25);
Phase("palisades")
{
First("start palisade");
R_Date("palisade post from trench of north palisade: Beta-221835", 810, 60);
R_Date("palisade post from trench of western-most palisade: UGAMS-4606", 870, 25);
Phase("Western palisade")
{
R_Date("palisade post from palisade trench: Beta-221833", 610, 50);
R_Date("palisade post from palisade trench: Beta-221834", 680, 70);
};
Last("end palisade");
Span("span palisades");
};
};
Boundary("End Kincaid");
};
Moundville

Plot()
{
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
Sequence()
{
  Boundary("Start Moundville");
  Phase("Moundville")
  {
    R_Date("Structure 17 posthole: Uga-1662", 485, 160)
    {
      Outlier("Charcoal", 1);
    }
    R_Date("cane from cache of burned botanical material in Mound W (105R3-R4): Uga-1661", 690, 85);
    Sequence("NR 6N2W South Wall.")
    {
      R_Date("Pit house floor shown in profile: Beta-1485", 990, 65)
      {
        Outlier("Charcoal", 1);
      }
      R_Date("Possible midden or pit house fill: Beta-1290", 930, 80)
      {
        Outlier("Charcoal", 1);
      }
      R_Date("Floor layer: Beta-1106", 1010, 80)
      {
        Outlier("Charcoal", 1);
      }
      R_Date("Midden: Beta-1289", 930, 80)
      {
        Outlier("Charcoal", 1);
      }
      Phase("fallen wall debris in daub layer")
      {
        R_Date("DIC-1241", 120, 60)
        {
          Outlier();
        }
        R_Date("DIC-1243", 690, 60)
        {
          Outlier("Charcoal", 1);
        }
      }
      R_Date("SCB deposit, base of midden zone: Beta-1107", 875, 80)
      {
        Outlier("Charcoal", 1);
      }
    }
  }
}
Phase("ECB Tract")
{
    First("start ECB Tract");
    After("Southern palisade trench fill (F29)")
    {
        R_Date("Beta-53767", 650, 60)
        {
            Outlier("Charcoal", 1);
        }
    }
    Sequence()
    {
        Phase()
        {
            After("Palisade trench fill (F169) north of structures")
            {
                R_Date("Beta-53393", 1100, 110)
                {
                    Outlier("Charcoal", 1);
                }
            }
            After("Bastion trench fill (F159)"
            {
                R_Date("Beta-53392", 1270, 90)
                {
                    Outlier("Charcoal", 1);
                }
            }
            After("Palisade trench fill (F173)"
            {
                R_Date("Beta-53768", 780, 90)
                {
                    Outlier("Charcoal", 1);
                }
            }
        }
        Phase("Pit (F45)")
        {
            R_Date("Beta-53389", 880, 70)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("Beta-53388", 670, 80)
            {
                Outlier("Charcoal", 1);
            }
        }
        R_Date("Pit (F19) within structure 4: Beta-53382", 720, 120);
    }
    Phase("Burial 8 (burial pit, F26)")
R_Date("matting from around the head of burial: Beta-53383", 640, 90);
R_Date("matting from around the head of burial: Beta-53766", 770, 60);
R_Date("Burial 9 (burial pit, F73), matting from around the head of burial: Beta-53391", 490, 80);
Last("end ECB Tract");
Span("span ECB Tract");
R_Date("PA Tract: Unknown material in isolated midden-filled depression (F5): Beta-537668", 580, 70);
R_Date("PA Tract: Unknown material in midden-filled depression (F110) associated with Structure 5.: Beta-53771", 820, 80);
R_Date("PA Tract: Pit (F9) associated with Structures 1, 2, and 6: Beta-53770", 940, 90)
{
    Outlier("Charcoal", 1);
};
R_Date("PA Tract: Midden-filled depression (F15) associated with Structures 1, 2, and 6: Beta-53398", 940, 70)
{
    Outlier("Charcoal", 1);
};
Phase("PA Tract: floor of semi-subterranean (structure 3)")
{
    R_Date("unknown material: Beta-53400", 840, 70);
    R_Date("unknown material: Beta-53401", 1100, 70)
    {
        Outlier();
    }
};
Phase("Mound Q")
{
    sequence("construction stages")
    {
        Phase("Stage II (summit)")
        {
            R_Date("Partially preserved hearth (F128) possibly associated with Structure 3: Beta-86994", 850, 130)
            {
                Outlier("charcoal", 1);
            }
            After("Wall trench (F34) associated with Structure 4")
            {
                R_Date("Beta-82816", 640, 70)
                {
                    Outlier("Charcoal", 1);
                }
            }
            After("Wall trench (F23) associated with Structure 1")
        }
Phase("Stage III")
{
    R_Date("midden: Beta-44468", 760, 80)
    {
        Outlier("charcoal", 1);
    }; 
    After("summit (Stage IIIA)")
    {
        R_Date("Beta-44473", 790, 60)
        {
            Outlier("Charcoal", 1);
        }
    }; 
};
Phase("Stage IV")
{
    R_Date("midden: Beta-44469", 720, 70)
    {
        Outlier("charcoal", 1);
    }
    R_Date("midden: Beta-44471", 650, 60)
    {
        Outlier("charcoal", 1);
    }
    R_Date("midden: Beta-44470", 850, 70)
    {
        Outlier("charcoal", 1);
    }
};
sequence("north flank midden")
{
    Phase("Level I")
    {
        R_Date("Beta-79973", 570, 50)
    }
}
Outlier("charcoal", 1);
}
};
R_Date("Beta-79972", 550, 60)
{
  Outlier("charcoal", 1);
}
};
};
Phase("Level 4")
{
  R_Date("Beta-44467", 770, 70)
  {
    Outlier("charcoal", 1);
  }
  R_Date("Beta-44472", 530, 60)
  {
    Outlier("charcoal", 1);
  }
  R_Date("Beta-44466", 510, 60)
  {
    Outlier("charcoal", 1);
  }
};
sequence("Mound E")
{
  R_Date("premound house basin (F2), old humus zone: Beta-71694", 860, 60)
  {
    Outlier("charcoal", 1);
  }
  After("Stage I")
  {
    R_Date("log retrieved through core: Beta-137378", 840, 60);
    R_Date("erosional sand wash (F34): Beta-71695", 700, 70);
  }
  Phase("Stage II")
  {
    R_Date("hearth (F7), organic zone: Beta-79969", 310, 70)
    {
      Outlier("charcoal", 1);
    }
    R_Date("flank midden: Beta-71697", 660, 70)
    {
      Outlier("Charcoal", 1);
    }
    R_Date("large posthole (F4): Beta-71696", 940, 90)
    {
      Outlier("charcoal", 1);
    }
    After()
{ R_Date("post insertion ramp (F26): Beta-79967", 790, 50)
   { Outlier("charcoal", 1);
   }
   
