

Sustainable Seed Source Project Phase 2

Commissioned and funded by the
Woodland Trust



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1. Foreword

Trees and woodland in the UK face a growing number of threats from pests and pathogens, as well as the need to adapt to a changing climate. These challenges require a range of responses from government and its agencies, woodland owners and forest managers.

Where it is possible to use natural regeneration, this often provides the best opportunity for adaptive woodland management. However, in many cases the regeneration of existing woodland and the expansion of trees and woodland in the UK for commercial timber production, woodland conservation and a range of other ecosystem functions, depends on a reliable and secure source of a tree seed. As this report highlights, there are insufficient registered seed stands and seed sources in the UK for broadleaved trees to meet demand. Importing seed to fulfil demand generates a risk of importing tree pests and diseases, but also of using seed which is maladapted to UK conditions; such as the apocryphal stories of wild cherry seed being collected from the waste of jam factories in Eastern Europe and grown for UK forest markets.

It is of course the case that in the past seed, other reproductive material and tree transplants have been imported from elsewhere in Europe and are part of UK woods. However, by collecting seed from trees now growing in the UK, and thus subjected to the selection pressure of UK conditions and climate change within the UK, we can work towards seed which is better adapted and free from imported pests and pathogens.

Long term resilience within tree species is likely to be greatest where there is good intraspecific genetic diversity with the potential for adaptive responses to change. This need not be at the expense of selection for phenotypic traits which favour timber production or other desirable characteristics. It is important that strategies are developed for each species which match its reproductive and stand characteristics and provide seed of good quality able to meet the needs of a range of users.

This report provides a valuable step in identifying what needs to be done to secure UK grown seed for a range of broadleaved species. Further work will be needed to develop specific recommendations for individual species and to ensure these are enacted.

The Woodland Trust



2. Executive summary

The British forestry sector requires a reliable and sustainable resource of good quality broadleaf tree seed for timber production, conservation, and planting to sustain ecosystem services. At present, the Forest Reproductive Materials (FRM) Register currently only includes 'selected' seed sources for relatively few species of interest: pedunculate oak, sessile oak, silver birch, beech, sycamore, sweet chestnut and small-leaved lime.

This report starts to address this by providing an overview of the potential domestic sources of seed for 15 broadleaf species of interest and also for yew, which are not currently included on the FRM Register. The broadleaved species are aspen, black walnut, black poplar, common alder, English elm, common walnut, field maple, hornbeam, London plane, Norway maple, wild apple, wild pear, wild service tree and wych elm. It also reports on small-leaved lime, where seed supplies are currently limited or very limited.

The timber potential of the species has been an important consideration in the prioritisation of the species. Where timber production is an objective there is a need to balance this with the consideration of the conservation requirements of each species and the need to foster intraspecific genetic diversity to promote long term resilience.

The report draws heavily on the "National Inventory database" (see page 5) and associated citations arising from three native tree population inventory projects undertaken in England, Wales and Scotland between 1998 and 2003, plus additional information provided by the Woodland Trust and a wide range of contributions by other organisations. Data (4111 individual reports) received by 26th October 2015 are presented in a series of tables and summarised within the report.

Sufficient outline data at an individual species level in the cases of aspen, black poplar, common alder, field maple, hornbeam, small-leaved lime, wych elm, wild service tree and yew is available, but detailed information to enable progression to the development of seed sources is still required, as it would be for the other species. There is almost sufficient data for English elm, Norway maple and wild apple. However data for black walnut, common walnut, London plane and wild pear is very limited.

For each species, the report proposes a strategy to develop sustainable seed sources which range from the identification of seed stands, including selected seed stands, for hornbeam, Norway maple, small-leaved lime and wych elm, to seedling and clonal seed orchards for the other species. This may be for timber production or conservation orchards depending on the individual species.

Recognising that resources are limited, prioritisation of the species has been proposed with aspen, common alder, hornbeam, small-leaved lime and wild apple having been given the highest priorities followed by black walnut, field maple, Norway maple, wild service tree and yew. Note that this prioritisation may well alter in the future once contributors and other parties have provided feedback on the report.

For several species (e.g. aspen and small-leaved lime), there are already 'working groups' taking forward work on their species of interest. Means to support and develop these groups further in terms of membership, geographic involvement, and acquirement of knowledge and establishment of productive, sustainable seed resources needs to be found, along with new initiatives for other priority species of interest.

Consideration should also been given to the reviewing policies regarding native species to include timber production seed sources for potentially productive native species as well as conservation. This plus the provision of grant and other support mechanisms to facilitate the identification, registration and management of seed production units whether in situ seed stands or ex situ seed orchards would aid the development of sustainable seed supply.



3. Objectives, methods, results

To identify domestic sources of seed for 15 broadleaf species and yew, which, with the exception of small-leaved lime, are not currently included in the National Register of Approved Basic Material for Great Britain's Register of Seed Stands.

Background

The British forestry sector requires a reliable resource of quality broadleaf tree seed. The Forest Reproductive Materials (FRM) Register currently includes details of 95 'selected' seed sources for relatively few species of interest: pedunculate oak, sessile oak, silver birch, beech, sycamore, sweet chestnut and small-leaved lime. For some species there are insufficient registered seed stands. This plus, occasional insufficient availability of British seed sources to meet demand can lead to the importation of seed/seedlings potentially maladapted to the British environment. These factors combined with the increase in introduced pests and diseases has highlighted the need to reduce the use of imported foreign tree seed by the forestry sector through identifying and making better use of domestic seed from British sources.

An assessment of the selected seed stands of broadleaved tree species currently included on the Forest Reproductive Materials Register was undertaken by Forestart Ltd on behalf of Future Trees Trust in 2014. This determined the selected seed stands' suitability as commercial seed sources and identified options to increase productivity along with maintenance works required to aid seed collection. It also highlighted the need for more selected stands of sweet chestnut and small-leaved lime to be identified.

To complement the review of selected seed stands, following a meeting of forestry and timber processing stakeholders in December 2013, a second project was commissioned with funding from the Woodland Trust. This project would identify possible species for which there is likely to be a future timber demand, but for which there are currently no Source Identified or Selected stands on the FRM register. The species of interest identified were:-

aspen	London plane
black walnut	Norway maple
black poplar	wild pear
common walnut	wild service
hornbeam	yew
small-leaved lime	

(for which there is only one registered selected stand)

Subsequently common alder, English elm, field Maple, wych elm and wild apple were added bringing the total to 16 species.

For these species, there are inadequate British seed sources identified and utilised to meet current requirements let alone potential increases in demand.

The informal project partnership includes Future Trees Trust (FTT), the Woodland Trust (WT), Millennium Seed Bank (MSB), Forest Research (FR), Forestry Commission (FC) and the Royal Forestry Society (RFS). These organisations along with the Wildlife Trusts, National Trust and Natural England hold sources of information on the whereabouts of stands or individual trees of 14 of the 16 target species (data for common alder and field maple were not requested as these species were included into the project at a late stage). The information was reviewed to pre-identify candidate population sites for the target species, meriting later detailed studies.

This second project has been undertaken as a preliminary desk-study with the following tasks:

- 1) To request and identify what information for the target species is recorded in databases or what other information sources are held by the partnership organisations and others.
- 2) To summarise findings in relation to potential seed stands/individual trees for the target species and identify where information is lacking.
- 3) To develop a draft overall summary strategy for the 16 species which considers seed demand, seed viability, genetic diversity, appropriate seed production unit type and prioritisation.
- 4) To identify potential synergies/opportunities for collaboration between organisations on an individual species basis to facilitate a sustainable seed supply.

Note that while the timber potential of the species is an important consideration in the identification of seed stands and individuals, it does not override consideration of the conservation requirements of each species and the need to foster intraspecific genetic diversity to promote long term resilience.



Task 1: To request and identify what information for the target species is recorded in databases or other information sources held by the partnership organisations and others.

a) National Inventory Databases

Between 1998 and 2003, three native tree population inventory projects were undertaken in England, Wales and Scotland¹, variously funded by Forest Research / FC in England, National Resources Wales (formerly Forestry Commission Wales), the Scottish Forestry Trust and FC-GB in terms of the national combination of data. This resulted in the creation of an inventory database comprising a register of important populations of each of the native species that were thought to be site-native and potentially suitable seed source populations. Many of the sites are Ancient Semi-natural Woodland; Plantation on Ancient Woodland Sites; Sites of Special Scientific Interest (SSSI) and/ or are nature reserves. The database includes all the native tree species in each region. Where possible, populations were selected to have sufficient breeding individuals to ensure genetic sustainability (more than 30 trees is usually considered sufficient).

As the main researcher on these projects, **Dr Scott McG. Wilson** was asked on behalf of Future Trees Trust to request access to the (largely unpublished) woodland species data from the various project sponsors for this project. This was undertaken and permission granted. The data was provided as a series of Excel, ArcGIS and SSSI citation files for the following species: aspen, black poplar, common alder, English elm, common walnut, field maple, hornbeam, small-leaved lime, wild apple, wild pear, wild service, wych elm and yew. No data was available for black walnut, London plane and Norway maple as these were not considered in the projects. In some cases, the organisations such as the Forestry Commission, Natural England, National Trust and the Woodland Trust owning or managing these populations are identified in the database. However, no personal contact data relating to private land ownership was supplied.

b) Woodland Trust

To identify additional sites to those reported in the National Inventory Database, a data information sheet (**Appendix 1**) was designed in collaboration with the Woodland Trust to collect information on species' populations and individual trees of interest. After test trialling on a subset of five woodland site managers, the data information sheet was revised and then circulated to all woodland site managers in England, Wales, Scotland and Northern Ireland. Datasheets were returned to a central point within the the Woodland Trust and collated

before submitting for review. ArcGIS data for aspen, common alder, elm species, field maple, hornbeam, small leaved lime, wild service and yew was populated onto UK maps to enable the distribution of sites from the National Inventory databases to be visualised (**Appendix 2**) and compared to the New Atlas species distribution maps

c) Forestry Commission / Forest Enterprise and Forest Research

Assistance to identify and locate species information at a stand level and, for rare species at an individual tree level, has been requested from Forestry Commission England who is coordinating efforts across the FC and Forest Enterprise to review their own inventory data and local knowledge of sites. Inventory data was initially screened for the occurrence of species of interest established or planted prior to 1965 and with a minimum stand size of 0.5ha. The stand size was subsequently reduced to 0.1ha to enable rarer species to be picked up.

d) National Trust

The National Trust has been approached regarding the provision of additional information on their sites listed in the National Inventory database and/or new sites.

e) Millennium Seed Bank, Royal Botanic Gardens, Kew

The Millennium Seed Bank is making multi provenance collections of the UK woody flora through the UK National Tree Seed Project. It has mapped species distribution data from the National Biodiversity Network databases against Forestry Commission Seed Zones. It is working with partners such as Wildlife Trusts and the Woodland Trust to identify potential seed sources across the UK for 50 species including aspen, common alder, black poplar, field maple, hornbeam, small-leaved lime, wild apple, wild service tree, wych elm and yew. This work is on-going and for all of these species at least one collection of seed material per species is already held.

f) Other organisations

The following organisations have been contacted: The Conservation Foundation in relation to elms and yew; the UK Black Poplar Conservation Group and Writtle College in relation to black poplar genetic resources; The Tree Council in relation to the Lime Woods Working Group (also contacted directly) and the Ancient Yew Group; the Tree Register of the British Isles (TROBI) in relation to notable/veteran and ancient trees for all species; The National Fruit Collection and East Malling Research in relation to wild apple and wild pear; Coille Alba in relation to aspen and Forestart Ltd in relation to current and likely future seed demand for all species of interest.

¹ In the Native Woodland Survey Scotland, all native woodlands > 0.5 ha were surveyed and a range of attributes recorded. Its available to access free online from here <http://scotland.forestry.gov.uk/supporting/communication-consultation/map-viewer-guidance>



Task 2: To summarise findings in relation to potential seed stands / individual trees for the target species and to identify where information is lacking.

National Inventory data

A breakdown of the species information taken from the National Inventory excerpts is provided in **Table 1**. In total there are 3,688 site listings for the 9 species (aspen, common alder, English elm, field maple, hornbeam, small-leaved lime, wild service tree, wych elm and yew) included in the database. The most reports by far were for common alder with 1040 reports followed by wych elm (665), field maple (648), aspen (273), yew (272), small-leaved lime (260), hornbeam (245), wild service tree (201) and English elm (84). Where National Inventory data was not available for seven species, i.e. black poplar, black walnut, common walnut, London Plane, Norway maple, wild apple and wild pear, SSSI citations were searched. This revealed 105 SSSI citations for 5 species: wild apple (93), wild pear (6), black poplar (4) and one each for common walnut and Norway maple. There were no species reports for black walnut and London plane. This demonstrates that there is very considerable variation in the number of sites reported for each species and that the distribution of the sites, as indicated by the location of seed zones with species present, is also highly variable with most being located in southern Britain.

Over 12% of the sites in the database (460) are listed under the Visit Woods scheme which encourages public access. This is an important consideration in relation to gaining easy access for future site assessments. Each site has between eight and one species of interest with 302 sites (66%) having two or more species. The targeting of sites with multiple species of interest offers potential efficiencies.

The Woodland Trust, Forestry Commission and National Trust between them have 418 species reports covering ten species listed in the National Inventory database (**Table 2**). These are distributed across 74 Woodland Trust sites, 84 Forestry Commission sites (52 in England, 25 in Scotland and 7 in Wales) and 51 National Trust sites. There are marked differences between the number of reports per species with the most reports being for common alder (119), followed by field maple (76), wych elm (61), yew (45), small-leaved lime (33), aspen (30), hornbeam (26), wild service tree (24), English elm (2) and wild pear (1). Sites, species and seed zone information are provided in **Tables 3 to 5**.

The Woodland Trust and Forestry Commission data includes sites in all Regions of Provenance with a total of 16 and 18 seed zones respectively represented overall. The

National Trust sites cover Regions of Provenance 20, 30 and 40 with 10 seed zones represented.

Additional data sources investigated

Woodland Trust

The Woodland Trust's request for species data information from its woodland site managers resulted in a return of datasheets for 58 sites reporting 89 occurrences of species of interest (**Table 6**). This information has been combined and cross-referenced to National Inventory data to form **Table 3**. The total number of species reports for the Woodland Trust is 264 across 132 sites and covers 14 species – only black walnut and common walnut are not represented. The Woodland Trust sites have been prioritised for site visits on the basis of number of species present and level of confidence in the data sources

Forestry Commission / Forest Enterprise and Forest Research

Excel and ArcGIS dataset relating to 223 reports covering eight species of interest were received from Forest Enterprise England as follow: aspen (8 totalling 10.84ha), common alder (57 totalling 99.58ha), field maple (18 totalling 21.49ha), Norway maple (28 totalling 32.40ha), small-leaved lime (88 totalling 231ha), wych elm (4 totalling 3.67ha), wild service tree (1 totalling 0.53ha) and yew (20 totalling 67.45ha). A threshold of 0.5ha per site was initially set for the individual species of interest – the reports are listed in **Table 7**. The percentage stand component formed by the species of interest in these reports ranges from 2% to 100%. However with an overall average of 45%, it is clear that for many of the stands, the species of interest form a major or important component of the stand composition. The reports for common alder, Norway maple, small-leaved lime and yew are particularly useful as these relate to stands of good size. Subsequently when the size of the species of interest component reduced to 0.1ha, further summary records for the six initial species were received, plus in addition reports for black poplar, black walnut, crab apple, English elm and hornbeam (**Table 8**). No records were available for common walnut, London plane and wild pear. The latter may be because of difficulty in securing a valid species code.

