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The Manor House West Street Chipping Norton Oxfordshire

Tree-ring Analysis of Oak Timbers from the East Range

Martin Bridge and Cathy Tyers

Discovery, Innovation and Science in the Historic Environment



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THE MANOR HOUSE
WEST STREET
CHIPPING NORTON
OXFORDSHIRE

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SUMMARY

Eight oak timbers were sampled from the roof of the east range. Seven of the eight ring-series cross-matched with each other and were combined to form a 179-year site master sequence which was dated to the period AD 1501–1679. The dated series show that felling took place over a period extending from summer AD 1677 to the spring of AD 1680, although the timbers were similar in growth characteristics, suggesting that they may all have grown in the same location. This makes AD 1680 as the most likely date of construction for this roof, or within a year or two after this date.

CONTRIBUTORS

Martin Bridge and Cathy Tyers

ACKNOWLEDGEMENTS

We are very grateful to the owner for allowing access to undertake this work. This building was one of several investigated as part of the Early Fabric in Historic Towns: Chipping Norton project, and we thank Rebecca Lane for managing the project on behalf of Historic England. Particular thanks go to Victoria Hubbard for her extensive input on coordinating the project in the town and her friendly encouragement, and to other members of the Chipping Norton Buildings Record and Oxfordshire Buildings Record. We are also grateful to Shahina Farid for commissioning the work and her input into the production of this report.

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INTRODUCTION

The Early Fabric in Historic Towns: Voluntary Group Projects, funded by Historic England, have been developed in the recognition and acknowledgement of the excellent work being undertaken by local vernacular groups in the study of local architectural trends and fabrics. The intention of these projects is to encourage this type of study through the provision of support and facilitate training of more people in building analysis and recording. The local projects were coordinated by Rebecca Lane (Historic England South West Region: Architectural Investigation).

Early Fabric in Chipping Norton Project

Whilst Chipping Norton features in a study on historic towns in Oxfordshire (Rodwell 1975), and some buildings have been recorded and published in detail (eg Simons and Phimester 2005), no systematic research had been undertaken on the buildings of the town before this project.

The project examined vernacular historic buildings in the centre of Chipping Norton, aiming to improve understanding of the morphology and development of the historic town plan and to understand this within the framework of economic and social change. It aimed to identify early plan forms and to understand the dates of the introduction of vernacular architectural details (eg in materials, carpentry, fenestration, and decorative features), thus mapping the survival of early (pre-1900) fabric and revealing the architectural evolution of the town's buildings.

Initially, 21 properties were identified that were thought to be key to understanding the town's architectural development for a programme of comprehensive investigation. These properties were assessed for their suitability for dendrochronology and 12 that contained oak timber considered suitable for analysis were initially sampled and analysed. Oak timbers from seven of these buildings could be dated by ring-width dendrochronology, whilst radiocarbon wiggle-matching was undertaken for one of the buildings where the ring-width dendrochronology had produced an undated site master chronology.

The results of the project are presented by Rosen and Cliffe (2017). The reports produced on the historic buildings recorded as part of this project by the Chipping Norton Buildings Record/Oxfordshire Buildings Record (OBR) will be deposited in the Oxfordshire Historic Environment Record.

The Manor House

This Grade II listed building (LEN: 1052600) sits on the western side of West Street in the centre of Chipping Norton (Fig 1). As an important building in the town, to the south of the old market square, and with questions as to how it developed, it was a natural candidate for dendrochronological investigation as part of the *Early Fabric in Historic Towns: Chipping Norton* project. It was hoped that any results obtained might provide additional evidence on the development of the building itself, but also the early development of Chipping Norton, this being one of several buildings in the centre of Chipping Norton investigated by the OBR.

This large building has been much altered through time, but is believed to have an early sixteenth-century core. The OBR team suggested that the roof of the east range (the nearest to the road) may represent the oldest surviving section. The timbers are lime-washed throughout the roof area, and plaster rises up the walls above the present ceiling line, suggesting that this has long been a habitable space. Two trusses are present, having large principal rafters, collars, and two tiers of purlins. The west truss has a number of added studs and the east truss has raking struts from the collar to the principals.

