

NFI provisional estimates for woodlands in the Borderlands

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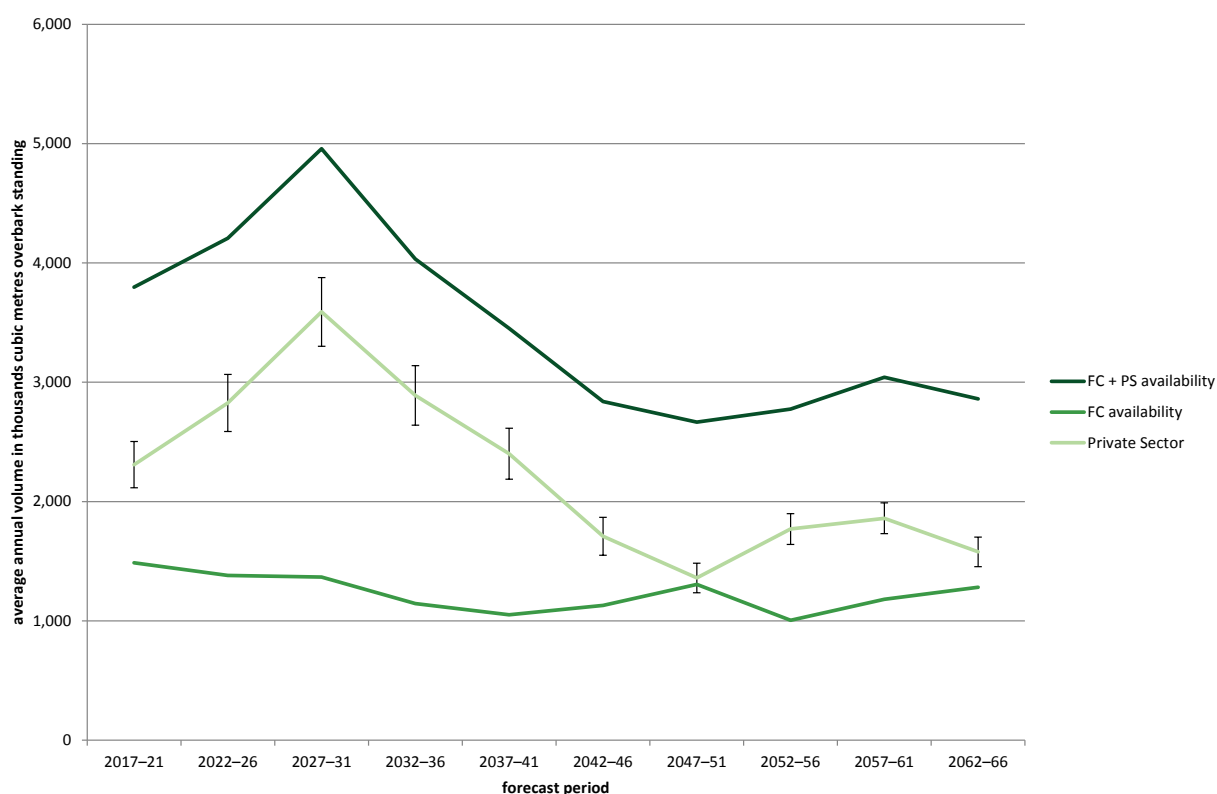
Summary

The National Forest Inventory (NFI) provides a record of the size and distribution of forests and woodlands in Great Britain and information on key forest attributes. This information, together with Forestry Commission growth and yield models, is used to forecast softwood timber availability. This report brings together key woodland information and a 50-year forecast of softwood timber volume that could potentially be produced from conifers growing in forests and woodlands in the Borderlands assuming certain harvesting scenarios are followed. This report is a sub-set of the information published in the NFI *50-year forecast of softwood timber availability* (2014) report.

In addition to the estimates for the Borderlands as a whole, the report includes summary estimates for five council areas and sub-totals for the areas of the Borderlands within England and Scotland. Additional charts for the council areas can be found in the accompanying spreadsheet. The estimates are broken down by Forestry Commission (FC) and Private sector ownership.

The 50-year forecast of softwood timber availability is summarised in **Figure 1**.

Figure 1 50-year forecast of softwood timber availability for FC and Private sector estates in the Borderlands



Key findings:

- The forecast of softwood availability for the Borderlands forest estate is an average of 3.5 million m³ of softwood timber per annum over the 50-year period. The forecast for Borderlands England is an average of 0.9 million m³ per annum; and for Borderlands Scotland 2.6 million m³.
- Softwood availability changes over the period of the forecast; it increases from 3.8 million m³ per annum in 2017–21 to 5.0 million m³ per annum in 2027–31 before reducing to 2.7 million m³ per annum in 2047–51.
- The profiles for the FC estate and Private sector estate show some similarities. Over the forecast period, both the FC estate and the Private sector estate show an overall reduction in forecast availability. The Private sector increases to the 2027–31 period and then both sectors reach a minimum availability before recovering in the last three or four periods, with annual availability in the last period (2062–66) showing a level below the 2017–21 period.
- The FC estate is projected to generate an average of 1.2 million m³ per annum for the next 50 years, if existing forest management plans are followed and production is not constrained. In the first five-year period (2017–21) 1.5 million m³ per annum would be potentially available and this will reduce to an average of 1.3 million m³ per annum in the final five-year period (2062–66). However, it should be noted that the published intention in Scotland is to constrain production at a national level and this will reduce availability overall.
- The potential availability of softwood timber from the Private sector estate for the Borderlands is forecast to average 2.2 million m³ per annum for the next 50 years. This assumes a management scenario of maximising timber productivity with moderate wind risk constraints. Within the Borderlands, the forecast for England is an average is 0.5 million m³ per annum; and for Scotland 1.8 million m³ per annum. Potential availability amounts to 2.3 million m³ per annum in the first five-year period, with maximum annual availability of 3.6 million m³ per annum occurring in the period 2027–31.

The Private sector forecast in this report represents potential availability of softwood timber under the assumption of harvesting to maximise timber production with moderate risk constraints. The actual levels of timber that will be produced will vary from the results reported here as production depends on the harvesting choices made by forest and woodland owners and owners are unlikely to consistently choose to maximise production over the forecast period.

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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.

Information and data collected by the National Forest Inventory is used for a number of purposes, including estimates and 50-year forecasts of forest metrics such as:

- standing volume
- timber availability
- tree growth and increment
- carbon stocks
- biomass

Estimates of aspects of the biodiversity and social value of forests and woodlands will also be provided by the NFI.

This report sets out the results of the 50-year forecast of softwood availability for all forests and woodlands in the Borderlands. For the public sector in the Borderlands this comprises the Forestry Commission in England and Scotland. The Private sector covers all other woodland ownerships in the Borderlands.

Timber is defined in this report as the volume of stemwood to 7 cm top diameter in m³ overbark standing (obs), including stump (above ground) and usable branchwood (of minimum 3 m in length and 7 cm top diameter).

It should be noted that this report assesses the potential amount of timber that could arise from forests in the Borderlands, and any references to volume, production or availability must be taken in that context.

A forecast of hardwood availability was published in 2014. Further information on this and other NFI outputs is available from the [NFI web pages](#).

Forecast of softwood availability

This report provides the latest overall softwood timber availability forecasts, giving a breakdown of forecast volume by size class and by country.

The forecasts of softwood availability for Britain are based on the FC/NRW's Sub-compartment database for public sector woodland and on the National Forest Inventory assessment of the current state of woodland in the Private sector. Recent estimates of standing timber volume and other attributes of coniferous stands in Britain can be found in the published NFI report *Standing timber volume for coniferous trees in Britain* (2012) which was updated in 2013. The forecast of softwood availability for Northern Ireland is derived from other sources.

The previous 25-year forecast of softwood availability in the UK was published in the NFI report entitled *25-year forecast of softwood timber availability* (2012).

How 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.

The forecast of softwood availability for the Borderlands is composed of two separate forecasts derived separately: a forecast for the Forestry Commission estate (referred to as the FC estate) in Britain and a forecast for the Private sector estate in Britain. The forecasts are based upon the same principles but use different data sources.

For the FC estate, information on woodland area and woodland characteristics has been extracted from the Forestry Commission's long-established Sub-compartment database. For the Private sector estate in Britain, the estimates were derived from results obtained to date from the National Forest Inventory.

The *National Forest Inventory forecasts methodology overview* (2012) and the technical documentation on *Felling and removals forecasts* (2012) give more information on the approaches used to derive the forecasts (see the [NFI web pages](#)).

