Supplemental Material

CONTACT-ERA CHRONOLOGY-BUILDING IN IROQUOIA: AGE-ESTIMATES FOR ARENDARHONON SITES AND IMPLICATIONS FOR IDENTIFYING CHAMPLAIN'S CAHIAGUÉ

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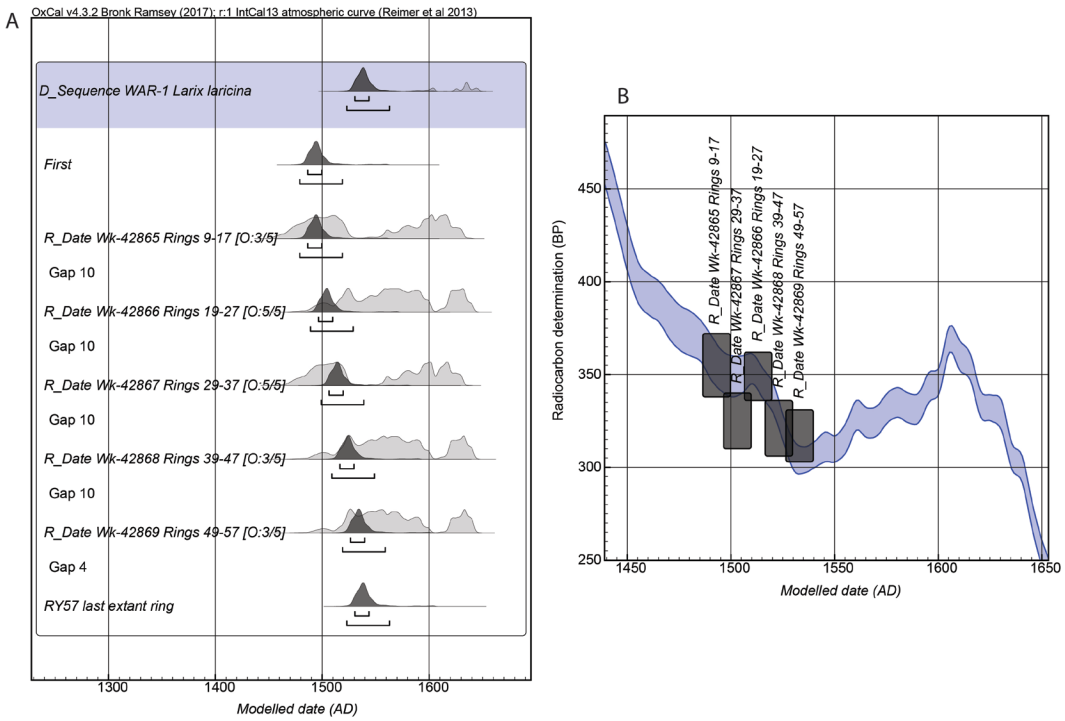
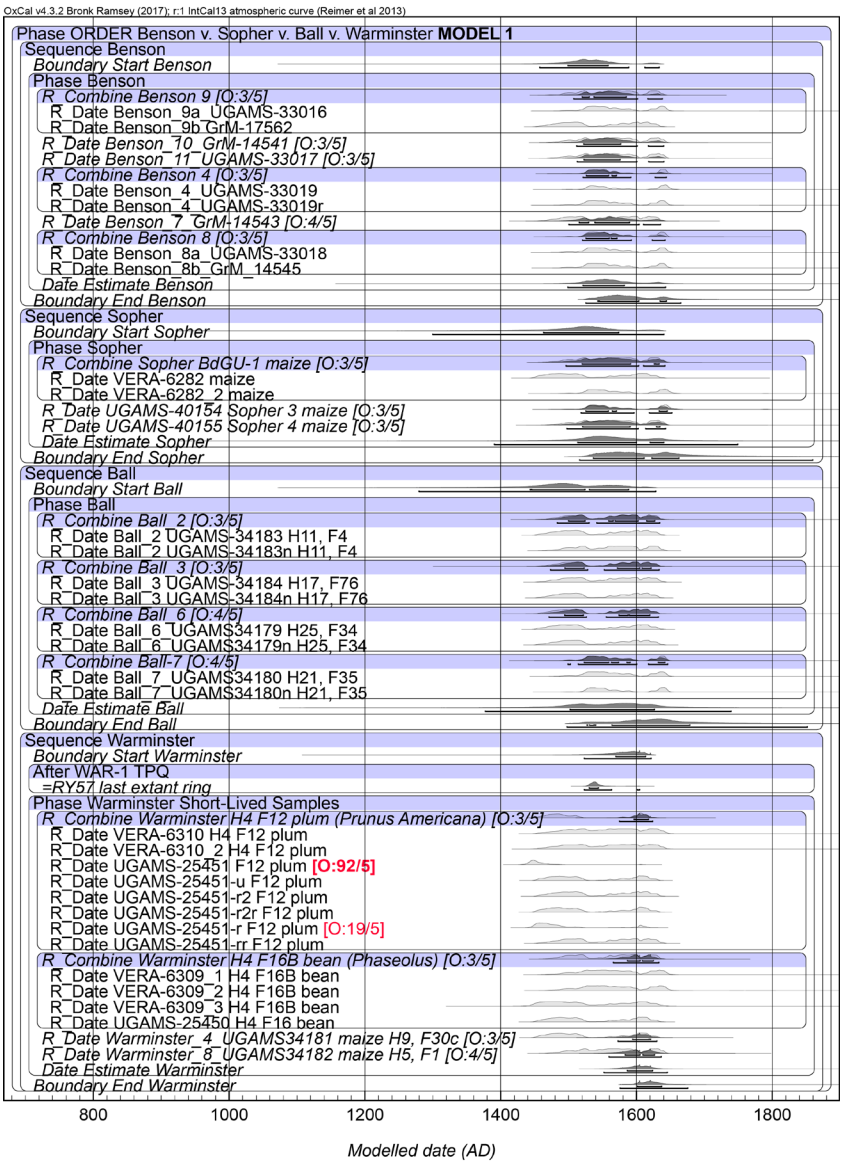
Supplemental Text

