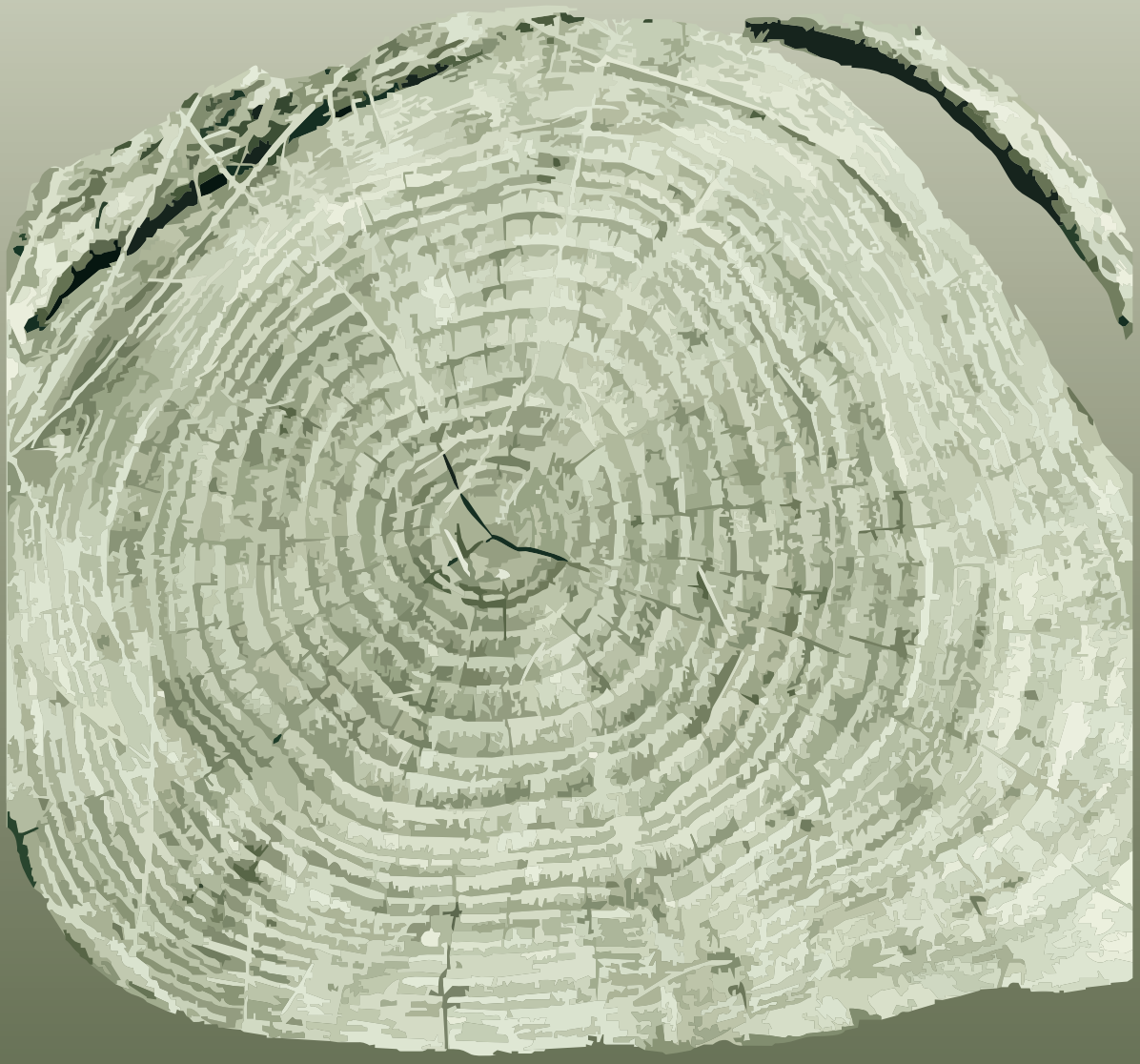
Landscape Evolution in the Middle Thames Valley
Heathrow Terminal 5 Excavations Volume 2

The Wood Charcoal

(Section 15)



by Dana Challinor

SECTION 15

THE WOOD CHARCOAL

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Introduction

This report covers the analysis of 60 selected samples from PSH02, TEC05 and LFA05, and builds upon the results from the Perry Oaks (WPR98; GA199; GAA00) excavations (Framework 2006). The samples from the 2002 and later excavations offered the opportunity to extend our comprehension of fuel use and the exploitation of woody resources in the Heathrow area for periods not represented in the earlier Perry Oaks report (Table 1). The earlier prehistoric and the later post-Roman periods were particularly lacking from the Perry Oaks report and the Terminal 5 evidence has added considerably to the understanding of fuel use at the site and provided complementary data to the other environmental analyses. Where possible, comments have been made on the local environment and availability of woodland timber, but it is acknowledged that there are difficulties in extrapolating directly and solely from charcoal to the landscape. Nonetheless, it is apparent that the charcoal results are fairly similar across the periods and indicate an increasingly open landscape, but with constant access to some mature woodland.

Methodology

Two approaches to the analysis were adopted. The first was to examine 20 representative fragments from a range of samples in order to build up a comparable data set for each period. In each sample, 20 fragments were identified and recorded in full, and the remaining fragments were scanned at low magnification to determine if the identifications appeared to be representative. This method provides a broad characterisation of the sample composition, but does not give a complete species list. The second approach was to analyse selected samples in greater detail (up to 100 fragments). At least one sample from each period was analysed in detail, and large

assemblages were divided using a riffle box. Cremation samples were all analysed by this method to ensure that any species dominance was fully recorded. Additional spit samples were scanned to see if there were any significant differences in assemblage compositions and the full results are recorded in the archive.

Maturity data was recorded where possible, but it is considered that the quantification of heartwood, sapwood and roundwood is unreliable in fragmented charcoals, so only presence is noted in the tables, although the full quantities are recorded. The charcoal was fractured and sorted into groups based on the anatomical features observed in transverse section at X7 to X45 magnification. Representative fragments from each group were then selected for further examination using a Meiji incident-light microscope at up to X400 magnification. Identifications were made with reference to Schweingruber (1990), Hather (2000) and modern reference material. Classification and nomenclature follow Stace (1997). Figures are based upon a combination of ubiquity and fragment count analysis. It is acknowledged that there are differential rates to fragmentation which limits its use as an analytical tool, but it has been used effectively to provide broad comparative data.

Results

The results of the Terminal 5 charcoal analysis are presented in the tables below as part of the discussion by period. A total of 2826 fragments were identified. In addition to those taxa already recorded in the Perry Oaks samples, a further seven species were noted from the Terminal 5 excavations. The preservation was generally poor, similar to that of the Perry Oaks samples. Fragments often crumbled when fractured and/or were very comminuted, so there were a high number of indeterminate fragments in some samples. In many samples, the charcoal was heavily encrusted with sediment, obscuring many of the key anatomical characteristics such as perforation plates and tyloses. Consequently there was a high number of *Alnus/Corylus* fragments which could not be differentiated, and it was not often possible to determine maturity in the large trees. The preservation of charcoal in waterlogged contexts was better, presumably because these pieces were not subjected to frequent wetting and drying, but were maintained in a constant wet state.