Sub-compartment database

The Sub-compartment database is a record of all land managed by the Forestry Commission. Each stand of trees is represented spatially, together with information on individual stand characteristics (e.g. species, planting year, spacing and yield class) which is periodically updated. As new surveys of stands are conducted (e.g. for operational purposes), survey results are also recorded against the stands. In addition, the database contains details of how the stands are planned to be managed – in particular, the planned frequency and type of thinning and a date for felling. These prescriptions are recorded in the FC forest design plans. Forest design plans are prepared and maintained by FC staff throughout England and Scotland. These plans form the basis of the harvesting regimes used to derive the estimates for the FC forecasts.

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 2013 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. Further details of the mapping work and the derivation of forested areas can be found in the 2010 Woodland Area reports in the [NFI web pages](#).

Estimates for the FC estate

Information from the Sub-compartment database was used to estimate standing volume and other attributes of stands at the reference date of 31 March 2012 on a stand-by-stand basis. For each stand, if an operational survey had been carried out close to the reference date, information from that survey was used to estimate the state of the stand at the reference date. Otherwise, an estimate was made of the state of the stand, normally involving the application of standard Forestry Commission growth and yield

models that take into account the past management of the stand. These data formed the basis of the volume forecasts.

Forestry Commission growth and yield models were then used to 'grow' the stands, based upon inventory data and yield class estimates. The stands were grown taking account of harvesting events that either thinned or felled a stand over the forecast period, producing the standing volume, increment and production volumes projected by the forecasts. The timing and scale of thinning and felling events was taken from FC forest management plans, which set prescriptions for harvesting across productive forest area on the FC estate. This was then aggregated to produce the estimated total production across a defined geographic area for particular types of stand (classified, for example, by species, age or size class). The stands were then restocked according to country-level prescriptions (details on restocking can be found in the section on assumptions used in the forecast). The FC production forecast is an output of this stand modelling process.

Because the resulting estimates are based on a full record of data from the Sub-compartment database, there is no sampling error involved in the estimation process, therefore no sampling standard error is calculated. However, the nature of the estimation process within each individual stand does introduce estimation error, with variable contributions from stand to stand, due to the type, age and accuracy of the information held in the Sub-compartment database. These estimation errors have not been quantified in this report.

Estimates for the Private sector estate

Forests on the National Forest Inventory woodland map were first separated into FC estate and Private sector estate holdings using Forestry Commission spatial records of management boundaries as at 31 March 2012. Estimates of softwood availability on the Private sector estate used a woodland area obtained from the map updated to 31 March 2014 (published in May 2015). This map contained a slightly larger area (around 2.3 million hectares) of Private sector woodland than was used in the 2012 forecast. A full account of the National Forest Inventory mapping exercise can be found in the *National Forest Inventory forecasts methodology overview*. The mapped woodland area results can be found in the [National Forest Inventory](#) woodland area statistics for Great Britain, England, Scotland and Wales.

In the course of the field survey work some 9,594 sample squares were surveyed of which 7,192 were located in Private sector woodland and the resulting data have been used to produce the results in this report. These surveyed sample squares are a sub-sample of a planned 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).

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 27,490 stands being assessed. Within each stand, field-based computer systems were used to locate two or three randomly located 100 m² (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 366,000 trees were measured. For 105,000 of these trees, 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 inventory data for the Private sector estate was then run against the headline scenario described in the *50-year forecast of softwood timber availability* (2014). Under this scenario, Private sector 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 Tables D3 England, D4 Scotland and D5 Wales in the *50-year forecast of softwood timber availability* (2014).

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 2014 publication *50-year forecast of softwood timber availability*.

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 the forecast

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* (2012) assumptions were made about changes in future forest ownership and thus how stands would be harvested over the forecast period. For simplicity, this current forecast assumes that there will be no future transfer of ownership.

Restocking

The restocking that is applied in this current forecast to both FC/NRW and Private sector woodlands in Britain builds on the approach that was adopted for the *50-year forecast of softwood timber availability* (2014), moving away from the scenario that replaced felled stands with exactly the same crop in the subsequent rotation, and restocking in a way that better reflects current practices. These scenarios were developed in liaison with the Private forest sector. For conifer stands, this includes conifer species diversification and the introduction of 5% open space and 5% broadleaved species. These restocked stands are managed according to a biological potential prescription where in areas considered to be at high risk from wind damage, as determined by a DAMS score of 16 or more, a strategy of no thinning – and felling conditional upon attainment of a top height (25 m and higher) – was assumed. The impact of restocking on production volumes makes itself felt during the latter half of the forecast period. These are included in the volumes presented, but they only have a significant contribution to harvested volumes from the period 2037–41. This restock scenario is only one possible scenario out of many for

restocking and was formulated in liaison with forest industry representatives. The National Forest Inventory has provided a range of modelled restocking and new planting scenarios to explore the impacts of these assumptions in the 50-year forecast report and the report *Evaluation of alternative harvesting and afforestation scenarios on British softwood timber availability* (2015).

Currently clearfelled areas

The current forecast assumes that all clearfelled areas are restocked, both within FC and the Private sector, applying the restocking assumptions as described above in the section on restocking.

To estimate area of clearfell for the FC estate, the Sub-compartment database records of clearfelling were used. For the Private sector estate, the area of clearfell was first identified by aerial photography and then updated with satellite imagery. This was used in conjunction with the field survey to estimate stocked area (**Table 1**) and area of clearfell (**Table 11**).

Overdue timber

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 a forecast. In the 50-year forecast (referenced at the end of this paragraph) a separate prescription for overdue timber was developed and implemented and this was run as part of the main scenario. This approach was also applied in the 2016 forecast (*25-year forecast of softwood timber availability* (2016)). For example, if the biological potential scenario is used, those stands less than age of maximum MAI will be managed according to that biological potential scenario, but for those stands currently beyond maximum MAI a separate prescription was used. The proposed prescriptions were developed in consultation with the Private sector, allocating around 70% of overdue timber over approximately 20 years. The prescriptions take into account tree species, presence and impact of current tree diseases, age of stand in relation to age of maximum MAI and historical market trends in harvesting. For a full description of the overdue prescription applied see Table D2 in the *50-year forecast of softwood timber availability* (2014).

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.

The fact that the volume of overdue timber represents a significant amount of total standing volume at the start of the forecast indicates that a portion of the estate is not currently being managed to either maximum MAI or shorter rotations. This is especially so in the Private sector and implies that the current practice on at least a portion of the Private sector estate is to leave some stands beyond the age of maximum MAI.

Since such stands are currently being managed differently from the assumed prescription, these, and some other stands that are currently below the age of maximum MAI, are also not likely to be managed to maximum MAI in the future. This forecast assumes they are, but the *Evaluation of alternative harvesting and afforestation scenarios on British softwood timber availability* (2015) report explores the impact of a proportion of all stands, irrespective of current age, becoming overdue.

For more information about the inventory methodology, see the *National Forest Inventory forecasts methodology overview* (2012).

Results

The forecast are projected from the stocked area and standing volume of conifers summarised in **Tables 1** and **4**, respectively.

Table 9 gives the 50-year forecast of softwood timber availability for the Borderlands and each district, broken down by FC estate and Private sector estate. **Figures 5a, 5b, 5c** and **5d** illustrate the 50-year forecast broken down by country, ownership and five-year period.

The baseline date for these FC forecasts is 31 March 2012. The forecast starts in 2013, with 2013 defined as starting 1 April 2012 and ending 31 March 2013. This convention applies to all forecast years or periods quoted. As the forecast reports on five-year cycles of production, the first period of 2013-16 has not been reported resulting in 2017–21 being the first period of availability reported.

For the Private sector in the Borderlands a baseline of 2013 has been used, which reflects the time period over which the field samples were surveyed. To create an even baseline between public and Private sector data, harvesting management scenarios were applied retrospectively to the data between 2013 and 2016. The opening areas and volumes reported in **Tables 1** and **4** are for 2012, the opening year of the published forecast. However, as the forecast has managed the growing stock from the baseline dates for both FC and Private sector the figures quoted are only as accurate as the presumption that the scenarios applied reflect actual management.

Table 10 and **Figures 6a, 6b and 6c** show the evolution of standing volume and **Table 11** and **Figures 7a, 7b and 7c** show the net increment under the headline scenario used to derive the forecast results. **Figure 8** shows the relationship between forecast standing volume, increment (i.e. gain in volume over time) and subsequent timber availability over the forecast period.

Table 3 gives estimates of clearfelled areas. For the FC estate, the area of clearfell is taken from the Sub-compartment database as at 31 March 2012. For the Private sector, the NFI fieldwork records clearfelled areas and these areas are combined with the areas of clearfell identified in the NFI map based on satellite imagery to provide the estimates shown in **Table 3**. Currently clearfelled areas are assumed to be restocked within this forecast and contribute marginally to future production

Further elaboration on the extent of clearfell can be obtained from *Preliminary estimates of canopy cover change in British woodlands* (2016).