Supplemental Figures 1–7

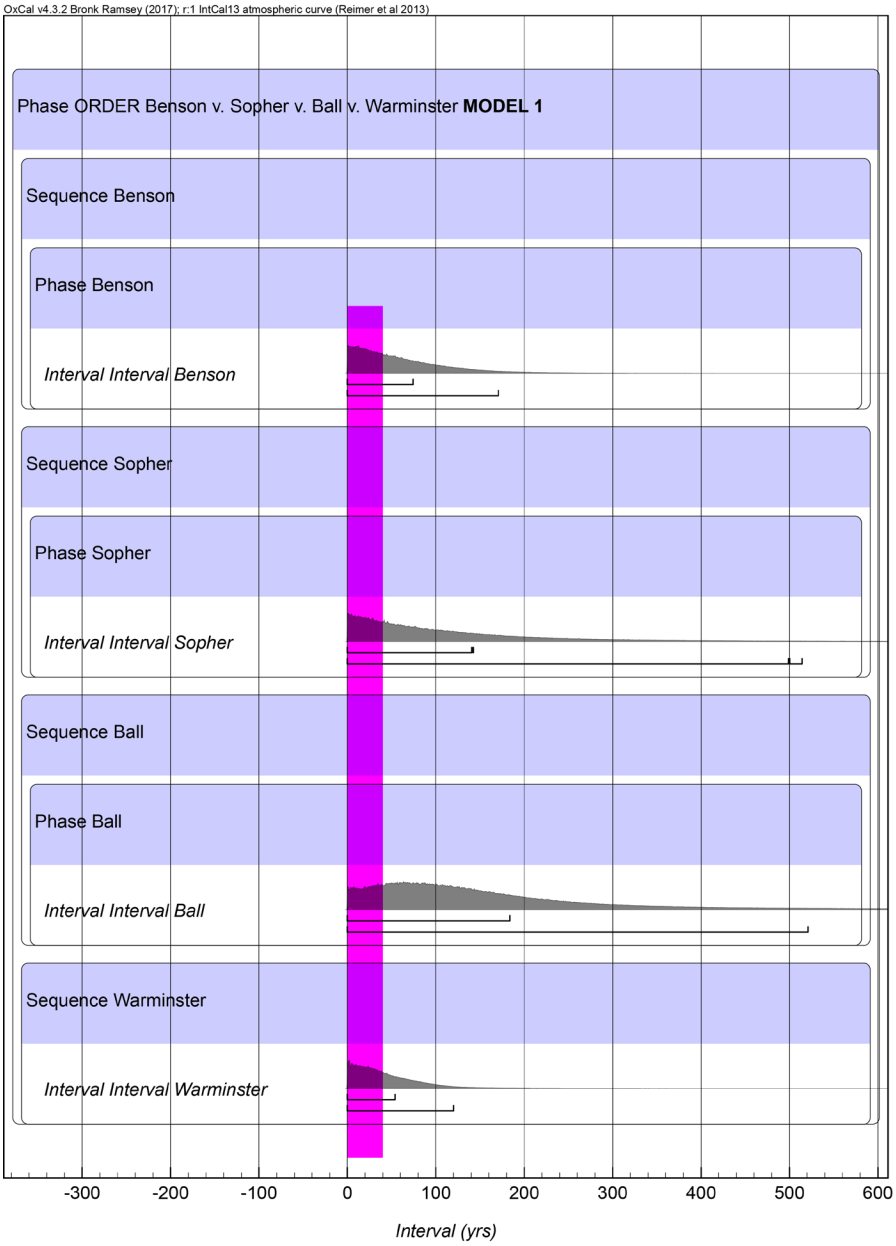
Supplemental Tables 1–9



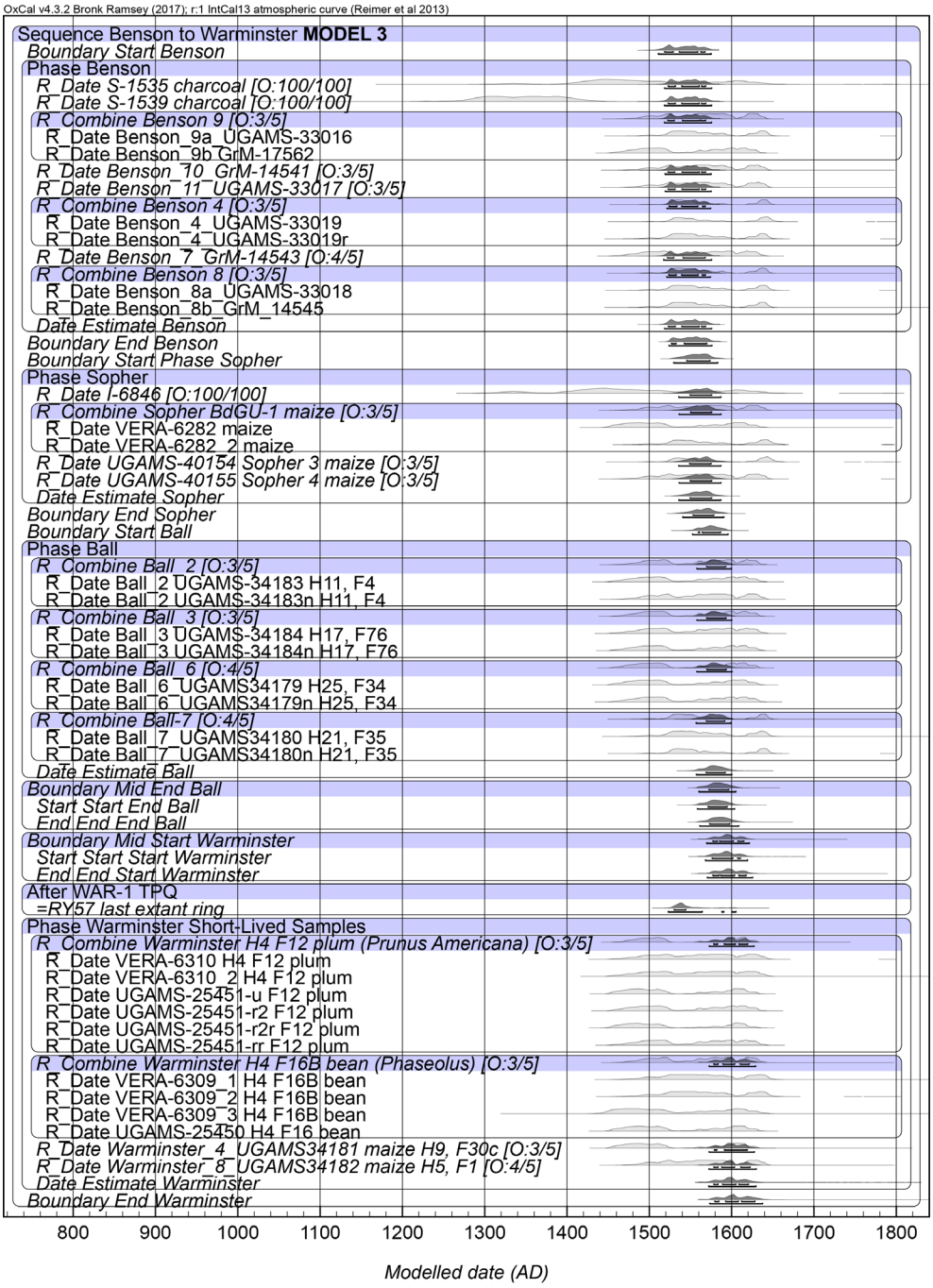
Supplemental Figure 1. The wiggle-match placement of the Feature 13 wood post, WAR-1, from Warminster (Manning et al. 2018) in terms of modelled calibrated calendar dates cal AD. This is used as a *terminus post quem* (TPQ) for the dates on short-lived samples from the Warminster site Phase. Note: the sample lacked evidence for original outermost rings or bark. We have to assume some time, likely a couple to several decades of tree-rings, are missing from the original post when cut for human use. The 'post' element in the TPQ is thus of this scale (note: we highlight that this is the 'post' of the *terminus post quem* – not the wood post forming the WAR-1 sample – so as to avoid confusion). We use this TPQ for the Warminster Phase, which is dated by short-lived samples, by cross-referencing the TPQ into the model with an After statement. A. The non-modelled probabilities for each dated set of tree rings (grey distributions) versus the modelled probabilities given the fixed tree-ring sequence. The 68.2% (*1530-1544 cal AD*) and 95.4% (*1522-1565 cal AD*) highest posterior density ranges are indicated by the upper and lower lines under each modelled probability distribution (note: sometimes there is a small ~2–4 % probability for a later range in the 1580s to 1600s cal AD). B. The placement of the ^{14}C ranges (1SD, Y axis) and 68.2% hpd ranges (X axis) in A. against the IntCal13 radiocarbon calibration curve (Reimer et al. 2013). Data from OxCal (Bronk Ramsey 2009a) with curve resolution set at 1 year.



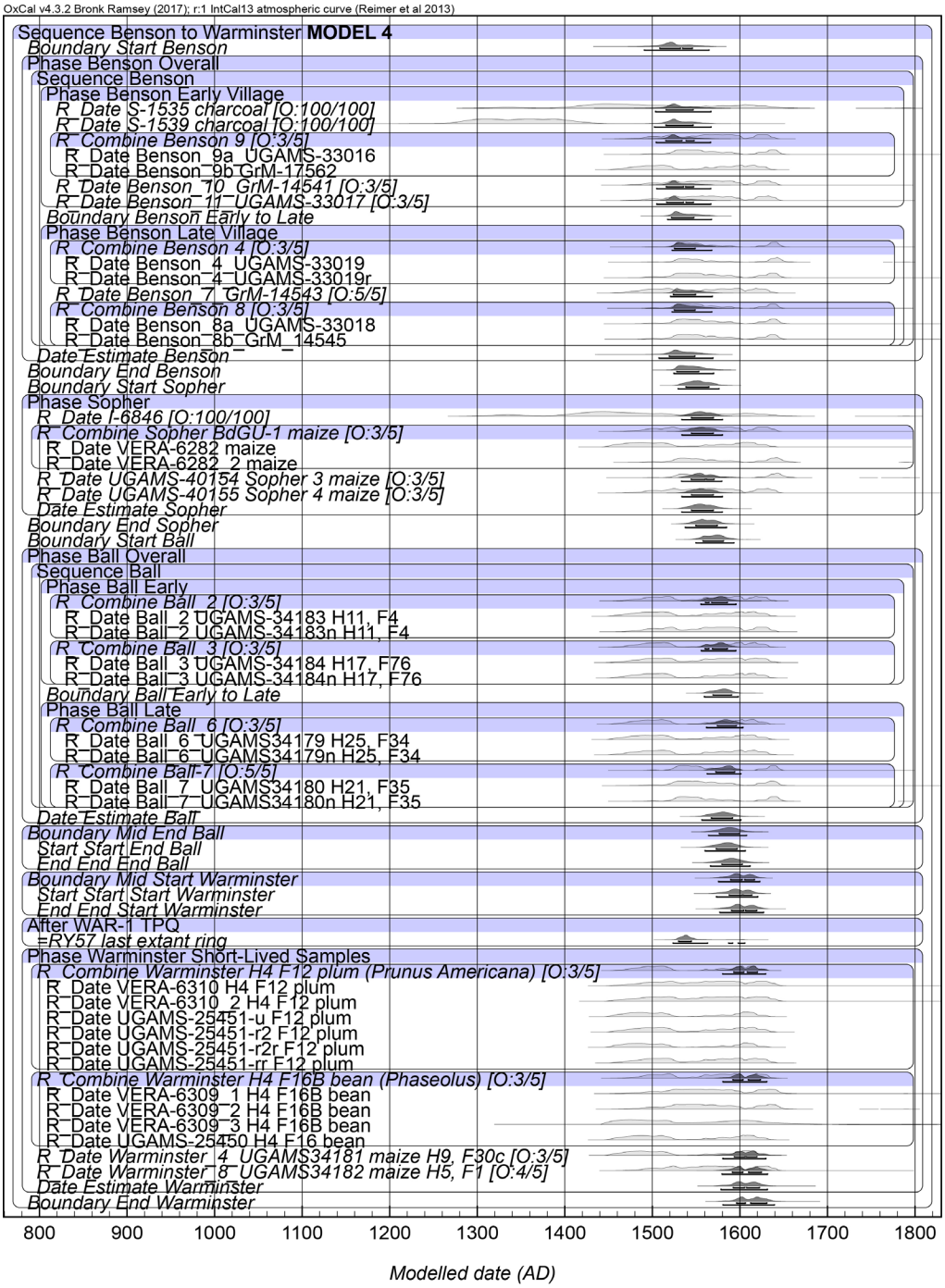
Supplemental Figure 2. Model 1. All data except the three dates run a long time ago with large errors on TPQ charcoal (indicated with a C in Figure 3). Each site Phase as a separate Sequence. The date in **bold red** is a very large likely outlier (92% probability). The other outlier >10% probability is in non-bold red. With no constraints on Phase length, the Date estimates for Benson, Sopher and Ball spread out to unrealistically long possible Phases due to the calibration curve shape and hence ambiguity for calendar ages. Data from OxCal (Bronk Ramsey 2009a; 2009b) and IntCal13 (Reimer et al. 2013) with curve resolution set at 1 year and shown as cal AD. Upper and lower lines indicate 68.2% and 95.4% hpd ranges. Amodel = 96, Aoverall = 99.