However, due to lack of common data coding or use of site names, it has not yet been possible to cross reference these two datasets with a total of 482 records with the National Inventory database information. To enable this, prioritisation of species has been agreed and Forest Enterprise England are undertaking further interrogation of their data resources which will include the addition of, for example, stand type information so high forest stands could be identified as these are of greatest interest in relation to seed production.



Forest Research (FR) has provided outline information on aspen, black poplar and wych elm as well as providing links to other potential sources of material: Newcastle University, Centre of Ecology & Hydrology and the Royal Botanic Garden Edinburgh in relation to small-leaved lime, wild apple and yew respectively.

Regarding aspen, there are a number of on-going initiatives/projects with a range of partner organisations (e.g. Coille Alba, Eadha, FR, Forest Enterprise Scotland, Future Tree Trust, Forestart Ltd., Universities of Edinburgh and Glasgow) mainly focussed in Scotland with some activity in the Lake District and Shropshire. Some are focussed on the development of aspen for biomass/production and others on conservation with some crossover. These have resulted in the identification of over 200 clones. Molecular markers have been developed and applied to identify male and female clones. The establishment or planned establishment of seed/clonal orchards is summarised in Table 9. Thus sufficient material to provide seed for northern Britain has been identified and efforts are now being made to coordinate the production of seed and its subsequent deployment to growers.

Assessments of the Forest Research clonal trials (3 replicated trials with 37 clones at Kilmichael, Cashel and Moray) and Eadha trials will provide provenance information. The level of activity and information on aspen in southern Britain is at a much lower level and significant efforts are required to develop southern seed sources whether at stand or orchard levels. Given that seed viability is highest in southern Britain, serious consideration should be given to locating further seed orchards there, independent of the original source locations of the plant material. This is especially valid for orchards principally to provide seed for production purposes rather than conservation purposes.

In relation to black poplar there is sufficient, genetically distinct, clonal material (100+ clones) established in collections (e.g. at Forest Research and Writtle College), assembled from very wide geographic area with the assistance of several black Poplar Working Groups, to establish a clonal seed orchard which would provide sufficient seed to exceed demand. This therefore avoids the need for additional material to be collected from the wild. The clones have been genetically characterised using molecular markers which are also able to identify male and female clones. Forest Research would be able to advise on the selection of clones and provision of propagating material to establish a clonal seed orchard. Molecular markers are also available for the characterisation of wych elm with the characterisation of seedlings and clonal material is currently being undertaken as part of a collaborative project between Forest Research and the Millennium Seed Bank.

National Trust

Data from the National Trust has, unfortunately, not been forthcoming because the National Trust has found it a challenge to secure the resources to undertake the necessary research.

Millennium Seed Bank, Royal Botanic Gardens, Kew

The UKNTSP is making multi provenance collections of 50 UK woody species including aspen, common alder, black poplar, field maple, hornbeam, small-leaved lime, wild apple, wild service tree, wych elm and yew. These collections will be made available for research and conservation projects. MSB have indicated collaboration on these species and the exchange of information/plant material with existing and new partners could potentially be undertaken. The hosting of gene banks for aspen and black poplar is of interest. A key output from this project will be a database of seed sources. Every seed collection is accompanied by a field data sheet giving full information on the seed source site and the source population. This will generate a full database of potential future seed sources, with known landowners who have already given consent for seed collecting (at least for this project). All collections will also be viability tested. Genetic studies will be carried out for a limited number of species.

Royal Botanic Garden Edinburgh

The Royal Botanic Garden Edinburgh is in the process of creating unique heritage yew hedges from 2000 plants (seedlings and cuttings) propagated from ancient, historic and threatened yew trees both in the UK and around the world. Around 20 per cent of the hedge will comprise plants grown from heritage trees which are of potential interest to this project. The rest will be from populations worldwide where the *Taxus* genus is listed nationally as threatened.

Limewoods Working Group

Members of the Limewoods Working Group have kindly identified 10 woods of small-leaved lime which have potential as seed stands, plus the registered seed stand at Hockering Wood, in Norfolk (**Table 10**). All the woods are mature, native stands with good light conditions in the canopy (important for seed production). Most are from coppice origin and have through lack of management reverted to high forest.

Newcastle University

Newcastle University is undertaking molecular research to understand the genetic structure, diversity, gene flow and reproduction methods of small-leaved lime and large-leaved lime from 27 ancient lime woods. Two of these study woods, Shrewley Wood and Lady Park Wood, are recommended as potential seed stands by the Limewoods Working Group. Sub-structure within both species was only loosely related to geographic location. Note: Molecular studies to investigate genetic

variability in small-leaved lime populations are also being undertaken at The University of Lincoln.

The Conservation Foundation

The yew Tree Campaign has been locating and propagating ancient yews through The Ancient yew Tree Group: some 335 ancient trees have been identified. Projects on elm in association with the National History Museum have also been conducted and resulted in hundreds of potential trees being identified.

The Tree Council

The Tree Council's Green Monuments Campaign involving the Woodland Trust, Ancient Tree Forum and the Tree Register of the British Isles has developed a provisional list of internationally important ancient trees in lowland Britain and Ireland. Some of these trees, such as yew could be of interest in the development of heritage seed sources. The Tree Council also oversees the Limewoods Working Group and yew Working Group.

Tree Register of the British Isles (TROBI)

As mentioned above, TROBI has contributed information for the Green Monuments Campaign relating to ancient trees. TROBI has an extensive species database on notable, veteran and ancient trees as well as some information on populations. The database includes all species of interest in this project; however species forming stands such as hornbeam, small-leaved lime and wych elm are considered less of a priority. TROBI has kindly agreed to review several priority species where data is limited from other sources, e.g. wild pear, London plane, and to provide sample data, which we are awaiting.

National Fruit Collection

The National Fruit Collection (NFC) in Kent has three accessions of wild apple, one is a reference accession from Cambridge University Botanic Garden. The other two are named accessions 'Simon' and 'St Milburgh White' from Faverham, Kent and Much Wenlock Shropshire respectively. The NFC also has one accession of wild pear.

East Malling Research

East Malling Research (EMR) in Kent does not hold accessions of either wild apple or wild pear in its main gene banks but has developed molecular markers which are able to distinguish between cultivated, ornamental and wild forms and which would be suitable for genetic diversity studies. In addition, EMR holds timber plus tree accessions of black walnut (35) and common walnut (7) from selection and breeding programmes at EMR, France and USA. The walnut clonal collection also includes hybrids and fruit varieties.

Task 3: To develop a draft overall summary strategy for the selected species which considers seed demand, seed viability, genetic diversity, appropriate seed production unit type and prioritisation.

Introduction

When the project was originally proposed, the remit was to identify stands and individual trees of 16 species of interest with the potential for seed production without any real parameters having been set regarding the number of stands and/or trees required. Thus to develop and focus the resources available to the project it was necessary to prepare a draft strategy summary for the species (**Table 11**). This took into consideration the life histories of the species, distribution, rarity, genetic knowledge, ease of seed collection, seed viability, seed demand, existing seed production resources (stands and orchards) and comments and feedback from contributors to the project. Forestart Ltd has been a key contributor to this task.

Comments on individual species

For species typically forming stands such as hornbeam, Norway maple, small-leaved lime and wych elm, the option of identifying seed stands should be prioritised with those of better timber quality being registered as selected seed stands. For species, such as aspen, black poplar and English elm, where clonal vegetative regeneration is the major mechanism for reproduction as regular flowering and/or production of viable seed is infrequent then establishment of clonal seed orchards in southern Britain should be prioritised. Consideration could be given to separate conservation and production orchards: with more focus on tree form in production orchards if sufficient 'plus trees' and demand exist. For both common alder and field maple where the species are common but rarely forming sufficiently large stands for seed collection, separate clonal seed orchards should be created in line with the key interest/use of the resulting seedling material, i.e. timber production or conservation.

For the wild rosacea, i.e. wild apple, wild pear and wild service tree, where seed collections in the wild are very difficult and expensive to undertake due to scattered and very small population sizes, then seed orchards should be established with material collected from a minimum of 50 sites for each species. In the case of wild apple and wild pear, particular consideration should be given to clonal seed orchards rather than seedlings to ensure trueness to type by reducing the risk of cultivated and ornamental forms or hybrids being incorporated. The use of molecular markers to distinguish between cultivated, ornamental and wild types apple and pear would increase confidence in the orchards trueness to type as well as characterise the genetic diversity within them.



Demand for the walnut species at present is low but likely to increase. In relation to black walnut, small existing stands of good quality could be utilised to provide seed for timber production. However, these should be supplemented by the creation of a clonal seed orchard using plus trees from existing breeding programmes along with the addition of new plus trees to increase the range of genotypes. For common walnut, relatively few plus trees are available. Thus considerable efforts would be required to identify and propagate sufficient trees to develop a clonal seed orchard. As common walnut has been selected and planted predominately for fruit production resulting in heavily branched trees and, in more modern varieties lateral bearing fruit habit, particular care must be given to selecting trees with timber potential. For both species, provenance trials exists which may offer material of interest for seed orchard establishment.

Yew is a complicated species to deal with because of its historical and cultural importance, typically scattered distribution and few large populations are suitable for seed stands. That said there is sufficient interest to develop separate conservation and production seed orchards with the latter being clonal to optimise the retention of good timber tree characteristics. Conservation orchards could be established either from seedlings or clonally. There is also the possibility of being able to identify seed stands in larger populations. The final species is London plane for which there is current negligible seed demand. As a species of increasing interest especially in relation to climate change scenarios, consideration should be given to establishing a small collection of plus trees including a subset of heavily burred forms prior to any commitment to the establishment of seed orchards.

Lack of Information

For the majority of the species of interest there is sufficient outline information available either in existing databases or held within various organisations to identify likely populations, seed stands and/or individual trees required to improve seed supply. Some information is still awaited from several organisations and is generally limited for Wales. However, detailed information is very limited and confidence levels in the information vary markedly. Thus considerable efforts at an individual species basis will be required to translate knowledge of the location of potential sites and trees, to securing access to enable the assessment and selection of populations, stands and trees for either production or conservation purposes. Species for which outline information is a particularly limiting factor are black walnut, common walnut, London plane and wild pear. Targeting of particular woodland agents and private owners with interest in the target species would result in additional trees being reported.

Prioritisation of Species

Initial ranking of the species according to seed demand, conservation and industry interest is given below. This may well be revised at a later date in light of feedback on this report.

Priority	Species
High	aspen, common alder
Medium to high	hornbeam, small-leaved lime, wild apple
Medium	black walnut, field maple, Norway maple, wild service tree, yew
Low to medium	black poplar, wych elm
Low	common walnut, wild pear
Very low	English elm, London plane

Task 4: To identify potential synergies / opportunities for collaboration between organisations on an individual species basis to facilitate the sustainable seed supply.

Despite still awaiting data from some contributors, it has become apparent when researching and compiling this report that there are a variety of organisations and individuals with common interests in some species. Also due to the requirement to focus resources, engagement with other potential key contributors, such as the Wildlife Trusts, site owners and managers has yet to take place. Thus much of which is reported here is a summary of background knowledge and should be considered as work in progress. It is recommended that this report is circulated to all contributing parties for consideration, particularly to aid agreement on the prioritisation of species in relation to future work and to facilitate discussion. Where appropriate/possible, work on individual species should be taken at a country or national level rather than locally focussed.

The main species where there are several interested organisations include aspen, black poplar, hornbeam, small-leaved lime, wild rose (apple, pear and wild service), wych elm and yew. In the cases of aspen and small-leaved lime, there are already strong collaborations in place between interested parties which could be further strengthened by the involvement of groups in southern and northern Britain respectively. Potentially interested parties by species are listed below. Note that lack of parties being mentioned does not imply their exclusion, but simply that their interest is not known. The involvement of the private forestry sector representation needs to be improved.



Organisations and Groups who expressed an interest in sustainable seed sources for the species listed	
Aspen:	Coille Alba, Eadha, Forestry Commission (FC), Forest Research (FR), Forest Enterprise Scotland, Future Tree Trust (FTT), Forestart Ltd., Millennium Seed Bank (MSB), Universities of Edinburgh and Glasgow, Woodland Trust
Black poplar:	FR, Black Poplar Working Group, MSB, Woodland Trust, Writtle College
Hornbeam:	FC, FTT, MSB, Woodland Trust
Small-leaved lime:	Limewoods Working Group, MSB, Universities of Newcastle and Lincoln, Woodland Trust
Wild Rosacea:	Centre of Ecology & Hydrology, East Malling Research, FTT, National Fruit Collection, MSB, Woodland Trust
Wych elm:	Conservation Foundation, FR, FC, MSB, TROBI, Woodland Trust
Yew:	Ancient Tree Group, Yew Working Group, FR, FTT, MSB, TROBI, Woodland Trust

While it is acknowledged that bringing together interested parties is challenging and time consuming, the drawing together of such expertise would pay significant dividends in terms of planning and progressing work on an individual species basis. Thus efforts should be made to enable this to occur along with the revision of planting policies regarding native species so that they better include the option to use timber production seed sources as well as conservation sources. In addition, the provision of grant and other support mechanisms to facilitate the identification, registration and management of seed production units whether in situ seed stands or ex situ seed orchards should aid the development of sustainable seed supply.



4. Next steps

This report provides an important stage in the development of UK seed sources for a range of broadleaved species.

- The report finds that there is sufficient information for most of the species considered to identify likely populations, seed stands and individual trees needed to improve seed supply. However considerable work is needed to move from this to securing access for assessment and selection.
- Further effort is needed to develop a more detailed strategy to identify the seed resource for: aspen, black poplar, common alder, English and wych elm, field maple, hornbeam, small-leaved lime, wild apple, wild pear, wild service tree, yew.
- Given the number of organisations with an interest in many of the principle species, there would seem to be value in drawing these interested parties together to agree plans for individual species.
- A gap in knowledge remains relating to seed sourcing for native shrub species. Further work will be undertaken to scope what might be needed.