Phase	Feature type	Perryoaks excavations			Terminal 5 excavations			Total
		GAA00	GAI99	WPR98	LFA05	PSH02	TEC05	
170 Late Mesolithic	Pit			2		2		**4**
200 Neolithic	Ditch					1		**1**
	Pit					1		**1**
205 Early Neolithic	Tree Throw					2		**2**
220 Middle or Late Neolithic	Tree Throw						1	**1**
225 Late Neolithic	Pit					2	3	**5**
	Tree Throw			1				**1**
230 Late Neolithic or Bronze Age	Pit					2		**2**
235 Late Neolithic to Early Bronze Age	Cremation			1				**1**
	Pit						1	**1**
240 Neolithic or Bronze Age	Tree Throw					1		**1**
300 Bronze Age	Ditch					1		**1**
300 Probably Bronze Age	Pit				1			**1**
315 Middle Bronze Age	Ditch					2	1	**3**
	Pit					3	3	**6**
	Posthole	2	1					**3**
	Water-hole						2	**2**
320 Middle or Late Bronze Age	Cremation				2		2	**4**
	Pit					5		**5**
325 Late Bronze Age	Cremation			3	5			**8**
	Ditch			1				**1**
	Pit		1	1		3		**5**
330 Late Bronze Age or Early Iron Age	Pit					1		**1**
	Water-hole					2		**2**
415 Early/Middle Iron Age	Posthole			1				**1**
420 Middle Iron Age	Ditch			1				**1**
	Pit			1		1		**2**
	Ring Ditch			1				**1**
425 Mid-Late Iron Age	Ditch			2				**2**
	Gully			1				**1**

430 Late Iron Age	Pit			1		1		**2**
500 Romano British	Ditch			1				**1**
610 Early or Middle Saxon	Construction Cut					1		**1**
	Pit					2		**2**
	Posthole					1		**1**
700 Medieval	Ditch					2		**2**
	Pit					2		**2**
720 Later Medieval	Kiln?					1		**1**
Total Result		**2**	**2**	**17**	**8**	**39**	**13**	**81**

Table 1: Number of features from which charcoal was examined from all phases of excavation

Notes on taxa

The taxonomic level of identification varied according to the biogeography and anatomy of the taxa, which are detailed below:

PINACEAE: *Pinus* sp., pine, tree. *P. sylvestris* L. (Scots pine) is the sole native species, but the species is thought to have become extinct and subsequently reintroduced, so the identification of the medieval fragment is given too genus.

TAXACEAE: *Taxus baccata* L. (yew), evergreen, large bush or tree, sole native species

ULMACEAE: *Ulmus* spp., (elm), large tree, several native species, not distinguishable anatomically

FAGACEAE:

- *Fagus sylvatica* L. (beech), tree, early native status debated, but not contentious for the periods relevant to this report
- *Quercus* spp. (oak), large tree, two native species not distinguishable anatomically

BETULACEAE:

- *Betula* spp. (birch), trees or shrubs, two native species, not distinguishable anatomically
- *Alnus glutinosa* Gaertn. (alder), tree preferring damp soils, only native species
- *Corylus avellana* L. (hazel), shrub or small tree, only native species

The last two genera have very similar anatomical structures and can be difficult to separate, hence the category *Alnus/Corylus*. Since both species were positively identified, this category may represent either or both taxa.

SALICAEAE: the genera *Salix* spp. (willow) and *Populus* spp. (poplar) are rarely possible to separate on anatomy. Both are trees although there is variation within the genera.

ROSACEAE:

- Amygdaloideae: subfamily including *Prunus* spp., trees or shrubs. *P. spinosa* L. (blackthorn), *P. avium* L. (wild cherry) and *P. padus* L. (bird cherry), all native, can be separated on the basis of ray width. *P. spinosa* was the only confirmed identification at Terminal 5; where the category *Prunus* sp. has been used, any of the three species may have been present.
- Maloideae, subfamily of various shrubs/small trees including several genera, *Pyrus* (pear), *Malus* (apple), *Sorbus* (rowan/service/whitebeam) and *Crataegus* (hawthorn), which are rarely distinguishable by anatomical characteristics.

FABACEAE: the genera *Cytisus* (broom) and *Ulex* (gorse), include several native shrubs, which are not easily separated by anatomical characteristics.

CELASTRACEAE: *Euonymus europaeus* L., (spindle) shrub or small tree, native.

AQUIFOLIACEAE: *Ilex aquifolium* L., (holly), evergreen tree or shrub, native

RHAMNACEAE: *Rhamnus cathartica* L. (purging buckthorn), shrub, native species

ACERACEAE: *Acer campestre* L. (field maple), tree, sole native species

OLEACEAE: *Fraxinus excelsior* L. (ash), tree, sole native species

Mesolithic

Two samples dating to the Mesolithic period produced identifiable charcoal. The condition of the charcoal was poor, similar to the preservation of the charcoal from the Perry Oaks Mesolithic pits. The charcoal from pit 578138 was sparse and too poorly preserved to allow analysis, but some *Quercus* sp. (oak) was noted. The sample from pit 524218 was dated to the late Mesolithic period and analysed in full (Table 2). There were a high number of indeterminate fragments, owing to the poor condition of the charcoal, but two taxa were identified; *Quercus* and *Corylus avellana* (hazel). The Mesolithic pits from Perry Oaks also produced *Quercus*, and some Maloideae (hawthorn type) fragments. Since all of these pits showed evidence of flint burning *in situ*, the charcoal is likely to have derived from the fuelwood selected for this purpose.

Analysis of charcoal of Mesolithic date is rare, so it is difficult to make comparisons to other sites or to make any environmental interpretations on the basis of two meagre samples. Pollen evidence from nearby sites indicates the area was likely to have been dominated by pine and hazel woodland in this period (Wiltshire 2006), so it is not surprising that there is a quantity of hazel in the charcoal record. Oak and hazel have been recovered from other deposits of this date (Smith 2002) and the selection of these species for fuel at Heathrow is consistent with known practices.

	Feature number	524218
	Context number	524219
	Sample number	15087
Quercus sp.	oak	6
Corylus avellana L.	hazel	31r
Indeterminate		21
Total		**58**

h=heartwood present; s=sapwood present; r=roundwood present

Table 2: Charcoal analysis from late Mesolithic pit 524218

Neolithic

Fourteen samples ranging in date from the early to late Neolithic period were examined from the Terminal 5 excavations, and the results are presented below in Tables 3 and 4. For the majority, a sample of 20 representative fragments was analysed in full and the remaining charcoal was assessed. The enhanced number of samples from the Terminal 5 excavations offered an opportunity to consider Neolithic fuel use in greater detail. The condition of the charcoal was generally poor, making maturity difficult to determine.

Feature types

Tree throws (Table 3)

Two early Neolithic samples and one middle or late Neolithic sample were analysed. An additional sample, from tree throw 611069 which cuts the Cursus ditch, was thought to be contemporary when analysed, but proved to be of more elusive date (Neolithic or Bronze Age). The assemblage produced a single taxon; *Quercus,* (oak) including fragments of heartwood, suggesting that this was the tree itself which had burned down.

