



Sustainable Seed Source Project

**Establishing the Seed Potential of Native
Stands of Hornbeam
December 2017**

**Commissioned and funded by
Woodland Trust**



Executive Summary

Hornbeam (*Carpinus betulus* L.) was identified as a medium priority native tree species for seed production by the Sustainable Seed Source Project, Phase 2. Whilst planting demand for species has increased, in part as a species that help substitute ash, there are currently no seed stands on the National Register of Approved Basic Material for forest reproductive material in Britain. This project has enabled 25 sites in private and public ownership to be assessed for their suitability as seed stands. It has identified 5 potential selected seed stands and 10 potential source identified seed stands suitable for Forest Reproductive Materials (FRM) registration. These stands, totalling 90.0ha, are located across six counties in southern and eastern England and cover seed zones 405 and 406. This provides a robust seed source resource with good geographic coverage across the majority of Hornbeam's native distribution area. It should also ensure that much of the species adaptive and genetic diversity is captured and utilised if the stands go on to be registered and become active seed stands. Assistance with FRM registration has been offered to private woodland owners and Estates.

Objectives

- 1) To assess 24 native stands to establish their potential as seed stands
- 2) To recommend at least 8 suitable stands that could be registered as selected stands or source identified stands

Background

Hornbeam (*Carpinus betulus* L.) belongs to the birch, hazel and alder family (*Betulaceae*). It is a locally common, native species to SE England. Whilst it has been widely planted across lowland Britain, it is a minor species in terms of total woodland area it occupies. It is a long-lived deciduous tree able to grow up to 30m in height and able to bear intense shade. It is very rarely damaged by frost and thrives on well drained, base-poor sandy or loamy clays, or clay-with-flints. It is a wind pollinated species. The tree provides a habitat for the caterpillars of several species and the seed of hornbeam is eaten by many small mammals and birds, especially finches, including the hawfinch. It is able to regenerate from seed freely and is initially slow growing.

Hornbeam is frequently present in ancient woodland, often as over mature coppice. It can form pure stands or be in mixture with other broadleaf species, especially oak. It coppices freely, grows well as a pollard tree. It is highly valued for firewood and charcoal. Hornbeam produces the hardest and toughest of British timbers used traditionally for hard wearing products such as pulley blocks, cogs, screws and chopping blocks. The creamy white colour timber is often cross-grained which makes working of the timber difficult and thus limits its use. High forest areas with good quality timber trees are very scarce.

Hornbeam has been identified¹ as a medium priority species for seed production in Britain. Interest in the planting of the species has increased due to its potential substitution for ash in relation to firewood production. Several 100,000s seedlings are produced annually by the nursery sector. However British seed can be difficult to source due to climatic factors. Seed viability is highest in southern Britain thus identifying and utilising southern stands is a priority.

Currently there are no registered seed stands of Hornbeam on the National Register of Approved Basic Material for Forest Reproductive Material in Britain. Seed stands are described as either source identified or select stands. Source identified stands can be from general or specific locations within a single region of provenance or seed zone altitude band in which no specific superior qualities are recognised. Seed from source identified stands is typically used for conservation purposes. Selected seed stands are stands showing superior characteristics, e.g. better form, growth rate and health and thus more sought after for commercial woodland purposes.

This project has been undertaken to identify seed stands of Hornbeam suitable for registration as either selected stands or source identified stands. This is to increase the number of stands potentially available for seed collection and thus improve supply and genetic diversity of seed to the nursery sector.

¹ Sustainable Seed Sources Project, Phase 2, 2015.

Approach

Background site information for potential sites of interest were identified by the Woodland Trust, the UK National Tree Seed Project (Royal Botanic Gardens Kew), Forestry Commission, review of National Inventory data and SSSI citations plus private individuals. The most promising 25 sites (allowing for one spare site) were selected by evaluating the data received, plus online searches including Google Earth to look at e.g. canopy structure. Maps were then produced for the woodland surveys.

A visit was made to each site to survey and to verify the area(s) of the potential seed stand(s). In some larger sites/woodland, more than one potential seed stand were assessed. Using a slightly modified version of FTT's Seed Stand Audit worksheet², data and images were collected for site and stand characteristics. Discussions with the site manager/owner were/are being undertaken as to the desirability and suitability of the stand becoming a registered stand, and its classification, i.e. source identified or selected stand, and likely management requirements. Information was compiled and is presented as a series of tables, maps and images. The area of the proposed seed stands are outlined in pale blue on the maps.

In addition, individual trees with superior form for timber production (plus trees) for Hornbeam were noted. As were trees, but not necessarily plus trees, and stands for several species, e.g. Aspen, Crab apple, Field Maple, Wild service tree and Yew, of interest to the Sustainable Seed Sources project. Plus trees and stand of potential interest to the Future Trees Trust were noted for Oak (Pedunculate and Sessile), Sweet chestnut and Wild cherry. These are mentioned within this document but will be reported on separately.