   After("wall trench (F42) of structure 3")
   {
   R_Date("Beta-79968", 570, 70)
   { 
   
   }
   
   R_Date("cane from smudge pit (F75), associated with structure 2: Beta-115822", 340, 80);
   R_Date("organic zone (Stage IIA): Beta-115827", 650, 60)
   { 
   Outlier("charcoal", 1);
   }
   
   R_Date("hearth in Stage IIA, organic zone: Beta-79970", 470, 40)
   { 
   Outlier("charcoal", 1);
   }
   
   Phase("Stage III")
   {
   Phase("structure I (Stage IIIA)")
   {
   R_Date("Outer rings of charred log in daub concentration (F2): Beta-115826", 320, 60)
   { 
   Outlier("Charcoal", 1);
   }
   
   R_Date("Daub concentration: Beta-79966", 360, 50)
   { 
   Outlier("Charcoal", 1);
   }
   
   R_Date("Post pit (F8, Stage IIIA): Beta-79965", 590, 80)
   { 
   Outlier("charcoal", 1);
   }
   
   Sequence("midden")
   { 
   R_Date("lower section of midden: Beta-115825", 900, 60)
   { 
   Outlier("charcoal", 1);
   }
   
   R_Date("upper section of midden: Beta-115824", 470, 40)
   { 
   Outlier("charcoal", 1);
   }
sequence("Mound R")
{
    R_Date("premound pit (F4): Beta-71693", 1040, 80)
    {
        Outlier("charcoal", 1);
    }
    Phase("Stage I (burned summit)"
    {
        R_Date("Beta-71685", 650, 60)
        {
            Outlier("Charcoal", 1);
        }
        R_Date("Beta-115819", 1020, 110)
        {
            Outlier("Charcoal", 1);
        }
    }
    Phase("Stage II"
    {
        R_Date("burned summit: Beta-71686", 1140, 90)
        {
            Outlier("Charcoal", 1);
        }
        R_Date("burned summit: Beta-115828", 740, 50)
        {
            Outlier("Charcoal", 1);
        }
        R_Date("downslope flank deposit (F10): Beta-115821", 790, 50)
        {
            Outlier("Charcoal", 1);
        }
    }
    Phase("stage III"
    {
        After()
        {
            R_Date("summit fill: Beta-71688", 1920, 130)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("wall trench: Beta-71687", 930, 90)
            {
                Outlier("Charcoal", 1);
            }
        }
        R_Date("architectural feature: Beta-115820", 970, 90)
Phase("Stage IV")
{
    After()
    {
        R_Date("fill near summit: Beta-71689", 510, 60)
        {
            Outlier("charcoal", 1);
        };
        R_Date("charred layer: Beta-115823", 570, 60)
        {
            Outlier("charcoal", 1);
        };
        R_Date("flank midden: Beta-71690", 1160, 120)
        {
            Outlier("charcoal", 1);
        };
        R_Date("flank midden: Beta-82815", 520, 60)
        {
            Outlier("charcoal", 1);
        };
    }
    Phase("Stage V")
    {
        R_Date("charred layer: Beta-71691", 640, 60)
        {
            Outlier("charcoal", 1);
        };
        R_Date("flank midden: Beta-71692", 500, 60)
        {
            Outlier("charcoal", 1);
        };
    }
    sequence("Mound F")
    {
        After("Stage I")
        {
            R_Date("fill, lower zone: Beta-71698", 750, 70)
            {
                Outlier("Charcoal", 1);
            };
            R_Date("fill, lower zone: Beta-71699", 780, 60)
            {
                Outlier("Charcoal", 1);
            };
        }
    };
}
sequence("Mound G")
{
  After("fill of old humus layer")
  {
    R_Date("Beta-71708", 1010, 80)
    {
      Outlier("charcoal", 1);
    }
  }
  R_Date("Stage I midden, lower flank: Beta-71709", 740, 50)
  {
    Outlier("Charcoal", 1);
  }
  Phase("Stage II")
  {
    R_Date("midden, summit: Beta-71704", 640, 70)
    {
      Outlier("charcoal", 1);
    }
    R_Date("midden, lower flank: Beta-71710", 780, 50)
    {
      Outlier("charcoal", 1);
    }
    After("fill, summit")
    {
      R_Date("Beta-71703", 640, 50);
    }
  }
  Phase("Stage III")
  {
    After("fill, summit")
    {
      R_Date("Beta-71705", 660, 60);
    }
    R_Date("midden, lower flank: Beta-71711", 580, 50)
    {