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Forestart Ltd.
Limewoods Working Group
Millennium Seed Bank
National Fruit Collection
National Trust
Newcastle University
Scottish Forestry Trust
The Conservation Foundation
Tree Register of the British Isles
The Woodland Trust
Dr. Scott McG.Wilson

Appendix 1:

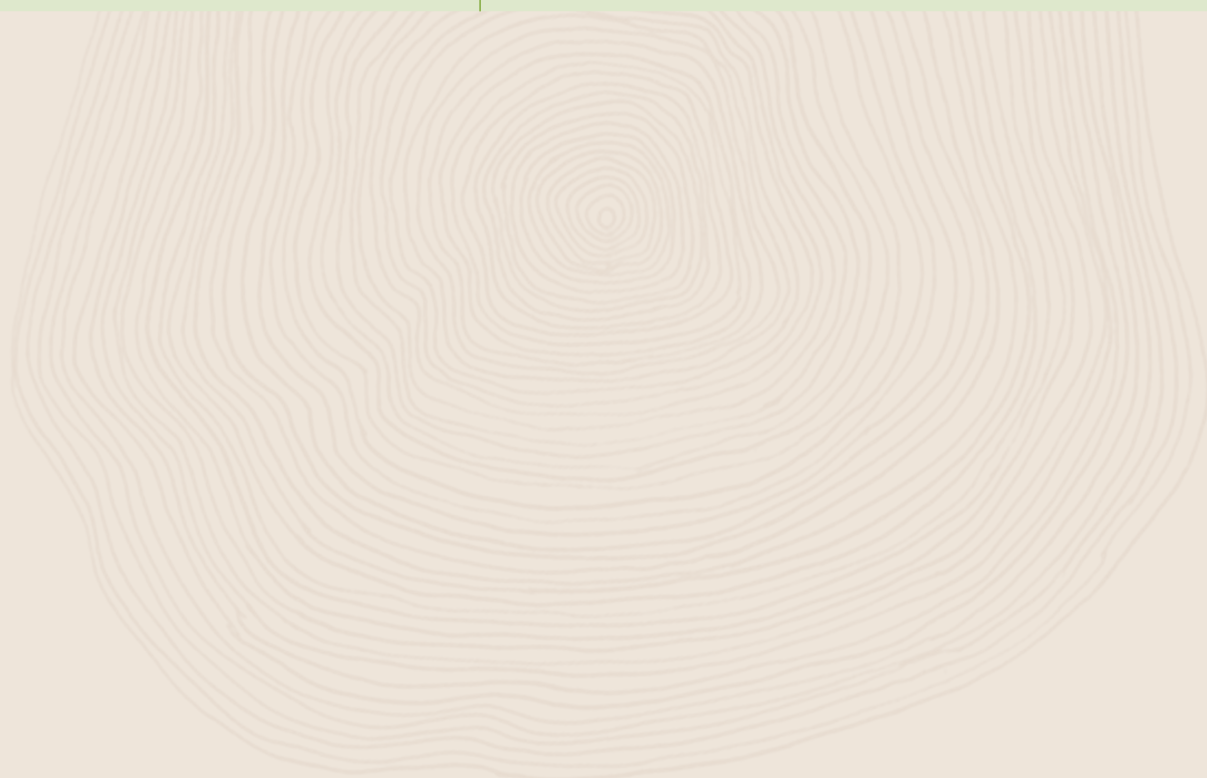
Data Information Sheet used by the Woodland Trust

Future Trees Trust - Sustainable Seed Source Desk Study: worksheet for data collection	
Site name	
Central grid reference (6 digit ref) County	
Site address	
Site contact Name	
Telephone and mobile numbers	
E-mail	
Unique ID	
1. Site characteristics	Answer Yes/No as appropriate and add comment if necessary
ASNW	
PAWS	
SSSI	
NNR	
CWS/LWS	
Other (state)	
High forest	
Coppice	
Wet Woodland	
Secondary	
Scrub/open	
Plantation	
Wood pasture	
Other (state)	

2. Factors affecting access and seed collection	Answer Yes/No as appropriate and add comment if necessary
Flat	
Slight	
Moderate	
Steep	
Very steep	
None	
Grass	
Grass/ weeds/bracken	
Significant woody species	
Free draining and dry	
Typcially good drainage	
Typcially poor drainage	
Excellent access throughout site	
Good tracked access to site for vehicles	
Limited access for agricultural machinery and 4 wheel drives	
Poor - no vehicle access possible	
Landowner/leaseholder likely agree access by arrangement	
Landowner/leaseholder not likely agree access by arrangement	
Free access to site	
Isolated - no issues	
Public footpaths	
Public access or roadside	
Urban fringe	
Unsafe - serious security issues	
Pheasants	
Pheasant pens or feeders	
Deer	

2. Factors affecting access and seed collection	Answer Yes/No as appropriate and add comment if necessary
Wild boar	
Livestock	
Grey squirrels	
Very high (closed canopy)	
High (partially open canopy)	
Moderate (well thinned)	
Low (largely open canopy)	
3. Tree(s) characteristics	Answer Yes/No as appropriate and add comment if necessary
Large (50+ individuals)	
Moderate (26 - 50 individuals)	
Small (11 to 25 individuals)	
Very small (up to 10 individuals)	
Isolated individual (s)	
Overmature	
Mature	
Semi mature	
Young	
Saplings/seedlings	
Uneven aged	
Very large (>90cm DBH)	
Large (60-90cm DBH)	
Medium (30-59cm DBH)	
Small (15-29cm DBH)	
Very small (<15cm DBH)	
Healthy (little or no signs of decline/disease)	
Some decline/disease (moderate crown/branch loss/stem decay)	
Poor health (substantial loss of vigour and crown)	

3. Tree(s) characteristics	Answer Yes/No as appropriate and add comment if necessary
Very large	
Large	
Moderate	
Small	
Very small	
Flowering	
Seed/fruit on trees or woodland floor	
Seedlings	
Vegetative regeneration e.g. suckers	
High (high quality timber stem - straight and cylindrical)	
Medium (potential timber stem with some defects)	
None	

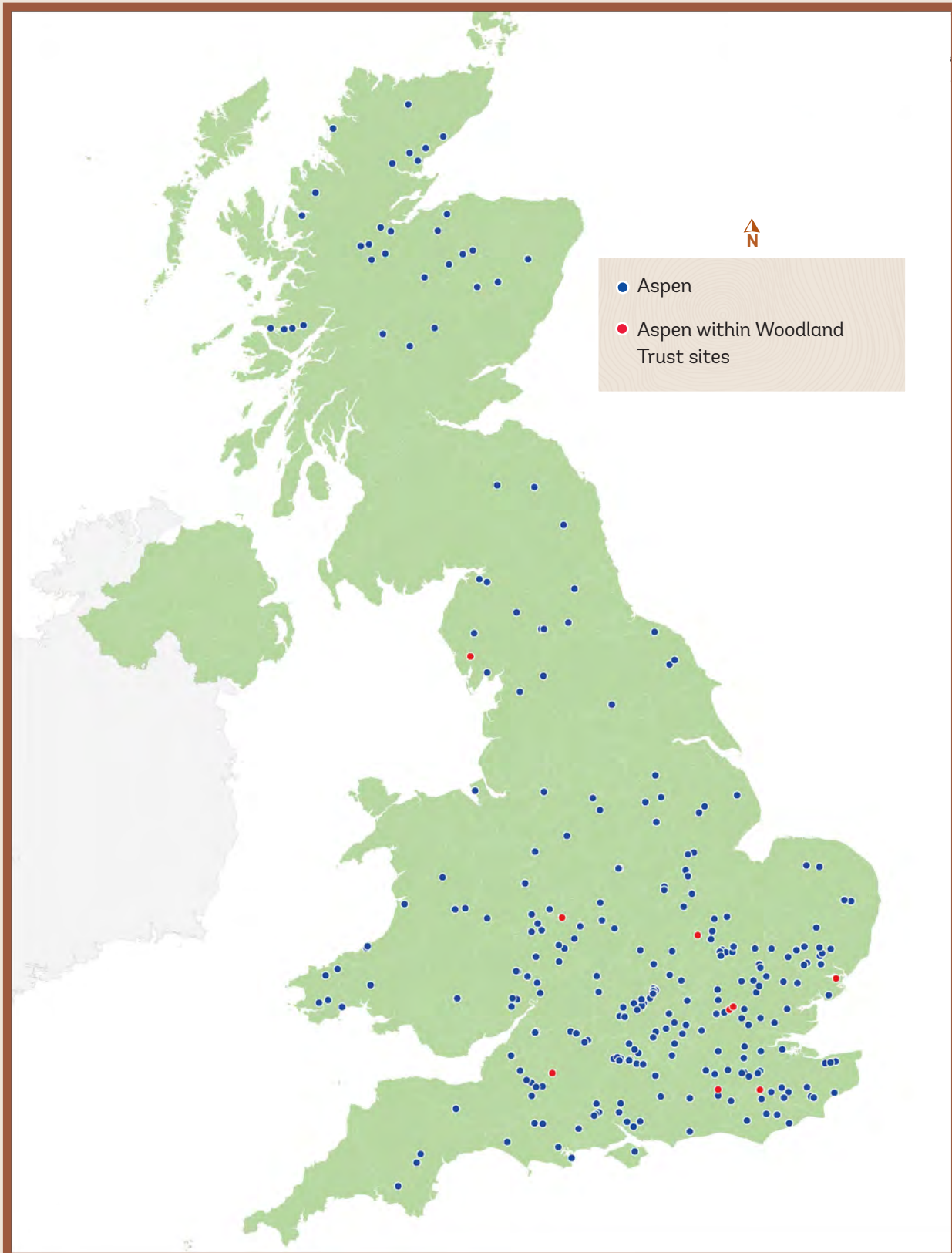


Appendix 2:



Distribution of referenced species : (from Country Inventories)

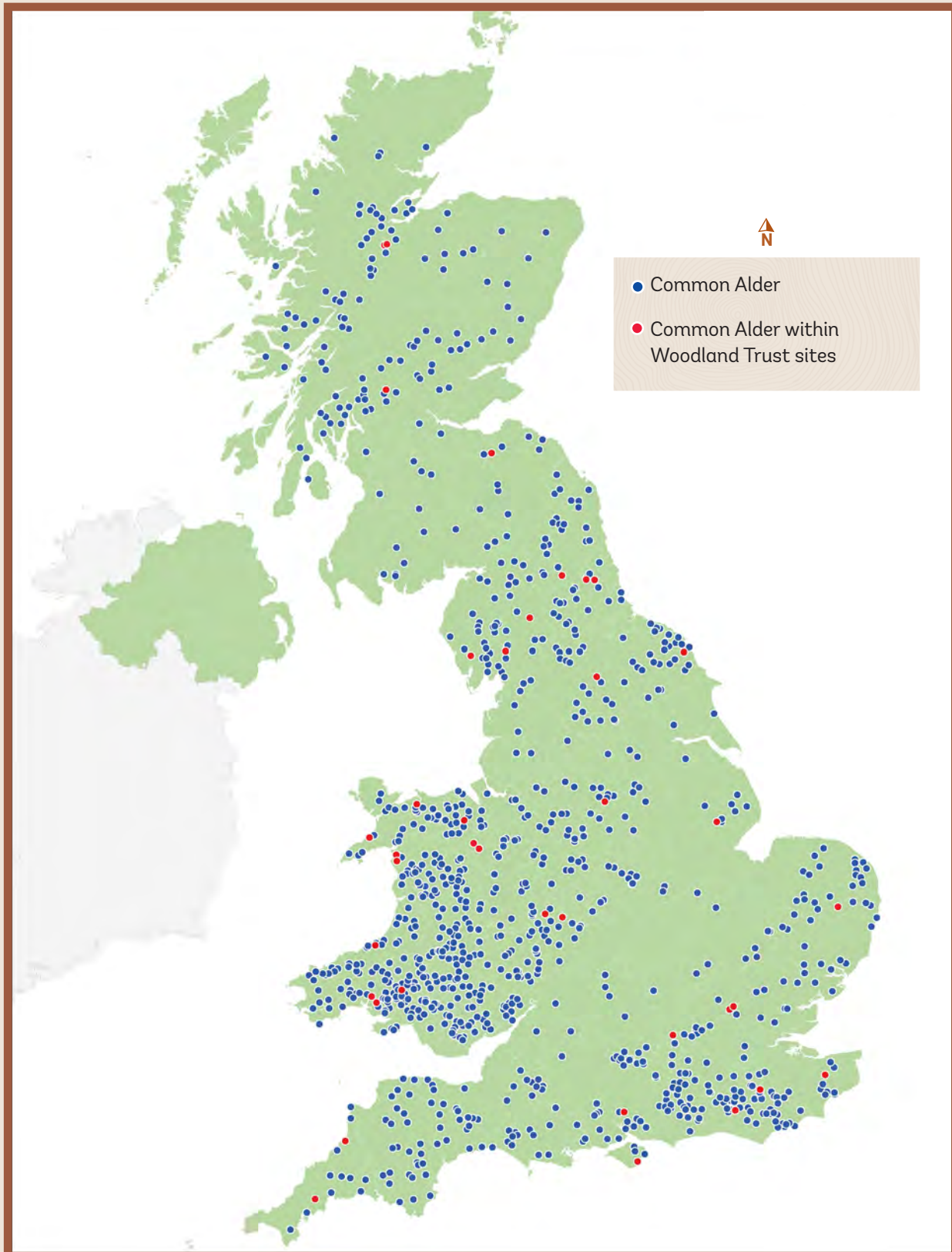
Distribution of aspen



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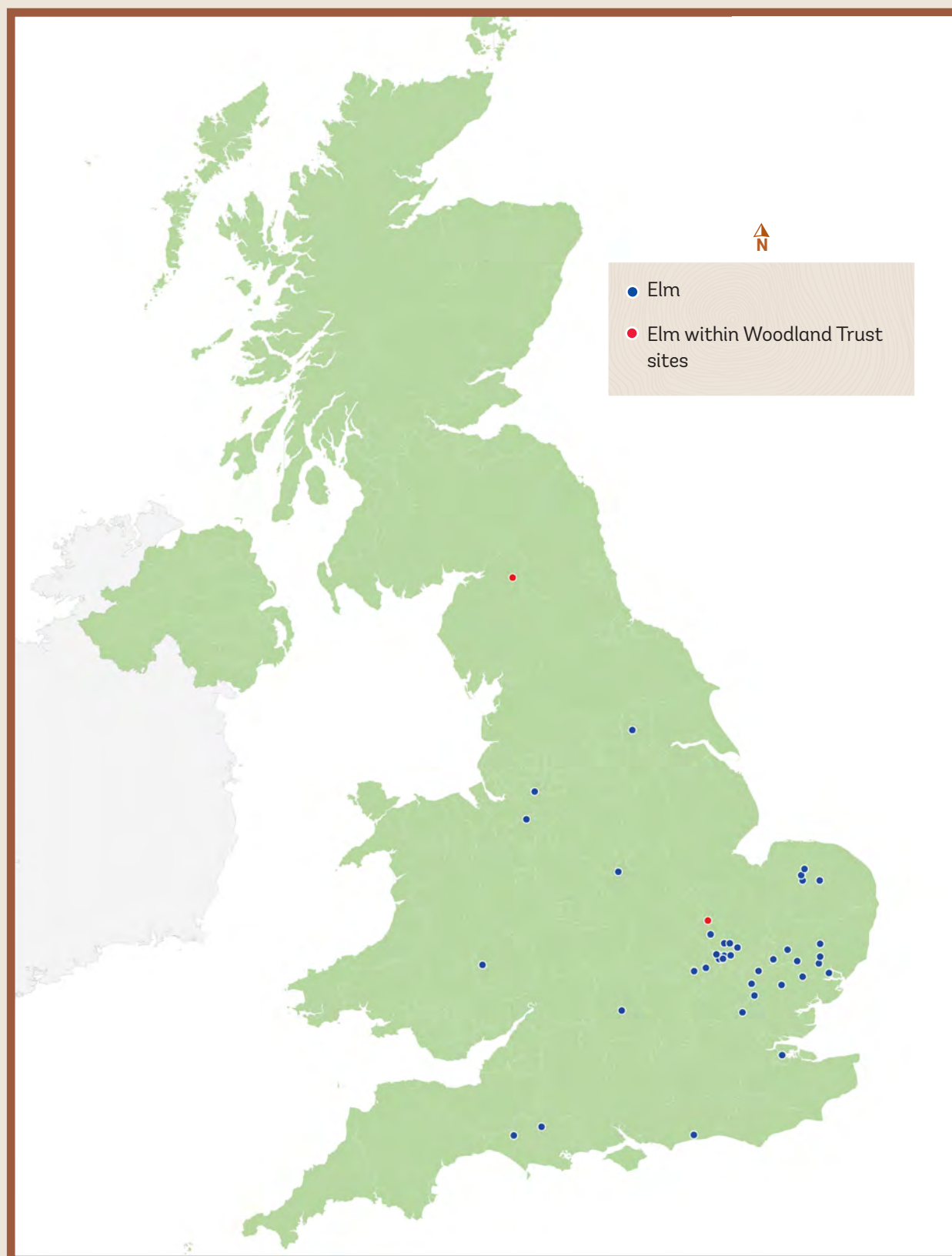
Distribution of common alder