Results

a) Location and ownership

A total of 25 sites were visited in November and December 2017. The sites surveyed (**Table 1**) were located across eight counties (Buckinghamshire, East Sussex, Essex, Hampshire, Hertfordshire, Kent, Suffolk & Surrey) and three covered seed zones (404, 405 & 406). Twelve sites were owned by the Woodland Trust, four by private individuals or Estates, four by the Forestry Commission, three by Wildlife Trusts, one by Essex County Council and one by the City of London. At some sites, more than one wood was surveyed, thus the total number of woods surveyed was 33.

b) Site and stand details plus seed stand assignment

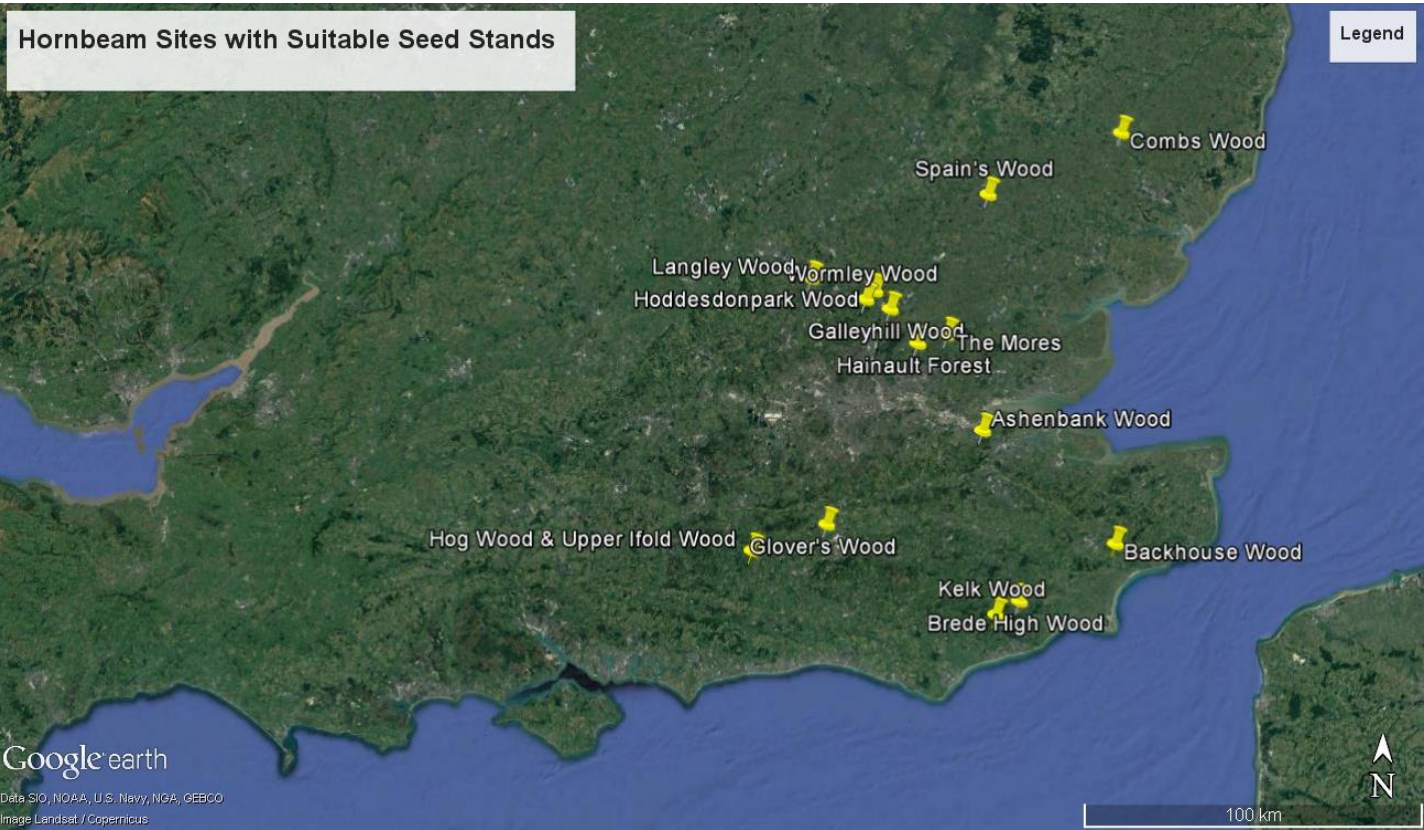
Individual site and stand information including central grid references for the potential seed stands is provided in **Table 2** with the associated key for descriptors being **Table 3**. Some 994.4ha of woodland was surveyed in the course of this project. Less than 10% (90.0ha) was considered suitable for registration as seed stands.

As expected, the vast majority of the stands were from predominately coppice origin with only Hog Wood and Upper Ifold Wood being from maiden trees. The proportion of standard trees present within a stand varied greatly from none to over 90%. In some sites, e.g. Hainault Forest, pollard trees formed a high proportion of the Hornbeam trees. Some of the older coppice stands had reverted to a high forest structure. With the exception of Backhouse Wood, which was a stand of young to semi mature trees, all sites were either a combination of semi mature to mature trees, or mature to over mature stands.