All volumes are given in cubic metres (m³) overbark standing (obs) and, as in previous forecasts, all volumes available for harvesting include thinnings and fellings. Volumes are presented as average annual volume for each five-year period. The values in the tables have been independently rounded, so may not add to the totals shown. In some breakdowns of Private sector estimates, the estimates in the body of the table may not sum to the quoted total because each individual value, including the total, has been independently generated by the estimation procedure used for results from the NFI sample survey. Sampling standard errors (SE) attached to Private sector estimates are expressed in relative terms (%) to the right of the relevant estimate.

Where the standard error is high this indicates that the estimate should be interpreted with a degree of caution. Any estimate with a relatively large standard error is shown in **amber** in the tables.

These standard errors depend on the combination of a number of factors but broadly:

- The more woodland that is within the area of interest the more samples that will have been selected, generally leading to lower standard errors
- Increasing the number of categories and sub-categories used (e.g. conifers and broadleaves then sub-divided into species groupings) may well result in higher standard errors, especially for the categories that occur less frequently such as minor species
- More variability will also result in higher standard errors; for instance if a species is usually more evenly stocked when compared with another then its standard error will tend to be lower than the latter species.

Additional charts showing results for the districts within the Borderlands can be found in the accompanying spreadsheet.

It should be noted that figures are not plotted to a common maximum scale; instead each one is presented to a maximum value that enables the detail within the country to be readily discerned.

Map 1 Borderlands



Stocked area and clearfell

Table 1a Borderlands - stocked area of conifers at 31 March 2012

District	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
Carlisle district	7.3	3.9	11	11.2
Cumbria excl. Carlisle	5.4	11.1	7	16.4
Northumberland	35.3	18.2	6	53.5
Borderlands England	47.9	33.2	4	81.1
Dumfries and Galloway	59.1	64.9	2	124.0
Scottish Borders	17.6	44.9	3	62.5
Borderlands Scotland	76.7	109.8	2	186.5
Borderlands	124.6	143.0	2	267.6

Table 1b Borderlands - stocked area of broadleaves at 31 March 2012

District	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
Carlisle district	0.4	4.5	9	5.0
Cumbria excl. Carlisle	2.1	23.7	4	25.8
Northumberland	2.0	19.4	6	21.4
Borderlands England	4.5	47.6	3	52.1
Dumfries and Galloway	4.0	25.2	7	29.2
Scottish Borders	1.1	15.7	7	16.8
Borderlands Scotland	5.0	41.0	5	46.0
Borderlands	9.5	88.6	3	98.2

Table 1c Borderlands - stocked area of all species at 31 March 2012

District	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
Carlisle district	7.7	8.5	4	16.2
Cumbria excl. Carlisle	7.4	34.8	2	42.2
Northumberland	37.3	37.7	3	75.0
Borderlands England	52.4	80.9	2	133.4
Dumfries and Galloway	63.0	90.2	2	153.2
Scottish Borders	18.7	60.7	2	79.4
Borderlands Scotland	81.7	150.9	1	232.6
Borderlands	134.1	231.9	1	366.0

Figure 2 Stocked area by species in the Borderlands

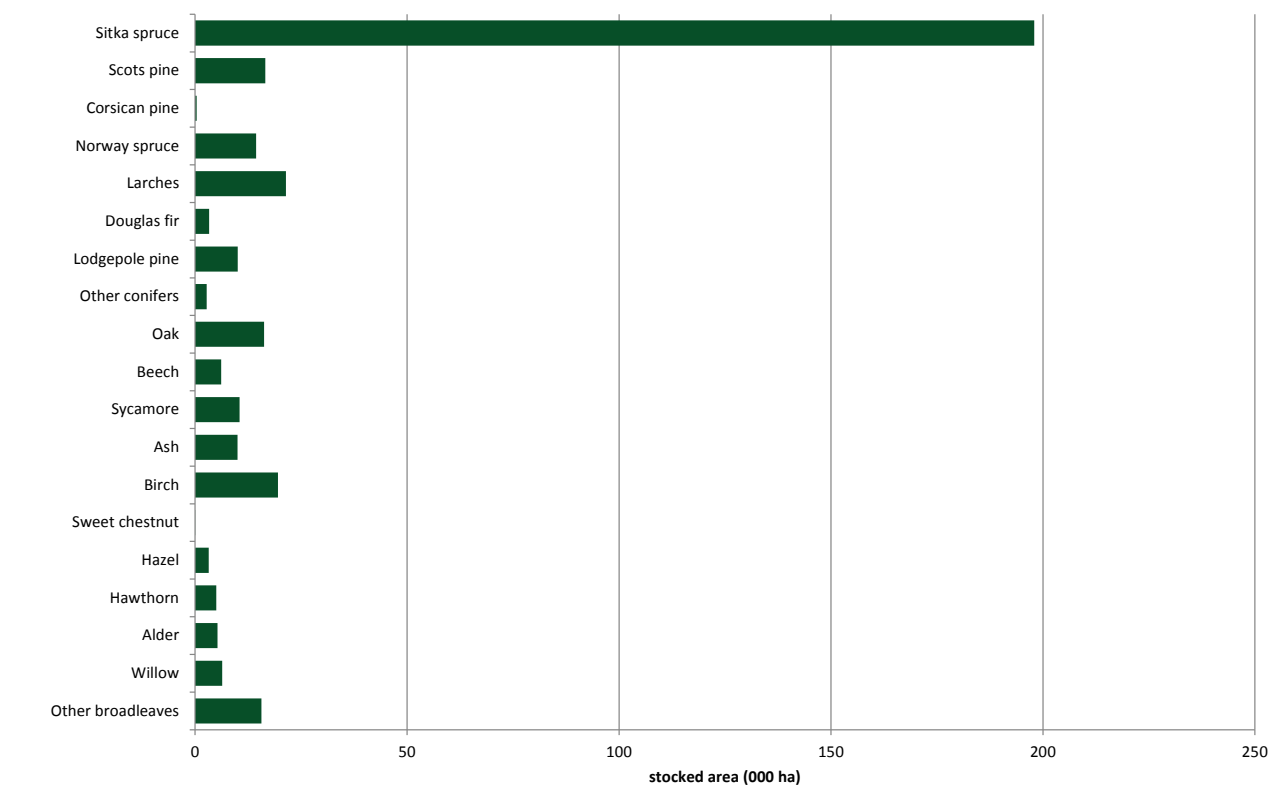


Table 2 Stocked area by species – Borderlands

Species	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
All species	134.1	231.9	1	366.0
All conifers	124.6	143.0	2	267.6
Sitka spruce	96.3	101.6	3	197.9
Scots pine	3.9	12.7	10	16.6
Corsican pine	0.2	0.2	55	0.4
Norway spruce	5.9	8.5	13	14.4
Larches	8.6	12.8	9	21.4
Douglas fir	1.4	1.9	25	3.3
Lodgepole pine	7.3	2.7	22	10.0
Other conifers	1.1	1.6	21	2.7
All broadleaves	9.5	88.6	3	98.2
Oak	1.0	15.3	7	16.3
Beech	0.3	5.8	11	6.2
Sycamore	0.2	10.3	9	10.5
Ash	0.2	9.8	9	10.0
Birch	1.3	18.2	7	19.5
Sweet chestnut	0.0	< 0.1	62	< 0.1
Hazel	0.2	3.1	11	3.2
Hawthorn	< 0.1	5.0	13	5.0
Alder	0.1	5.2	12	5.3
Willow	< 0.1	6.4	20	6.4
Other broadleaves	6.3	9.4	8	15.7

Table 3 Clearfelled area at 31 March 2012

District	FC	Private sector		Total
	area (000 ha)	area (000 ha)	SE%	area (000 ha)
Carlisle district	0.5	0.2	79	0.7
Cumbria excl. Carlisle	0.6	1.2	35	1.8
Northumberland	2.1	1.0	45	3.1
Borderlands England	3.2	2.4	26	5.6
Dumfries and Galloway	4.9	4.9	20	9.7
Scottish Borders	1.2	3.4	23	4.6
Borderlands Scotland	6.1	8.3	15	14.3
Borderlands	9.3	10.7	13	20.0