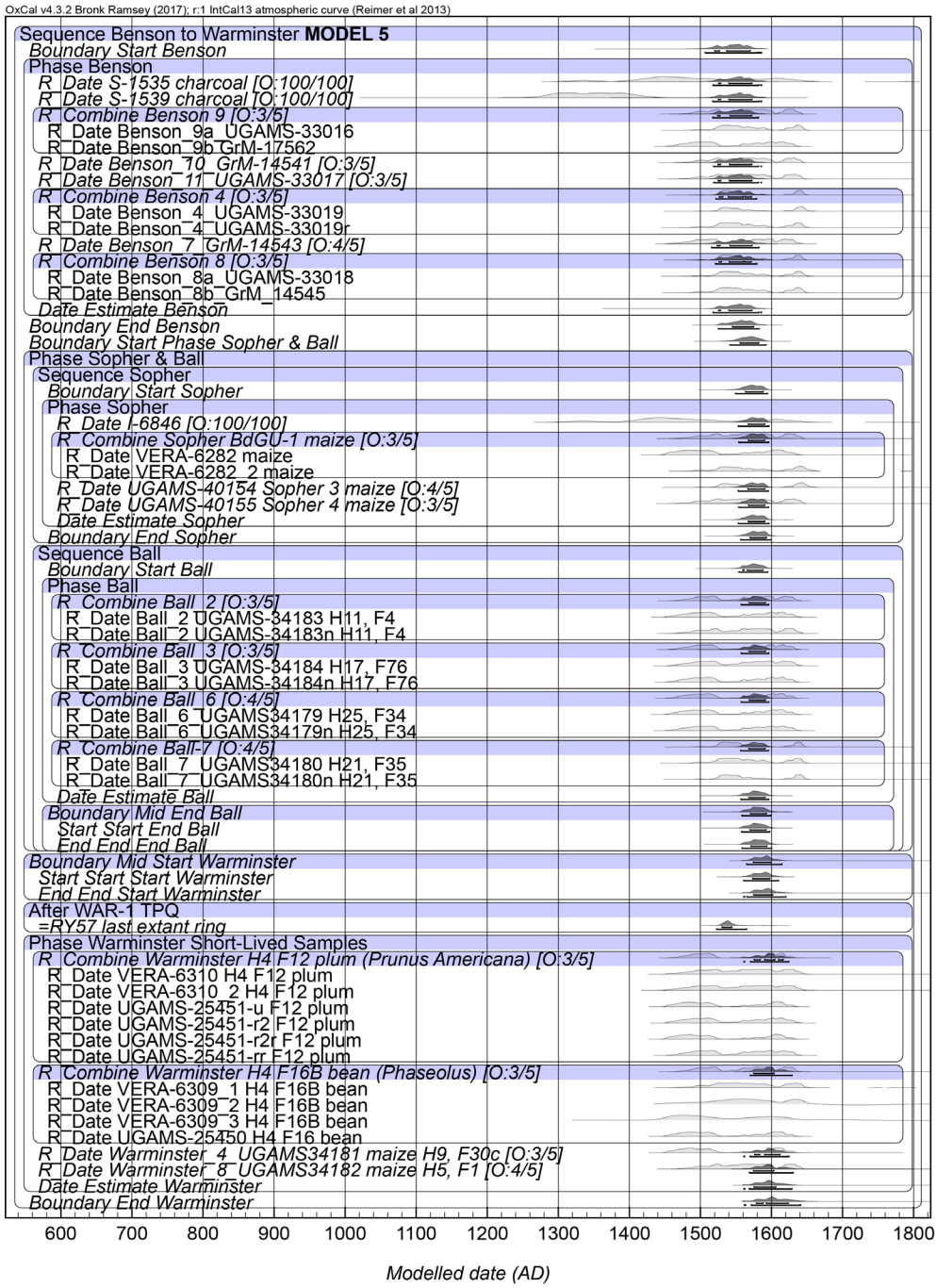
Supplemental Figure 3. The Interval query results for the durations of each site Phase in Model 1. With no additional constraints, these are far too long (see also Supplemental Table 3). The magenta bar indicates a 0-40 year site Phase length, with a 40-year total site duration considered about the maximum plausible from ethnohistoric and archaeological criteria (see main text). Model 1, in contrast, at 68.2% and especially 95.4% hpd finds much longer possible site durations (outputs of the model run illustrated are listed in the main text). Hence the introduction of a site duration constraint in Model 2 – see main text.



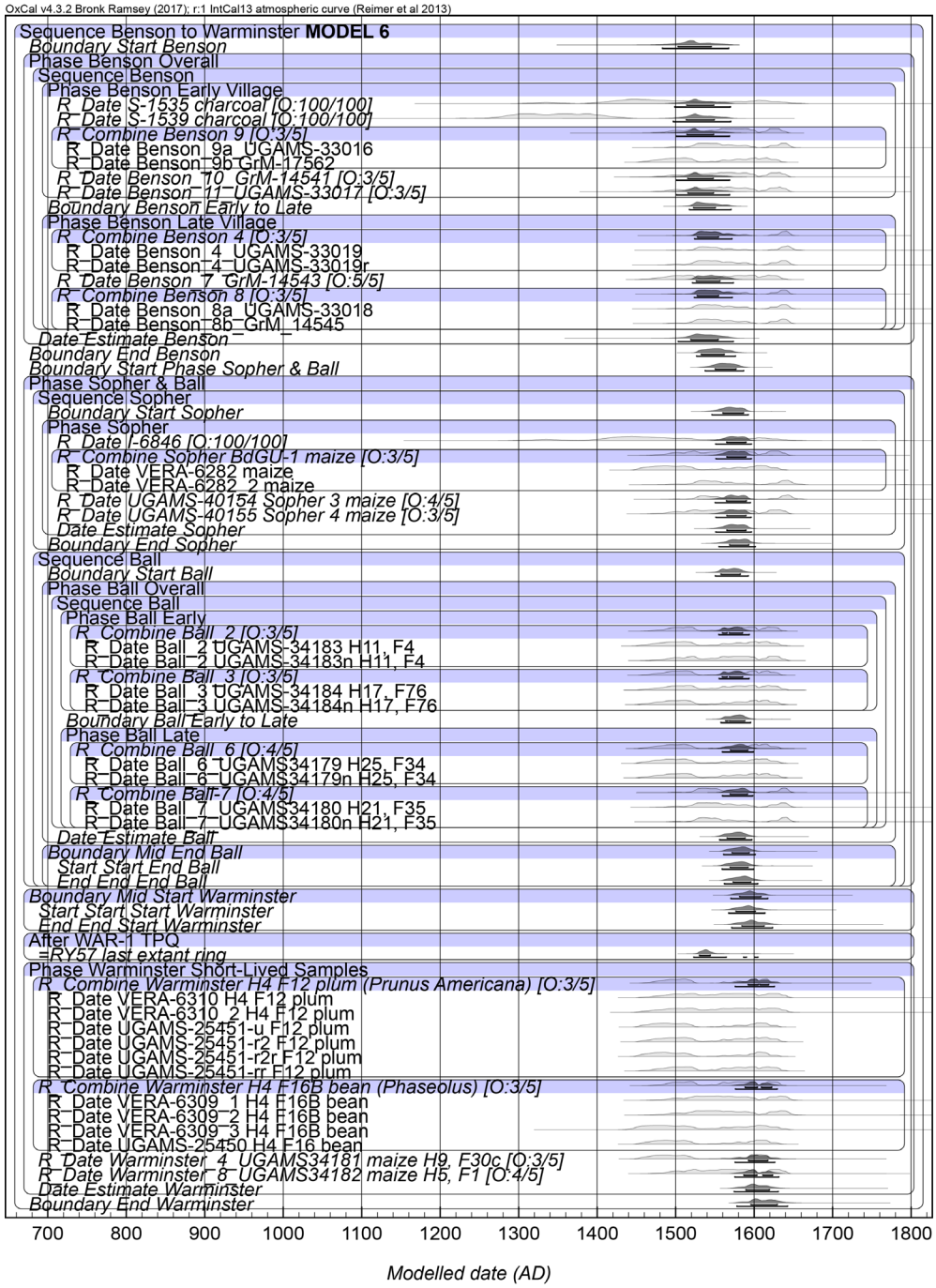
Supplemental Figure 4. Example Model 3 results. Data from OxCal (Bronk Ramsey 2009a; 2009b) and IntCal13 (Reimer et al. 2013) with curve resolution set at 1 year and shown as cal AD. Upper and lower lines indicate 68.2% and 95.4% hpd ranges. Amodel = 75, Aoverall = 80.



Supplemental Figure 5. Example Model 4 results. Data from OxCal (Bronk Ramsey 2009a; 2009b) and IntCal13 (Reimer et al. 2013) with curve resolution set at 1 year and shown as cal AD. Upper and lower lines indicate 68.2% and 95.4% hpd ranges. Amodel = 72, Aoverall = 78.



Supplemental Figure 6. Example Model 5 results. Data from OxCal (Bronk Ramsey 2009a; 2009b) and IntCal13 (Reimer et al. 2013) with curve resolution set at 1 year and shown as cal AD. Upper and lower lines indicate 68.2% and 95.4% hpd ranges. Amodel = 67, Aoverall = 71.



Supplemental Figure 7. Example Model 6 results. Data from OxCal (Bronk Ramsey 2009a; 2009b) and IntCal13 (Reimer et al. 2013) with curve resolution set at 1 year and shown as cal AD. Upper and lower lines indicate 68.2% and 95.4% hpd ranges. Amodel = 64, Aoverall = 70.

Supplemental Table 1. Individual non-modelled calibrated calendar age ranges for the radiocarbon dates in Table 1 at 68.2%, 95.4% and 99.7% probability from IntCal13 (Reimer et al. 2013) employing OxCal (Bronk Ramsey 2009a) with curve resolution set at 5 years. See also Figure 4. We include the 99.7% ranges to illustrate that at this probability level four dates include a low probability very late (and historically impossible) calibrated range in the late 18th century AD indicated in red (see also Figure 4).

Sample and Lab ID	Non-modelled Calibrated Calendar Age Ranges (cal AD)					
	68.2%		95.4%		99.7%	
	from	*to*	*from*	*to*	*from*	*to*
R_Date Benson S-1535 charcoal	1414	1625	1323	1646	1287	1799
R_Date Benson S-1539 charcoal	1295	1397	1271	1428	1214	1454
R_Date Benson_9a_UGAMS-33016 maize	1522	1644	1498	1649	1476	1655
R_Date Benson_9b_GrM-17562 maize	1481	1625	1460	1634	1452	1639
R_Date Benson_10_GrM-14541 maize	1518	1635	1491	1643	1471	1646
R_Date Benson_11_UGAMS-33017 maize	1521	1636	1491	1644	1471	1648
R_Date Benson_4_UGAMS-33019 maize	1525	1649	1519	1655	1487	1665
R_Date Benson_4_UGAMS-33019r maize	1522	1644	1498	1649	1476	1655
R_Date Benson_7_GrM-14543 maize	1491	1631	1471	1635	1459	1643
R_Date Benson_8a_UGAMS-33018 maize	1523	1645	1499	1650	1480	1657
R_Date Benson_8b_GrM_14545 maize	1523	1643	1513	1648	1480	1654
R_Date Sopher I-6846 bark	1405	1625	1310	1645	1279	1799
R_Date Sopher VERA-6282 maize	1460	1620	1450	1634	1446	1641
R_Date Sopher VERA-6282_2 maize	1522	1650	1495	1660	1475	1795
R_Date Sopher 3 UGAMS-40154 maize	1524	1650	1516	1661	1487	1795
R_Date Sopher 4 UGAMS-40155 maize	1518	1636	1489	1643	1466	1649
R_Date Ball_2 UGAMS-34183 H11, F4 maize	1478	1625	1457	1634	1451	1641
R_Date Ball_2 UGAMS-34183n H11, F4 maize	1499	1633	1485	1640	1466	1645
R_Date Ball_3 UGAMS-34184 H17, F76 maize	1490	1630	1468	1635	1456	1643

