National Forest Inventory statistics for the Lake District National Park

NFI summary report

Lake District National Park

Map 1 Location map for Lake District National Park
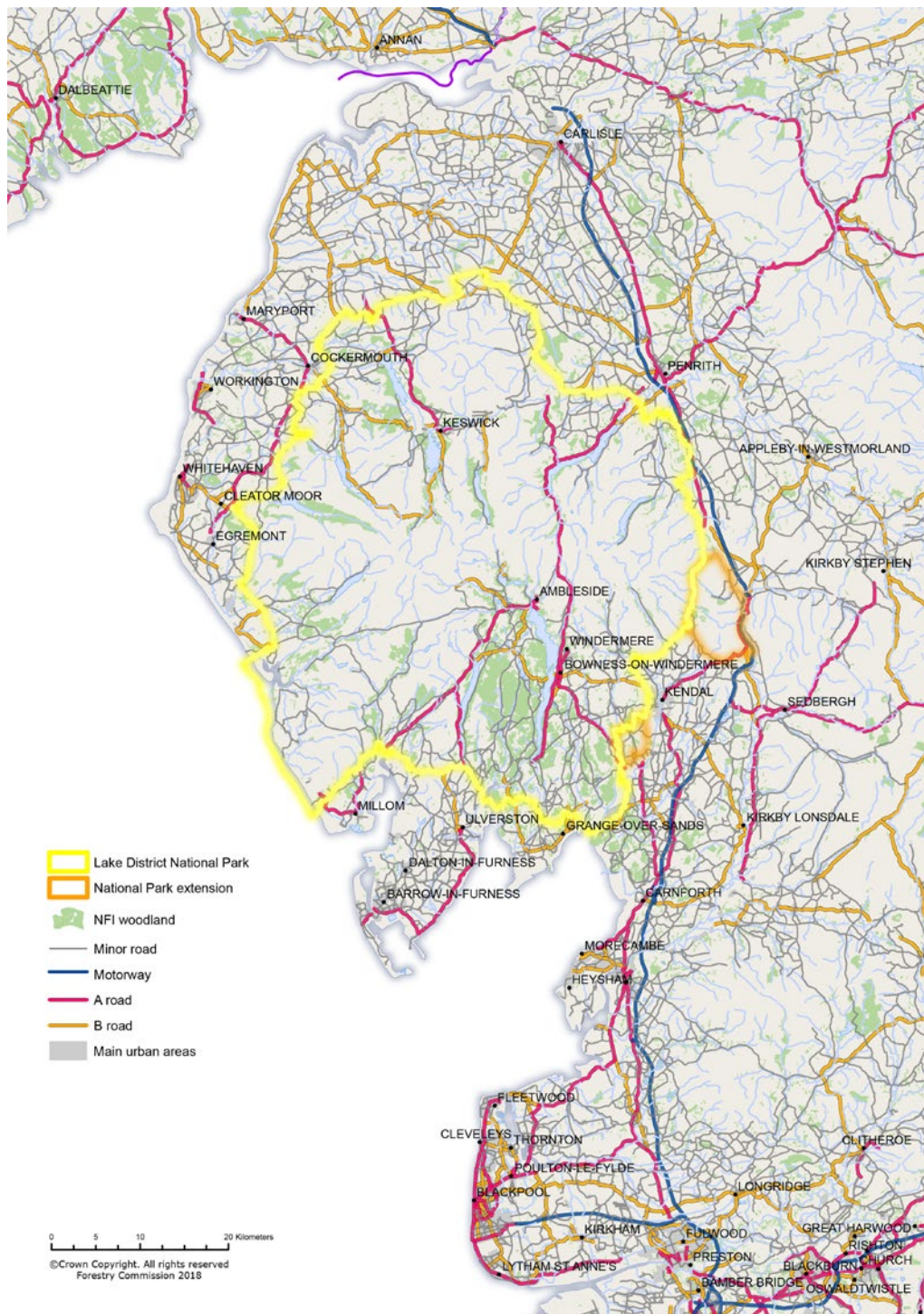
Key findings for the Lake District National Park

The Lake District National Park has a total land area of 236,240 hectares; this includes an extension of 7,034 hectares that was added in 2016. The 1951 Lake District National Park boundary is also the boundary for the English Lake District World Heritage Site, designated in 2017, and the area this report focuses on. The Lake District National Park was extended by 3% in 2016 and this report also provides figures for the newly extended boundary of the Lake District National Park. The English Lake District World Heritage Site has a land area of 229,205 hectares with 13% woodland cover, some 30% of the woodland is under Forestry Commission ownership or management.

Sitka spruce is the most commonly occurring of the conifer species whether assessed by stocked area (48%), standing volume (43%) or number of trees (56%).

Oak is the most commonly occurring of the broadleaved species when assessed by stocked area (30%) or standing volume (45%) but birch is the most frequently occurring when assessed by number of trees (27%).

Some 33% of standing coniferous volume is beyond the age of maximum mean annual increment (or above terminal height of 25m in higher windthrow risk areas). The harvesting assumptions applied in the forecast assume that a proportion of this volume will be felled over a period of time from the start of the forecast. Some 51% of conifer sections show evidence of thinning.

Overall 50% of standing broadleaved volume is beyond the age of maximum mean annual increment (or above terminal height of 25m in higher windthrow risk areas). Some 24% of broadleaved sections show evidence of thinning.

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Introduction

National forest inventories are carried out by the Forestry Commission to provide accurate, up-to-date information about the size, distribution, composition and condition of the forests and woodlands in Great Britain (GB). This information is essential for developing and monitoring policies and guidance to support sustainable forest management.

The current National Forest Inventory (NFI), which began in 2010, is a multipurpose operation that has involved the production of a forest and woodland map for Britain and a continuing programme of field surveys (the first cycle of field surveys completed in late 2015) of the mapped forest and woodland areas. Thirty additional field samples were taken in winter 2017-18 under the NFI top-up scheme, and have been used in the calculation of these estimates.

Information and data collected by the National Forest Inventory are being used for a number of purposes, including estimates and 25-year forecasts of forest metrics such as:

- standing volume
- timber availability
- tree growth and increment
- carbon stocks
- biomass
- habitat condition
- biodiversity
- social use of forests and woodlands

This report brings together key woodland information for the Lake District National Park previously published across the range of NFI thematic reports. The data sources and methodology covering the suite of reports is available on the NFI web pages.

Part 1 – introduction and methodology

How the estimates are prepared

The methodology introduces the National Forest Inventory. It describes the metrics presented in this report and how they are derived. Like many NFI reports, the estimates in this report have been provided for all woodland breaking out the results by ownership i.e. whether part of England's public forest estate (usually described as FC woodland) or part of the private sector (PS). The methodology covers how the private sector forecasts are prepared and includes commentary on the assumptions made in order to calculate the forecast estimates.

National Forest Inventory

The National Forest Inventory is composed of two elements: a woodland map and a field survey. The woodland map covers all forests and woodlands of over 0.5 hectare with a width of 20 metres and a minimum of 20% canopy cover (or the potential to achieve it), including new planting, clearfelled sites and restocked sites. It is based upon interpretation of 25 cm resolution colour aerial photography for England and Scotland and 40 cm resolution aerial photography for Wales. The map was validated and updated using satellite imagery (available up to 2014), which gave an independent crosscheck of woodland present. Satellite imagery was also used to identify areas of recently felled forests and woodland. Particular attention was paid to identifying areas of woodland loss verified as being due to the establishment of wind farms or the restoration of habitats.

Field survey work was then used to refine the map-based estimates of woodland and clearfelled areas and to measure detailed aspects of the forest. Field surveys carried out between 2010 and 2015 were used to estimate standing volume (and other forest metrics). This involved the ground surveying of 1 hectare sample squares that were partially or entirely covered by forest, including clearfelled areas, according to the woodland map.

In the course of the field survey work some 6,636 sample squares were surveyed in England of which 572 were located in North West England. Of these, 153 sample squares were in the W H S boundary of the Lake District National Park. These surveyed sample squares are a sub-sample of the 15,000 statistically representative squares covering all woodland in Britain that has been surveyed during the first cycle of the National Forest Inventory field surveys (completed in late 2015).

The 2016 extension to the National Park boundary contained a further 2 squares.

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At each sample square, the area was stratified into forest and non-forest and the forested area was further stratified into different woodland types or stands, where information on species, age, management and a range of other parameters was collected. Typically, sample squares covered parts of different forest stands, resulting in 1,193 woodland stands being assessed in North West England (13,723 across England and 28,493 across Britain). Within each stand, field-based computer systems were used to locate two or three randomly located 100 m^2 (0.01 hectare) circular plots, within which all trees of greater than or equal to 4 cm diameter at breast height (DBH) were mapped, species and age identified, stocking assessed and diameters measured. A total of 22,553 trees were measured in North West England (307,892 across England and 613,928 across Britain). For 7,932 of these trees in North West England (108,403 across England and 214,459 across Britain), additional measurements of tree height and crown dimensions were taken for yield class assessment and for other purposes. The resulting data were used to estimate the standing volume of the trees that provided the initial values of timber present in the stand from which forecasts of future timber availability were projected. All squares were marked on the ground with metal pegs and GPS data of their location were recorded for checking and future measurement. All measurements were subject to office-based checks and 7% were re-measured in the field by an independent quality assurance team to ensure consistency and high standards of data quality.

The results for individual surveyed squares were aggregated and scaled up to the areas identified by the woodland map, using standard statistical survey methodology, to produce the estimates in this report. Along with these estimates, associated sampling standard errors have also been calculated and reported. The sampling standard error will account for random variation arising from the selection of the sample, and random measurement errors, but not from any systematic biases in the field measurements. However, because of the quality assurance process it is thought unlikely that any substantial biases of this nature are present in the survey data. The sources of error that are not accounted for in the reported standard errors will be those deriving from the use of empirical models to estimate standing volumes from the recorded survey data and, in some cases, the use of Forestry Commission growth and yield models (where these are used to project the results from an earlier survey to 31 March 2016 – the reference date used for the figures in this report).

Further details can be found in the NFI reports published on the [NFI web pages](#).

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Derivation of woodland area statistics

These estimates are based on the National Forest Inventory (NFI) definitions of woodland. In the NFI, woodland is defined as areas with a canopy cover of 20% or more (or the potential to achieve this), a minimum area of 0.5 hectares and a minimum width of 20 metres. Areas of less than 0.5 hectares of open space within woodlands are included as part of the total woodland area, being considered as an integral part of the woodland ecosystem. Integral areas of greater than 0.5 hectares of open space are excluded.

The term 'Assumed woodland' refers to areas under woodland grant scheme or areas of FC new planting for which evidence of tree or ground disturbance cannot be interpreted from the latest aerial imagery.

'Low density woodland' refers to the area mapped as woodland in the National Inventory of Woodland and Trees (NIWT) which was excluded from the original NFI map as the canopy density was too low. Such areas were further investigated and if archive aerial images prove that there had been a higher density of woodland canopy cover than at present, they were included in the woodland map as low density woodland. The presumption behind this is that such sites may have included seed tree sites or group felling and that they may revert to the threshold canopy occupancy for woodland in time.

The estimates in this report are based on the NFI woodland map with a reference date of 31st March 2016.

Orchards and nurseries are not included in the woodland area estimates.

Interpreted Forest Types and Interpreted Open Areas (IOAs)

Within each distinct woodland, internal parcels with a minimum area of 0.5 hectares have been classified as a single Interpreted Forest Type (IFT). Similarly, parcels of open space are classified as Interpreted Open Areas (IOAs). Definitions of the IFTs and IOAs can be found in **Appendix A – Interpreted Forest Types and Interpreted Open Areas**.

Ancient and semi-natural woodland

Ancient woodland is land that has had a continuous woodland cover since at least 1600 AD and may be ancient semi-natural woodland (ASNW), which retains a native tree and shrub cover that has not been planted, although it may have been managed by

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coppicing or felling and allowed to regenerate naturally, or plantation on ancient woodland sites (PAWS) where the original tree cover has been felled and replaced by planting, often with conifers, and usually over the last century.

The estimates in this report have been derived using the Ancient Woodlands (England) data set (2018) published by Natural England.

The Ancient Woodlands boundary and the NFI woodland boundary are not necessarily co-incident as they have been identified using different criteria. Where ancient woodland is under 0.5 ha in size or achieves less than 20% canopy cover it will not be within the NFI woodland. As a consequence, this report presents both the area within the ancient woodland boundary and the sub-set of this area which is also within the NFI woodland boundary.

Species diversity

The Shannon Index combines species richness and evenness into a single indicator. The non-normalised value is presented in this report.

Derivation of estimates of current stocks

This report provides estimates of the net area under canopy (referred to as stocked area), the standing volume, the number of trees, biomass and carbon stocks in live trees in woodlands within the Lake District National Park.

Stocked area

The National Forest Inventory (NFI) woodland map provides information on the spatial location and extent of woodland. Summing the areas of woodland defined in the map provides a gross estimate of woodland areas in GB, countries and regions. Which includes clearfell sites, assumed woodland area (according to grant scheme records), and integral areas of open space of less than 0.5 hectares.

Estimates of stocked area represent the area of woodland currently covered by trees of the relevant species or group of species. Total stocked area across all species (inclusive of both conifer and broadleaves) will therefore differ from total woodland area as estimated from the woodland map, since it will not include current areas of clearfell and most areas of open space of less than 0.5 hectares. On the other hand, it may include estimates derived from areas of woodland located outside the NFI woodland map.

Care needs to be taken in the interpretation of stocked areas of individual species, since many woodlands contain an intimate mix of species, and in such cases procedures are

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used to allocate the total area covered by the woodland into the areas occupied by its constituent species. The total stocked area of a given species does not therefore represent discrete areas of land covered by pure stands of the species, but may represent the sum of shares of areas of mixed woodland allocated to it by these procedures.

Standing volume

Standing volume is defined as the live stemwood and useable branchwood to a minimum of 7 cm top diameter. It excludes roots, below-ground stump material, small branches, foliage and deadwood. It is reported in cubic metres overbark standing.

Standing volume in trees in woodlands of less than 0.5 hectares in extent is not included.

Standing volume is the baseline for the forecasts of softwood and hardwood availability presented in this report.

Numbers of trees

Estimates are provided in this report of the current numbers of live trees in woodland within the Lake District National Park. In order to compile such estimates, a minimum tree size needs to be defined. In this report, a live tree is considered countable once it has grown to a size at which its diameter at breast height (DBH) has reached at least 4 centimetres. Windblown trees are included in these estimates, but not standing dead trees.

For the purposes of this report, measurable stems arising from coppice stools are counted as separate trees when calculating the estimated tree numbers. The use of this definition varies from the convention of regarding a single coppice stool with many measurable stems as a single tree. This will not impact upon the stocked area and standing volume estimates, but will affect the estimates of tree numbers for those species that tend to be coppiced, such as sweet chestnut and hazel.

Biomass stocks

The biomass estimates in this report are for total biomass in living trees in stands that have achieved a mean diameter at breast height (DBH) of 7 centimetres or more. The estimates do not therefore include biomass in young stands that have not grown to this minimum mean diameter nor, for example, in stands of coppice in which stems are harvested before reaching this minimum diameter. The estimates incorporate both

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above- and below-ground parts of the tree, including major roots, stump, stem, branches, twigs and foliage. Included in the estimates are all trees within areas defined by the National Forest Inventory as areas of woodland. This definition of woodland excludes trees in small copses, hedgerows, and individual isolated trees.

Carbon stocks

Carbon is defined in this report as carbon stored in all living plant material in both the above and below ground parts of trees (including major roots, stumps, stems, branches, twigs and foliage) in stands with a mean diameter (at breast height) of 7 cm or more. The estimates do not include carbon in young stands that have not grown to this minimum mean diameter nor, for example, carbon in the stems of coppice that are harvested before reaching this minimum mean diameter. Also excluded is carbon in standing dead trees, growing saplings and seedlings, shrubs (except shrubs growing with the morphology of trees), other ground layer vegetation, lying deadwood, litter, soil, harvested wood products and substitution effects (e.g. avoided emissions by using timber in place of steel).

Estimates of current stock

The estimates of current stocks for each of the metrics described above were calculated for individual surveyed squares and then aggregated and scaled up to the areas identified by the woodland map, using standard statistical survey methodology, to produce the estimates in this report. Along with these estimates, associated sampling standard errors have also been calculated and reported. The sampling standard error will account for random variation arising from the selection of the sample, and random measurement errors, but not from any systematic biases in the field measurements. However, because of the quality assurance process it is thought unlikely that any substantial biases of this nature are present in the survey data. The sources of error that are not accounted for in the reported standard errors will be those deriving from use of empirical models to estimate standing volumes from the recorded survey data and, in some cases, the use of Forestry Commission growth and yield models (where these are used to project the results from an earlier survey to 31 March 2016 – the reference date used for the figures in this report).

Derivation of the existing woodland management information and economic viability data

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These estimates are taken directly from the assessments made in each stand within the sample squares. For a stand to register an activity that activity must have occurred within the NFI sample square, not the woodland as a whole.

Levels of management activity

Levels of past management can give an indication of how stands will be managed and harvested in the future. This uses the assumption that if stands have been in the hands of owners who were, or are, currently active in managing and thinning their stands, then they are more likely to continue to do so. Such information can be used to assess what proportion of stands may be thinned and harvested in future and is presented in the following figures.

The criteria used for assessing management covers most forest management activities, such as establishment, thinning and clearfelling, and as active management for recreation. For a stand to register an activity that activity must have occurred within the NFI sample square, not the woodland as a whole. The activities assessed in the survey are listed in the *Interpreting NFI Timber Volume Forecasts* (2012) report. The results presented distinguish between recent activity (less than 3 years ago), older activity (greater than 3 years ago) and where both recent and older activity has been observed.

The results show the proportion of stands where any given management activity has been observed during the NFI field sample assessments and the whether the activity appears to be recent, older or both. The results are presented as a proportion of stands and are intended to provide an overall picture of the proportion of woodland found to be under active management. The results cover all woodland in the Lake District National Park and do not differentiate by ownership.

Harvesting constraints

The National Forest Inventory has measured some of the factors that will help to determine if some stands can be harvested or not, or if they are less likely to be harvested. Many factors affect whether a stand can be physically harvested including slope, access and roading and these areas are reported in the following figures. However it cannot be fully determined on this information whether owners will choose to harvest these 'difficult' stands or not.

The survey does not assess if there are restrictions on such roads for timber haulage, which will be the case for a proportion of these roads.

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The assessment criteria set for surveyors when gathering this information is:
- 'can a harvesting vehicle get on site?'
- If not, 'can a skyline be used or is it not possible to get any sort of mechanised harvesting on site?'

This is assessment considers site conditions regardless of the tree cover. Sites are categorised as:

- Wheeled vehicle on site possible – this category includes any mechanical harvesting: wheeled harvesting vehicles, tracked harvesting vehicles and skylines
- Wheeled vehicle on site impossible - tracked vehicles or skylines only can be used
- Sky line site – the site is such that only skylines can be used to harvest the site (e.g. for steep slopes where it would be dangerous or impossible for tracked or wheeled vehicles to operate)
- Mech. Harvesting Impossible
- Not Possible to Assess (this option is allowed when a surveyor cannot access the site)

Distance from square to road

This is the distance, as the crow flies, to the nearest category 1A road (able to take a 32 ton timber lorry) or better. 'CAT 1A' roads within the forest are defined as:

- principal timber haulage route on a long-term basis;
- constructed to high specification;
- maintained to a high standard;
- all year but not all weather;

These can be assessed either as a map exercise or by field assessments. Distances are recorded as:
- <200m
- 200 – 400m
- 400 – 600m
- 600 – 800m
- 800 – 1000m
- 1000m
- Not Possible to Assess

As noted, the survey does not assess if the roads identified are restricted from timber haulage, or if the road accessed by the stand only leads to roads that could not support timber haulage.

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A transport route is assessed and mapped as a linear feature regardless of its length and size within the sample square. The open space associated with the feature will *also* be mapped and assessed as a separate area as long as it meets the area criteria of ≥0.05ha within the square.

Types of access

- Public Road - A road over which the public has the right of access. Also includes Private roads.

- Forest Road sealed surface - A road through the forest for use by the owner and workers – bituminised

- Forest Road unsealed surface - As above but metalled not bituminised

- Ride sealed surface - Rides are often vegetated, un-metalled or un-surfaced corridors often giving access to or through a forest. They also include de-classified category 1A roads that are no longer maintained but still surfaced.

- Ride unsurfaced - Rides are vegetated, un-metalled or un-surfaced corridors often giving access to or through a forest.

- Extraction rack: Dozed - A path/corridor constructed by bulldozer through the forest that is used to extract timber (Linear Feature assigned to the main Rack only)

- Extraction rack - A path/corridor through the forest that is used to extract timber (assign Linear Feature to the main Rack only)

Yield classes

The mean yield class estimates are based on the top height / age relationship measured in the NFI sample squares. Young stands are excluded from this assessment.

How volume forecasts are derived

Forecasts of softwood availability are derived by assessing:

- woodland area
- woodland characteristics (e.g. age, species) within this area

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- how quickly the trees are growing (yield class)
- when the trees will be harvested

Timber is defined in this report as the volume of stemwood to 7 cm top diameter in m^3 overbark standing (obs), including stump (above ground) and usable branchwood (of minimum 3 m length and 7 cm top diameter). It should be noted that, in this report, the forecast of timber availability is the potential amount of timber that could arise and any reference to volume, production or availability should be taken in that context.

Forecast estimates

The inventory data derived from the National Forest Inventory was run against the headline scenario for the private sector described in the *50-year forecast of softwood timber availability* (2014) and also used in the *25-year forecast of softwood timber availability* (2016). Under this scenario, forests are managed under a regime designed:

- to maximise productivity (biological potential), within which it is assumed that timber will be harvested in the year of maximum Mean Annual Increment (MAI);
- to take account of thinning and wind constraints with stands being thinned unless they are assessed with a DAMS (Detailed Aspect Methodology Score) score of 16 or greater in which case they are treated as no thin and a top height at clearfell of 25 m is applied;
- to harvest a proportion of overdue stands (i.e. stands that have exceeded the prescribed age for felling according to the scenario), where overdue stands are handled according to overdue timber allocation option 1 described in Table D2 in the *50-year forecast of softwood timber availability* (2014);
- to restock stands which are currently felled and to restock any stands felled within the forecast period according to the country-level restocking options described in **Appendix B – Forecast assumptions**.

This scenario, selected after consultation with Private sector woodland owners and timber processors, aims to maximise timber production in a way that involves relatively straightforward and transparent management prescriptions.

This report concentrates on the headline scenario. Alternative harvesting scenarios and their impact on timber availability are explored in the *50-year forecast of softwood timber availability* (2014).

This set of harvesting assumptions is also used for the broadleaved stands in the forecast with one modification whereby only 15% of young stands (where there can be no evidence of previous thinning) are thinned in the future.

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The forecast results for individual surveyed squares were aggregated and scaled up to the areas identified by the woodland map, using standard statistical survey methodology, to produce the estimates in this report. Along with these estimates, associated sampling standard errors have also been calculated and reported. The sampling standard error will account for random variation arising from the selection of the sample, and random measurement errors, but not from any systematic biases in the field measurements. However, because of the quality assurance process it is thought unlikely that any substantial biases of this nature are present in the survey data.

There are four classes of error or uncertainty that are not accounted for or contained in the quoted sampling standard errors:

1. Errors in standing volume estimates arising from random variation about, and systematic bias in, the empirical models used to estimate standing volumes from mensuration data. It is not thought that this will contribute a large source of additional error.

2. Random variation about, and biases in, the growth and yield models used to project the future growth of stands. It is known that biases exist in these models, some of which have recently been quantified, and both these biases and annual random variation about the growth model projections will contribute accumulating errors in the longer term forecasts such that errors contributed by these sources will eventually become a larger source of error than sampling error.

3. The forecasts are conditional upon future conditions of growth being equal to those experienced in the past. The quoted sampling standard errors do not therefore take account of any major sudden events that significantly impact upon the tree stock, such as meteorological conditions of a type not experienced in the past, or of more gradual deviation from past conditions, such as the possible accumulating impact of climate change. These sources of error will impact more heavily on forecasts further into the future rather than on short-term forecasts.

4. It is important to also note that in the statement above that the forecasts are 'conditional upon the underlying assumptions'. This means in effect that it is assumed that every stand is managed in the future exactly as prescribed by the future management scenario being analysed. In practice there will be considerable uncertainty and variation in the future management of forest stands. This is a major source of future uncertainty and therefore another major source of error in longer term forecasts.

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Incorporation of these unaccounted sources of error in future forecasts would require a different forecasting model that is beyond current capacity to implement. The effect would be that the magnitude of standard errors fully accounting for all sources of variation in the forecasts would be close to the sampling standard errors for short-term forecasts, but would then continuously expand for forecasts further into the future. However, the advantage of the semi-deterministic forecasts used in this report are that the comparative effects of alternative management scenarios on future production and state of the woodland resource can be easily identified, even if the forecast values themselves are subject to increasing uncertainty the further they project into the future.

Assumptions used in this forecast

Management prescriptions

Due to the relatively low proportion of forests and woodlands on the public forest estate within the Lake District National Park, the forecast in this report assumes that woodland will be managed according to the prescription described above rather than the timing and scale of thinning and felling events being taken from the approved forest design plans (which set out the prescriptions for harvesting across the productive forest area on the FC estate) compiled by local planning foresters for the public forest estate in England.

Ownership

Forests and woodlands are harvested differently under different ownership types. Given that forecasts are largely based on the assumptions made about harvesting prescriptions, the rate of change of ownership is important. In the *25-year forecast of softwood timber availability* (2016) assumptions were made about changes in future forest ownership and thus how stands would be harvested over the forecast period. For simplicity, the forecast in this report assumes that there will be no future transfer of ownership.

Restocking

Both the softwood and hardwood forecasts restock currently clearfelled land; in addition the softwood forecast reduces the stocked area at restock, as well as altering the species mix. The softwood forecast assumes that 5% of conifer stocked area is converted to

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broadleaved stocked area at time of restock this assumption has an impact upon the hardwood forecast.

These assumptions do not impact greatly within the first 25 years of either forecast, but impacts are evident in the second half of a 50-year forecast where the future conifer clearfellings that are generated by the forecast have the effect of adding broadleaved stocked area over time and will thus increase potential hardwood availability in the long term.

The prescriptions for which tree species will be replanted during restocking of woodland felled within the forecast period are described in **Appendix B – Forecast assumptions**. The same prescription applies to restocking currently clearfelled land. They also set out the assumption for the reduction in net conifer stocked area as a percentage of current net stocked conifer area.

This restock scenario is only one of many possible future scenarios for restocking.

Currently clearfelled areas

The assumption used for restocking includes the restocking of the areas classed as clearfelled at 31 March 2016. This is similar to the approach taken in the 25-year forecast of softwood availability (2016), in which areas that were in a clearfell state at the start of the forecast period were restocked, but differs from that applied to the *25-year forecast of softwood timber availability* (2012).

Overdue timber

In the forecast, overdue timber is timber contained within stands that, at the start of the forecast period, are already over the age prescribed for felling according to the management scenario used for the forecast.

Softwood

All areas felled as overdue were restocked in the forecast according to the restock scenario, in common with any other stand felled during the forecast period. This approach will not materially affect the forecast timber volumes as the replacement stands are unlikely to mature within the forecast period. This will depend on species, yield class and the length of the applied rotation.

Hardwood

These 'overdue' stands represent a significant area of land and volume of hardwood timber, which will impact on a longer term timber forecast, and special provision has now been made for them.

The prescriptions for handling overdue timber were developed in consultation with the private sector and are set out below.

The overdue timber prescriptions take into account tree species, age of stand in relation to age of maximum MAI and current market practice in harvesting:

- For oak and beech stands above maximum MAI but below 80 cm mean dbh, intermediate thin until fell at 80 cm mean dbh.
- For oak and beech stands between 80 cm and 100 cm mean dbh, clearfell evenly over a 20 year period with intermediate thinning.
- For oak and beech stands over 100 cm mean dbh, fell evenly over 10 years.
- For ash and other species beyond maximum MAI, fell evenly over ten years if mean dbh is less than 60 cm, or fell immediately if greater than 60 cm dbh

These prescriptions were formulated with particular reference to mean stand dbh per species, with different species achieving optimal commercial value at different sizes.

All areas felled as overdue were restocked in the forecast according to the restocking prescription, in common with any other stand felled in the forecast period. Subsequent restocking of these stands is carried out according to the like-for-like scenario.

Impact of harvesting on standing volume

The level and frequency of thinning and felling will have an impact on standing volume and increment over time. If removals exceed increment then standing volumes will be reduced and vice versa.

A large determinant in the forecast for total standing volume in Britain is the underlying age class structure of the forests in England, where the majority of broadleaves are less than 100 years of age and most are less than 40 years of age. This is evidently due to the reestablishment of broadleaved woodland after the devastation of woodland that occurred during the two world wars and the preceding centuries, which seriously depleted GB woodlands. This has driven a broadleaved resource that is in 'recovery', one which has developed from a largely unstocked phase through to a current predominantly immature phase that is in the process of development into a more mature phase. This history is reflected in the age class structure of broadleaves found by the NFI and previous surveys. The forecasts presented in this document show that, without a

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significant increase in removals in the future, standing volumes of broadleaves will be expected to almost double in the forecast period.

This contrasts with forests of a more evenly distributed age found in most other countries, which result in a more even evolution of total standing volume, increment and production through time. Any comparisons of level of cut to increment should account for this. It should also be noted that the core 50-year forecast of this report is a limited projection of standing volume of broadleaves through time, focussing on a 50 year period, which represents a fraction of the life cycle of GB forests.

Impact of future events

In addition to the impact of harvesting decisions, there are other unpredictable external factors that are likely to have an impact on all production over the period of the forecast. For example, pest and disease outbreaks, economic factors, severe weather events (windthrow), changes in land use (wind farms and habitat restoration) and changes in government policy (affecting for example grants and regulation, land sales and forest management) will all have impacts.

The forecasts in this report make no assumptions about the impact of pests and diseases. The volumes set out in the main reports assume no impact on availability or production occurring from current or potential outbreaks of pests and diseases. This 'neutral' approach was taken since reliably predicting the rate of spread and impact of the pests and diseases currently of concern was considered to be impractical at this time.

Hard to harvest sites

Whether timber on hard to harvest sites will come to market will depend on the economic viability of the harvesting at that point in time, which in turn will depend upon the technology of the time, the cost of harvesting and the value of timber at that time. These are all difficult factors to predict over a long forecast period; historically, ease of harvesting has alternated between making notable to little impact on production. The *25-year forecast of softwood timber availability* (2016) assumed that almost all coniferous timber within woodlands would come to market at some point, irrespective of ease of harvesting or site access. Figures on the proportion of 'difficult' sites to harvest are provided, so users of the forecast can make their own estimate of what proportion of that timber would never come to market due to these factors.

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Note on the estimates

The values in the tables have been independently rounded, so may not add to the totals shown. In some breakdowns the estimates in the body of the table may not sum to the quoted total because each individual value, including the total, has been independently generated by the estimation procedure used for results from the NFI sample survey. Sampling standard errors (SE) attached to the estimates are expressed in relative terms (%) to the right of the relevant estimate and as ± error bars in the figures. Percentages in the pie charts may also not sum to 100 due to rounding.