Outlier("charcoal", 1);
};
};
After("stage IV fill, summit")
{
  R_Date("Beta-71706", 510, 60);
};
};
Phase("Mound V")
{
  After("fill of east berm, structure 1 (F8)")
  {
    R_Date("Beta-161959", 590, 60)
    {

    }
  };
  Phase("structure 1b")
  {
    R_Date("roof support post (F33): Beta-161962", 540, 50)
    {
      Outlier("charcoal", 1);
    };
    R_Date("roof beam: Beta-161961", 240, 60)
    {
      Outlier("charcoal", 1);
    };
    R_Date("corner post of structure 2: Beta-161960", 570, 60)
    {
      Outlier("charcoal", 1);
    };
  };
}
Boundary("End Moundville");
};
Moundville (Alternative model)

Plot()
{
  Sequence()
  {
    Boundary("Start Moundville");
    Phase("Moundville")
    {
      R_Date("Structure 17 posthole: Uga-1662", 485, 160);
      R_Date("cane from cache of burned botanical material in Mound W (105R3-R4): Uga-1661", 690, 85);
    }
    Sequence("NR 6N2W South Wall.")
    {
      R_Date("Pit house floor shown in profile: Beta-1485", 990, 65);
      R_Date("Possible midden or pit house fill: Beta-1290", 930, 80);
      R_Date("Floor layer: Beta-1106", 1010, 80);
      R_Date("Midden: Beta-1289", 930, 80);
    }
    Phase("fallen wall debris in daub layer")
    {
      R_Date("DIC-1241", 120, 60)
      {
        Outlier();
      }; R_Date("DIC-1243", 690, 60);
      ;
      ;
    }
    R_Date("SCB deposit, base of midden zone: Beta-1107", 875, 80);
    Phase("ECB Tract")
    {
      First("start ECB Tract");
      After("Southern palisade trench fill (F29)")
      {
        R_Date("Beta-53767", 650, 60);
      }
    }
  }
}
After("Pit (F45)")
{
  R_Date("Beta-53389", 880, 70);
  R_Date("Beta-53388", 670, 80);
};
R_Date("Pit (F19) within structure 4: Beta-53382", 720, 120);
Phase("Burial 8 (burial pit, F26)"
{
  R_Date("matting from around the head of burial: Beta-53383", 640, 90);
  R_Date("matting from around the head of burial: Beta-53766", 770, 60);
};
R_Date("Burial 9 (burial pit, F73), matting from around the head of burial: Beta-53391", 490, 80);
Last("end ECB Tract");
Span("span ECB Tract");
};
After()
{
  R_Date("PA Tract: Unknown material in isolated midden-filled depression (F5): Beta-537668", 580, 70);
};
After()
{
  R_Date("PA Tract: Unknown material in midden-filled depression (F110) associated with Structure 5.: Beta-53771", 820, 80);
};
After()
{
  R_Date("PA Tract: Pit (F9) associated with Structures 1, 2, and 6: Beta-53770", 940, 90);
};
After()
{
  R_Date("PA Tract: Midden-filled depression (F15) associated with Structures 1, 2, and 6: Beta-53398", 940, 70);
};
After("PA Tract: floor of semi-subterranean (structure 3)"
{
  R_Date("unknown material: Beta-53400", 840, 70);
  R_Date("unknown material: Beta-53401", 1100, 70)
  {Outlier();
  }
};
Phase("Mound Q")
{
  sequence("construction stages")
}
Phase("Stage II (summit)"")
{
  R_Date("Partially preserved hearth (F128) possibly associated with Structure 3: Beta-86994", 850, 130);
  After("Wall trench (F34) associated with Structure 4")
  {
    R_Date("Beta-82816", 640, 70);
  };
  After("Wall trench (F23) associated with Structure 1")
  {
    R_Date("Beta-86993", 480, 80);
  };
  After("wall trench (F77) associated with Structure 2")
  {
    R_Date("Beta-79971", 450, 60)
    {
      Outlier();
    };
  };
}
Phase("Stage III")
{
  After()
  {
    R_Date("midden: Beta-44468", 760, 80);
  };
  After("summit (Stage IIIA)"")
  {
    R_Date("Beta-44473", 790, 60);
  };
}
Phase("Stage IV")
{
  R_Date("midden: Beta-44469", 720, 70);
  R_Date("midden: Beta-44471", 650, 60);
  After()
  {
    R_Date("midden: Beta-44470", 850, 70);
  };
}
sequence("north flank midden")
{
  Phase("Level I")
  {
    R_Date("Beta-79973", 570, 50);
    R_Date("Beta-79972", 550, 60);
  };
  Phase("Level 4")
sequence("Mound E")
{
  R_Date("premound house basin (F2), old humus zone: Beta-71694", 860, 60);
  After("Stage I")