Site code		PSH02		TEC05
Phase		205 Early Neolithic		220 Middle or Late Neolithic
Feature number		527288	558057	820018
Context number		527289	558059	820021
Sample number		15531	16056	29007
Ulmus sp.	elm	1		
Quercus sp.	oak			22rs
Corylus avellana L.	hazel	2	2	
Alnus/Corylus	alder/hazel		1	
Prunus spinosa L.	blackthorn		1	16r
Maloideae	hawthorn group		2	24r
Rhamnus cathartica L.	buckthorn			1r
Fraxinus excelsior L.	ash	17	14hs	
Indeterminate				7
Total		**20**	**20**	**70**

h=heartwood present; s=sapwood present; r=roundwood present

Table 3: Charcoal from Neolithic tree-throw holes

The other samples produced a range of taxa, including *Corylus avellana* (hazel), *Prunus spinosa* (blackthorn), Maloideae (hawthorn, apple, pear etc.), *Rhamnus cathartica* (buckthorn) and *Fraxinus excelsior* (ash). Many of the fragments from 820018, in particular, came from roundwood, consistent with the gathering of branches. These findings confirmed that fuelwood had been collected for a fire lit within the shelter of the tree throw hole, rather than representing the remains of the tree burnt *in situ*. Tree throw 527288 contained a fragment of *Ulmus* sp. (elm), as did the late Neolithic tree throw from Perry Oaks (156191). In general, there is a strong hedgerow/woodland margin type component to the assemblages, and both *Prunus spinosa* and *Fraxinus* excelsior are light-demanding species, suggesting some open areas.

There was a notable preference for *Fraxinus* in the early Neolithic sample from 558057, which seems to have been replaced by *Quercus* in the late period sample from 820018. This trend appears to be borne out by the late Neolithic samples from other feature types, but with only one early sample it is difficult to gauge the significance.

Stanwell Cursus (Table 4)

Only one sample (context 537129) from the eastern ditch of the Cursus (512070) produced identifiable charcoal, but this was sparse and the condition was poor. Assessment showed that some *Quercus* was present. The western ditch (512071), by contrast, was entirely dominated by *Fraxinus excelsior* (ash). All 20 fragments fully identified from context 527108 (sample 17028) proved to be *Fraxinus*. Assessment on the remaining charcoal from this sample, and from context 574049 indicated that *Fraxinus* was the only species present. *Fraxinus* makes an excellent fuelwood but is also good for structural purposes (Edlin 1949); its use as a fuel is sometimes restricted to reserve supplies for artefactual or other uses. Clearly there was no need to conserve *Fraxinus* resources in the Neolithic in the Heathrow area, since ash is generally well represented in the samples of this period. *Fraxinus* is also a coloniser of open areas, which suggests that some re-growth was occurring following clearance.

	Feature number	512070 (east ditch)	512071 (west ditch)	
	Context number	537129	527108	574049
	Sample number	17081	17028	17083
Quercus sp.	oak	+		
Fraxinus excelsior L.	ash		20	+

+ = present

Table 4: Charcoal from the Stanwell Cursus

Pits (Table 5)

Plain Bowl Pits

A single sample from pit 527124 was analysed. It produced such a wide range of taxa that it was considered that 20 fragments were not representative and 100% of the identifiable charcoal was examined. Seven taxa were positively identified from this sample, whereas the other Neolithic samples produced on average three. Interestingly, there was nothing unusual in the taxa identified; all of these species were recovered from other samples of Neolithic date. The composition of this assemblage suggests that it represents either the remains of several burning events or that there was a lack of deliberate selection in fuelwood collection.

Grooved Ware pits

Two samples from Grooved Ware pit 531011 were analysed. Both were dominated by *Quercus,* with a few fragments of *Prunus spinosa* and *Rhamnus cathartica*, suggesting that the main fuelwood was oak, with a couple of hedgerow/scrub-type species used for kindling.

	Site code	PSH02	PSH02		TEC05			PSH02		TEC05
	Phase	200 Neolithic	225 Late Neolithic		225 Late Neolithic			230 Late Neolithic or Bronze Age		235 Late Neolithic to Early Bronze Age
	Feature number	527124	531011		695027	827269	833068	510070		705080
	Context number	527113	531019	531017	695028	827270	833071	510072	510073	705081
	Sample number	17038	16032	16034	27308	29097	29112	16063	16065	27316

Quercus sp.	oak	16h	18	19r	14	49hrs	14rhs	2	2	8
Alnus glutinosa Gaertn.	alder							18r	18	
Corylus avellana L.	hazel	7					8r			
Alnus/Corylus	alder/hazel				1					
Prunus spinosa L.	blackthorn	11	2		4		9r			6
Prunus sp.	cherry type					1r				
Maloideae	hawthorn group	10				29	19r			
Rhamnus cathartica L.	buckthorn	2		1						6
Acer campestre L.	field maple	9								
Fraxinus excelsior L.	ash	3h			1					
Indeterminate		5				6	3			
Total		**63**	**20**	**20**	**20**	**85**	**53**	**20**	**20**	**20**

h=heartwood present; s=sapwood present; r=roundwood present

Table 5: Charcoal from Neolithic Pits

Late Neolithic and other pits

Samples from five other pits dated to the late Neolithic and/or Bronze Age (see Table 5 for phasing) were also examined. The three late Neolithic pits from Tec05 (69027, 827069, 833068) produced mixed assemblages with oak, and a range of hedgerow/scrub species, such as Maloideae and *Prunus spinosa*. Pit 510070 was notable in that both samples from this feature produced the same assemblages of charcoal, which were dominated by *Alnus glutinosa* (alder). This pit was adjacent to the Stanwell Cursus and it may have had a specific function for which charcoal was used as a fuel, since alder makes a better charcoal than wood fuel. Certainly it is not widely used in the Neolithic samples at Heathrow.

The woody environment in the Neolithic period is characterised by mixed deciduous woodland with a reasonably strong presence of thorny scrub suggesting some clearance. Taxa such as hawthorn group, blackthorn and buckthorn would have grown in the woodland margins or in hedgerows. Ash and blackthorn are light-demanding and frequent colonisers of open spaces. Although alder is not common in the Neolithic charcoal assemblage at Heathrow, it would have grown in the damp soil conditions and was apparently, infrequently exploited for fuelwood. This type of woodland habitat, with less densely wooded areas where shrubs flourish, is similar to the picture from other sites in Southern Britain (eg Gale 2004).

Given that the charcoal derives from wood gathered as fuel, any environmental analysis is limited. It is of interest that such a diverse range of species was utilised for fuel, suggesting that collection practices were fairly wide ranging. Of course, most of the deposits are likely to be the remains of domestic fires, and hence may be the result of more than one burning event. In any case, the results from Heathrow are consistent with those from Neolithic sites in the Thames Valley (e.g. Challinor, forthcoming a) suggesting that collection and/or woodland clearance practices may have been similar.