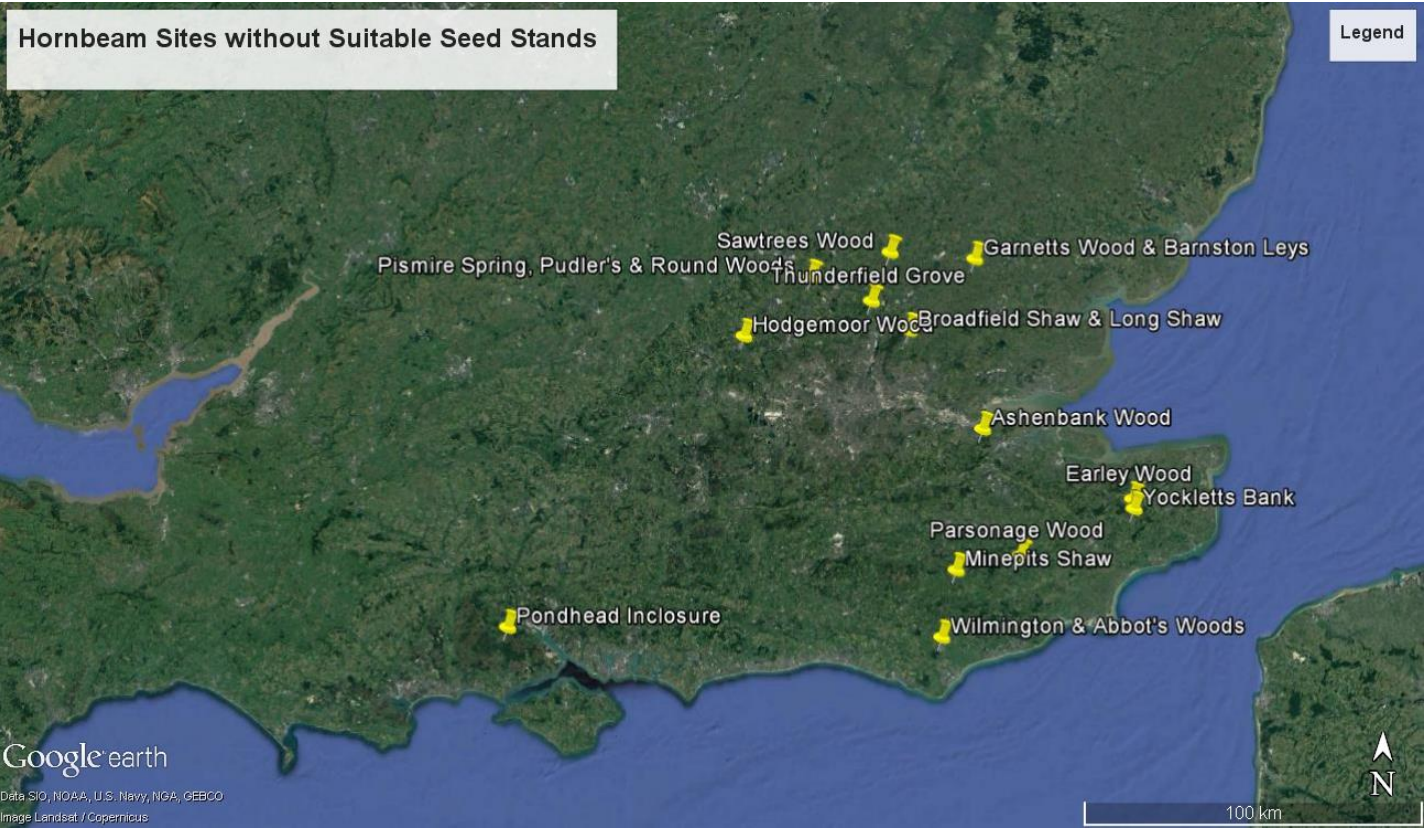
The total number of potential seed stands was 15 comprising of 10 source identified stands totalling 79.9ha and six selected stands totalling 10.1ha (Table 4). The majority of the seed stands were small, ranging from 0.7ha to 6.5ha. The exceptions were three large stands: Galleyhill Wood (15.2ha), Hainault Forest (30.6ha) and Wormley Wood (14.9ha). Except for Galleyhill Wood, these large stands had within them solid areas of other tree species. Fifteen sites were either not of large enough size, and/or, had insufficient semi mature and mature hornbeam in close proximity to each other to be suitable as a seed stand. The locations of the suitable and unsuitable seed stand sites are shown in Maps 1 and 2 respectively. Images and maps for the suitable stands are provided in **Appendix 1**.

² Sustainable Seed Sources Project, Phase 1, 2014.

Map 1: Distribution of Hornbeam Sites Recommended for Registration As Seed Stands.



Map 2: Distribution of Hornbeam Sites Not Suitable for Registration.



It should be noted that all the potential seed stands identified would benefit from management intervention to, e.g. improve crown size and stand quality through thinning, control ground vegetation to improve access for the laying of nets etc.

In the course of surveying the woods, it became clear that locating high quality stands suitable for registration as select stands was challenging. This is because Hornbeam has very rarely been managed for timber production. However, it was possible to identify potential 39 plus trees in 24 woods. These could form the basis of a plus tree collection to create a clonal seed orchard for timber production. Additional Hornbeam plus trees would be required to complete the collection. A further 55 trees covering a range of species of interest were also noted as a possible resource for future research.

c) Seed Stand Registration and Interaction with Owners and Managers

The outcome of the site visits is/has been relayed to the site owners and managers with maps provided as appropriate. Whilst registration of the seed stands has been encouraged, it cannot be assumed. Further assistance with seed stand registration has been offered to the private landowners and Estates – it is expected that at least one will confirm interest in further support. It has been assumed that other parties have resources to take registration forward if it is desired. This has been confirmed by the Woodland Trust for their sites.