Standing volume

Table 4a Standing volume of conifers at 31 March 2012

District	FC	Private sector		Total
	volume (000 m ³ obs)	volume (000 m ³ obs)	SE%	volume (000 m ³ obs)
Carlisle district	1,396	1,326	14	2,722
Cumbria excl. Carlisle	1,132	3,672	9	4,804
Northumberland	6,298	6,766	8	13,064
Borderlands England	8,826	11,764	6	20,590
Dumfries and Galloway	12,761	19,459	5	32,220
Scottish Borders	3,696	16,886	6	20,582
Borderlands Scotland	16,457	36,345	4	52,801
Borderlands	25,283	48,108	3	73,391

Table 4b Standing volume of broadleaves at 31 March 2012

District	FC	Private sector		Total
	volume (000 m ³ obs)	volume (000 m ³ obs)	SE%	volume (000 m ³ obs)
Carlisle district	16	964	29	980
Cumbria excl. Carlisle	312	4,273	7	4,585
Northumberland	57	3,407	7	3,464
Borderlands England	385	8,644	5	9,028
Dumfries and Galloway	261	3,755	11	4,016
Scottish Borders	51	1,698	12	1,748
Borderlands Scotland	311	5,453	9	5,764
Borderlands	696	14,096	5	14,793

Table 4c Standing volume of all species at 31 March 2012

District	FC	Private sector		Total
	volume (000 m ³ obs)	volume (000 m ³ obs)	SE%	volume (000 m ³ obs)
Carlisle district	1,413	2,304	14	3,717
Cumbria excl. Carlisle	1,444	7,946	6	9,391
Northumberland	6,354	10,211	7	16,565
Borderlands England	9,211	20,461	4	29,672
Dumfries and Galloway	13,021	23,194	5	36,215
Scottish Borders	3,747	18,619	5	22,366
Borderlands Scotland	16,768	41,813	3	58,581
Borderlands	25,979	62,275	3	88,254

Figure 3 Standing volume by species at 31 March 2012

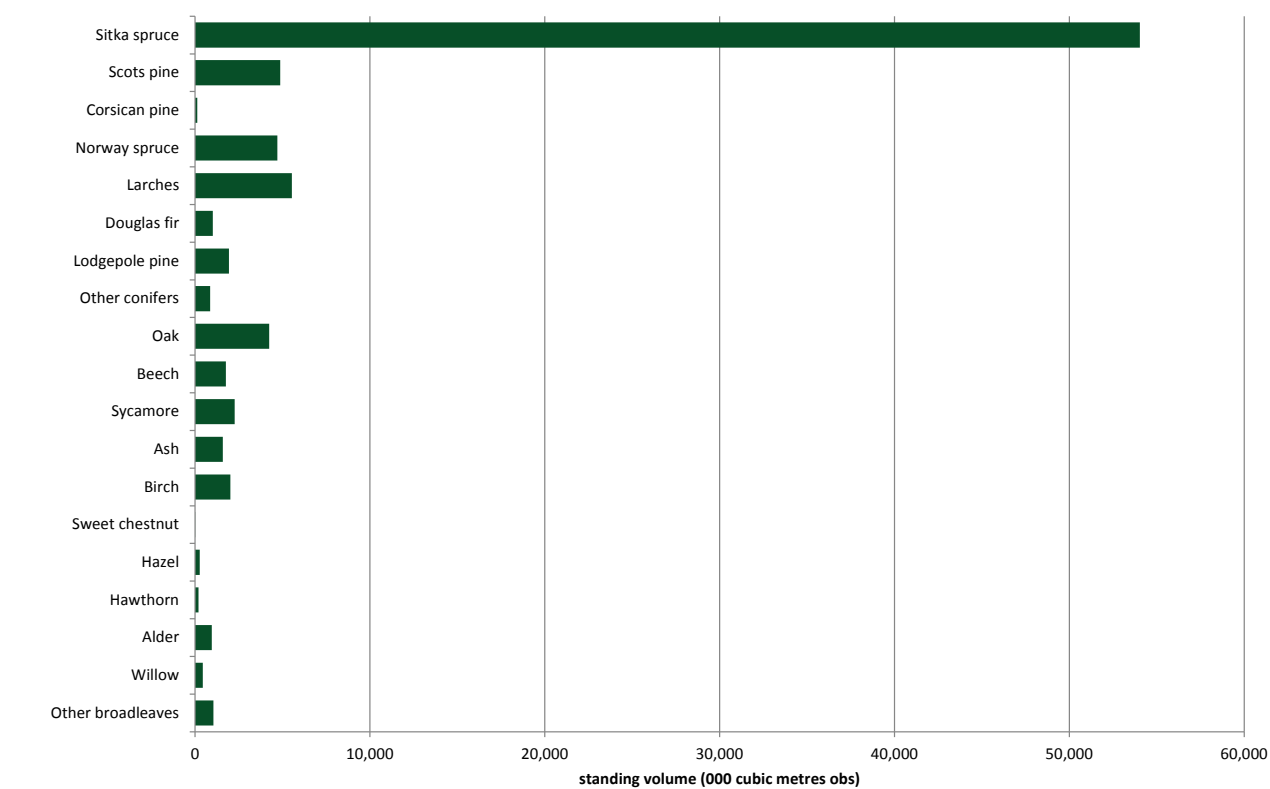


Table 5 Borderlands - standing volume by species at March 2012

Species	FC	Private sector		Total
	volume (000 m ³ obs)	volume (000 m ³ obs)	SE%	volume (000 m ³ obs)
All species	25,979	62,275	3	88,254
All conifers	25,283	48,108	3	73,391
Sitka spruce	19,877	34,154	5	54,031
Scots pine	605	4,263	12	4,868
Corsican pine	49	75	61	124
Norway spruce	1,362	3,346	15	4,708
Larches	1,491	4,042	11	5,534
Douglas fir	331	677	32	1,008
Lodgepole pine	1,328	607	25	1,934
Other conifers	240	617	28	857
All broadleaves	696	14,096	5	14,793
Oak	192	4,048	10	4,240
Beech	57	1,697	22	1,754
Sycamore	27	2,230	12	2,257
Ash	35	1,551	12	1,587
Birch	112	1,903	9	2,015
Sweet chestnut	0	< 1	78	< 1
Hazel	25	243	16	269
Hawthorn	0	198	16	198
Alder	13	940	15	953
Willow	< 1	439	20	439
Other broadleaves	233	814	17	1,047

Number of trees

Table 6a Standing number of conifers at 31 March 2012

District	FC	Private sector		Total
	trees (000)	trees (000)	SE%	trees (000)
Carlisle district	12,831	3,841	19	16,671
Cumbria excl. Carlisle	6,965	11,609	12	18,574
Northumberland	55,129	22,883	10	78,013
Borderlands England	74,925	38,333	8	113,259
Dumfries and Galloway	91,346	91,967	4	183,314
Scottish Borders	23,791	57,048	5	80,839
Borderlands Scotland	115,138	149,016	3	264,153
Borderlands	190,063	187,349	3	377,412

Table 6b Standing number of broadleaves at 31 March 2012

District	FC	Private sector		Total
	trees (000)	trees (000)	SE%	trees (000)
Carlisle district	566	5,521	18	6,087
Cumbria excl. Carlisle	3,447	23,014	7	26,461
Northumberland	2,118	24,171	9	26,288
Borderlands England	6,131	52,705	6	58,836
Dumfries and Galloway	5,638	34,035	9	39,673
Scottish Borders	1,789	21,000	9	22,789
Borderlands Scotland	7,427	55,035	7	62,461
Borderlands	13,557	107,740	4	121,297

Table 6c Standing number of all species at 31 March 2012

District	FC	Private sector		Total
	trees (000)	trees (000)	SE%	trees (000)
Carlisle district	13,397	9,320	13	22,716
Cumbria excl. Carlisle	10,412	34,707	7	45,119
Northumberland	57,247	47,181	7	104,428
Borderlands England	81,056	91,207	4	172,263
Dumfries and Galloway	96,984	126,224	4	223,208
Scottish Borders	25,580	78,428	4	104,009
Borderlands Scotland	122,564	204,652	3	327,216
Borderlands	203,620	295,860	2	499,480

Biomass stocks

Table 7a Biomass stocks in live woodland coniferous trees at 31 March 2012

District	FC	Private sector		Total
	biomass (000 odt)	biomass (000 odt)	SE%	biomass (000 odt)
Carlisle district	978	768	14	1,747
Cumbria excl. Carlisle	734	2,215	9	2,948
Northumberland	4,345	4,169	8	8,514
Borderlands England	6,058	7,152	5	13,210
Dumfries and Galloway	8,556	11,555	5	20,112
Scottish Borders	2,436	9,999	5	12,435
Borderlands Scotland	10,992	21,554	4	32,546
Borderlands	17,049	28,706	3	45,756