R_Date Ball_3 UGAMS-34184n H17, F76 maize	1477	1625	1462	1634	1452	1638
R_Date Ball_6_UGAMS34179 H25, F34 maize	1470	1620	1456	1633	1450	1637
R_Date Ball_6_UGAMS34179n H25, F34 maize	1483	1625	1460	1634	1452	1640
R_Date Ball_7_UGAMS34180 H21, F35 maize	1522	1643	1495	1648	1475	1654
R_Date Ball_7_UGAMS34180n H21, F35 maize	1524	1645	1516	1650	1487	1656
R_Date Warminster Wk-42865 Rings 9-17 wood	1475	1620	1463	1633	1451	1636
R_Date Warminster Wk-42866 Rings 19-27 wood	1518	1634	1493	1641	1475	1645
R_Date Warminster Wk-42867 Rings 29-37 wood	1486	1625	1474	1632	1457	1635
R_Date Warminster Wk-42868 Rings 39-47 wood	1521	1635	1496	1643	1477	1645
R_Date Warminster Wk-42869 Rings 49-57 wood	1522	1638	1499	1644	1486	1645
R_Date Warminster VERA-6310 H4 F12 plum	1494	1633	1478	1641	1454	1647
R_Date Warminster VERA-6310_2 H4 F12 plum	1490	1632	1470	1640	1450	1647
R_Date Warminster UGAMS-25451 F12 plum	1439	1461	1430	1487	1421	1618
R_Date Warminster UGAMS-25451-u F12 plum	1466	1618	1452	1631	1446	1636
R_Date Warminster UGAMS-25451-r2 F12 plum	1473	1625	1456	1634	1450	1640
R_Date Warminster UGAMS-25451-r2r F12 plum	1463	1617	1451	1631	1445	1635
R_Date Warminster UGAMS-25451-r F12 plum	1448	1485	1442	1618	1436	1631
R_Date Warminster UGAMS-25451-rr F12 plum	1488	1630	1466	1635	1455	1641
R_Date Warminster VERA-6309_1 H4 F16B bean	1521	1641	1488	1647	1460	1656
R_Date Warminster VERA-6309_2 H4 F16B bean	1521	1642	1489	1648	1461	1660
R_Date Warminster VERA-6309_3 H4 F16B bean	1451	1622	1444	1635	1434	1645
R_Date Warminster UGAMS-25450 H4 F16 bean	1465	1619	1453	1632	1447	1637
R_Date Warminster_4_UGAMS34181 maize H9, F30c	1466	1618	1452	1631	1446	1636
R_Date Warminster_8_UGAMS34182 maize H5, F1	1515	1635	1489	1642	1467	1646

Supplemental Table 2. Order analysis from Model 1. Probability that t_1 (left column) is older than t_2. If P>50 then older, if P<50 then more recent. **Black = t_1 older than t_2**, **Red = t_1 more recent than t_2**.

Model 1 Site Phase Uniform Probability Interval NO Constraints, Am=96, Ao=99. Probability $t_1 < t_2$													
t_1	t_2												
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warm.	Date Estimate Warm.	End Warm.	Site Duration
Start Benson	0.00	1.00	1.00	0.41	0.71	0.92	0.32	0.67	0.93	0.87	0.94	0.97	*0-74yrs (68.2%) 0-171yrs (95.4%)*
Date Estimate Benson	0.00	0.00	1.00	0.23	0.53	0.80	0.19	0.52	0.84	0.71	0.85	0.92	
End Benson	0.00	0.00	0.00	0.11	0.35	0.64	0.10	0.36	0.71	0.47	0.65	0.77	
Start Sopher	0.59	0.77	0.89	0.00	1.00	1.00	0.42	0.72	0.93	0.87	0.93	0.97	*0-143yrs (68.2%) 0-514yrs (95.4%)*
Date Estimate Sopher	0.29	0.47	0.65	0.00	0.00	1.00	0.21	0.49	0.77	0.61	0.73	0.81	
End Sopher	0.08	0.20	0.36	0.00	0.00	0.00	0.07	0.27	0.55	0.32	0.44	0.55	
Start Ball	0.68	0.81	0.90	0.58	0.79	0.93	0.00	1.00	1.00	0.89	0.96	0.99	*0-184yrs (68.2%) 0-521yrs (95.4%)*
Date Estimate Ball	0.33	0.48	0.64	0.28	0.51	0.73	0.00	0.00	1.00	0.60	0.73	0.82	
End Ball	0.07	0.16	0.29	0.07	0.23	0.45	0.00	0.00	0.00	0.22	0.34	0.47	
Start Warminster	0.13	0.29	0.53	0.13	0.39	0.68	0.11	0.40	0.78	0.00	1.00	1.00	*0-54yrs (68.2%) 0-120yrs (95.4%)*
Date Estimate Warminster	0.06	0.15	0.35	0.07	0.27	0.56	0.04	0.27	0.66	0.00	0.00	1.00	
End Warminster	0.03	0.08	0.23	0.03	0.19	0.45	0.01	0.18	0.53	0.00	0.00	0.00	

Note to Supplemental Table 2. With no constraint on the duration (Interval) of the site Phases, as in Model 1, the OxCal Order analysis is ambiguous and clearly inappropriate in cultural terms. The data suggest total site OxCal Phase durations that are much too long (see main text and Supplemental Figure 3). In consequence, the OxCal Order analysis becomes ambiguous. Thus the start boundaries for Sopher and Ball are placed as older than the start boundary for Benson, *but* the OxCal Date Estimate and end boundary for Benson are placed as older than the OxCal Date Estimates and end boundary dates for Sopher and Ball! This situation occurs because Sopher and Ball (and also Benson) are, in the absence of a constraint, permitted to extend over what are culturally impossibly over-long periods. Such as, e.g., 0–143 years (68.2% hpd) and 0–514 years (95.4% hpd) for Sopher and 0–184 years (68.2% hpd) and 0–521 years (95.4% hpd) for Ball (the OxCal Interval values vary by run with these stated values in the typical range of several runs). Such very long site OxCal Phases are not possible from ethnographic and archaeological considerations for these sites (see main text). Maximum total site duration is instead usually estimated to fall within a 0–40 years range for these sites (see main text). Hence we move to Model 2, where total site duration is constrained within very conservative and generous, but not massively over-long ranges (see main text and Supplemental Table 3).

Supplemental Table 3. Order analysis from Model 2. Probability that t_1 (left column) is older than t_2. If P>50 then older, if P<50 then more recent. Order results are listed for iterations of Model 2 with uniform probability constraints on an OxCal Interval query for each site Phase of 0–50, 0–60, 0–70, 0–80, 0–90, 0–100 and 0–120 years. **Black = t_1 older than t_2**, **Red = t_1 more recent than t_2**, **Blue = t_1 about same age as t_2**. OxCal Amodel (Am) and Aoverall (Ao) values are listed.

Model 2 Site Phase Uniform Probability Interval Constraint 0–50 years, Am=89, Ao=93. **Probability $t_1 < t_2$**												
t_1	t_2											
	Start Benson	**Date Estimate Benson**	**End Benson**	**Start Sopher**	**Date Estimate Sopher**	**End Sopher**	**Start Ball**	**Date Estimate Ball**	**End Ball**	**Start Warminster**	**Date Estimate Warminster**	**End Warminster**
Start Benson	0.00	1.00	1.00	**0.53**	0.65	0.75	**0.57**	0.64	0.71	**0.87**	0.90	0.92
Date Estimate Benson	0.00	0.00	1.00	0.41	**0.52**	0.64	0.51	**0.58**	0.65	0.82	**0.87**	0.90
End Benson	0.00	0.00	0.00	0.30	0.40	**0.52**	0.43	0.51	**0.58**	0.73	0.82	**0.87**
Start Sopher	**0.47**	0.59	0.70	0.00	1.00	1.00	**0.53**	0.60	0.67	**0.79**	0.84	0.88
Date Estimate Sopher	0.35	**0.48**	0.60	0.00	0.00	1.00	0.47	**0.53**	0.61	0.74	**0.79**	0.84
End Sopher	0.25	0.36	**0.48**	0.00	0.00	0.00	0.40	0.47	**0.54**	0.67	0.74	**0.79**
Start Ball	**0.43**	0.49	0.57	**0.47**	0.53	0.60	0.00	1.00	1.00	**0.73**	0.83	0.90
Date Estimate Ball	0.36	**0.42**	0.49	0.40	**0.47**	0.53	0.00	0.00	1.00	0.62	**0.72**	0.82
End Ball	0.29	0.35	**0.42**	0.33	0.39	**0.46**	0.00	0.00	0.00	0.51	0.61	**0.72**
Start Warminster	**0.13**	0.18	0.27	**0.21**	0.26	0.33	**0.27**	0.38	0.49	0.00	1.00	1.00
Date Estimate Warminster	0.10	**0.13**	0.18	0.16	**0.21**	0.26	0.17	**0.28**	0.39	0.00	0.00	1.00
End Warminster	0.08	0.10	**0.13**	0.12	0.17	**0.21**	0.10	0.18	**0.28**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–60 years, Am=92, Ao=95. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warminster	Date Estimate Warminster	End Warminster
Start Benson	0.00	1.00	1.00	**0.53**	0.67	0.79	**0.57**	0.65	0.74	**0.87**	0.91	0.94
Date Estimate Benson	0.00	0.00	1.00	0.39	**0.53**	0.67	0.49	**0.58**	0.66	0.81	**0.87**	0.91
End Benson	0.00	0.00	0.00	0.27	0.39	**0.52**	0.39	0.49	**0.58**	0.70	0.81	**0.87**
Start Sopher	**0.47**	0.61	0.73	0.00	1.00	1.00	**0.53**	0.61	0.71	**0.80**	0.85	0.90
Date Estimate Sopher	0.33	**0.47**	0.61	0.00	0.00	1.00	0.45	**0.53**	0.62	0.73	**0.80**	0.85
End Sopher	0.21	0.33	**0.48**	0.00	0.00	0.00	0.37	0.45	**0.54**	0.63	0.73	**0.79**
Start Ball	**0.43**	0.51	0.61	**0.47**	0.55	0.63	0.00	1.00	1.00	**0.74**	0.84	0.92
Date Estimate Ball	0.35	**0.42**	0.51	0.39	**0.47**	0.55	0.00	0.00	1.00	0.61	**0.72**	0.83
End Ball	0.26	0.34	**0.42**	0.29	0.38	**0.46**	0.00	0.00	0.00	0.49	0.59	**0.71**
Start Warminster	**0.13**	0.19	0.30	**0.20**	0.27	0.37	**0.26**	0.39	0.51	0.00	1.00	1.00