Due to biological and sampling constraints, for example where there is a very small population of a species within a particular region, the estimates may have a high associated standard error. Since this indicates a high level of uncertainty around those estimates then caution should be used when drawing any conclusions from these values as the estimate may not be representative of the real population. Such estimates have been shown in amber in the tables.

Part 2 – What our woodlands are like today

Part 2 - what our woodlands are like today

Woodland area statistics

Woodland area by woodland type

Figure 1 Woodland area by woodland type

■ Woodland land cover
■ Non-woodland land cover
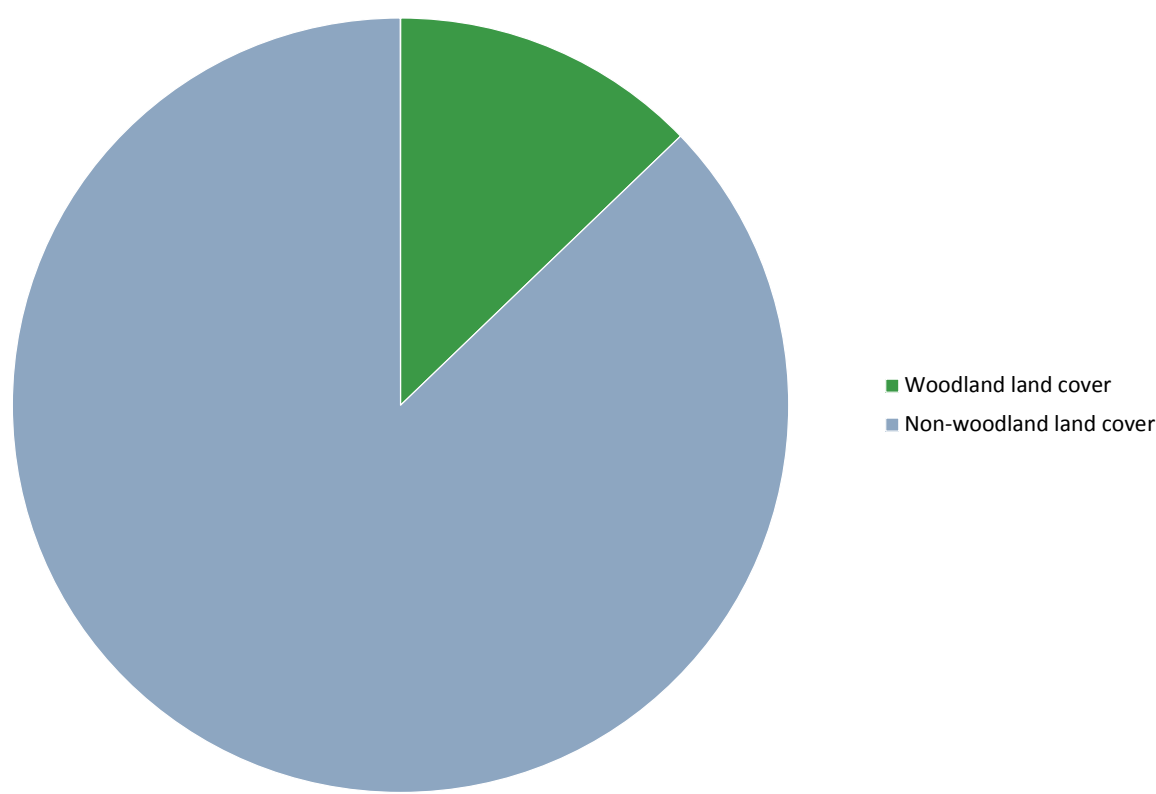
Table 1 Woodland area by woodland type

Woodland Type	Area (ha)	%
Lake District National Park - W H S		
Woodland	28,569	97
Assumed woodland	645	2
Low density	95	0
Total mapped woodland	**29,309**	**100**
Non-woodland area	199,896	
Land area	229,205	
Woodland land cover		**13**
Non-woodland land cover		**87**

Part 2 - what our woodlands are like today

Woodland area by ownership

Map 2 Woodland map by ownership

Ownership
- Forestry Commission
- Other
- Main urban areas
- Lake District National Park

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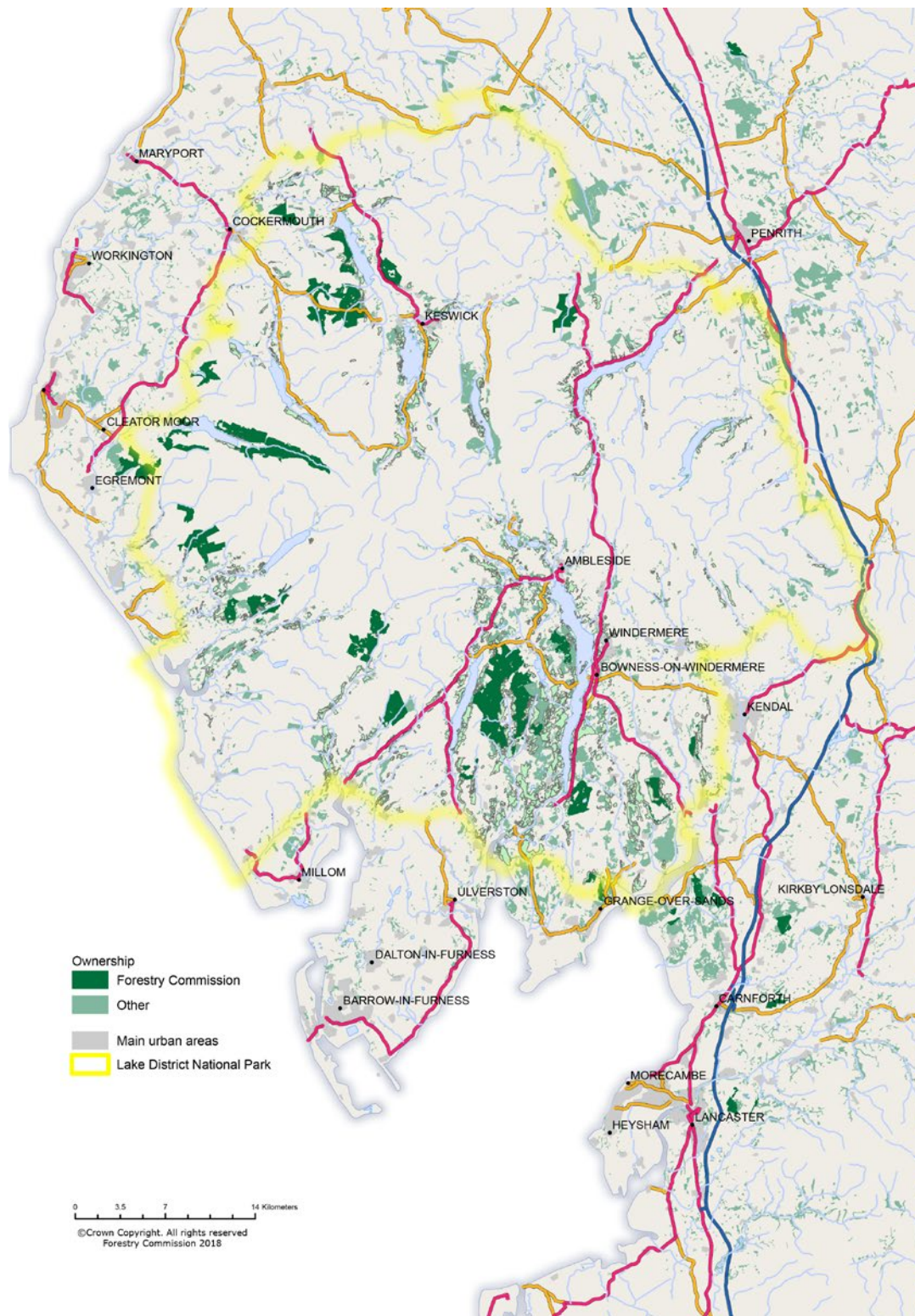
Part 2 - what our woodlands are like today

Figure 2 Woodland area by ownership

- ■ Forestry Commission
- ■ Other ownership
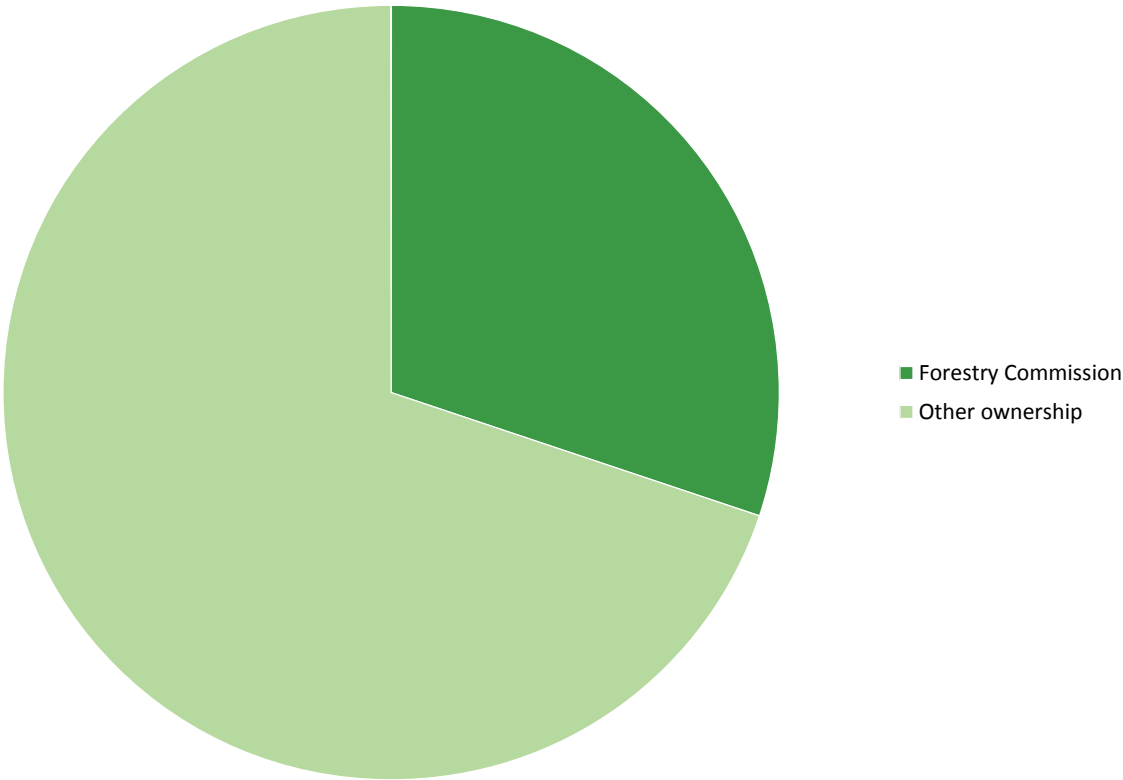
Table 2 Woodland area by ownership

Ownership	Area (ha)	% Woodland
Lake District National Park - W H S		
Forestry Commission	8,839	30
Other ownership	20,469	70
Total area of woodland	**29,309**	**100**

Part 2 - what our woodlands are like today

Woodland area by interpreted forest type

Map 3 Woodland map by interpreted forest type

Interpreted woodland type

- Assumed woodland
- Broadleaved
- Conifer
- Coppice
- Coppice with standards
- Failed
- Felled
- Ground prep
- Low density
- Mixed mainly broadleaved
- Mixed mainly conifer
- Shrub
- Windblow
- Young trees
- Lake District National Park
- Main urban areas

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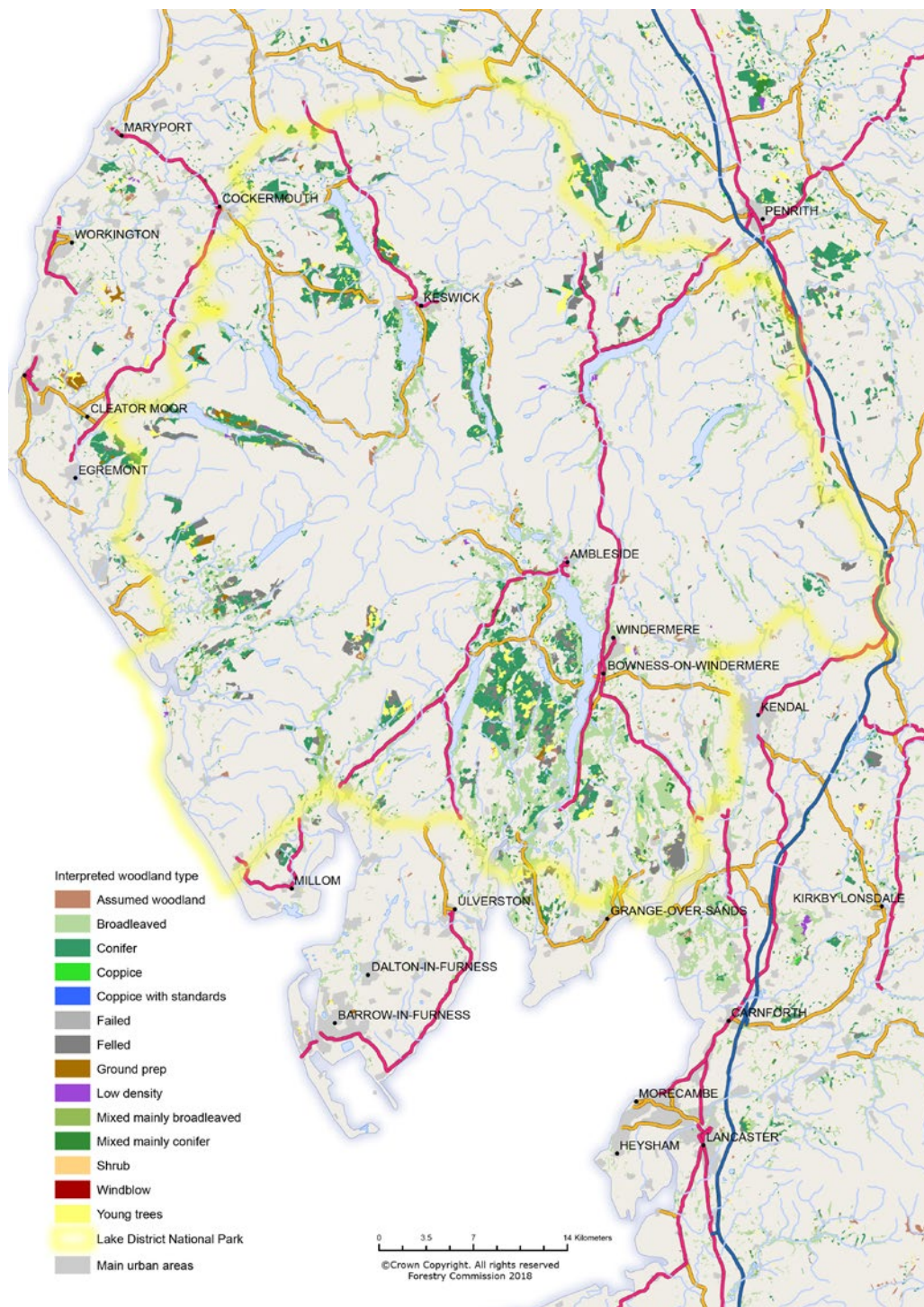
Part 2 - what our woodlands are like today

Figure 3 Woodland area by interpreted forest type

Legend:
- Broadleaved
- Conifer
- Felled
- Ground prep
- Mixed mainly broadleaved
- Mixed mainly conifer
- Young trees
- Coppice
- Coppice with standards
- Shrub
- Assumed woodland
- Low density
- Failed
- Windthrow
- Cloud/shadow/uncertain
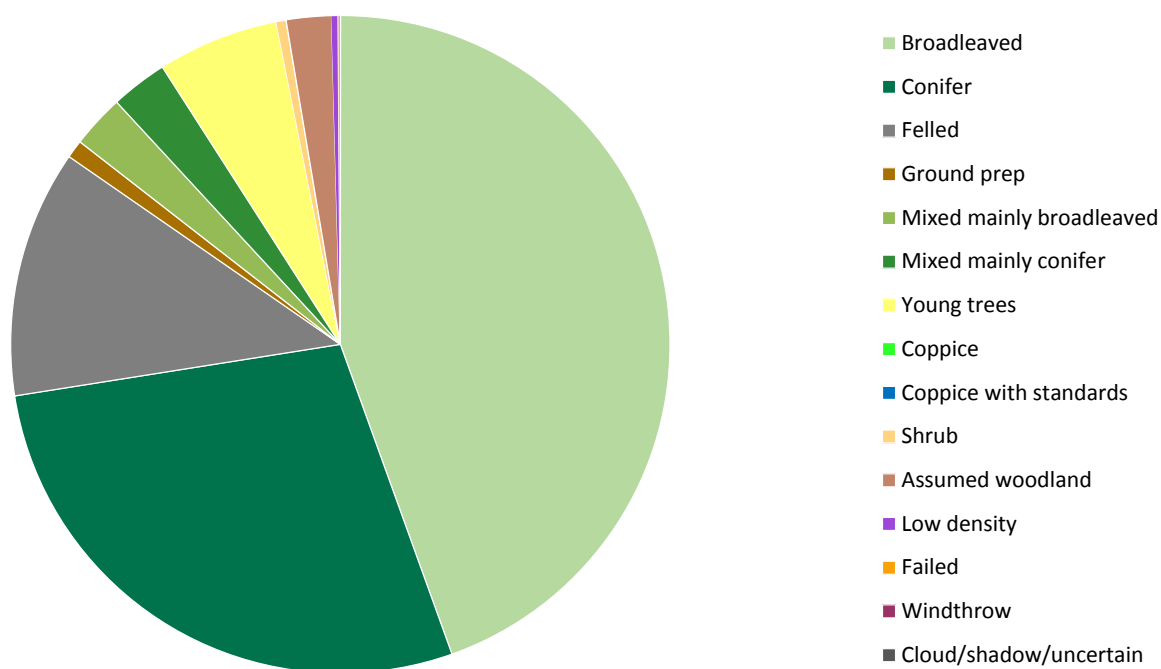
Table 3 Woodland area by interpreted forest type

Forest type	Total area (ha)	% of total area
Lake District National Park - W H S		
Broadleaved	13,041	44
Conifer	8,207	28
Felled	3,561	12
Ground prep	262	< 1
Mixed mainly broadleaved	764	3
Mixed mainly conifer	817	3
Young trees	1,743	6
Coppice	0	0
Coppice with standards	0	0
Shrub	139	< 1
Assumed woodland	645	2
Low density	95	< 1
Failed	11	< 1
Windthrow	21	< 1
Cloud/shadow/uncertain	2	< 1
TOTALS	**29,309**	**100**

Part 2 - what our woodlands are like today

Woodland area by interpreted forest type and woodland size

Map 4 Woodland map by size and altitude

Hectares
- <2
- 2 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 500
- 500 - 1000
- 1000 - 2000
- 2000 - 3000
- 3000 - 4000
- 4000 - 5000
- 5000 - 6000
- 6000 - 7000
- 8000 - 9000
- >9000

Terrain
- <50m
- 600m - 700m
- >1300m

0   3.5   7   14 Kilometers

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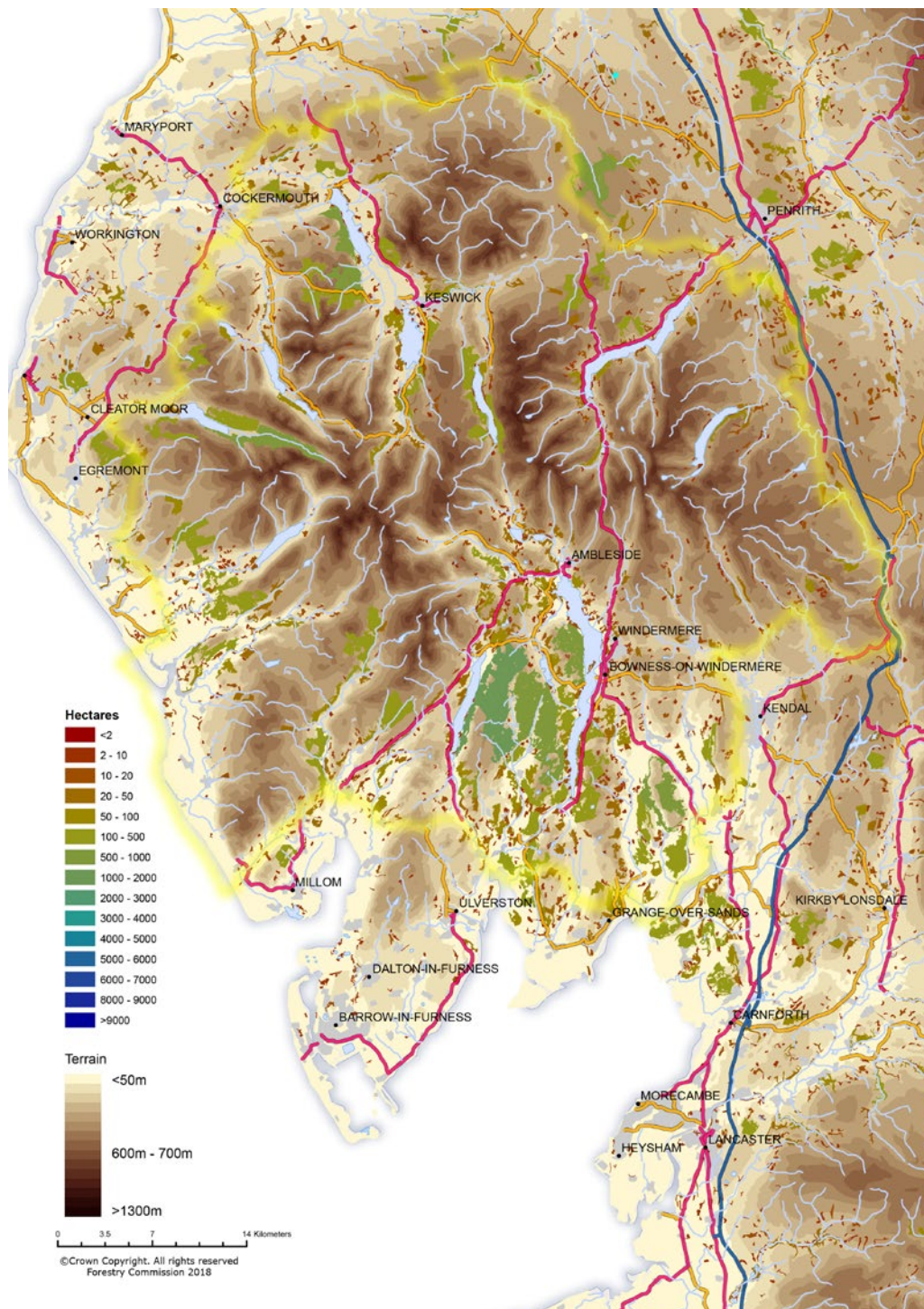
Figure 4 Woodland area by interpreted forest type and woodland size
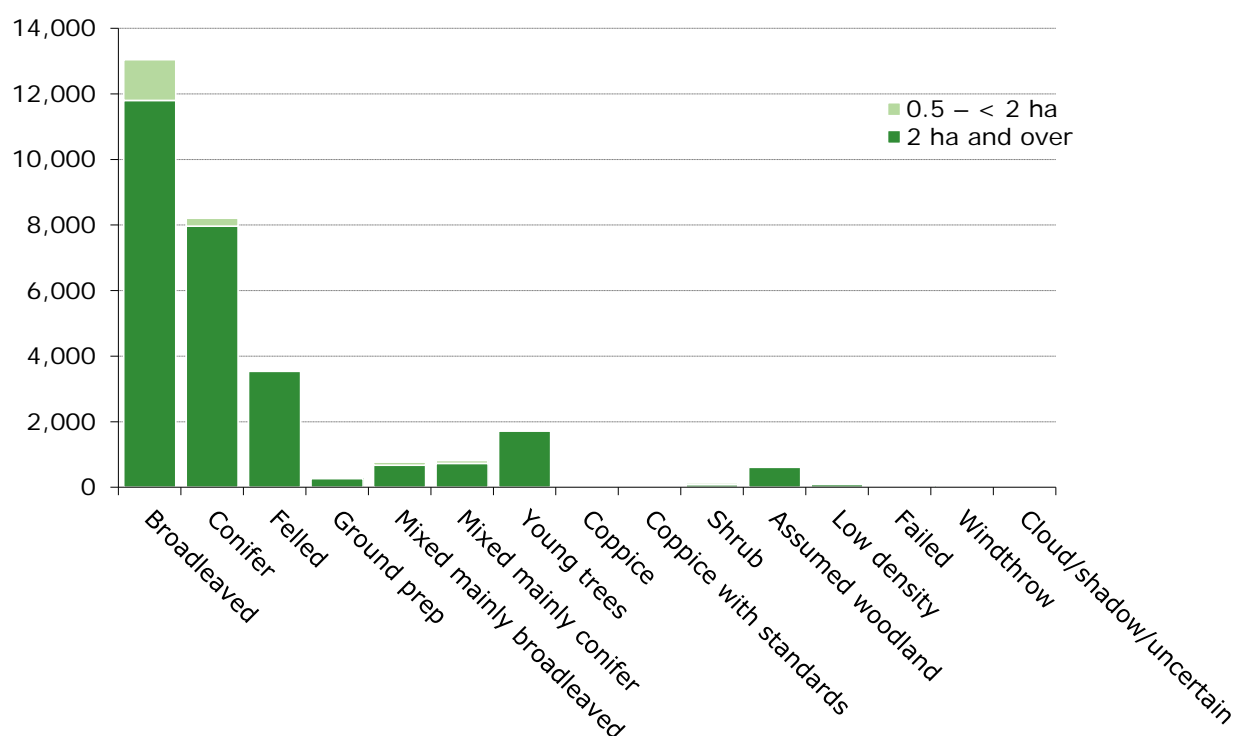
Table 4 Woodland area by interpreted woodland type and woodland size

Forest type	Woodland size		Total area	
	2 ha and over	0.5 – < 2 ha	(ha)	%
Lake District National Park - W H S				
Broadleaved	11,802	1,239	13,041	44
Conifer	7,963	244	8,207	28
Felled	3,541	20	3,561	12
Ground prep	262	0	262	< 1
Mixed mainly broadleaved	675	89	764	3
Mixed mainly conifer	730	87	817	3
Young trees	1,716	27	1,743	6
Coppice	0	0	0	0
Coppice with standards	0	0	0	0
Shrub	82	57	139	< 1
Assumed woodland	609	36	645	2
Low density	91	4	95	< 1
Failed	11	0	11	< 1
Windthrow	21	0	21	< 1
Cloud/shadow/uncertain	2	0	2	< 1
TOTALS	**27,504**	**1,805**	**29,309**	**100**

Part 2 - what our woodlands are like today

Woodland area by interpreted forest type and ownership

Figure 5 Woodland area by interpreted forest type and ownership
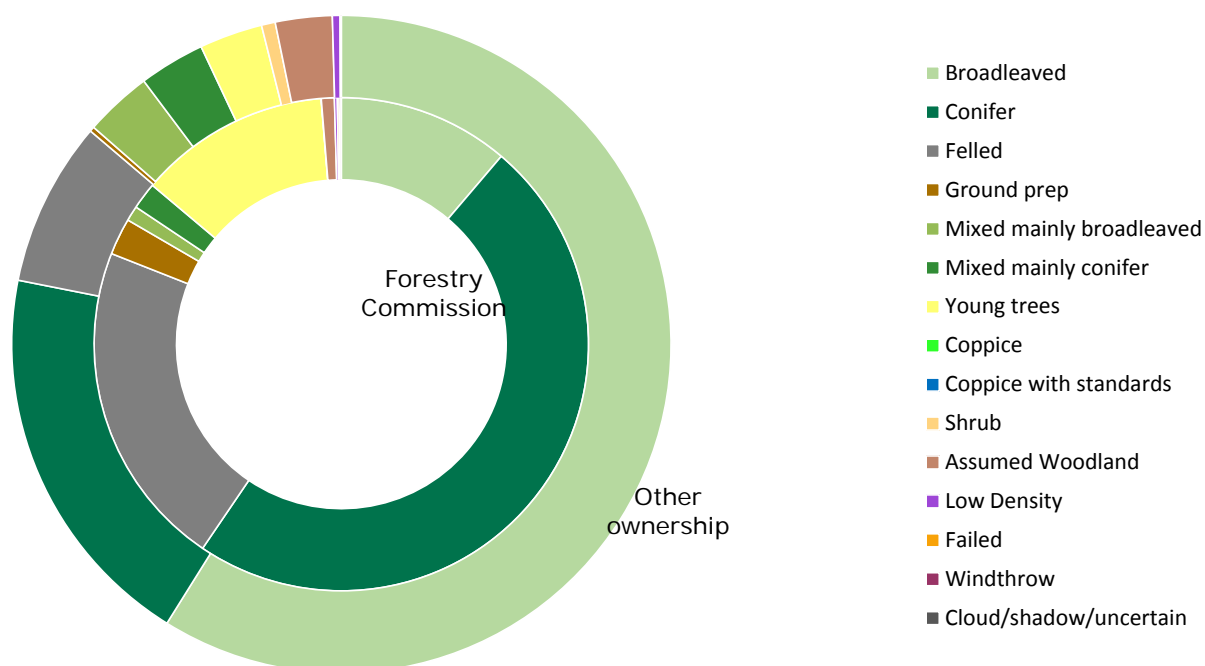
Table 5 Woodland area by interpreted forest type and ownership

Forest type	Forestry Commission		Other ownership	
	Area (ha)	% of total area	Area (ha)	% of total area
Lake District National Park - W H S				
Broadleaved	990	11	12,051	59
Conifer	4,268	48	3,940	19
Felled	1,901	22	1,660	8
Ground prep	213	2	48	< 1
Mixed mainly broadleaved	87	< 1	677	3
Mixed mainly conifer	155	2	662	3
Young trees	1,109	13	635	3
Coppice	0	0	0	0
Coppice with standards	0	0	0	0
Shrub	< 1	< 1	138	< 1
Assumed Woodland	75	< 1	570	3
Low Density	16	< 1	78	< 1
Failed	10	< 1	< 1	< 1
Windthrow	11	< 1	10	< 1
Cloud/shadow/uncertain	2	< 1	0	0
TOTALS	**8,839**	**100**	**20,469**	**100**

Part 2 - what our woodlands are like today

Woodland area by interpreted forest type, woodland size and ownership

Table 6 Woodland area by interpreted forest type, woodland size and ownership

Forest type	2 ha and over		0.5 – < 2 ha		Total area	
	Forestry Commission	Other	Forestry Commission	Other	ha	%
Lake District National Park - W H S						
Broadleaved	980	10,822	10	1,229	13,041	44
Conifer	4,266	3,697	1	243	8,207	28
Felled	1,899	1,642	3	17	3,561	12
Ground prep	213	48	0	0	262	< 1
Mixed mainly broadleaved	87	588	0	89	764	3
Mixed mainly conifer	155	574	0	87	817	3
Young trees	1,108	608	< 1	27	1,743	6
Coppice	0	0	0	0	0	0
Coppice with standards	0	0	0	0	0	0
Shrub	0	82	< 1	57	139	< 1
Assumed woodland	75	534	0	36	645	2
Low Density	16	74	0	4	95	< 1
Failed	10	< 1	0	0	11	< 1
Windthrow	11	10	0	0	21	< 1
Cloud/shadow/uncertain	2	0	0	0	2	< 1
Totals	**8,824**	**18,680**	**15**	**1,789**	**29,309**	**100**