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Distribution of elm (species unspecified)



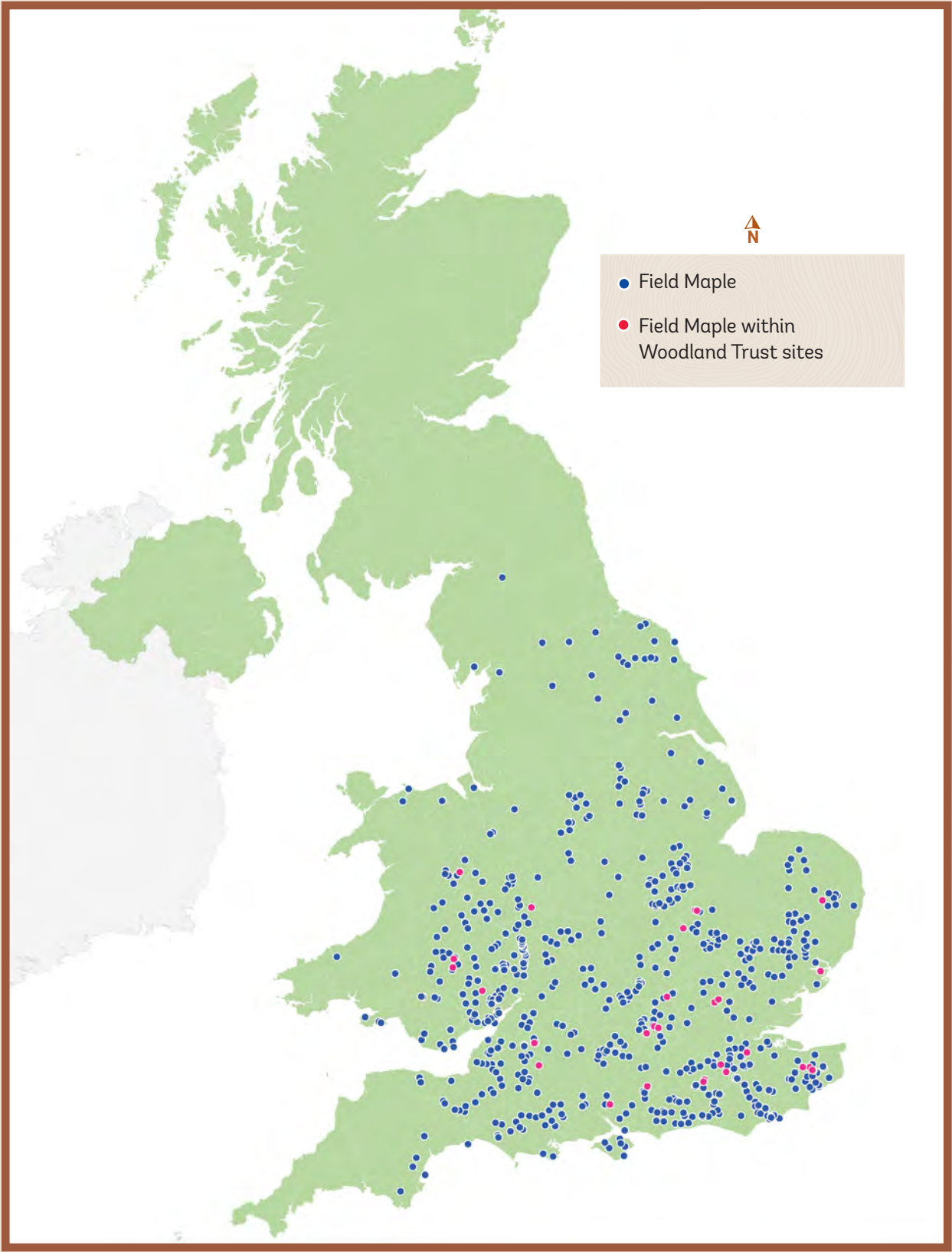
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Distribution of English elm

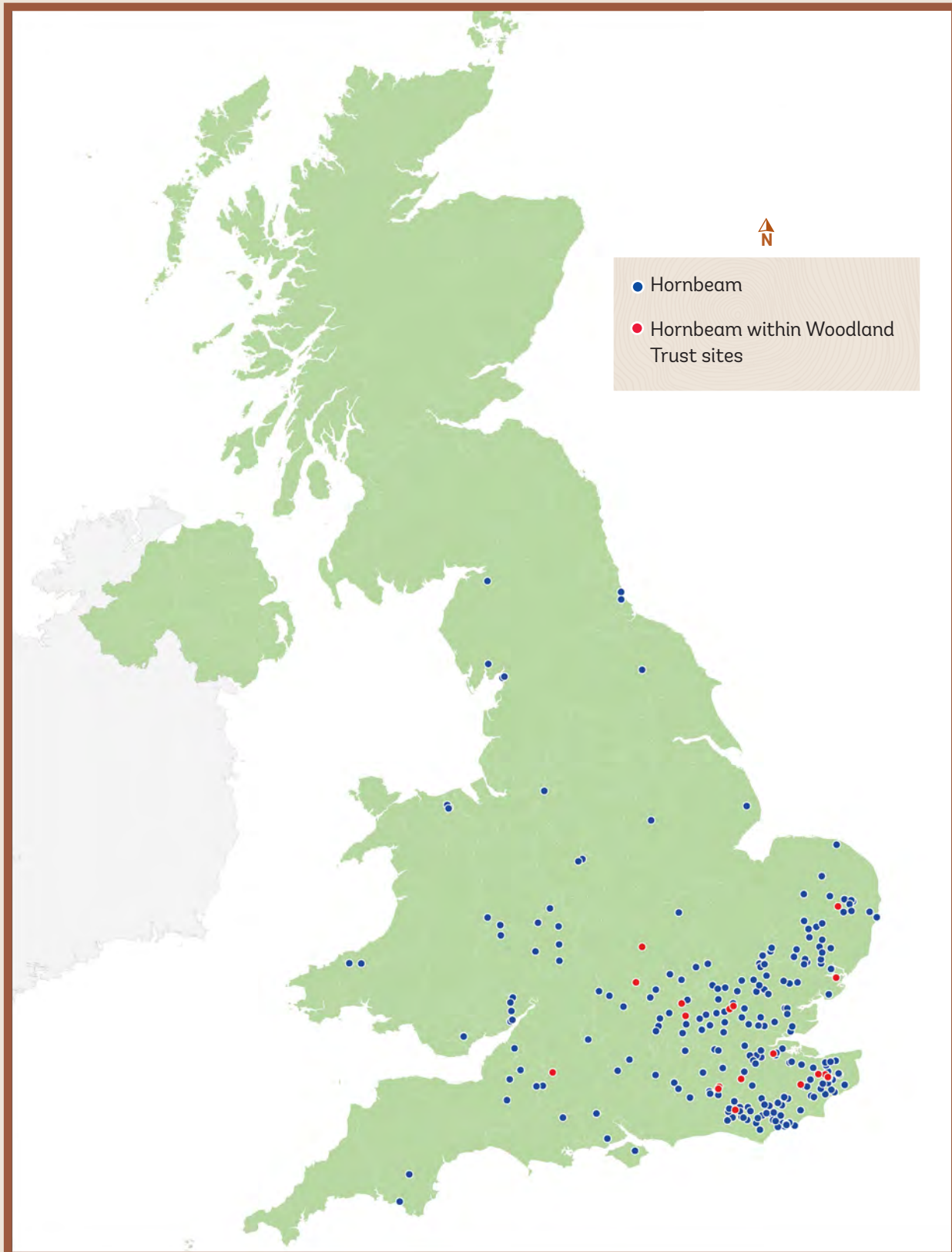


Distribution of field maple



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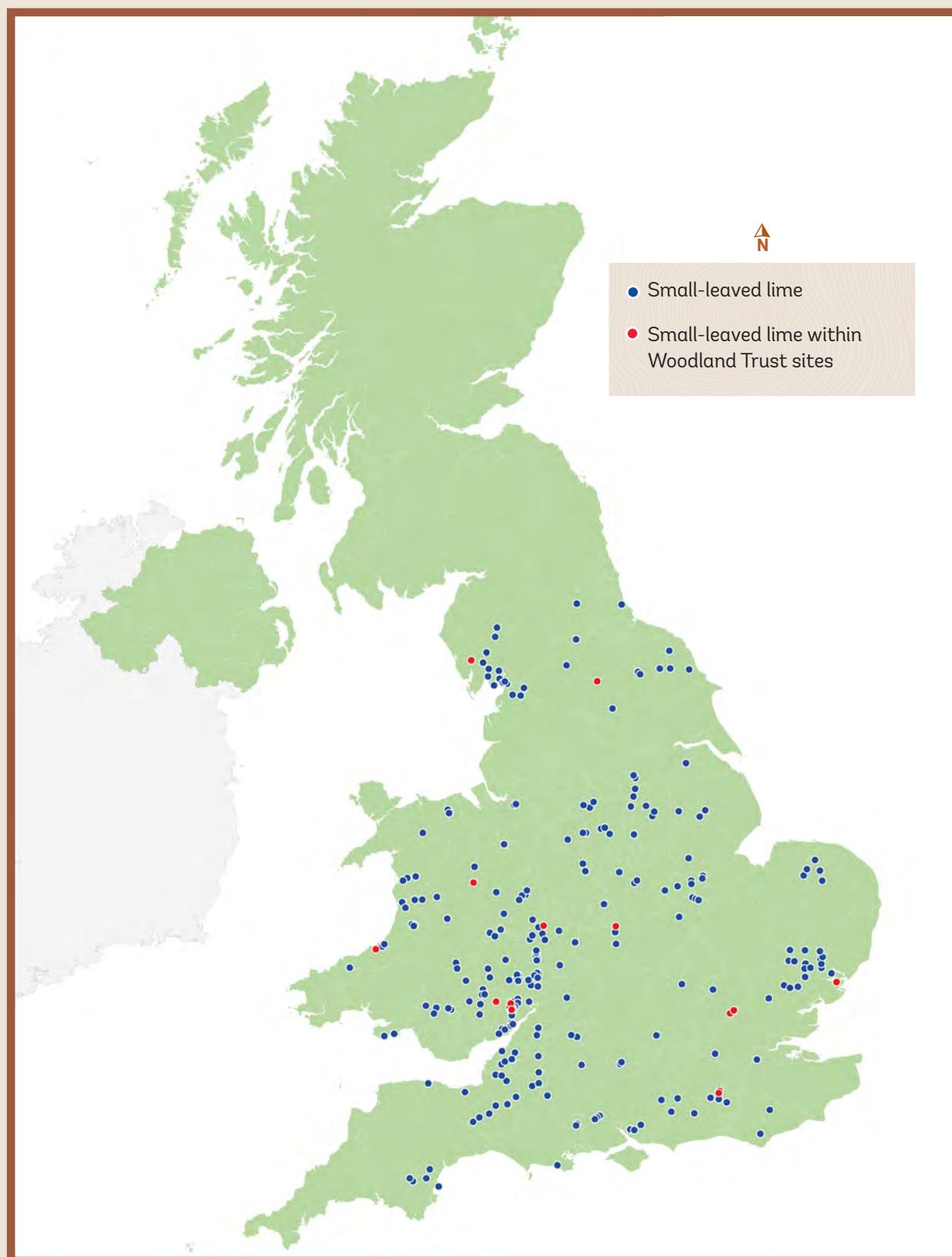
Distribution of hornbeam



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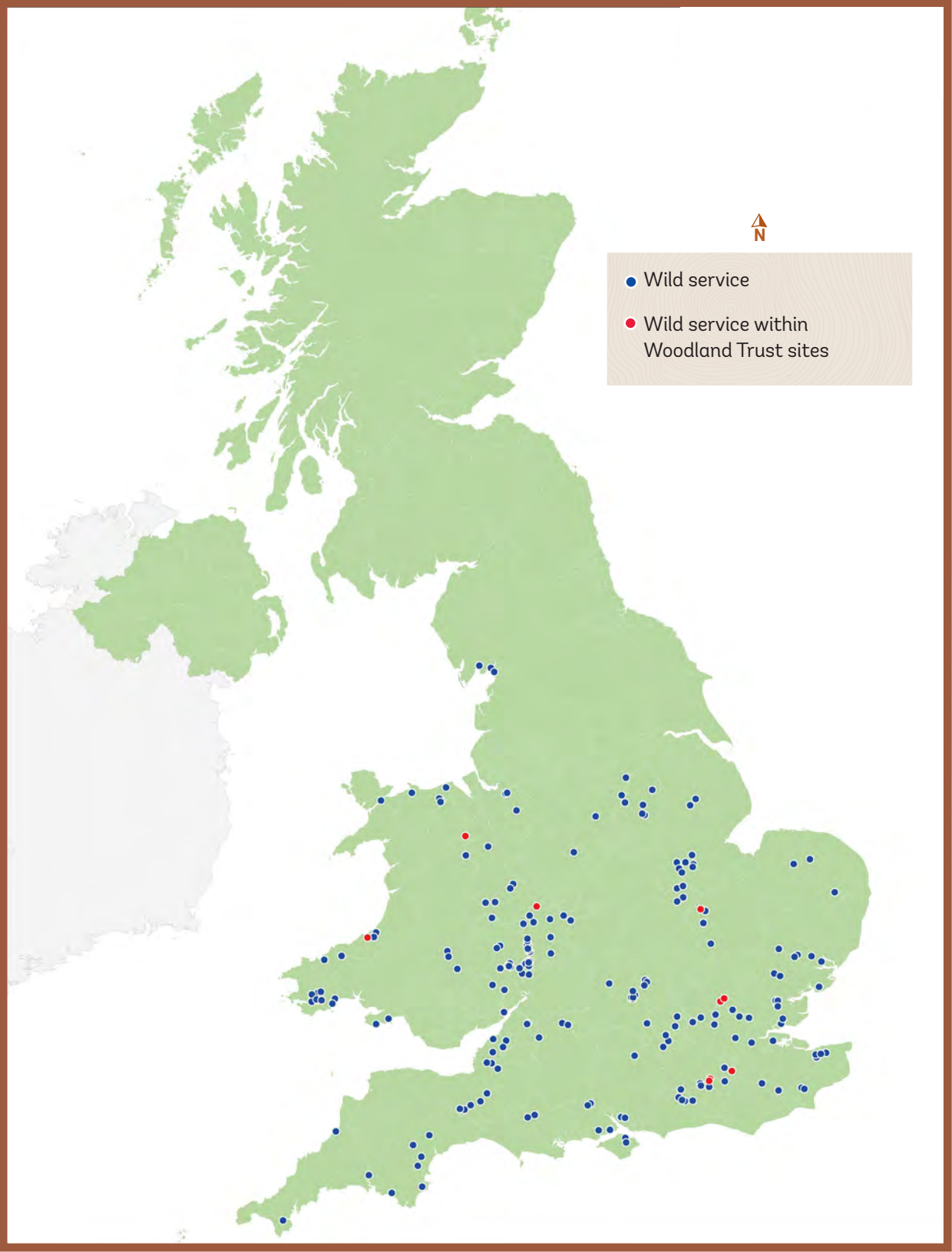
Distribution of small-leaved lime