Date Estimate Warminster	0.09	**0.13**	0.19	0.15	**0.20**	0.27	0.16	**0.28**	0.41	0.00	0.00	1.00
End Warminster	0.06	0.09	**0.13**	0.10	0.15	**0.21**	0.08	0.17	**0.29**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–70 years, Am=94, Ao=97. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	**Date Estimate Benson**	**End Benson**	**Start Sopher**	**Date Estimate Sopher**	**End Sopher**	**Start Ball**	**Date Estimate Ball**	**End Ball**	**Start Warminster**	**Date Estimate Warminster**	**End Warminster**
Start Benson	0.00	1.00	1.00	**0.52**	0.68	0.81	**0.56**	0.66	0.77	**0.86**	0.91	0.94
Date Estimate Benson	0.00	0.00	1.00	0.37	**0.53**	0.68	0.47	**0.58**	0.68	0.78	**0.87**	0.92
End Benson	0.00	0.00	0.00	0.25	0.38	**0.53**	0.36	0.48	**0.59**	0.64	0.79	**0.87**
Start Sopher	**0.48**	0.63	0.75	0.00	1.00	1.00	**0.53**	0.63	0.74	**0.80**	0.86	0.91
Date Estimate Sopher	0.32	**0.47**	0.62	0.00	0.00	1.00	0.43	**0.53**	0.64	0.71	**0.80**	0.86
End Sopher	0.19	0.32	**0.47**	0.00	0.00	0.00	0.33	0.44	**0.54**	0.58	0.71	**0.79**
Start Ball	**0.44**	0.53	0.64	**0.47**	0.57	0.67	0.00	1.00	1.00	**0.74**	0.85	0.93
Date Estimate Ball	0.34	**0.42**	0.52	0.37	**0.47**	0.56	0.00	0.00	1.00	0.59	**0.72**	0.84
End Ball	0.23	0.32	**0.41**	0.26	0.36	**0.46**	0.00	0.00	0.00	0.46	0.58	**0.71**
Start Warminster	**0.14**	0.22	0.36	**0.20**	0.29	0.42	**0.26**	0.41	0.54	0.00	1.00	1.00
Date Estimate Warminster	0.09	**0.13**	0.21	0.14	**0.20**	0.29	0.15	**0.28**	0.42	0.00	0.00	1.00
End Warminster	0.06	0.08	**0.13**	0.09	0.14	**0.21**	0.07	0.16	**0.29**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–80 years, Am=95, Ao=99. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warminster	Date Estimate Warminster	End Warminster
Start Benson	0.00	1.00	1.00	**0.52**	0.70	0.83	**0.56**	0.68	0.80	**0.86**	0.92	0.95
Date Estimate Benson	0.00	0.00	1.00	0.36	**0.53**	0.70	0.45	**0.57**	0.70	0.77	**0.87**	0.92
End Benson	0.00	0.00	0.00	0.23	0.37	**0.54**	0.32	0.46	**0.59**	0.60	0.76	**0.87**
Start Sopher	**0.48**	0.64	0.77	0.00	1.00	1.00	**0.52**	0.64	0.76	**0.80**	0.87	0.92
Date Estimate Sopher	0.30	**0.47**	0.63	0.00	0.00	1.00	0.41	**0.53**	0.66	0.69	**0.79**	0.86
End Sopher	0.17	0.30	**0.46**	0.00	0.00	0.00	0.29	0.42	**0.54**	0.54	0.68	**0.78**
Start Ball	**0.44**	0.55	0.68	**0.48**	0.59	0.71	0.00	1.00	1.00	**0.75**	0.86	0.94
Date Estimate Ball	0.32	**0.43**	0.54	0.36	**0.47**	0.58	0.00	0.00	1.00	0.59	**0.72**	0.84
End Ball	0.20	0.30	**0.41**	0.24	0.34	**0.46**	0.00	0.00	0.00	0.43	0.56	**0.69**
Start Warminster	**0.14**	0.23	0.40	**0.20**	0.31	0.46	**0.25**	0.41	0.57	0.00	1.00	1.00
Date Estimate Warminster	0.08	**0.13**	0.24	0.13	**0.21**	0.32	0.14	**0.28**	0.44	0.00	0.00	1.00
End Warminster	0.05	0.08	**0.13**	0.08	0.14	**0.22**	0.06	0.16	**0.31**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–90 years, Am=97, Ao=99. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warminster	Date Estimate Warminster	End Warminster
Start Benson	0.00	1.00	1.00	**0.53**	0.71	0.85	**0.55**	0.69	0.82	**0.85**	0.93	0.96
Date Estimate Benson	0.00	0.00	1.00	0.34	**0.53**	0.71	0.42	**0.57**	0.71	0.73	**0.86**	0.93
End Benson	0.00	0.00	0.00	0.21	0.35	**0.53**	0.28	0.43	**0.59**	0.53	0.74	**0.87**
Start Sopher	**0.47**	0.66	0.79	0.00	1.00	1.00	**0.52**	0.65	0.78	**0.79**	0.88	0.93
Date Estimate Sopher	0.29	**0.47**	0.65	0.00	0.00	1.00	0.39	**0.53**	0.67	0.66	**0.79**	0.87
End Sopher	0.15	0.29	**0.47**	0.00	0.00	0.00	0.26	0.40	**0.54**	0.49	0.66	**0.78**
Start Ball	**0.45**	0.58	0.72	**0.48**	0.61	0.74	0.00	1.00	1.00	**0.74**	0.87	0.95
Date Estimate Ball	0.31	**0.43**	0.57	0.35	**0.47**	0.60	0.00	0.00	1.00	0.57	**0.72**	0.86
End Ball	0.18	0.29	**0.41**	0.22	0.33	**0.46**	0.00	0.00	0.00	0.40	0.55	**0.70**
Start Warminster	**0.15**	0.27	0.47	**0.21**	0.34	0.51	**0.26**	0.43	0.60	0.00	1.00	1.00
Date Estimate Warminster	0.07	**0.14**	0.27	0.12	**0.21**	0.34	0.13	**0.28**	0.45	0.00	0.00	1.00
End Warminster	0.04	0.07	**0.13**	0.07	0.13	**0.22**	0.05	0.14	**0.30**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–100 years, Am=97, Ao=100. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warminster	Date Estimate Warminster	End Warminster
Start Benson	0.00	1.00	1.00	**0.52**	0.71	0.86	**0.53**	0.69	0.83	**0.84**	0.93	0.96
Date Estimate Benson	0.00	0.00	1.00	0.34	**0.53**	0.72	0.40	**0.56**	0.72	0.70	**0.85**	0.93
End Benson	0.00	0.00	0.00	0.20	0.35	**0.54**	0.25	0.42	**0.59**	0.49	0.72	**0.86**
Start Sopher	**0.48**	0.66	0.80	0.00	1.00	1.00	**0.50**	0.66	0.80	**0.78**	0.88	0.94
Date Estimate Sopher	0.29	**0.47**	0.65	0.00	0.00	1.00	0.37	**0.52**	0.68	0.63	**0.78**	0.88
End Sopher	0.14	0.28	**0.46**	0.00	0.00	0.00	0.24	0.38	**0.54**	0.45	0.63	**0.77**
Start Ball	**0.47**	0.61	0.75	**0.50**	0.63	0.76	0.00	1.00	1.00	**0.74**	0.88	0.96
Date Estimate Ball	0.31	**0.44**	0.58	0.34	**0.48**	0.62	0.00	0.00	1.00	0.55	**0.73**	0.87
End Ball	0.17	0.28	**0.41**	0.20	0.32	**0.46**	0.00	0.00	0.00	0.37	0.53	**0.70**
Start Warminster	**0.16**	0.30	0.51	**0.22**	0.37	0.55	**0.26**	0.45	0.63	0.00	1.00	1.00
Date Estimate Warminster	0.07	**0.15**	0.28	0.12	**0.22**	0.37	0.12	**0.27**	0.47	0.00	0.00	1.00
End Warminster	0.04	0.07	**0.14**	0.06	0.12	**0.23**	0.04	0.13	**0.30**	0.00	0.00	0.00

Model 2 Site Phase Uniform Probability Interval Constraint 0–120 years Am=98 Ao=101. Probability $t_1 < t_2$												
t_1	t_2											
	Start Benson	Date Estimate Benson	End Benson	Start Sopher	Date Estimate Sopher	End Sopher	Start Ball	Date Estimate Ball	End Ball	Start Warminster	Date Estimate Warminster	End Warminster
Start Benson	0.00	1.00	1.00	**0.53**	0.74	0.89	**0.52**	0.71	0.86	**0.86**	0.94	0.97
Date Estimate Benson	0.00	0.00	1.00	0.32	**0.53**	0.73	0.36	**0.55**	0.74	0.71	**0.85**	0.93
End Benson	0.00	0.00	0.00	0.17	0.33	**0.54**	0.21	0.38	**0.58**	0.47	0.67	**0.82**
Start Sopher	**0.47**	0.68	0.83	0.00	1.00	1.00	**0.49**	0.67	0.82	**0.80**	0.89	0.94
Date Estimate Sopher	0.26	**0.47**	0.67	0.00	0.00	1.00	0.34	**0.52**	0.69	0.64	**0.78**	0.87
End Sopher	0.11	0.27	**0.46**	0.00	0.00	0.00	0.20	0.35	**0.53**	0.43	0.60	**0.73**
Start Ball	**0.48**	0.64	0.79	**0.51**	0.66	0.80	0.00	1.00	1.00	**0.77**	0.90	0.96
Date Estimate Ball	0.29	**0.45**	0.62	0.33	**0.48**	0.65	0.00	0.00	1.00	0.58	**0.74**	0.86
End Ball	0.14	0.26	**0.42**	0.18	0.31	**0.47**	0.00	0.00	0.00	0.37	0.52	**0.68**
Start Warminster	**0.14**	0.29	0.53	**0.20**	0.36	0.57	**0.23**	0.42	0.63	0.00	1.00	1.00
Date Estimate Warminster	0.06	**0.15**	0.33	0.11	**0.22**	0.40	0.10	**0.26**	0.48	0.00	0.00	1.00
End Warminster	0.03	0.07	**0.18**	0.06	0.13	**0.27**	0.04	0.14	**0.32**	0.00	0.00	0.00

Note to Model 2 iterations with OxCal Interval constraints of 0–100 and 0–120 years. In the 0–100 year constraint iteration the order for the start boundaries for Sopher and Ball becomes ambiguous (P=0.5, blue text), while the OxCal Date estimates and end boundary order remains with Sopher older than Ball (as in the 0–50 years to 0–90 years iterations). With the further possible OxCal Phase duration extension in the 0–120 years model, the OxCal Order

analysis becomes problematic with the start boundary for Ball now indicated as just older than the start boundary for Sopher ((blue highlight) – although the OxCal Date estimate and end boundary order continue to show Sopher as older than Ball. The reason that this ambiguous to problematic order has become possible is because of the now implausibly long overall OxCal Phase durations possible for the sites.

