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Scientific Dating

Wrest Park
Silsoe
Bedfordshire

Tree-ring Analysis of Yew Trunks

Martin Bridge and Cathy Tyers

Discovery, Innovation and Science in the Historic Environment

Research Report Series no. 187-2020

Front Cover: Suggested location of the removed yew trunks at Wrest Park © Historic England. Photograph by Martin Bridge

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SUMMARY
Two *ex situ* trunks had been retained from the western section of an old yew hedge. A subsection of each trunk was cut to retain rings as close to the pith as possible and out to the bark. One radius was found to have 218 rings, the other 215 rings. Comparisons between the measured series from the different trunk sections suggested that they were most likely from the same tree, even though they were expected to represent two different trees. Few rings were lost from near the pith, and the trees were most likely planted around AD 1780–1800, making them younger than the map evidence for a hedge being present in AD 1717.

CONTRIBUTORS
Martin Bridge and Cathy Tyers

ACKNOWLEDGEMENTS
The gardening team at Wrest Park, led by Andrew Luke (English Heritage), were very helpful in arranging access and cutting slices of the trunks. For guidance and assistance we thank Andrew Hann, English Heritage Properties Historian, who requested the work. This investigation was commissioned and facilitated by Shahina Farid (Historic England Scientific Dating Team).

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INTRODUCTION

Wrest Park is situated to the east of the village of Silsoe (Fig 1), some 14km south of Bedford. It consists of a house of the AD 1830s set in a landscaped garden of seventeenth-century origin, with extensive eighteenth-century and later features. Since being taken into guardianship by English Heritage, an extensive programme of restoration has been taking place, part of which included the removal of an overgrown yew (*Taxus baccata* L) hedge, which map evidence suggested was present in AD 1717. Andrew Hann (English Heritage Properties Historian Team Leader) requested that dendrochronological investigation be carried out on trunks retained by the gardening team in an attempt to assess whether the trees removed were original to this hedge, or whether they represent later re-plantings.

METHODOLOGY

Trunks were retained when the western arm of the hedge was dug up. These were stored for later investigation. In December 2017, when the site was visited, two trunks were located in store (Figs 2–3), one bearing a metal tag with the number 3533 on it. These two trunks were each cut by chainsaw into cross-sectional slices by a member of the English Heritage garden team, and taken back to the laboratory.

The cross-sectional samples were then sub-sectioned on a bandsaw and the longest diameter was retained, including rings as close to the centre (pith) as possible and out to the bark. These were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be as clearly distinguishable as possible. 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 combination of visual matching and a process of qualified statistical comparison by computer. 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-screen to assist 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.

RESULTS AND INTERPRETATION

Neither cross-section retained the pith, but not many rings had been lost from either trunk. One radius was found to retain 218 rings to the bark, the other 215 rings to the bark (Table 1). The ring-width measurements for the two measured series are provided in the Appendix.

Comparisons of the ring-width series show that there are two places where the ring-width sequences go out of phase (Fig 5), but otherwise the agreement between the

two series is so strong that dendrochronologically it would appear that the two trunk sections were very probably from the same tree, even though they had been thought to be from different trees. Series WRSTPKy2 (215 rings) was therefore divided into three sections (a, b, and c) where the rings were in phase with those from the slightly longer WRSTPKy1 series. It is a possibility that rings were missing rings in sample WRSTPKy2. Sometimes, in harsh conditions, rings are not formed around the entirety of the trunk, and thus may be missing in part of the trunk, or present towards the crown, but not lower down (Fritts 1976). The lobate growth also results in some areas where the rings become very narrow. This may be seen in Figure 4, where the rings which are clearly visible on one side of the photograph are 'compressed' on the other side, and one can appreciate that they may actually merge around parts of the circumference to give a different ring count on alternative radii.