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Distribution of wild service

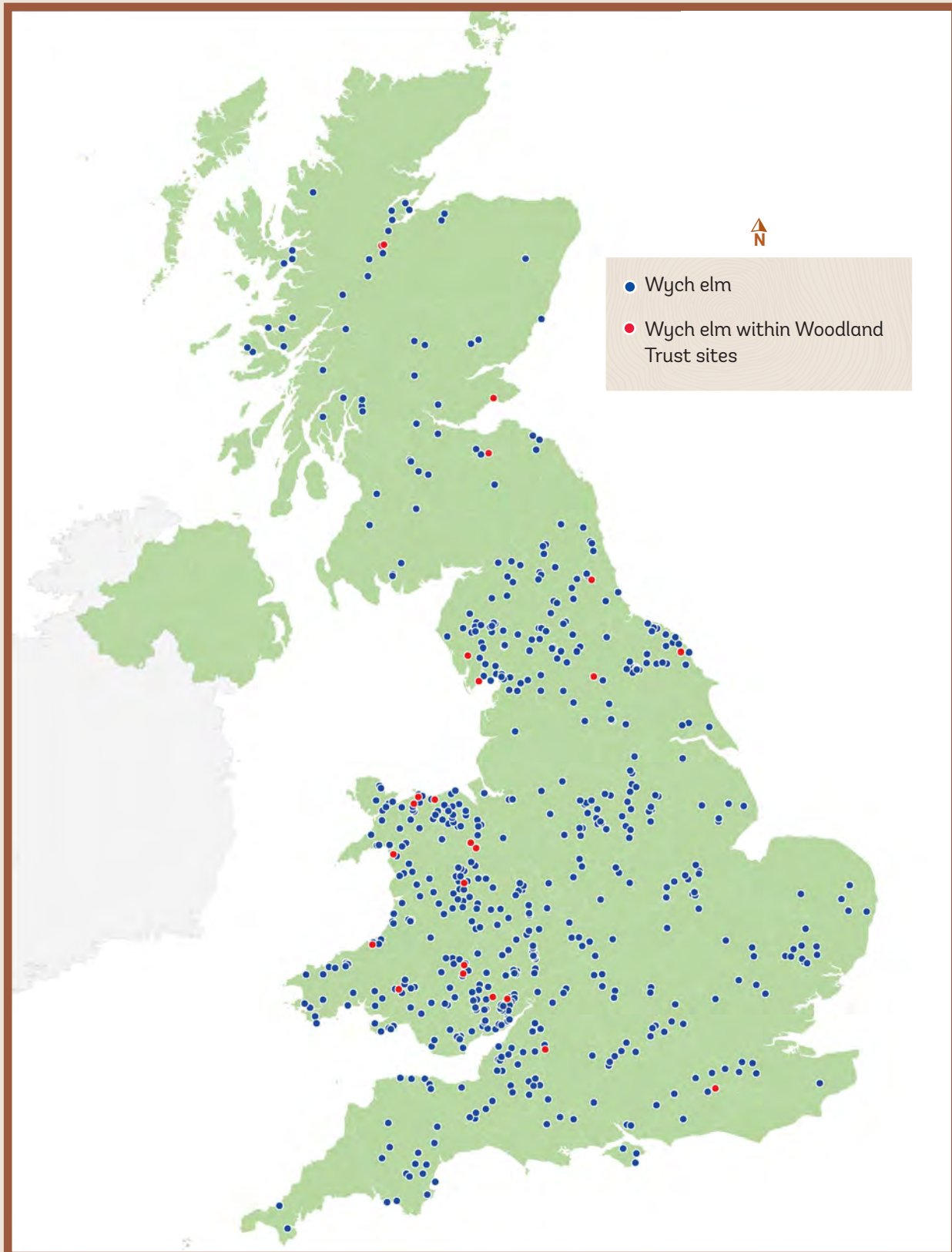


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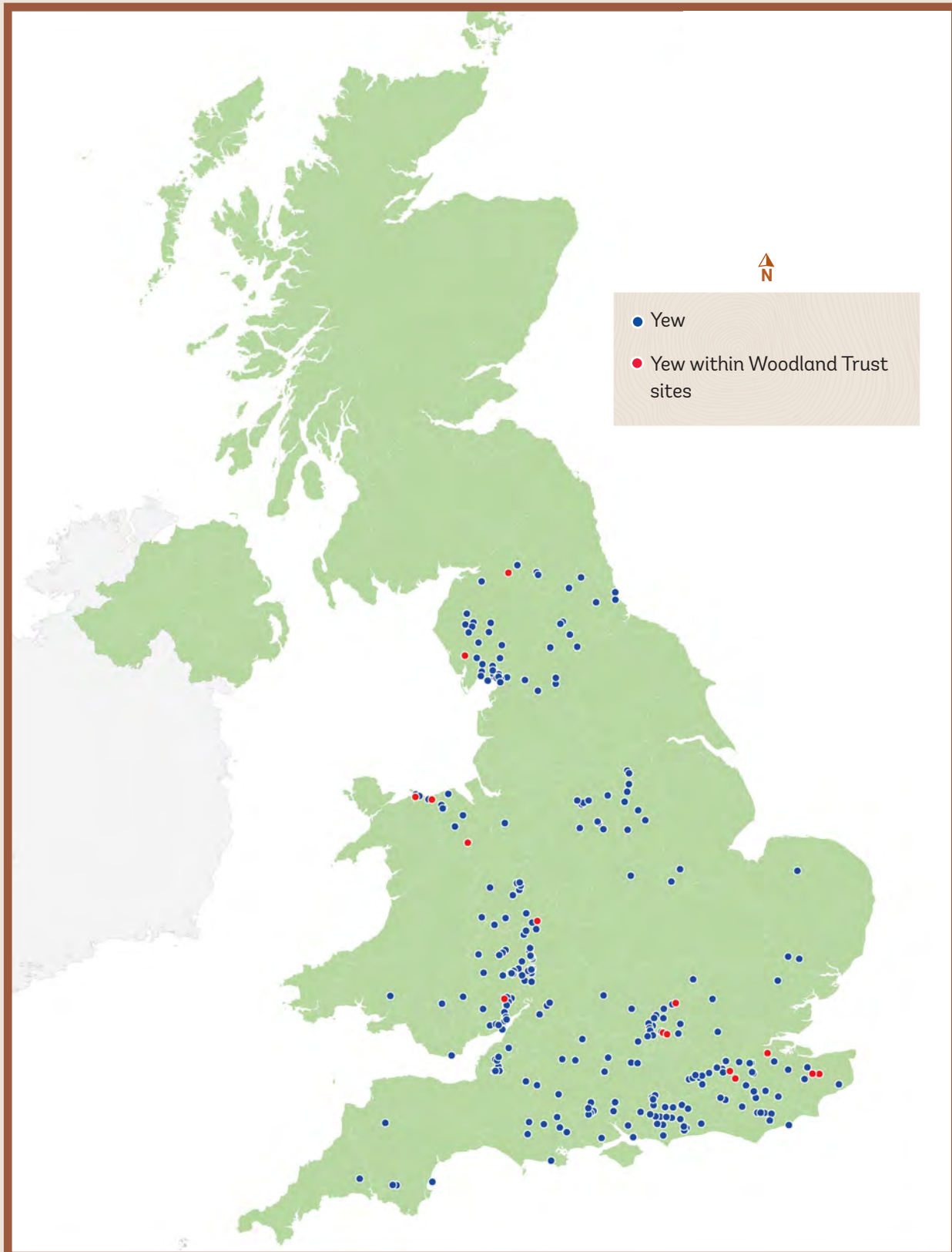


Distribution of wych elm



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Distribution of yew



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6. Tables

Table 1: Summary of the number of reports by species and seed zone from National Inventory excerpts

Seed Zone	Aspen	Black poplar*	Common alder	Wild apple*	English elm	Field maple	Horn-beam	Common walnut*	Black walnut	London plane	Norway maple*	Small-leaved lime	Wych elm	Wild pear*	Wild service	Yew
	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW
101																
102	2		3													
103																
104			3										5			
105	5		16										6			
106			27										7			
107			6										7			
108			6										3			
109	3		24										9			3
201	15		27				1						12			
202	6		22										4			
203			14										9			
204	2		23		1	1	2					1	18			4
301	3		28	2	2	2	3					14	35		3	26
302	11		84	3	2	16	1					13	65		5	21
303	9		178	7		24	3					24	86		17	4
304	5	2	112	3		29	4					13	68		9	12
305	9		72	5	1	28	2					11	27		15	8
401	4		39	2	1	19	1					10	35			3
402	40		30	19	14	98	10					25	48	1	32	10
403	28	1	94	13	6	89	13					53	79	2	40	41
404	32		52	16	17	106	19					51	81		21	48
405	82	1	139	15	30	185	153	1			1	25	41		51	89
406	17		41	8	10	51	33					20	20	3	8	3
Totals	273	4	1040	93	84	648	245	1	0	0	1	260	665	6	201	272

* Information from SSSI citations only

Table 2: Number of National Inventory reports for each species for three organisations

Species	Code	Woodland Trust	Forestry Commission	National Trust	Total no. of species reports
Aspen (<i>Populus tremula</i>)	ASP	8	14	8	30
Black poplar (<i>Populus nigra</i> var. <i>betulifolia</i>)	BPO	0	0	0	0
Common alder (<i>Alnus glutinosa</i>)	CAR	37	52	30	119
Wild apple (<i>Malus sylvestris</i> spp. <i>sylvestris</i>)	CAP	0	0	0	0
English elm (<i>Ulmus procera</i>)	EEM	1	0	1	2
Field maple (<i>Acer campestre</i>)	FM	28	33	15	76
Hornbeam (<i>Carpinus betulus</i>)	HBM	17	3	6	26
Common walnut (<i>Juglans regia</i>)	JRE	0	0	0	0
Black walnut (<i>Juglans nigra</i>)	JNI	0	0	0	0
London plane (<i>Platanus x acerifolia</i>)	LPL	0	0	0	0
Norway maple (<i>Acer platanoides</i>)	NOM	0	0	0	0
Small-leaved lime (<i>Tilia cordata</i>)	SLI	13	12	9	34
Wych elm (<i>Ulmus glabra</i>)	WEM	23	16	22	61
Wild Pear (<i>Pyrus pyraeaster</i>)	WPE	0	0	1	1
Wild service (<i>Sorbus torminalis</i>)	WST	9	9	6	24
Yew (<i>Taxus baccata</i>)	YEW	15	10	20	45
Total reports by site		151	149	118	418

Table 3: Summary of Woodland Trust sites listed in the National Inventory which have species of interest
 note - presence of additional Woodland Trust data indicated.

Woodland Trust Site	Designation	Seed zone	NI data	WT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Miltonrigg Woods	ASNW, PAWS	109	y	n					1												1
Balmacaan	SSSI	201	y	y	1		1										1				3
Ledmore & Migdale	SSSI, ASNW, PAWS	201	y	y	1			1													2
Urquart Bay	SSSI, ASNW	201	y	y			1										1				2
Glen Finglas	NNR, ASNW	202	y	y			1														1
Currie Wood	PAWS	203	y	n			1										1				2
Keil's Den	ASNW, PAWS	203	y	n													1				1
Hedley Hall	SSSI, ASNW	204	y	n			1										1				2
Beckmickle Ing	ASNW	301	y	n			1														1
Low Wood	SSSI, ASNW, PAWS	301	y	n	1		1									1	1			1	5
Sea Wood	SSSI, ASNW, PAWS	301	y	n													1				1
Burrs Wood	ASNW	302	y	n			1														1
Dufton Ghyll Wood	SSSI, ASNW	302	y	n			1														1
Nunsbrough Wood	ASNW	302	y	n			1														1
Pontburn Wood	ASNW	302	y	n			1														1
Coed Aber Artro	SSSI, PAWS	303	y	n			1														1
Coed Allt Cefn Maesllan	ASNW, PAWS	303	y	n			1								1	1	1		1		4
Coed Elnion	SSSI	303	y	n			1														1
Coed Gwempa	ASNW	303	y	n			1														1
Coed Llechwedd	SSSI, ASNW, SAC	303	y	n			1										1				2
Coed Tregib	SSSI, ASNW	303	y	n			1										1				2
Green Castle Wood	SSSI, ASNW	303	y	n			1														1
Cilcenni Dingle	SSSI, ASNW, PAWS	304	y	n					1								1				2
Coed Ceunant	PAWS	304	y	n			1														1
Coed y Gopa	SSSI, PAWS	304	y	y											1	1	1			1	4
Marl Hall Woods	SSSI, PAWS	304	y	y												1	1			1	3
Park Wood, by Talgarth	PAWS	304	y	n					1								1				2
Pen y Coed	SSSI	304	y	n													1		1	1	3
Pentre Wood	SSSI, ASNW, CWS	304	y	y			1										1				2

Table 3: Summary of Woodland Trust sites listed in the National Inventory which have species of interest
note - presence of additional Woodland Trust data indicated.

Woodland Trust Site	Designation	Seed zone	NI data	WT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Crowhill Valley	SSSI	305	y	n			1														1
Millook Valley Woods	ASNW	305	y	n			1														1
Hackfall	SSSI	401	y	n			1									1	1				3
Scar & Castlebeck Woods	SSSI	401	y	n			1										1				2
Archers Wood	ASNW, CWS	402	y	n						1											1
Aversley Wood	SSSI, ASNW	402	y	y	1		1	1	1	1									1		6
Tattershall Carrs	SSSI, ASNW	402	y	n			1														1
Stoke Wood	ASNW	402	y	y							1						1		1		3
Swineshead & Spanoak Woods	SSSI, ASNW	402	y	n	1					1											2
Coed Gwraig	SSSI, ASNW, PAWS	403	y	n						1						1	1		1	1	5
Everdon Stubbs	SSSI, ASNW	403	y	n							1										1
Gaer Fawr Wood	SSSI, PAWS, SAC	403	y	n						1						1					2
Graig Wood	PAWS	403	y	n													1				1
Piles Coppice	ASNW	403	y	y												1					1
The Wilderness	SSSI	403	y	n			1			1									1		3
Uffmoor Wood	ASNW, PAWS	403	y	n	1		1														2
Wassell Wood	ASNW, SAM	403	y	n												1				1	2
America Wood	SSSI, ASNW	404	y	n			1														1
Cadora Woods	SSSI, ANSW, PAWS, SAC, SAM	404	y	n												1	1				2
Clanger Wood	SSSI, PAWS	404	y	n	1					1	1										3
Colerne Park & Monks Wood	SSSI, ASNW	404	y	y					1	1							1				3
Priory Grove	NNR, ASNW	404	y	y												1	1			1	3
Ashenbank Wood	SSSI, ASNW	405	y	n							1									1	2
Binswood	ASNW	405	y	n						1											1
Bisham Woods	SSSI, ASNW	405	y	n			1			1										1	3
Chesham Bois Wood	ASNW	405	y	y					1		1										2
Costells Wood	ASNW, CWS	405	y	n			1				1										2
Denge & Pennypot Woods	ASNW	405	y	n			1			1	1									1	4
Dering Wood	ASNW	405	y	y	1						1										2
Earley Wood	ASNW	405	y	n						1	1										2

Table 3: Summary of Woodland Trust sites listed in the National Inventory which have species of interest
 note - presence of additional Woodland Trust data indicated.