Supplementary Table 4. OxCal runfile for Model 1.

```
Options()
 {
  Resolution=1;
 };
 Plot("ORDER Benson, Sopher, Ball, Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
  };
  Phase ("ORDER Benson v. Sopher v. Ball v.
Warminster")
```

```
{
 Sequence ("Benson")
 {
  Boundary ("Start Benson");
  Phase ("Benson")
  {
   R_Combine("Benson 9",8)
   {
    Outlier("General",0.05);
    R_Date("Benson_9a_UGAMS-33016", 304, 21)
    {
     Outlier("SSimple",0.05);
    };
    R_Date("Benson_9b GrM-17562",352,20)
    {
     Outlier("SSimple",0.05);
    };
   };
   R_Date("Benson_10_GrM-14541", 323, 20)
   {
    Outlier ("General",0.05);
   };
   R_Date("Benson_11_UGAMS-33017", 320, 21)
   {
    Outlier ("General",0.05);
   };
   R_Combine ("Benson 4",8)
   {
    Outlier("General",0.05);
    R_Date("Benson_4_UGAMS-33019", 289, 21)
    {
     Outlier("SSimple",0.05);
    };
    R_Date("Benson_4_UGAMS-33019r", 304, 21)
    {
     Outlier("SSimple",0.05);
    };
   };
   R_Date("Benson_7_GrM-14543", 342, 20)
   {
    Outlier ("General",0.05);
   };
```

```
  R_Combine ("Benson 8",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_8a_UGAMS-33018", 302, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_8b_GrM_14545", 305, 20)
   {
    Outlier("SSimple",0.05);
   };
  };
  Date ("Date Estimate Benson");
  Interval("Interval Benson");
 };
 Boundary ("End Benson");
};
Sequence ("Sopher")
{
 Boundary ("Start Sopher");
 Phase ("Sopher")
 {
  R_Combine ("Sopher BdGU-1 maize",8)
  {
   Outlier ("General",0.05);
   R_Date("VERA-6282 maize", 364, 27)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date("VERA-6282_2 maize", 292, 27)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
  {
   Outlier ("General",0.05);
  };
  R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
  {
   Outlier ("General",0.05);
  };
```

```
  Date ("Date Estimate Sopher");
  Interval("Interval Sopher");
 };
 Boundary ("End Sopher");
};
Sequence ("Ball")
{
 Boundary ("Start Ball");
 Phase ("Ball")
 {
  R_Combine ("Ball_2",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Combine ("Ball_3",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_3 UGAMS-34184n H17, F76",353,19)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Combine ("Ball_6",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
```

```
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Combine ("Ball-7",8)
     {
      Outlier ("General",0.05);
      R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
      {
       Outlier("SSimple", 0.05);
      };
     };
     Date ("Date Estimate Ball");
     Interval("Interval Ball");
    };
    Boundary ("End Ball");
   };
   Sequence ("Warminster")
   {
    Boundary ("Start Warminster");
    After ("WAR-1 TPQ")
    {
     Date ("=RY57 last extant ring");
    };
    Phase ("Warminster Short-Lived Samples")
    {
     R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6310 H4 F12 plum",334,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6310_2 H4 F12 plum",340,31)
      {
       Outlier("SSimple", 0.05);
      };
```

```
      R_Date ("UGAMS-25451 F12 plum",427,22)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-u F12 plum",365,21)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-r2 F12 plum",355,22)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-r2r F12 plum",368,21)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-r F12 plum",396,21)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-rr F12 plum",346,21)
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6309_1 H4 F16B bean",314,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6309_2 H4 F16B bean",311,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6309_3 H4 F16B bean",374,40)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25450 H4 F16 bean",363,22)
```

```
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
     {
      Outlier ("General",0.05);
     };
     R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
     {
      Outlier ("General",0.05);
     };
     Date ("Date Estimate Warminster");
     Interval("Interval Warminster");
    };
    Boundary ("End Warminster");
   };
   Order ("Order of Site Data");
  };
 };
```

Supplemental Table 5. OxCal runfile for Model 2, with the iteration with uniform probability constraint of 0-80 years on the Interval query for each site Phase given.

```
Options()
 {
  Resolution=1;
 };
 Plot("ORDER Benson, Sopher, Ball, Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
  };
```

```
  Phase ("ORDER Benson v. Sopher v. Ball v.
Warminster")
  {
   Sequence ("Benson")
   {
    Boundary ("Start Benson");
    Phase ("Benson")
    {
     R_Combine("Benson 9",8)
     {
      Outlier("General",0.05);
      R_Date("Benson_9a_UGAMS-33016", 304, 21)
      {
       Outlier("SSimple",0.05);
      };
      R_Date("Benson_9b GrM-17562",352,20)
      {
       Outlier("SSimple",0.05);
      };
     };
     R_Date("Benson_10_GrM-14541", 323, 20)
     {
      Outlier ("General",0.05);
     };
     R_Date("Benson_11_UGAMS-33017", 320, 21)
     {
      Outlier ("General",0.05);
     };
     R_Combine ("Benson 4",8)
     {
      Outlier("General",0.05);
      R_Date("Benson_4_UGAMS-33019", 289, 21)
      {
       Outlier("SSimple",0.05);
      };
      R_Date("Benson_4_UGAMS-33019r", 304, 21)
      {
       Outlier("SSimple",0.05);
      };
     };
     R_Date("Benson_7_GrM-14543", 342, 20)
     {
```

```
   Outlier ("General",0.05);
  };
  R_Combine ("Benson 8",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_8a_UGAMS-33018", 302, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_8b_GrM_14545", 305, 20)
   {
    Outlier("SSimple",0.05);
   };
  };
  Date ("Date Estimate Benson");
  Interval("Interval Benson",U(0,80));
 };
 Boundary ("End Benson");
};
Sequence ("Sopher")
{
 Boundary ("Start Sopher");
 Phase ("Sopher")
 {
  R_Combine ("Sopher BdGU-1 maize",8)
  {
   Outlier ("General",0.05);
   R_Date("VERA-6282 maize", 364, 27)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date("VERA-6282_2 maize", 292, 27)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
  {
   Outlier ("General",0.05);
  };
  R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
  {
```

```
   Outlier ("General",0.05);
  };
  Date ("Date Estimate Sopher");
  Interval("Interval Sopher",U(0,80));
 };
 Boundary ("End Sopher");
};
Sequence ("Ball")
{
 Boundary ("Start Ball");
 Phase ("Ball")
 {
  R_Combine ("Ball_2",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Combine ("Ball_3",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_3 UGAMS-34184n H17, F76",353,19)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Combine ("Ball_6",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
   {
    Outlier("SSimple", 0.05);
```

```
      };
      R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Combine ("Ball-7",8)
     {
      Outlier ("General",0.05);
      R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
      {
       Outlier("SSimple", 0.05);
      };
     };
     Date ("Date Estimate Ball");
     Interval("Interval Ball",U(0,80));
    };
    Boundary ("End Ball");
   };
   Sequence ("Warminster")
   {
    Boundary ("Start Warminster");
    After ("WAR-1 TPQ")
    {
     Date ("=RY57 last extant ring");
    };
    Phase ("Warminster Short-Lived Samples")
    {
     R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6310 H4 F12 plum",334,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6310_2 H4 F12 plum",340,31)
      {
```

```
       Outlier("SSimple", 0.05);
      };
      //R_Date ("UGAMS-25451 F12 plum",427,22)
      //{
      // Outlier("SSimple", 0.05);
      //};
      //Outlier 92/5 or 91/5 Model 1
      R_Date ("UGAMS-25451-u F12 plum",365,21)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-r2 F12 plum",355,22)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25451-r2r F12 plum",368,21)
      {
       Outlier("SSimple", 0.05);
      };
      //R_Date ("UGAMS-25451-r F12 plum",396,21)
      //{
      // Outlier("SSimple", 0.05);
      //};
      //Outlier around 19/5 in re-run of Model 1
excluding UGAMS-25451 and so excluded in Model 2
      R_Date ("UGAMS-25451-rr F12 plum",346,21)
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6309_1 H4 F16B bean",314,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6309_2 H4 F16B bean",311,28)
      {
       Outlier("SSimple", 0.05);
      };
```

```
      R_Date ("VERA-6309_3 H4 F16B bean",374,40)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("UGAMS-25450 H4 F16 bean",363,22)
      {
       Outlier("SSimple", 0.05);
      };
     };
     R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
     {
      Outlier ("General",0.05);
     };
     R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
     {
      Outlier ("General",0.05);
     };
     Date ("Date Estimate Warminster");
     Interval("Interval Warminster",U(0,80));
    };
    Boundary ("End Warminster");
   };
   Order ("Order of Site Data");
  };
 };
```