Concluding remarks

This project has built upon the work on Hornbeam data compiled under the Sustainable Seed Source Project, Phase 2. It has enabled the identification of five potential selected seed stands and 10 potential source identified seed stands totalling 90ha. These are located across six counties and distributed across seed zones 404 and 405. This would provide a robust seed resource with good geographic coverage across the majority of Hornbeam's native distribution area. It should also ensure that much of the species adaptive and genetic diversity is captured and utilised if the stands go on to be registered and become active seed stands.

K Russell Consulting Ltd

On behalf of Future Trees Trust
December 2017

Acknowledgements

The assistance of the following organisations was gratefully received during the course project:

City of London – Epping Forest
Forestry Commission
Forest Enterprise
Rod Pass Associates Ltd.
UKNTSP, Royal Botanic Gardens Kew
Wildlife Trusts
Woodland Trust

Along with private woodland owners and Estates.

Table 1: Hornbeam Woods: Sites Visited, Designations and Ownership

Site	County	Seed zone	Listed in National Inventory (NI) Database	Designations	Initial point of contact/ information	Ownership	Woodland area surveyed
Ashenbank Wood	Kent	405	Yes	SSSI, TPO, ASNW	NI & SSSI review	Woodland Trust	30.0
Backhouse Wood	Kent	405	Yes	PAWS	Karen Russell	Private	27.7
Brede High Wood	East Sussex	405	Yes	ASNW, PAWS, AONB	NI review & WT report	Woodland Trust	127.9
Chaldean Estate: Cook's Wood & Sawtrees Wood	Hertfordshire	405	Yes	ASNW (Sawtrees Wood)	Rod Pass Associates Ltd	Private	23.8
Chiddingfold Forest: Hog Wood & Upper Ifold Wood	Surrey	405	Yes	SSSI, ASNW, PAWS	NI review	Forestry Commission	6.3
Combs Wood	Suffolk	406	Yes	SSSI, ASNW	NI review	Suffolk Wildlife Trust	14.3
Debden Estate: Broadfield Shaw & Long Shaw	Essex	405	Yes	ASNW	WT report	Woodland Trust	8.3
Earley Wood	Kent	405	Yes	ASNW	NI review	Woodland Trust	19.8
Galleyhill Wood	Essex	405	Yes	ASNW	Karen Russell	City of London	37.4
Garnetts Wood and Barnston Lays	Essex	405	Yes	SSSI, ASNW	NI & SSSI review	Essex County Council	24.6
Glover's Wood	Surrey	405	Yes	SSSI, ASNW	NI review & WT report	Woodland Trust	25.6
Hainault Forest	Essex	405	Yes	SSSI, ASNW	NI review & WT report	Woodland Trust	113.0
Heartwood Forest: Langley Wood, Pismire Spring, Pudler's Wood & Round Wood	Hertfordshire	405	Yes	ASNW (Langley Wood & Pudler's Wood)	WT report	Woodland Trust	17.8
Hoddesdonpark Wood	Hertfordshire	405	Yes	SSSI, NNR, ANSW	NI & SSSI review	Woodland Trust	62.0
Hodgemoor Wood	Buckinghamshire	405	Yes	SSSI, ASNW, AONB	NI review & WT report	Forestry Commission	67.0
Kelk Wood	East Sussex	405	Yes	ASNW, AONB	Esus Forestry	Private	12.4
Minepits Shaw	East Sussex	405	Yes	ASNW, AONB	NI review	Woodland Trust	2.9
Parsonage Wood	Kent	405	Yes	SSSI, ASNW, AONB	NI review	Kent Wildlife Trust	9.7
Pondhead Inclosure	Hampshire	404	Yes	NP, SSSI, ASNW, PAWS	UKNTSP	Forestry Commission	76.0
Spain's Wood	Suffolk	406	Yes	ASNW	Rod Pass Associates Ltd	Private	22.4
The Mores	Essex	405	Yes	-	WT report	Woodland Trust	16.1
Thunderfield Grove	Hertfordshire	405	Yes	ASNW, PAWS	NI review & WT report	Woodland Trust	24.8
Wilmington Wood & Abbot's Wood	East Sussex	405	Yes	ASNW, PAWS	Karen Russell	Forestry Commission	118.0
Wormley Wood	Hertfordshire	405	Yes	SSSI, NNR, ASNW	NI review & WT report	Woodland Trust	81.3
Yocketts Bank	Kent	405	Yes	SSSI, ASNW, AONB	NI review	Kent Wildlife Trust	25.3
							994.4

Key

AONB	Area of Outstanding Natural Beauty	PAWS	Plantation on Ancient Woodland Site
ASNW	Ancient Semi Native Woodland	SSSI	Site of Special Scientific Interest
NI	National Inventory report	TPO	Tree Preservation Order
NNR	National Nature Reserve	UKNTSP	UK National Tree Seed Project
NP	National Park	WT report	Woodland Trust field report