Bronze Age

Feature types

Cremation Deposits (Table 6)

Seven cremation-related deposits from LFA05 and two from TEC05 were examined. One of these (from 699016) did not produce human bone but it was thought during excavation to be a cremation deposit due to its proximity to the other cremation burials and the similarity of the features. There was no other evidence to suggest that it was a hearth or other deposit, so it has been included. Where the deposits had been sampled in spits, all of the samples were scanned, but no significant differences in assemblages from the same contexts were revealed.

Site code		LFA05		TEC05		LFA05				
Phase		320 Middle or Late Bronze Age		320 Middle or Late Bronze Age		325 Late Bronze Age				
Feature number		699001	699010	827119	830083	699016	699044	699046	699048	699060
Context number		699002	699013	827140	830084	699017	699045	699047	699049	699061
Sample number		27106	27114	29078	29079	27118	27166	27167	27168	27241
Ulmus sp.	elm								1	
Quercus sp.	oak		83hs	127s	7		25	8	32	23
Alnus glutinosa Gaertn.	alder					1	50			
Corylus avellana L.	hazel		1							
Alnus/Corylus	alder/hazel	10						2		
Prunus spinosa L.	blackthorn					153r				
Prunus sp.	cherry type				16					
Maloideae	hawthorn group	41r		1	3		15	13	3	86r

Site code		LFA05		TEC05		LFA05				
Phase		320 Middle or Late Bronze Age		320 Middle or Late Bronze Age		325 Late Bronze Age				
Feature number		699001	699010	827119	830083	699016	699044	699046	699048	699060
Context number		699002	699013	827140	830084	699017	699045	699047	699049	699061
Sample number		27106	27114	29078	29079	27118	27166	27167	27168	27241
Rhamnus cathartica L.	buckthorn	37r								
Acer campestre L.	field maple				65r					
Fraxinus excelsior L.	ash		13							
Indeterminate		4		1	4	3	8	4	2	
Total		92	97	129	95	157	98	27	38	109

h=heartwood present; s=sapwood present; r=roundwood present

Table 6: Charcoal from the Bronze Age cremation deposits

It is immediately striking that a surprising range of taxa were utilised in these cremations and only three of the seven confirmed cremation deposits were dominated by oak (Fig. 1). The dominance of a single species in Bronze Age cremation assemblages is a trend has been noted at other sites and may be of ritual significance (Thompson 1999). Certainly, there is some suggestion that fuelwood was more carefully selected for cremations than for domestic purposes at other sites (eg Challinor, forthcoming b). Oak is commonly used for cremations, since it is highly suited to the practical requirements of cremating a human body (Edlin 1949). It is perhaps surprising, then, that oak is not better represented. Nonetheless, the other species used, Maloideae (hawthorn type), *Acer* (maple) and *Rhamnus* (buckthorn) have been recovered from cremation assemblages at other sites (Campbell & Robinson, in press). The single fragment of *Ulmus* (elm) may have been an accidental inclusion on the pyre, or deliberately included as a pyre good. It seems unlikely to have been selected as fuelwood, since it is the only fragment recovered from the assemblages and, although the pollen record at Perry Oaks (Wiltshire 2006) indicates that elm was growing in the catchment area during the Middle Bronze Age, it was not commonly used as fuelwood. Elm wood was used in the past for a number of structural and artefactual uses, including coffins (Gale & Cutler 2000), which may be significant.

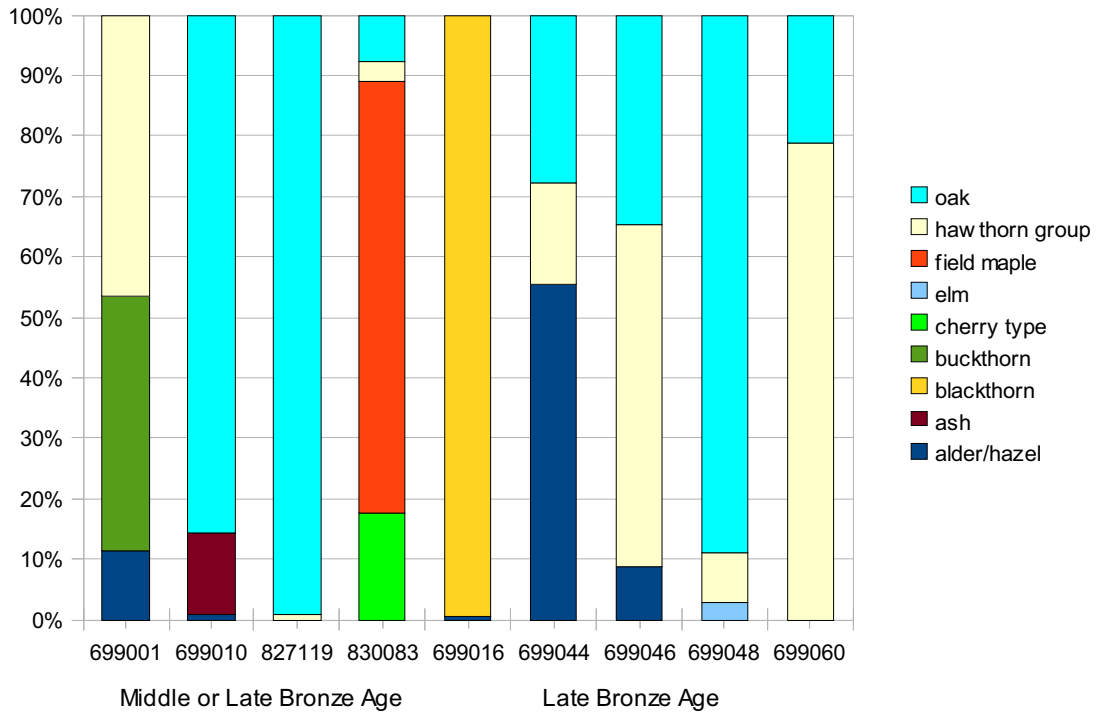

Figure 1: Composition of charcoal assemblages from LFA and TEC cremation deposits

The assemblage from 669016 differs from the other Terminal 5 cremation deposits in so far as it almost exclusively comprised *Prunus spinosa* (blackthorn), with a single *Alnus* fragment. This is similar to Middle/Late Bronze Age cremation assemblages at Dorney (Challinor forthcoming b) and Ashville (Jones 1978), which were also dominated by *Prunus.* In that respect, it would be appropriate as a pyre-related assemblage but it does contrast with the other confirmed cremation deposits at Terminal 5, and, since there is no human bone, its function must remain uncertain. It is of interest that the Terminal 5 cremations are so diverse in character; Maloideae is dominant in 699060, and significant in 699046 and 69001, while *Acer* forms the main component of 830083 from TEC05. Samples from the same area are not necessarily alike, as the other TEC05 sample from 827119 is dominated by *Quercus.*

A recent study of early/middle Bronze Age cremation burials at Raunds suggests that there may be a correlation between the age/sex of the deceased and the fuelwood used, where infants and adults tended to be associated with a single species and children with mixed assemblages (Campbell & Robinson in press). The results from Terminal 5, for which age/gender data was available, do not entirely fit into this

hypothesis since neither 699001, an infant, nor 699046, an adult, were dominated by a single species (Table 7). Nonetheless, five of the eight cremations from Heathrow which produced analysable charcoal are consistent with the Raunds results. Of course, there are cremations of varying date represented at Terminal 5, from Late Neolithic/Early Bronze Age (137027) to Late Bronze Age/Early Iron Age, so practices may not have remained consistent throughout that period. The link with gender is more difficult to analyse since we do not have a full dataset to compare; the only cremations to be sexed were from Perry Oaks (106013 and 137027) and both were probable female adults. Interestingly, one was dominated by oak, while the other produced mixed species, with differing assemblages in each context.