Table 7b Biomass stocks in live woodland broadleaved trees at 31 March 2012

District	FC	Private sector		Total
	biomass (000 odt)	biomass (000 odt)	SE%	biomass (000 odt)
Carlisle district	18	850	28	867
Cumbria excl. Carlisle	289	3,811	6	4,100
Northumberland	61	3,236	7	3,297
Borderlands England	368	7,897	5	8,265
Dumfries and Galloway	260	3,430	11	3,690
Scottish Borders	54	1,551	10	1,605
Borderlands Scotland	314	4,981	8	5,295
Borderlands	682	12,877	4	13,559

Table 7c Biomass stocks in live woodland trees at 31 March 2012

District	FC	Private sector		Total
	biomass (000 odt)	biomass (000 odt)	SE%	biomass (000 odt)
Carlisle district	996	1,627	15	2,623
Cumbria excl. Carlisle	1,023	6,028	5	7,051
Northumberland	4,406	7,429	7	11,835
Borderlands England	6,425	15,084	3	21,509
Dumfries and Galloway	8,816	14,975	4	23,791
Scottish Borders	2,490	11,572	5	14,062
Borderlands Scotland	11,306	26,547	3	37,853
Borderlands	17,731	41,631	2	59,362

Carbon stocks

Table 8a Carbon stocks in live woodland coniferous trees at 31 March 2012

District	FC	Private sector		Total
	carbon (000 t C)	carbon (000 t C)	SE%	carbon (000 t C)
Carlisle district	489	384	14	873
Cumbria excl. Carlisle	367	1,107	9	1,474
Northumberland	2,173	2,085	8	4,257
Borderlands England	3,029	3,576	5	6,605
Dumfries and Galloway	4,278	5,778	5	10,056
Scottish Borders	1,218	4,999	5	6,217
Borderlands Scotland	5,496	10,777	4	16,273
Borderlands	8,525	14,353	3	22,878

Table 8b Carbon stocks in live woodland broadleaved trees at 31 March 2012

District	FC	Private sector		Total
	carbon (000 t C)	carbon (000 t C)	SE%	carbon (000 t C)
Carlisle district	9	425	28	434
Cumbria excl. Carlisle	145	1,906	6	2,050
Northumberland	31	1,618	7	1,648
Borderlands England	184	3,948	5	4,132
Dumfries and Galloway	130	1,715	11	1,845
Scottish Borders	27	776	10	803
Borderlands Scotland	157	2,490	8	2,647
Borderlands	341	6,439	4	6,780

Table 8c Carbon stocks in live woodland trees at 31 March 2012

District	FC	Private sector		Total
	carbon (000 t C)	carbon (000 t C)	SE%	carbon (000 t C)
Carlisle district	498	814	15	1,312
Cumbria excl. Carlisle	512	3,014	5	3,526
Northumberland	2,203	3,714	7	5,917
Borderlands England	3,213	7,542	3	10,755
Dumfries and Galloway	4,408	7,487	4	11,896
Scottish Borders	1,245	5,786	5	7,031
Borderlands Scotland	5,653	13,273	3	18,926
Borderlands	8,866	20,815	2	29,681

50-year softwood forecast

Timber availability

Figure 4 50-year forecast of softwood timber availability

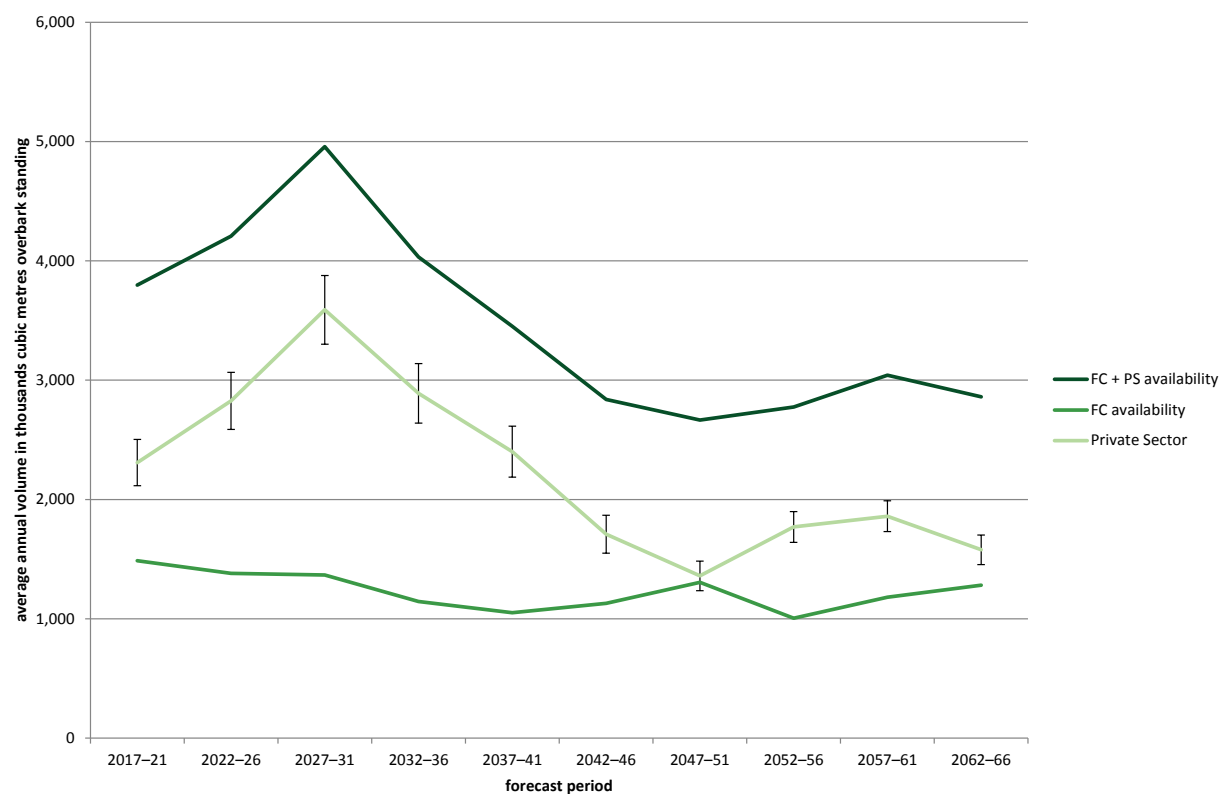


Table 9 50-year forecast of softwood availability; average annual volumes within periods – Borderlands districts

Forecast period	FC	PS		Total
	volume (000m ³ obs)	volume (000m ³ obs)	SE%	volume (000m ³ obs)
Carlisle District				
2017–21	68	52	43	120
2022–26	90	153	29	242
2027–31	105	101	29	206
2032–36	46	56	43	102
2037–41	73	25	32	98
2042–46	32	29	25	61
2047–51	49	38	37	87
2052–56	73	51	28	124
2057–61	70	73	43	143
2062–66	96	59	36	155
Cumbria excluding Carlisle District				
2017–21	49	159	20	208
2022–26	51	213	25	263
2027–31	38	210	21	249
2032–36	52	179	24	231
2037–41	47	121	19	168
2042–46	71	131	24	202
2047–51	54	84	15	138
2052–56	38	110	24	148
2057–61	112	87	12	199
2062–66	46	75	10	122
Northumberland				
2017–21	363	320	20	682
2022–26	301	297	21	598
2027–31	281	395	24	676
2032–36	276	486	23	762
2037–41	224	400	21	624
2042–46	311	207	27	518
2047–51	303	129	21	432
2052–56	242	100	14	342
2057–61	460	198	22	658
2062–66	356	125	28	481
Dumfries and Galloway				
2017–21	788	1,027	13	1,815
2022–26	717	1,210	13	1,927
2027–31	752	1,563	12	2,315
2032–36	615	1,371	13	1,986
2037–41	574	1,435	13	2,009
2042–46	559	829	15	1,387
2047–51	598	661	14	1,259
2052–56	492	916	12	1,408
2057–61	409	894	10	1,303
2062–66	614	755	12	1,369
Scottish Borders				
2017–21	219	751	15	970
2022–26	222	954	16	1,176
2027–31	191	1,319	14	1,511
2032–36	155	797	17	952
2037–41	132	420	14	552
2042–46	157	513	16	670
2047–51	301	448	17	749
2052–56	159	594	11	753
2057–61	131	608	11	739
2062–66	169	564	13	733

Table 9 cont'd 50-year forecast of softwood availability; average annual volumes within periods – Borderlands by country

