

# National Forest Inventory statistics for Exmoor National Park

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# NFI summary report

# **Exmoor National Park**

Map 1 Location map for Exmoor National Park



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# Key findings for Exmoor National Park

Exmoor National Park has a land area of 69,312 hectares, with 14% woodland cover. Some 14% 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 (37%), standing volume (32%) or number of trees (34%).

Oak is the most commonly occurring of the broadleaved species whether assessed by stocked area (26%), standing volume (46%) or number of trees (22%)

Some 53% 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 66% of conifer sections show evidence of thinning.

Overall 54% 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 8% 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 Exmoor 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 <u>NFI web pages</u>.

# 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. Unlike many NFI reports, the estimates in this report have been provided for all woodland without 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). This is due to the relatively small area of woodland in the Exmoor National Park under FC ownership. 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 1,204 were located in South West England. Of these, 48 sample squares were in the Exmoor National Park. These surveyed sample squares are a subsample 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).

A 'top-up' scheme was commissioned providing an increase in the sampling intensity within Exmoor National Park, thus providing more accurate estimates for the National

Park. Under this scheme, an additional 30 sample squares were selected and surveyed during winter 2017-18. The data from these 78 sample squares in the National Park have been used to produce the results in this report.

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 2,929 woodland stands being assessed in South 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<sup>2</sup> (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 65,133 trees were measured in South West England (307,892 across England and 613,928 across Britain). For 23,292 of these trees in South 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.

# 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 31<sup>st</sup> 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**.

# 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, the biomass and carbon stocks in live trees in woodlands within the Exmoor 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 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 Exmoor 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 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

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) and older activity (greater than 3 years ago).

## 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.

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.

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  $\geq 0.05$ ha 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
- 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<sup>3</sup> 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.

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.

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 Exmoor 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 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 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.

# 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 attached to the estimates are expressed in relative terms (%) to the right of the relevant estimate and as  $\pm$  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.

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# 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)	%	
Exmoor National Park			
Woodland	9,356	99%	
Assumed woodland	99	1%	
Low density	33	0%	
Total mapped woodland	9,487	100%	
Non-woodland area	59,825		
Land area	69,312		
Woodland land cover		14%	
Non-woodland land cover		86%	

# Woodland area by ownership

## Map 2 Woodland map by ownership



Figure 2 Woodland area by ownership



Table 2 Woodland area by ownership

Ownership	Area (ha)	% Woodland	
Exmoor National Park			
Forestry Commission	1,283	14%	
Other ownership	8,205	86%	
Total area of woodland	9,487	100%	

# Woodland area by interpreted forest type

#### Map 3 Woodland map by interpreted forest type



#### Figure 3 Woodland area by interpreted forest type



- 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
Exmoor National Park		
Broadleaved	5,617	59%
Conifer	2,787	29%
Felled	397	4%
Ground prep	34	0%
Mixed mainly broadleaved	155	2%
Mixed mainly conifer	100	1%
Young trees	238	3%
Coppice	0	0%
Coppice with standards	0	0%
Shrub	23	0%
Assumed woodland	99	1%
Low density	33	0%
Failed	6	0%
Windthrow	0	0%
Cloud/shadow/uncertain	0	0%
TOTALS	9,487	100%

# Woodland area by interpreted forest type and woodland size







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

#### Table 4 Woodland area by interpreted woodland type and woodland size

Forest type	Woodla	Total area	
Forest type	2 ha and over	0.5 – < 2 ha	(ha)
Exmoor National Park			
Broadleaved	5,330	286	5,617
Conifer	2,736	51	2,787
Felled	396	< 1	397
Ground prep	32	2	34
Mixed mainly broadleaved	126	30	155
Mixed mainly conifer	80	19	100
Young trees	224	14	238
Coppice	0	0	0
Coppice with standards	0	0	0
Shrub	18	5	23
Assumed woodland	92	7	99
Low density	31	2	33
Failed	6	0	6
Windthrow	0	0	0
Cloud/shadow/uncertain	0	0	0
TOTALS	9,071	417	9,487

# Woodland area by interpreted forest type and ownership

Broadleaved Conifer Felled Ground prep Mixed mainly broadleaved Mixed mainly conifer Young trees Coppice Forestry Coppice with standards Commission Shrub Assumed Woodland Low Density Failed Windthrow Other Cloud/shadow/uncertain ownership

Figure 5 Woodland area by interpreted forest type and ownership

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

	Forestry Commission		Other ownership			
Forest type	Area (ha)	% of total area	Area (ha)	% of total area		
Exmoor National Park						
Broadleaved	123	10%	5,493	67%		
Conifer	991	77%	1,797	22%		
Felled	118	9%	279	3%		
Ground prep	8	1%	26	0%		
Mixed mainly broadleaved	5	0%	150	2%		
Mixed mainly conifer	3	0%	97	1%		
Young trees	29	2%	209	3%		
Coppice	0	0%	0	0%		
Coppice with standards	0	0%	0	0%		
Shrub	0	0%	23	0%		
Assumed Woodland	5	0%	94	1%		
Low Density	< 1	0%	32	0%		
Failed	0	0%	6	0%		
Windthrow	0	0%	0	0%		
Cloud/shadow/uncertain	0	0%	0	0%		
TOTALS	1,283	100%	8,205	100%		
# Woodland area by interpreted forest type, woodland size and ownership

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

	2 ha ar	nd over	0.5 -	Tatalanaa	
Forest type	Forestry Commission	Other	Forestry Commission	Other	(ha)
Exmoor National Park					
Broadleaved	123	5,207	0	286	5,617
Conifer	991	1,745	0	51	2,787
Felled	118	278	0	< 1	397
Ground prep	8	24	0	2	34
Mixed mainly broadleaved	5	120	0	30	155
Mixed mainly conifer	3	77	0	19	100
Young trees	29	195	0	14	238
Coppice	0	0	0	0	0
Coppice with standards	0	0	0	0	0
Shrub	0	18	0	5	23
Assumed woodland	5	87	0	7	99
Low Density	< 1	30	0	2	33
Failed	0	6	0	0	6
Windthrow	0	0	0	0	0
Cloud/shadow/uncertain	0	0	0	0	0
Totals	1,283	7,788	0	417	9,487