The *t*-values obtained for each of these sections against WRSTPKy1 were:

WRSTPKy2a t = 17.7 at relative years 2–89 (88 years overlap)

WRSTPKy2b t = 13.4 at relative years 91–178 (88 years overlap)

WRSTPKy2c t = 8.4 at relative years 180–218 (39 years overlap)

The areas of non-alignment (Fig 5) either mean that a ring is potentially missing between WRSTPKy2a and WRSTPKy2b and between WRSTPKy2b and WRSTPKy2c or that false rings have been measured at these positions on WRSTPKy1. With no other trunks from the yew hedge to compare these to, it is not possible to ascertain which is the case, although it is felt more likely that one trunk exhibits missing rings, as 'wedging out' of yew rings was noted in a previous study (Bridge 2010).

With the innermost rings missing, the absolute age of the trees is a matter of slight conjecture, but, assuming the trees were cut in 2017, these trunks were probably from a tree or trees planted around AD 1780–1800, and are therefore younger than the map evidence for the hedge dating to AD 1717.

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TABLES

Table 1: Details of the ring-series measured

Sample	No of rings	Relative date span	Mean ring width	Sensitivity
WRSTPKy1	218	1–218	1.47	0.26
WRSTPKy2a	88	2–89	1.91	0.21
WRSTPKy2b	88	91–178	1.14	0.25
WRSTPKy2c	39	180–218	1.26	0.30