Forecast period	FC	PS		Total
	volume (000m ³ obs)	volume (000m ³ obs)	SE%	volume (000m ³ obs)
Borderlands				
2017–21	1,487	2,309	8	3,796
2022–26	1,380	2,826	8	4,207
2027–31	1,367	3,589	8	4,956
2032–36	1,145	2,889	9	4,033
2037–41	1,051	2,401	9	3,452
2042–46	1,129	1,709	9	2,838
2047–51	1,305	1,360	9	2,665
2052–56	1,005	1,770	7	2,775
2057–61	1,182	1,860	7	3,041
2062–66	1,282	1,579	8	2,861
Borderlands – England				
2017–21	479	531	14	1,011
2022–26	441	663	14	1,104
2027–31	424	707	15	1,131
2032–36	374	721	17	1,095
2037–41	345	546	16	891
2042–46	413	367	18	780
2047–51	406	252	13	658
2052–56	353	261	13	614
2057–61	642	358	15	1,000
2062–66	499	260	16	758
Borderlands – Scotland				
2017–21	1,007	1,778	10	2,785
2022–26	939	2,164	10	3,103
2027–31	943	2,883	9	3,826
2032–36	770	2,168	10	2,938
2037–41	707	1,855	10	2,562
2042–46	716	1,342	11	2,058
2047–51	899	1,108	11	2,007
2052–56	651	1,509	8	2,161
2057–61	540	1,502	8	2,042
2062–66	784	1,319	9	2,102

Figure 5a 50-year forecast of softwood timber availability for FC and Private sector estates in the Borderlands in England

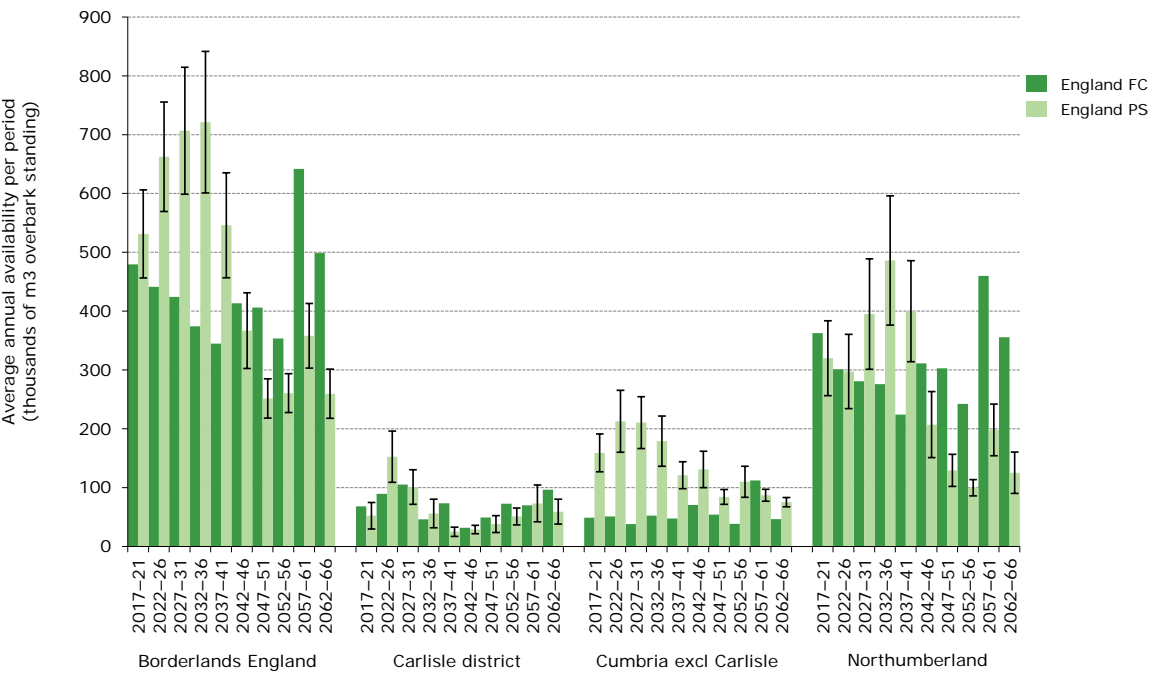


Figure 5b 50-year forecast of softwood timber availability for FC and Private sector estates in the Borderlands in Scotland

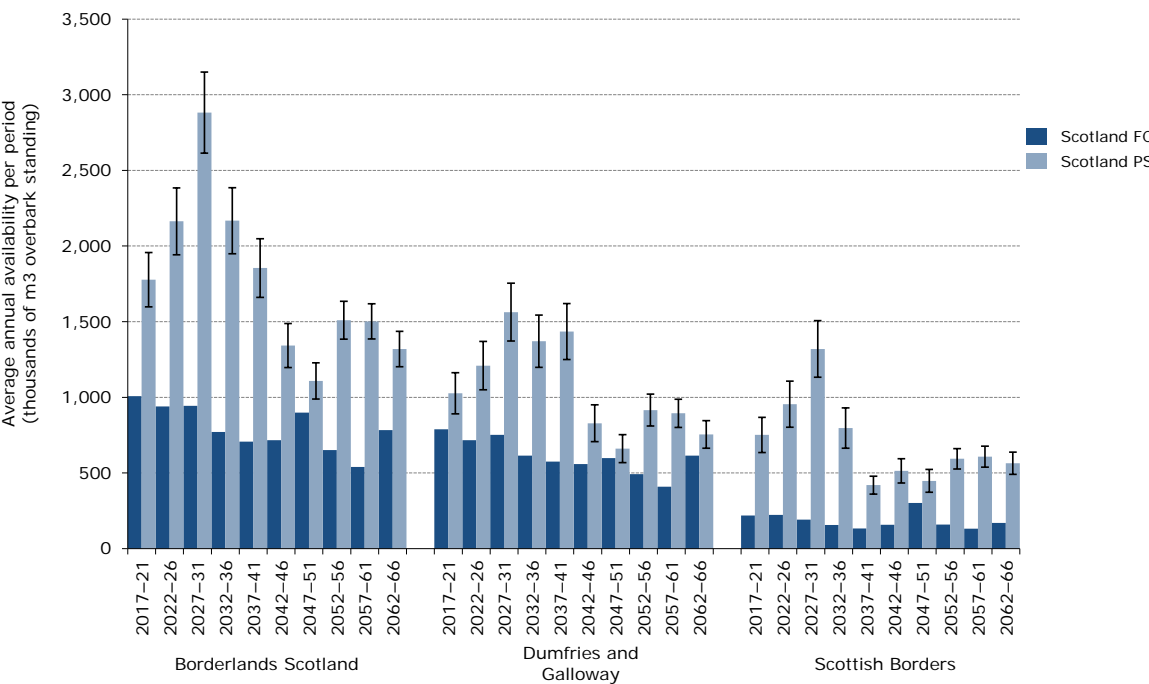


Figure 5c 50-year forecast of softwood timber availability for FC and Private sector estates in the Borderlands by country