Woodland Trust Site	Designation	Seed zone	NI data	WT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Edolphs Copse	ASNW	405	y	y				1		1	1					1			1		5
Glover's Wood	SSSI	405	y	y	1					1	1					1	1		1		6
Harpsden & Peveril Woods	SSSI, ASNW	405	y	n						1											1
Hoddesdon Park Wood	NNR, ASNW	405	y	y	1		1			1	1					1			1		6
Hurst Wood	ASNW	405	y	n	1		1														2
Marden Park	SSSI, ASNW	405	y	n						1	1					1				1	4
Otterbourne Park Wood	ASNW	405	y	n			1			1											2
Park Wood, Welsh Bicknor	SSSI, ASNW	405	y	n						1	1									1	3
Pullingshill Wood & Marlow Common	SSSI, ASNW	405	y	n						1										1	2
Saxten Cages & Wilmay Woods	ASNW, CWS	405	y	n						1											1
Staffhurst Wood	SSSI, ASNW	405	y	y	1				1	1	1								1	1	6
Stour Wood	SSSI, ASNW	405	y	n	1					1	1					1					4
Tring Park	SSSI, ASNW, PAWS	405	y	y						1	1									1	3
Wormley Wood (& Nut Wood)	NNR, ASNW	405	y	y	1		1			1	1					1			1		6
Tyrrels Wood	SSSI, ASNW	406	y	n			1			1	1										3
Number of reports per species for Woodland Trust sites					14	0	37	3	5	28	19	0	0	0	1	17	25	0	11	15	175

Key	
NI data	Present in National Inventory dataset
WT data	Reported by Woodland Trust Officers in 2015 + historic information on conservation features and trees of interest. Data for 10 CAR & 4 FM to be added when detail known.
ASP	Aspen
BPO	Black poplar
CAR	Common alder
CAP	Crab apple
EEM	English elm
FM	Field maple
HBM	Hornbeam
JRE	Common walnut
JNI	Black walnut
LPL	London Plane
NOM	Norway maple
SLI	Small-leaved lime
WEM	Wych elm
WPE	Wild pear
WST	Wild service tree
YEW	Yew
1	Priority site for visit
1	Potential site for visit
1	Not of obvious interest

Table 4: Summary of Forestry Commission sites listed in the National Inventory which have species of interest

Forestry Commission Site	Designation	Seed zone	NI data	FC data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Kinloch and Kyleakin Hills	SSSI	104	y	n													1				1
Coille Phuiteachain	SSSI	105	y	n			1														1
Glen Loy - Strone	-	105	y	n			1														1
Loch Arkaig	-	105	y	n			1										1				2
Loch Sunart	NNR, SSSI	105	y	n	1		1														2
River Grudie & Coille Ceann Lochluichart	SSSI	105	y	n			1														1
Craighoyle Woodland	SSSI	106	y	n			1														1
Dunmore Woods	SSSI	106	y	n			1														1
Hells Glen	SSSI	106	y	n													1				1
Kenmore Wood	-	106	y	n			1														1
Millarochy, Sallachy & Ross Woods	SSSI	106	y	n			1														1
Loch Eck	SSSI	106	y	n			1														1
Rowarden-nan Woods/ Craigrostan Woods	SSSI	106	y	n			1										1				2
Strathlachan Forest	-	106	y	n			1														1
Stuckbeg	-	106	y	n			1														1
Tairlaw Glen and Craigen-callie	-	107	y	n													1				1
Chain Wood	-	108	y	n			1														1
Holystone Burn Wood	SSSI, ASNW	109	y	n			1														1
Easter Ness Forest/ Inverfarigaig	SSSI	201	y	n	1		1														2
Glenmore Forest	NNR, SSSI	201	y	n			1														1
Kyle of Sutherland	-	201	y	n	1																1
Parellel Roads of Lochaber	SSSI	201	y	n			1														1
Ben An & Benachaille Woods	SSSI	202	y	n			1														1
Coille Bhienie	-	202	y	n	1																1
Cuilvona & Craigmor Woods	SSSI	202	y	n			1														1
Hutton Roof Crags	SSSI, PAWS	202	y	n						1							1				1
Strother Hills	SSSI, PAWS	204	y	n			1														1
Great Knott, Hall & Bowkerstead Woods	-	301	y	n			1														1
Coed-y-Graig & Perfeddnant	PAWS	303	y	n			1														1

Table 4: Summary of Forestry Commission sites listed in the National Inventory which have species of interest

Coed Maes-Mawr, Coaed Esgairneiriau a Ch	SSSI, PAWS	303	y	n			1													1
Dyffrynoedd Nedda Mellte a Moel Pen-dery	SSSI	303	y	n			1			1										2
Graig Ddu Wood	ASNW	303	y	n			1													1
Graig Gelli Galed	-	303	y	n			1													1
Gro Ystwyth	SSSI, PAWS	303	y	n			1													1
Coed Craig Ty-bach	ASNW	304	y	n			1													1
Ruttersleigh	SSSI	305	y	n			1			1										2
Thurlbear Wood & Quarrylands	SSSI, ASNW	305	y	n						1										1
Scar End Wood	SSSI, ASNW	401	y	n			1													1
Bardney Limewoods	SSSI, ASNW	402	y	n			1			1										2
Bedford Purlieus	SSSI, ASNW	402	y	n						1						1	1			3
Bevercotes Park	SSSI, ASNW	402	y	n						1										1
Caster Hanglands	NNR, ASNW	402	y	n						1										1
Clipsham Old Quarry & Pickworth Great Wood	SSSI, ASNW	402	y	n	1					1						1		1		4
Owston Woods	SSSI, PAWS	402	y	n			1			1										2
Potton Wood	SSSI, PAWS	402	y	n	1					1										2
Salcey Forest	SSSI, ASNW	402	y	n						1										1
Shabbing-ton Woods Complex	SSSI, PAWS	402	y	n	1					1										2
Waterperry Wood	SSSI	402	y	n	1													1		2
Wellow Park	SSSI	402	y	n											1	1		1		3
Burnt Wood	SSSI, ASNW	403	y	n	1		1													2
Dimmings Dale and The Ranger	SSSI, ASNW	403	y	n			1													1
Dymock Woods	SSSI, ASNW	403	y	n			1			1					1			1	1	5
Haugh Wood	SSSI, PAWS	403	y	n	1		1			1					1			1		5
Mayhill Wood	SSSI	403	y	n											1			1	1	3
Shining Cliff Woods	SSSI, PAWS	403	y	n			1								1	1			1	4
Shrawley Wood	SSSI, ASNW	403	y	n			1													1

Table 4: Summary of Forestry Commission sites listed in the National Inventory which have species of interest

Forestry Commission Site	Designation	Seed zone	NI data	FC data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Blaccliff-Wyndcliff	SSSI, PAWS	404	y	n						1											1
Cleddon Shoots Woodland	SSSI, PAWS	404	y	n			1														1
Dingle Wood	SSSI, ASNW	404	y	n						1											1
Graig Wood/Lower Hael Wood	SSSI, ASNW	404	y	n			1			1											2
Lady Park Wood, by Symonds Yat	NNR, ASNW	404	y	n			1			1						1					3
Livox Wood	SSSI, PAWS	404	y	n			1			1											2
Nagshead	SSSI, ASNW	404	y	n			1														1
Parkhurst Forest	SSSI	404	y	n													1				1
Penarth Brook Woodlands	SSSI, ASNW	404	y	n						1											1
Poor's Allotment	SSSI, ASNW	404	y	n						1										1	2
Savernake Forest	SSSI, PAWS	404	y	n						1							1		1		3
The New Forest	SSSI, ASNW	404	y	n			1														1
Upper Wye Gorge	NNR, PAWS	404	y	n			1			1						1	1			1	5
Welshbury Hill	ASNW	404								1						1					2
Bear, Oveys and Great Bottom Woods	SSSI	405	y	n	1					1							1			1	4
Botley Wood & Everett's & Mushes Copses	SSSI, ASNW	405	y	n	1		1			1						1	1		1	1	7
Chalkney Wood	SSSI, PAWS	405	y	n	1		1			1	1					1					5
Chiddingfold Forest	SSSI, ASNW	405	y	n	1		1				1								1		4
Gravetye, Minepit, Wildgoose & Giffard's Woods	ASNW	405	y	n			1														1
Hodgemoor Wood	SSSI, ASNW	405	y	n						1											1
Homefield Wood	SSSI, PAWS	405	y	n						1							1			1	3

Table 4: Summary of Forestry Commission sites listed in the National Inventory which have species of interest

Forestry Commission Site	Designation	Seed zone	NI data	FC data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Lineage Wood & Railway Track	SSSI, PAWS	405	y	n						1											1
Maysleith Wood, Hatch & Wardley Hangers	PAWS	405	y	n			1														1
Orlestone Forest	SSSI, PAWS	405	y	n						1											1
South Downs - Northside & Teglage	SSSI, PAWS	405	y	n						1											1
St. Leonard's Forest	SSSI, PAWS	405	y	n			1														1
West Harting Down	SSSI	405	y	n																1	1
Wilmington and Abbot's Woods	-	405	y	n							1					1					2
Number of reports per species for Forestry Commission sites					14	0	52	0	0	33	3	0	0	0	0	12	16	0	9	10	149

KEY

NI data	Present in National Inventory dataset		
FC data	Additional data received but not yet able to cross reference to identify sites in common		
ASP	Aspen	JNI	Black walnut
BPO	Black poplar	LPL	London Plane
CAR	Common alder	NOM	Norway maple
CAP	Crab apple	SLI	Small-leaved lime
EEM	English elm	WEM	Wych elm
FM	Field maple	WPE	Wild pear
HBM	Hornbeam	WST	Wild service tree
JRE	Common walnut	YEW	Yew



Table 5: Summary of National Trust Sites listed in the National Inventory which have species of interest

National Trust Site	Designation	Seed gone	NI data	NT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Gibside	SSSI, PAWS	204	y	n													1				1
Buttermere Fells	SSSI, ASNW	301	y	n																1	1
Dodgson Wood	SSSI, ASNW	301	y	n			1									1	1			1	4
Eaves Wood	SSSI	301	y	n							1					1			1	1	4
Gowbarrow Park	SSSI, PAWS	301	y	n			1									1	1			1	4
Great Wood & Castle-head Wood	SSSI, PAWS	301	y	n			1										1			1	3
Johnny Wood	SSSI, ASNW	301	y	n													1				1
Lodare - Troutdale	SSSI, ASNW	301	y	n			1										1			1	3
Low Wood	SSSI	301	y	n			1									1	1			1	4
Milkingstead Wood & Stanley Ghyll	SSSI, ASNW	301	y	n			1														1
Stonethwaite	SSSI, ASNW	301	y	n			1										1				2
Tarn Hows	SSSI, PAWS	301	y	n			1									1	1				3
Stewardpeel Woods	SSSI, PAWS	302	y	n			1										1			1	3
Upper Wharfdale - Eshber Wood	SSSI, ASNW	302	y	n																1	1
Coed Gan-llwyd/Parc Domelynlllyn a Glasdi	NNR, PAWS	303	y	n			1										1				2
Hook Wood/Milford	SSSI, PAWS	303	y	n	1		1												1		3
Milford Haven Waterway - Lawrenny Wood	SSSI	303	y	n															1		1
Stackpole	NNR	303	y	n			1										1				2
Twyni Chwitffordd, Morfa Landimor a Bae - Whiteford Burrows	SSSI, ASNW	303	y	n						1							1				2
Beacon Beacons - Glyn Tarell	SSSI, ASNW	304	y	n			1														1
Hembury Woods	SSSI, ASNW	305	y	n			1									1	1				3
Holnicote Estate - Horner Wood	NNR, ASNW	305	y	n			1			1							1				3
Holnicote Estate - Mansley Combe	SSSI	305	y	n			1			1							1				3

Table 5: Summary of National Trust sites listed in the National Inventory which have species of interest

National Trust Site	Designation	Seed gone	NI data	NT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Killerton Estate - Ashclyst Forest	-	305	y	n			1														1
Lydford Gorge	ASNW	305	y	n													1				1
Park Wood	SSSI	305	y	n			1													1	2
Peter's Wood	ASNW	305	y	n			1														1
Teign Valley Woods - Bridford Wood	ASNW	305	y	n	1		1										1		1		4
Watersmeet	SSSI, ASNW	305	y	n			1										1				2
Clumber Park	SSSI	402	y	n	1		1									1					3
The Clappers & Roberts Farm	NNR	402	y	n																1	1
Dovedale Valley & Biggin Dale - Dovedale Wood	NNR, SSSI, ASNW	403	y	n						1						1	1			1	4
Fishpond Valley - Croft Wood	SSSI, ASNW	403	y	n			1				1										2
Pepper Box Hill	SSSI	404	y	n																1	1
Walton & Ivythorn Woods	SSSI, ASNW	404	y	n						1											1
Woodchester Park	SSSI	404	y	n																1	1
Wotton Hill - Westridge Wood	SSSI, ASNW	404	y	n						1						1	1				3
Ashridge Commons & Woods	SSSI, ASNW	405	y	n	1					1	1										3
Blackdown & Marley Common	-	405	y	n			1														1
Blake's Wood & Lingwood Common	SSSI, ASNW	405	y	n			1				1								1		3
Bookham Commons	SSSI, ASNW	405	y	n	1					1											2
Bradenham Woods, Park Wood & The Coppice	SSSI, ASNW	405	y	n						1										1	2
Cow Wood & Harry's Wood - Nymans	-						1			1											2
Danbury & Lingwood Commons	SSSI	405	y	n							1								1		2

Table 5: Summary of National Trust sites listed in the National Inventory which have species of interest

National Trust Site	Designation	Seed gone	NI data	NT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Danbury & Lingwood Commons	SSSI	405	y	n							1								1		2
Devil's Punch Bowl, Hindhead Commons	SSSI	405	y	n			1										1				2
Hatfield Forest	NNR, ASNW	405	y	n	1		1		1	1	1										5
Leith Hill	SSSI	405	y	n			1													1	2
Mole Gap to Reigate Escarpment, Headley Heath	SSSI	405	y	n	1					1								1		1	4
Ranmore Common - Polesden Lacey	SSSI	405	y	n						1										1	2
Selborne Common & Hangers	SSSI, ASNW	405	y	n						1										1	2
Wakehurst & Chiddingfold Woods	SSSI, ASNW	405	y	n	1		1			1										1	4
Number of reports per species for National Trust sites					8	0	30	0	1	15	6	0	0	0	0	9	22	1	6	20	118