METHODOLOGY

Fieldwork for the present study was carried out in October 2015, following an initial assessment of the potential for dating a few weeks beforehand, and consultation with those involved in the project and the owners. In the initial assessment, accessible oak timbers with more than 50 rings and where possible traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. Those timbers judged to be potentially useful were cored using a 16mm auger attached to an electric drill. The cores were labelled, and stored for subsequent analysis.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (2004). Cross-matching was attempted by a process of qualified statistical comparison by computer, supported by visual checks. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted on the computer monitor to allow visual comparisons to be made between sequences. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

In comparing one sample or site master against other samples or chronologies, t -values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious t -values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some t -value in the range of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified. Where two individual samples match together with a t -value of 10 or above, and visually exhibit exceptionally similar ring patterns, they may have originated from the same parent tree. Same-tree matches can also be identified through the external characteristics of the timber itself, such as knots and shake patterns. Lower t -values however do not preclude same tree derivation.

Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward. Depending on the completeness of the final ring (ie if it has only the spring vessels or earlywood formed, or the latewood or summer growth) a precise felling date and season can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using an empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* (*tpq*) or felled-after date.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 9–41 rings (Miles 1997). It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

RESULTS AND DISCUSSION

Eight timbers, all thought to be original elements to the east range roof, were sampled (Table 1). The collars to the two trusses were not sampled as they looked to be later replacement timbers of likely twentieth-century origin. The positions of the timbers sampled are shown in Figure 2, and the east and west trusses are illustrated in Figures 3 and 4. Seven of the eight series cross-matched each other (Table 2) and were combined to form a 179-year sequence which was dated to the period AD 1501–1679 (Table 3). One of the dated individual timber series, from the south principal rafter to the east truss (cnmnr02), was only partially measured, the outermost rings to the heartwood/sapwood boundary being too narrow to distinguish. This sample also had complete sapwood, detached from the main core with an unknown number of rings lost between the two sections. The rings in this detached section were also too narrow to distinguish, although at least 34 sapwood rings could be seen. The remaining sample, from the upper purlin in the east bay (cnmnr07i and cnmnr07ii) fractured during coring, and the short sequences obtained could not be matched with the remaining samples. The ring-width data are given in the Appendix.

It is interesting to note that whilst samples cnmnr01 and cnmnr02 matched each other well, and samples cnmnr03, cnmnr05, cnmnr06, and cnmnr08 matched each other well too, the matching between these two sub-groups was poor. The individual matches between cnmnr03, cnmnr05, cnmnr06, and cnmnr08 were below $t = 10$ in several instances (Table 2), but the nature of the narrow bands is such (Fig 5) that it was considered that they may all have potentially been derived from a single tree. This idea was discounted however when they were found to have different end dates, which although possible with differential growth in parts of the

same tree, was considered unlikely. Nevertheless, the great similarity in growth suggests they may have grown in the same location.

The dated series (Fig 6) show that felling took place over a period extending from summer AD 1677 to spring AD 1680, although the timbers were similar in growth characteristics, suggesting that they may all have grown in the same location. This makes the most likely date of construction of this roof AD 1680, or within a year or two after this date. This is later than the sixteenth-century date thought to represent the earliest phase of the Manor House.

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TABLES

Table 1: Details of samples taken from the roof of the east range, The Manor House, West Street, Chipping Norton

Sample number	Timber and position	No of rings	Mean ring width (mm)	Dates spanning (AD)	h/s boundary (AD)	Sapwood rings	Mean sensitivity	Felling date ranges (AD)
cnmnr01	North principal rafter, east truss	175	0.80	1505–1679	1644	35¼C	0.22	spring 1680
cnmnr02	South principal rafter, east truss	137 (+4NM)	0.88	1501–1637	-	(+≥34NM)	0.23	c 1670-80s
cnmnr03	Lower south purlin, middle bay	124	1.34	1553–1676	1651	25½C	0.19	summer 1677
cnmnr04	Lower north purlin, middle bay	103	1.48	1568–1670	1651	19 (+8NM)	0.21	1678–92
cnmnr05	Upper north purlin, middle bay	107	1.28	1572–1678	1653	25½C	0.21	summer 1679
cnmnr06	Upper south purlin, middle bay	120	1.38	1560–1679	1651	28¼C	0.20	spring 1680
cnmnr07i	Upper south purlin, east bay	32	2.57	-	-	-	0.27	
cnmnr07ii	<i>ditto</i>	28	0.75	-	-	-	0.19	-
cnmnr08	North principal rafter, west truss	102	1.10	1577–1678	1651	27½C	0.23	summer 1679