Part 2 - what our woodlands are like today

Woodland area by size class distribution

Figure 6 Woodland area by size class distribution
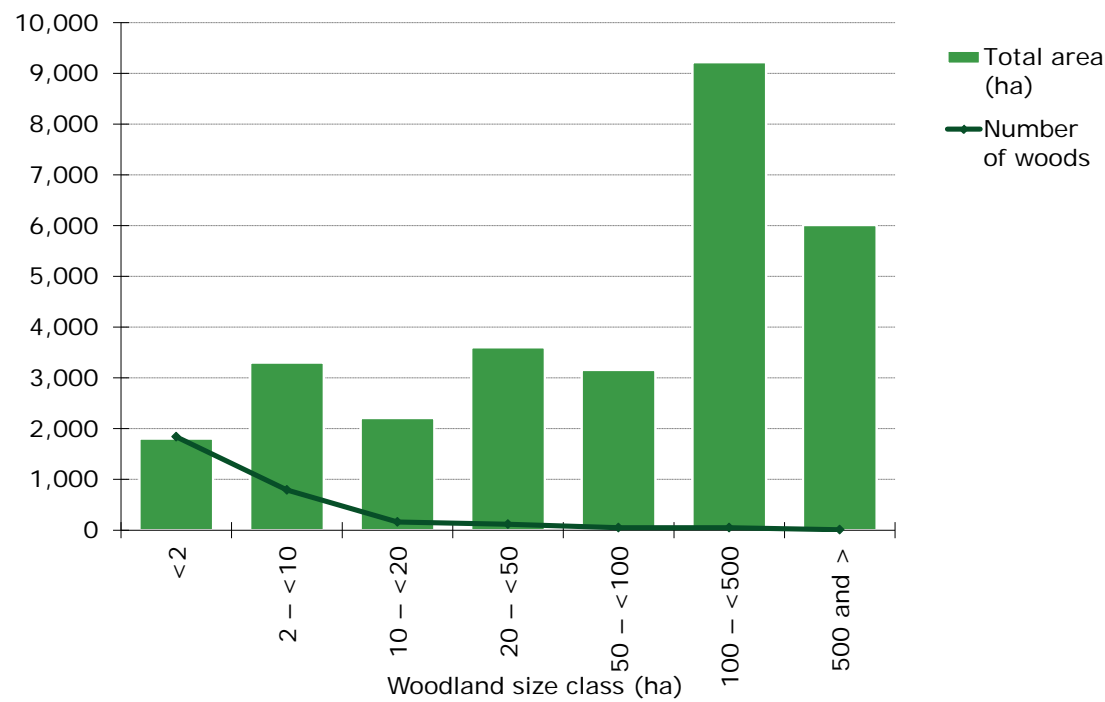
Table 7 Woodland area by size class distribution

Size class (ha)	Total area (ha)	Number of woods	% of total area	Mean wood area (ha)
Lake District National Park - W H S				
<2	1,805	1,839	6	< 1
2 – <10	3,304	791	11	4
10 – <20	2,209	160	8	14
20 – <50	3,604	118	12	31
50 – <100	3,158	50	11	63
100 – <500	9,218	48	31	192
500 and >	6,011	7	21	859
All woods	**29,309**	**3,013**	**100**	**10**

Part 2 - what our woodlands are like today

Open areas in woodland by land use type

Figure 7 Open areas in woodland by land use type
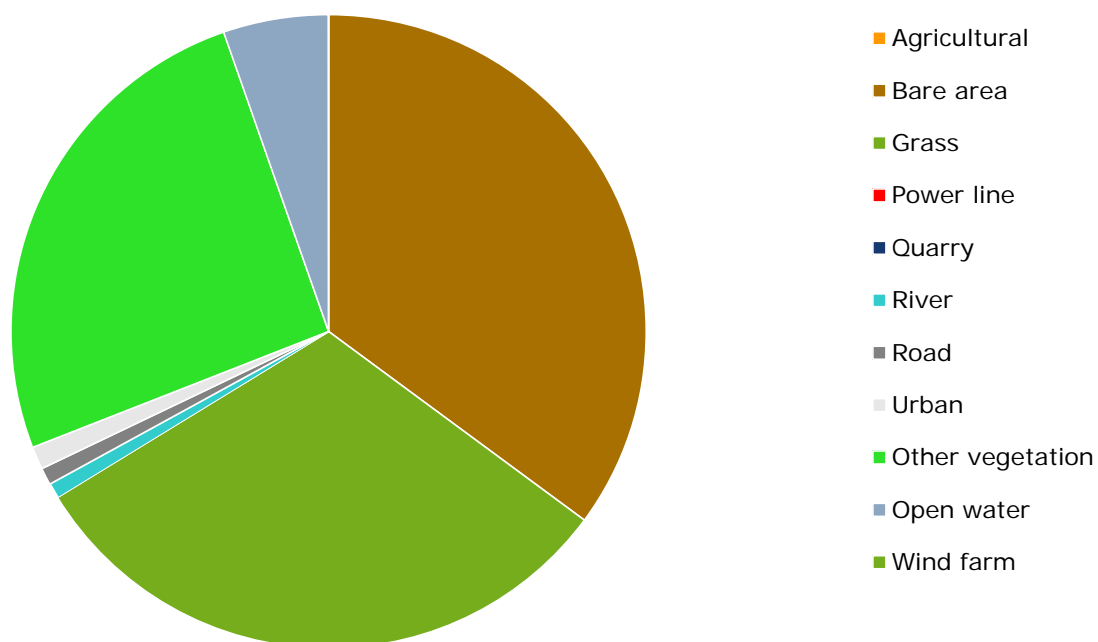
Table 8 Open areas in woodland by land use type

Interpreted open area	Total area (ha)	% of total area
Lake District National Park - W H S		
Agricultural	0	0
Bare area	200	35
Grass	177	31
Power line	0	0
Quarry	0	0
River	4	< 1
Road	5	< 1
Urban	7	1
Other vegetation	146	26
Open water	31	5
Wind farm	0	0
TOTALS	**570**	**100**

Part 2 - what our woodlands are like today

Ancient woodland in the Lake District National Park

Map 5 Ancient woodland map
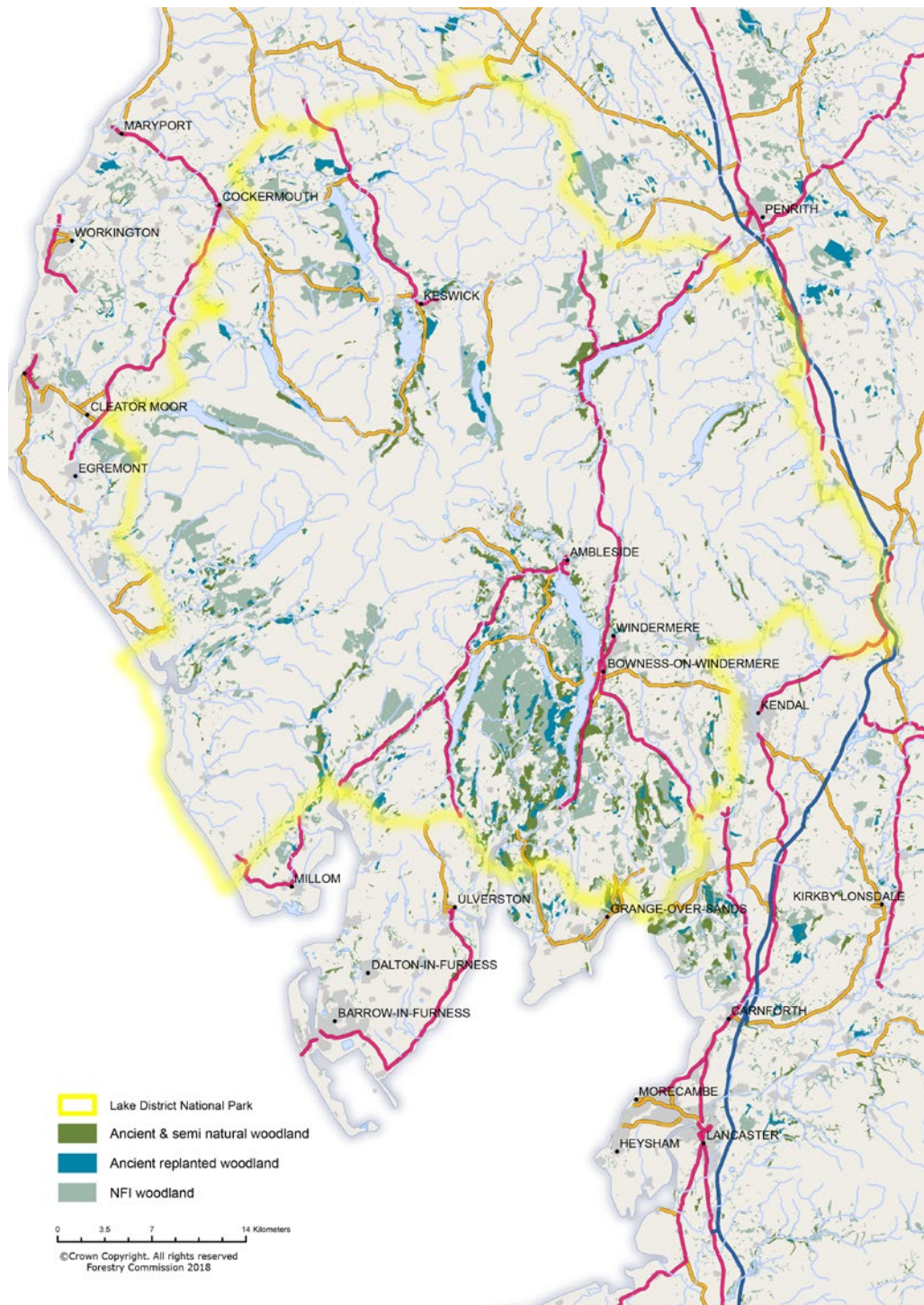
Part 2 - what our woodlands are like today

Table 9 Ancient woodland by ownership

Ownership	Ancient and Semi-Natural Woodland		Ancient replanted woodland		Total	
	Area (ha)	% of total area	Area (ha)	% of total area	Area (ha)	% of total area
Lake District National Park - W H S						
Ancient woodland						
Forestry Commission	490	7	763	23	1,253	13
Private sector	6,074	93	2,550	77	8,624	87
Total area	**6,564**	**100**	**3,313**	**100**	**9,877**	**100**
Ancient woodland within NFI woodland						
Forestry Commission	484	8	758	24	1,242	13
Private sector	5,564	92	2,463	76	8,027	87
Total area	**6,048**	**100**	**3,221**	**100**	**9,269**	**100**

Note that Ancient Replanted Woodland is alternatively known as Plantations on ancient woodland sites (PAWS). The Ancient woodland data[*] does not differentiate between areas of restored and unrestored PAWS.

Species diversity

Table 10 Measure of diversity - Shannon index

	Shannon Index
Lake District National Park - W H S	2.85

---

[*] Data sourced from Natural England https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodlands-england

Net area under canopy

Stocked area by species

Figure 8 Stocked area by principal tree species
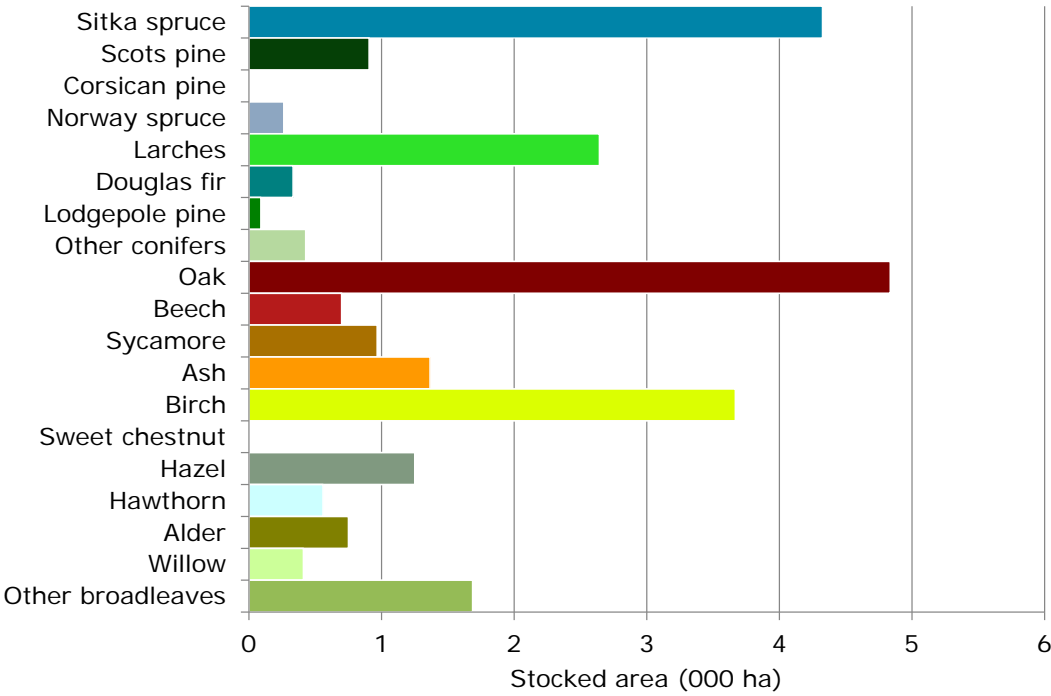
Part 2 - what our woodlands are like today

Table 11 Stocked area by principal tree species

Principal species	FC area (000 ha)	Private sector area (000 ha)	SE%	Total area (000 ha)	% of all species
Conifers					
Sitka spruce	2.9	1.5	20	4.3	17.1
Scots pine	0.3	0.6	31	0.9	3.6
Corsican pine	< 0.1	0.0	-	< 0.1	< 0.1
Norway spruce	< 0.1	0.2	61	0.3	1.0
Larches	1.0	1.6	19	2.6	10.5
Douglas fir	0.2	< 0.1	77	0.3	1.3
Lodgepole pine	< 0.1	< 0.1	120	< 0.1	0.4
Other conifers	0.2	0.3	28	0.4	1.7
All conifers	**4.8**	**4.3**	*9*	**9.0**	**35.7**
Broadleaves					
Oak	0.4	4.4	9	4.8	19.1
Beech	0.1	0.6	27	0.7	2.8
Sycamore	< 0.1	0.9	26	1.0	3.8
Ash	< 0.1	1.3	17	1.4	5.4
Birch	0.6	3.1	11	3.7	14.5
Sweet chestnut	0.0	< 0.1	90	< 0.1	< 0.1
Hazel	< 0.1	1.2	17	1.3	4.9
Hawthorn	0.0	0.6	34	0.6	2.2
Alder	< 0.1	0.7	24	0.7	3.0
Willow	< 0.1	0.4	27	0.4	1.6
Other broadleaves	0.4	1.2	11	1.7	6.7
All broadleaves	**1.8**	**14.4**	*3*	**16.2**	**64.1**
All species					
All species	**6.6**	**18.7**	*2*	**25.3**	**100.0**

Part 2 - what our woodlands are like today

Figure 9 Stocked area by principal conifer species

Sitka spruce
Scots pine
Corsican pine
Norway spruce
Larches
Douglas fir
Lodgepole pine
Other conifers
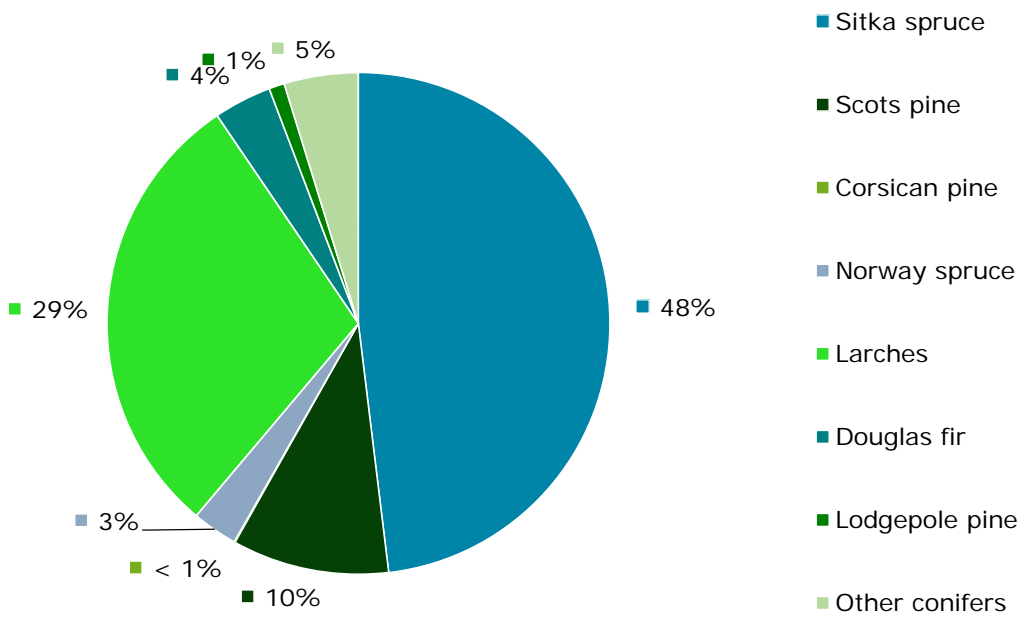
Figure 10 Stocked area by principal broadleaved species

Oak
Beech
Sycamore
Ash
Birch
Sweet chestnut
Hazel
Hawthorn
Alder
Willow
Other broadleaves
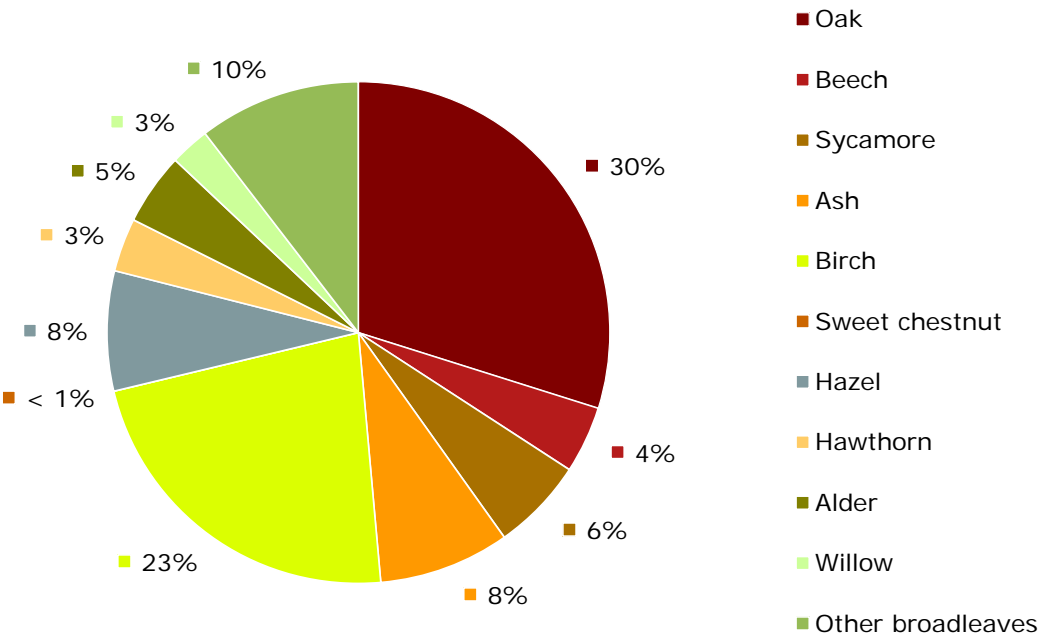
Part 2 - what our woodlands are like today

Stocked area by age class

Figure 11 Stocked area by age class
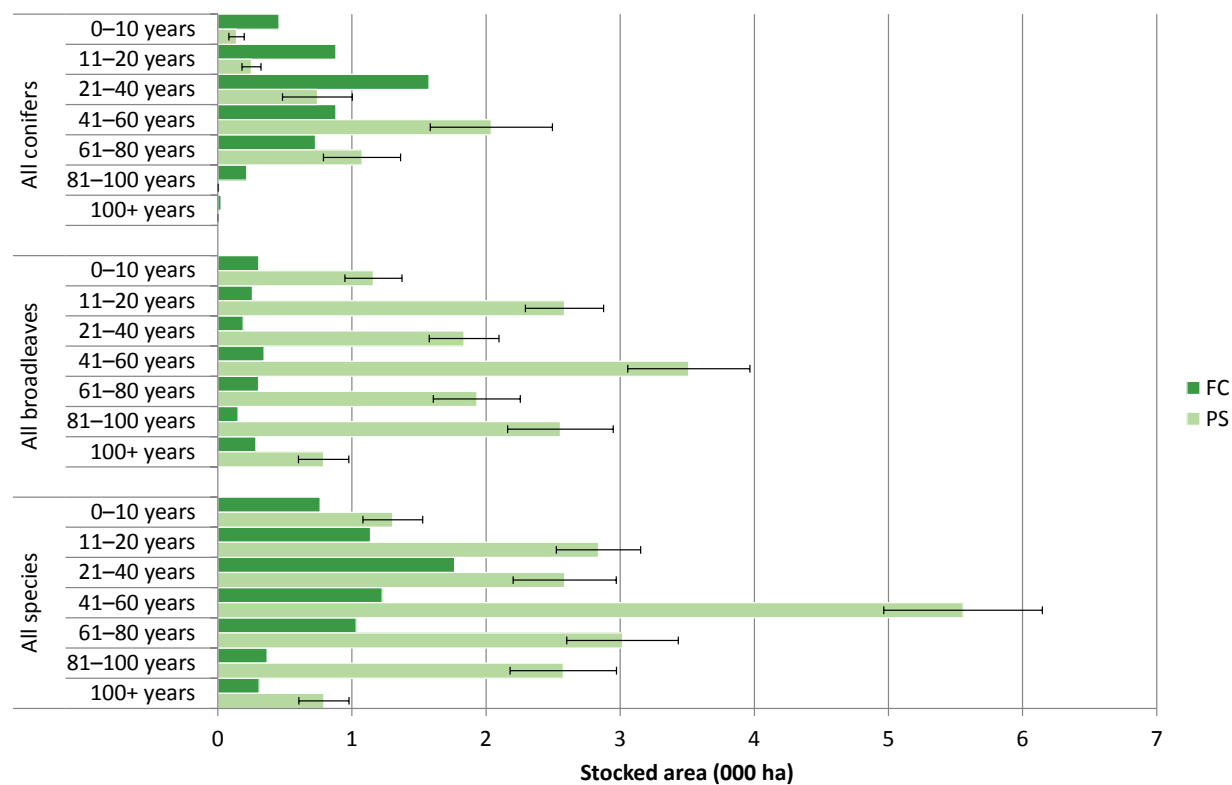
Table 12 Stocked area by age class

Age class (years)	FC	Private sector		Total	proportion by area	
	area (000 ha)	area (000 ha)	SE%	area (000 ha)	% within category	% of total
All conifers						
0–10	0.5	0.1	41	0.6	6.6	2.4
11–20	0.9	0.3	28	1.1	12.6	4.5
21–40	1.6	0.7	35	2.3	25.7	9.2
41–60	0.9	2.0	22	2.9	32.4	11.6
61–80	0.7	1.1	27	1.8	20.0	7.1
81–100	0.2	< 0.1	99	0.2	2.4	0.9
100+	< 0.1	0.0	-	< 0.1	0.3	< 0.1
Total	**4.8**	**4.3**	**9**	**9.0**	**100.0**	**35.7**
All broadleaves						
0–10	0.3	1.2	18	1.5	9.0	5.8
11–20	0.3	2.6	11	2.8	17.5	11.2
21–40	0.2	1.8	14	2.0	12.5	8.0
41–60	0.3	3.5	13	3.9	23.8	15.3
61–80	0.3	1.9	17	2.2	13.8	8.8
81–100	0.2	2.6	15	2.7	16.7	10.7
100+	0.3	0.8	24	1.1	6.6	4.2
Total	**1.8**	**14.4**	**3**	**16.2**	**100.0**	**64.1**
All species						
0–10	0.8	1.3	17	2.1	8.2	8.2
11–20	1.1	2.8	11	4.0	15.7	15.7
21–40	1.8	2.6	15	4.4	17.2	17.2
41–60	1.2	5.6	11	6.8	26.8	26.8
61–80	1.0	3.0	14	4.0	16.0	16.0
81–100	0.4	2.6	15	2.9	11.6	11.6
100+	0.3	0.8	24	1.1	4.4	4.4
Total	**6.6**	**18.7**	**2**	**25.3**	**100.0**	**100.0**

Part 2 - what our woodlands are like today

Stocked area by mean stand dbh class

Figure 12 Stocked area by mean stand dbh class
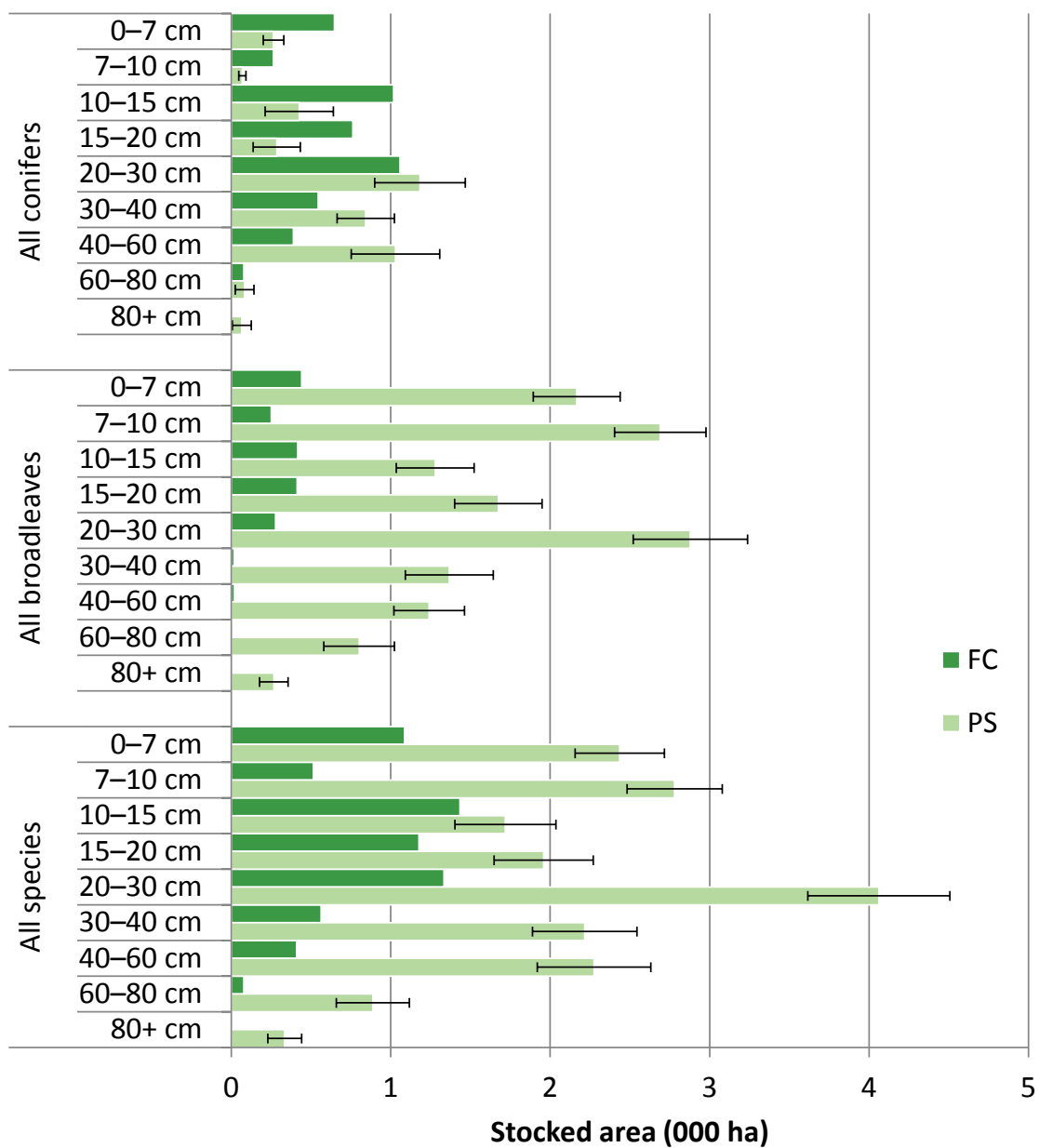
Part 2 - what our woodlands are like today

Table 13 Stocked area by mean stand dbh class

Mean stand DBH (cm)	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
All conifers				
0–7	0.6	0.3	24	**0.9**
7–10	0.3	< 0.1	32	**0.3**
10–15	1.0	0.4	50	**1.4**
15–20	0.8	0.3	52	**1.0**
20–30	1.1	1.2	24	**2.2**
30–40	0.5	0.8	21	**1.4**
40–60	0.4	1.0	27	**1.4**
60–80	< 0.1	< 0.1	71	**0.2**
80+	< 0.1	< 0.1	90	**< 0.1**
Total	**4.8**	**4.3**	**9**	**9.0**
All broadleaves				
0–7	0.4	2.2	13	**2.6**
7–10	0.3	2.7	11	**2.9**
10–15	0.4	1.3	19	**1.7**
15–20	0.4	1.7	16	**2.1**
20–30	0.3	2.9	12	**3.2**
30–40	< 0.1	1.4	20	**1.4**
40–60	< 0.1	1.2	18	**1.3**
60–80	0.0	0.8	28	**0.8**
80+	< 0.1	0.3	33	**0.3**
Total	**1.8**	**14.4**	**3**	**16.2**
All species				
0–7	1.1	2.4	12	**3.5**
7–10	0.5	2.8	11	**3.3**
10–15	1.4	1.7	18	**3.2**
15–20	1.2	2.0	16	**3.1**
20–30	1.3	4.1	11	**5.4**
30–40	0.6	2.2	15	**2.8**
40–60	0.4	2.3	16	**2.7**
60–80	< 0.1	0.9	26	**1.0**
80+	< 0.1	0.3	32	**0.3**
Total	**6.6**	**18.7**	**2**	**25.3**

Part 2 - what our woodlands are like today

Clearfelled area

Table 14 Clearfelled area

Clearfelled area	FC	Private sector		Total
	area (000 ha)	area (000 ha)	*SE%*	area (000 ha)
Lake District National Park - W H S	762.9	653.3	30	**1,416.2**

Comparison of mapped area estimates and stocked area estimates

Figure 13 Simplified comparison of mapped area and stocked area
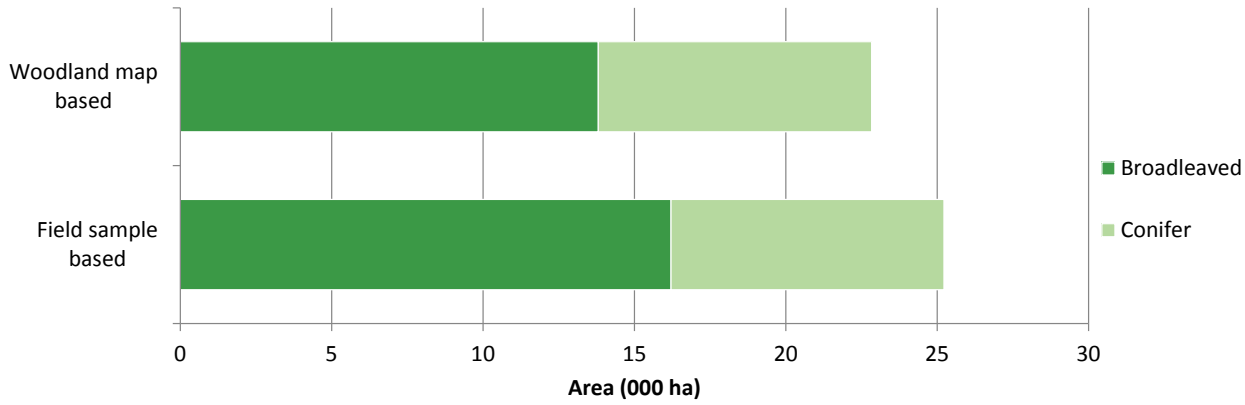
Table 15 Simplified comparison of mapped area and stocked area

	Woodland map based	Field sample based
	area (000 ha)	
Lake District National Park - W H S		
Broadleaved	13.8	16.2
Conifer	9.0	9.0

The broadleaved class includes broadleaved, mixed mainly broadleaved, coppice and coppice with standards. The conifer class includes conifer and mixed mainly conifer. The transition class is excluded from the woodland map based area as it is not possible to differentiate between conifer and broadleaves with aerial photography interpretation. Transition area (young trees) is included in the field sample based estimates.