Feature	Context	Sample	Deposit type	Age/ years	Taxa	Other remains
699001	699002	27106	redeposited pyre debris	infant >4yr	*Rhamnus*, Maloideae, *Alnus/Corylus*	
699010	699013	27114	redeposited pyre debris	infant >4yr	***Quercus***, *Fraxinus*, *Corylus*	*Arrhenatherum* tubers
699040	699045	27166	unurned burial	juvenile 5-7yr	*Alnus*, *Quercus*, Maloideae	
699046	699047	27167	unurned burial	adult >18yr	*Quercus*, *Alnus/Corylus*, Maloideae	
699048	699049	27168	?redeposited pyre debris	subadult/adult >13yr	***Quercus***, Maloideae, *Ulmus*	*Arrhenatherum* tubers
699060	699061	27241	unurned burial	adult >18yr	*Quercus*, **Maloideae**	
106013	106014/5/6	1563	unurned burial	adult >35 yrs ?female	*Quercus*, *Alnus/Corylus*, Maloideae, *Acer*	
137027	137036	1566	redeposited pyre debris	adult 18-35yrs ?female	***Quercus***, Maloideae, *Rhamnus*	*Arrhenatherum* tubers

Table 7: Cremation deposits from LFA showing burial types and fuelwood taxa; taxa highlighted in bold were clearly dominant in the assemblage (Burial and bone data from McKinley, this volume)

The presence of *Arrhenatherum elatius* (onion couch) tubers in three of the cremation deposits is also of interest. Why these tubers are frequently recovered from Bronze Age cremation deposits is still unclear, but is discussed in the Perry Oaks charcoal report (Challinor 2006). The assemblages which produced the tubers are all from redeposited pyre debris, and it has been argued that assemblages characterised by mixed species and tubers may have resulted from a specific pyre construction, over a

pit (Campbell 2007). In that case, it is apparent that the pyre construction did not relate to the age or size of the deceased, which were an infant, a subadult and an adult.

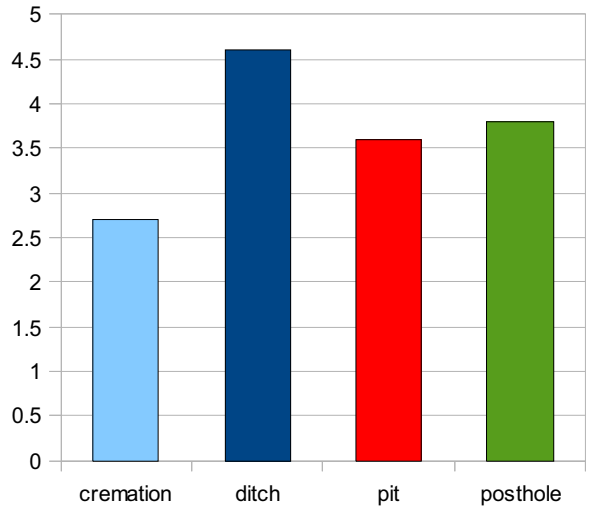

Figure 2: Average number of charcoal taxa per Bronze Age feature type (includes data from Perryoaks and middle and late phases have been grouped together)

An examination of the average number of taxa per feature reveals that there is a greater range of taxa utilised in features such as pits, ditches and waterholes (Fig. 2). Since the charcoal from these features is likely to be of domestic origin, it does suggest a more careful selection of fuel wood for the cremations. It also shows that while this may be a general trend, there is still an average of 2.7 taxa per cremation, which is quite high compared with other cremations of this date (eg Challinor, forthcoming b). The tendency to use oeveral taxa at Heathrow may relate to pyre type and/or pyre goods.

Pits, Waterholes and Ditches

There was little evidence in the deposits of the analysed pits, ditches and waterholes to indicate a specific function for the fires from which the charcoals derived. It is assumed that the assemblages generally came from domestic hearths, or crop processing, although this was only confirmed in two middle Bronze Age pits (821063, 546202) which produced associated charred plant assemblages (Carruthers, *CD Section 14*).

Two general Bronze Age samples, which could not be more finely phased, are presented in Table 8. The PSH02 ditch (527148) produced a very mixed assemblage,

with *Quercus, Corylus,* Maloideae, *Acer* and *Fraxinus.* No single taxa seemed to be dominant. Pit 712001, in contrast, was dominated by a single taxon – *Alnus glutinosa* (alder), including fragments from small diameter branchwood. The charcoal was found in association with charred cereal grains and probably came from the same provenance (crop processing or cooking), the remains of which were then dumped into the pit. *Alnus* thrives in damp soil conditions, which supports the insect evidence that the conditions were wetter. Indeed, the insects suggest that the waterhole was in an area on the periphery of grazing and pasture, which may account for the use of *Alnus* wood, which does not burn well (Edlin 1949) and was not extensively used. It is worth mentioning that it makes a good charcoal fuel, as indeed does *Quercus*. Some of the middle Bronze Age pits also produced alder roundwood, and the other species recorded are not dissimilar to those of later phases.

	Site code	PSH02	LFA05
	Phase	300 Bronze Age	300 Probably Bronze Age
	Feature type	Ditch	Pit
	Feature number	527148	712001
	Context number	527116	712002
	Sample number	17037	27158
Quercus sp.	oak	4	3rs
Alnus glutinosa Gaertn.	alder		19r
Corylus avellana L.	hazel	6r	
Maloideae	hawthorn group	2	
Acer campestre L.	field maple	2	
Fraxinus excelsior L.	ash	6	
Indeterminate			1
Total		**20**	**23**

h=heartwood present; s=sapwood present; r=roundwood present

Table 8: Charcoal from general Bronze Age features

Chronological groups

Middle Bronze Age (Table 9) and Middle or Late Bronze Age (Table 10)

Samples from twelve middle Bronze Age features from PSH02 and TEC05 were analysed, comprising three ditches (539283, 539096, 827385), six pits (543202, 546202, 580035, 814081, 821063, 823154), two waterholes (693006, 836052) and a

well (543201). A further four pits from PSH02 (528131, 552175, 557019, 580063) were also examined, but these were less finely phased – to the middle or late Bronze Age. The assemblages were similar, with slightly less oak in the latter group, so have been discussed together.