Key

NI data	Present in National Inventory dataset
NT data	Not yet received
ASP	Aspen
BPO	Black poplar
CAR	Common alder
CAP	Crab apple
EEM	English elm
FM	Field maple
HBM	Hornbeam
JRE	Common walnut
JNI	Black walnut
LPL	London Plane
NOM	Norway maple
SLI	Small-leaved lime
WEM	Wych elm
WPE	Wild pear
WST	Wild service tree
YEW	Yew

Table 6: Summary of additional Woodland Trust sites to those listed in the National Inventory which have species of interest and their ranking

Woodland Trust Site	Designation	Seed gone	NI data	WT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Lang Craigs	SSSI, ASNW	107	n	y											1		1				2
Irthing Gorge Woodland	SSSI, SAC, ASNW, PAWS	109	n	y																1	1
Uig Wood	SSSI	201	n	y			1										1				2
Den Wood	-	202	n	y			1														1
Backmuir	-	203	n	y		1	1														2
Beeslack	ASNW	203	n	y																1	1
Butterdean	LEPO	203	n	y							1										1
Milltown & Lantyan	ASNW, CWS	204	n	y							1										1
Morses Grove	-	204	n	y												1					1
Morton Wood	CWS	204	n	y		1															1
Railway Wood, Co. Durham	-	204	n	y		1															1
Riverside South	ASNW	204	n	y																1	1
Hyning Scout	ASNW, PAWS	301	n	y																1	1
Lower Grass Woods	ASNW	302	n	y					1												1
Masons Wood	ASNW	302	n	y						1							1				2
Mayfield	-	302	n	y						1										1	2
Skipton Castle Woods	ASNW, PAWS	302	n	y							1										1
Thwait-stones	SSSI, ASNW	302	n	y	1															1	2
Westway	-	302	n	y						1					1						2
Coed Ysgubor Wen	ASNW	303	n	y			1														1
Coed Bron Garth	SSSI, ASNW, PAWS	304	n	y							1									1	2
Crowhill	SSSI, ASNW, CWS	305	n	y			1														1
Hardwick	ASNW, CWS	305	n	y					1							1					2
Kingswood	ASNW, CWS	305	n	y			1														1
Statfold	-	305	n	y	1																1
Stratton Wood	-	305	n	y				1													1
Cropton Bank	ASNW?	401	n	y				1							1						2
Bramingham	ASNW	402	n	y				1													1
Enos Wood	-	402	n	y					1												1
Kempston	ASNW, CWS	402	n	y					1								1				2
Orton Longueville	-	402	n	y					1												1

Table 6: Summary of additional Woodland Trust sites to those listed in the National Inventory which have species of interest and their ranking

Woodland Trust Site	Designation	Seed gone	NI data	WT data	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW	No. of species on site
Bishops Knoll	-	404	n	y										1							1
Churchdown Hill	-	404	n	y				1													1
Dolebury Warren	SAM	404	n	y												1				1	2
Duncliffe	ASNW, PAWS, CWS	404	n	y												1					1
Fifehead	ASNW	404	n	y	1																1
Ringsettle	ASNW, PAWS, CWS	404	n	y							1										1
Lineover Wood	SSSI, ASNW, PAWS	404	n	y														1			1
Tanners Wood	-	404	n	y	1	1															2
The Nymph Hay	-	404	n	y						1											1
Tinney's Firs	ASNW	404	n	y																1	1
Brede High Woods	ASNW, PAWS	405	n	y	1		1				1								1		4
Butcher's Wood	ASNW, CWS	405	n	y							1										1
Debden	ASNW	405	n	y							1								1		2
Durfold	SSSI, ASNW, PAWS	405	n	y															1		1
Friegland	SSSI, ASNW, CWS	405	n	y																1	1
Great Ridings	ASNW	405	n	y							1				1						2
Hainault	SSSI, NNR, ASNW	405	n	y				1			1								1		3
Hammond's Copse	ASNW, PAWS	405	n	y	1														1		2
Heartwood	ASNW, CWS	405	n	y							1										1
Joydens	ASNW, PAWS, CWS	405	n	y	1			1						1	1	1	1		1	1	8
Nellington	ASNW	405	n	y										1						1	2
Packing Wood	SSSI, ASNW, PAWS	405	n	y															1		1
The Mores	-	405	n	y							1										1
Thunderfield Grove	ASNW, PAWS	405	n	y							1										1
Vanhurst Copse	SSSI, ASNW	405	n	y													1			1	2
Worms Wood	-	405	n	y		1										1					2
Number of reports per species for additional Woodland Trust sites					7	6	7	6	5	4	13	0	0	3	5	6	6	1	7	13	89

Key	
NI data	Present in National Inventory dataset
WT data	Reported by Woodland Trust Officers in 2015 + historic information on conservation features and trees of interest
ASP	Aspen
BPO	Black poplar
CAR	Common alder
CAP	Crab apple
EEM	English elm
FM	Field maple
HBM	Hornbeam
JRE	Common walnut
JNI	Black walnut
LPL	London Plane
NOM	Norway maple
SLI	Small-leaved lime
WEM	Wych elm
WPE	Wild pear
WST	Wild service tree
YEW	Yew
1	Priority site for visit
1	Potential site for visit
1	Not of obvious interest

Table 7: Forestry Commission reports of species of interest in England covering 0.5ha or more					
Forest ref	Sub Cpt Id	Species	Species %	Species Area (ha)	Sub Cpt Area (ha)
101	10003064	ASP	14	1.50	10.70
101	10003096	ASP	5	0.94	18.80
101	10003105	ASP	8	0.50	6.30
101	10003133	ASP	4	0.69	17.30
101	30000146	ASP	14	0.65	4.70
101	510000600	ASP	4	0.80	20.10
101	510000686	ASP	15	2.97	19.80
101	510000716	ASP	10	2.79	27.90
317	140001435	CAR	100	0.65	0.65
317	140034003	CAR	22	1.12	5.10
112	40042885	CAR	38	2.53	6.66
113	500000073	CAR	12	0.60	5.02
304	90021020	CAR	12	10.32	86.00
304	90022971	CAR	25	6.40	25.59
304	90023471	CAR	38	1.36	3.60
317	140031518	CAR	20	2.08	10.39
317	140000412	CAR	100	1.06	1.06
112	40024389	CAR	100	1.14	1.14
112	40020974	CAR	33	0.53	1.61
113	50016335	CAR	13	0.77	5.91
304	90020484	CAR	33	5.02	15.21
304	90023474	CAR	70	2.51	3.58
117	70001457	CAR	10	0.64	6.38
101	510003007	CAR	93	0.84	0.90
113	50002970	CAR	100	0.81	0.81
112	40049939	CAR	29	1.04	3.58
117	70021100	CAR	100	2.78	2.78
314	120004306	CAR	60	1.79	2.99
317	140031956	CAR	32	0.55	1.72
112	40023916	CAR	33	0.58	1.75
112	40024040	CAR	67	0.93	1.39
304	90020657	CAR	2	2.65	132.48
117	70027051	CAR	100	1.56	1.56
317	140000155	CAR	23	0.58	2.50
112	40042887	CAR	40	0.61	1.52
112	40007605	CAR	20	0.52	2.58
112	40025619	CAR	100	2.93	2.93
112	40038485	CAR	60	0.57	0.95
113	50003026	CAR	6	0.64	10.66
113	50000546	CAR	100	1.15	1.15
317	110002372	CAR	50	0.63	1.25
304	90020448	CAR	2	0.83	41.57
304	90020513	CAR	4	0.85	21.18
317	140035205	CAR	60	1.05	1.75
317	140036521	CAR	52	3.09	5.95

Table 7: Forestry Commission reports of species of interest in England covering 0.5ha or more

Forest ref	Sub Cpt Id	Species	Species %	Species Area (ha)	Sub Cpt Area (ha)
113	50000277	CAR	100	0.68	0.68
304	90023526	CAR	60	7.68	12.80
117	70020948	CAR	5	0.76	15.21
117	70022874	CAR	15	1.00	6.70
101	10004334	CAR	13	0.69	5.33
317	140026822	CAR	63	2.49	3.96
312	110017557	CAR	70	0.93	1.33
112	40025491	CAR	100	0.93	0.93
304	80004603	CAR	52	1.87	3.59
317	110002375	CAR	30	0.68	2.28
314	120004220	CAR	95	0.91	0.96
317	140001315	CAR	62	7.50	12.09
112	40025607	CAR	73	1.06	1.45
113	50019680	CAR	83	3.03	3.65
113	50000076	CAR	40	1.00	2.50
312	110008633	CAR	23	1.30	5.64
312	110008633	CAR	30	1.69	5.64
117	70013375	CAR	10	0.54	5.43
117	70027077	CAR	10	0.75	7.74
101	510001699	FM	8	0.81	10.15
101	30000237	FM	11	0.87	7.93
101	30000281	FM	38	1.77	4.66
101	510002863	FM	14	0.63	4.50
101	30012008	FM	11	0.64	5.81
304	90018145	FM	47	2.48	5.28
101	510003099	FM	5	0.65	12.98
101	300000000	FM	13	1.48	11.35
101	30000228	FM	17	0.95	5.58
101	30000432	FM	9	0.59	6.52
101	30012759	FM	23	1.64	7.13
101	510003232	FM	45	1.06	2.35
101	30000277	FM	29	2.24	7.72
103	20023073	FM	20	1.15	5.73
101	510003233	FM	8	0.74	9.22
101	30000021	FM	51	0.56	1.10
101	510002865	FM	24	0.80	3.34
101	30012739	FM	24	2.44	10.16
103	20002423	NOM	100	1.71	1.70
103	20002445	NOM	100	0.55	0.50
103	20004306	NOM	40	0.60	1.50
103	20015573	NOM	75	1.38	1.80
103	80000890	NOM	60	0.99	1.70
103	80001008	NOM	44	0.54	1.20
103	80001062	NOM	60	3.28	5.50
103	80001069	NOM	100	0.55	0.50

Table 7: Forestry Commission reports of species of interest in England covering 0.5ha or more					
Forest ref	Sub Cpt Id	Species	Species %	Species Area (ha)	Sub Cpt Area (ha)
103	80001073	NOM	90	1.85	2.10
103	80001118	NOM	73	1.00	1.40
103	80001138	NOM	20	0.58	2.90
103	80001143	NOM	40	1.00	2.50
103	80002293	NOM	33	0.57	1.70
103	80002328	NOM	60	0.69	1.20
304	80002736	NOM	100	1.70	1.70
304	80002747	NOM	80	0.95	1.20
103	80003438	NOM	73	1.05	1.40
304	80004456	NOM	23	0.50	2.20
304	80004483	NOM	25	0.59	2.30
304	80004491	NOM	20	1.05	5.30
304	80005069	NOM	100	1.13	1.10
304	80005105	NOM	100	3.15	3.20
304	80005140	NOM	100	1.36	1.40
304	80005420	NOM	60	0.93	1.60
304	80006612	NOM	100	0.70	0.70
304	80006877	NOM	70	1.54	2.20
103	80013179	NOM	84	1.37	1.60
317	140002234	NOM	40	1.08	2.70
101	10002888	SLI	40	1.48	3.70
101	10003064	SLI	20	2.14	10.70
101	10003068	SLI	26	1.44	5.50
101	10003084	SLI	23	3.04	13.20
101	10003088	SLI	56	4.42	7.90
101	10003089	SLI	55	6.31	11.50
101	10003095	SLI	61	5.34	8.70
101	10003096	SLI	45	8.45	18.80
101	10003105	SLI	12	0.76	6.30
101	10003112	SLI	45	2.85	6.30
101	10003120	SLI	72	1.36	1.90
101	10003121	SLI	50	0.89	1.80
101	10003133	SLI	49	8.47	17.30
101	10003149	SLI	25	2.02	8.10
101	10003151	SLI	52	5.40	10.40
101	10003152	SLI	20	0.53	2.70
101	10003168	SLI	12	0.56	4.70
101	10003169	SLI	32	1.31	4.10
101	10003175	SLI	41	2.77	6.80
101	10003231	SLI	47	6.51	13.90
101	10003259	SLI	11	0.55	5.00
101	10003262	SLI	17	1.92	11.30
101	10003263	SLI	33	0.99	3.00
101	10003287	SLI	75	0.97	1.30
101	10003288	SLI	32	2.81	8.80

Table 7: Forestry Commission reports of species of interest in England covering 0.5ha or more

Forest ref	Sub Cpt Id	Species	Species %	Species Area (ha)	Sub Cpt Area (ha)
101	10003290	SLI	70	15.09	21.60
101	10005341	SLI	51	4.18	8.20
101	10006740	SLI	35	0.53	1.50
101	10006754	SLI	15	1.04	6.90
101	10007608	SLI	11	1.66	15.10
101	10007615	SLI	73	1.75	2.40
101	10007619	SLI	41	1.24	3.00
101	10009704	SLI	45	0.52	1.20
101	10009710	SLI	13	0.55	4.20
101	10009711	SLI	43	2.69	6.20
101	10009717	SLI	52	1.16	2.20
101	10009894	SLI	12	0.59	4.90
101	10010024	SLI	80	2.13	2.70
103	20001604	SLI	30	0.62	2.10
103	20006936	SLI	43	1.44	3.40
103	20006937	SLI	20	1.66	8.30
103	20021027	SLI	15	0.93	6.20
103	30012537	SLI	70	1.69	2.40
112	50000679	SLI	16	0.58	3.60
112	50000746	SLI	4	0.53	13.40
112	50000781	SLI	5	0.55	11.00
112	50014168	SLI	60	1.50	2.50
317	110001286	SLI	60	1.46	2.40
317	110003546	SLI	43	1.38	3.20
317	110003547	SLI	83	10.32	12.40
317	110016702	SLI	72	4.02	5.60
317	110016730	SLI	73	1.83	2.50
317	110016736	SLI	91	6.11	6.70
317	110016737	SLI	88	9.01	10.20
317	110016742	SLI	14	0.94	6.70
317	140000036	SLI	10	0.71	7.10
317	140000201	SLI	11	0.51	4.60
317	140000206	SLI	14	0.51	3.70
317	140000221	SLI	25	0.97	3.90
317	140000224	SLI	39	2.80	7.20
317	140001801	SLI	100	0.72	0.70
317	140002974	SLI	25	1.91	7.60
317	140022744	SLI	25	1.01	4.00
317	140023814	SLI	100	0.79	0.80
317	140028549	SLI	65	11.36	17.50
317	140029057	SLI	100	0.76	0.80
317	140029441	SLI	100	0.78	0.80
317	140029452	SLI	100	1.11	1.10
317	140029461	SLI	100	1.45	1.40
317	140030168	SLI	30	2.65	8.80