Supplemental Table 6. OxCal runfile for Model 3.

```
Options()
 {
  Resolution=1;
 };
 Plot("Sequence Benson, Sopher, Ball Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
  };
```

```
Sequence ("Benson to Warminster")
{
 Boundary ("Start Benson");
 Phase ("Benson")
 {
  R_Date("S-1535 charcoal",430,80)
  {
   Outlier("Charcoal",1);
  };
  R_Date("S-1539 charcoal",620,70)
  {
   Outlier("Charcoal",1);
  };
  R_Combine("Benson 9",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_9a_UGAMS-33016", 304, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_9b GrM-17562",352,20)
   {
    Outlier("SSimple",0.05);
   };
  };
  R_Date("Benson_10_GrM-14541", 323, 20)
  {
   Outlier ("General",0.05);
  };
  R_Date("Benson_11_UGAMS-33017", 320, 21)
  {
   Outlier ("General",0.05);
  };
  R_Combine ("Benson 4",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_4_UGAMS-33019", 289, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_4_UGAMS-33019r", 304, 21)
   {
```

```
   Outlier("SSimple",0.05);
  };
 };
 R_Date("Benson_7_GrM-14543", 342, 20)
 {
  Outlier ("General",0.05);
 };
 R_Combine ("Benson 8",8)
 {
  Outlier("General",0.05);
  R_Date("Benson_8a_UGAMS-33018", 302, 21)
  {
   Outlier("SSimple",0.05);
  };
  R_Date("Benson_8b_GrM_14545", 305, 20)
  {
   Outlier("SSimple",0.05);
  };
 };
 Date ("Date Estimate Benson");
 Interval("Interval Benson");
};
Boundary ("End Benson");
Interval ("Interval between Benson and Sopher");
Boundary ("Start Phase Sopher");
Phase ("Sopher")
{
 R_Date("I-6846", 445, 85)
 {
  Outlier("Charcoal",1);
 };
 R_Combine ("Sopher BdGU-1 maize",8)
 {
  Outlier ("General",0.05);
  R_Date("VERA-6282 maize", 364, 27)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date("VERA-6282_2 maize", 292, 27)
  {
   Outlier("SSimple", 0.05);
  };
```

```
 };
 R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
 {
  Outlier ("General",0.05);
 };
 R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
 {
  Outlier ("General",0.05);
 };
 Date ("Date Estimate Sopher");
 Interval("Interval Sopher");
};
Boundary ("End Sopher");
Interval("Interval Between Sopher and Ball");
Boundary ("Start Ball");
Phase ("Ball")
{
 R_Combine ("Ball_2",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
  {
   Outlier("SSimple", 0.05);
  };
 };
 R_Combine ("Ball_3",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_3 UGAMS-34184n H17, F76",353,19)
  {
   Outlier("SSimple", 0.05);
  };
 };
 R_Combine ("Ball_6",8)
```

```
 {
  Outlier ("General",0.05);
  R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
  {
   Outlier("SSimple", 0.05);
  };
 };
 R_Combine ("Ball-7",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
  {
   Outlier("SSimple", 0.05);
  };
 };
 Date ("Date Estimate Ball");
 Interval("Interval Ball");
};
Boundary ("Mid End Ball")
{
 Transition("Duration End Ball");
 Start("Start End Ball");
 End("End End Ball");
};
Boundary("Mid Start Warminster")
{
 Transition("Duration Start Warminster");
 Start("Start Start Warminster");
 End("End Start Warminster");
};
After ("WAR-1 TPQ")
{
 Date ("=RY57 last extant ring");
};
```

```
   Phase ("Warminster Short-Lived Samples")
   {
    R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
    {
     Outlier("General", 0.05);
     R_Date ("VERA-6310 H4 F12 plum",334,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6310_2 H4 F12 plum",340,31)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451 F12 plum",427,22)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-u F12 plum",365,21)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2 F12 plum",355,22)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2r F12 plum",368,21)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451-r F12 plum",396,21)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-rr F12 plum",346,21)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
    {
```

```
     Outlier("General", 0.05);
     R_Date ("VERA-6309_1 H4 F16B bean",314,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_2 H4 F16B bean",311,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_3 H4 F16B bean",374,40)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25450 H4 F16 bean",363,22)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
    {
     Outlier ("General",0.05);
    };
    R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
    {
     Outlier ("General",0.05);
    };
    Date ("Date Estimate Warminster");
    Interval("Interval Warminster");
   };
   Boundary ("End Warminster");
  };
 };
```

Supplemental Table 7. OxCal runfile for Model 4.

```
Options()
 {
  Resolution=1;
 };
 Plot("Sequence Benson, Sopher, Ball Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
```

```
};
Sequence ("Benson to Warminster")
{
 Boundary ("Start Benson");
 Phase ("Benson Overall")
 {
  Sequence ("Benson")
  {
   Phase ("Benson Early Village")
   {
    R_Date("S-1535 charcoal",430,80)
    {
     Outlier("Charcoal",1);
    };
    R_Date("S-1539 charcoal",620,70)
    {
     Outlier("Charcoal",1);
    };
    R_Combine("Benson 9",8)
    {
     Outlier("General",0.05);
     R_Date("Benson_9a_UGAMS-33016", 304, 21)
     {
      Outlier("SSimple",0.05);
     };
     R_Date("Benson_9b GrM-17562",352,20)
     {
      Outlier("SSimple",0.05);
     };
    };
    R_Date("Benson_10_GrM-14541", 323, 20)
    {
     Outlier ("General",0.05);
    };
    R_Date("Benson_11_UGAMS-33017", 320, 21)
    {
     Outlier ("General",0.05);
    };
   };
   Boundary ("Benson Early to Late");
   Phase ("Benson Late Village")
   {
```

```
   R_Combine ("Benson 4",8)
   {
    Outlier("General",0.05);
    R_Date("Benson_4_UGAMS-33019", 289, 21)
    {
     Outlier("SSimple",0.05);
    };
    R_Date("Benson_4_UGAMS-33019r", 304, 21)
    {
     Outlier("SSimple",0.05);
    };
   };
   R_Date("Benson_7_GrM-14543", 342, 20)
   {
    Outlier ("General",0.05);
   };
   R_Combine ("Benson 8",8)
   {
    Outlier("General",0.05);
    R_Date("Benson_8a_UGAMS-33018", 302, 21)
    {
     Outlier("SSimple",0.05);
    };
    R_Date("Benson_8b_GrM_14545", 305, 20)
    {
     Outlier("SSimple",0.05);
    };
   };
  };
 };
 Date ("Date Estimate Benson");
 Interval("Interval Benson");
};
Boundary ("End Benson");
Interval ("Interval between Benson and Sopher");
Boundary ("Start Sopher");
Phase ("Sopher")
{
 R_Date("I-6846", 445, 85)
 {
  Outlier("Charcoal",1);
 };
```

```
 R_Combine ("Sopher BdGU-1 maize",8)
 {
  Outlier ("General",0.05);
  R_Date("VERA-6282 maize", 364, 27)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date("VERA-6282_2 maize", 292, 27)
  {
   Outlier("SSimple", 0.05);
  };
 };
 R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
 {
  Outlier ("General",0.05);
 };
 R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
 {
  Outlier ("General",0.05);
 };
 Date ("Date Estimate Sopher");
 Interval("Interval Sopher");
};
Boundary ("End Sopher");
Interval("Interval Between Sopher and Ball");
Boundary ("Start Ball");
Phase ("Ball Overall")
{
 Sequence ("Ball")
 {
  Phase ("Ball Early")
  {
   R_Combine ("Ball_2",8)
   {
    Outlier ("General",0.05);
    R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
    {
     Outlier("SSimple", 0.05);
    };
    R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
    {
     Outlier("SSimple", 0.05);
```

```
  };
 };
 R_Combine ("Ball_3",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_3 UGAMS-34184n H17, F76",353,19)
  {
   Outlier("SSimple", 0.05);
  };
 };
};
Boundary ("Ball Early to Late");
Phase ("Ball Late")
{
 R_Combine ("Ball_6",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
  {
   Outlier("SSimple", 0.05);
  };
 };
 R_Combine ("Ball-7",8)
 {
  Outlier ("General",0.05);
  R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
  {
   Outlier("SSimple", 0.05);
  };
  R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
  {
   Outlier("SSimple", 0.05);
  };
 };
```

```
      };
     };
     Date ("Date Estimate Ball");
     Interval("Interval Ball");
    };
    Boundary ("Mid End Ball")
    {
     Transition("Duration End Ball");
     Start("Start End Ball");
     End("End End Ball");
    };
    Boundary("Mid Start Warminster")
    {
     Transition("Duration Start Warminster");
     Start("Start Start Warminster");
     End("End Start Warminster");
    };
    After ("WAR-1 TPQ")
    {
     Date ("=RY57 last extant ring");
    };
    Phase ("Warminster Short-Lived Samples")
    {
     R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6310 H4 F12 plum",334,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6310_2 H4 F12 plum",340,31)
      {
       Outlier("SSimple", 0.05);
      };
      //R_Date ("UGAMS-25451 F12 plum",427,22)
      //{
      // Outlier("SSimple", 0.05);
      //};
      R_Date ("UGAMS-25451-u F12 plum",365,21)
      {
       Outlier("SSimple", 0.05);
```

```
     };
     R_Date ("UGAMS-25451-r2 F12 plum",355,22)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2r F12 plum",368,21)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451-r F12 plum",396,21)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-rr F12 plum",346,21)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
    {
     Outlier("General", 0.05);
     R_Date ("VERA-6309_1 H4 F16B bean",314,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_2 H4 F16B bean",311,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_3 H4 F16B bean",374,40)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25450 H4 F16 bean",363,22)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
    {
```

```
     Outlier ("General",0.05);
    };
    R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
    {
     Outlier ("General",0.05);
    };
    Date ("Date Estimate Warminster");
    Interval("Interval Warminster");
   };
   Boundary ("End Warminster");
  };
 };
```