  {
    R_Date("log retrieved through core: Beta-137378", 840, 60);
    R_Date("erosional sand wash (F34): Beta-71695", 700, 70);
  }
  Phase("Stage II")
  {
    R_Date("hearth (F7), organic zone: Beta-79969", 310, 70)
    {
      Outlier();
    }
    R_Date("flank midden: Beta-71697", 660, 70);
    After()
    {
      R_Date("large posthole (F4): Beta-71696", 940, 90);
    }
    After()
    {
      R_Date("post insertion ramp (F26): Beta-79967", 790, 50);
    }
    After("wall trench (F42) of structure 3")
    {
      R_Date("Beta-79968", 570, 70)
      {
      }
    }
    R_Date("cane from smudge pit (F75), associated with structure 2: Beta-115822", 340, 80)
    {
      Outlier();
    }
  }
  R_Date("organic zone (Stage IIA): Beta-115827", 650, 60);
  R_Date("hearth in Stage IIA, organic zone: Beta-79970", 470, 40)
  {
    Outlier();
  }
};
Phase("Stage III")
{
    Phase("structure I (Stage IIIA)")
    {
        R_Date("Outer rings of charred log in daub concentration (F2): Beta-115826", 320, 60);
        R_Date("Daub concentration: Beta-79966", 360, 50);
    };
    R_Date("Post pit (F8, Stage IIIA): Beta-79965", 590, 80);
    Sequence("midden")
    {
        After()
        {
            R_Date("lower section of midden: Beta-115825", 900, 60);
        };
        R_Date("upper section of midden: Beta-115824", 470, 40);
    };
};
sequence("Mound R")
{
    R_Date("premound pit (F4): Beta-71693", 1040, 80);
    Phase("Stage I (burned summit)")
    {
        R_Date("Beta-71685", 650, 60)
        {
            Outlier();
        };
        R_Date("Beta-115819", 1020, 110);
    };
    Phase("Stage II")
    {
        After()
        {
            R_Date("burned summit: Beta-71686", 1140, 90);
        };
        R_Date("burned summit: Beta-115828", 740, 50);
        R_Date("downslope flank deposit (F10): Beta-115821", 790, 50);
    };
    Phase("stage III")
    {
        After()
        {
            R_Date("summit fill: Beta-71688", 1920, 130);
            R_Date("wall trench: Beta-71687", 930, 90);
        };
        R_Date("architectural feature: Beta-115820", 970, 90)
        {
            Outlier();
        };
    };
}
Phase("Stage IV")
{
  After()
  {
    R_Date("fill near summit: Beta-71689", 510, 60);
  }
  R_Date("charred layer: Beta-115823", 570, 60);
  After()
  {
    R_Date("flank midden: Beta-71690", 1160, 120);
  }
  R_Date("flank midden: Beta-82815", 520, 60);
}
Phase("Stage V")
{
  R_Date("charred layer: Beta-71691", 640, 60);
  R_Date("flank midden: Beta-71692", 500, 60);
}
sequence("Mound F")
{
  After("Stage I")
  {
    R_Date("fill, lower zone: Beta-71698", 750, 70);
    R_Date("fill, lower zone: Beta-71699", 780, 60);
    R_Date("fill, upper zone: Beta-71700", 800, 70);
    R_Date("fill, upper zone: Beta-71701", 700, 80);
  }
  R_Date("Stage III flank midden: Beta-71702", 880, 60);
}
sequence("Mound G")
{
  After("fill of old humus layer")
  {
    R_Date("Beta-71708", 1010, 80);
  }
  R_Date("Stage I midden, lower flank: Beta-71709", 740, 50);
  Phase("Stage II")
  {
    R_Date("midden, summit: Beta-71704", 640, 70);
    R_Date("midden, lower flank: Beta-71710", 780, 50);
    After("fill, summit")
    {
      R_Date("Beta-71703", 640, 50);
    }
  }
  Phase("Stage III")
  {
    After("fill, summit")
  }
{ R_Date("Beta-71705", 660, 60); }
R_Date("midden, lower flank: Beta-71711", 580, 50);
);
After("stage IV fill, summit")
{
  R_Date("Beta-71706", 510, 60);
};
Phase("Mound V")
{
  After("fill of east berm, structure 1 (F8)")
  {
    R_Date("Beta-161959", 590, 60)
    {
      
    }
  };
  Phase("structure 1b")
  {
    R_Date("roof support post (F33): Beta-161962", 540, 50);
    R_Date("roof beam: Beta-161961", 240, 60)
    {
      Outlier();
    };
    R_Date("corner post of structure 2: Beta-161960", 570, 60);
  };
  Boundary("End Moundville");
};
Southwind