# 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)
Exmoor Nationa	al Park			
<2	417	414	4%	1
2 - <10	941	209	10%	5
10 - <20	519	38	5%	14
20 - <50	1,583	54	17%	29
50 - <100	1,312	18	14%	73
100 - <500	3,181	15	34%	212
500 and >	1,534	2	16%	767
All woods	9,487	750	100%	13

# 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
Exmoor National Park		
Agricultural	18	11%
Bare area	2	1%
Grass	133	81%
Power line	0	0%
Quarry	0	0%
River	0	0%
Road	0	0%
Urban	< 1	0%
Other vegetation	8	5%
Open water	1	1%
Wind farm	0	0%
TOTALS	164	100%

# Net area under canopy

## Stocked area by species

Figure 8 Stocked area by principal tree species



#### Table 9 Stocked area by principal tree species

	FC/PS			
Principal species	area (000 ha)	SE%		
Conifers				
Sitka spruce	0.8	25		
Scots pine	0.2	40		
Corsican pine	< 0.1	99		
Norway spruce	0.2	57		
Larches	0.3	42		
Douglas fir	0.4	26		
Lodgepole pine	0.0	-		
Other conifers	0.4	35		
All conifers	2.2	10		
Broadleaves				
Oak	1.8	15		
Beech	0.4	23		
Sycamore	0.2	37		
Ash	0.8	20		
Birch	0.7	21		
Sweet chestnut	0.2	46		
Hazel	1.1	16		
Hawthorn	0.2	26		
Alder	0.1	39		
Willow	0.1	44		
Other broadleaves	1.5	14		
All broadleaves	7.2	4		
All species				
All species	9.4	3		



#### Figure 9 Stocked area by principal conifer species

Figure 10 Stocked area by principal broadleaved species



# Stocked area by age class

#### Figure 11 Stocked area by age class



#### Table 10 Stocked area by age class

	FC/PS			
Age class (years)	area (000 ha)	SE%		
All conifers				
0–10	0.4	33		
11–20	< 0.1	43		
21–40	0.3	40		
41–60	0.6	24		
61–80	0.6	30		
81–100	< 0.1	68		
100+	< 0.1	82		
Total	2.2	10		
All broadleaves				
0–10	1.5	14		
11–20	0.9	17		
21–40	1.6	14		
41–60	1.0	18		
61–80	0.7	20		
81–100	1.2	20		
100+	0.2	41		
Total	7.2	4		
All species				
0–10	2.0	12		
11–20	1.0	13		
21–40	1.9	13		
41–60	1.7	13		
61–80	1.3	13		
81–100	1.3	13		
100+	0.2	13		
Total	9.4	3		

# Stocked area by mean stand dbh class

Figure 12 Stocked area by mean stand dbh class



#### Table 11 Stocked area by mean stand dbh class

	FC/PS			
Mean stand DBH (cm)	area (000 ha)	SE%		
All conifers				
0–7	0.4	32		
7–10	< 0.1	45		
10–15	< 0.1	38		
15–20	0.4	34		
20–30	0.3	34		
30–40	0.6	29		
40–60	0.4	32		
60–80	< 0.1	64		
80+	0.0	-		
Total	2.2	10		
All broadleaves				
0–7	2.0	13		
7–10	0.9	16		
10–15	1.2	16		
15–20	1.4	16		
20–30	0.8	24		
30–40	0.5	24		
40–60	0.2	30		
60–80	< 0.1	48		
80+	< 0.1	48		
Total	7.2	4		
All species				
0–7	2.4	11		
7–10	0.9	15		
10–15	1.3	15		
15–20	1.8	14		
20–30	1.1	19		
30–40	1.1	18		
40–60	0.6	22		
60–80	0.1	40		
80+	< 0.1	48		
Total	9.4	3		

# Clearfelled area

#### Table 12 Clearfelled area

	FC/PS		
Clearfelled area	area (000 ha)	SE%	
Exmoor National Park	0.1	57	

# Comparison of mapped area estimates and stocked area estimates



#### Figure 13 Simplified comparison of mapped area and stocked area

#### **Table 13** Simplified comparison of mapped area and stocked area

	Woodland map based	Field sample based	
	area (000 ha)		
Exmoor National Park			
Broadleaved	5.8	7.2	
Conifer	2.9	2.2	

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.

# Standing volume

# Standing volume by species

Figure 14 Standing volume by principal tree species



## **Table 14** Standing volume by principal tree species

	FC/PS			
Principal species	volume (000 m <sup>3</sup> obs)	SE%		
Conifers				
Sitka spruce	362	34		
Scots pine	143	58		
Corsican pine	< 1	99		
Norway spruce	126	58		
Larches	157	47		
Douglas fir	211	28		
Lodgepole pine	0	-		
Other conifers	136	42		
All conifers	1,135	13		
Broadleaves				
Oak	645	20		
Beech	47	31		
Sycamore	31	39		
Ash	207	30		
Birch	136	22		
Sweet chestnut	55	53		
Hazel	162	22		
Hawthorn	9	34		
Alder	42	52		
Willow	7	58		
Other broadleaves	65	34		
All broadleaves	1,405	9		
All species				
All species	2,540	7		



#### Figure 15 Standing volume by principal conifer species

Figure 16 Standing volume by principal broadleaved species



# Standing volume by age class

Figure 17 Standing volume by age class



#### Table 15 Standing volume by age class

	FC/PS			
Age class (years)	volume (000 m <sup>3</sup> obs)	SE%		
All conifers				
0–10	0	-		
11–20	5	70		
21–40	128	41		
41–60	511	28		
61–80	380	30		
81–100	107	73		
100+	4	95		
Total	1,135	13		
All broadleaves				
0–10	1	48		
11–20	17	15		
21–40	220	15		
41–60	287	20		
61–80	293	22		
81–100	498	25		
100+	90	34		
Total	1,405	9		
All species				
0–10	1	48		
11–20	22	21		
21–40	347	18		
41–60	799	19		
61–80	673	19		
81–100	605	24		
100+	94	33		
Total	2,540	7		