A mixed range of species was identified, including many roundwood fragments; the most common being *Quercus* (oak) and Maloideae (hawthorn type). The condition of the charcoal was often too poor to distinguish between *Alnus/Corylus* (alder/hazel) and either or both species could be present. The presence of species such as *Alnus glutinosa* (alder) and *Populus/Salix* (poplar/willow) indicates that wetland resources were also being exploited, since these taxa prefer damp soil conditions. None of these species burn very well, at least not unless well seasoned (Edlin 1949), so it perhaps not surprising that they are not better represented in the charcoal record. It may be significant that the ditch with the largest wetland assemblage (539283) was in the western edge of the site, on the lower lying levels. This suggests that the gathering of fuelwood was very local. In addition, there was a wetland component to the charred plant remains in pit 821063 from area TEC05 (Carruthers, *CD Section 14*), so the area would have supported such taxa. *Euonymus* (spindle) was the only new taxon to be identified. It is a shrub of hedgerows and woodland margins and not often used as a wood fuel although it was traditionally used for charcoal-making (Edlin 1949). In general, there is a strong presence of shrub species such as *Prunus,* Maloideae, *Euonymus* and *Rhamnus* which supports the evidence from the pollen that the area was well cleared.

Site code		PSH02						TEC05					
Feature type		Ditch	Ditch	Well	Pit	Pit	Pit	Water-hole	Pit	Pit	Pit	Ditch	Water-hole
Feature number		539096	539283	543201	543202	546202	580035	693006	814081	821063	823154	827385	836052
Context number		527085	539284	543212	543204	546204	580038	693004	814086	821066	823155	816152	836059
Sample number		17033	16663	17532	17524	16577	15055	27042	29033	29036	29082	29101	29119
Taxus baccata L.	yew	1											
Fagus sylvatica L.	beech						6						
Quercus sp.	oak	11r	1	7h	11hs	2		20rhs	8	52rhs	5	76rs	10h
Alnus glutinosa Gaertn.	alder	3r	11r	6r		12r							
Corylus avellana L.	hazel									1		2r	

Alnus/ Corylus	alder/ hazel				3							1	2
Populus/ Salix	poplar/ willow		7			2	13			7r		2	
Prunus spinosa L.	blackthorn	3r										10r	
Prunus sp.	cherry type	1r		4r	2					2r			
Maloideae	hawthorn group	1		3r	2r	2	1		12	36r	6r	6r	8
Euonymus europaeus L.	spindle					1							
Rhamnus cathartica L.	buckthorn										8r		
Acer campestre L.	field maple										1		
Fraxinus excelsior L.	ash		1		2	1h						1	
Indeterminate										4		7	
Total		20	20	20	20	20	20	20	20	102	20	105	20

h=heartwood present; s=sapwood present; r=roundwood present

Table 9: Charcoal from the Middle Bronze Age features

A species not often found in the archaeological charcoal record is *Taxus baccata* (yew). It will grow in most soils and burns quite well but can be explosive (Gale & Cutler 2000). Whether its scarcity in the archaeological record is due to its burning properties, or to spiritual associations, is open to speculation; it was certainly available as a resource in later prehistory.

	Site code	PSH02				
	Feature type	Pit				
	Feature number	538131	552175	557019		580063
	Context number	538132	552176	557020	557021	580055
	Sample number	16554	22002	16505	16555	15064
Quercus sp.	oak		10			9
Alnus/Corylus	alder/hazel		3			
Prunus spinosa L.	blackthorn	3	3r	2	6	
Prunus sp.	cherry type					
Maloideae	hawthorn group	17r	3	12r	8	5
Rhamnus cathartica L.	buckthorn		1	6	6r	2
Acer campestre L.	field maple					4r
Total		**20**	20	**20**	**20**	20

h=heartwood present; s=sapwood present; r=roundwood present

Table 10: Charcoal from the middle or late Bronze Age features

The dominance of oak in the middle Bronze Age waterhole (693006) at TEC05 is noteworthy since all of the other samples (including the cremations) all produced mixed assemblages. This assemblage was entirely composed of oak, with fragments of roundwood, heartwood and sapwood. It is plausible that by the middle Bronze Age, oak supplies were more limited, but the charcoal may relate to the function of the fire or indicate that structural timbers had been used, particularly since there was little domestic charred waste and the waterlogged plant remains were rich in nettles, probably colonisers of the area post-abandonment (Carruthers, *CD Section 14*).

Late Bronze Age and Late Bronze Age or Early Iron Age

Samples from late Bronze Age pit 558001 and late Bronze Age or early Iron Age waterhole 581168 and pit 510127 were all analysed (Table 11). The evidence recovered is not dissimilar to the earlier phases, with much the same range of species recovered. This suggests not only available resources had changed little, but also that the gathering practices were consistent. This suggests some deliberate selection, on the basis that only a limited range of taxa are recovered from the samples, time and again. Having said that, the fact that there are several taxa in each sample does suggest a less focussed selection than for specific activities such as metalworking or cremation.

The selection of domestic fuelwood in this period seems to be consistent throughout the middle and late phases. Oak continued to be utilised but a range of other, supplementary woods were also used. Many of these derive from hedgerow/scrub and presumably reflect what was easily available in the increasingly cleared landscape. The assemblage associated with crop processing from pit 546204 is surprisingly dominated by riverine-type species – *Alnus* and *Salix/Populus*. Since these species do not burn as well as others, it seems likely that the assemblage reflects the immediate environment. Moreover, there is a range of several species in the sample, which may signify that several burning events are represented.

Site code		PSH02					
Phase		325 Late Bronze Age			330 Late Bronze Age or Early Iron Age		
Feature type		Pit			Pit	Water-hole	
Feature number		558001			510127	581168	
Context number		558005	558009	558011	510128	581170	580291
Sample number		16004	16008	16014	16081	16080	16088
Quercus sp.	oak	9	5	14	12r	12hs	4hs
Alnus glutinosa Gaertn.	alder			2	1		
Corylus avellana L.	hazel						5
Alnus/Corylus	alder/hazel				4	7	
Prunus spinosa L.	blackthorn	1					3
Prunus sp.	cherry type	8	12	3			
Maloideae	hawthorn group	2	2		3	1	
Acer campestre L.	field maple		1				7
Fraxinus excelsior L.	ash			1			1
Total		20	20	20	20	20	20

h=heartwood present; s=sapwood present; r=roundwood present

Table 11: Charcoal from the Later Bronze Age phases

Iron Age

Two samples from Iron Age pits at PSH02 were analysed (Table 12); one from middle Iron Age pit 529306 and the other from late Iron Age pit 538348. The assemblage from pit 529306 was chiefly composed of *Alnus* wood, with a single *Ulmus* fragment, and a little *Prunus* and *Quercus*. Pit 538348 produced little charcoal but a range of species were identified; similar quantities of *Fraxinus*, *Acer* and *Quercus* and a couple of fragments of *Betula* and Maloideae. The mixed assemblage may have originated from several burning events/deposition, and the main taxa would have provided a reasonable fire for domestic purposes.

The charcoal record from the Iron Age at Perry Oaks consisted of a wide range of species, including *Pinus* (pine), *Fagus* (beech), *Quercus, Corylus* (hazel), *Prunus* (blackthorn), Maloideae, *Rhamnus* (buckthorn), *Acer* and *Fraxinus*. Most of the charcoal taxa identified at Terminal 5 and Perry Oaks are present in the pollen record,

although the pollen for the Middle Iron Age suggests that the settlement was set in a very clear landscape with few trees and shrubs.