Plot()
{
    Outlier_Model("Charcoal", Exp(1, -10, 0), U(0, 3), "r");
    Sequence()
    {
        Boundary("Start Southwind");
        Phase("Southwind")
        {
            Sequence()
            {
                R_Date("Pit (F08-3): Beta-248604", 900, 40)
                {
                    Outlier("Charcoal", 1);
                }
                Phase(palisade)
                {
                    First("start palisade");
                    R_Date("Post mold at the base of the stockade trench (F01-1B): Beta-310905", 520, 30)
                    {
                        Outlier("Charcoal", 1);
                    }
                    R_Date("Post mold at the base of the stockade trench (F01-1C): Beta-310906", 850, 30)
                    {
                        Outlier("Charcoal", 1);
                    }
                    R_Date("Palisade bastion post mold (F10-02F): Beta-248607", 880, 40)
                    {
                        Outlier("Charcoal", 1);
                    }
                    Last("end palisade");
                    Span("span palisade");
                }
            }
            R_Date("Circular stain with burnt wood and daub fragments (F04-1): Beta-248603", 350, 40)
            {
                Outlier();
            }
            R_Date("Circular stain with daub and charcoal fragments (F04-14): Beta-248605", 700, 40)
            {
                Outlier("Charcoal", 1);
            }
            R_Date("Oblong soil stain with daub and charcoal fragments (F05-9): Beta-248606", 760, 40)
        }
    }
}
Outlier("Charcoal", 1);
};
After("Large feature that may be the possible remnants of a rectangular structure (F04-13)")
{
  R_Date("Beta-248608", 760, 40)
  {
    Outlier("Charcoal", 1);
  }
  R_Date("maize from smudge pit (PH-WB-21): UGa-4715", 890, 135);
};
Boundary("End Southwind");
};
Southwind (Alternative model)

Plot()
{
    Sequence()
    {
        Boundary("Start Southwind");
        Phase("Southwind")
        {
            Sequence()
            {
                R_Date("Pit (F08-3): Beta-248604", 900, 40)
                {
                    Phase(palisade)
                    {
                        First("start palisade");
                        R_Date("Post mold at the base of the stockade trench (F01-1B): Beta-310905", 520, 30)
                        {
                            R_Date("Post mold at the base of the stockade trench (F01-1C): Beta-310906", 850, 30)
                        };
                        R_Date("Palisade bastion post mold (F10-02F): Beta-248607", 880, 40)
                    };
                    Last("end palisade");
                    Span("span palisade");
                }
                R_Date("Circular stain with burnt wood and daub fragments (F04-1): Beta-248603", 350, 40)
                {
                    Outlier();
                };
                R_Date("Circular stain with daub and charcoal fragments (F04-14): Beta-248605", 700, 40)
                {
                };
                R_Date("Oblong soil stain with daub and charcoal fragments (F05-9): Beta-248606", 760, 40)
                {
                };
                After("Large feature that may be the possible remnants of a rectangular structure (F04-13)"
                {
                    R_Date("Beta-248608", 760, 40)
                };
            };
            R_Date("Beta-248603", 350, 40)
        };
        R_Date("Beta-248605", 700, 40)
    };
    R_Date("Beta-248606", 760, 40)
}
R_Date("maize from smudge pit (PH-WB-21): UGa-4715", 890, 135);
Boundary("End Southwind");
Appendix D. Description of Bayesian models and results

Angel Mounds

Fifty-six radiocarbon results from Angel Mounds have been modeled (Appendix A). One radiocarbon result (Beta-309046) is from a sample of unidentified bark found in a palisade posthole (W-11-D) in a section of the palisade (East Village heavy trench) superimposed by separate dated palisade section (East Village palisade) and a house dated (Beta-284697) through a wood charcoal (*Acer* sp.) sample from wall trench fill. Three radiocarbon results (Beta-278197, Beta-278198, Beta-284697) from the East Village palisade come from wood charcoal (*Robinia pseudoacacia*, *Carya* sp., and *Acer* sp.) found in palisade trench fill. A different palisade section (East Village screen) shares an architectural relationship with the East Village palisade, suggesting contemporaneity (Black 1967). A radiocarbon result (Beta-284695) from the East Village screen comes from unidentified wood charcoal found in palisade trench fill. A radiocarbon result (Beta-309045) comes from charred cane (*Arundinaria gigantean*) found in a stratum of burned materials (W-10-D) superimposed by the East Village palisade. An additional radiocarbon result comes from unidentified nutshell from a large pit (X-11-B/ Feature 37) that appears to underlie the East Village palisade (Black 1967; Peterson 2010).

A radiocarbon result (Beta-234734) is also available from a large piece of charred wood (*Fraxinus sp.*) found at the base of a palisade trench (M13D/5R3). An additional radiocarbon result (Beta-241196) is from a sample of wood charcoal (*Ulmus rubra*) found in a posthole of a palisade bastion (0-7-C). Seven additional
radiocarbon results (Beta-284695, Beta-241195, Beta-284696, Beta-241193, Beta-278196, Beta-286636, Beta-278199) come from wood charcoal (*Cary sp.*, *Fraxinus sp.*, *Quercus sp.*, and unidentified) found in palisade trench fill. All wood charcoal dates from palisade trench and wall trench fill are modeled as TPQ because the origin of the dated wood charcoal is unknown and very well may come from a time prior to palisade construction.

The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B. Two dates (DIC-2359, DIC-1023) from unidentified wood charcoal were excluded from modeling because they are clear outliers when compared to the other dates due to their much younger age. Six additional dates (M-2, M-4, M-9, M-5, M-7, M-10) were excluded from modeling because they are early Michigan dates run with carbon black and were noted to not be reliable by the Michigan radiocarbon laboratory (Crane and Griffin 1964:8). Additionally, a date (Beta-265981) from residue adhering to the interior surface of a Mississippian pottery sherd is excluded from analysis because it has been found to be an outlier much earlier than the other dates (Reber et al. 2015).