Standing volume by mean stand dbh class

Figure 18 Standing volume by stand mean dbh class



Standing volume (000 m<sup>3</sup> obs)

Table	16	Standing	volume	by	mean	stand	dbh	class
IUDIC		Standing	volume	Ny	mean	Stand	GDT	Clubb

	FC/PS			
Mean stand DBH (cm)	volume	SF%		
	(000 m <sup>3</sup> obs)	JE 70		
All conifers				
0–7	< 1	37		
7–10	5	72		
10–15	12	41		
15–20	106	43		
20–30	218	36		
30–40	422	29		
40–60	309	33		
60–80	62	61		
80+	0	-		
Total	1,135	13		
All broadleaves				
0–7	8	27		
7–10	33	19		
10–15	160	19		
15–20	368	18		
20–30	265	26		
30–40	237	25		
40–60	161	32		
60–80	156	64		
80+	16	51		
Total	1,405	9		
All species				
0–7	8	27		
7–10	39	19		
10–15	172	18		
15–20	473	17		
20–30	483	21		
30–40	660	20		
40–60	470	24		
60–80	218	49		
80+	16	51		
Total	2.540	7		

# Number of measureable trees

Number of measureable trees by species

Figure 19 Number of measureable trees by principal tree species



Table 17	' Number	of measure	eable trees	by	principa	al tree	species
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	FC/PS		
Principal species	number of trees (thousands)	SE%	
Conifers			
Sitka spruce	711	41	
Scots pine	169	30	
Corsican pine	1	99	
Norway spruce	123	54	
Larches	265	34	
Douglas fir	346	36	
Lodgepole pine	0	-	
Other conifers	459	43	
All conifers	2,074	17	
Broadleaves			
Oak	2,327	20	
Beech	602	35	
Sycamore	395	46	
Ash	788	27	
Birch	1,440	20	
Sweet chestnut	177	56	
Hazel	2,287	17	
Hawthorn	417	29	
Alder	277	43	
Willow	102	47	
Other broadleaves	1,704	20	
All broadleaves	10,518	7	
All species			
All species	12,592	6	

# Number of measureable trees by age class







Table 18 N	umber of	measureable	trees by	age class
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	FC/PS		
Age class (years)	number of trees (thousands)	SE%	
All conifers			
0–10	0	-	
11–20	284	51	
21–40	700	43	
41–60	589	27	
61–80	407	27	
81–100	81	68	
100+	13	82	
Total	2,074	17	
All broadleaves			
0–10	113	40	
11–20	2,176	17	
21–40	3,790	13	
41–60	1,792	26	
61–80	942	23	
81–100	1,468	22	
100+	236	68	
Total	10,518	7	
All species			
0–10	113	40	
11–20	2,460	17	
21–40	4,490	13	
41–60	2,381	21	
61–80	1,350	18	
81–100	1,550	21	
100+	249	65	
Total	12,592	6	

# Number of measureable trees by mean stand dbh class

Figure 21 Number of measureable trees by mean stand dbh class



Number of trees (thousands)

	FC/PS		
Mean stand DBH	number of trees (thousands)	SE%	
All conifers			
0–7 cm	12	37	
7–10 cm	282	52	
10–15 cm	183	36	
15–20 cm	651	44	
20–30 cm	419	35	
30–40 cm	379	28	
40–60 cm	134	30	
60–80 cm	13	55	
80+ cm	0	-	
Total	2,074	17	
All broadleaves			
0–7 cm	1,540	27	
7–10 cm	2,321	15	
10–15 cm	3,089	18	
15–20 cm	2,332	18	
20–30 cm	801	24	
30–40 cm	291	23	
40–60 cm	99	30	
60–80 cm	44	59	
80+ cm	2	51	
Total	10,518	7	
All species			
0–7 cm	1,552	27	
7–10 cm	2,603	14	
10–15 cm	3,272	17	
15–20 cm	2,982	17	
20–30 cm	1,220	20	
30–40 cm	670	18	
40–60 cm	233	22	
60–80 cm	57	46	
80+ cm	2	51	
Total	12,592	6	

#### **Table 19** Number of measureable trees by mean stand dbh class

# Biomass stocks in live woodland trees

## Biomass stocks by species

Figure 22 Biomass stocks by principal tree species



#### Table 20 Biomass stocks by principal tree species

	FC/PS		
Principal species	biomass (000 odt)	SE%	
Conifers			
Sitka spruce	197	33	
Scots pine	90	57	
Corsican pine	< 1	99	
Norway spruce	64	57	
Larches	88	47	
Douglas fir	133	28	
Lodgepole pine	0	-	
Other conifers	75	41	
All conifers	648	13	
Broadleaves			
Oak	564	19	
Beech	44	29	
Sycamore	27	39	
Ash	169	29	
Birch	133	22	
Sweet chestnut	43	52	
Hazel	142	21	
Hawthorn	11	32	
Alder	34	52	
Willow	7	52	
Other broadleaves	70	29	
All broadleaves	1,245	9	
All species			
All species	1,893	7	

# Carbon stocks in live woodland trees

## Carbon stocks by species

Figure 23 Carbon stocks by principal tree species



#### Table 21 Carbon stocks by principal tree species

	FC/PS		
Principal species	carbon (000 t)	SE%	
Conifers			
Sitka spruce	99	33	
Scots pine	45	57	
Corsican pine	< 1	99	
Norway spruce	32	57	
Larches	44	47	
Douglas fir	67	28	
Lodgepole pine	0	-	
Other conifers	37	41	
All conifers	324	13	
Broadleaves			
Oak	282	19	
Beech	22	29	
Sycamore	14	39	
Ash	85	29	
Birch	67	22	
Sweet chestnut	22	52	
Hazel	71	21	
Hawthorn	6	32	
Alder	17	52	
Willow	4	52	
Other broadleaves	35	29	
All broadleaves	623	9	
All species			
All species	946	7	

# Existing woodland management information and economic viability data

# Sample square distribution

Table 22 Sample square distribution

Number of squares surveyed	Number of squares surveyed	Number of squares containing coniferous species	Number of squares containing broadleaved species
Exmoor National Park	80	49	74