Table 2: Assessment of Hornbeam Stands for Seed Stand Potential

STAND CHARACTERISTICS														RECOMMENDATIONS						
Site Name/ Seed Stand Name	Grid Ref	Seed Zone	Area of seed stand or wood (Ha)	Slope	Vegetation	Drainage	Site Access	Security	Predators	Collection Methods	Tree Density/Ha	Est No Of Target Trees/Ha	Crown Size	Other Species	Species removal	Thinning	Vegetation Removal	Access Improvements	Reassess Boundary	Other Comments
Ashenbank Wood	TQ675692	405	30.0	3	2 to 4	2	2	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Wood was surveyed but insufficient number of large, semi to mature hornbeam with large crowns present to form a seed stand. Very large, veteran hornbeam trees present in typically very small, scattered groups. Mature sweet chestnut standards form a couple of good quality stands which would be suitable for seed collection. One field maple plus tree also selected and a massive, heavily burred chestnut of good form. Heavy public usage.
Backhouse Wood	TR071377	405	3.8	1	1	2	3	1	GS	N	800	600	2,3	Oak, Birch	Y	Y	N	N	N	Very good quality stand of young and semi mature, mixed high forest with hornbeam dominating. Some of the hornbeam is of coppice origin. Crowns are healthy but relatively few are of a large size. The biggest trees are located in the western part of the stand. It would make a good select stand especially after thinning to favour the hornbeam and further crown development. Several plus trees of hornbeam are present in the seed stand area and another to the eastern side of the wood. Promising young oak are also present in the wood. Recommend as a future select stand.

Brede High Wood	TQ794207	405	1.7	2	4 to 5	2	2	3	GS	C, N	600	150	3 to 2	Oak, Ash	Y	Y	Y	N	N	Small, semi mature high forest stand (Cpt 5c) of oak, ash and hornbeam of good quality and with hornbeam plus trees located to the west of the main ride. A smaller area in Cpt 5b of large crowned hornbeam of average to poor quality is located to the east of the main ride. If the main stand was thinned to favour the development of the hornbeam it has the potential to become a small select stand for this species in 10 to 20 years. At present, both areas could be source identified only. Bramble and recent natural regeneration of hornbeam is frequent in places and would currently hinder collection without management. Hornbeam coppice present in Cpt 7a (Coneyburrow Wood) has too small canopy sizes to be of interest for seed collection. However, there is a small stand of good quality, semi mature alder coppice with some potential plus trees. Recommend as a potential select stand.
Chaldean Estate: Cook's Wood & Round Wood	TL388194	405	3.0	2	2	1	3	2	GS	N, C	200	170	2, 3	Oak	N	Y	N	N	N	Over mature, quite sparse hornbeam coppice with very widely spaced oak standards situated against large glade on eastern side. Tree quality is variable with most being of average to good quality. Tree size ranges from medium sized to large trees. Large crowned trees are located against the glade and ride. The site is generally quite flat but drops away steeply on the western margin. Old buildings present. Very little ground vegetation except for a few small areas of bracken. Recommend as a source identified stand.
Chaldean Estate: Sawtrees Wood	TL387186	405	20.8	2, 3	1 to 4	1	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Woodland surveyed for seed stand potential. A few large trees present but these are very scattered or in small groups. Most hornbeam are either too young or have too small crowns to be of interest. In the eastern third of the wood (New Plantation) there is an area of good quality mature oak with potential plus trees and also a plus tree of field maple.
Chiddingfold Forest: Hog Wood	TQ010321	405	3.5	3	1, 4 to 5	2	3	1	SG	N	500	300	2, 3	Oak, Ash	Y	Y	Y	Y	N	Variable stand of mature hornbeam with coppice and standard trees (planted 1941, Cpt 9065b) with the coppice stems being above average but the standards typically of only average quality. Large crowned trees present. Large hornbeam forms almost a pure stand in the southern half which has little ground vegetation but has deep gully cutting through. In the northern half, the canopy is more open and interspersed with mature oak and ash. In places the ground vegetation is heavy. Two hornbeam plus trees selected. Recommend as a source identified stand.

Chiddingfold Forest: Upper Ifold Wood	TQ005328	405	1.7	2	1, 4 to 5	2	2	2	SG	N	300	150	3	Oak	Y	Y	Y	N	N	Small stand of high quality, mature hornbeam and oak high forest (planted 1920, Cpt 9044d) with a few hornbeam coppice stools. The hornbeam quality in the eastern half is good to excellent whilst elsewhere it is more variable and typically trees are of average quality. The oak is competing strongly with the hornbeam. There are large crowned hornbeam present within the stand and immediately adjacent to it. One excellent plus tree selected with 10m clean stem and good balanced crown. Ground vegetation varies from nothing to bramble and recent woody regeneration of hornbeam and birch. A forest road borders the northern edge of the stand. Following thinning to favour the development of the better hornbeam, it would make a select stand. Recommend as a select stand.
Combs Wood	TM055567	406	1.2	1	2	2	3	3	SG	N,C	400	300	3	Ash, Oak	Y	Y	N	N	N	Small area of high quality, straight stemmed hornbeam coppice with some standard trees. Crowns are medium sized and healthy. Interspersed with ash and very occasional oak. Some hornbeam and ash are over mature and starting to collapse in places. South eastern margin has recently been opened up. Potential select stand especially if thinned (remove ash) to favour the hornbeam and their crown development. Much of the hornbeam in western half of the wood has been coppiced in last 20 years or so - very high levels of squirrel damaged evident. Recommend as a potential select stand.
Debden Estate: Broadfield Shaw	TQ451969	405	5.3	2	1 to 4	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Main area of large hornbeam located in the central third but not enough individual trees to make a seed stand. The quality of the trees is average to good. In the longer term, if the wood was thinned to favour the hornbeam to increase the number of large crowned trees then there may be seed stand potential but it would be limited. Crab apple with tiny fruit located towards the northern end of the wood, midway between the west and east margins.
Debden Estate: Long Shaw	TQ452973	405	3.0	2	1 to 4	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Scattered small groups of large crowned hornbeam trees of average quality but insufficient to make a seed stand. Good quality wild service tree with nice lower stem located just to inside of the western woodland margin towards the northern end of the wood.
Earley Wood	TR120503	405	19.8	3	1 to 4	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Much of the hornbeam is young coppice and there are too few large crowned trees to make a seed stand. One small area of high quality, semi mature hornbeam with both coppice and singled stems was located which also had an excellent plus tree. A young field maple plus tree of coppice origin also selected and an area of good quality mature sweet chestnut with potential plus trees noted.