Supplemental Table 8. OxCal runfile for Model 5.

```
Options()
 {
  Resolution=1;
 };
 Plot("Sequence Benson, Sopher, Ball Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
  };
```

```
Sequence ("Benson to Warminster")
{
 Boundary ("Start Benson");
 Phase ("Benson")
 {
  R_Date("S-1535 charcoal",430,80)
  {
   Outlier("Charcoal",1);
  };
  R_Date("S-1539 charcoal",620,70)
  {
   Outlier("Charcoal",1);
  };
  R_Combine("Benson 9",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_9a_UGAMS-33016", 304, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_9b GrM-17562",352,20)
   {
    Outlier("SSimple",0.05);
   };
  };
  R_Date("Benson_10_GrM-14541", 323, 20)
  {
   Outlier ("General",0.05);
  };
  R_Date("Benson_11_UGAMS-33017", 320, 21)
  {
   Outlier ("General",0.05);
  };
  R_Combine ("Benson 4",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_4_UGAMS-33019", 289, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_4_UGAMS-33019r", 304, 21)
   {
```

```
      Outlier("SSimple",0.05);
     };
    };
    R_Date("Benson_7_GrM-14543", 342, 20)
    {
     Outlier ("General",0.05);
    };
    R_Combine ("Benson 8",8)
    {
     Outlier("General",0.05);
     R_Date("Benson_8a_UGAMS-33018", 302, 21)
     {
      Outlier("SSimple",0.05);
     };
     R_Date("Benson_8b_GrM_14545", 305, 20)
     {
      Outlier("SSimple",0.05);
     };
    };
    Date ("Date Estimate Benson");
    Interval("Interval Benson");
   };
   Boundary ("End Benson");
   Interval ("Interval between Benson and Sopher &
Ball");
   Boundary ("Start Phase Sopher & Ball");
   Phase ("Sopher & Ball")
   {
    Sequence ("Sopher")
    {
     Boundary ("Start Sopher");
     Phase ("Sopher")
     {
      R_Date("I-6846", 445, 85)
      {
       Outlier("Charcoal",1);
      };
      R_Combine ("Sopher BdGU-1 maize",8)
      {
       Outlier ("General",0.05);
       R_Date("VERA-6282 maize", 364, 27)
       {
```

```
    Outlier("SSimple", 0.05);
   };
   R_Date("VERA-6282_2 maize", 292, 27)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
  {
   Outlier ("General",0.05);
  };
  R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
  {
   Outlier ("General",0.05);
  };
  Date ("Date Estimate Sopher");
  Interval("Interval Sopher");
 };
 Boundary ("End Sopher");
};
Sequence ("Ball")
{
 Boundary ("Start Ball");
 Phase ("Ball")
 {
  R_Combine ("Ball_2",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Combine ("Ball_3",8)
  {
   Outlier ("General",0.05);
   R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
   {
```

```
     Outlier("SSimple", 0.05);
    };
    R_Date ("Ball_3 UGAMS-34184n H17, F76",353,19)
    {
     Outlier("SSimple", 0.05);
    };
   };
   R_Combine ("Ball_6",8)
   {
    Outlier ("General",0.05);
    R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
    {
     Outlier("SSimple", 0.05);
    };
    R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
    {
     Outlier("SSimple", 0.05);
    };
   };
   R_Combine ("Ball-7",8)
   {
    Outlier ("General",0.05);
    R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
    {
     Outlier("SSimple", 0.05);
    };
    R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
    {
     Outlier("SSimple", 0.05);
    };
   };
   Date ("Date Estimate Ball");
   Interval("Interval Ball");
  };
  Boundary ("Mid End Ball")
  {
   Transition("Duration End Ball");
   Start("Start End Ball");
   End("End End Ball");
  };
 };
};
```

```
   Boundary("Mid Start Warminster")
   {
    Transition("Duration Start Warminster");
    Start("Start Start Warminster");
    End("End Start Warminster");
   };
   After ("WAR-1 TPQ")
   {
    Date ("=RY57 last extant ring");
   };
   Phase ("Warminster Short-Lived Samples")
   {
    R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
    {
     Outlier("General", 0.05);
     R_Date ("VERA-6310 H4 F12 plum",334,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6310_2 H4 F12 plum",340,31)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451 F12 plum",427,22)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-u F12 plum",365,21)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2 F12 plum",355,22)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2r F12 plum",368,21)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451-r F12 plum",396,21)
     //{
```

```
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-rr F12 plum",346,21)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
    {
     Outlier("General", 0.05);
     R_Date ("VERA-6309_1 H4 F16B bean",314,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_2 H4 F16B bean",311,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_3 H4 F16B bean",374,40)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25450 H4 F16 bean",363,22)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
    {
     Outlier ("General",0.05);
    };
    R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
    {
     Outlier ("General",0.05);
    };
    Date ("Date Estimate Warminster");
    Interval("Interval Warminster");
   };
   Boundary ("End Warminster");
```

```
  };
};
```

Supplemental Table 9. OxCal runfile for Model 6.

```
Options()
 {
  Resolution=1;
 };
 Plot("Sequence Benson, Sopher, Ball Warminster")
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Outlier_Model("SSimple",N(0,2),0,"s");
  Outlier_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");
  D_Sequence("WAR-1 Larix laricina")
  {
   First ();
   R_Date ("Wk-42865 Rings 9-17",355,17)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42866 Rings 19-27",325,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42867 Rings 29-37",349,13)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42868 Rings 39-47",321,15)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(10);
   R_Date ("Wk-42869 Rings 49-57",317,14)
   {
    Outlier ("SSimple",0.05);
   };
   Gap(4);
   Date ("RY57 last extant ring");
  };
```

```
Sequence ("Benson to Warminster")
{
 Boundary ("Start Benson");
 Phase ("Benson Overall")
 {
  Sequence ("Benson")
  {
   Phase ("Benson Early Village")
   {
     R_Date("S-1535 charcoal",430,80)
    {
     Outlier("Charcoal",1);
    };
    R_Date("S-1539 charcoal",620,70)
    {
     Outlier("Charcoal",1);
    };
    R_Combine("Benson 9",8)
  {
   Outlier("General",0.05);
   R_Date("Benson_9a_UGAMS-33016", 304, 21)
   {
    Outlier("SSimple",0.05);
   };
   R_Date("Benson_9b GrM-17562",352,20)
   {
    Outlier("SSimple",0.05);
   };
  };
    R_Date("Benson_10_GrM-14541", 323, 20)
    {
     Outlier ("General",0.05);
    };
    R_Date("Benson_11_UGAMS-33017", 320, 21)
    {
     Outlier ("General",0.05);
    };
   };
   Boundary ("Benson Early to Late");
   Phase ("Benson Late Village")
   {
    R_Combine ("Benson 4",8)
```

```
      {
       Outlier("General",0.05);
       R_Date("Benson_4_UGAMS-33019", 289, 21)
       {
        Outlier("SSimple",0.05);
       };
       R_Date("Benson_4_UGAMS-33019r", 304, 21)
       {
        Outlier("SSimple",0.05);
       };
      };
      R_Date("Benson_7_GrM-14543", 342, 20)
      {
       Outlier ("General",0.05);
      };
      R_Combine ("Benson 8",8)
      {
       Outlier("General",0.05);
       R_Date("Benson_8a_UGAMS-33018", 302, 21)
       {
        Outlier("SSimple",0.05);
       };
       R_Date("Benson_8b_GrM_14545", 305, 20)
       {
        Outlier("SSimple",0.05);
       };
      };
     };
    };
    Date ("Date Estimate Benson");
    Interval("Interval");
   };
   Boundary ("End Benson");
   Interval ("Interval between Benson and Sopher &
Ball");
   Boundary ("Start Phase Sopher & Ball");
   Phase ("Sopher & Ball")
   {
    Sequence ("Sopher")
    {
     Boundary ("Start Sopher");
     Phase ("Sopher")
```

```
 {
  R_Date("I-6846", 445, 85)
  {
   Outlier("Charcoal",1);
  };
  R_Combine ("Sopher BdGU-1 maize",8)
  {
   Outlier ("General",0.05);
   R_Date("VERA-6282 maize", 364, 27)
   {
    Outlier("SSimple", 0.05);
   };
   R_Date("VERA-6282_2 maize", 292, 27)
   {
    Outlier("SSimple", 0.05);
   };
  };
  R_Date("UGAMS-40154 Sopher 3 maize", 287, 23)
  {
   Outlier ("General",0.05);
  };
  R_Date("UGAMS-40155 Sopher 4 maize", 323, 23)
  {
   Outlier ("General",0.05);
  };
  Date ("Date Estimate Sopher");
  Interval("Interval Sopher");
 };
 Boundary ("End Sopher");
};
Sequence ("Ball")
{
 Boundary ("Start Ball");
 Phase ("Ball Overall")
 {
  Sequence ("Ball")
  {
   Phase ("Ball Early")
   {
    R_Combine ("Ball_2",8)
    {
     Outlier ("General",0.05);
```

```
          R_Date ("Ball_2 UGAMS-34183 H11, F4",353,22)
          {
           Outlier("SSimple", 0.05);
          };
          R_Date ("Ball_2 UGAMS-34183n H11, F4",333,19)
          {
           Outlier("SSimple", 0.05);
          };
         };
         R_Combine ("Ball_3",8)
         {
          Outlier ("General",0.05);
          R_Date ("Ball_3 UGAMS-34184 H17, F76",344,22)
          {
           Outlier("SSimple", 0.05);
          };
          R_Date ("Ball_3 UGAMS-34184n H17,
F76",353,19)
          {
           Outlier("SSimple", 0.05);
          };
         };
        };
        Boundary ("Ball Early to Late");
        Phase ("Ball Late")
        {
         R_Combine ("Ball_6",8)
         {
          Outlier ("General",0.05);
          R_Date ("Ball_6_UGAMS34179 H25, F34",358,21)
          {
           Outlier("SSimple", 0.05);
          };
          R_Date ("Ball_6_UGAMS34179n H25, F34",351,21)
          {
           Outlier("SSimple", 0.05);
          };
         };
         R_Combine ("Ball-7",8)
         {
          Outlier ("General",0.05);
          R_Date ("Ball_7_UGAMS34180 H21, F35",307,22)
```

```
          {
           Outlier("SSimple", 0.05);
          };
          R_Date ("Ball_7_UGAMS34180n H21, F35",298,19)
          {
           Outlier("SSimple", 0.05);
          };
         };
        };
       };
       Date ("Date Estimate Ball");
       Interval("Interval Ball");
      };
      Boundary ("Mid End Ball")
      {
       Transition("Duration End Ball");
       Start("Start End Ball");
       End("End End Ball");
      };
     };
    };
    Boundary("Mid Start Warminster")
    {
     Transition("Duration Start Warminster");
     Start("Start Start Warminster");
     End("End Start Warminster");
    };
    After ("WAR-1 TPQ")
    {
     Date ("=RY57 last extant ring");
    };
    Phase ("Warminster Short-Lived Samples")
    {
     R_Combine ("Warminster H4 F12 plum (Prunus
Americana)",8)
     {
      Outlier("General", 0.05);
      R_Date ("VERA-6310 H4 F12 plum",334,28)
      {
       Outlier("SSimple", 0.05);
      };
      R_Date ("VERA-6310_2 H4 F12 plum",340,31)
```

```
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451 F12 plum",427,22)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-u F12 plum",365,21)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2 F12 plum",355,22)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25451-r2r F12 plum",368,21)
     {
      Outlier("SSimple", 0.05);
     };
     //R_Date ("UGAMS-25451-r F12 plum",396,21)
     //{
     // Outlier("SSimple", 0.05);
     //};
     R_Date ("UGAMS-25451-rr F12 plum",346,21)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Combine ("Warminster H4 F16B bean
(Phaseolus)",8)
    {
     Outlier("General", 0.05);
     R_Date ("VERA-6309_1 H4 F16B bean",314,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_2 H4 F16B bean",311,28)
     {
      Outlier("SSimple", 0.05);
     };
     R_Date ("VERA-6309_3 H4 F16B bean",374,40)
     {
```

```
      Outlier("SSimple", 0.05);
     };
     R_Date ("UGAMS-25450 H4 F16 bean",363,22)
     {
      Outlier("SSimple", 0.05);
     };
    };
    R_Date ("Warminster_4_UGAMS34181 maize H9,
F30c",365,21)
    {
     Outlier ("General",0.05);
    };
    R_Date ("Warminster_8_UGAMS34182 maize H5,
F1",326,21)
    {
     Outlier ("General",0.05);
    };
    Date ("Date Estimate Warminster");
    Interval("Interval Warminster");
   };
   Boundary ("End Warminster");
  };
 };
```