FIGURES

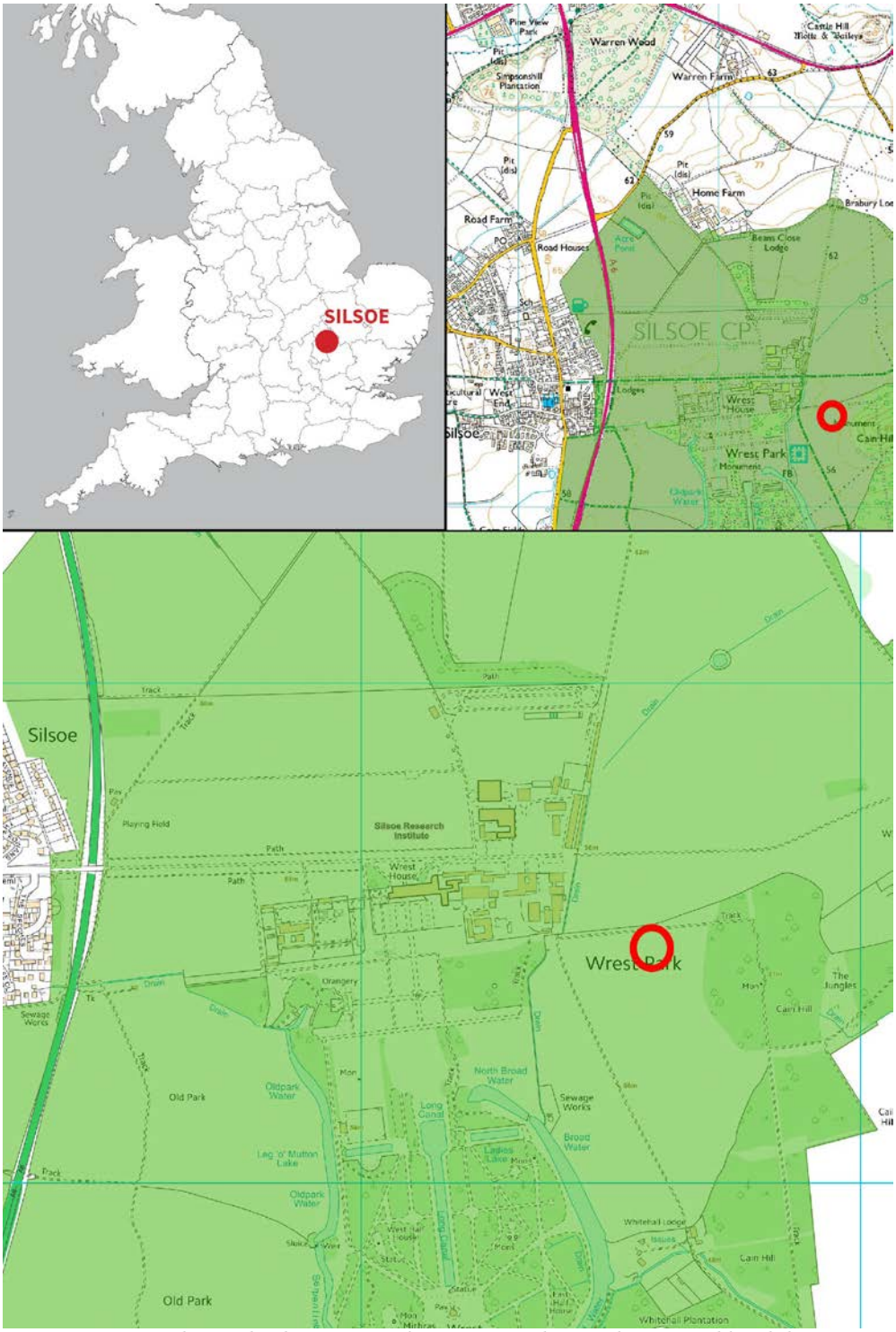

Figure 1: Maps to show the location of Wrest Park in Silsoe, Bedfordshire, marked in red and shown within the zone of the Register of Historic Parks and Gardens of Special Historic Interest. Scale: top right 1:25000; bottom 1:10000. © Crown Copyright and database right 2020. All rights reserved. Ordnance Survey Licence number 100024900. © British Crown and SeaZone Solutions Ltd 2020. All rights reserved. Licence number 102006.006. © Historic England

Figure 2: The first yew trunk sampled for this investigation (photograph Martin Bridge)

Figure 3: The second trunk sampled for this investigation (photograph Martin Bridge)