Galleyhill Wood	TL394035	405	15.2	2, 3	1	1	3	3	GS	N	450	400	1, 2	Oak	N	Y	N	N	N	Large stand of over mature hornbeam coppice of variable quality but tending to be of average quality overall thus it would make a source identified stand. The trees are 70+ years in age and form medium to large trees with the largest being located along the main ride running NE-SW. Some starting to collapse in places. It would be possible to select a few hornbeam plus trees. There are areas of good quality silver birch with potential plus trees. Recommend as a source identified stand.
Garnetts Wood and Barnston Lays	TL635182	405	24.6	1	2	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Although hornbeam is frequent, there were insufficient large crowned trees present in close proximity to each other to create a hornbeam seed stand. The quality of the hornbeam was variable - only one plus tree selected. Two crab apple trees were located along with a wild service plus tree and three areas of aspen with potential plus trees.
Glover's Wood	TQ230409	405	1.6	2	2, some 4	2	3	2	SG	N	400	300	3	Ash	Y	Y	Y	N	Y	Only the woodland area owned by the Woodland Trust (WT) was surveyed. Within the WT ownership, there are insufficient large crowned trees in close proximity to each other to make a seed stand except for one small area (1.6ha) of semi mature trees of coppice origin. In this area, there are good quality trees present and two hornbeam plus trees were selected. This stand has potential in the long term to become a future source identified seed stand if managed for crown development. At present crowns are only small to medium sized. In addition, three plus trees of field maple and three crab apple trees were identified. Note that outside of WT ownership, the western side of Glover's Wood following Welland Gill appears to have areas of fine hornbeam coppice and standards which could make a select seed stand. It is recommended that the owner is identified to see if access would be possible to further assess and discuss seed stand potential. Recommend as future source identified stand.
Hainault Forest	TQ476939	405	30.6	2	1, 4 & 5	2	3	3	GS	C, N,T	600	400	1, 2	Oak, Ash	Y	Y	Y	N	N	Substantial amenity woodland with a network of rides, glades and other open space. Many mature, large crowned hornbeam present often as old pollards. Hornbeam is a dominant species and forms pure stands in places. Ground vegetation is highly variable from nothing to bramble and heavy woody growth. However, sufficient trees present in areas with little ground vegetation to enable seed collection. The overall quality of the area proposed as a potential source identified seed stand is average. Better formed trees are present to the eastern end of Hainault Forest but dense holly forms the understorey and thus prevents easy access. Three hornbeam plus trees selected and a crab apple located. Heavy public usage. Recommend as source identified stand.

Heartwood Forest: Langley Wood	TL161110	405	6.5	1	2	2	2	3	SG	N	500	300	3 to 4	Lime & oak	N	Y	N	N	N	Predominately an over mature hornbeam coppice wood interspersed with small areas of high quality semi-mature and mature lime as coppice and standards. The hornbeam is of average quality overall - two plus trees selected but these are not outstanding trees. There are several areas of large crowned hornbeam. Suppressed bramble is present in places but otherwise there is little ground vegetation. The wood has high public usage along roped off pathways. Recommend registration as hornbeam source identified stand. Other trees of interest: Field maple (veteran tree and plus tree). Recommend as a source identified stand.
Heartwood Forest: Pismire Spring	TL154113	405	2.3	2	2	2	2	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Wood was surveyed but insufficient number of large, semi to mature hornbeam with large crowns present to warrant inclusion as a seed stand. One hornbeam plus tree selected.
Heartwood Forest: Pudlers Wood	TL158116	405	7.2	2 to 3	1 with some 4	2	2	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Wood was surveyed but insufficient number of large, semi to mature hornbeam with large crowns present to warrant inclusion as a seed stand. Some good areas of coppice. One hornbeam plus tree and one field maple plus tree selected.
Heartwood Forest: Round Wood	TL161120	405	1.8	2	2	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Wood was surveyed but hornbeam coppice is too young to be of interest. No trees of interest selected.
Hoddesdonpark Wood	TL351084	405	2.1	2	1, 4 in parts	2	3	3	GS	N, T	250	120	1, 2	Oak, Ash	Y	Y	Y?	N	Y	Potentially a source identified stand with widely spaced, large to very large crowned hornbeam trees, mostly as standard trees. Quality of the hornbeam is poor to average. Tree size decreases to the south. Large oak and mature ash intersperse the hornbeam. There is generally little ground vegetation except for some localised areas of recent mixed broadleaf natural regeneration and holly. Small watercourses present. No hornbeam plus trees found in wood. However, there are good areas of sessile and pedunculate oak which have potential plus trees adjacent to the seed stand and in the eastern half of the wood. A crab apple tree is located to the NW corner of the wood. Recommend as a source identified stand.
Hodgemoor Wood	SU967935	405	67.0	2	1 to 5	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Woodland surveyed for seed stand potential. Some large hornbeam trees present but these are very scattered or in small groups, most of which tend to be located towards the woodland margins. A mature plus tree stool of hornbeam with six very straight stems was selected towards the SW corner of the wood and a crab apple to the NE corner of the wood.
Kelk Wood	TQ730160	405	0.7	3	3 & 4	2	3	1	n/a	N, T	250	50	2 to 1	Ash, Oak	Y	Y	Y	N	N	Very small area of large crowned hornbeam trees (c.50) from coppice and as standards of average quality. Stand interspersed with mature ash and split at the eastern end by overhead powerlines, plus old infrastructure for sewage system. Bramble heavy in places. Borderline source identified stand due to small size and site constraints already mentioned. Excellent wild service tree located along with an area of good chestnut and oak standards with some potential plus trees present. Recommend as a source identified stand.