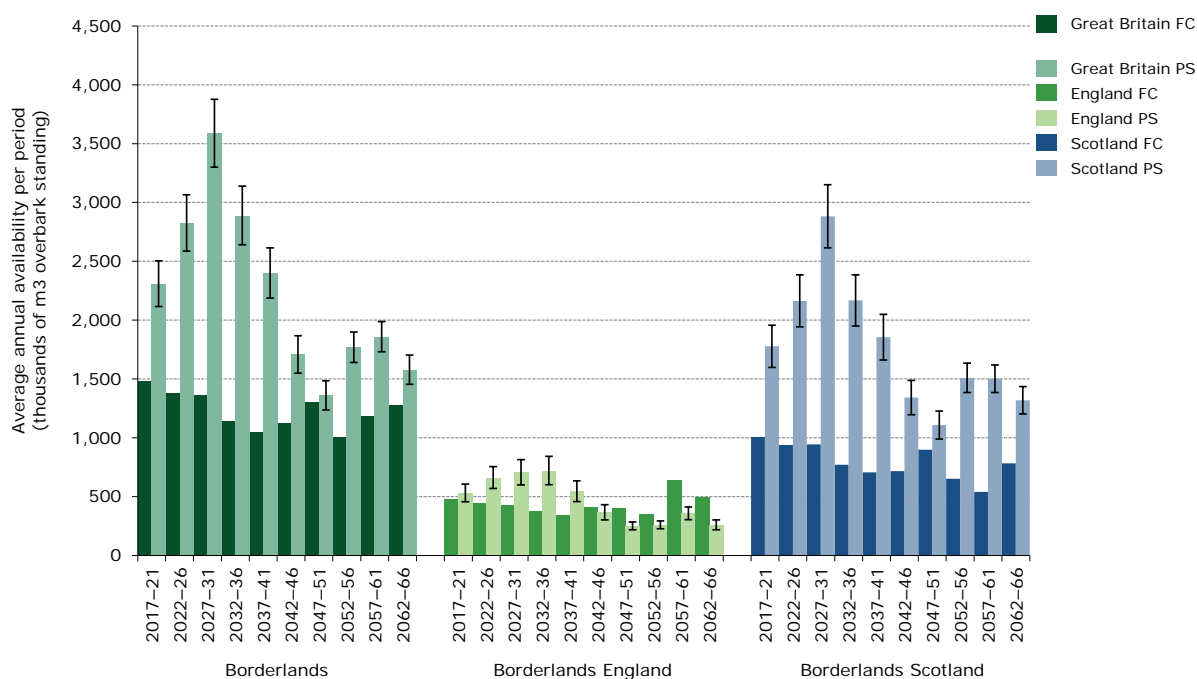
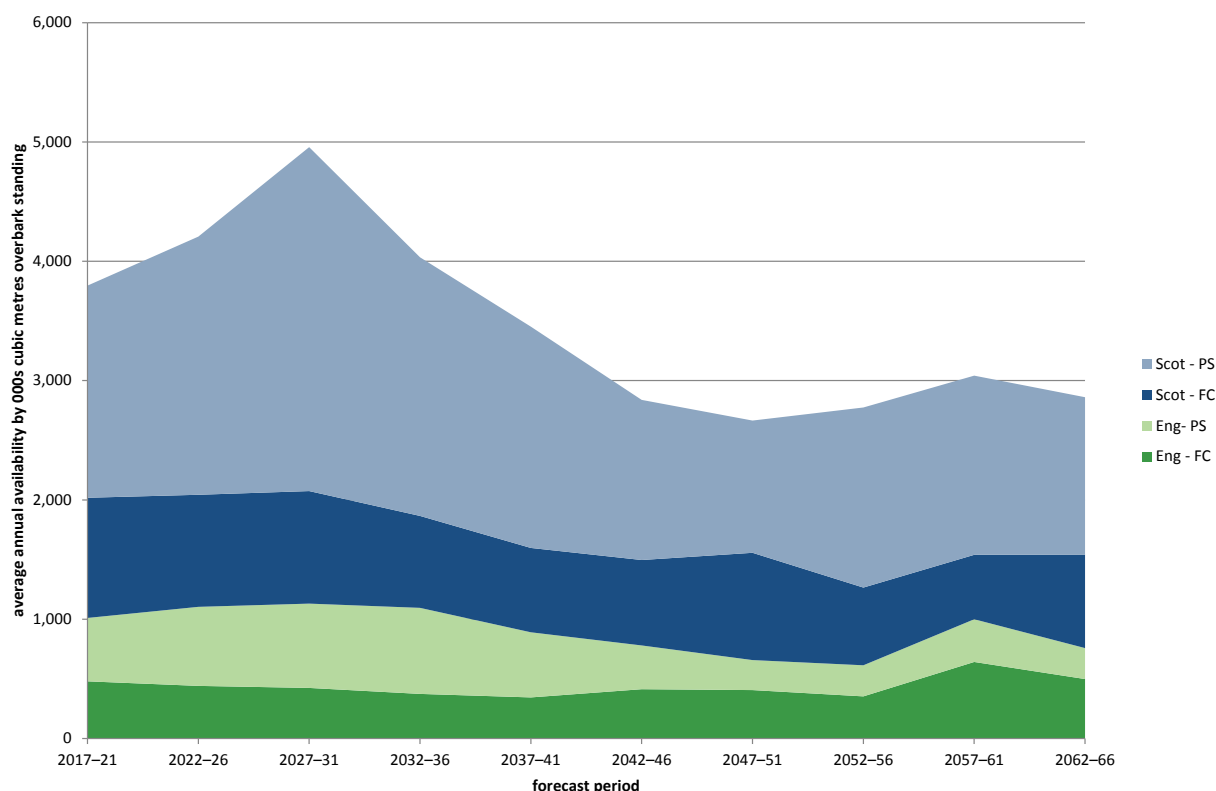


Figure 5d 50-year forecast of softwood timber availability for FC and Private sector estates in the Borderlands by country – (stacked area chart)



Standing volume

Table 10 50-year forecast of coniferous standing volume; average annual volumes within periods – Borderlands by district

Forecast period	FC	Private sector		Total
	volume (000m³ obs)	volume (000m³ obs)	SE%	volume (000m³ obs)
Carlisle district				
2017–21	1,238	1,384	14	2,622
2022–26	1,154	1,172	15	2,326
2027–31	964	826	18	1,790
2032–36	913	548	20	1,461
2037–41	970	569	20	1,539
2042–46	1,096	654	20	1,750
2047–51	1,341	744	18	2,085
2052–56	1,445	730	18	2,175
2057–61	1,616	793	17	2,409
2062–66	1,584	654	16	2,238
Cumbria excl. Carlisle				
2017–21	1,226	3,471	9	4,698
2022–26	1,249	3,071	9	4,319
2027–31	1,327	2,574	10	3,901
2032–36	1,403	2,146	12	3,549
2037–41	1,463	1,785	13	3,248
2042–46	1,487	1,751	14	3,238
2047–51	1,484	1,684	13	3,168
2052–56	1,603	1,876	12	3,479
2057–61	1,608	2,077	10	3,684
2062–66	1,486	2,420	9	3,906
Northumberland				
2017–21	5,115	6,688	8	11,803
2022–26	4,875	6,503	8	11,378
2027–31	4,835	5,536	9	10,371
2032–36	5,022	4,240	10	9,262
2037–41	5,485	3,056	12	8,541
2042–46	5,956	2,438	13	8,394
2047–51	6,449	2,334	13	8,783
2052–56	7,000	2,726	13	9,727
2057–61	7,409	3,085	11	10,493
2062–66	7,158	3,474	9	10,632
Dumfries and Galloway				
2017–21	11,514	20,954	5	32,468
2022–26	10,459	20,476	5	30,935
2027–31	9,484	18,363	5	27,847
2032–36	9,016	15,861	5	24,877
2037–41	8,969	12,786	6	21,755
2042–46	9,129	11,811	6	20,941
2047–51	9,621	11,969	6	21,590
2052–56	10,407	12,222	5	22,629
2057–61	11,845	12,175	5	24,019
2062–66	12,764	12,325	5	25,089
Scottish Borders				
2017–21	3,496	15,844	5	19,340
2022–26	3,290	14,509	6	17,798
2027–31	3,126	11,228	6	14,354
2032–36	3,181	8,333	7	11,514
2037–41	3,393	8,230	8	11,622
2042–46	3,665	8,503	7	12,168
2047–51	3,541	9,063	6	12,604
2052–56	3,206	9,588	5	12,794
2057–61	3,435	9,810	5	13,245
2062–66	3,589	10,174	5	13,764

Table 10 cont'd 50-year forecast of coniferous standing volume; average annual volumes within periods – Borderlands by country

Forecast period	FC	Private sector		Total
	volume (000m ³ obs)	volume (000m ³ obs)	SE%	volume (000m ³ obs)
Borderlands				
2017–21	22,589	48,341	3	70,930
2022–26	21,027	45,731	3	66,757
2027–31	19,736	38,527	4	58,263
2032–36	19,534	31,128	4	50,662
2037–41	20,281	26,425	4	46,706
2042–46	21,333	25,158	4	46,490
2047–51	22,436	25,793	3	48,229
2052–56	23,660	27,143	3	50,803
2057–61	25,911	27,939	3	53,851
2062–66	26,582	29,047	3	55,630
Borderlands England				
2017–21	7,579	11,543	6	19,123
2022–26	7,278	10,746	6	18,024
2027–31	7,126	8,936	6	16,062
2032–36	7,338	6,934	7	14,272
2037–41	7,919	5,409	8	13,328
2042–46	8,538	4,843	9	13,381
2047–51	9,274	4,762	9	14,036
2052–56	10,048	5,333	8	15,380
2057–61	10,632	5,954	7	16,586
2062–66	10,229	6,548	6	16,777
Borderlands Scotland				
2017–21	15,010	36,797	4	51,807
2022–26	13,748	34,985	4	48,733
2027–31	12,610	29,591	4	42,201
2032–36	12,197	24,194	4	36,390
2037–41	12,362	21,015	5	33,377
2042–46	12,794	20,315	5	33,109
2047–51	13,162	21,031	4	34,193
2052–56	13,612	21,810	4	35,423
2057–61	15,279	21,985	4	37,264
2062–66	16,353	22,499	3	38,853

Figure 6a 50-year forecast of coniferous standing volume for FC and Private sector estates in the Borderlands England by district