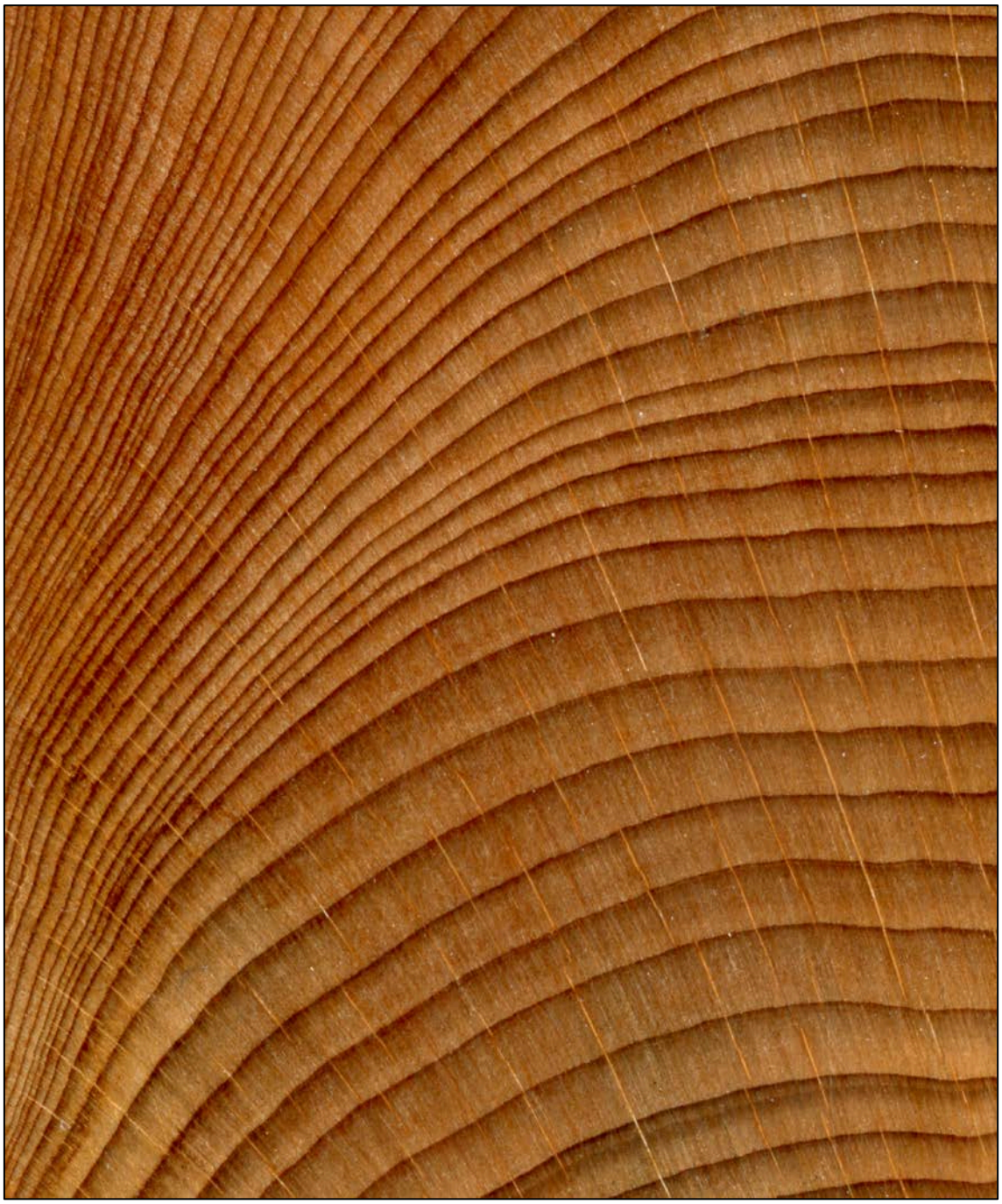

Figure 4: Scanned section of WRSTPKy, approximately 40mm long, with growth from bottom to top, showing how the rings may 'wedge out' such that on the left side one can see converging ring boundaries. Further around the circumference it is possible that two or more rings may merge to give only a single ring (photograph Martin Bridge)