Minepits Shaw	TQ607279	405	2.9	3, 4	2	2	4	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Hornbeam coppice woodland of high quality especially north of the watercourse where the trees are older. To the south of the watercourse is almost pure hornbeam coppice whereas to the north, it is more mixed woodland with ash, birch, oak and beech. Stem straightness and form is particularly good in the hornbeam. Crowns are generally too small to be of interest as seed stand. However, two hornbeam plus trees selected along with two field maple plus trees.	
Parsonage Wood	TQ797328	405	9.7	3	1 to 5	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Woodland surveyed for seed stand potential. Some large crowned hornbeam trees present but these either in small groups or insufficient numbers to make a seed stand. Several areas of the wood have been recently coppiced. A mature plus tree hornbeam from coppice origin was selected on the eastern side of the wood and a field maple plus tree in the western arm. Good quality, mature oak with potential plus trees are present much of the wood except for the recently coppiced central part.	
Pondhead Inclosure	SU310071	404	76.0	1	1 to 5	2 to 3	2	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Woodland was surveyed but insufficient number of large, semi to mature hornbeam with large crowns present to warrant inclusion as a seed stand. Coppice typically of poor quality and forming small, scattered areas. Veteran hornbeam trees present. One yew plus tree selected.	
Spain's Wood	TL669374	406	1.7	1	1	2	3	1	D, GS	N, C	400	200	2, 3	Ash, Oak	Y	Y	N	N	N	Small stand of semi mature and mature hornbeam forming high forest and split by wide central ride. Overall the trees are of average to high quality with good stem straightness and form. Several plus trees are present within the seed stand and in the wider wood. Trees are either standards or from coppice origin. The largest crowned trees are located at the southern end of seed stand. The northern end comprises of younger coppice trees with some standards and would benefit from singling if seed production is to be favoured. With thinning to the best hornbeam it would make a select stand. Without further thinning it is a good source identified stand. Three hornbeam plus trees and one field maple plus tree selected, and two crab apple trees located. Recommend as a potential select stand.

The Mores	TQ562965	405	1.8	2	2	2	3	3	D	N, T	500	350	1 & 2	Ash, Oak	Y	Y	N	N	N	Average quality hornbeam coppice with some good trees located in the southern half of the wood. Trees are mature to over mature. The density of the stand reduces markedly in eastern half where the very larger trees are present - some of which are starting to decline. Ash is locally strong in places. Heavy usage by deer has suppressed bramble where present. The western boundary is a ditch line and the northern boundary a small watercourse. One hornbeam plus tree and two field maple plus trees selected. A small area of good quality alder with potential plus trees follows watercourse. Crab apple located towards northern edge. Hornbeam in the northern half of the wood are tending to collapse and are fewer in number. Well used network of paths cut through wood. Main access is from the western end of wood. Recommend as a source identified hornbeam stand.
Thunderfield Grove	TL338052	405	24.8	2	2	2	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Hornbeam present in most of the broadleaved areas but there were insufficient large crowned trees present to create hornbeam seed stand. The general quality of the hornbeam trees was good and two plus trees were selected. In addition two wild services trees were located - one a plus tree and the other a veteran tree.
Wilmington Wood & Abbot's Wood	TQ567076	405	118.0	2	1 to 4	2	2	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Woodland was surveyed but insufficient number of large, semi to mature hornbeam with large crowns present to warrant inclusion as a seed stand. Coppice areas typically small and often of poor form. One hornbeam plus tree selected. Good semi mature oak present in western half of Abbot's Wood. High public usage.
Wormley Wood	TL320058	405	14.9	2	1	2	3	3	SG	N, T	300	120	2 to 1	Oak	N	Y	N	N	Y	Mature hornbeam and oak high forest with some hornbeam coppice stools. The hornbeam quality and density is variable with most trees only being of average quality in part due to being open grown in past. The crowns are large to very large generally with some smaller trees being located to the southern end of the seed stand area. Some young holly in places but otherwise little vegetation. Includes an small area of large, veteran field maple trees. Elsewhere in the wood, there are some good hornbeam - one plus tree selected. A very large wild service tree also located. Recommend as a source identified stand.
Yocketts Banks	TR125476	405	25.3	3	1 to 4	1	3	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Insufficient large crowned trees present to create hornbeam seed stand. Several small groups of hornbeam present and three plus trees selected. Also of note is the high quality of the young yew trees present which would be potential plus trees and at the northern end, good mature wild cherry.

Table 3: Key for Descriptors and Abbreviations used in Table 3.