	Site code	PSH02	PSH02
	Phase	420 Middle Iron Age	430 Late Iron Age
	Feature type	Pit	Pit
	Feature number	529306	538348
	Context number	554144	538349
	Sample number	17519	17149
Ulmus sp.	elm	1	
Fagus sylvatica L.	beech		
Quercus sp.	oak	4	7
Betula sp.	birch		2
Alnus glutinosa Gaertn.	alder	13	
Prunus spinosa L.	blackthorn	2	
Maloideae	hawthorn group		1
Acer campestre L.	field maple		10
Fraxinus excelsior L.	ash		10h
Indeterminate			7
Total		20	**37**

h=heartwood present; s=sapwood present; r=roundwood present

Table 12: Charcoal from Iron Age pits

The charcoal assemblages confirm that there were local woody resources, perhaps hedgerows and single trees bounding fields, which were being managed for fuelwood. The presence of *Acer* indicates relatively mature woodland or hedgerows, and the charcoal record, in general, does not suggest a shortage of resources, since oak is well represented. It seems reasonable to suppose that these resources were being pollarded or coppiced regularly, which would reduce the pollen production.

Romano-British

There were no samples from the Terminal 5 excavations to produce analysable charcoal assemblages of this date. The assessment of Romano-British samples showed that *Quercus* was commonly recovered from samples of this date and context 553170 from pit 553166 revealed a range of species (even though there were less then 10 fragments), including Maloideae, *Acer* and Salicaceae (willow family). The charcoal from Perryoaks was dominated by oak, with a range of additional species in smaller quantities. Clearly, oak was specifically selected for activities such as crop processing and there is no indication of any shortage in resources. The charcoal, therefore, does not support the pollen evidence from Perry Oaks that the landscape was 'virtually cleared of trees and shrubs' (Wiltshire 2006). It seems more likely that the alternate proposal, that the trees were subjected to a vigorous management regime, which restricted the production of pollen, is valid. The pollen results from Terminal 5 may further elucidate the issue.

Anglo-Saxon

There were no samples of this date from Perry Oaks, so it was useful to find several with charcoal assemblages, although the quantity of charcoal was low which limits the potential for interpretation **(**Table 13). All the contexts examined relate to the Anglo-Saxon farmstead entity.

Feature types

SFB group 1

Two of the samples analysed, from posthole 538287 and construction cut 538326, were from SFB group 1. Both samples were dominated by *Quercus*, although the 538326 also produced three other species. It is likely that the structural wood for the building was oak, since this makes excellent building timber, but it must be remembered that the charcoal was not recovered from in situ burning, and is more likely to represent the remains of domestic debris, probably dumped into the building

post-abandonment. *Acer* and *Fraxinus* are also commonly used in building structures, but they are also frequently found in domestic fire contexts, as is Maloideae. Certainly, these taxa could easily have grown in hedgerows or local woodland in the vicinity of the site.

Pit clusters

Two samples were analysed that related to pit cluster 1 (525340) and pit cluster 2 (555767). The latter was entirely composed of *Quercus*, while the former produced *Corylus* and *Prunus spinosa* as well. *Corylus* commonly grows either as understorey in oak woodland or as a shrub in woodland margins/hedgerows, which is the habitat for *P. spinosa*. The charcoal in itself offers no clues to the activity which produced it, although it is likely to be of domestic origin given the archaeology with which it is associated.

	Site code	PSH02	PSH02	PSH02	PSH02
	Phase	610 Early or Middle Saxon	610 Early or Middle Saxon	610 Early or Middle Saxon	610 Early or Middle Saxon
	Feature type	Pit	Posthole	SFB	Pit
	Feature number	525340	538287	538326	555767
	Context number	525322	538288	538329	555771
	Sample number	15142	19218	15146	19199
Quercus sp.	oak	12	71hs	36s	38hs
Corylus avellana L.	hazel	5			
Prunus spinosa L.	blackthorn	3			
Maloideae	hawthorn group		1	6	
Acer campestre L.	field maple			4	
Fraxinus excelsior L.	ash			1	
Indeterminate		1	2	2	
Total		**21**	**74**	**49**	**38**

h=heartwood present; s=sapwood present; r=roundwood present

Table 13: Charcoal from early-middle Saxon features

There are few comparable studies of charcoal of Anglo-Saxon date, so the results from Terminal 5 are important, even if this interpretation must be somewhat limited. The main issue for this period concerns post-Roman woodland regeneration. The

charcoal assemblage has quite a strong hedgerow component, including field maple, which could represent remnants of Roman hedgerows. However, the taxa exploited do not differ significantly from the Roman assemblages, so the charcoal does not offer a reliable indicator of environment change. Nonetheless, the results are interesting in the light of evidence for the deliberate use of heather as fuel from nearby Saxon sites at Hounslow and Kingston upon Thames (see discussion in Smith 2002, 33). It is thought that extensive areas of heath were exploited and managed in the early to later medieval periods. The charcoal evidence from the Early Anglo-Saxon period at Heathrow indicates that this was not yet the case.

Medieval

Five samples were analysed from a range of features dating to the medieval period, with one later medieval (kiln 523075) (Table 14). It is immediately striking that kiln 523075 differs significantly from the other samples (Fig. 3). It is entirely composed of *Quercus* charcoal while the others produced mixed assemblages with a range of other taxa. While this could be due to the later medieval date of kiln 523075, it seems more likely that it should relate to the nature of the context. The use of the fuel for industrial purposes makes it likely that the oak was converted to charcoal prior to use as fuel. This cannot be confirmed archaeologically, but it is interesting that the assemblages from the pits and ditches do not suggest such a focused selection of fuelwood.

The usual firewood in the medieval period was underwood from managed woodlands, bound into faggots (Rackham 1996). The taxa identified at T5 are consistent with this and, many of the pieces were small diameter roundwood (not complete). The difficulties with the interpretation of mixed assemblages of charcoal are that some of the taxa may not have been collected as fuelwood but could represent the remains of artefacts or structural timbers. Indeed, there is a suggestion that deposit 559109 was a structure burnt *in situ,* although the quantity of charred cereal remains from this context suggests that either the structure was related to crop processing or there was a mixed assemblage of dumped charred remains and burnt structure. Moreover, both the genera of *Cytisus/Ulex* were commonly bound into brooms, and may have entered

the archaeological record as defunct artefacts thrown onto the fire, rather than representing a common shrub growing in the vicinity. However, the presence of *Cytisus/Ulex* in the medieval period is of particular interest given the lack of evidence for exploitation of heathland resources in the earlier Saxon period at Heathrow (see above). Clearly, by the later medieval period a range of woody environments were being managed for fuel (and presumably timber) use, including heaths, which is consistent with the picture from other sources (Rackham 1997).