# Evidence of management



#### Figure 24 Evidence of management in broadleaved sections

\* Brash Removal / Mulched / Burned

#### Figure 25 Evidence of management in conifer sections



\* Brash Removal / Mulched / Burned





Go to Part 2

# Suitability for harvesting



#### Figure 27 Suitability for harvesting

# Distance to road

#### Figure 28 Distance to road



Go to Part 2

# Type of road or ride









# Mean yield class



Figure 31 Mean yield class by principal tree species

71 National Forest Inventory statistics for Exmoor National Park

#### Table 23 Mean yield class by principal tree species

Principal species	mean yield class weighted by area	
Conifers		
Sitka spruce	15.4	
Scots pine	10.1	
Corsican pine	0.0	
Norway spruce	14.7	
Larches	10.6	
Douglas fir	15.2	
Lodgepole pine	0.0	
Other conifers	13.8	
All conifers	13.7	
Broadleaves		
Oak	4.1	
Beech	5.4	
Sycamore	3.1	
Ash	6.8	
Birch	3.5	
Sweet chestnut	7.6	
Hazel	2.4	
Hawthorn	2.3	
Alder	4.8	
Willow	4.6	
Other broadleaves	2.9	
All broadleaves	4.2	
All species		
All species	7.0	
## Overdue timber stocks

### Overdue volume and area

#### Table 24 Standing volume in overdue timber stocks

	FC/PS	
	volume (000 m <sup>3</sup> obs)	SE %
Exmoor National Pa	ark	
All conifers	604	24
All broadleaves	755	16
All species	1,359	14

#### Table 25 Stocked area of overdue timber stocks

	FC/PS				
	area (000 ha)	SE %			
Exmoor National Pa	ark				
All conifers	0.7	22			
All broadleaves	1.6	14			
All species	2.3	12			

# Part 3 – How our woodlands might change over time

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### 50-year softwood forecast

### 50-year forecast of softwood timber availability

Figure 32 Summary of 50-year forecast of softwood timber availability; average annual volume within period





**Figure 33** 50–year forecast of softwood timber availability; average annual volume within period

**Table 26** Summary of 50-year forecast of softwood timber availability; averageannual volume within period

	FC/PS				
Forecast period	volume (000 m <sup>3</sup> obs)	SE%			
Exmoor National Pa	ark				
2018–21	49	22			
2022–26	38	26			
2027–31	76	28			
2032–36	34	32			
2037–41	28	18			
2042–46	22	16			
2047–51	27	21			
2052–56	23	12			
2057–61	35	18			
2062–66	39	26			

## 50-year forecast of softwood timber availability by principal species

**Table 27** 50-year forecast of softwood timber availability by principal species;average annual volume within period

	2018–21		2022–26	
	FC/PS		FC/PS	
Principal species	volume	SF%	volume	SE%
	(000 m <sup>3</sup> obs)	0270	(000 m <sup>3</sup> obs)	0270
Exmoor National Park				
All conifers	49	22	38	26
Sitka spruce	14	46	7	35
Scots pine	7	80	2	73
Corsican pine	0	-	< 1	99
Norway spruce	2	53	1	37
Larches	7	62	5	41
Douglas fir	10	44	12	45
Lodgepole pine	0	-	0	-
Other conifers	9	66	10	81

**Table 27 (cont'd)** 50-year forecast of softwood timber availability by principal species; average annual volume within period

	2027–31		2032–36	
Dringing charies	FC/PS		FC/PS	
Principal species	volume	SF%	volume	SF%
	(000 m <sup>3</sup> obs)	0270	(000 m <sup>3</sup> obs)	SE70
Exmoor National Park				
All conifers	76	28	34	32
Sitka spruce	29	53	17	61
Scots pine	3	60	2	76
Corsican pine	< 1	99	< 1	99
Norway spruce	19	78	3	69
Larches	4	43	4	46
Douglas fir	11	67	4	40
Lodgepole pine	0	-	0	-
Other conifers	8	59	3	33

**Table 27 (cont'd)** 50-year forecast of softwood timber availability by principal species; average annual volume within period

	2037–41		2042–46	
	FC/PS		FC/PS	
Principal species	volume	SF%	volume	SF%
	(000 m <sup>3</sup> obs)	02/0	(000 m <sup>3</sup> obs)	0270
Exmoor National Park				
All conifers	28	18	22	16
Sitka spruce	8	33	9	30
Scots pine	3	61	3	41
Corsican pine	< 1	68	< 1	68
Norway spruce	5	72	2	96
Larches	4	46	3	46
Douglas fir	4	38	3	37
Lodgepole pine	0	-	< 1	87
Other conifers	4	33	2	33

**Table 27 (cont'd)** 50-year forecast of softwood timber availability by principal species; average annual volume within period

	2047–51		2052–56	
	FC/PS		FC/PS	
Principal species	volume	SE%	volume	SE%
	(000 m³ obs)		(000 m³ obs)	
Exmoor National Park				
All conifers	27	21	23	12
Sitka spruce	9	30	10	27
Scots pine	2	56	3	49
Corsican pine	< 1	68	< 1	66
Norway spruce	< 1	52	1	73
Larches	3	44	3	46
Douglas fir	8	60	3	28
Lodgepole pine	< 1	87	< 1	87
Other conifers	4	38	3	32

**Table 27 (cont'd)** 50-year forecast of softwood timber availability by principal species; average annual volume within period

	2057–61		2062–66	
	FC/PS		FC/PS	FC/PS
Principal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All conifers	35	18	39	26
Sitka spruce	11	26	24	43
Scots pine	2	54	3	50
Corsican pine	< 1	93	< 1	87
Norway spruce	1	64	2	55
Larches	3	44	3	47
Douglas fir	8	61	3	27
Lodgepole pine	< 1	87	< 1	87
Other conifers	9	54	5	23

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

**Table 28** 50-year forecast of softwood timber availability by top diameter class;

 average annual volume within period

Top diameter class (cm)	2018–21		2022–26	
	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
7–14	4	27	3	24
14–16	2	30	1	22
16–18	2	29	2	26
18–24	9	24	7	30
24–34	16	26	14	34
34–44	8	29	6	26
44–54	4	35	2	24
54+	3	37	3	38
Total	49	22	38	26