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=86.7$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in *cal A.D. 1215–1285* (95% probability; Figure 2; *Angel Mounds:* start palisade), probably in *cal A.D. 1225–1275* (68% probability). The final activity associated with the palisade is estimated to have occurred in *cal A.D. 1310–1430* (95% probability; Figure 2; *Angel Mounds:* end
palisade), probably in cal A.D. 1345–1415 (68% probability). The palisade is estimated to have lasted for 50–195 years (95% probability; Figure 3; Angel Mounds: palisade span), probably for 85–165 years (68% probability).
Figure D.1. Results and structure of the primary chronological model for Angel Mounds. The brackets and keywords define the model structure. The outlined distribution is the result of radiocarbon calibration and the solid distributions are the chronological model results.

Aztalan

Seventeen radiocarbon results from Aztalan have been modeled (Appendix A). Two of these (Beta-310903, Beta-310904) are from the outer rings of two preserved posts from a palisade bastion (Tower B in 1,4). It is feasible that these two samples are the same age, as the measurements pass a chi-square test ($T=0.5; \text{df}=1; T'(0.05)=3.8$), suggesting that the palisade may have been constructed in the time range of their combined date (cal A.D. 1030–1160, 95% probability). The palisade superimposes a possible pit (Feature 30) dated with a sample of unidentified wood charcoal (WIS-191). The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B. One result was excluded from modeling (M-642), this sample was submitted for radiocarbon dating in the 1950s to the Michigan laboratory and is a clear outlier when compared to the other dates due to its much younger age.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}}=82$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1045–1230 (95% probability;
Figure 2; Aztalan: start palisade), probably in cal A.D. 1080–1180 (68% probability).

The final activity associated with the palisade is estimated to have occurred in cal A.D. 1075–1315 (95% probability; Figure 2; Aztalan: end palisade), probably in cal A.D. 1120–1230 (68% probability). The palisade is estimated to have lasted for 1–130 years (95% probability; Figure 3; Aztalan: palisade span), probably for 1–60 years (68% probability).
Figure D.2. Results and structure of the primary chronological model for Aztalan. The brackets and keywords define the model structure. The format is as described in Figure D.1.

*Cahokia*

One hundred forty-four radiocarbon results from Cahokia have been modeled (Appendix A). The palisade is dated through four radiocarbon results from samples of preserved wooden posts (WIS-444, WIS-359, WIS-366, Beta-148265) from different palisade sections and two samples from unidentified charcoal (Beta-150315, Beta-148263) from palisade trench contexts. Three radiocarbon results (WIS-493, WIS-494, WIS-495) are also available from preserved timbers from structures superimposed by the palisade. An additional radiocarbon result (GX-859) is available from unidentified material found in a house feature underlying the palisade (Anderson 1969:92) and a radiocarbon result (Beta-148266) is available from unidentified charcoal from a midden layer superimposed by the palisade (Trubitt 2001; Trubitt and Kelly 2012). The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B. Two radiocarbon results (ISGS-283, M-1295) from unidentified organic material were excluded from modeling because they are clear outliers when compared to the other dates due to their much older ages and also because exactly what was dated is unclear (Crane and Griffin 1963:236; Fowler 1963:50, 1997:213; Liu et al. 1986:79).

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement.
(A_{model}=100.5) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in \textit{cal A.D. 1215–1355} (95\% probability; Figure 2; \textit{Cahokia: start palisade}), probably in \textit{cal A.D. 1245–1315} (68\% probability). The final activity associated with the palisade is estimated to have occurred in \textit{cal A.D. 1305–1465} (95\% probability; Figure 2; \textit{Cahokia: end palisade}), probably in \textit{cal A.D. 1355–1440} (68\% probability). The palisade is estimated to have lasted for 20–195 years (95\% probability; Figure 3; \textit{Cahokia: palisade span}), probably for 55–150 years (68\% probability).
Figure D.3. Results and structure of the primary chronological model for Cahokia.

The brackets and keywords define the model structure. The format is as described in Figure D.1.
Etowah

Twenty-one radiocarbon results from Etowah have been modeled (Appendix A). Two of these (Beta-134792, Beta-134793) are from charred wooden palisade posts. The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}}=106.9$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1100–1430 (95% probability; Figure 2; Etowah: start palisade), probably in cal A.D. 1180–1350 (68% probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1230–1590 (95% probability; Figure 2; Etowah: end palisade), probably in cal A.D. 1280–1460 (68% probability). The palisade is estimated to have lasted for 1–320 years (95% probability; Figure 3; Etowah: palisade span), probably for 1–160 years (68% probability).
Figure D.4. Results and structure of the primary chronological model for Etowah. The brackets and keywords define the model structure. The format is as described in Figure D.1.

**Kincaid**

Twenty-three radiocarbon results from Kincaid have been modeled (Appendix A).
Four of these (Beta-221835, UGAMS-4606, Beta-221833, Beta-221834) are from charred wooden palisade posts. The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=89.4$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1155–1285 (95% probability; Figure 2; Kincaid: start palisade), probably in cal A.D. 1175–1245 (68% probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1295–1440 (95% probability; Figure 2; Kincaid: end palisade), probably in cal A.D. 1325–1405 (68% probability). The palisade is estimated to have lasted for 60–240 years (95% probability; Figure 3; Kincaid: palisade span), probably for 105–200 years (68% probability).
Figure D.5. Results and structure of the primary chronological model for Kincaid. The brackets and keywords define the model structure. The format is as described in Figure D.1.