Part 2 - what our woodlands are like today

Standing volume

Standing volume by species

Figure 14 Standing volume by principal tree species
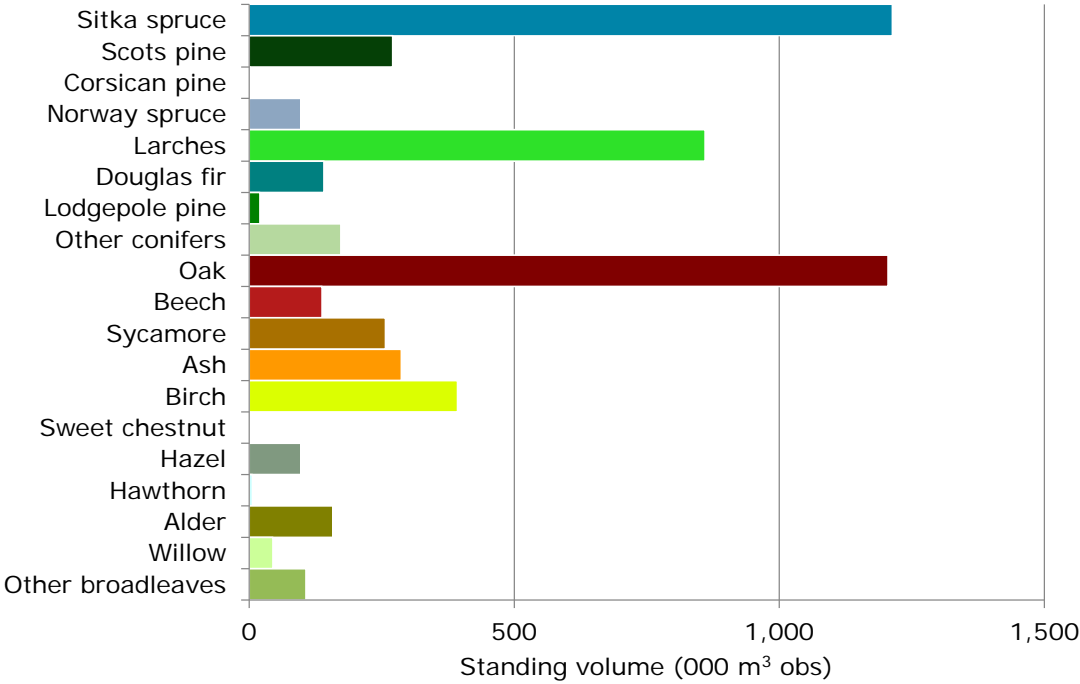
Part 2 - what our woodlands are like today

Table 16 Standing volume by principal tree species

Principal species	FC volume (000 m³ obs)	Private sector volume (000 m³ obs)	SE%	Total volume (000 m³ obs)	% of all species
Conifers					
Sitka spruce	612	601	24	1,213	22.1
Scots pine	42	228	34	271	4.9
Corsican pine	2	0	-	2	< 0.1
Norway spruce	38	60	57	97	1.8
Larches	224	636	22	860	15.6
Douglas fir	71	70	78	141	2.6
Lodgepole pine	19	1	120	20	0.4
Other conifers	36	137	35	173	3.1
All conifers	**1,043**	**1,753**	*12*	**2,797**	**50.9**
Broadleaves					
Oak	103	1,102	11	1,205	21.9
Beech	26	112	32	138	2.5
Sycamore	7	250	31	257	4.7
Ash	9	278	22	287	5.2
Birch	44	349	12	393	7.1
Sweet chestnut	0	< 1	90	< 1	0.0
Hazel	15	83	26	98	1.8
Hawthorn	0	6	28	6	0.1
Alder	4	154	29	158	2.9
Willow	< 1	45	36	45	0.8
Other broadleaves	52	55	25	107	2.0
All broadleaves	**259**	**2,439**	*6*	**2,698**	**49.1**
All species					
All species	**1,303**	**4,196**	*6*	**5,498**	**100.0**

Part 2 - what our woodlands are like today

Figure 15 Standing volume by principal conifer species

Legend:
- Sitka spruce
- Scots pine
- Corsican pine
- Norway spruce
- Larches
- Douglas fir
- Lodgepole pine
- Other conifers
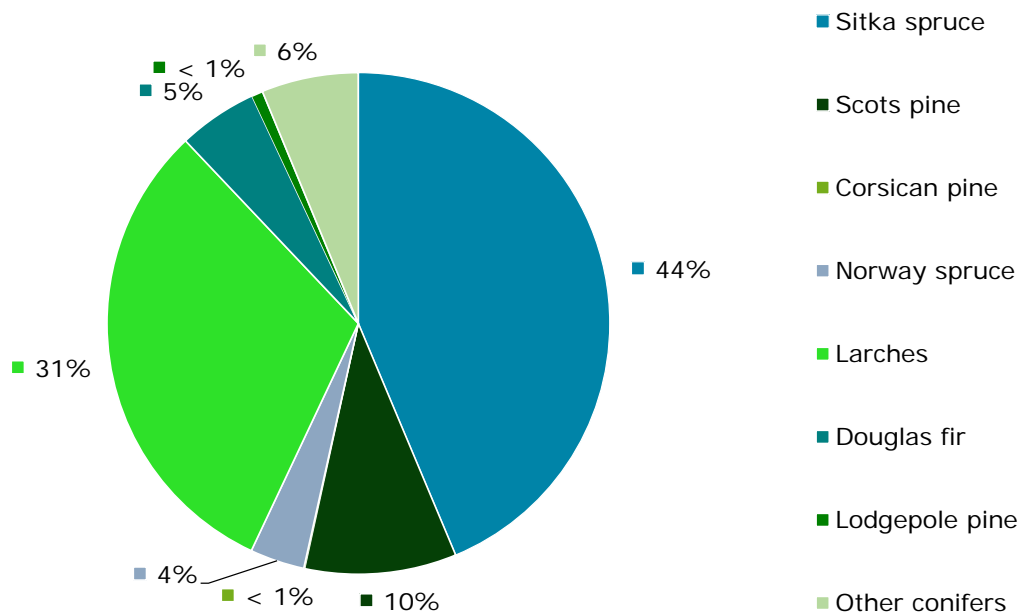
Figure 16 Standing volume by principal broadleaved species

Legend:
- Oak
- Beech
- Sycamore
- Ash
- Birch
- Sweet chestnut
- Hazel
- Hawthorn
- Alder
- Willow
- Other broadleaves
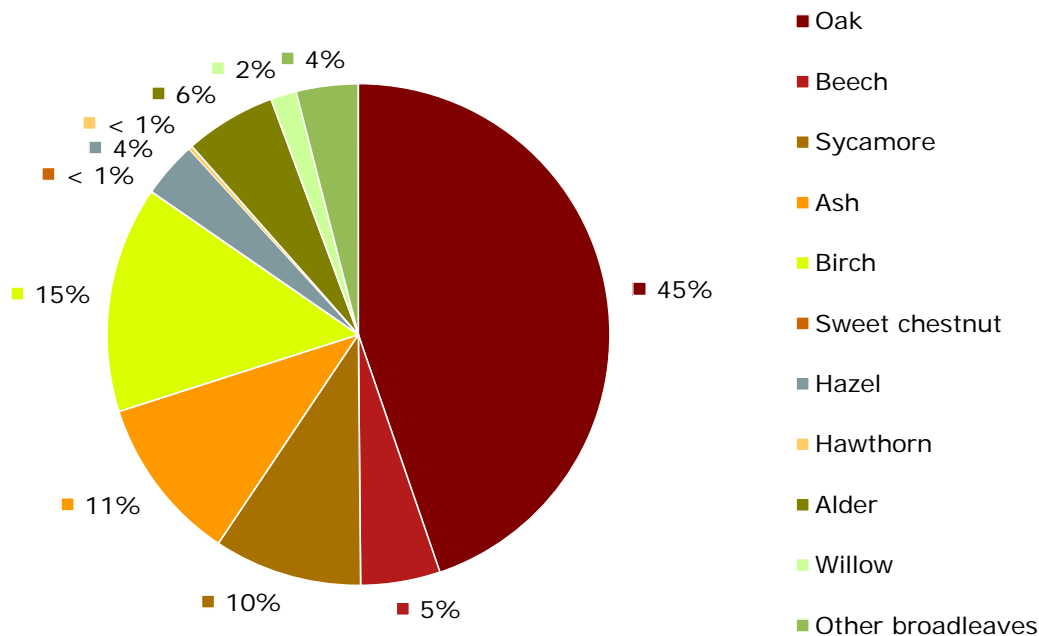
Standing volume by age class

Figure 17 Standing volume by age class
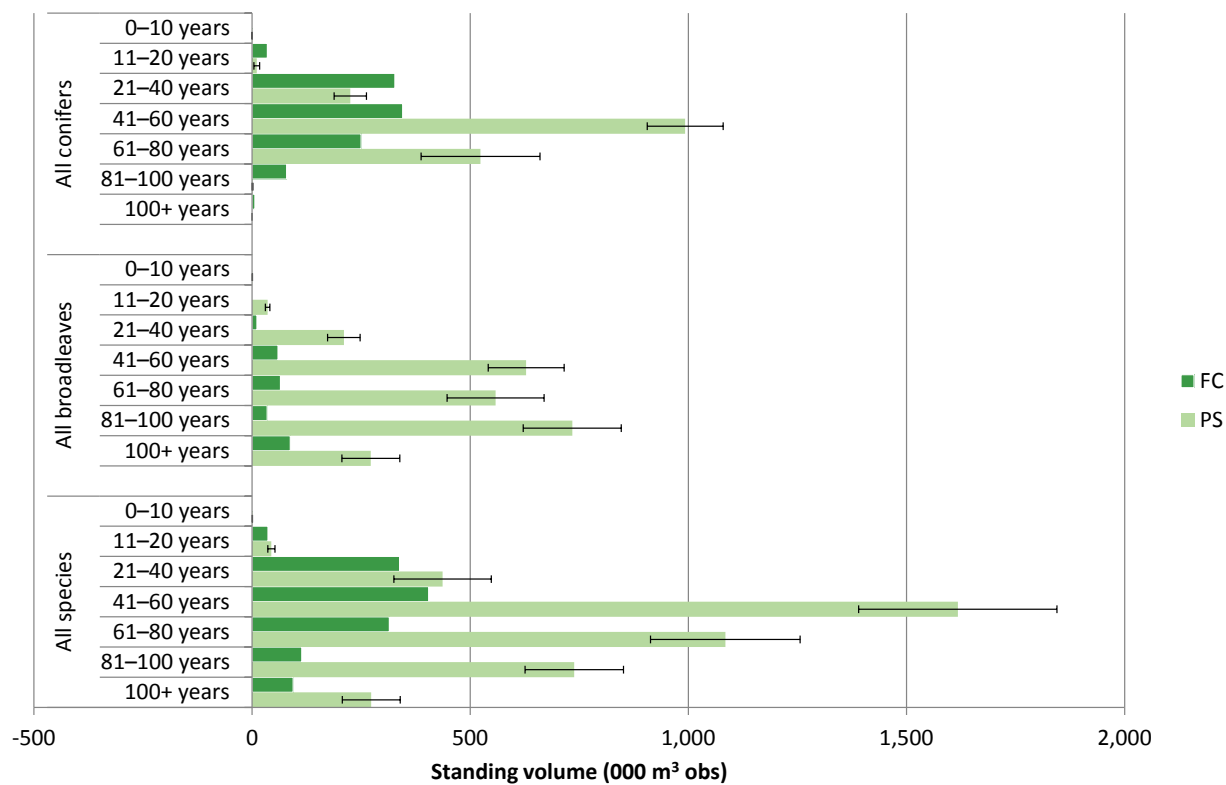
Part 2 - what our woodlands are like today

Table 17 Standing volume by age class

Age class (years)	FC volume (000 m³ obs)	Private sector volume (000 m³ obs)	SE%	Total volume (000 m³ obs)
All conifers				
0–10	< 1	< 1	120	< 1
11–20	35	11	60	46
21–40	327	225	16	553
41–60	345	993	9	1,338
61–80	250	524	26	773
81–100	79	< 1	117	80
100+	6	0	-	6
Total	**1,043**	**1,753**	**12**	**2,797**
All broadleaves				
0–10	< 1	< 1	49	< 1
11–20	2	36	14	37
21–40	11	210	18	221
41–60	60	628	14	688
61–80	65	558	20	623
81–100	35	734	15	769
100+	88	272	24	360
Total	**259**	**2,439**	**6**	**2,698**
All species				
0–10	< 1	< 1	46	< 1
11–20	37	44	19	81
21–40	338	437	26	775
41–60	405	1,618	14	2,023
61–80	315	1,085	16	1,399
81–100	114	738	15	852
100+	94	273	24	367
Total	**1,303**	**4,196**	**6**	**5,498**

Part 2 - what our woodlands are like today

Standing volume by mean stand dbh class

Figure 18 Standing volume by stand mean dbh class

Standing volume (000 m³ obs)

Table 18 Standing volume by mean stand dbh class

Mean stand DBH (cm)	FC volume (000 m³ obs)	Private sector volume (000 m³ obs)	SE%	Total volume (000 m³ obs)
All conifers				
0–7	< 1	< 1	59	< 1
7–10	6	3	29	9
10–15	93	62	50	155
15–20	174	84	49	258
20–30	414	501	26	915
30–40	195	414	23	608
40–60	125	587	28	712
60–80	36	64	44	100
80+	< 1	39	90	40
Total	**1,043**	**1,753**	**12**	**2,797**
All broadleaves				
0–7	< 1	12	15	12
7–10	7	70	16	76
10–15	68	182	18	250
15–20	94	265	18	360
20–30	82	655	13	737
30–40	3	347	22	350
40–60	4	399	18	403
60–80	< 1	319	27	319
80+	< 1	192	32	192
Total	**259**	**2,439**	**6**	**2,698**
All species				
0–7	< 1	12	15	13
7–10	13	74	16	86
10–15	161	245	18	406
15–20	268	348	18	616
20–30	496	1,154	13	1,651
30–40	198	761	16	959
40–60	129	987	18	1,116
60–80	36	383	24	419
80+	< 1	232	30	233
Total	**1,303**	**4,196**	**6**	**5,498**

Number of measurable trees

Number of measurable trees by species

Figure 19 Number of measurable trees by principal tree species
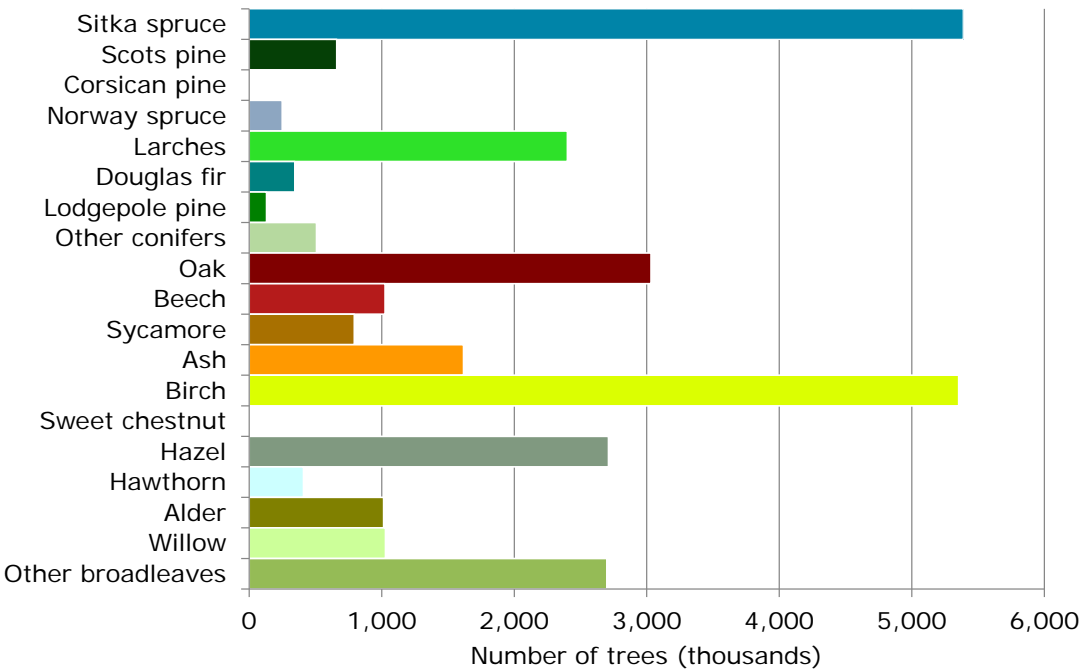
Table 19 Number of measurable trees by principal tree species

Principal species	FC number of trees (thousands)	Private sector number of trees (thousands)	SE%	Total number of trees (thousands)
Conifers				
Sitka spruce	3,823	1,565	29	5,388
Scots pine	231	431	34	661
Corsican pine	4	0	-	4
Norway spruce	69	181	65	250
Larches	1,214	1,187	23	2,401
Douglas fir	234	111	90	345
Lodgepole pine	127	3	120	130
Other conifers	219	289	38	509
All conifers	**5,920**	**3,709**	**15**	**9,629**
Broadleaves				
Oak	570	2,461	13	3,031
Beech	225	800	39	1,025
Sycamore	63	730	21	793
Ash	100	1,518	19	1,618
Birch	823	4,531	16	5,354
Sweet chestnut	0	< 1	90	< 1
Hazel	201	2,510	20	2,711
Hawthorn	0	410	28	410
Alder	42	972	22	1,014
Willow	6	1,022	30	1,028
Other broadleaves	717	1,982	14	2,699
All broadleaves	**2,746**	**16,931**	**7**	**19,677**
All species				
All species	**8,666**	**20,701**	**6**	**29,367**

Number of measurable trees by age class

Figure 20 Number of measurable trees by age class
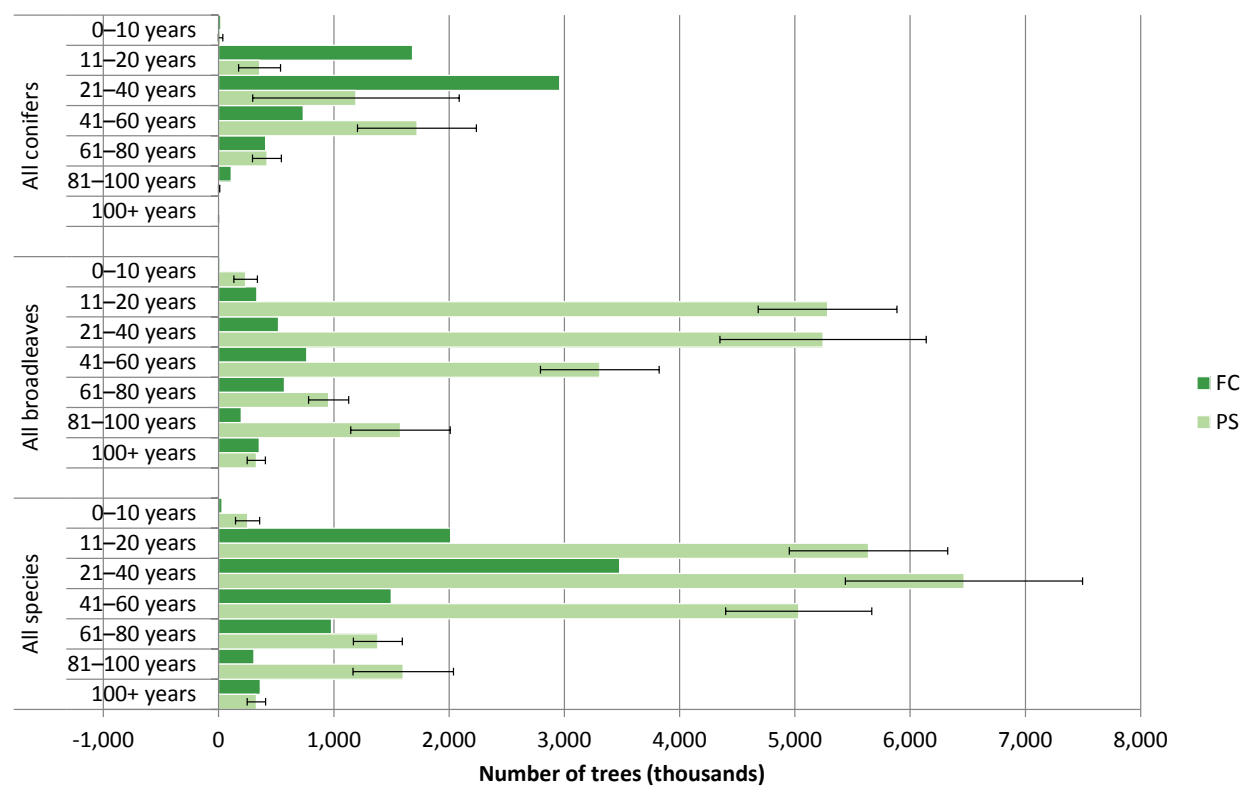
Table 20 Number of measurable trees by age class

Age class (years)	FC number of trees (thousands)	Private sector number of trees (thousands)	SE%	Total number of trees (thousands)
All conifers				
0–10	19	16	120	35
11–20	1,682	355	51	2,037
21–40	2,960	1,192	75	4,152
41–60	734	1,721	30	2,454
61–80	408	419	30	828
81–100	110	5	107	115
100+	8	0	-	8
Total	**5,920**	**3,709**	**15**	**9,629**
All broadleaves				
0–10	11	234	44	246
11–20	330	5,284	11	5,615
21–40	519	5,245	17	5,764
41–60	764	3,308	16	4,072
61–80	572	955	18	1,526
81–100	196	1,578	27	1,774
100+	353	327	24	680
Total	**2,746**	**16,931**	**7**	**19,677**
All species				
0–10	30	251	42	281
11–20	2,012	5,639	12	7,651
21–40	3,479	6,467	16	9,946
41–60	1,498	5,034	13	6,531
61–80	980	1,381	15	2,361
81–100	306	1,601	27	1,907
100+	361	328	24	689
Total	**8,666**	**20,701**	**6**	**29,367**

Number of measurable trees by mean stand dbh class

Figure 21 Number of measurable trees by mean stand dbh class
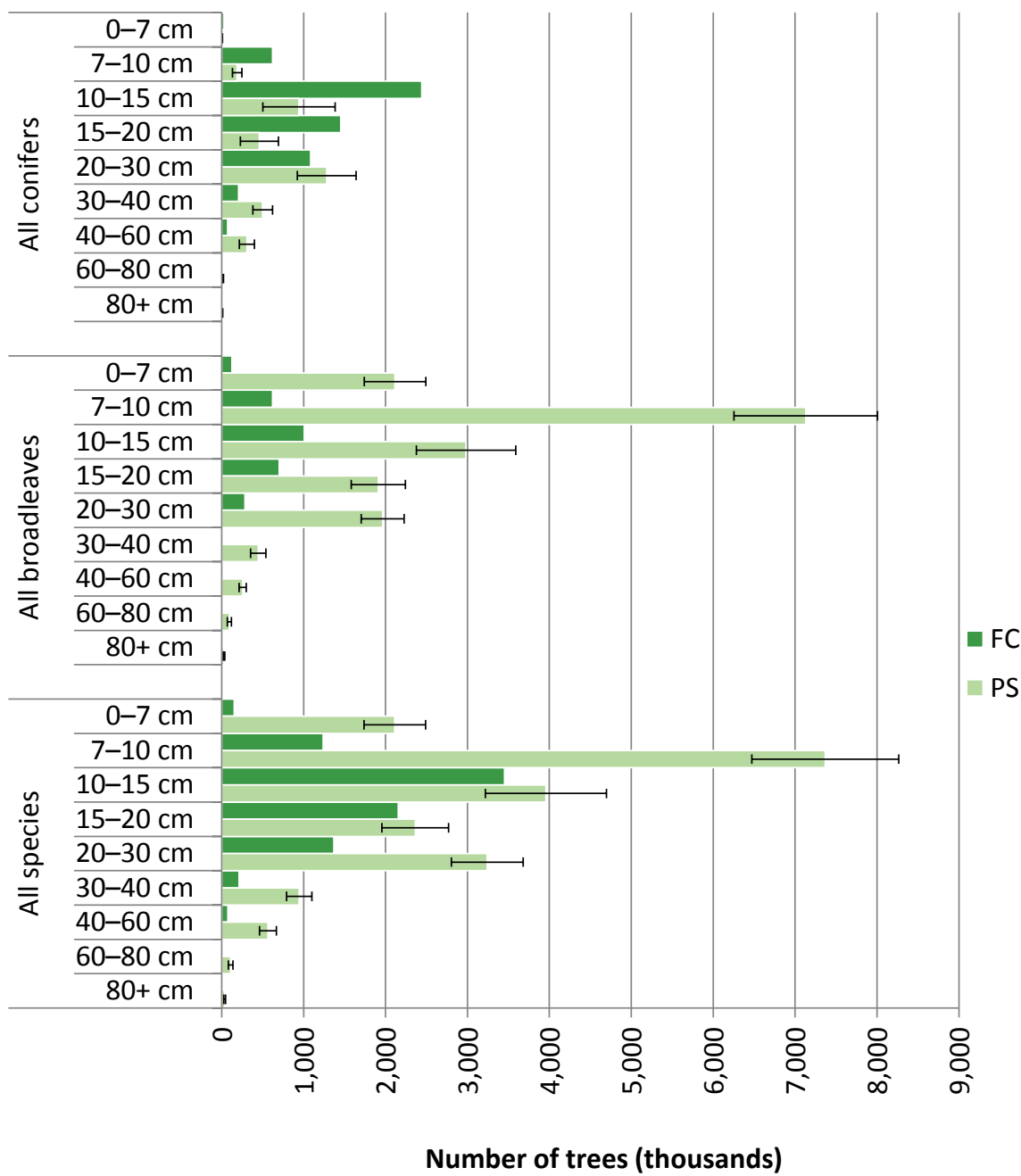
Table 21 Number of measurable trees by mean stand dbh class

Mean stand DBH	FC number of trees (thousands)	Private sector number of trees (thousands)	SE%	Total number of trees (thousands)
All conifers				
0–7 cm	29	6	61	34
7–10 cm	620	189	30	809
10–15 cm	2,444	943	47	3,386
15–20 cm	1,455	460	51	1,914
20–30 cm	1,084	1,282	28	2,366
30–40 cm	207	500	24	708
40–60 cm	73	309	30	382
60–80 cm	8	15	46	23
80+ cm	< 1	6	90	6
Total	**5,920**	**3,709**	**15**	**9,629**
All broadleaves				
0–7 cm	125	2,115	18	2,241
7–10 cm	620	7,131	12	7,751
10–15 cm	1,009	2,983	20	3,992
15–20 cm	701	1,912	17	2,612
20–30 cm	284	1,965	13	2,249
30–40 cm	4	446	21	451
40–60 cm	3	256	17	259
60–80 cm	< 1	94	28	94
80+ cm	< 1	29	34	29
Total	**2,746**	**16,931**	**7**	**19,677**
All species				
0–7 cm	154	2,113	18	2,267
7–10 cm	1,240	7,369	12	8,609
10–15 cm	3,452	3,959	19	7,411
15–20 cm	2,155	2,363	17	4,518
20–30 cm	1,369	3,242	13	4,610
30–40 cm	212	946	16	1,158
40–60 cm	76	565	18	641
60–80 cm	8	109	25	117
80+ cm	< 1	36	32	36
Total	**8,666**	**20,701**	**6**	**29,367**

Biomass stocks in live woodland trees

Biomass stocks by species

Figure 22 Biomass stocks by principal tree species
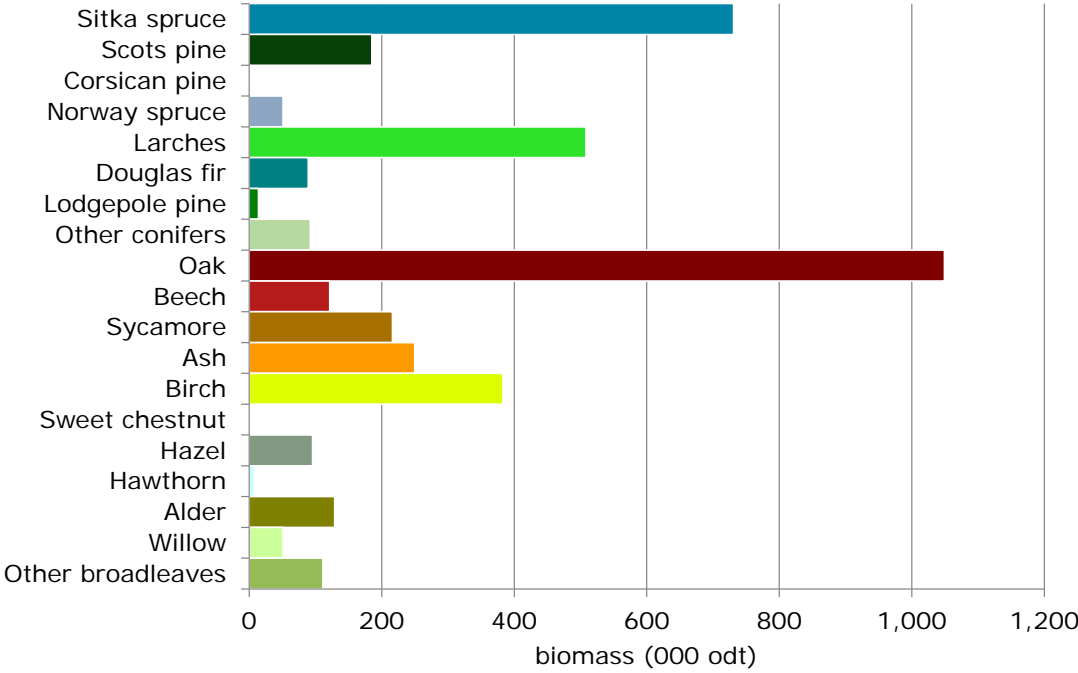
Part 2 - what our woodlands are like today