**Table 28 (cont'd)** 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

	2027–31		2032–36	
Top diameter class (cm)	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
7–14	8	48	4	27
14–16	4	62	1	29
16–18	5	59	1	33
18–24	15	40	6	47
24–34	22	32	10	52
34–44	12	36	5	32
44–54	7	42	2	24
54+	4	30	4	31
Total	76	28	34	

**Table 28 (cont'd)**50-year forecast of softwood timber availability by topdiameter class; average annual volume within period

Top diameter class	2037–41		2042–46	
	FC/PS		FC/PS	
(cm)	volume	SE0/	volume	SE0/
	(000 m <sup>3</sup> obs)	3E 70	(000 m <sup>3</sup> obs)	3E 70
Exmoor National Park				
7–14	4	21	4	20
14–16	1	19	1	18
16–18	1	20	1	19
18–24	4	20	4	19
24–34	6	22	5	21
34–44	4	25	3	22
44–54	3	28	1	24
54+	5	32	3	37
Total	28	18	22	16

**Table 28 (cont'd)** 50-year forecast of softwood timber availability by top diameter class; average annual volume within period

	2047–51		2052–56	
Top diameter class	FC/PS		FC/PS	
(cm)	volume	SE%	volume	SE%
	(000 m <sup>3</sup> obs)	JL 70	(000 m <sup>3</sup> obs)	JL 70
Exmoor National Park				
7–14	4	17	5	18
14–16	1	16	1	14
16–18	1	17	1	14
18–24	5	23	4	16
24–34	8	34	5	17
34–44	4	31	3	19
44–54	2	26	1	22
54+	2	39	2	38
Total	27	21	23	12

**Table 28 (cont'd)**50-year forecast of softwood timber availability by topdiameter class; average annual volume within period

	2057–61		2062–66	
Top diameter class	FC/PS		FC/PS	
(cm)	volume	SF%	volume	SF%
	(000 m <sup>3</sup> obs)	SE 70	(000 m <sup>3</sup> obs)	SE 70
Exmoor National Park				
7–14	6	18	6	17
14–16	2	24	2	19
16–18	2	28	2	22
18–24	7	29	7	26
24–34	9	23	11	36
34–44	4	25	6	43
44–54	2	24	3	48
54+	3	37	3	34
Total	35	18		

### 50-year forecast of softwood timber availability % spruce

Table 29 50-year for	ecast of softwood t	timber availability	y % s	spruce
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Exmoor National Dark		Top diameter class (cm)								
EXILIOO		7–14	14–16	16–18	18–24	24-34	34-44	44–54	54+	Total
2018–21	FC/PS (%)	41	49	50	43	35	26	20	18	34
2022–26	FC/PS (%)	17	15	16	17	18	26	45	35	22
2027–31	FC/PS (%)	71	73	75	68	61	61	64	48	64
2032–36	FC/PS (%)	51	57	55	61	69	64	57	50	61
2037–41	FC/PS (%)	54	47	38	27	38	51	58	53	45
2042-46	FC/PS (%)	57	51	45	33	29	47	57	69	46
2047–51	FC/PS (%)	46	48	44	32	20	26	36	60	34
2052–56	FC/PS (%)	49	54	52	51	44	46	51	61	50
2057–61	FC/PS (%)	45	38	33	30	30	32	37	60	36
2062–66	FC/PS (%)	59	64	65	68	70	69	70	62	67

### 50-year forecast of standing volume in conifers

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



**Table 30** 50–year forecast of standing volume in conifers; average annual volume within period

	FC/PS				
Forecast period	volume (000 m <sup>3</sup> obs)	SE%			
Exmoor National Pa	ark				
2018–21	1,042	14			
2022–26	982	14			
2027–31	759	16			
2032–36	613	15			
2037–41	581	14			
2042–46	588	13			
2047–51	588	12			
2052–56	630	12			
2057–61	655	11			
2062–66	610	10			



### 50-year forecast of net increment in conifers

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



**Table 31** 50-year forecast of net increment in conifers; average annual volume within period

FC/PS				
volume	SE0/			
(000 m <sup>3</sup> obs)	3E 70			
ark				
22	21			
25	14			
22	12			
21	14			
23	14			
27	13			
30	11			
32	10			
33	10			
31	10			
	FC/PS volume (000 m <sup>3</sup> obs) ark 22 25 22 21 23 27 30 32 33 33			



### Combined standing volume, net increment and availability

Figure 36 50-year forecast of standing volume, net increment and softwood availability



### 50-year hardwood forecast

### 50-year forecast of hardwood timber availability

Figure 37 Summary of 50-year forecast of hardwood timber availability; average annual volume within period





**Figure 38** 50–year forecast of hardwood timber availability; average annual volume within period

**Table 32** 50–year forecast of hardwood timber availability; average annual volume within period

	FC/PS				
Forecast period	volume	CF0/			
	(000 m <sup>3</sup> obs)	<i>JE 70</i>			
Exmoor National Pa	ark				
2018–21	10	55			
2022–26	4	20			
2027–31	11	51			
2032–36	4	22			
2037–41	5	23			
2042–46	8	33			
2047–51	5	15			
2052–56	6	14			
2057–61	4	16			
2062–66	6	22			



## 50-year forecast of hardwood timber availability by principal species

**Table 33** 50-year forecast of hardwood timber availability by principal species;average annual volume within period

	2018–21		2022–26	
Dringing chasies	FC/PS		FC/PS	
Philicipal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	10	55	4	20
Oak	7	81	< 1	40
Beech	< 1	59	< 1	45
Sycamore	< 1	87	< 1	56
Ash	1	42	< 1	34
Birch	< 1	37	< 1	52
Sweet chestnut	< 1	73	< 1	68
Hazel	< 1	85	< 1	81
Hawthorn	< 1	66	< 1	60
Alder	0	80	< 1	96
Willow	0	-	< 1	74
Other broadleaves	< 1	65	< 1	49