**Moundville**

Ninety radiocarbon results from Moundville have been modeled (Appendix A). Four of these (Beta-53767, Beta-53393, Beta-53392, Beta-53668) come from unidentified
wood charcoal found in palisade trenches (Feature 29, Feature 169, Feature 159, Feature 173). Three of these (Feature 169, Feature 159, Feature 173) are superimposed by a pit (Feature 34) dated through unidentified charcoal (Beta-53389, Beta-53388). The unidentified wood charcoal dates from palisade trenches are modeled as TPQ because the origin of the dated wood charcoal is unknown and very well may come from a time prior to palisade construction.

The dated palisade sections come from the ECB Tract, as do four other dated features (Feature 34, Feature 19, Burial 8, Burial 9). The chronological model for Moundville cannot reliably estimate the timing of palisade construction because there are no direct dates from the palisade or its use. Instead, the model provides an estimate for the beginning, ending, and span of activity for the ECB Tract. The dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B. Two results were excluded from modeling (DIC-1241, Beta-53401) because they are clear outliers when compared to the other dates, calibrating to cal A.D. 1660–1950 and cal A.D. 720–1120, respectively. Another result (Beta-115820) was also excluded from modeling because its context is unclear from the published description.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=86.8$) between the radiocarbon dates and the model assumptions. The model estimates that activity in the ECB Tract began in cal A.D. 1180–1300 (95% probability; Figure 2; Moundville: start ECB Tract), probably in cal A.D. 1225–1275 (68% probability). The final activity associated with the ECB Tract is estimated to
have occurred in cal A.D. 1365–1600 (95% probability; Figure 2; Moundville: ECB Tract), probably in cal A.D. 1400–1520 (68% probability). Activity in the ECB Tract is estimated to have lasted for 100–360 years (95% probability; Figure 3; Moundville: ECB Tract span), probably for 145–280 years (68% probability).
Figure D.6. Results and structure of the primary chronological model for Moundville. The brackets and keywords define the model structure. The format is as described in Figure D.1.

\textit{Southwind (12PO265)}

Nine radiocarbon results from Southwind have been modeled (Appendix A). Three of these (Beta-310905, Beta-310906, Beta-248607) are from wood charcoal (\textit{Gleditsia} or \textit{Gymnocladus}, Diffuse-porous hardwood, and unidentified) samples found in palisade post molds. The palisade overlies a pit (Feature 08-3) dated (Beta-248604) with a sample of unidentified wood charcoal. The remaining dated contexts are described in Appendix A and the stratigraphic relationships between samples are shown in Appendix B. One result was excluded from modeling (Beta-248603) because it is a clear outlier when compared to the other dates due to its much younger age. Four dates (UGa-4645, UGa-4646, UGa-4647, UGa-4716) from Southwind have unknown age offsets from coal contamination and were not included in modeling (Munson 1994:Table 15.3; Tankersley et al. 1987).

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=93.5$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in \textit{cal A.D. 1075–1295 (95\% probability; Figure 2; Southwind: start palisade)}, probably in \textit{cal A.D. 1160–1230 (68\% probability}). The final activity associated with the palisade is estimated to have occurred in \textit{cal A.D. 1310–1470 (95\% probability; Figure 2; Southwind: end}}
palisade), probably in cal A.D. 1320–1440 (68% probability). The palisade is estimated to have lasted for 65–320 years (95% probability; Figure 3; Southwind: palisade span), probably for 115–260 years (68% probability).

Figure D.7. Results and structure of the primary chronological model for Southwind. The brackets and keywords define the model structure. The format is as described in Figure D.1.

Annis Village

Three radiocarbon results from Annis Village are available (Appendix A). Two of these (Beta-181396, Beta-181398) are from unidentified wood charcoal fragments.
found in palisade trench fill. An additional radiocarbon result (Beta-181397) is from unidentified charred nutshell found in palisade trench fill. These three results serve as TPQ for palisade construction because the origin of the dated samples is unknown and very well may come from a time prior to palisade construction. These results were not modeled because the Annis Village radiocarbon dataset is not robust enough to construct a meaningful chronological model. The 95% calibrations for the three dates ranges are cal A.D. 1270–1400 (Beta-181396), cal A.D. 1280–1400 (Beta-181398), and cal A.D. 1250–1390 (Beta-181397) (Appendix A), suggesting that the palisade was constructed after cal A.D. 1250–1390 (Beta-181397).

Jonathan Creek

Four radiocarbon results from Jonathan Creek are available (Appendix A). One radiocarbon result (Beta-180074) is from a maize kernel found in a small pit associated with a structure (Feature 13) that overlies a palisade (Feature 15). Another radiocarbon result (Beta-180075) is from the outer rings of unidentified charred wood fragment from a structure (Feature 31) on a small mound that overlies a palisade (Feature 7). While the Jonathan Creek radiocarbon database is not robust enough to construct a meaningful chronological model, these two dates likely date a time after the palisade construction started and have 95% calibrations at cal A.D. 1160–1280 and cal A.D. 1160–1290, respectively (Appendix A), suggesting that the palisade was likely constructed before cal A.D. 1160–1290 (Beta-180074). The end of palisade construction at Jonathan Creek is effectively unknown, although the available radiocarbon data does not extend into the A.D. 1400s (Appendix A; Schroeder 2006).
Appendix E. Description of alternative Bayesian models and results

Angel Mounds (alternative)