Key: NM = not measured; h/s = heartwood/sapwood boundary; ¼C = complete sapwood, felled the following spring; ½C = complete sapwood, felled the following summer

Table 2: Cross-matching between individual timbers (values of t above 3.5 are significant)

t -values						
Sample number	cnmnr02	cnmnr03	cnmnr04	cnmnr05	cnmnr06	cnmnr08
cnmnr01	7.9	5.0	3.3	4.3	5.0	3.6
cnmnr02		3.7	5.1	5.2	3.6	2.7
cnmnr03			6.9	7.7	8.3	9.9
cnmnr04				7.5	6.4	6.9
cnmnr05					7.6	6.1
cnmnr06						6.9

Table 3: Dating evidence for the site master, CNMNR1, as spanning AD 1501–1679

Source region:	Chronology name:	Publication reference:	File name:	Span of chronology (AD)	Overlap (years)	<i>t</i> -value
Hampshire	Blaegrove Cottage, Up Nately	(Bridge <i>et al</i> 2011)	BLAEGROV	1347–1610	110	7.1
Norfolk	Langley Abbey	(Arnold and Howard 2014)	LNGLSQ02	1426–1611	111	7.0
Somerset	8 Market Place, Shepton Mallet	(Miles 2002)	SHPTNMLT	1518–1677	160	6.9
Kent	Knole House	(Miles and Bridge 2010)	KNOLE1	1431–1605	105	6.7
Essex	The Granary, Cressing Temple	(Andrews <i>et al</i> 1994)	CRG_LT9	1487–1622	122	6.6
Hampshire	Chawton House	(Miles and Haddon-Reece 1996)	CHAWTON1	1511–1592	82	6.6
Norfolk	Godwick Great Barn, Tittleshall	(Arnold and Howard 2013)	GDWKSQ01	1406–1597	97	6.5
Wales	Oxwich Castle	(Miles <i>et al</i> 2006)	OXWICH	1459–1630	130	6.5
Buckinghamshire	Boarstall Tower	(Miles and Worthington 1999)	BOARSTL2	1450–1614	114	6.4
Suffolk	Nettlestead Chace	(Miles <i>et al</i> 2007)	NETTLE1	1466–1562	62	6.3
Warwickshire	Halls Croft, Stratford-upon-Avon	(Miles and Worthington 1999)	HLSCRFT2	1457–1613	113	6.2
Oxfordshire	Cottesmore Farm, Ewelme	(Miles and Worthington 1997)	COTTESMR	1433–1601	101	6.1