**Table 33 (cont'd)** 50-year forecast of hardwood timber availability by principal species; average annual volume within period

	2027–31		2032–36	
Dringing spacing	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	11	51	4	22
Oak	8	63	< 1	47
Beech	< 1	48	< 1	37
Sycamore	< 1	43	< 1	62
Ash	< 1	21	< 1	53
Birch	< 1	38	< 1	77
Sweet chestnut	< 1	60	< 1	58
Hazel	< 1	62	< 1	48
Hawthorn	< 1	44	< 1	35
Alder	< 1	98	< 1	54
Willow	< 1	61	< 1	55
Other broadleaves	< 1	31	< 1	21

**Table 33 (cont'd)** 50-year forecast of hardwood timber availability by principal species; average annual volume within period

	2037–41		2042–46	
Dringing charles	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	5	23	8	
Oak	1	51	< 1	39
Beech	1	49	3	83
Sycamore	< 1	51	< 1	55
Ash	< 1	18	< 1	19
Birch	< 1	38	< 1	32
Sweet chestnut	< 1	56	1	94
Hazel	< 1	57	< 1	38
Hawthorn	< 1	36	< 1	31
Alder	< 1	54	< 1	54
Willow	< 1	50	< 1	50
Other broadleaves	2	21	2	24

**Table 33 (cont'd)** 50-year forecast of hardwood timber availability by principal species; average annual volume within period

	2047–51		2052–56	
Dringing angling	FC/PS		FC/PS	
Fincipal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	5	15	6	14
Oak	< 1	37	< 1	33
Beech	< 1	30	< 1	29
Sycamore	< 1	40	< 1	52
Ash	< 1	18	1	18
Birch	< 1	61	< 1	36
Sweet chestnut	< 1	59	< 1	59
Hazel	< 1	64	< 1	44
Hawthorn	< 1	38	< 1	39
Alder	< 1	85	< 1	98
Willow	< 1	50	< 1	50
Other broadleaves	2	23	2	25

**Table 33 (cont'd)** 50-year forecast of hardwood timber availability by principal species; average annual volume within period

	2057–61		2062–66	
Dringing spacing	FC/PS		FC/PS	
Filicipal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	4	16	6	22
Oak	< 1	35	< 1	31
Beech	< 1	29	< 1	28
Sycamore	< 1	93	< 1	76
Ash	< 1	32	< 1	42
Birch	< 1	25	< 1	22
Sweet chestnut	< 1	59	< 1	59
Hazel	< 1	51	< 1	59
Hawthorn	< 1	39	< 1	39
Alder	< 1	98	< 1	98
Willow	< 1	50	< 1	50
Other broadleaves	2	24	3	38

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

**Table 34** 50-year forecast of hardwood timber availability by top diameter class;

 average annual volume within period

	2018–21		2022–26	
Top diameter class	FC/PS		FC/PS	
(cm)	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
7–14	1	36	1	19
14–16	< 1	55	< 1	27
16–18	< 1	60	< 1	29
18–24	2	63	< 1	33
24–34	3	66	< 1	27
34–44	1	58	< 1	28
44–54	< 1	38	< 1	32
54+	< 1	42	< 1	39
Total	10	55	4	20

**Table 34 (cont'd)** 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

	2027–31		2032–36	
Top diameter class (cm)	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
7–14	2	17	2	13
14–16	< 1	35	< 1	30
16–18	< 1	42	< 1	41
18–24	1	48	< 1	50
24–34	3	62	< 1	45
34–44	2	65	< 1	49
44–54	1	66	< 1	58
54+	< 1	53	< 1	85
Total	11	51	4	22

**Table 34 (cont'd)**50-year forecast of hardwood timber availability by topdiameter class; average annual volume within period

	2037–41		2042–46	
Top diameter class	FC/PS		FC/PS	
(cm)	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park			· · · · · · · · · · · · · · · · · · ·	
7–14	3	15	3	18
14–16	< 1	16	< 1	15
16–18	< 1	20	< 1	19
18–24	< 1	32	< 1	28
24–34	< 1	53	1	65
34–44	< 1	73	< 1	76
44–54	< 1	89	< 1	76
54+	< 1	75	< 1	74
Total	5	23	8	33

**Table 34 (cont'd)** 50-year forecast of hardwood timber availability by top diameter class; average annual volume within period

	2047–51		2052–56	
Top diameter class	FC/PS		FC/PS	
(cm)	volume	SE%	volume	SE%
	(000 m <sup>3</sup> obs)	JL 70	(000 m <sup>3</sup> obs)	JL 70
Exmoor National Park				
7–14	3	21	2	22
14–16	< 1	17	< 1	18
16–18	< 1	21	< 1	18
18–24	< 1	23	1	19
24–34	< 1	20	1	19
34–44	< 1	38	< 1	18
44–54	< 1	52	< 1	32
54+	< 1	75	< 1	68
Total	5	15	6	14

**Table 34 (cont'd)**50-year forecast of hardwood timber availability by topdiameter class; average annual volume within period

	2057–61		2062–66	
Top diameter class	FC/PS		FC/PS	
(cm)	volume	SE%	volume	SE%
	(000 m° obs)		(000 m° obs)	
Exmoor National Park				
7–14	2	22	2	20
14–16	< 1	20	< 1	21
16–18	< 1	17	< 1	19
18–24	< 1	15	1	21
24–34	< 1	22	1	44
34–44	< 1	31	< 1	46
44–54	< 1	34	< 1	34
54+	< 1	38	< 1	38
Total	4	16	6	22

### 50-year forecast of standing volume in broadleaves

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



**Table 35** 50-year forecast of standing volume in broadleaves; average annual volume within period

	FC/PS				
Forecast period	volume	SE0/			
	(000 m <sup>3</sup> obs)	<i>SE 70</i>			
Exmoor National Pa	ark				
2018–21	1,442	9			
2022–26	1,535	8			
2027–31	1,650	8			
2032–36	1,815	7			
2037–41	1,970	7			
2042–46	2,112	7			
2047–51	2,245	6			
2052–56	2,375	6			
2057–61	2,495	6			
2062–66	2,608	6			