An alternative Bayesian model was created for Angel Mounds by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=84.4$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1215–1285 (95% probability), probably in cal A.D. 1225–1275 (68% probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1305–1420 (95% probability), probably in cal A.D. 1340–1410 (68% probability). The palisade is estimated to have lasted for 45–190 years (95% probability), probably for 80–160 years (68% probability).
Figure E.1. Results and structure of the alternative chronological model for Angel Mounds. The brackets and keywords define the model structure. The format is as described in Figure D.1.
An alternative Bayesian model was created for Aztalan by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}}=78.6$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in $\text{cal A.D. } 1035–1155$ (95% probability; Figure 2), probably in $\text{cal A.D. } 1060–1140$ (68% probability). The final activity associated with the palisade is estimated to have occurred in $\text{cal A.D. } 1070–1210$ (95% probability), probably in $\text{cal A.D. } 1100–1170$ (68% probability). The palisade is estimated to have lasted for $1–105$ years (95% probability), probably for $1–55$ years (68% probability).
Figure E.2. Results and structure of the alternative chronological model for Aztalan.

The brackets and keywords define the model structure. The format is as described in Figure D.1.

**Cahokia (alternative)**

An alternative Bayesian model was created for Cahokia by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1
(Appendix A) were modeled as $TPQ$ and charcoal outlier modeling was not used. Without the charcoal outlier modeling, a date (WIS-988) had to be excluded from the model due to its much older age and a second date (Beta-241384) due to its much younger age.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}}=77.2$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in $\text{cal A.D. 1175–1270 (95\% probability)}$, probably in $\text{cal A.D. 1205–1260 (68\% probability)}$. The final activity associated with the palisade is estimated to have occurred in $\text{cal A.D. 1255–1400 (95\% probability)}$, probably in $\text{cal A.D. 1270–1390 (68\% probability)}$. The palisade is estimated to have lasted for $\text{10–190 years (95\% probability)}$, probably for $\text{30–155 years (68\% probability)}$. 
Figure E.3. Results and structure of the alternative chronological model for Cahokia.
The brackets and keywords define the model structure. The format is as described in
Figure D.1.

*Etowah (alternative)*

An alternative Bayesian model was created for Etowah by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{model}=96.6$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in *cal A.D. 1025–1255 (95% probability)*, probably in *cal A.D. 1045–1225 (68% probability)*. The final activity associated with the palisade is estimated to have occurred in *cal A.D. 1160–1390 (95% probability)*, probably in *cal A.D. 1220–1295 (68% probability)*. The palisade is estimated to have lasted for *1–260 years (95% probability)*, probably for *1–180 years (68% probability)*.
Figure E.4. Results and structure of the alternative chronological model for Etowah.

The brackets and keywords define the model structure. The format is as described in Figure D.1.
An alternative Bayesian model was created for Kincaid by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used. Without the charcoal outlier modeling, a date (DIC-903) had to be excluded from the model due to its much older age.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement \(A_{\text{model}}=67.1\) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1155–1245 (95% probability), probably in cal A.D. 1180–1220 (68% probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1285–1400 (95% probability), probably in cal A.D. 1300–1380 (68% probability). The palisade is estimated to have lasted for 70–220 years (95% probability), probably for 100–185 years (68% probability).
Figure E.5. Results and structure of the alternative chronological model for Kincaid.

The brackets and keywords define the model structure. The format is as described in Figure D.1.
An alternative Bayesian model was created for Moundville by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used. Without the charcoal outlier modeling, seven dates (Beta-71690, Beta-71686, Beta-115825, Beta-44470, Beta-44467, Beta-71696, Beta-44468) had to be modeled as TPQ due their much older age and six dates (Beta-79970, Beta-115822, Beta-79969, Beta-79971, Beta-71685, Beta-161961) had to be excluded from modeling due to their much younger age.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}} = 61.7$) between the radiocarbon dates and the model assumptions. The model estimates that activity in the ECB Tract began in cal A.D. 1125–1295 (95% probability), probably in cal A.D. 1185–1275 (68% probability). The final activity associated with the ECB Tract is estimated to have occurred in cal A.D. 1320–1480 (95% probability), probably in cal A.D. 1380–1460 (68% probability). Activity in the ECB Tract is estimated to have lasted for 70–300 years (95% probability), probably for 130–250 years (68% probability).
Figure E.6. Results and structure of the alternative chronological model for Moundville. The brackets and keywords define the model structure. The format is as described in Figure D.1.
An alternative Bayesian model was created for Southwind by slightly modifying the primary model described in Appendix D. Specifically, all samples ranked 1 (Appendix A) were modeled as TPQ and charcoal outlier modeling was not used.

The algorithm used for this model can be directly derived from the model structure shown in Appendix B and Appendix C. The model shows good overall agreement ($A_{\text{model}}=92.9$) between the radiocarbon dates and the model assumptions. The model estimates that the palisade was constructed in cal A.D. 1065–1245 (95% probability), probably in cal A.D. 1160–1210 (68% probability). The final activity associated with the palisade is estimated to have occurred in cal A.D. 1310–1440 (95% probability), probably in cal A.D. 1320–1430 (68% probability). The palisade is estimated to have lasted for 90–300 years (95% probability), probably for 115–260 years (68% probability).
Figure E.7. Results and structure of the alternative chronological model for Southwind. The brackets and keywords define the model structure. The format is as described in Figure D.1.
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