Slope	1 Flat 2 Slight 3 Moderate 4 Steep 5 Very steep
Vegetation	1 None 2 Grass/ sedges/ little vegetation 3 Grass/ weeds/ bracken 4 Significant woody species including Rubus Rosa etc. Rhodedendron = R. 5 Item 4 plus significant volunteers trees preventing commercial collection
Drainage	1 Dry 2 Average drainage unpassable in prolonged wet weather 3 Poor drainage 4 Some surface water 5 Surface water throughout site
Site Access	1 Excellent access throughout site 2 Good tracked access to site for vehicles 3 Limited access for agricultural machinery and 4 wheel drives 4 Poor - no gateways or tracks to site or too steep to access with vehicles 5 Access denied by landowner
Security	1 Isolated no issues 2 Public footpaths 3 Public access or roadside 4 Urban fringe 5 Unsafe - serious security issues
Predators	P Pheasants PP Pheasant pens or feeders D Deer WB Wild Boar GS Grey Squirrels

Collection Methods	C - Cherry picker	
	N - Nets	
	H - Hand picking	
	T - Tree Climbing	
	L Livestock	
	Suffix H to above indicates exceptionally heavy infestation	
	n/a Not applicable	
Tree Density	Figure is for all large semi mature and mature trees per hectare not just target species	
Est No Of Trees	Estimated number of target species trees per hectare in stand that can be harvested	
Crown Size	1 Very Large	
	2 Large	
	3 Healthy	
	4 Small	
	5 Diseased or dead branches	
Recommendations	Species removal	Y/N
	Thinning	Y/N
	Vegetation removal	Y/N
	Access improvements	Y/N
	Reassess boundary to enlarged stand through selective thinning	Y/N
	Other comments includes:	
	Description of seed stand	
	Designations	
	Source identified	
	Select stand	
	Not suitable as a seed stand	

*Taken and adapted from FTT Sustainable Seed Sources Project, Phase 1

Table 4: Heanbeam Project: Summary of Seed Stand Recommendations

Site	County	Seed zone	Recommendation	Seed stand area (ha)
Ashenbank Wood	Kent	405	Not suitable as a seed stand	n/a
Backhouse Wood	Kent	405	Recommend as a potential select stand	3.8
Brede High Wood	East Sussex	405	Recommend as a potential select stand	1.7
Chaldean Estate: Cook's Wood	Hertfordshire	405	Recommend as a source identified stand	3.0
Chaldean Estate: Sawtrees Wood	Hertfordshire	405	Not suitable as a seed stand	n/a
Chiddingfold Forest: Hog Wood	Surrey	405	Recommend as a source identified stand	3.5
Chiddingfold Forest: Upper Ifold Wood	Surrey	405	Recommend as a potential select stand	1.7
Combs Wood	Suffolk	406	Recommend as a potential select stand	1.2
Debden Estate: Broadfield Shaw	Essex	405	Not suitable as a seed stand	n/a
Debden Estate: Long Shaw	Essex	405	Not suitable as a seed stand	n/a
Earley Wood	Kent	405	Not suitable as a seed stand	n/a
Galleyhill Wood	Essex	405	Recommend as a source identified stand	15.2
Garnetts Wood and Barnston Lays	Essex	405	Not suitable as a seed stand	n/a
Glover's Wood	Surrey	405	Recommend as a source identified stand	1.6
Hainault Forest	Essex	405	Recommend as a source identified stand	30.6
Heartwood Forest: Langley Wood	Hertfordshire	405	Recommend as a source identified stand	6.5
Heartwood Forest: Pismire Spring	Hertfordshire	405	Not suitable as a seed stand	n/a
Heartwood Forest: Pudler's Wood	Hertfordshire	405	Not suitable as a seed stand	n/a
Heartwood Forest: Round Wood	Hertfordshire	405	Not suitable as a seed stand	n/a
Hoddesdonpark Wood	Hertfordshire	405	Recommend as a source identified stand	2.1
Hodgemoor Wood	Buckinghamshire	405	Not suitable as a seed stand	n/a
Kelk Wood	East Sussex	405	Recommend as a source identified stand	0.7
Minepits Shaw	East Sussex	405	Not suitable as a seed stand	n/a
Parsonage Wood	Kent	405	Not suitable as a seed stand	n/a
Pondhead Inclosure	Hampshire	404	Not suitable as a seed stand	n/a
Spain's Wood	Suffolk	406	Recommend as a potential select stand	1.7
The Mores	Essex	405	Recommend as a source identified stand	1.8
Thunderfield Grove	Hertfordshire	405	Not suitable as a seed stand	n/a
Wilmington Wood & Abbot's Wood	East Sussex	405	Not suitable as a seed stand	n/a
Wormley Wood	Hertfordshire	405	Recommend as a source identified stand	14.9
Yockletts Bank	Kent	405	Not suitable as a seed stand	n/a

Notes:

994.4 ha of woodland surveyed across 31 woods spread over over 25 sites where hornbeam was a major component. A total of 90.0 ha of hornbeam was identified with seed stand potential as follows:

5 stands totalling 10.1 ha recommended for registration as selected seed stands

10 stands totalling 79.9ha recommended for registration as source identified seed stands

16 sites/stands not considered suitable as seed stands - either too small total area and/or insufficient suitable trees in proximity to each other

Appendix 1: Location Maps and Images for the Potential New Hornbeam Seed Stands