**Table 36** 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

	2018–21		2022–26	
Dringing charles	FC/PS		FC/PS	
Principal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	1,442	9	1,535	8
Oak	634	19	638	18
Beech	51	29	59	27
Sycamore	33	39	37	38
Ash	213	30	230	29
Birch	146	22	160	22
Sweet Chestnut	58	54	65	54
Hazel	171	21	183	20
Hawthorn	12	32	15	30
Alder	40	49	40	47
Willow	7	51	10	43
Other broadleaves	76	31	100	27

**Table 36 (cont'd)** 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

	2027–31		2032–36	
Dringing chasies	FC/PS		FC/PS	
Philicipal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	1,650	8	1,815	7
Oak	634	19	671	18
Beech	70	26	84	24
Sycamore	40	38	44	37
Ash	252	28	276	27
Birch	177	22	192	22
Sweet Chestnut	73	53	81	52
Hazel	196	20	209	19
Hawthorn	20	28	25	27
Alder	40	48	42	48
Willow	13	39	16	38
Other broadleaves	135	23	175	20

**Table 36 (cont'd)** 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

	2037–41		2042–46	
Dringing charles	FC/PS		FC/PS	
Philicipal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	1,970	7	2,112	7
Oak	706	18	741	18
Beech	97	23	109	22
Sycamore	48	36	51	35
Ash	298	26	316	25
Birch	203	21	211	21
Sweet Chestnut	88	52	92	51
Hazel	220	19	230	18
Hawthorn	31	27	36	26
Alder	44	47	46	47
Willow	20	38	24	38
Other broadleaves	215	19	256	18

**Table 36 (cont'd)** 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

	2047–51		2052–56	
Dringing charles	FC/PS		FC/PS	
Philicipal species	volume	<u>650/</u>	volume	<u>cr</u> 0/
	(000 m <sup>3</sup> obs)	SE %	(000 m <sup>3</sup> obs)	<i>SE 7</i> 0
Exmoor National Park				
All broadleaves	2,245	6	2,375	6
Oak	777	18	810	17
Beech	115	23	128	23
Sycamore	54	35	57	35
Ash	332	25	342	25
Birch	220	21	228	21
Sweet Chestnut	97	51	103	52
Hazel	238	18	242	18
Hawthorn	42	26	47	26
Alder	47	46	49	46
Willow	28	39	31	40
Other broadleaves	297	17	337	17

**Table 36 (cont'd)** 50-year forecast of standing volume in broadleaves by principal species; average annual volume within period

	2057–61		2062–66	
Dringing spacing	FC/PS		FC/PS	
Principal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	2,495	6	2,608	6
Oak	842	17	871	17
Beech	141	23	154	23
Sycamore	59	35	60	35
Ash	349	24	356	24
Birch	235	21	243	21
Sweet Chestnut	110	52	116	52
Hazel	248	18	253	18
Hawthorn	52	26	57	26
Alder	50	46	51	45
Willow	35	40	38	41
Other broadleaves	375	17	409	17

### 50-year forecast of net increment in broadleaves

Figure 40 50-year forecast of net increment in broadleaves; average annual volume within period



**Table 37** 50-year forecast of net increment in broadleaves; average annual volume within period

	FC/PS			
Forecast period	volume	SE0/		
	(000 m <sup>3</sup> obs)	<i>SE 70</i>		
Exmoor National Pa	ark			
2018–21	22	25		
2022–26	31	8		
2027–31	35	6		
2032–36	36	6		
3037–41	35	6		
2042–46	34	6		
2047–51	33	7		
2052–56	31	7		
2057–61	29	7		
2062–66	27	7		

**Table 38** 50-year forecast of net increment in broadleaves by principal species;average annual volume within period

	2018–21 2022–26		)	
Principal species	FC/PS		FC/PS	
	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	22	25	31	8
Oak	2	204	7	32
Beech	2	25	2	28
Sycamore	< 1	38	< 1	35
Ash	4	26	4	24
Birch	4	33	4	23
Sweet Chestnut	1	83	2	62
Hazel	3	21	3	23
Hawthorn	< 1	30	< 1	28
Alder	- 1	129	< 1	98
Willow	< 1	48	< 1	44
Other broadleaves	4	19	7	15

**Table 38 (cont'd)** 50-year forecast of net increment in broadleaves by principal species; average annual volume within period

	2027–31		2032–36	
Dringing chasies	FC/PS		FC/PS	
Philicipal species	volume	SE%	volume	SE%
	(000 m <sup>3</sup> obs)	JL 70	(000 m <sup>3</sup> obs)	JE 70
Exmoor National Park				
All broadleaves	35	6	36	6
Oak	8	19	8	18
Beech	3	27	3	25
Sycamore	< 1	32	< 1	37
Ash	5	20	5	18
Birch	4	20	3	20
Sweet Chestnut	2	57	2	56
Hazel	3	23	3	23
Hawthorn	1	28	1	27
Alder	< 1	40	< 1	42
Willow	< 1	44	< 1	45
Other broadleaves	8	14	9	14

**Table 38 (cont'd)** 50-year forecast of net increment in broadleaves by principal species; average annual volume within period

	2037–41		2042–46	
Dringing chasics	FC/PS		FC/PS	
Principal species	volume (000 m <sup>3</sup> obs)	SE%	volume (000 m <sup>3</sup> obs)	SE%
Exmoor National Park				
All broadleaves	35	6	34	6
Oak	8	17	8	17
Beech	3	25	3	24
Sycamore	< 1	39	< 1	40
Ash	5	17	4	17
Birch	3	19	2	19
Sweet Chestnut	2	56	2	57
Hazel	2	22	2	21
Hawthorn	1	27	1	26
Alder	< 1	41	< 1	39
Willow	< 1	46	< 1	47
Other broadleaves	10	15	10	15

**Table 38 (cont'd)** 50-year forecast of net increment in broadleaves by principal species; average annual volume within period