Table 22 Biomass stocks by principal tree species

Principal species	FC biomass (000 odt)	Private sector biomass (000 odt)	SE%	Total biomass (000 odt)	% of all species
Conifers					
Sitka spruce	390	341	23	731	17.8
Scots pine	31	154	35	185	4.5
Corsican pine	< 1	0	-	< 1	< 0.1
Norway spruce	20	31	56	51	1.2
Larches	144	364	22	508	12.4
Douglas fir	46	43	77	89	2.2
Lodgepole pine	13	< 1	120	14	0.3
Other conifers	21	71	35	92	2.2
All conifers	**666**	**1,018**	**12**	**1,684**	**41.0**
Broadleaves					
Oak	92	957	11	1,049	25.5
Beech	24	97	31	122	3.0
Sycamore	6	210	31	216	5.3
Ash	9	241	22	250	6.1
Birch	44	339	12	383	9.3
Sweet chestnut	0	< 1	90	< 1	0.0
Hazel	13	82	24	96	2.3
Hawthorn	0	8	27	8	0.2
Alder	3	126	28	129	3.1
Willow	< 1	51	36	51	1.2
Other broadleaves	48	63	20	111	2.7
All broadleaves	**240**	**2,180**	**6**	**2,419**	**58.9**
All species					
All species	**906**	**3,201**	**5**	**4,107**	**100.0**

Carbon stocks in live woodland trees

Carbon stocks by species

Figure 23 Carbon stocks by principal tree species
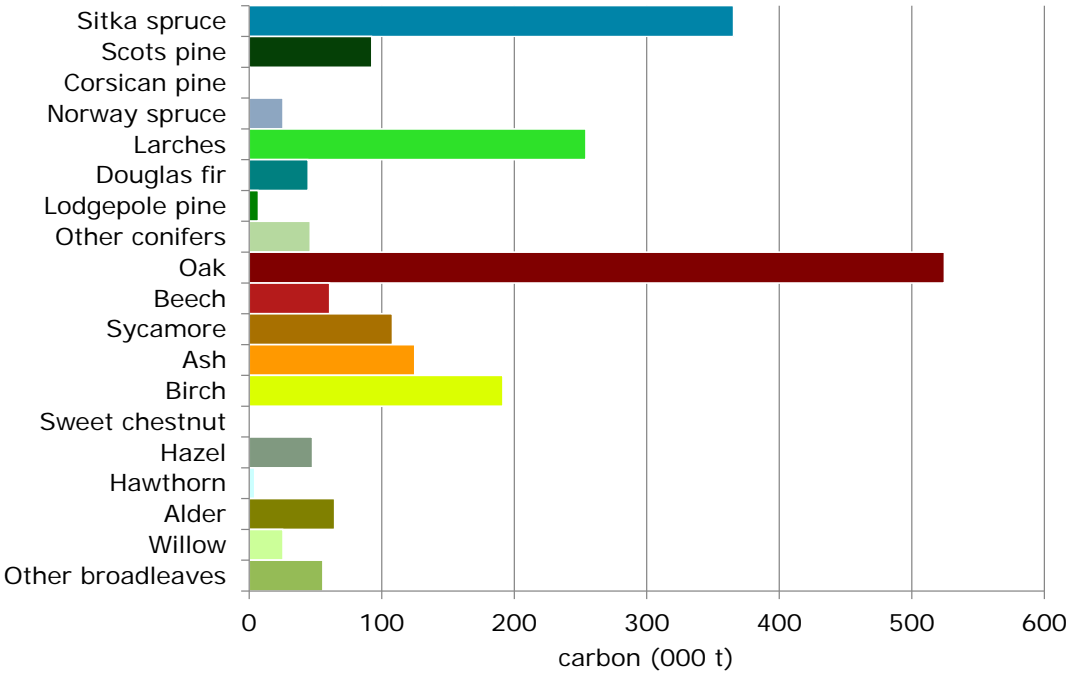
Part 2 - what our woodlands are like today

Table 23 Carbon stocks by principal tree species

Principal species	FC carbon (000 t)	Private sector carbon (000 t)	SE%	Total carbon (000 t)	% of all species
Conifers					
Sitka spruce	195	170	23	365	17.8
Scots pine	16	77	35	93	4.5
Corsican pine	< 1	0	-	< 1	< 0.1
Norway spruce	10	15	56	25	1.2
Larches	72	182	22	254	12.4
Douglas fir	23	22	77	45	2.2
Lodgepole pine	7	< 1	120	7	0.3
Other conifers	10	36	35	46	2.2
All conifers	**333**	**509**	**12**	**842**	**41.0**
Broadleaves					
Oak	46	478	11	525	25.5
Beech	12	49	31	61	3.0
Sycamore	3	105	31	108	5.3
Ash	4	121	22	125	6.1
Birch	22	169	12	191	9.3
Sweet chestnut	0	< 1	90	< 1	0.0
Hazel	7	41	24	48	2.3
Hawthorn	0	4	27	4	0.2
Alder	2	63	28	65	3.1
Willow	< 1	26	36	26	1.2
Other broadleaves	24	32	20	56	2.7
All broadleaves	**120**	**1,090**	**6**	**1,210**	**58.9**
All species					
All species	**453**	**1,601**	**5**	**2,054**	**100.0**

Existing woodland management information and economic viability data

Sample square distribution

Table 24 Sample square distribution

Number of squares surveyed	Number of Private sector squares surveyed	Number of Forestry Commission squares surveyed
Lake District National Park - W H S	116	32

Part 2 - what our woodlands are like today

Evidence of management

Table 25 Evidence of management

% sections	Broadleaf				Conifer			
Evidence of management	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age
Any management activity	**3.30**	**57.32**	**5.72**	**66.33**	**1.09**	**84.25**	**2.86**	**88.20**
Agroforestry	-	-	-	-	-	-	-	-
Brash Removal / Mulched / Burned	-	-	-	-	-	-	-	-
Brashing	-	0.38	-	0.38	-	2.56	0.54	3.10
Cleaning	-	1.14	0.38	1.52	-	-	-	-
Clearfell	-	15.73	1.15	16.88	0.54	29.55	1.77	31.87
Conservation	-	-	-	-	-	-	-	-
Coppicing	-	3.47	0.43	3.89	-	-	-	-
De-stumped	-	-	-	-	-	-	-	-
Draining	-	0.75	1.24	2.00	-	5.38	-	5.38
Fencing - Complete	1.98	14.30	2.48	18.77	-	3.36	-	3.36
Fencing - Partial	-	3.73	-	3.73	-	1.09	-	1.09
Game Birds	-	-	-	-	-	-	-	-
Grazing	-	-	0.41	-	-	-	-	-
Mounded	-	-	-	-	-	-	0.54	0.54
Orchard	-	-	-	-	-	-	-	-
Ornamental	-	-	-	-	-	-	-	-
Other	1.60	4.44	1.66	7.70	-	-	-	-
Personal Recreation	-	-	0.45	-	-	-	-	-
Planting	1.32	16.57	2.09	19.97	0.54	42.04	0.54	43.12
Ploughed DM	-	-	-	-	-	4.77	-	4.77
Ploughed SM	-	0.72	-	0.72	-	5.57	-	5.57
Pollarding	0.38	-	-	0.38	-	-	-	-
Pruning	-	-	0.79	0.79	-	-	-	-
Public Recreation	-	-	-	-	-	-	-	-
Ripped	-	-	-	-	-	-	-	-
Scarified	-	-	-	-	-	1.63	-	1.63
Shelter / Screening	-	-	-	-	-	-	-	-
Thinning More than Once	-	13.75	3.33	17.08	0.54	39.53	-	40.07
Thinning Once	-	7.23	1.54	8.76	-	10.25	1.77	12.03
Timber Production	-	-	-	-	-	-	-	-
Weeding	-	-	-	-	-	-	-	-
Windrowed	-	-	-	-	-	-	-	-

Note that the percentages in the body of the table may sum to over 100 as some sections have evidence of more than one type of management.

Part 2 - what our woodlands are like today

Table 25 cont'd Evidence of management

% sections	Neither broadleaf nor conifer				Total			
Evidence of management	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age
Any management activity	**3.00**	**19.42**	**6.71**	**29.13**	**2.44**	**64.75**	**4.71**	**71.89**
Agroforestry	-	-	-	-	-	-	-	-
Brash Removal / Mulched / Burned	-	2.80	-	2.80	-	0.21	-	-
Brashing	-	-	-	-	-	1.18	0.21	0.21
Cleaning	-	-	-	-	-	0.62	0.21	0.21
Clearfell	-	10.91	-	10.91	0.21	20.62	1.30	1.30
Conservation	-	-	-	-	-	-	-	-
Coppicing	-	-	-	-	-	1.90	0.23	0.23
De-stumped	-	-	-	-	-	-	-	-
Draining	-	5.60	-	5.60	-	2.87	0.68	0.68
Fencing - Complete	-	5.71	-	5.71	1.08	9.51	1.36	1.36
Fencing - Partial	-	-	-	-	-	2.45	-	-
Game Birds	-	-	-	-	-	-	-	-
Grazing	-	-	-	-	-	-	0.23	0.23
Mounded	-	-	-	-	-	-	0.21	0.21
Orchard	-	-	-	-	-	-	-	-
Ornamental	-	-	-	-	-	-	-	-
Other	3.00	-	6.71	9.71	1.10	2.43	1.40	1.40
Personal Recreation	-	-	-	-	-	-	0.24	0.24
Planting	-	-	6.71	6.71	0.93	25.01	1.84	1.84
Ploughed DM	-	-	-	-	-	1.81	-	-
Ploughed SM	-	-	-	-	-	2.51	-	-
Pollarding	-	-	-	-	0.21	-	-	-
Pruning	-	-	-	-	-	-	0.43	0.43
Public Recreation	-	-	-	-	-	-	-	-
Ripped	-	-	-	-	-	-	-	-
Scarified	-	-	-	-	-	0.62	-	-
Shelter / Screening	-	-	-	-	-	-	-	-
Thinning More than Once	-	-	-	-	0.21	22.52	1.82	1.82
Thinning Once	-	-	-	-	-	7.84	1.51	1.51
Timber Production	-	-	-	-	-	-	-	-
Weeding	-	-	-	-	-	-	-	-
Windrowed	-	-	-	-	-	-	-	-

Note that the percentages in the body of the table may sum to over 100 as some sections have evidence of more than one type of management.

Figure 24 Evidence of management in broadleaved sections
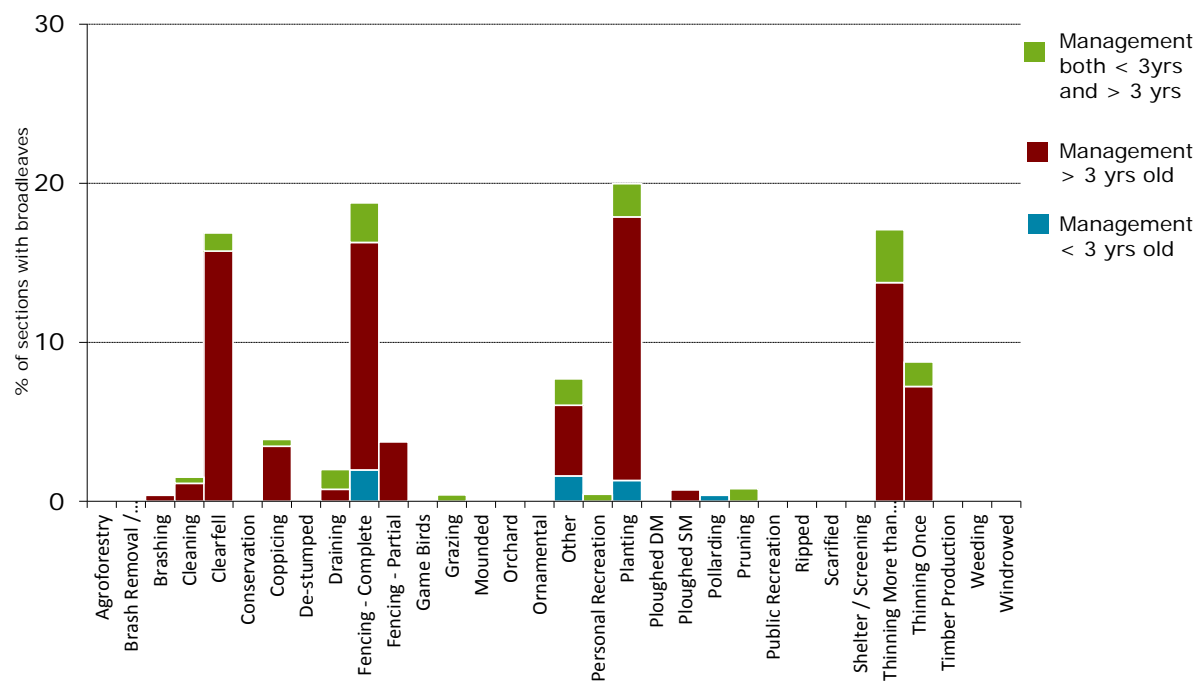
Figure 25 Evidence of management in conifer sections
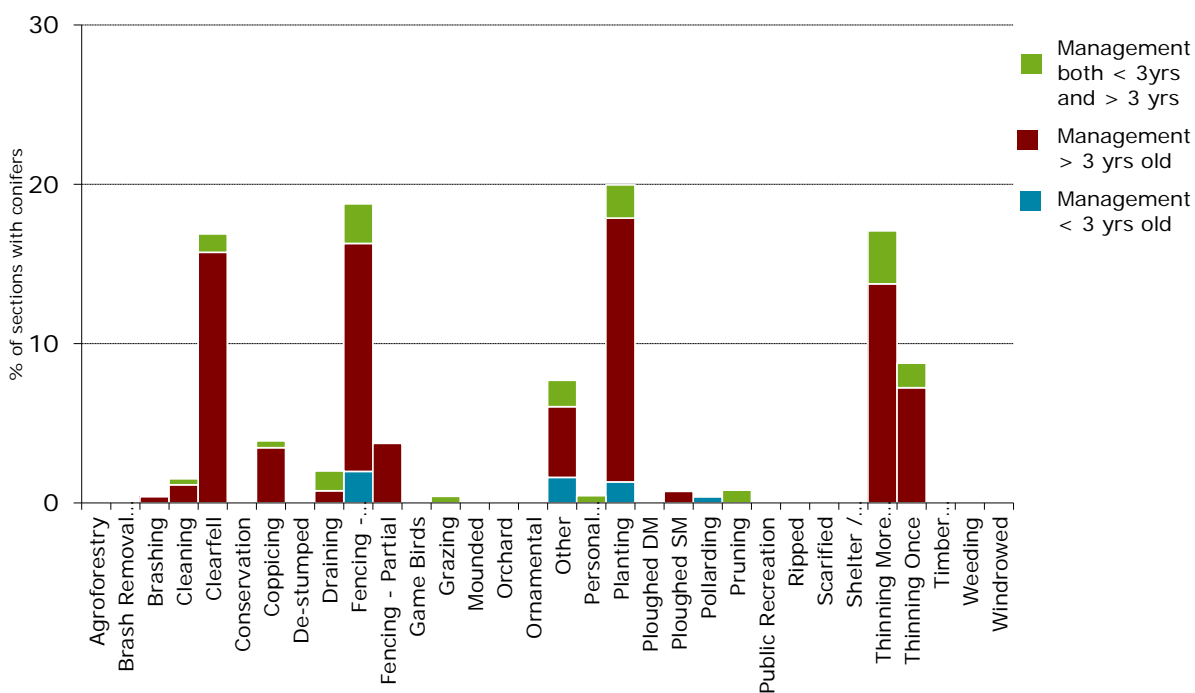
Figure 26 Evidence of management in sections with neither broadleaves nor conifers
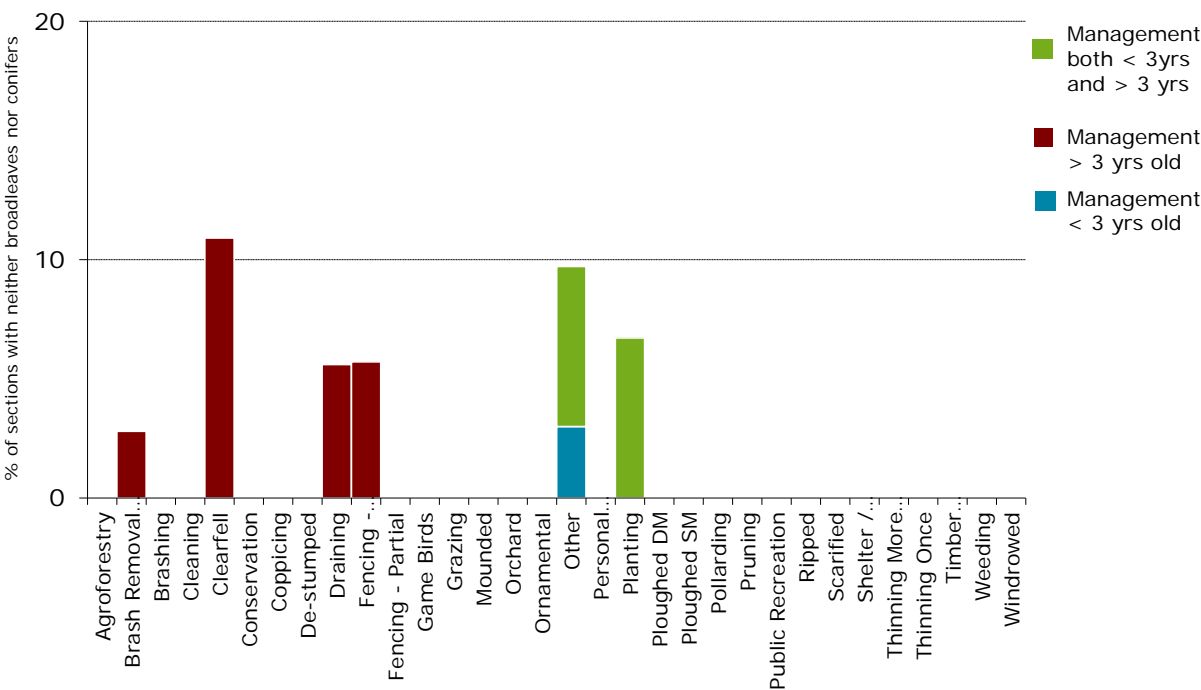
Evidence of thinning

Table 26 Evidence of thinning

% sections	Broadleaf				Conifer			
Evidence of thinning	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age
Any thinning	-	**20.14**	**4.09**	**24.23**	**0.54**	**48.70**	**1.23**	**51.01**
First thinning	-	6.39	0.77	7.16	-	9.17	1.77	10.94
Subsequent thinning	-	13.75	3.33	17.08	0.54	39.53	-	40.07
No evidence of thinning	75.77			75.77	48.99			48.99

Table 26 cont'd Evidence of thinning

% sections	Neither broadleaf nor conifer				Total			
Evidence of thinning	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age	< 3 yrs old only	> 3 yrs old only	both <3 and >3	Any age
Any thinning	-	-	-	-	**0.21**	**29.50**	**2.91**	**32.61**
First thinning	-	-	-	-	-	**6.97**	**1.09**	**8.07**
Subsequent thinning	-	-	-	-	**0.21**	**22.52**	**1.82**	**24.55**
No evidence of thinning	100.00			100.00	**67.39**			**67.39**

Figure 27 Evidence of thinning
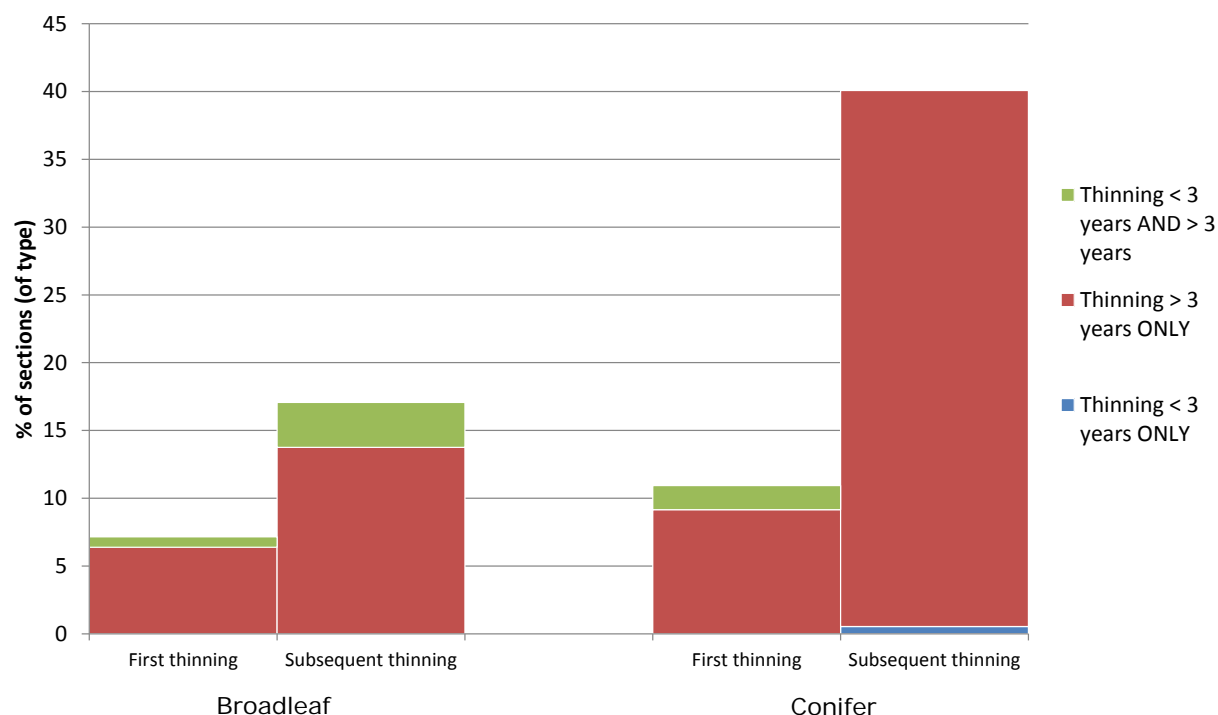
Suitability for harvesting

Figure 28 Suitability for harvesting

Chart legend:
- Not possible to assess
- Mechanised harvesting impossible on site
- Sky line site
- Tracked vehicle only on site
- Wheeled vehicle possible on site

Y-axis: % of sections (by type)

X-axis categories: Lake District National Park - W H S, Broadleaf, Conifer, Neither BL nor conifer
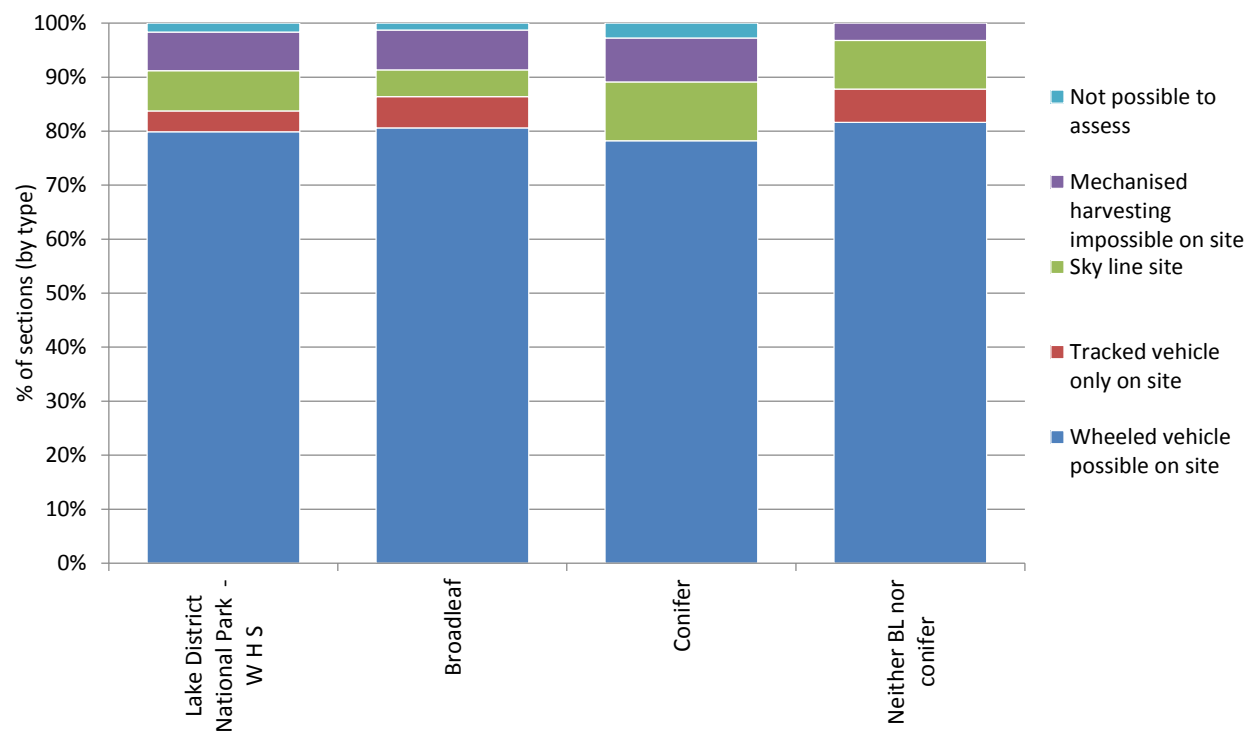
Part 2 - what our woodlands are like today

Distance to road

Figure 29 Distance to road
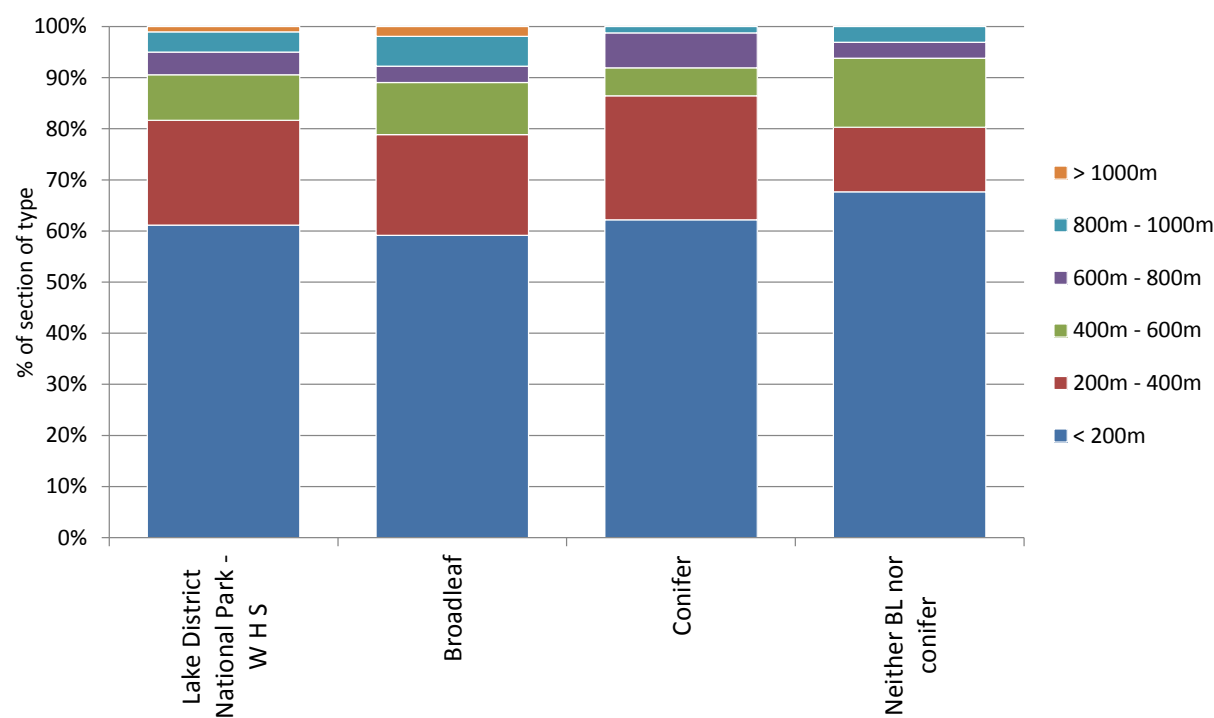
Part 2 - what our woodlands are like today