Table 7: Forestry Commission reports of species of interest in England covering 0.5ha or more					
Forest ref	Sub Cpt Id	Species	Species %	Species Area (ha)	Sub Cpt Area (ha)
317	140034762	SLI	31	0.94	3.00
317	140035621	SLI	31	2.15	6.90
317	140035626	SLI	50	1.47	2.90
317	140035633	SLI	19	0.58	3.10
317	140036399	SLI	75	4.20	5.60
101	510000600	SLI	16	3.21	20.10
101	510000602	SLI	33	1.68	5.10
101	510000686	SLI	51	10.09	19.80
101	510000716	SLI	29	8.08	27.90
101	510000729	SLI	18	1.09	6.10
101	510000731	SLI	37	1.93	5.20
101	510000733	SLI	55	3.76	6.80
101	510000736	SLI	56	3.96	7.10
101	510000742	SLI	36	4.27	11.90
101	510000751	SLI	13	1.42	11.00
101	510000760	SLI	6	0.79	13.20
101	510000762	SLI	17	1.78	10.50
101	510000764	SLI	45	1.09	2.40
101	10006754	WEM	9	0.62	6.90
101	30012722	WEM	70	1.04	1.50
101	510001699	WEM	6	0.61	10.20
101	510001701	WEM	24	1.40	5.80
101	300000019	WST	58	0.53	0.90
112	50000625	YEW	67	3.29	4.90
112	50000631	YEW	75	1.46	2.00
112	50000640	YEW	30	1.54	5.10
112	50000734	YEW	43	1.54	3.60
112	50000740	YEW	25	0.58	2.30
112	50000742	YEW	9	0.88	9.70
112	50000747	YEW	40	0.98	2.40
112	50000750	YEW	80	2.09	2.60
112	50000756	YEW	22	1.05	4.80
112	50000765	YEW	67	0.88	1.30
112	50000775	YEW	60	5.85	9.80
112	50000776	YEW	25	4.63	18.50
112	50000779	YEW	67	1.01	1.50
304	80006858	YEW	70	5.26	7.50
304	80006887	YEW	68	2.79	4.10
304	80006897	YEW	80	4.64	5.80
304	80006901	YEW	30	4.27	14.20
304	80006907	YEW	100	13.52	13.50
304	80013167	YEW	100	9.25	9.20
304	90018284	YEW	5	1.94	38.70

Key	
ASP	Aspen
BPO	Black poplar
CAR	Common alder
CAP	Crab apple
EEM	English elm
FM	Field maple
HBM	Hornbeam
JRE	Common walnut
JNI	Black walnut
LPL	London Plane
NOM	Norway maple
SLI	Small-leaved lime
WEM	Wych elm
WPE	Wild pear
WST	Wild service tree
YEW	Yew

Table 8: Summary of Forestry Commission component data relating to species of interest

Occurrence of species	ASP	BPO	CAR	CAP	EEM	FM	HBM	JRE	JNI	LPL	NOM	SLI	WEM	WPE	WST	YEW
No. of components	20	2	57	3	7	18	97	0	1	0	74	136	18	0	5	44
Area (ha)	15	0.2	99.6	2	2.6	21.5	56	0	0.1	0	45	244	7	0	1	100

Key

ASP	Aspen
BPO	Black poplar
CAR	Common alder
CAP	Crab apple
EEM	English elm
FM	Field maple
HBM	Hornbeam
JRE	Common walnut
JNI	Black walnut
LPL	London Plane
NOM	Norway maple
SLI	Small-leaved lime
WEM	Wych elm
WPE	Wild pear
WST	Wild service tree
YEW	Yew

Table 9: Aspen seed/clone orchards either established or planned †

Location	Organisation	Type
Fort Augustus*	Coille Alba (on NFE)	outside
Kincraig	Coille Alba	poly-tunnel
Dundreggan	TFL	poly-tunnel and outside
Galloway	FES	outside
Fife*	FES	outside
NRS	FR	poly-tunnel
Shropshire*	Forestart	outside

† taken from the Minutes of the aspen 2nd meeting held at the NRS, Roslin, 26/11/14 and currently under discussion and not yet finalised.

*considered to be the key strategic facilities

Table 10: List of small-leaved lime woods with potential as seed stands*

Site	County	Seed zone	Listed in National Inventory Database
Bishop's Enclosure & Great Lion Copse	Hampshire	405	No
Cranborne Copse	Dorset	404	No
Enborne Copse	Berkshire	404	Yes
Flaxley Wood	Gloucestershire	404	No
Hockering Wood	Norfolk	406	Yes - also registered seed stand
Hope Wood	Gloucestershire	404	No
Kings Wood	Bedfordshire	402	Yes
Lady Park Wood	Monmouthshire	404	Yes
Mugglewort Wood	Gloucestershire	404	No
Shrawley Wood	Worcestershire	403	Yes
Welshbury Wood	Gloucestershire	404	No

* Information kindly provided by Limewoods Working Group members

Table 11: Seed production strategy for the 16 species of interest

Species	Sales of seedlings in winter 2002/03*	Estimated current seed demand	Proposed Seed Production Strategy			Priority	Comment
			Seed stands	Seedling orchards	Clonal orchards		
Aspen (<i>Populus tremula</i>)	274,621	Upper 100,000s		X	X (Main option)	High	Significant seed production has not occurred in wild for about 20 years. High increase in demand for plants - for biomass and conservation purposes. Scottish clonal trials, collections and orchards exist or are planned. Need to locate southern Britain clones (males and females). Create a southern Britain seed orchard. Consider creating a northern Britain seed orchard but located in southern England to maximise seed production.
Black poplar (<i>Populus nigra</i> var. <i>betulifolia</i>)	16,050	Low 1000s			X	Low	Clonal collections exist but females rare. Location of wild trees documented. Natural regeneration in the wild is unlikely due to lack of suitable conditions. Demand for seedlings is low as nurseries frequently use cuttings. Creation of one orchard with 100 diverse clones would provide ample seed and widen the genetic base of plantings.
Black walnut (<i>Juglans nigra</i>)	data not available	Low 1000s	X		X	Medium	A few good quality young plantations of high quality are coming into seed production in East of England. Provenance trials exist and a small clonal plus tree collection. These could potentially be screened and used to create two clonal orchards - one from mature plus trees and the other from seedling selections. Sourcing other plus trees is desirable. Most seed currently imported.
Common alder (<i>Alnus glutinosa</i>)	2,042,684	2,000,000+		X (for conservation)	X (for production)	High	Large market demand and geographically widely planted. Valued for conservation and increasingly for production. Large stands suitable for seed collection are sparse. Little is known about provenance differences in GB. Creation of seed orchards (seedling and clonal orchards for conservation and production purposes respectively) for northern and southern Britain a priority.
English elm (<i>Ulmus procera</i>)	data not available	Negligible			X	Low	Demand for seed is very low. Conservation initiatives have identified surviving mature trees, some of which are plus trees. A clonal orchard of plus trees would be a high risk venture but likely to widely supported. Forestry sector would be able to assist in the location of plus trees.
Common walnut (<i>Juglans regia</i>)	data not available	Low 1000s			X	Low	Sourcing material from timber trees as opposed to trees selected for fruit production is critical. Good quality, mature timber trees are very scarce. Small number of plus trees in a collection in Kent. Provenance trials exist that could potentially be screened for young plus trees and used in addition to plus trees from continental Europe to establish a clonal seed orchard. Most seed currently imported.

Table 11: Seed production strategy for the 16 species of interest

Species	Sales of seedlings in winter 2002/03*	Estimated current seed demand	Proposed Seed Production Strategy			Priority	Comment
			Seed stands	Seedling orchards	Clonal orchards		
Field maple (<i>Acer campestre</i>)	751,633	1,000,000+		X (for conservation)	X (for production)	Medium	Demand for the species is high. Frequently imported for amenity and hedging plantings. Typically considered a small tree rather than high forest species so not considered a productive native species however fine timber trees do occur. Seed viability reduces northwards in GB. Does not typically form stands. Creation of southern and northern seedling seed orchards would have merit as would creation of a clonal production seed orchard using trees selected for their good timber form.
Hornbeam (<i>Carpinus betulus</i>)	290,145	Low 100,000s	X (Main option)	X	X	Medium to high	Frequently present in native woodland, often as overmature coppice. Increasing demand for seed. Seed viability is high in southern England but decreases northwards thus focus mainly on stands in southern Britain. High variability in the quality and straightness of trees. Opportunity to select better stands for timber production. To identify up to 8 potential seed stands, screen minimum of 24 stands. Consider mature coppice if owner willing to convert to open high forest to encourage seed production. Plus trees are scarce but do occasionally occur so opportunity for a clonal orchard.
London plane (<i>Platanus x acerifolia</i>)	data not available	Negligible			X	Very low	Rarely planted for forestry as predominately grown as an amenity tree especially in urban and parkland settings. Able to cope with difficult growing conditions and drought. Very low seed viability (6 to 10% typically). Two distinct forms of growth exist - normal trees vs heavily burred, squat trees. The timber from the burred trees is highly valued and sold as lace wood. Opportunity exists to identify plus trees of both forms and to create two small orchards if there is sufficient industry interest. However the recent arrival of <i>Splanchnonema platani</i> (Massaria disease of London Plane) makes this unlikely.
Norway maple (<i>Acer platanoides</i>)	data not available	Upper 10,000s	X (Main option)	X		Low to medium	Quite widely planted and often from sources resulting in quite coarsely formed trees. Mature stands of good quality are quite scarce. Seed production and viability is greater in southern Britain than elsewhere. Two approaches proposed: 1) Identify and assess 12 to 18 stands with the objective of selecting at least six stands suitable for registration; 2) Collect seed lots and screen seedlings for <i>Verticillium</i> resistance (main fungal disease).

Table 11: Seed production strategy for the 16 species of interest

Species	Sales of seedlings in winter 2002/03*	Estimated current seed demand	Proposed Seed Production Strategy			Priority	Comment
			Seed stands	Seedling orchards	Clonal orchards		
Small-leaved lime (<i>Tilia cordata</i>)	142,284	Lower 100,000s	X			Medium to high	Present in native woodland often as coppice. High forest stands of good timber quality do exist but are very scarce so would need to identify overmature or singled coppice stands as well. Seed production and viability is highest in southern Britain thus identifying stands there should be prioritised there. Identify and assess 12 to 18 stands initially with the objective of selecting at least six stands suitable for registration.
Wild apple (<i>Malus sylvestris</i> spp. <i>Sylvestris</i>)	186,100	Low 10,000s		X	X (Main option)	Medium to high	A rare species with a scattered distribution. Frequently cultivated and ornamental forms or hybrids are planted as wild apple so it is a priority to source 'true to type' individuals. Seed commonly imported as British seed sources very limited and costly to collect and extract. The identification of 100 potential wild apples initially should result in sufficient true to type individuals to establish a seed orchard (minimum of 50 genotypes). Molecular tools exist which are able to distinguish between wild, cultivated, ornamental and hybrid types thus consideration should be given to fingerprinting accessions to ensure trueness to type before creation of a clonal seed orchard.
Wild Pear (<i>Pyrus pyraeaster</i>)	data not available	Upper 1000s			X	Low	Very rare species. Approach would be as with wild apple but of less of a priority if seedling numbers is main driver. Timber value is very high.
Wych elm (<i>Ulmus glabra</i>)	44,912	Upper 10,000s		X	X (Main option)	Very low	It's frequent and widespread distribution across Britain justifies a north/south split of collections. As it is susceptible to Dutch Elm Disease (but less attractive to the beetle vector), it is, as with English Elm, a high risk species to work with. Selection of trees of reasonable to good form would be desirable as often the form is poor or shrubby. Collections of 50 to 100 individuals would form a useful conservation collection resource as well as potential seed production unit.
Wild service (<i>Sorbus torminalis</i>)	17,627	Mid 10,000s			X	Medium	Relatively rare species with a scattered distribution and often associated with ancient woodland. Has the ability to reproduce clonally by suckers as well as from seed. Seed collections are often from very small populations or individual trees and seed viability is often low especially outside of southern Britain. Has considerable potential as a high value timber tree but culture for this is not developed as in continental Europe. Establish two seed orchards of minimum of 50 individuals each both in southern Britain to improve seed viability but split into northern and southern orchards.

Table 11: Seed production strategy for the 16 species of interest

Species	Sales of seedlings in winter 2002/03*	Estimated current seed demand	Proposed Seed Production Strategy			Priority	Comment
			Seed stands	Seedling orchards	Clonal orchards		
Yew (<i>Taxus baccata</i>)	126,297	Low 100,000s	X?	X	X	Medium	Scattered but common tree rarely occurring as a main component of woodland. A long lived species often associated with churchyards and historic buildings and with considerable heritage value. Its timber is highly valued, however trees of good timber form, i.e. straight and unfluted stems, are scarce. Establish two orchards; one a heritage orchard with from seed collected from important historic trees (50 to 100) and the other as a clonal orchard with cuttings or graftwood being collected from trees (50) of good timber form. Assess 10 large stands where yew forms a major component for suitability as seed stands.

* Taken from Russell & Evans 2003.

Nursey review of sustainable seed sources species collected in the UK						
Species	Total sales of seedlings (British & Imported)*	No. of British nurseries collecting seed *	No. of British nurseries providing imported seedlings*	Imported source*	No. of nurseries identifying seed collection difficulty (and reason if given)*	Forestart Ltd feedback July/ August 2014
Aspen (<i>Populus tremula</i>)	274,621	6	9	Hungary, Netherlands	3	In demand - 500,000+. Infrequent seed production & viability at times. Planning orchard
Black poplar (<i>Populus nigra</i> var. <i>betulifolia</i>)	16,050	4	3	Czech Republic	2 - occasionally poor seed availability	Little demand. Nurseries use cuttings
Black walnut (<i>Juglans nigra</i>)	-	4	-	-	-	Small demand (1,000s) - most imported
Common alder (<i>Alnus glutinosa</i>)	2,042,684	11	4	Netherlands	-	Large market demand (2+ million), geographically widely planted. Consider northern and southern seed orchards.
Common walnut (<i>Juglans regia</i>)	-	-	-	-	-	Small demand (1,000s) - most imported
Field maple (<i>Acer campestre</i>)	751,633	8	9	Hungary, Netherlands	-	In demand - 1+ million. A lot of importation for amenity and hedge plantings. Seed viability decreases northwards. Shrub and timber forms thus create conservation and production seed orchards.
Hornbeam (<i>Carpinus betulus</i>)	290,145	6	10	France, Hungary, Netherlands	1	Reasonably good demand and increasing. Collection from individuals and stands. Need more stands
London plane (<i>Platanus x acerifolia</i>)	-	-	-	-	-	No commercial demand
Norway maple (<i>Acer platanoides</i>)	-	-	-	-	-	Very small demand. Orchard material from EMR. More required
Small-leaved lime (<i>Tilia cordata</i>)	142,284	3	10	Eastern Europe, Germany, Hungary, Italy, Netherlands	12 - no seed	Small demand - collection from individual trees. Would like stands
Wild apple (<i>Malus sylvestris</i> spp. <i>Sylvestris</i>)	186,100	7	9	Germany, Netherlands	7 - poor seed availability, costly extraction	Good demand. Trueness to type important
Wild Pear (<i>Pyrus pyraeaster</i>)	-	-	-	-	-	Very small demand but interested in developing
Wild service (<i>Sorbus torminalis</i>)	17,627	5	3	Germany	2 - poor seed availability	Small demand - collection from individual trees. Has potential.
Wych elm (<i>Ulmus glabra</i>)	44,912	7	2	-	-	-
Yew (<i>Taxus baccata</i>)	126,297	7	4	Netherlands	1	Small demand - collection from individual trees or small 'stands'





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