FIGURES

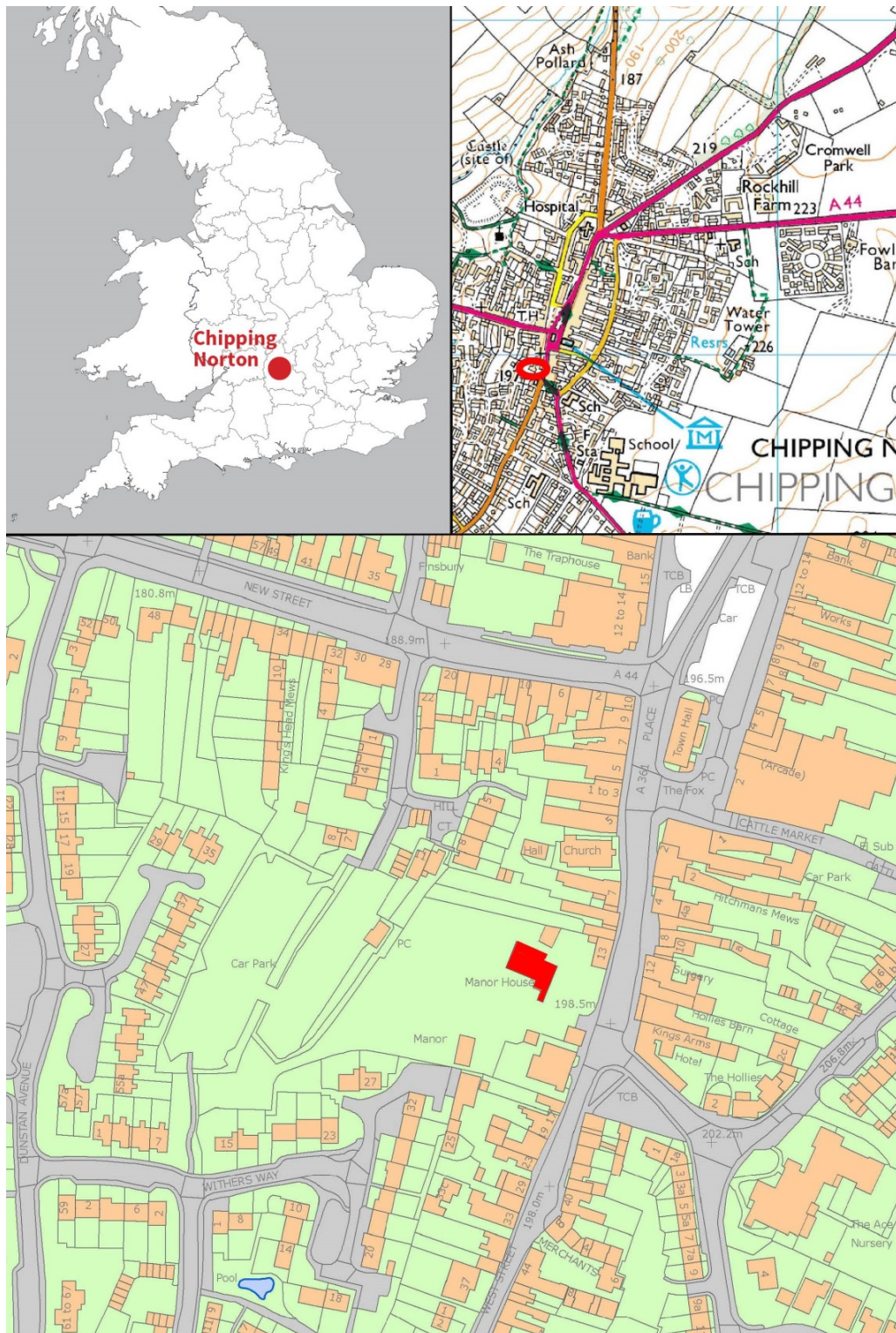


Figure 1: Maps to show the location of the Manor House on West Street in Chipping Norton, marked in red. Scale: top right 1:15000; bottom 1:2000. © Crown Copyright and database right 2020. All rights reserved. Ordnance Survey Licence number 100024900. © British Crown and SeaZone Solutions Ltd 2020. All rights reserved. Licence number 102006.006. © Historic England