Type of road or ride

Figure 30 Road or ride in survey square
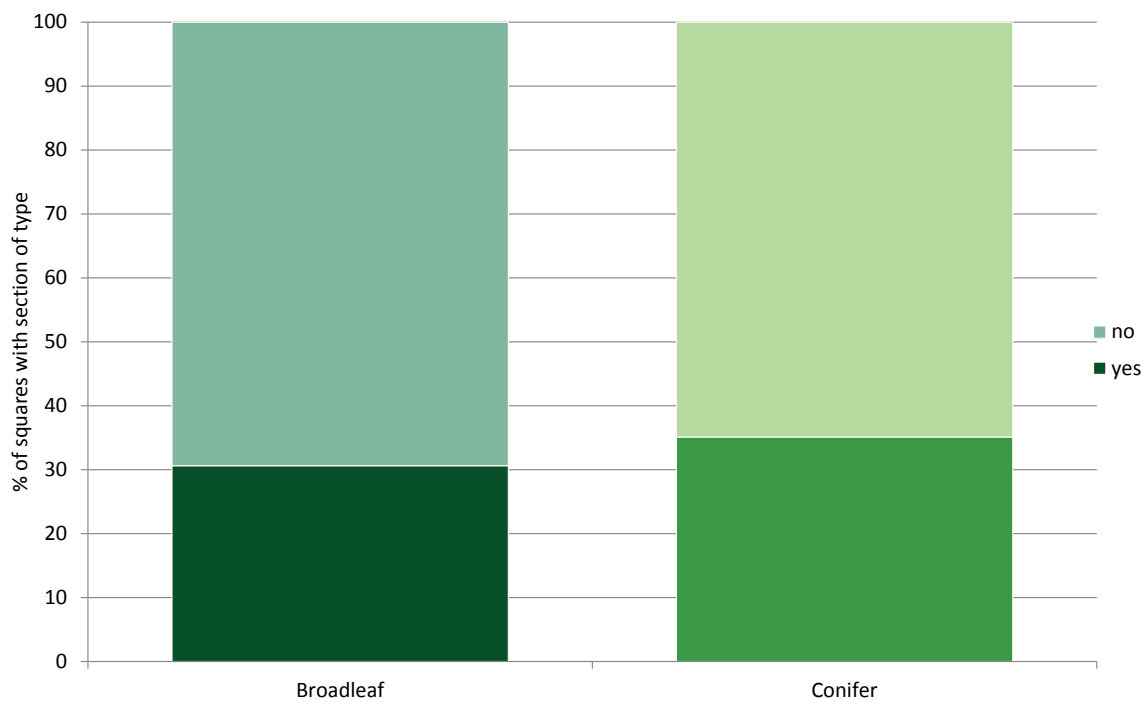
Figure 31 Type of road or ride in survey square
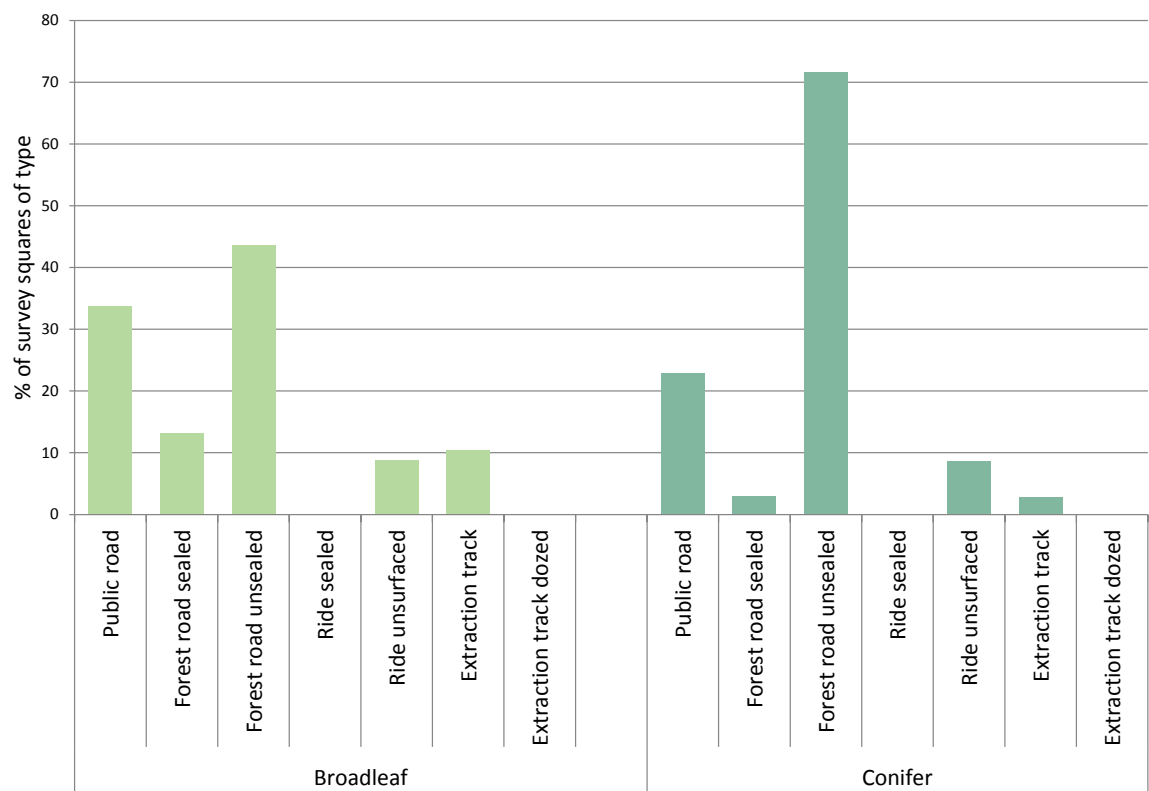
Mean yield class

Figure 32 Mean yield class by principal tree species
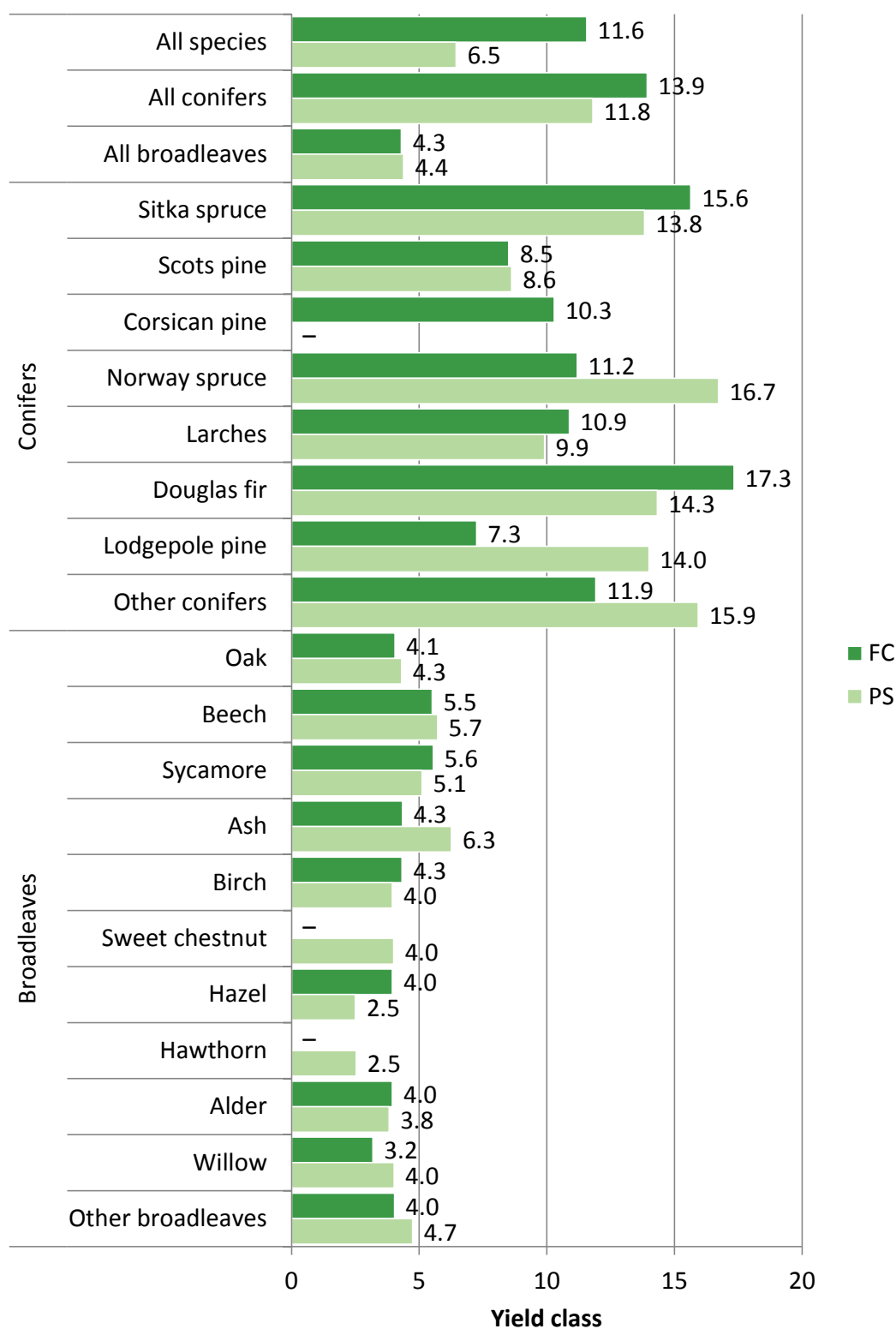
Table 27 Mean yield class by principal tree species

Principal species	FC	Private sector
	mean yield class weighted by area (000 m^3 obs)	
Conifers		
Sitka spruce	15.6	13.8
Scots pine	8.5	8.6
Corsican pine	10.3	–
Norway spruce	11.2	16.7
Larches	10.9	9.9
Douglas fir	17.3	14.3
Lodgepole pine	7.3	14.0
Other conifers	11.9	15.9
All conifers	13.9	11.8
Broadleaves		
Oak	4.1	4.3
Beech	5.5	5.7
Sycamore	5.6	5.1
Ash	4.3	6.3
Birch	4.3	4.0
Sweet chestnut	–	4.0
Hazel	4.0	2.5
Hawthorn	–	2.5
Alder	4.0	3.8
Willow	3.2	4.0
Other broadleaves	4.0	4.7
All broadleaves	4.3	4.4
All species		
All species	11.6	6.5

Part 2 - what our woodlands are like today

Overdue timber stocks

Overdue volume and area

Table 28 Standing volume in overdue timber stocks

	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	SE %	volume (000 m³ obs)
Lake District National Park - W H S				
All conifers	47	868	18	915
All broadleaves	2	1,349	10	1,351
All species	**49**	**2,215**	**9**	**2,264**

Table 29 Stocked area of overdue timber stocks

	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE %	area (000 ha)
Lake District National Park - W H S				
All conifers	0.1	1.6	18	1.7
All broadleaves	< 0.1	4.8	8	4.9
All species	**0.2**	**6.4**	**7**	**6.6**

Part 3 – How our woodlands might change over time

Part 3 - how our woodlands might change

50-year softwood forecast

50-year forecast of softwood timber availability

Figure 33 Summary of 50-year forecast of softwood timber availability; average annual volume within period
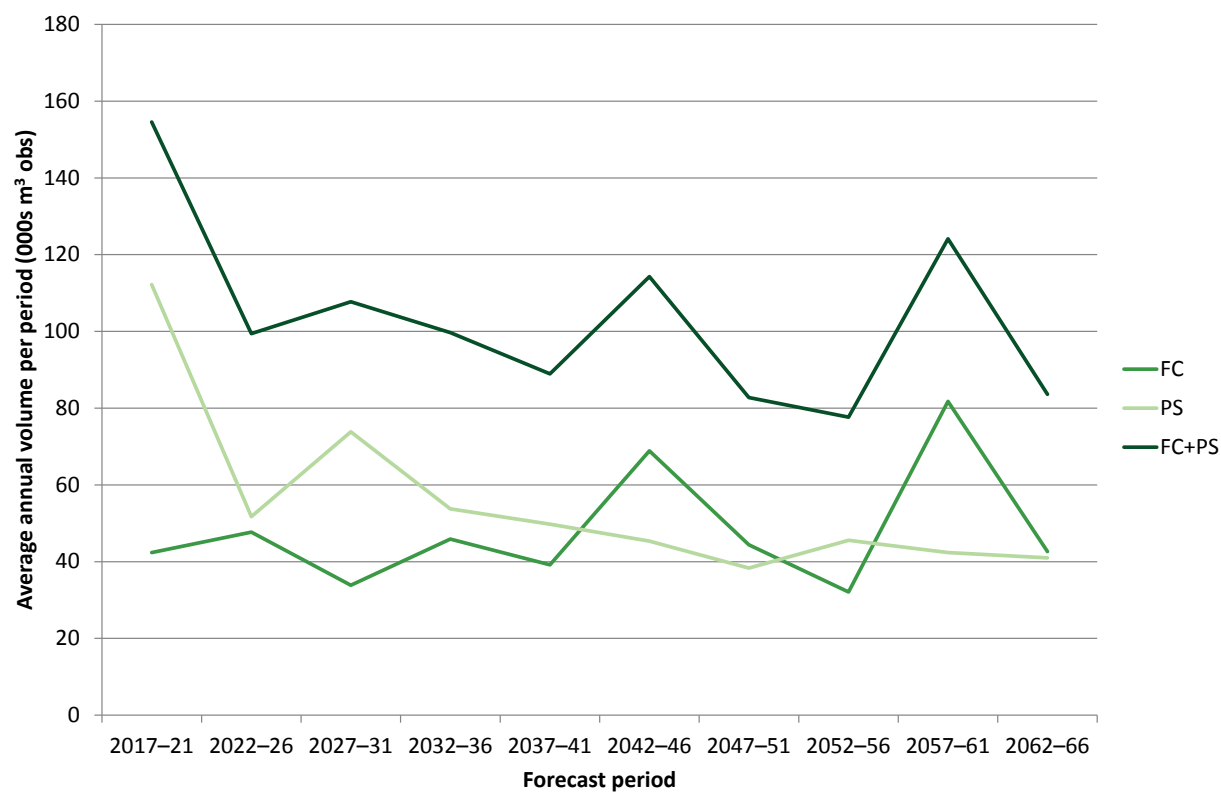
Part 3 - how our woodlands might change

Figure 34 50–year forecast of softwood timber availability; average annual volume within period
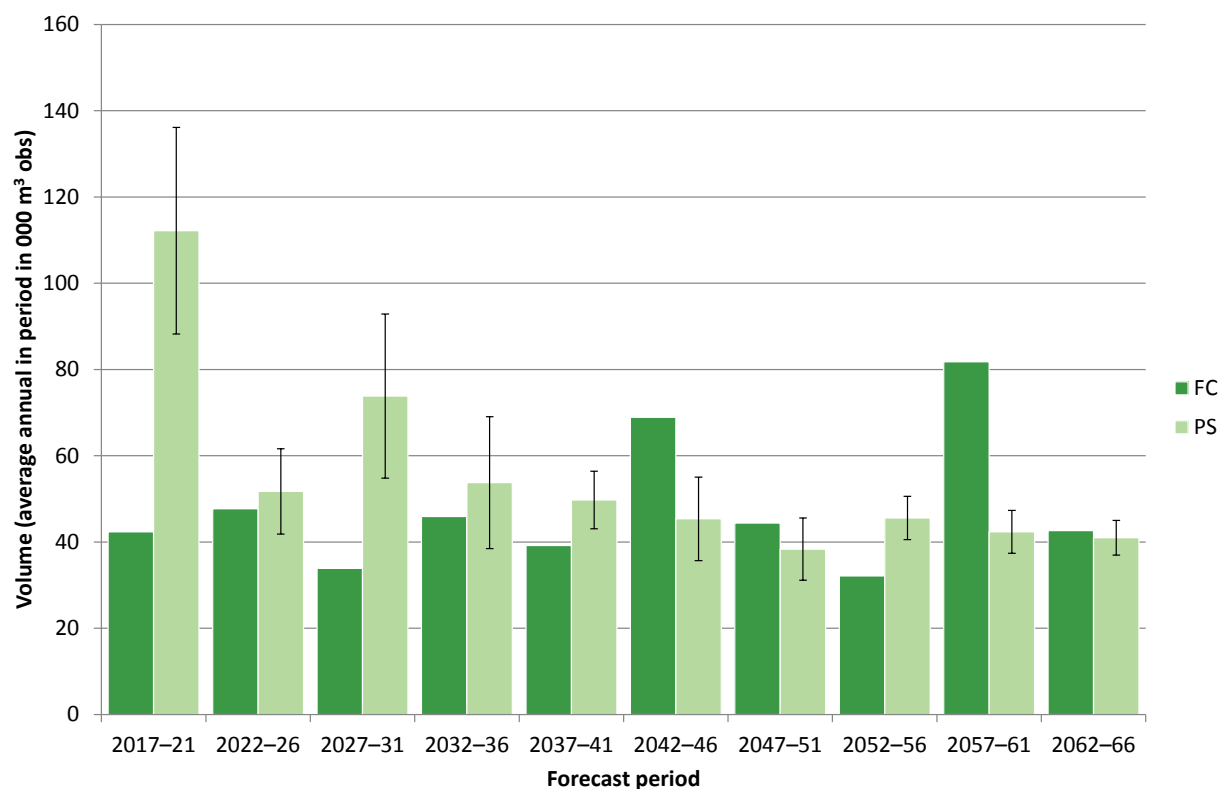
Table 30 Summary of 50–year forecast of softwood timber availability; average annual volume within period

Forecast period	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	*SE%*	volume (000 m³ obs)
Lake District National Park - W H S				
2017–21	42	112	*21*	**155**
2022–26	48	52	*19*	**99**
2027–31	34	74	*26*	**108**
2032–36	46	54	*28*	**100**
2037–41	39	50	*13*	**89**
2042–46	69	45	*21*	**114**
2047–51	44	38	*19*	**83**
2052–56	32	46	*11*	**78**
2057–61	82	42	*12*	**124**
2062–66	43	41	*10*	**84**

Part 3 - how our woodlands might change

50-year forecast of softwood timber availability by principal species

Table 31 50-year forecast of softwood timber availability by principal species; average annual volume within period

Principal species	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m^3 obs)		SE%	volume (000 m^3 obs)		SE%
Lake District National Park - W H S						
All conifers	**42**	**112**	*21*	**48**	**52**	*19*
Sitka spruce	32	42	*47*	32	19	*46*
Scots pine	< 1	11	*77*	1	3	*29*
Corsican pine	< 1	0	-	< 1	0	-
Norway spruce	< 1	2	*61*	2	2	*59*
Larches	7	35	*27*	9	22	*20*
Douglas fir	1	3	*89*	2	< 1	*78*
Lodgepole pine	< 1	< 1	*120*	< 1	< 1	*120*
Other conifers	1	17	*45*	< 1	4	*71*

Table 31 (cont'd) 50-year forecast of softwood timber availability by principal species; average annual volume within period

Principal species	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m^3 obs)		SE%	volume (000 m^3 obs)		SE%
Lake District National Park - W H S						
All conifers	**34**	**74**	*26*	**46**	**54**	*28*
Sitka spruce	24	31	*50*	34	25	*55*
Scots pine	< 1	6	*47*	1	8	*50*
Corsican pine	< 1	0	-	< 1	0	-
Norway spruce	< 1	8	*76*	< 1	1	*76*
Larches	6	22	*40*	7	16	*20*
Douglas fir	2	< 1	*61*	2	2	*93*
Lodgepole pine	< 1	< 1	*120*	< 1	< 1	*120*
Other conifers	< 1	4	*50*	< 1	1	*35*

Part 3 - how our woodlands might change

Table 31 (cont'd) 50-year forecast of softwood timber availability by principal species; average annual volume within period

Principal species	2037–41			2042–46		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All conifers	**39**	**50**	*13*	**69**	**45**	*21*
Sitka spruce	28	15	*27*	31	12	*21*
Scots pine	< 1	9	*32*	2	17	*52*
Corsican pine	< 1	< 1	*29*	< 1	< 1	*29*
Norway spruce	< 1	2	*90*	2	1	*45*
Larches	6	16	*23*	20	9	*27*
Douglas fir	3	2	*39*	9	2	*25*
Lodgepole pine	< 1	< 1	*120*	< 1	< 1	*114*
Other conifers	< 1	5	*44*	4	3	*20*

Table 31 (cont'd) 50-year forecast of softwood timber availability by principal species; average annual volume within period

Principal species	2047–51			2052–56		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All conifers	**44**	**38**	*19*	**32**	**46**	*11*
Sitka spruce	24	18	*36*	17	22	*18*
Scots pine	2	4	*35*	2	5	*31*
Corsican pine	< 1	< 1	*29*	< 1	< 1	*29*
Norway spruce	2	2	*42*	1	1	*27*
Larches	8	8	*27*	6	9	*25*
Douglas fir	5	3	*22*	3	4	*20*
Lodgepole pine	< 1	< 1	*29*	< 1	< 1	*29*
Other conifers	2	4	*14*	2	5	*14*

Part 3 - how our woodlands might change

Table 31 (cont'd) 50-year forecast of softwood timber availability by principal species; average annual volume within period

Principal species	2057–61			2062–66		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All conifers	**82**	**42**	*12*	**43**	**41**	*10*
Sitka spruce	59	19	*19*	27	15	*19*
Scots pine	4	5	*30*	3	7	*22*
Corsican pine	< 1	< 1	*29*	< 1	< 1	*29*
Norway spruce	2	1	*25*	2	2	*23*
Larches	11	8	*26*	4	7	*24*
Douglas fir	4	4	*18*	3	5	*17*
Lodgepole pine	< 1	< 1	*29*	< 1	< 1	*29*
Other conifers	3	5	*13*	3	6	*12*

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50-year forecast of softwood timber availability by top diameter class

Table 32 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	8	10	21	10	5	22
14–16	3	5	21	4	2	27
16–18	3	6	20	4	3	29
18–24	10	25	20	12	12	33
24–34	11	37	25	11	16	21
34–44	4	17	33	4	7	21
44–54	2	8	41	2	3	24
54+	< 1	5	28	< 1	4	26
Total	**42**	**112**	**21**	**48**	**52**	**19**

Table 32 (cont'd) 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	6	5	23	7	4	22
14–16	3	3	32	3	1	23
16–18	3	4	31	4	2	34
18–24	10	17	33	14	10	37
24–34	9	25	29	13	19	38
34–44	2	11	27	3	9	28
44–54	< 1	4	29	1	4	28
54+	< 1	5	34	< 1	4	27
Total	**34**	**74**	**26**	**46**	**54**	**28**

Table 32 (cont'd) 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2037–41 FC volume (000 m³ obs)	2037–41 Private sector volume (000 m³ obs)	2037–41 SE%	2042–46 FC volume (000 m³ obs)	2042–46 Private sector volume (000 m³ obs)	2042–46 SE%
Lake District National Park - W H S						
7–14	8	6	*18*	12	10	*15*
14–16	3	2	*18*	4	2	*14*
16–18	3	2	*22*	4	2	*18*
18–24	10	8	*22*	13	6	*27*
24–34	10	15	*16*	17	13	*33*
34–44	3	8	*17*	9	6	*36*
44–54	1	4	*18*	4	3	*44*
54+	< 1	4	*21*	6	4	*31*
Total	**39**	**50**	***13***	**69**	**45**	***21***

Table 32 (cont'd) 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2047–51 FC volume (000 m³ obs)	2047–51 Private sector volume (000 m³ obs)	2047–51 SE%	2052–56 FC volume (000 m³ obs)	2052–56 Private sector volume (000 m³ obs)	2052–56 SE%
Lake District National Park - W H S						
7–14	11	11	*14*	8	11	*12*
14–16	4	2	*15*	3	3	*13*
16–18	3	2	*15*	3	3	*14*
18–24	10	4	*16*	7	9	*15*
24–34	10	7	*31*	7	9	*15*
34–44	4	5	*37*	3	4	*18*
44–54	2	3	*40*	1	2	*22*
54+	2	5	*31*	1	4	*31*
Total	**44**	**38**	***19***	**32**	**46**	***11***

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Table 32 (cont'd) 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2057–61			2062–66		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		*SE%*	volume (000 m³ obs)		*SE%*
Lake District National Park - W H S						
7–14	10	11	*15*	7	11	*15*
14–16	4	3	*11*	3	3	*12*
16–18	5	3	*12*	3	3	*11*
18–24	19	8	*13*	11	9	*11*
24–34	25	8	*16*	11	8	*12*
34–44	10	4	*21*	4	3	*18*
44–54	4	2	*23*	2	2	*22*
54+	4	4	*31*	2	3	*30*
Total	**82**	**42**	***12***	**43**	**41**	***10***

50-year forecast of softwood timber availability % spruce

Table 33 50–year forecast of softwood timber availability % spruce

Lake District National Park - W H S		Top diameter class (cm)								
		7–14	14–16	16–18	18–24	24–34	34–44	44–54	54+	Total
2017–21	FC (%)	40	41	41	39	36	34	31	20	**37**
	PS (%)	42	42	42	42	41	30	13	18	**39**
2022–26	FC (%)	39	39	40	39	38	35	33	21	**37**
	PS (%)	40	44	43	43	36	32	33	46	**39**
2027–31	FC (%)	43	45	45	45	47	45	46	31	**45**
	PS (%)	58	62	62	61	58	53	48	9	**55**
2032–36	FC (%)	43	42	42	42	45	43	40	23	**42**
	PS (%)	43	41	37	38	28	21	22	16	**30**
2037–41	FC (%)	52	56	57	59	57	48	41	26	**54**
	PS (%)	54	63	63	57	44	32	27	14	**46**
2042–46	FC (%)	55	57	58	61	57	45	35	29	**55**
	PS (%)	38	33	29	25	32	38	39	38	**34**
2047–51	FC (%)	52	54	55	58	58	50	40	32	**54**
	PS (%)	44	45	46	48	45	36	23	7	**40**
2052–56	FC (%)	49	51	49	48	40	29	28	23	**44**
	PS (%)	46	46	41	38	45	49	49	36	**44**
2057–61	FC (%)	51	52	52	54	58	59	49	37	**54**
	PS (%)	44	49	46	40	39	40	40	33	**41**
2062–66	FC (%)	47	50	50	48	47	41	37	30	**47**
	PS (%)	47	55	55	56	64	78	80	17	**56**

Part 3 - how our woodlands might change

50-year forecast of standing volume in conifers

Figure 35 50–year forecast of standing volume in conifers; average annual volume within period
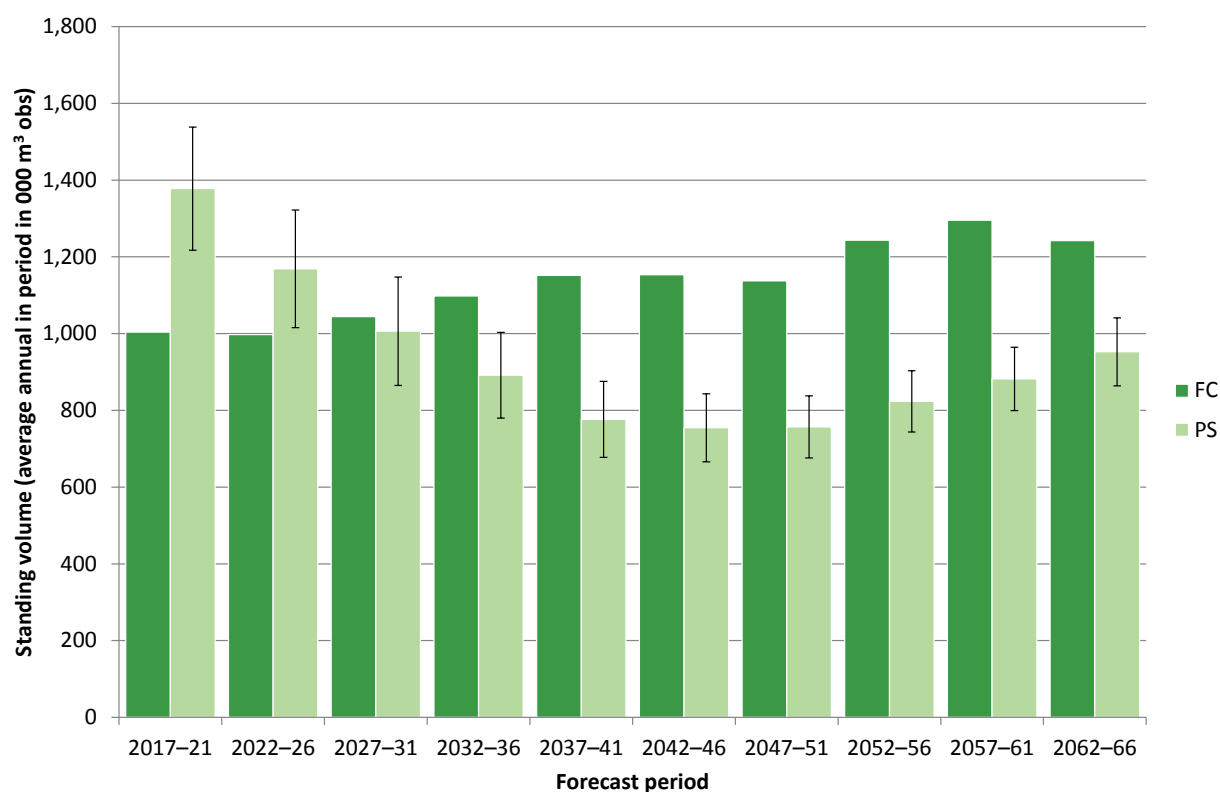
Table 34 50–year forecast of standing volume in conifers; average annual volume within period

Forecast period	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	SE%	volume (000 m³ obs)
Lake District National Park - W H S				
2017–21	1,004	1,378	12	**2,382**
2022–26	997	1,169	13	**2,166**
2027–31	1,044	1,006	14	**2,050**
2032–36	1,098	892	13	**1,990**
2037–41	1,152	777	13	**1,928**
2042–46	1,153	755	12	**1,908**
2047–51	1,137	757	11	**1,894**
2052–56	1,243	824	10	**2,067**
2057–61	1,296	882	9	**2,177**
2062–66	1,242	953	9	**2,195**

Part 3 - how our woodlands might change

50-year forecast of net increment in conifers

Figure 36 50-year forecast of net increment in conifers; average annual volume within period
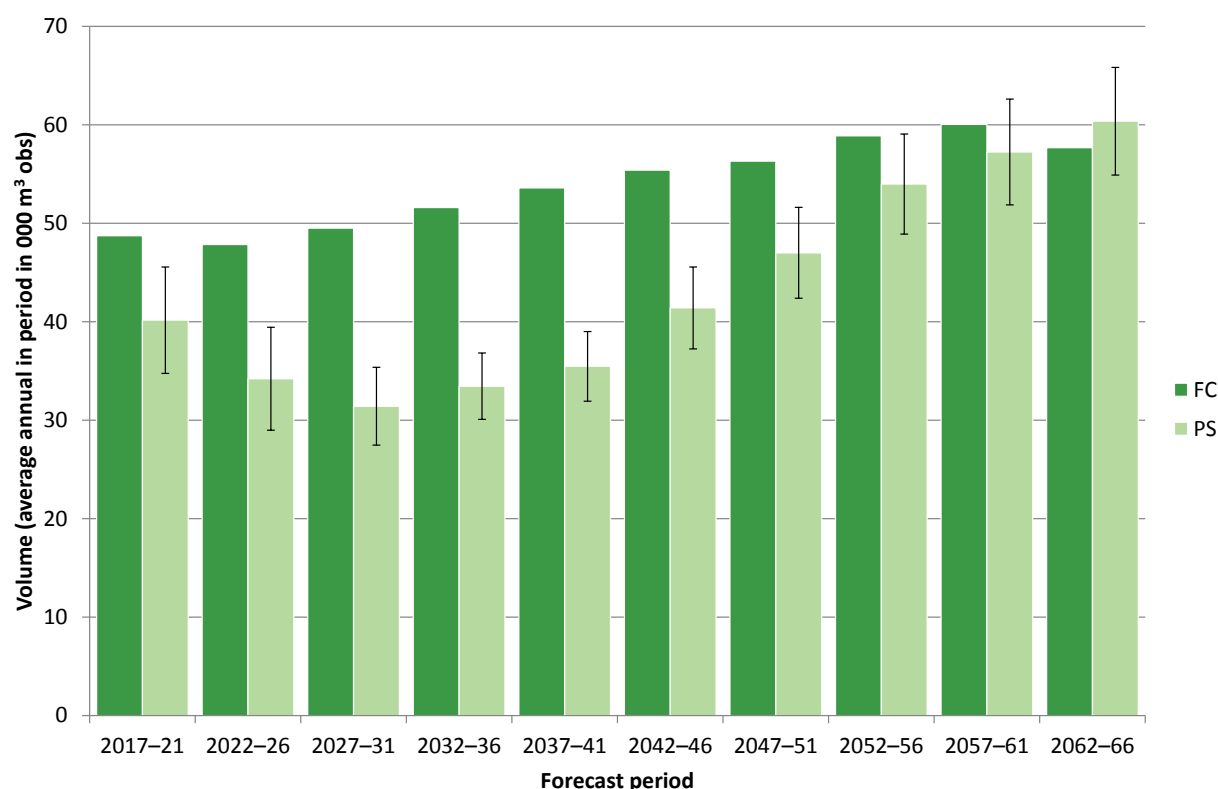
Table 35 50-year forecast of net increment in conifers; average annual volume within period

	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	*SE%*	volume (000m³ obs)
Lake District National Park - W H S				
2017–21	49	40	*13*	**89**
2022–26	48	34	*15*	**82**
2027–31	50	31	*13*	**81**
2032–36	52	33	*10*	**85**
3037–41	54	35	*10*	**89**
2042–46	55	41	*10*	**97**
2047–51	56	47	*10*	**103**
2052–56	59	54	*9*	**113**
2057–61	60	57	*9*	**117**
2062–66	58	60	*9*	**118**