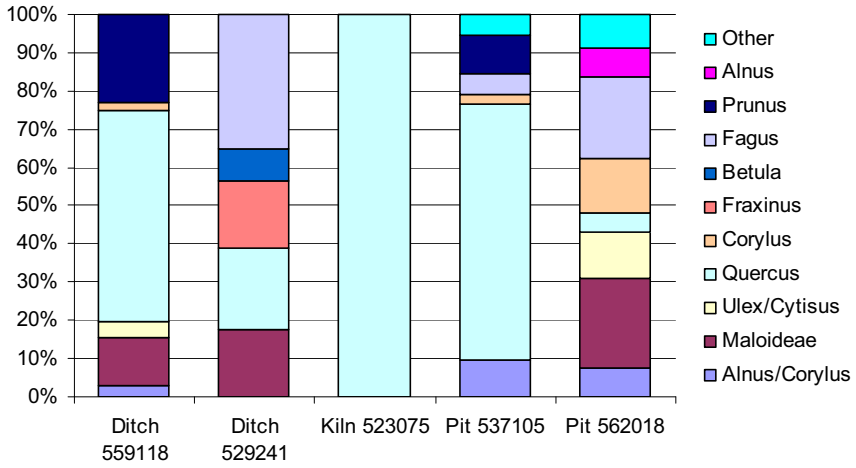

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Figure 3: Composition of the medieval charcoal assemblages from PSH02 (% based upon fragment count)

	Phase	700 Medieval				720 Later Medieval
	Feature type	Ditch	Pit	Ditch	Pit	Kiln
	Feature number	529241	537105	559118	562018	523075
	Context number	538020	537108	559109	562020	523077
	Sample number	16502	17063	15507	15044	19136
Pinus sp.	pine		1			
Fagus sylvatica L.	beech	30	4		22	
Quercus sp.	oak	18r	48h	53	5	157hs
Betula sp.	birch	7				
Alnus glutinosa Gaertn.	alder				8	
Corylus avellana L.	hazel		2	2	15	
Alnus/Corylus	alder/hazel		7	3	8	
Populus/Salix	poplar/willow		3		5	
Prunus sp.	cherry type		7	22r		
Maloideae	hawthorn group	15r		12r	24r	

Cytisus/Ulex	broom/gorse			4r	13r	
Ilex aquifolium L.	holly				4	
Fraxinus excelsior L.	ash	15r				
Indeterminate		13	4	7	8r	
Total		**98**	**76**	**103**	**112**	**157**

h=heartwood present; s=sapwood present; r=roundwood present

Table 14: Charcoal from medieval features

The presence of *Fagus sylvatica* (beech) in three of the medieval samples at Heathrow is also of interest. That beech grew in the area is attested by the middle Bronze Age beech charcoal in pit 580035, and its presence in a Romano-British sample at Perry Oaks (Challinor 2006), but it only appears to be a rare inclusion in fuelwood selection prior to the medieval period.

Conclusions

- While there is no evidence for any shortage of oak in any period, since it is consistently used for fuelwood, a range of supplementary species are also utilised. This is likely to reflect what was easily and locally available and tends to indicate hedgerows and scrub type habitats, with riverside type species often used as well.
- Although there is no direct evidence for woodland management, this seems likely, given the species selection and the fact that the charcoal indicates access to mature woodland, even when the pollen evidence suggests a very open landscape.
- There is no evidence from the charcoal record of significant environment changes from the Roman to Saxon periods.
- By the medieval period, there are indications of the growth of heathland in the Hounslow area and the exploitation of resources for fuel use.
- Beech does not appear to have been selected for use as fuel until the medieval period.
- The selection of fuelwood tends to be consistent with standard scavenging and

gathering practices from local available resources.

- There is evidence for more focussed selection of fuelwood for specific functions such as kiln firing, crop processing and cremations.
- In general terms, the pyre debris from Heathrow tends to be associated with a range of mixed taxa, rather than the classic Bronze Age assemblage dominated by a sole species.

References

Campbell, G. 2007. *Cremation deposits and the use of wood in cremation ritual, in J Harding & F Healy, The Raunds Area Project: A Neolithic and Bronze Age Landscape in Northamptonshire, 30-33, Swindon, English Heritage*

Challinor, D. 2006. Wood Charcoal and Charred Plant Remains, in Framework Archaeology, *Landscape Evolution in the Middle Thames Valley, Heathrow Terminal 5 Excavations, Volume 1 Perryoaks*, Framework Archaeology Monograph 1

Challinor, D, forthcoming a. The Wood Charcoal, in T. Allen & A. Barclay, *Opening the Wood, Marking the Land; the Mesolithic to Early Bronze Age*, Oxford Archaeology Monograph.

Challinor, D, forthcoming b. The Wood Charcoal, in T. Allen & A. Barclay, *Marking the Land; the Middle Bronze Age to Romano-British* , Oxford Archaeology Monograph

Edlin, H L, 1949. *Woodland crafts in Britain: an account of the traditional uses of trees and timbers in the British countryside*, London, Batsford

Framework 2006. Landscape Evolution in the Middle Thames Valley. Heathrow Terminal 5 Excavations Volume 1, Perry Oaks. Framework Archaeology Monograph No. 1

Gale, R, 2004. Charcoal from Later Neolithic/Early Bronze Age, Iron Age and Early Roman contexts, in G Lambrich, T Allen & F Healy, *Gravelly Guy, Stanton Harcourt: the development of a Prehistoric and Romano-Community*, 445-456 Oxford, Oxford Archaeological Unit

Gale, R & Cutler, D, 2000. *Plants in Archaeology: Identification manual of vegetative plant materials used in Europe and the southern Mediterranean to c. 1500*, Westbury and Kew.

Hather, J G, 2000. *The Identification of Northern European Woods; A Guide for Archaeologists and Conservators*, London, Archetype Publications

Jones, M, 1978. The plant remains, in M Parrington, *The excavation of an Iron Age settlement, Bronze Age ring-ditches and Roman features at Ashville Trading Estate, Abingdon, Oxfordshire, 1974-76*, Oxfordshire Archaeological Unit Report, **1**, 93-110, London, Council for British Archaeology

Rackham, O, 1996 *Trees and Woodland in the British Landscape*, Phoenix, London

Rackham O, 1997. *The History of the Countryside,* London, Phoenix Giant

Smith, W, 2002. *A Review of Archaeological Wood Analyses in Southern England,* Centre for Archaeology Report, English Heritage

Schweingruber, F H, 1990. *Microscopic wood anatomy*, 3rd Edition, Swiss Federal Institute for Forest, Snow and Landscape Research

Stace, C, 1997. *New Flora Of The British Isles*, Second Edition, Cambridge, Cambridge University Press

Thompson, G B, 1999. The analysis of wood charcoals from selected pits and funerary contexts, in A Barclay and C Halpin, *Excavations at Barrow Hills, Radley, Oxfordshire, volume 1: the Neolithic and Bronze Age monument complex*, Thames Valley Landscapes, **11**, 247-253, Oxford, Oxford Archaeological Unit

Wiltshire, P, 2006. Palynological Analysis, in Framework Archaeology, *Landscape Evolution in the Middle Thames Valley, Heathrow Terminal 5 Excavations, Volume 1 Perryoaks*, Framework Archaeology Monograph 1

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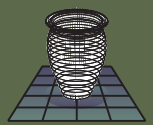

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