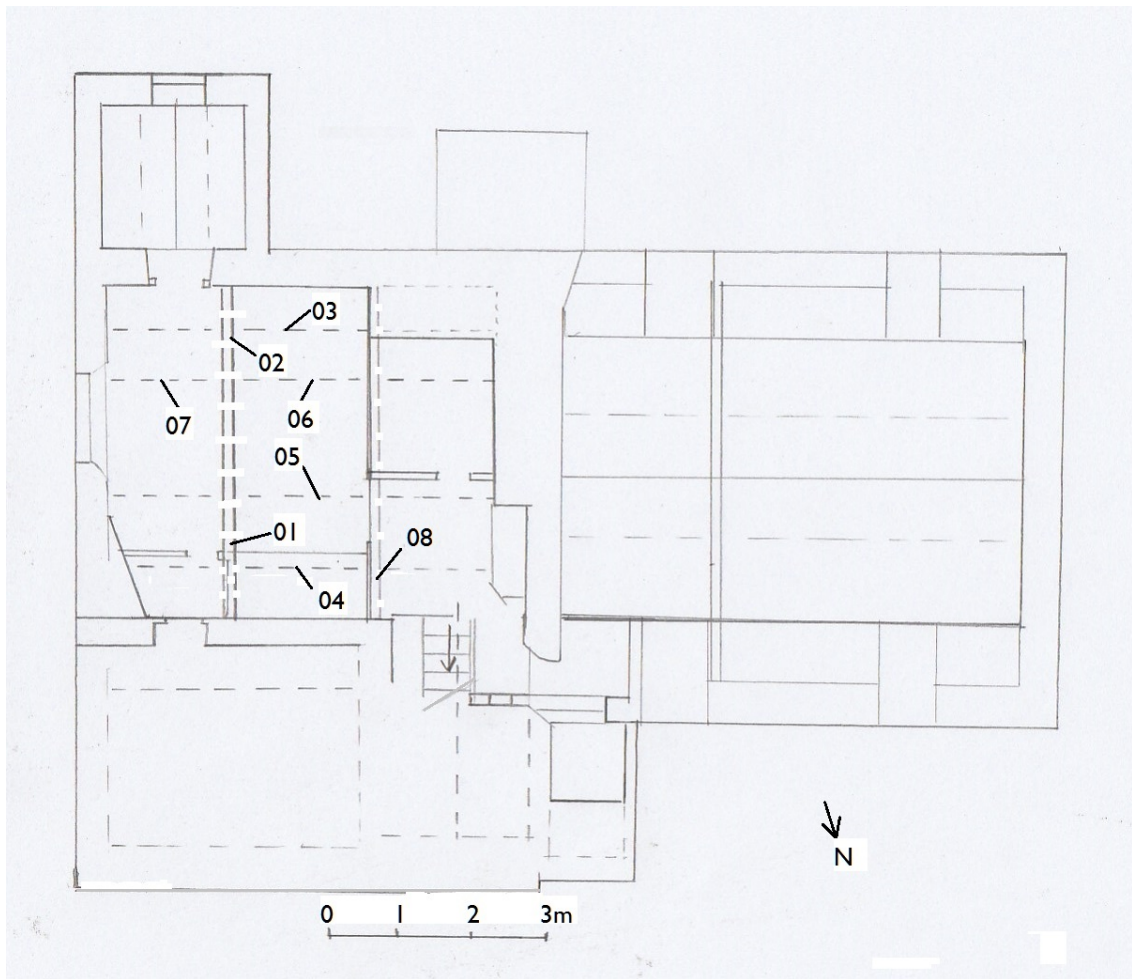


Figure 2: Plan of the attics showing the locations of the timbers sampled (redrawn from an original by Jo Cormier)



Figure 3: View of the east truss (looking east) photograph Martin Bridge



Figure 4: View of the west truss (looking west) photograph Martin Bridge

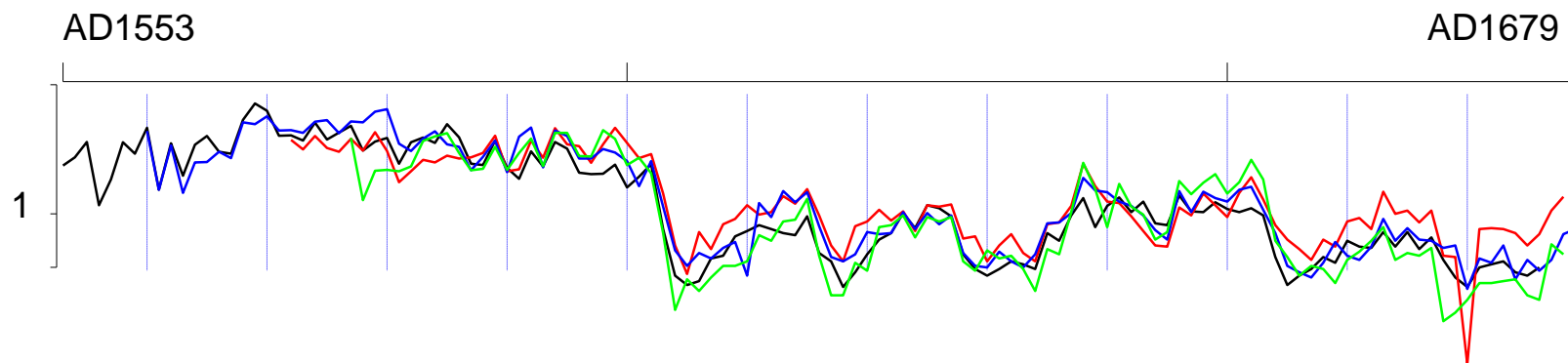


Figure 5: Plots of the ring-width series of samples cnmnr03 (black), cnmnr05 (red), cnmnr06 (blue), and cnmnr08 (green) showing their great similarity (x-axis = time in years, y-axis = ring-width (mm) on a logarithmic scale)