Combined standing volume, net increment and availability

Figure 37 50-year forecast of standing volume, net increment and softwood availability

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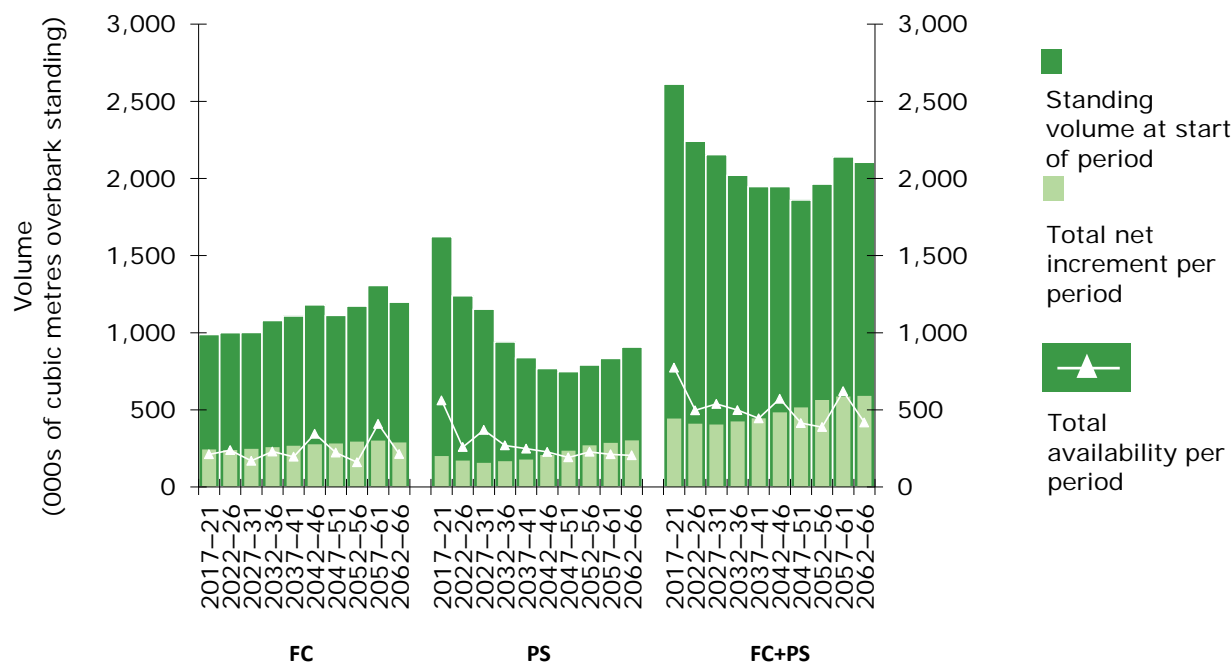
50-year hardwood forecast

50-year forecast of hardwood timber availability

Figure 38 Summary of 50-year forecast of hardwood timber availability; average annual volume within period
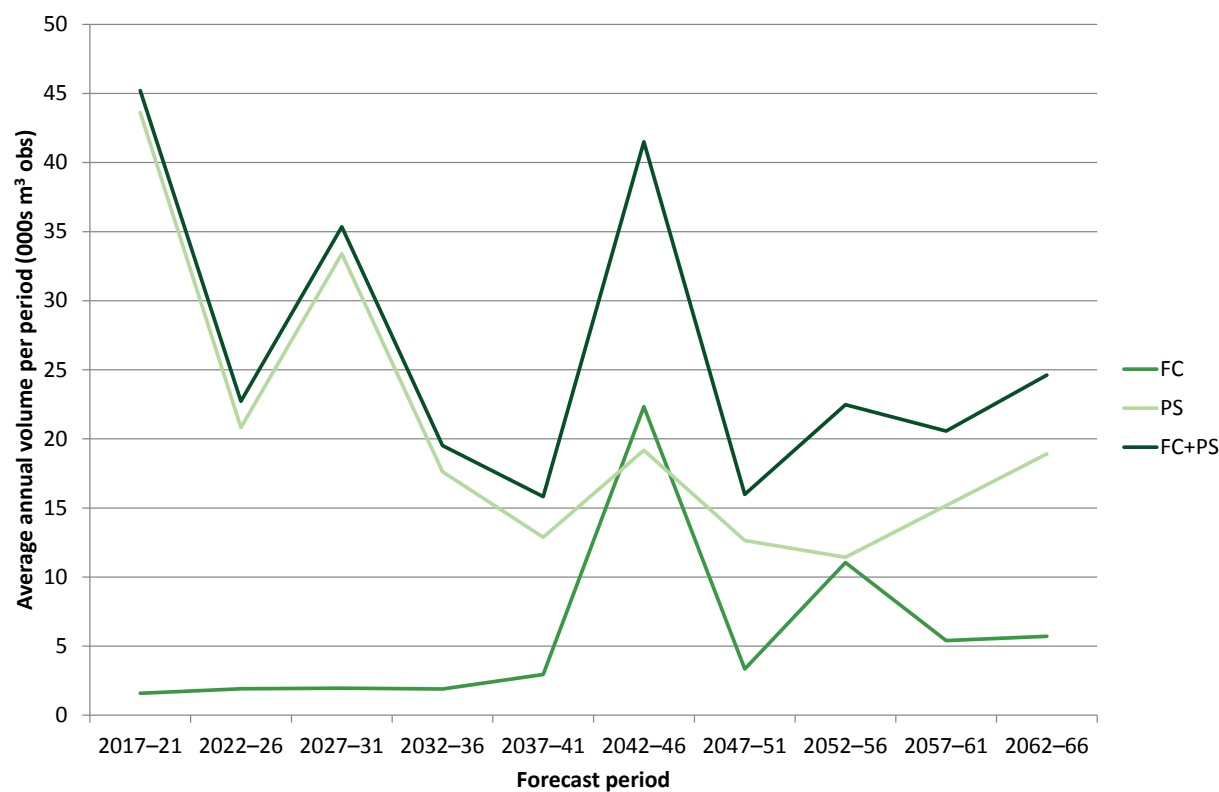
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Figure 39 50–year forecast of hardwood timber availability; average annual volume within period
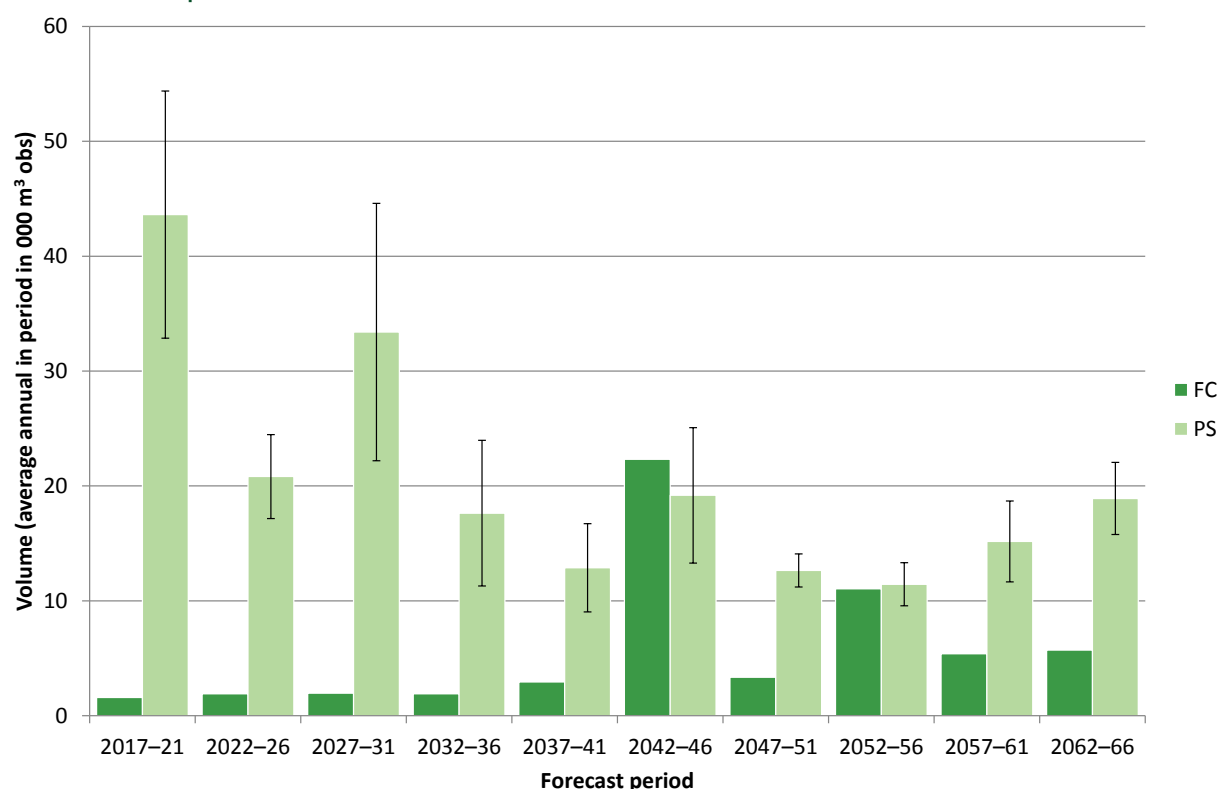
Table 36 50–year forecast of hardwood timber availability; average annual volume within period

Forecast period	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	SE%	volume (000 m³ obs)
Lake District National Park - W H S				
2017–21	2	44	25	45
2022–26	2	21	18	23
2027–31	2	33	34	35
2032–36	2	18	36	20
2037–41	3	13	30	16
2042–46	22	19	31	42
2047–51	3	13	11	16
2052–56	11	11	16	22
2057–61	5	15	23	21
2062–66	6	19	17	25

Part 3 - how our woodlands might change

50-year forecast of hardwood timber availability by principal species

Table 37 50-year forecast of hardwood timber availability by principal species; average annual volume within period

Principal species	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m3 obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**2**	**44**	**25**	**2**	**21**	**18**
Oak	< 1	21	40	< 1	6	28
Beech	< 1	2	56	< 1	< 1	51
Sycamore	< 1	3	56	< 1	2	64
Ash	< 1	4	51	< 1	4	46
Birch	< 1	9	36	< 1	5	29
Sweet chestnut	0	0	-	0	0	-
Hazel	< 1	2	49	< 1	< 1	43
Hawthorn	0	< 1	51	0	< 1	61
Alder	< 1	< 1	70	< 1	< 1	64
Willow	< 1	< 1	31	< 1	< 1	30
Other broadleaves	< 1	1	77	< 1	1	68

Table 37 (cont'd) 50-year forecast of hardwood timber availability by principal species; average annual volume within period

Principal species	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**2**	**33**	**34**	**2**	**18**	**36**
Oak	< 1	25	42	< 1	10	49
Beech	< 1	5	77	< 1	5	85
Sycamore	< 1	< 1	60	< 1	< 1	42
Ash	< 1	< 1	26	< 1	< 1	38
Birch	< 1	1	43	< 1	< 1	20
Sweet chestnut	0	0	-	0	0	-
Hazel	< 1	< 1	29	< 1	< 1	22
Hawthorn	0	< 1	57	0	< 1	45
Alder	< 1	< 1	38	< 1	< 1	34
Willow	< 1	< 1	29	< 1	< 1	25
Other broadleaves	< 1	< 1	19	< 1	< 1	23

Table 37 (cont'd) 50-year forecast of hardwood timber availability by principal species; average annual volume within period

Principal species	2037–41			2042–46		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**3**	**13**	**30**	**22**	**19**	**31**
Oak	< 1	7	51	14	8	67
Beech	< 1	< 1	83	< 1	< 1	31
Sycamore	< 1	< 1	45	< 1	< 1	56
Ash	< 1	1	45	< 1	2	29
Birch	1	2	23	3	5	24
Sweet chestnut	0	0	-	0	0	-
Hazel	< 1	< 1	37	< 1	< 1	33
Hawthorn	0	< 1	33	0	< 1	32
Alder	< 1	< 1	42	< 1	< 1	35
Willow	< 1	< 1	24	< 1	< 1	24
Other broadleaves	< 1	< 1	21	2	2	21

Table 37 (cont'd) 50-year forecast of hardwood timber availability by principal species; average annual volume within period

Principal species	2047–51			2052–56		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**3**	**13**	**11**	**11**	**11**	**16**
Oak	< 1	3	28	3	4	35
Beech	< 1	< 1	29	< 1	< 1	25
Sycamore	< 1	< 1	43	< 1	< 1	46
Ash	< 1	2	35	< 1	1	47
Birch	1	4	19	3	2	23
Sweet chestnut	0	0	-	0	0	-
Hazel	< 1	1	27	2	< 1	27
Hawthorn	0	< 1	32	0	< 1	32
Alder	< 1	< 1	46	< 1	< 1	72
Willow	< 1	< 1	24	< 1	< 1	24
Other broadleaves	< 1	1	22	2	1	23

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Table 37 (cont'd) 50-year forecast of hardwood timber availability by principal species; average annual volume within period

Principal species	2057–61			2062–66		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**5**	**15**	**23**	**6**	**19**	**17**
Oak	< 1	6	49	2	4	21
Beech	< 1	< 1	23	< 1	< 1	25
Sycamore	< 1	< 1	52	< 1	2	55
Ash	< 1	3	57	< 1	3	58
Birch	2	4	28	2	6	27
Sweet chestnut	0	0	-	0	0	-
Hazel	< 1	< 1	44	< 1	1	69
Hawthorn	0	< 1	48	0	< 1	32
Alder	< 1	< 1	72	< 1	< 1	69
Willow	< 1	< 1	24	< 1	< 1	24
Other broadleaves	< 1	< 1	24	2	1	24

Part 3 - how our woodlands might change

50-year forecast of hardwood timber availability by top diameter class

Table 38 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	< 1	4	23	1	3	12
14–16	< 1	2	27	< 1	< 1	19
16–18	< 1	2	27	< 1	< 1	21
18–24	< 1	7	23	< 1	4	20
24–34	< 1	12	27	< 1	6	20
34–44	< 1	7	33	< 1	3	23
44–54	< 1	4	37	< 1	1	27
54+	< 1	6	48	< 1	2	49
Total	**2**	**44**	**25**	**2**	**21**	**18**

Table 38 (cont'd) 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	1	3	19	1	3	13
14–16	< 1	< 1	41	< 1	< 1	32
16–18	< 1	1	50	< 1	< 1	41
18–24	< 1	6	48	< 1	2	58
24–34	< 1	10	40	< 1	5	53
34–44	< 1	6	46	< 1	3	44
44–54	< 1	3	46	< 1	1	51
54+	0	3	45	< 1	3	58
Total	**2**	**33**	**34**	**2**	**18**	**36**

Part 3 - how our woodlands might change

Table 38 (cont'd) 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2037–41			2042–46		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	1	5	14	6	6	13
14–16	< 1	< 1	18	2	1	13
16–18	< 1	< 1	28	3	1	14
18–24	< 1	1	50	7	3	21
24–34	< 1	3	55	4	3	58
34–44	< 1	2	50	< 1	2	76
44–54	< 1	< 1	42	< 1	1	78
54+	< 1	< 1	84	< 1	< 1	62
Total	**3**	**13**	**30**	**22**	**19**	**31**

Table 38 (cont'd) 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2047–51			2052–56		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	2	6	14	4	5	15
14–16	< 1	1	13	2	< 1	16
16–18	< 1	1	13	2	< 1	19
18–24	< 1	3	15	3	2	26
24–34	< 1	1	17	< 1	1	33
34–44	< 1	< 1	35	< 1	< 1	32
44–54	< 1	< 1	40	< 1	< 1	35
54+	< 1	< 1	81	< 1	< 1	75
Total	**3**	**13**	**11**	**11**	**11**	**16**

Part 3 - how our woodlands might change

Table 38 (cont'd) 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

Top diameter class (cm)	2057–61			2062–66		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
7–14	3	4	15	2	5	15
14–16	< 1	< 1	14	< 1	1	18
16–18	< 1	< 1	14	< 1	1	19
18–24	1	2	19	1	4	20
24–34	< 1	3	33	< 1	4	25
34–44	< 1	2	43	< 1	2	31
44–54	< 1	1	51	< 1	< 1	46
54+	< 1	2	51	< 1	< 1	49
Total	**5**	**15**	**23**	**6**	**19**	**17**

Part 3 - how our woodlands might change

50-year forecast of standing volume in broadleaves

Figure 40 50–year forecast of standing volume in broadleaves; average annual volume within period

Table 39 50–year forecast of standing volume in broadleaves; average annual volume within period

Forecast period	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	SE%	volume (000 m³ obs)
Lake District National Park - W H S				
2017–21	269	2,489	6	**2,758**
2022–26	283	2,647	6	**2,931**
2027–31	299	2,838	6	**3,138**
2032–36	318	3,031	5	**3,349**
2037–41	336	3,239	5	**3,575**
2042–46	314	3,460	5	**3,774**
2047–51	272	3,647	5	**3,919**
2052–56	275	3,849	5	**4,124**
2057–61	265	4,024	5	**4,289**
2062–66	273	4,173	5	**4,446**

Part 3 - how our woodlands might change

Table 40 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

Principal species	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**269**	**2,489**	**6**	**283**	**2,647**	**6**
Oak	104	1,095	11	106	1,125	11
Beech	27	114	31	29	125	30
Sycamore	7	249	30	7	250	30
Ash	9	281	22	9	288	22
Birch	48	353	12	54	383	12
Sweet Chestnut	0	< 1	90	0	< 1	90
Hazel	15	95	25	16	113	25
Hawthorn	0	10	26	0	19	28
Alder	4	163	29	4	177	29
Willow	< 1	52	34	< 1	63	33
Other broadleaves	54	72	18	57	101	15

Table 40 (cont'd) 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

Principal species	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**299**	**2,838**	**6**	**318**	**3,031**	**5**
Oak	109	1,135	11	112	1,148	12
Beech	31	131	29	33	123	29
Sycamore	7	261	29	7	274	29
Ash	10	310	22	10	338	21
Birch	62	428	12	71	478	12
Sweet Chestnut	0	< 1	90	0	< 1	90
Hazel	16	136	23	16	159	22
Hawthorn	0	29	29	0	42	31
Alder	4	192	28	4	206	28
Willow	< 1	75	32	< 1	86	31
Other broadleaves	61	137	13	64	175	13

Part 3 - how our woodlands might change

Table 40 (cont'd) 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

Principal species	2037–41			2042–46		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)	volume (000 m³ obs)	SE%	volume (000 m³ obs)	volume (000 m³ obs)	SE%
Lake District National Park - W H S						
All broadleaves	**336**	**3,239**	**5**	**314**	**3,460**	**5**
Oak	116	1,178	12	94	1,231	12
Beech	35	122	30	37	137	29
Sycamore	6	289	28	5	301	28
Ash	11	363	20	10	382	20
Birch	79	525	12	80	563	12
Sweet Chestnut	0	< 1	90	0	< 1	90
Hazel	17	178	21	15	195	20
Hawthorn	0	55	32	0	67	32
Alder	4	218	28	4	228	27
Willow	< 1	97	30	< 1	108	30
Other broadleaves	68	211	12	67	245	12

Table 40 (cont'd) 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

Principal species	2047–51			2052–56		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)	volume (000 m³ obs)	SE%	volume (000 m³ obs)	volume (000 m³ obs)	SE%
Lake District National Park - W H S						
All broadleaves	**272**	**3,647**	**5**	**275**	**3,849**	**5**
Oak	59	1,276	12	61	1,337	12
Beech	38	152	28	40	168	28
Sycamore	5	312	27	4	321	27
Ash	9	398	20	9	412	19
Birch	80	591	12	83	624	11
Sweet Chestnut	0	< 1	90	0	< 1	90
Hazel	13	207	20	11	216	19
Hawthorn	0	80	33	0	92	33
Alder	3	235	27	3	242	27
Willow	< 1	117	30	< 1	127	29
Other broadleaves	64	275	12	64	306	11

Part 3 - how our woodlands might change

Table 40 (cont'd) 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

Principal species	2057–61			2062–66		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**265**	**4,024**	**5**	**273**	**4,173**	**5**
Oak	60	1,387	*12*	63	1,448	*12*
Beech	41	185	*27*	43	202	*26*
Sycamore	5	328	*27*	5	332	*27*
Ash	7	421	*19*	7	422	*20*
Birch	81	651	*11*	82	662	*12*
Sweet Chestnut	0	< 1	*90*	0	< 1	*90*
Hazel	6	225	*19*	7	228	*20*
Hawthorn	0	102	*34*	0	114	*34*
Alder	3	248	*27*	3	253	*27*
Willow	1	135	*29*	1	143	*29*
Other broadleaves	61	336	*11*	61	363	*11*

Part 3 - how our woodlands might change

50-year forecast of net increment in broadleaves

Figure 41 50-year forecast of net increment in broadleaves; average annual volume within period

Table 41 50–year forecast of net increment in broadleaves; average annual volume within period

Forecast period	FC	Private sector		Total
	volume (000 m³ obs)	volume (000 m³ obs)	*SE%*	volume (000 m³ obs)
Lake District National Park - W H S				
2017–21	5	61	5	**65**
2022–26	5	64	5	**68**
2027–31	5	63	5	**68**
2032–36	6	61	5	**67**
3037–41	6	59	5	**65**
2042–46	6	57	5	**64**
2047–51	7	54	5	**61**
2052–56	7	51	5	**58**
2057–61	7	48	5	**55**
2062–66	7	45	5	**52**

Part 3 - how our woodlands might change

Table 42 50–year forecast of net increment in broadleaves by principal species; average annual volume within period

Principal species	2017–21			2022–26		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**5**	**61**	**5**	**5**	**64**	**5**
Oak	< 1	19	10	< 1	19	11
Beech	< 1	3	27	< 1	4	26
Sycamore	< 1	3	26	< 1	3	25
Ash	< 1	6	19	< 1	6	20
Birch	1	12	14	2	12	15
Sweet Chestnut	0	0	90	0	0	90
Hazel	< 1	5	21	< 1	5	19
Hawthorn	0	1	30	0	2	33
Alder	< 1	3	30	< 1	4	27
Willow	< 1	2	29	< 1	2	28
Other broadleaves	1	6	15	1	8	13

Table 42 (cont'd) 50–year forecast of net increment in broadleaves by principal species; average annual volume within period

Principal species	2027–31			2032–36		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**5**	**63**	**5**	**6**	**61**	**5**
Oak	< 1	18	11	1	17	11
Beech	< 1	4	27	< 1	3	28
Sycamore	< 1	3	25	< 1	3	25
Ash	< 1	6	19	< 1	6	19
Birch	2	11	15	2	11	13
Sweet Chestnut	0	0	90	0	0	90
Hazel	< 1	5	18	< 1	5	16
Hawthorn	0	2	33	0	3	34
Alder	< 1	3	26	< 1	3	25
Willow	< 1	2	28	< 1	2	27
Other broadleaves	1	8	12	1	8	12

Part 3 - how our woodlands might change

Table 42 (cont'd) 50–year forecast of net increment in broadleaves by principal species; average annual volume within period

Principal species	2037–41			2042–46		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**6**	**59**	**5**	**6**	**57**	**5**
Oak	1	16	11	1	16	11
Beech	< 1	3	30	< 1	3	29
Sycamore	< 1	3	26	< 1	3	28
Ash	< 1	6	21	< 1	5	23
Birch	3	11	13	3	11	14
Sweet Chestnut	0	0	90	0	0	90
Hazel	< 1	4	16	< 1	4	16
Hawthorn	0	3	35	0	3	34
Alder	< 1	2	25	< 1	2	25
Willow	< 1	2	27	< 1	2	26
Other broadleaves	1	8	12	1	8	12

Table 42 (cont'd) 50–year forecast of net increment in broadleaves by principal species; average annual volume within period

Principal species	2047–51			2052–56		
	FC	Private sector		FC	Private sector	
	volume (000 m³ obs)		SE%	volume (000 m³ obs)		SE%
Lake District National Park - W H S						
All broadleaves	**7**	**54**	**5**	**7**	**51**	**5**
Oak	2	16	10	2	16	10
Beech	< 1	4	26	< 1	4	26
Sycamore	< 1	3	29	< 1	2	30
Ash	< 1	5	25	< 1	4	26
Birch	2	10	14	2	9	14
Sweet Chestnut	0	0	90	0	0	90
Hazel	< 1	3	17	< 1	3	17
Hawthorn	0	3	35	0	3	35
Alder	< 1	2	26	< 1	2	26
Willow	< 1	2	25	< 1	2	25
Other broadleaves	1	8	12	1	7	12

Table 42 (cont'd) 50–year forecast of net increment in broadleaves by principal species; average annual volume within period

Principal species	2057–61 FC	2057–61 Private sector volume (000 m^3 obs)	2057–61 SE%	2062–66 FC	2062–66 Private sector volume (000 m^3 obs)	2062–66 SE%
Lake District National Park - W H S						
All broadleaves	**7**	**48**	**5**	**7**	**45**	**5**
Oak	2	16	10	2	16	10
Beech	< 1	4	24	< 1	4	24
Sycamore	< 1	2	30	< 1	2	30
Ash	< 1	4	25	< 1	3	21
Birch	2	8	14	2	7	13
Sweet Chestnut	0	0	90	0	0	90
Hazel	< 1	2	17	< 1	2	16
Hawthorn	0	3	35	0	2	35
Alder	< 1	1	26	< 1	1	25
Willow	< 1	2	25	< 1	2	25
Other broadleaves	1	7	13	1	6	12

Part 3 - how our woodlands might change

Combined standing volume, net increment and availability

Figure 42 50-year summary of hardwood standing volume, increment and softwood availability
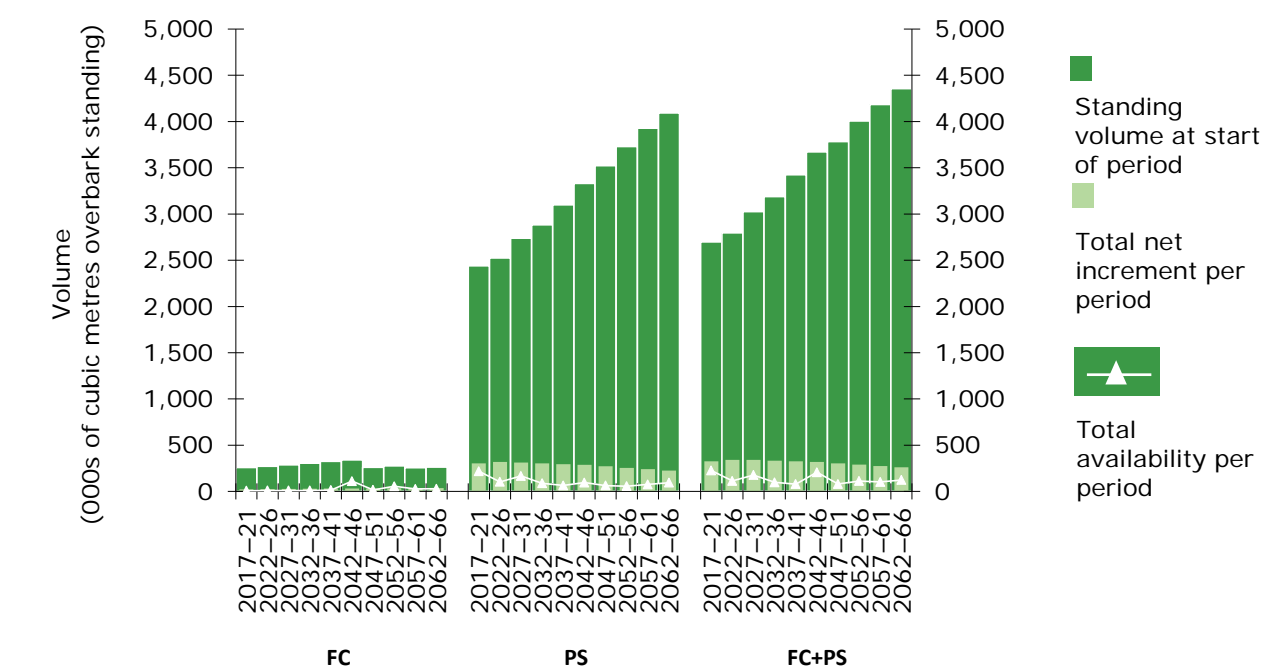
Part 4 – the 2016 extension to the National Park boundary

Although the majority of this report refers to the World Heritage Site boundary some information relating to the area that was added in 2016 will help to complete the view of the National Park.