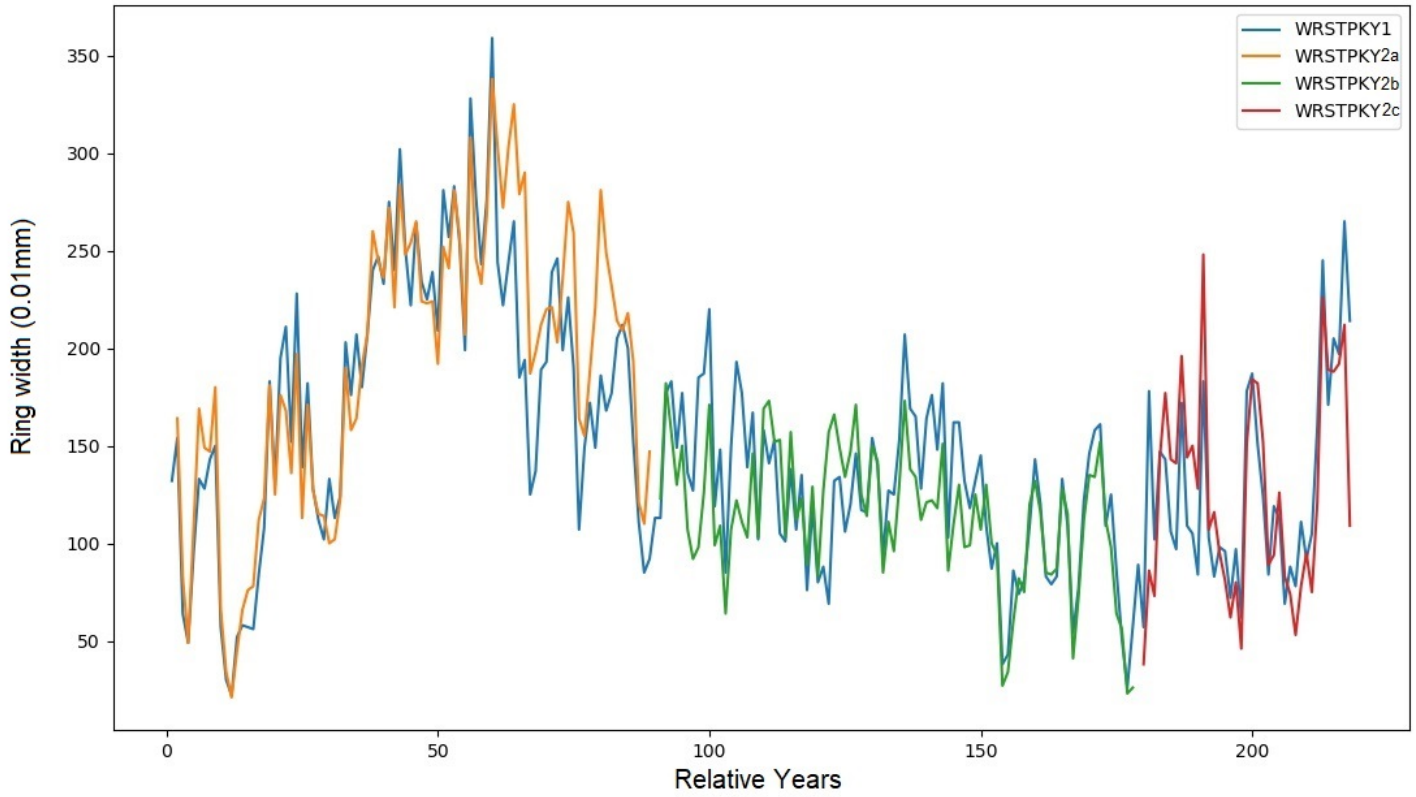

Figure 5: Ring-width plots of the measured sequences showing the fit between WRSTPKy1 and the sections of WRSTPKy2

APPENDIX

Ring width values (0.01mm) for the sequences measured

WRSTPKy1

132	154	64	49	95	133	128	143	150	57
30	22	52	58	57	56	84	108	183	130
195	211	152	228	139	182	128	112	102	133
113	124	203	176	207	180	207	240	247	233
275	240	302	251	222	264	234	225	239	209
281	257	283	254	199	328	278	243	276	359
244	222	244	265	185	194	125	137	189	193
239	246	199	226	190	107	149	172	149	186
168	177	205	212	200	152	111	85	92	113
113	177	183	149	177	136	127	185	187	220
119	148	85	149	193	177	139	167	102	158
141	153	105	101	138	107	135	76	119	80
88	69	132	134	106	120	146	117	116	154
140	94	127	125	153	207	169	165	128	164
176	148	182	103	162	162	132	118	132	145
109	87	100	38	43	86	74	81	109	143
120	83	79	83	133	109	54	77	122	146
158	161	109	125	86	51	26	57	89	57
178	102	147	143	106	97	172	109	105	84
183	103	83	98	96	72	97	62	178	187
151	124	84	119	113	69	88	78	111	92
105	160	245	171	205	197	265	214		

WRSTPKy2a

164	83	49	108	169	149	147	180	66	34
21	45	66	76	78	112	123	181	125	176
168	136	197	113	171	127	115	114	100	102
122	190	158	164	191	207	260	245	236	272
221	284	248	254	265	224	223	224	192	252
241	281	258	207	308	246	233	268	338	303
272	303	325	279	290	187	198	212	220	221
203	236	275	259	164	155	188	221	281	249
232	214	209	218	193	121	110	147		

WRSTPKy2b

123	182	157	130	150	107	92	98	126	171
99	109	64	107	122	111	103	146	103	169
173	152	153	103	157	112	123	89	129	83
127	157	166	149	134	147	171	125	114	150
142	85	111	96	130	173	138	134	112	121
122	118	151	86	110	130	98	99	125	107
130	100	94	27	34	60	82	75	120	132
116	85	84	87	128	115	41	72	112	135
134	152	112	98	64	56	23	26		

WRSTPKy2c

38	86	73	144	177	143	141	196	144	150
128	248	107	116	95	81	62	80	46	151
184	182	152	89	94	126	83	74	53	78
95	75	121	226	189	188	192	212	109	

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