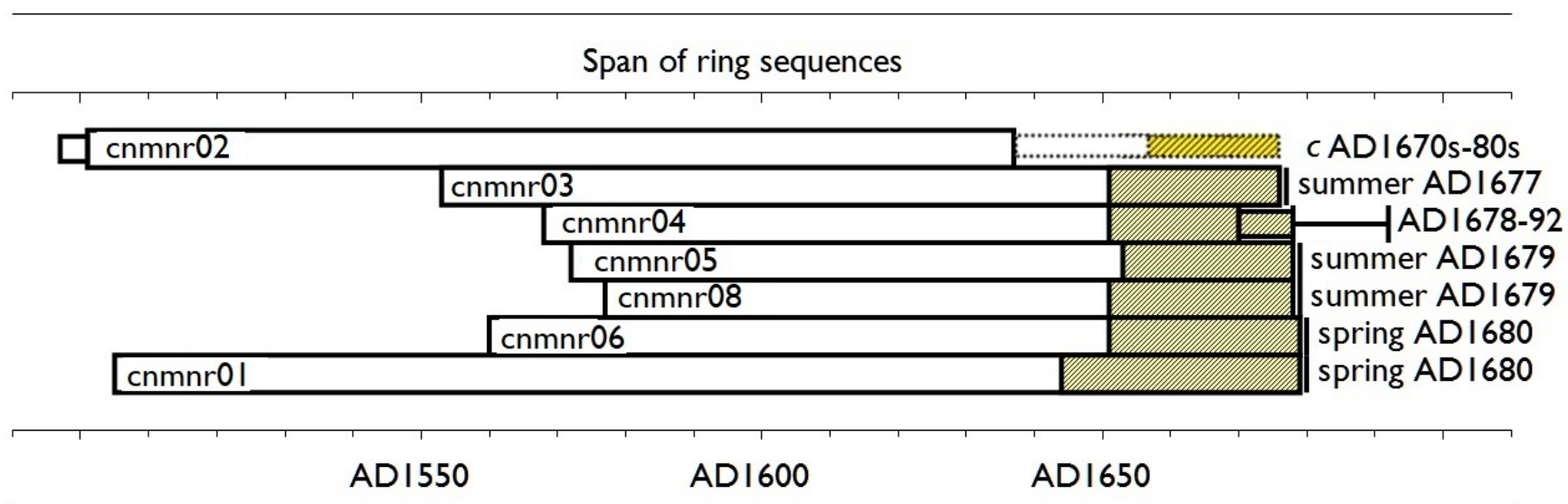


Figure 6: Bar diagram showing the relative positions of overlap and felling dates or likely felling date ranges for the individual samples from The Manor, Chipping Norton. White bar – heartwood; yellow hatched bar – sapwood; narrow sections of bar – additional unmeasured rings; dotted section of bar – additional uncounted rings

APPENDIX

Ring width values (0.01mm) for the sequences measured

cnmnr01

141	167	121	140	183	199	223	186	210	184
151	195	193	198	228	166	247	205	130	102
101	124	134	150	109	70	205	111	105	110
147	125	125	135	215	234	188	108	141	97
185	78	123	113	110	76	92	74	102	111
89	65	58	63	80	74	63	60	38	48
55	53	50	90	79	85	46	43	51	47
41	44	66	46	42	64	65	35	52	56
49	59	50	43	66	50	64	71	69	54
62	64	60	59	74	58	74	78	61	36
21	55	57	46	49	46	51	37	63	53
57	50	40	45	43	62	44	48	43	50
58	75	45	32	46	46	41	38	40	39
46	38	50	67	70	56	58	37	42	40
46	65	50	114	54	69	65	78	71	51
32	25	41	55	48	45	50	48	65	50
75	62	56	39	38	28	35	33	46	40
43	42	55	43	41					