Woodland area by woodland type

Figure 43 Woodland area by woodland type

■ Woodland land cover
■ Non-woodland land cover
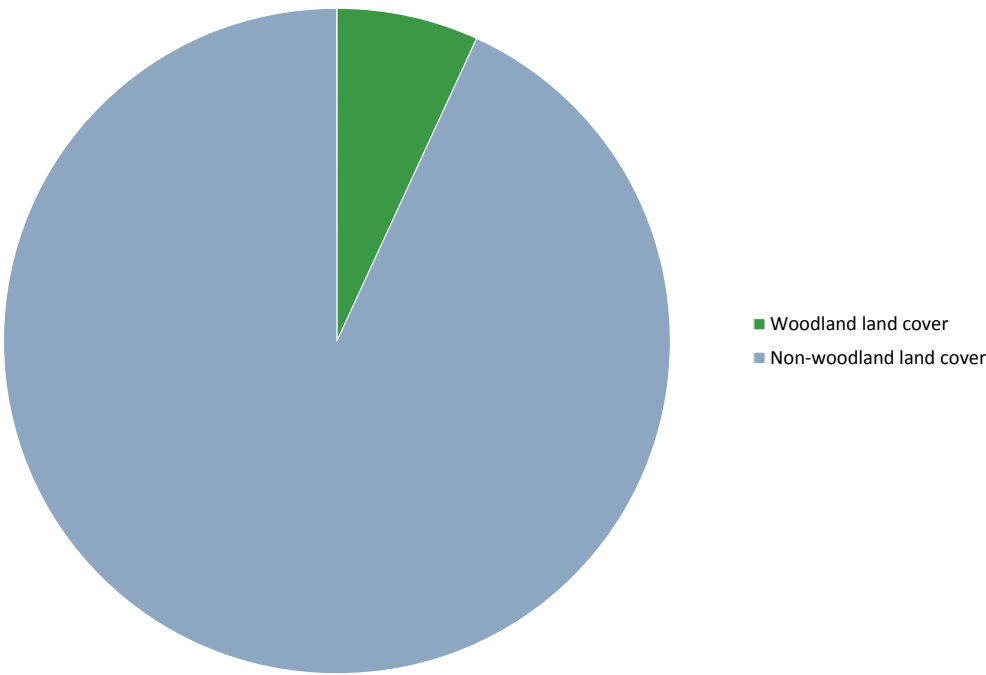
Table 43 Woodland area by woodland type

Woodland Type	Area (ha)	%
Lake District National Park - 2016 extension		
Woodland	458	95
Assumed woodland	26	5
Low density	0	0
Total mapped woodland	**483**	**100**
Non-woodland area	6,551	
Land area	7,034	
Woodland land cover		**7**
Non-woodland land cover		**93**

Figure 44 Woodland area by ownership
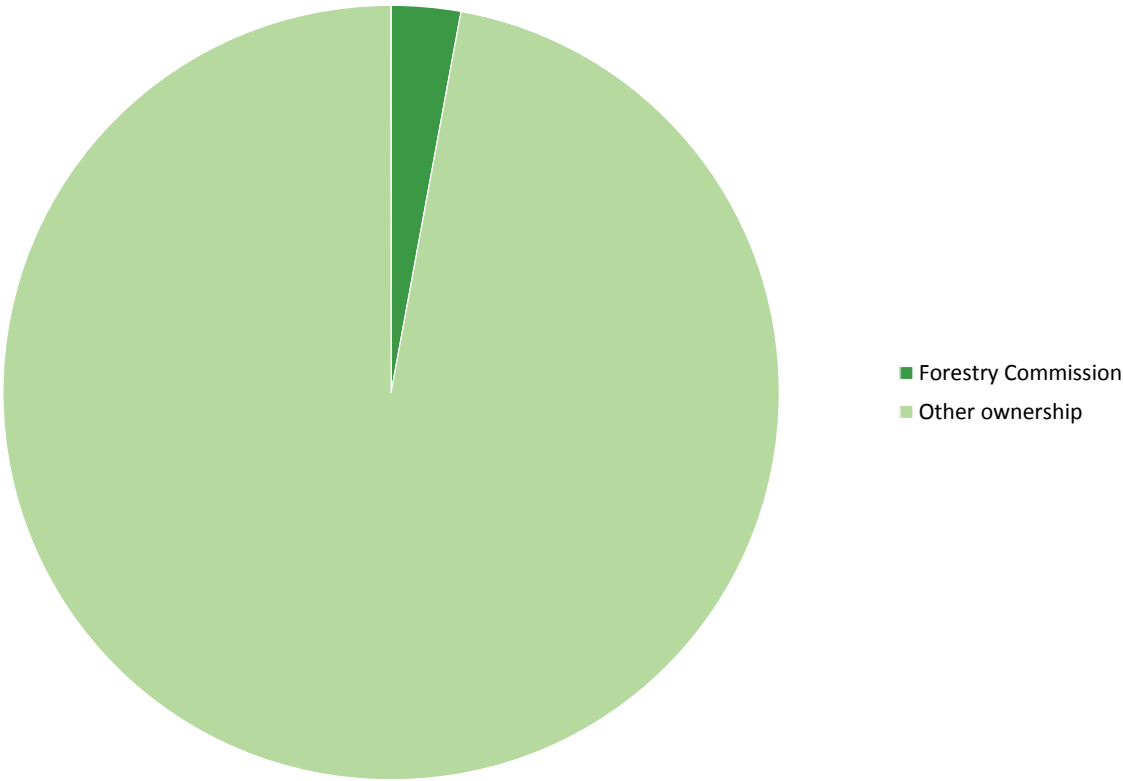
Table 44 Woodland area by ownership

Ownership	Area (ha)	% Woodland
Lake District National Park - 2016 extension		
Forestry Commission	14	3
Other ownership	470	97
Total area of woodland	**484**	**100**

Part 4 -2016 extension to the National Park

Figure 45 Woodland area by interpreted forest type

Legend:
- Broadleaved
- Conifer
- Felled
- Ground prep
- Mixed mainly broadleaved
- Mixed mainly conifer
- Young trees
- Coppice
- Coppice with standards
- Shrub
- Assumed woodland
- Low density
- Failed
- Windthrow
- Cloud/shadow/uncertain
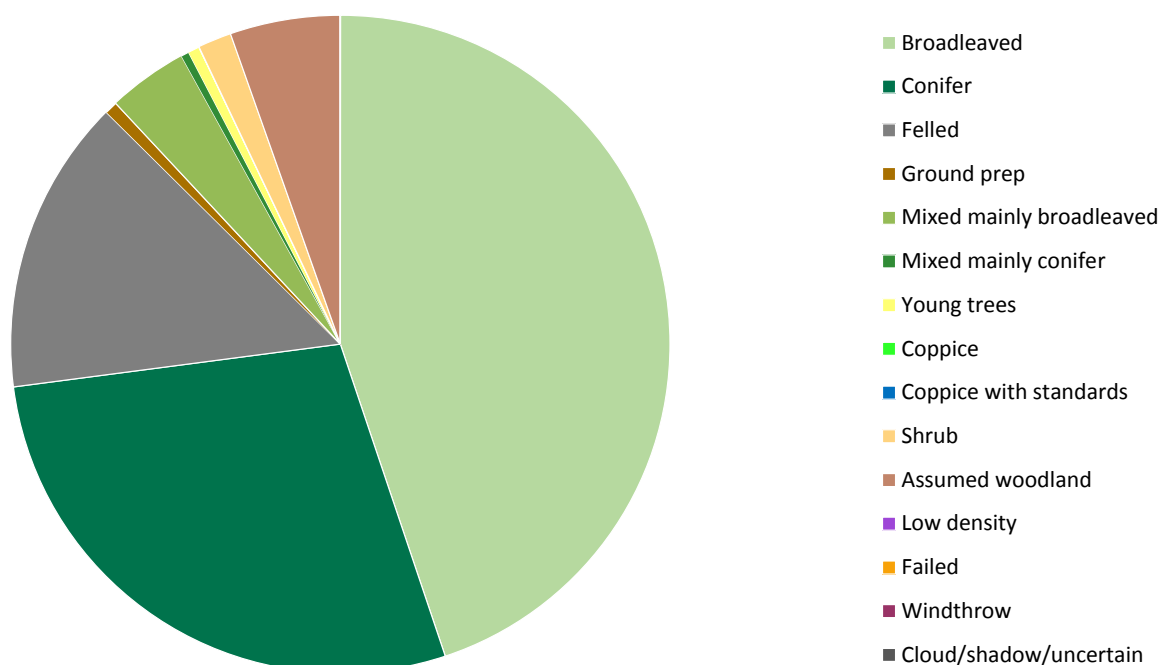
Table 45 Woodland area by interpreted forest type

Forest type	Total area (ha)	% of total area
Lake District National Park - 2016 extension		
Broadleaved	217	45
Conifer	136	28
Felled	70	15
Ground prep	3	< 1
Mixed mainly broadleaved	19	4
Mixed mainly conifer	2	< 1
Young trees	3	< 1
Coppice	0	0
Coppice with standards	0	0
Shrub	8	2
Assumed woodland	26	5
Low density	0	0
Failed	0	0
Windthrow	0	0
Cloud/shadow/uncertain	0	0
TOTALS	**484**	**100**

Part 4 -2016 extension to the National Park

Figure 46 Woodland area by interpreted forest type and ownership
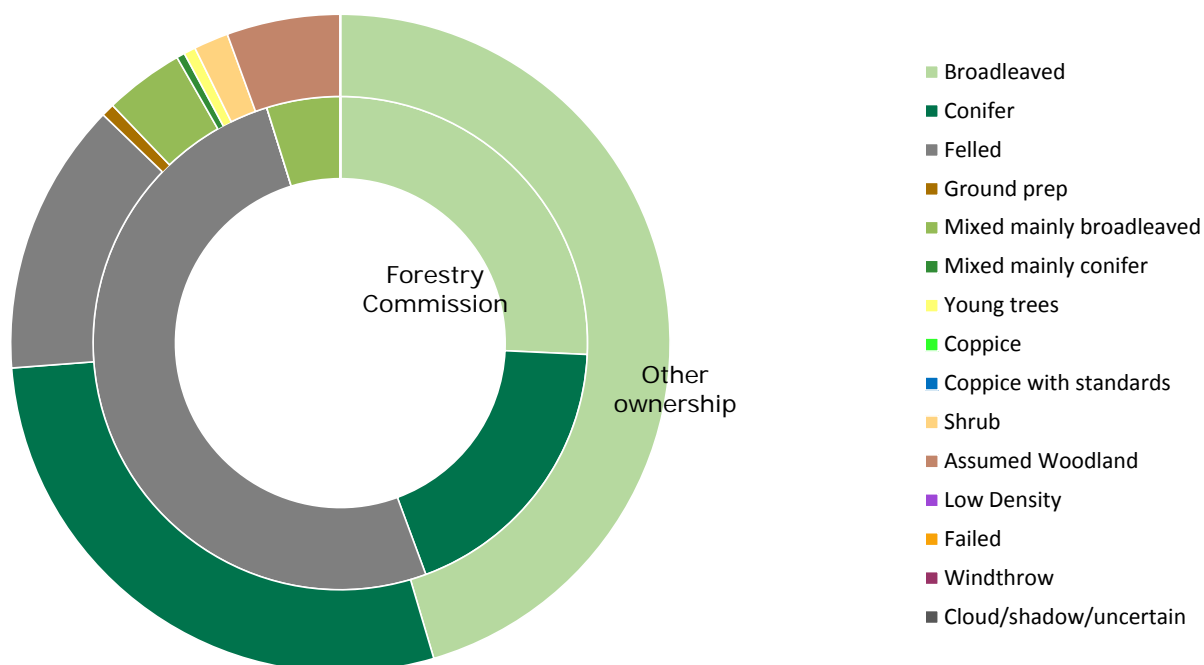
Table 46 Woodland area by interpreted forest type

Forest type	Forestry Commission		Other ownership	
	Area (ha)	% of total area	Area (ha)	% of total area
Lake District National Park - 2016 extension				
Broadleaved	4	26	213	45
Conifer	3	19	133	28
Felled	7	51	63	13
Ground prep	0	0	3	< 1
Mixed mainly broadleaved	< 1	5	18	4
Mixed mainly conifer	0	0	2	< 1
Young trees	0	0	3	< 1
Coppice	0	0	0	0
Coppice with standards	0	0	0	0
Shrub	0	0	8	2
Assumed Woodland	0	0	26	6
Low Density	0	0	0	0
Failed	0	0	0	0
Windthrow	0	0	0	0
Cloud/shadow/uncertain	0	0	0	0
TOTALS	**14**	**100**	**470**	**100**

Part 4 -2016 extension to the National Park

Ancient woodland in the Lake District National Park

Note that Ancient Replanted Woodland is alternatively known as Plantations on ancient woodland sites (PAWS). The Ancient woodland data[*] does not differentiate between areas of restored and unrestored PAWS.

Table 47 Ancient woodland by ownership

Ownership	Ancient and Semi-Natural Woodland		Ancient replanted woodland		Total	
	Area (ha)	% of total area	Area (ha)	% of total area	Area (ha)	% of total area
Lake District National Park - 2016 extension						
Ancient woodland						
Forestry Commission	0	0	0	0	0	0
Private sector	92	100	20	100	112	100
Total area	**92**	**100**	**20**	**100**	**112**	**100**
Ancient woodland within NFI woodland						
Forestry Commission	0	0	0	0	0	0
Private sector	85	100	20	100	105	100
Total area	**85**	**100**	**20**	**100**	**105**	**100**

Table 48 Ancient woodland by ownership

Ownership	Ancient and Semi-Natural Woodland		Ancient replanted woodland		Total	
	Area (ha)	% of total area	Area (ha)	% of total area	Area (ha)	% of total area
Lake District National Park - 2016 boundary						
Ancient woodland						
Forestry Commission	490	7	763	23	1,253	13
Private sector	6,166	93	2,570	77	8,736	87
Total area	**6,656**	**100**	**3,333**	**100**	**9,989**	**100**
Ancient woodland within NFI woodland						
Forestry Commission	484	8	758	23	1,242	13
Private sector	5,650	92	2,483	77	8,132	87
Total area	**6,134**	**100**	**3,240**	**100**	**9,374**	**100**

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[*] Data sourced from Natural England https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodlands-england

Appendix A – Interpreted Forest Types and Interpreted Open Areas

Table 49 Description of interpreted forest types

Abbreviation code	Description text	Comments
B	Broadleaved	The canopy of broadleaved woodland is generally more uneven than that of coniferous woodland, being made up of rounded crowns but with variations according to species, age, height and season. Boundaries with adjacent internal polygons are generally less clearly defined than with conifers and naturally occurring stands. Some conifer trees may also be present but greater than 80% of the area will consist of broadleaved trees.
C	Conifer	Coniferous woodland often occurs as large plantations with trees in regular rows and the stand edges may be regular and sharply defined. Some broadleaved trees may also be present but greater than 80% of the area will consist of conifer trees.
F	Felled	Areas of woodland where the trees have been harvested or felled. Stumps or felled trees may be visible and there may be long heaps of felling debris ('windrows'). Some standing trees within this limit may also be present but should be disregarded. This category should not be confused with coppice. The areas concerned may also have been restocked but the new trees are not yet visible.
G	Ground prepared for planting	Very difficult to differentiate from agricultural, but may show plough furrows, spaced earth mounds or weed killed patches or strips as part of a new woodland regime. Likely to be part of an approved grant scheme held on Grants & Licenses databases.
Mc	Mixed mainly conifer	Mixed woodland exhibits intermediate characteristics between conifer and broadleaved woodland. There can be several types of mixed woodland. A plantation of alternate rows of conifers and broadleaves may produce a 'striped' appearance. Conifers and broadleaves may be planted in blocks, or there may be general interspersed woodland. The proportion of the conifers will be more than 50% of the area and less than 80%.
Mb	Mixed mainly broadleaved	Mixed woodland exhibits intermediate characteristics between conifer and broadleaved woodland. There can be several types of mixed woodland. A plantation of alternate rows of conifers and broadleaves may produce a 'striped' appearance. Conifers and broadleaves may be planted in blocks, or there may be general interspersed woodland. The proportion of the broadleaves will be more than 50% of the area and less than 80%.
N	Young trees	Areas where planting is clearly visible but the trees cannot yet be differentiated between conifer and broadleaved due to their immaturity. Such areas can be either on land new to woodland or where a felled crop has been replaced.

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Abbreviation code	Description text	Comments
O	Coppice	The most important characteristic of coppice areas on aerial photographs is their very even, smooth appearance. The coppice area may be made up of a patchwork of different ages (heights) but all exhibit this very even texture. Areas recently cut may appear to have a very clear floor with little felling debris. Coppice is always of broadleaved trees.
P	Coppice with standards	Some areas of coppice may also include larger broadleaved trees set into the coppice matrix. Such broadleaved trees, often oak, are known as standards and show very clearly over the even coppice as large, rounded crowns. The distribution of the standards may also be fairly scattered with approximately 25 stems per hectare.
S	Shrub	This category is intended to include areas that may possibly be woodland, where the growth is close to the ground and shows a rough character but no clear differentiation between conifer and broadleaved can yet be made. Areas being colonised by woody species may fall into this category. The cover will be at least 20%.
Aw	Assumed woodland	Areas of woodland identified as having been planted through woodland planting grant aid, which are not currently visible in aerial photography, but are assumed to exist.
Ld	Low density	The 'low density' polygons are areas that were mapped by NIWT but not mapped by NFI where investigation of the archive images shows a higher density than at present. These have been included for future monitoring.
CS	Cloud/shadow	If cloud or shadow areas obscure woodland detail and it is difficult to allocate one of the above IFTs, then a feature is digitised around the uncertain area.
X	Uncertain	Where the interpreter is uncertain of the IFT/IOA to be used, X will be designated. The rate of use of this category should decline over time, as operators become more proficient and better at recognising IFTs/IOAs. As part of the quality control and update procedures Xs will be checked against the latest imagery.
Fa	Failed	Areas that show evidence of ground prep over several years and still exhibit no evidence of trees, based on the latest available imagery.
Wt	Windblow	Area of woodland where the trees have been uprooted or broken by the wind and which remain uncleared and not regenerated based on the latest available imagery.

Table 50 Description of interpreted open areas

Abbreviation code	Description text	Comments
A	Agricultural	May contain a cereal crop or pasture.
Ba	Bare area	Bare ground or rock.
Gs	Grass	A predominantly grassy area - may or may not be agricultural.
L	Power line	Linear feature, possibly shadow evidence of poles, pylons or
Q	Quarry	Evidence of change from vegetation to geology; sand, slate, rock etc. Active quarries could have buildings, and heavy plant tracks leading into the quarry.
Ri	River	Linear feature; depending on location can be fairly straight or meander through woodland.
Ro	Road	Linear feature; often fairly straight with gentle bends or turning circles.
U	Urban	Buildings within woodland areas; may include gardens surrounding the buildings.
V	Other vegetation	Not covered by the above (e.g. gorse, rhododendron, bracken, heather etc.).
W	Open water	Normally labelled within OS MasterMap ®, areas of even colour.
Wf	Wind farm	Possible shadow evidence of turbines, normally in groups.

Appendix B – Forecast assumptions

Table 51 Restock prescription in England

Species	Current stocked area	Conifer species as a % of conifer area	Proposed conifer species as a % of conifer area	Assumed % change to conifer woodland
Sitka spruce	81	25.2	30.0	
Scots pine	67	20.9	25.0	
Corsican pine	43	13.4	0.5	
Norway spruce	29	9.0	10.0	
Larches	44	13.7	2.0	
Douglas fir	25	7.8	14.0	
Lodgepole pine	8	2.5	0.5	
Other conifer species	24	7.5	18.0	
Total	321	100.0	100.0	-10
Areas	Area	% of total woodland area		
Total conifer stocked area	321	24.8		
Total broadleaved stocked area	886	68.5		
Total conifer and broadleaved stocked area	1,207	93.3		
Total unstocked area	88	6.8		
Woodland area at 2011	1,294			
Projected change after one rotation				
Resultant total conifer stocked area	289	22.3		
Resultant total broadleaved stocked area	902	69.7		
Resultant total conifer and broadleaved stocked area	1,190	92.0	Figures assume 50% of the conifer reduction goes to broadleaved trees and 50% to open	
Resultant total unstocked area	104	8.0		

Table 52 Overdue timber allocation – conifers

Species	Prescription by years beyond maximum MAI (as of base year)		
	0-10 yrs beyond	10-30 yrs beyond	30 + yrs beyond
Sitka spruce	Fell 50% 1- 25 yrs	Fell 50% 1- 25 yrs	Fell 75% 1-25 yrs
	Fell 50% 26-50	Fell 40% 26-50 yrs	
		10% zero intervention	25% zero intervention
Norway spruce	Fell 50% 1- 25 yrs	Fell 50% 1- 25 yrs	Fell 75% 1-25 yrs
	Fell 50% 26-50	Fell 40% 26-50 yrs	
		10% zero intervention	25% zero intervention
Douglas fir	Fell 50 % 1- 25 yrs	Fell 75 % 1- 25 yrs	Fell 75% over 10 yrs
	Fell 25% 26- 50 yrs	25% zero intervention	25% zero intervention
	25% zero intervention		
Scots pine	Fell 0% 1-25 yrs	Fell 50 % 1- 25 yrs	Fell 50% 1- 25 yrs
	Fell 75% 26-50 yrs	Fell 25 % 26-50 yrs	50% zero intervention
	25% zero intervention	25% zero intervention	
Larches	Fell 50% 1- 10 yrs	Fell 50 % 1- 25 yrs	Fell 75% 1- 10 yrs
	Fell 40% 11-25 yrs	Fell 40 % 26-50 yrs	25% zero intervention
	10% zero intervention	10% zero intervention	
Corsican pine	Fell 50% 1- 10 yrs	Fell 50 % 1- 25 yrs	Fell 75% 1- 10 yrs
	Fell 40% 11-25 yrs	Fell 25% 26- 50 yrs	25% zero intervention
	10% zero intervention	25% zero intervention	
Lodgepole pine	Fell 50% 1- 10 yrs	Fell 50 % 1-25 yrs	Fell 75% 1- 10 yrs

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	Prescription by years beyond maximum MAI (as of base year)		
Species	0-10 yrs beyond	10-30 yrs beyond	30 + yrs beyond
	Fell 40% 11- 25 yrs	Fell 25 % 26- 50 yrs	25% zero intervention
	10% zero intervention	25% zero intervention	
Other conifer species	Fell 50 % 1-25 yrs	Fell 75 % 1- 25 yrs	Fell 75% 1- 10 yrs
	Fell 25% 26- 50 yrs	25% zero intervention	25% zero intervention
	25% zero intervention		

Glossary

Actual production	Timber reported as having been felled and removed from the forest. The Forestry Commission keeps records of actual production for its estate, while estimates for the Private sector come from surveys of harvesting companies and timber processors. These figures are available from Forestry Commission Statistics.
Aerial photograph	Photograph of the ground taken from an elevated/direct–down position, with a camera that is not supported by a ground-based structure.
Age class	A grouping of trees into specific age ranges for classification purposes.
Area (forest/woodland)	Forest and woodland area can be defined in net or gross terms. Net area is the land actually covered by trees (in the National Forest Inventory that is to the drip line of the canopy). Gross area includes both the area covered by trees and the open spaces (<0.5 hectare) within (e.g. rides, glades, ponds).
Availability	A term to describe what timber could potentially be available for harvesting within a forest area.
Biological potential	A term applied to forecast scenarios with the objective of maximising timber production. It typically involves felling stands in the year of maximum MAI and management table thinning. It may not take account of factors that constrain thinning and felling (e.g. wind risk or pest attack). The forecast results set out in this report involve constraints on thinning and times of felling to take account of wind risk.
Broadleaves	Trees and shrubs that belong to the angiosperm division of the plant kingdom (as distinct from the gymnosperm division that includes conifers). Most in the UK have laminar leaves and are deciduous. Sometimes referred to as 'hardwoods'.
Canopy cover	Area covered by a mass of foliage and branches formed collectively by the crowns of trees.
Clearfell area	Area here all the trees have been felled at once. In non-clearfell areas, only some of the trees are felled at any one time.
Clearfelling	Cutting down of an area of woodland (if it is within a larger area of woodland it is typically a felling greater than 0.25 hectare). Sometimes a scatter or small clumps of trees may be left standing within the felled area.
Conifers	Trees and shrubs that belong to the gymnosperm division of the plant kingdom (as distinct from the angiosperm division that includes broadleaves). Conifers mostly have needles or scale-like leaves and are usually evergreen. Sometimes referred to as 'softwoods'.
Cumulative volume production	The total volume of timber that is forecast to be produced over the entire forecast period, including any overdue timber.
DAMS (Detailed Aspect Methodology Score)	A measure of exposure at a particular location. Can be used as a proxy indicator of the risk of catastrophic wind damage to a stand of trees. May be used to influence decisions on thinning and timing of clearfelling where wind is a risk factor.
DBH (diameter at breast height)	The diameter on the stem of a tree at 'breast height', defined as 1.3 m from ground level.
Dothistroma needle blight	A disease of conifers (especially pine) which causes defoliation, losses in yield and, in severe cases, tree death. Also known as red band needle blight.

Felling plan	A spatial and temporal plan of harvesting activities within a forest or woodland.
Forest (or woodland)	Land predominately covered in trees (defined as land under stands of trees with a canopy cover of at least 20%, or the ability to achieve this, and with a minimum area of 0.5 hectare and minimum width of 20 m), whether in large tracts (generally called forests) or smaller areas known by a variety of terms (including woods, copses, spinneys or shelterbelts).
Forest management plan	A holistic spatial and temporal plan stating the objectives of management together with details of forestry proposals over a period of five years and outlining intentions over a minimum total of 10 years. Such plans allow managers to communicate proposals and demonstrate sustainable forest management. They can be used to authorise thinning, felling and other management operations.
Forest Service	An agency within the Department of Agriculture and Rural Development (DARD) in Northern Ireland responsible for the regulation of forestry and the management of state forests in Northern Ireland.
Forestry Commission	The government department responsible for regulating forestry, implementing forestry policy and managing state forests in England and Scotland. Forestry policy is devolved, with the exception of common issues addressed on a GB or UK basis, such as international forestry, plant health and forestry standards.
Forestry Commission (FC) estate	Forests, woodlands, open land and other property managed by the Forestry Commission.
Great Britain (GB)	England, Scotland and Wales.
Hardwood	The wood of broadleaved trees or the broadleaves themselves.
High forest	Woodland which is not managed as coppice or pollards and which may or may not be managed for timber.
Increment	The increase in volume of a tree or a stand over a year or annualised over a specified period measured either in m^3 per year or in m^3 per hectare per year. See also Mean Annual Increment (MAI).
Interpreted forest type (IFT)	Interpreted forest type is a classification of woodland into woodland types as identified from aerial photography and satellite imagery.
Interpreted open area (IOA)	Interpreted open are is a classification of open spaces within woodlands as identified from aerial photography and satellite imagery.
Like-for-like (restocking)	The restocking of areas of felled trees with trees of the same species and yield class.
Maximising productivity	The management of woodland to maximise volume production by thinning at the MTI.
Mean annual increment (MAI)	The average annual rate of volume production from year of planting to a given year, expressed in m^3 obs per hectare per year. In even-aged stands it is calculated by dividing cumulative volume production by age.
MTT (management table thinning)	A sequence of thinnings prescribed by Forestry Commission yield tables over the life of a forest stand. Management table thinning refers to the pattern of thinning recommended in these yield tables. In standard yield tables the thinnings are set to an intensity which aims to maximise diameter increment whilst also maintaining maximum cumulative volume production
MTI (marginal thinning intensity)	The maximum sustainable intensity of thinning defined as 70% of yield class per hectare per year (m^3 obs/ha/year).

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Maximum MAI (maximum mean annual increment) (MMAI)	The age at which a stand reaches the maximum average rate of volume increment which it can achieve. Felling the stand at this age will ensure that the stand reaches its highest average production per annum for its lifespan, thus optimising the stand in terms of volume production over the long term.
Mean annual increment (MAI)	The average rate of volume production up to a given year, expressed in m^3 per hectare per year. In even-aged stands it is calculated by dividing cumulative volume production by age.
Mensuration	The study of the measurement of lengths, areas, volumes and related quantities. Forest mensuration is concerned with the measurement of trees, woodlands and forests, including standing and felled timber.
National Forest Inventory (NFI)	An inventory run by the Forestry Commission, set up in 2009, to provide a record of key information about GB forests and woodlands.
National Inventory of Woodland and Trees (NIWT)	An inventory run by the Forestry Commission, set up in 1995 and completed in 2002, to provide a record of key information about GB forests and woodlands.
Natural Resources Wales (NRW)	Natural Resources Wales is the largest Welsh Government Sponsored Body - employing 1,900 staff across Wales with a budget of £180 million. NRW was formed in April 2013, largely taking over the functions of the Countryside Council for Wales, Forestry Commission Wales and the Environment Agency in Wales, as well as certain Welsh Government functions.
Overbark	Used as a qualification when the diameter or volume of wood includes the bark.
Overbark standing (OBS)	Timber is defined in this report as the volume of stemwood to 7 cm top diameter in m^3 overbark standing (obs), including stump (above ground) and usable branchwood (of minimum 3 m in length and 7 cm top diameter).
Overdue	Timber contained in stands that are beyond the felling age prescribed by the harvesting scenario at the start of the forecast.
Phytophthora	Fungus-like pathogens that can cause extensive damage and mortality to trees and other plants.
Planned production	The volumes and assortments published in the removals forecast, reflecting the cumulative impact of managing the FC estate (as of 31 March 2012) in accordance with approved forest design and thinning plans.
Potential production	A forecast which will not necessarily transpire. As the private sector estate forecast makes assumptions about future levels of harvest, and the assumptions may not transpire, this forecast is one of potential production.
Private sector estate	Forests and woodlands in the UK not managed by the Forestry Commission, Natural Resources Wales or Forest Service. In the context of the National Forest Inventory, 'Private sector' is used for convenience although it includes land owned or managed by bodies such as local authorities and charities.
Production forecast	A forecast of softwood volume production based on a firm plan of harvesting.
Restocking plan	A spatial and temporal plan describing how felled areas are to be replanted or regenerated.
Satellite imagery	Imagery of the earth taken from space from a satellite.
Softwood	The wood of coniferous trees or the conifers themselves.

Stand	A distinct area of woodland, generally composed of a uniform group of trees in terms of species composition and spatial distribution, and age and size class distribution.
Standard error (SE)	The measure of the margin of error associated with an estimate as a result of sampling from a population with statistical variability. Larger standard errors indicate less precision in the estimate. Standard errors in this report are quoted in relative terms (i.e. as percentages of the value of the estimate).
Standing volume	The live stemwood and usable branchwood of trees (up to 7 cm top diameter). It excludes roots, below ground stump material, small branches, foliage and deadwood. For Private sector woodland only, it also excludes trees in woodlands of less than 0.5 hectare. Usually expressed as m^3 overbark standing (m^3 obs).
Stemwood	The woody material forming the above ground main growing shoot(s) of a tree or stand of trees. The stem includes all woody volume above ground with a diameter greater than 7 cm overbark. Stemwood includes wood in major branches where there is at least 3 m of straight length to 7 cm top diameter.
Stocked area	The area stocked with living trees. The stocked areas in this report are quoted in gross terms for the FC/NRW estate and in net terms for the private sector estate (see the definition of area above).
Sub-compartment database (SCDB)	A database owned and maintained by the Forestry Commission that holds an inventory of all stands of trees managed by the Forestry Commission (including that formerly managed by Forestry Commission Wales which is now managed by Natural Resources Wales).
Sustainable forest management	The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity and vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national and global levels, and that does not cause damage to other ecosystems.
Terminal height	The top height of a stand at which wind damage is expected to reach a level necessitating clearfelling.
Thinning	The periodic harvesting of trees in a woodland, involving the removal of some trees for commercial use and the retention of others for future production or long-term retention.
Thinning plan	A spatial and temporal plan of harvesting activities within a forest or woodland.
Top diameter	The diameter of the smaller (top) end of a length of stemwood, branchwood or log, often used to define different categories of wood products (e.g. sawlogs, roundwood, pulp) and merchantable timber.
Top height	The mean total height of the 100 largest dbh trees per hectare.
UK (United Kingdom)	Great Britain and Northern Ireland.
Windthrow	Uprooting of trees by the wind. Windthrow can be endemic – i.e. that caused by frequently recurring peak winds – or catastrophic – an infrequent occurrence associated with exceptionally strong winds where large areas/numbers of trees are blown down.
Woodland	see Forest.
Yield class (YC)	An index used in the UK of the potential productivity of even-aged stands of trees based on maximum MAI. It reflects the potential productivity of the site for the tree species growing on it.

NFI national reports and papers

This series of reports is part of the wider suite of publications from the National Forest Inventory (NFI). NFI reports that contain information relating to this series of reports are:

- NFI woodland area statistics, Great Britain, England, Scotland, Wales (2011)
- Standing timber volume for coniferous trees in Britain (2012)
- 25-year forecast of softwood availability (2012)
- 25-year forecast of standing coniferous volume and increment (2012)
- Preliminary estimates of broadleaved species in British woodlands, with special focus on ash (2012)
- Biomass in live woodland trees in Britain (2014)
- Carbon in live woodland trees in Britain (2014)
- 50-year forecast of softwood availability (2014)
- 50-year forecast of hardwood availability (2014)
- 25-year forecast of softwood availability (2016)

Each theme has a series of associated reports, papers and data, tailored for different audiences and uses.

This report contains a subset of the information provided in the Official Statistics report *25-year forecast of softwood timber availability* (2016). More information about Official Statistics and the UK Statistics Authority is available at www.statisticsauthority.gov.uk

National Forest Inventory statistician: David Ross

Lead authors

L. Halsall, J. Gilbert, E. Whitton

Reviewed by:

L. Halsall