	2047–51	2047–51 2052–56		)
Dringinal spacios	FC/PS		FC/PS	
Principal species	volume	SE0/	volume	SE0/
	(000 m <sup>3</sup> obs)	3E 70	(000 m <sup>3</sup> obs)	<i>SE 70</i>
Exmoor National Park				
All broadleaves	33	7	31	7
Oak	7	16	7	16
Beech	3	25	3	25
Sycamore	< 1	41	< 1	40
Ash	3	17	3	16
Birch	2	18	2	18
Sweet Chestnut	1	58	1	58
Hazel	2	21	1	20
Hawthorn	1	26	1	27
Alder	< 1	42	< 1	44
Willow	< 1	47	< 1	47
Other broadleaves	10	15	10	15

**Table 38 (cont'd)** 50-year forecast of net increment in broadleaves by principal species; average annual volume within period

	2057–61 2062-		2062–66	-66	
Dringinal spacios	FC/PS		FC/PS		
Filicipal species	volume	SE0/	volume	SE0/	
	(000 m <sup>3</sup> obs)	3E 70	(000 m <sup>3</sup> obs)	<i>SE 70</i>	
Exmoor National Park					
All broadleaves	29	7	27	7	
Oak	7	16	6	16	
Beech	3	24	3	24	
Sycamore	< 1	39	< 1	37	
Ash	2	17	2	17	
Birch	2	17	2	16	
Sweet Chestnut	1	57	1	57	
Hazel	1	20	1	20	
Hawthorn	1	27	1	27	
Alder	< 1	44	< 1	45	
Willow	< 1	47	< 1	47	
Other broadleaves	10	15	9	15	

### Combined standing volume, net increment and availability

Figure 41 50-year summary of hardwood standing volume, increment and softwood availability



Go to Part 3

## Appendix A – Interpreted Forest Types and Interpreted Open Areas

#### Table 39 Description of interpreted forest types

Abbreviation	Description	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.
С	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.
Мс	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
0	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.
Ρ	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 tres have been uprooted or broken by the wind and which remain uncleared and not regenerated based on the latest available imagery.

### Table 40 Description of interpreted open areas

Abbreviation code	Description text	Comments
А	Agricultural	May contain a cereal crop or pasture.
Ва	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	Not covered by the above (e.g. gorse, rhododendron, bracken, beather etc)
W	Open water	Normally labelled within OS MasterMap $\mathbb{R}$ areas of even colour
Wf	Wind farm	Possible shadow evidence of turbines, normally in groups.

## Appendix B – Forecast assumptions

Species	Current stocked	Conifer species	Proposed conifer	Assumed %
	area	as a % of conifer	species as a % of	change to conifer
		area	conifer area	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	24	7.5	18.0	
species				
Total	321	100.0	100.0	-10
Areas	Area	% of total		
		woodland area		
Total conifer	321	24.8		
stocked area				
Total broadleaved	886	68.5		
stocked area				
Total conifer and	1,207	93.3		
broadleaved				
stocked area				
Total unstocked	88	6.8		
area				
Woodland area at	1,294			
2011				
Projected change				
after one rotation	000	00.0		
Resultant total	289	22.3		
conifer stocked				
area Desultant tatal	000	(0.7		
Resultant total	902	69.7		
proadleaved				
Stocked area	1 100	02.0		
Resultant total	1,190	92.0	Figures assume	
broadloaved			50% OF LITE	
stockod area				
SIUCKEU dI Ed			and 50% to once	
Posultant total	104	Q ()		
unstockod aroa	104	0.0		
UNSLUCKEU di Ed				

### Table 41 Restock prescription in England

#### Table 42 Overdue timber allocation – conifers

	Prescription by years beyond maximum MAI (as of base year)			
Species	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	25% zero	
		intervention	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	25% zero	
		intervention	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	25% zero	
		intervention	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	25% zero		
	intervention	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	
	100/	100/	Intervention	
	10% zero	10% zero		
	Intervention	Intervention		
O anala an aire a				
	Fell 50% 1- 10 yrs	Fell 50 % 1- 25 yrs	Fell 75% 1- 10 yrs	
	Feil 40% 11-25 yrs	Fell 25% 26- 50 yrs	25% Zero	
	100/ 7000	250/ 3000	Intervention	
	IU% Zeru	23% Zeru		

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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	25% zero		
	intervention	intervention		
Other conifer	Fell 50 % 1-25 yrs	Fell 75 % 1- 25 yrs	Fell 75% 1- 10 yrs	
species				
	Fell 25% 26- 50 yrs	25% zero	25% zero	
		intervention	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.
riena prietograpii	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 and woodland area can be defined in net or gross terms. Net area
(forest/woodland)	is the land actually covered by trees (in the National Forest Inventory
(iorest/woodiand)	that is to the drin line of the capenv). Gross area includes both the area
	(< 0.5) botter within (o.g. ridos
	diados, nonds)
	A term to describe what timber could notentially be available for
Availability	A term to describe what timber could potentially be available for
Distantial a stantial	A terms angliad to foreset area.
Biological potential	A term applied to forecast scenarios with the objective of maximising
	timber production. It typically involves feiling 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	The total volume of timber that is forecast to be produced over the entire
production	forecast period, including any overdue timber.
DAMS (Detailed	A measure of exposure at a particular location. Can be used as a proxy
Aspect Methodology	indicator of the risk of catastrophic wind damage to a stand of trees. May
Score)	be used to influence decisions on thinning and timing of clearfelling where
	wind is a risk factor.
DBH (diameter at	The diameter on the stem of a tree at 'breast height', defined as 1.3 m
breast height)	from ground level.
Dothistroma needle	A disease of conifers (especially pine) which causes defoliation. losses in
blight	vield and, in severe cases, tree death. Also known as red band needle
	blight.
	1 ····································

# NFI summary report

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	Forests, woodlands, open land and other property managed by the
(FC) estate	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 <sup>3</sup> per year or in m <sup>3</sup> 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 vield 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 <sup>3</sup> 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 <sup>3</sup> obs/ha/year).

Maximum MAI (maximum mean annual increment)	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
(MMAI)	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 <sup>3</sup> 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 <sup>3</sup> 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.

# NFI summary report

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 <sup>3</sup> overbark standing (m <sup>3</sup> 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 abve).
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) Windthrow	Great Britain and Northern Treland. 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 <u>www.statisticsauthority.gov.uk</u>

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