cnmnr02

180	113	92	100	186	204	213	209	201	221
258	195	271	169	159	197	202	195	188	161
225	196	139	121	104	130	172	162	105	114
204	109	124	100	159	129	116	151	136	172
174	99	102	64	105	65	73	102	135	93
89	83	119	117	93	68	69	70	58	57
58	47	40	45	45	52	54	95	69	66
50	42	31	37	34	34	38	33	36	48
45	38	41	43	56	44	40	58	61	41
55	60	44	38	51	61	54	55	65	46
59	74	42	38	13	36	41	40	40	57
55	48	76	55	62	58	31	40	43	38
54	42	53	16	55	74	61	61	45	32
45	45	29	32	47	43	54			

cnmnr03

180	199	240	111	152	239	208	285	134	236
159	232	258	213	208	314	384	351	259	260
244	304	247	269	292	216	241	252	184	239
253	237	298	254	184	181	244	175	153	214
178	240	221	165	162	163	182	138	157	183
83	47	42	44	58	60	76	81	87	83
79	77	97	62	56	41	49	61	73	79
101	84	111	107	97	61	51	47	51	56
54	51	79	72	98	121	85	110	122	102
116	89	87	125	103	102	115	106	102	107
98	59	42	47	51	59	55	72	67	66

80	67	80	65	75	57	46	41	52	54
56	49	47	52						

cnmnr04

390	373	359	374	428	353	399	330	271	391
306	292	308	224	283	241	300	338	258	176
234	322	179	176	258	150	223	195	157	161
188	144	124	102	132	126	86	60	90	72
88	69	79	92	102	113	114	146	116	83
82	81	117	122	102	113	75	110	104	97
74	75	79	65	81	50	58	88	91	125
122	113	103	125	84	89	59	69	112	98
116	123	76	134	142	130	46	49	54	60
53	74	81	89	78	79	82	77	77	77
49	113	79							

cnmnr05

246	219	258	223	213	249	216	270	215	147
168	193	187	203	196	199	210	259	168	172
244	198	284	233	228	186	233	285	237	197
207	128	68	48	80	65	88	94	111	99
102	124	113	135	98	68	56	86	91	105
92	103	81	111	109	112	74	76	56	68
78	62	56	88	90	110	184	140	116	114
97	81	68	67	108	98	128	111	96	129
156	119	87	73	65	57	73	67	91	95
83	131	100	104	90	104	60	59	16	83
84	83	79	68	78	104	123			

cnmnr06

274	134	230	129	187	188	213	197	305	298
328	276	277	268	307	313	267	308	305	347
358	235	215	250	273	233	226	170	200	244
166	256	286	176	276	258	196	196	220	211
190	140	190	109	64	53	62	58	66	71
47	114	96	132	115	130	86	59	56	61
80	78	79	102	83	101	88	98	62	53
52	63	56	52	61	89	90	101	155	133
130	116	110	98	82	73	132	102	131	121
116	134	139	105	79	53	49	46	55	71
60	57	67	94	72	84	73	72	66	68
40	58	55	68	45	57	50	57	78	83

cnmnr07i

419	373	431	528	138	129	161	129	225	243
252	253	302	247	197	229	249	298	471	218
374	291	272	241	320	287	163	247	179	154
84	123								

cnmnr7ii

109	121	113	116	128	122	119	145	144	61
36	32	46	49	65	55	58	51	65	76
95	50	47	45	33	42	38	47		

cnmnr08

252	118	169	171	168	178	243	257	267	210
170	173	226	171	210	250	179	268	268	202
201	277	249	181	198	164	79	31	45	39
46	53	53	56	77	72	91	93	120	60
37	37	55	50	85	87	98	75	96	91
96	56	50	64	58	60	51	39	65	61
102	186	135	85	144	109	99	73	80	149
127	146	162	128	147	193	152	72	59	47
53	51	43	57	63	72	85	57	62	60
66	27	30	35	43	43	44	45	37	35
69	61								



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