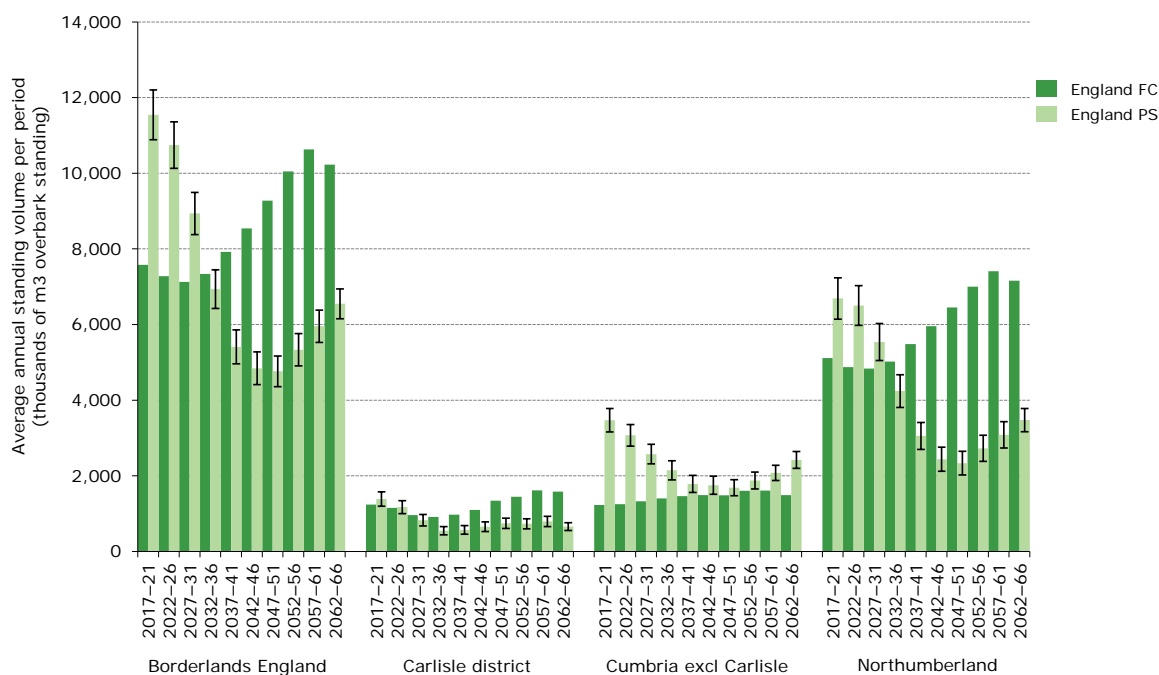


Figure 6b 50-year forecast of coniferous standing volume for FC and Private sector estates in Borderlands Scotland by district

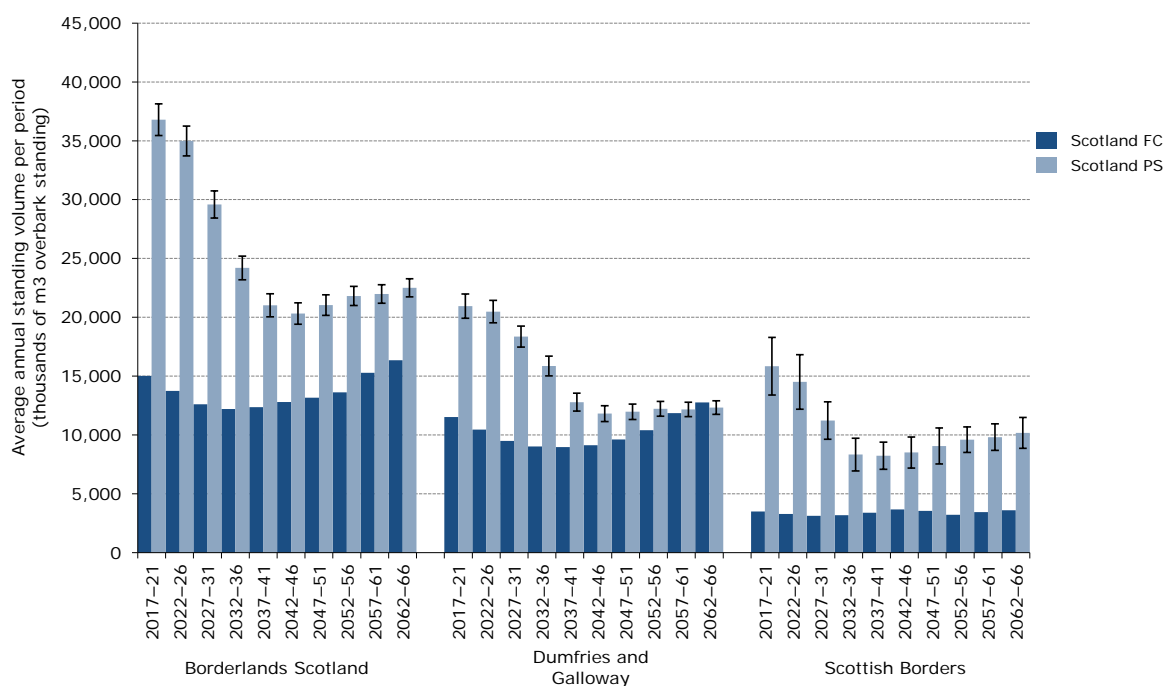
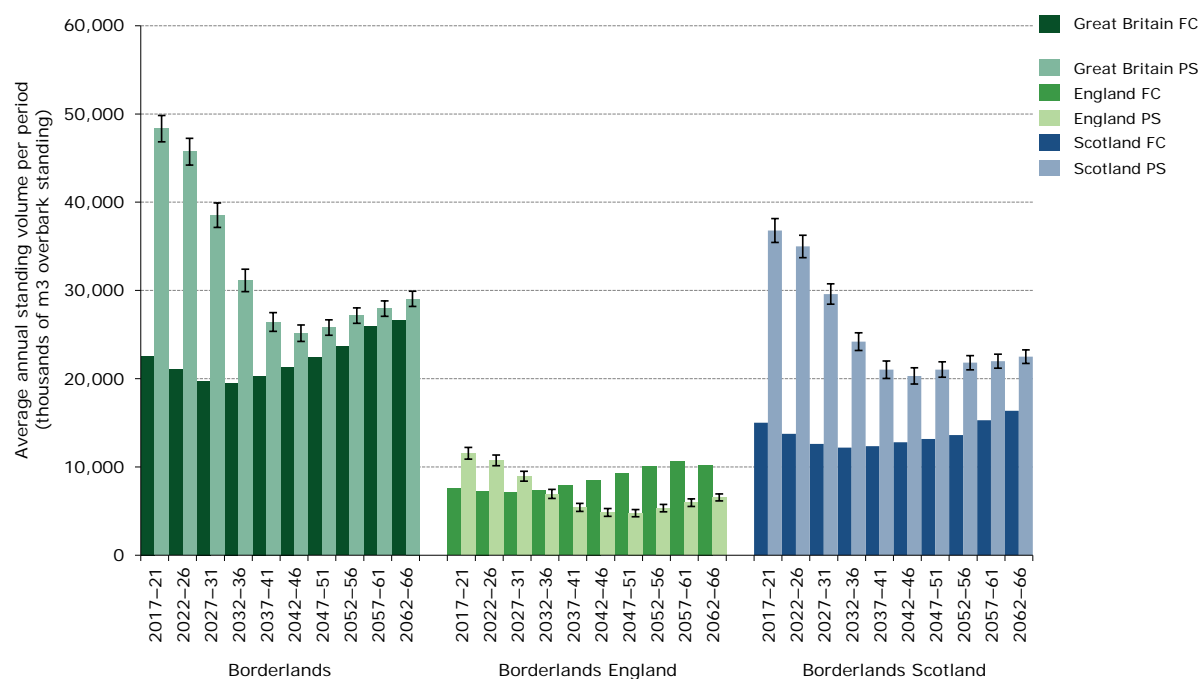


Figure 6c 50-year forecast of coniferous standing volume for FC and Private sector estates in Borderlands by country



Net increment

Table 11 50-year forecast of coniferous net increment; average annual volumes within periods – Borderlands districts

Forecast period	FC	Private sector		Total
	volume (000m³ obs)	volume (000m³ obs)	SE%	volume (000m³ obs)
Carlisle district				
2017–21	65	60	12	126
2022–26	60	54	13	114
2027–31	61	43	18	103
2032–36	62	35	22	97
2037–41	72	38	21	110
2042–46	81	45	18	127
2047–51	90	53	14	142
2052–56	92	53	14	145
2057–61	93	55	14	148
2062–66	88	48	13	137
Cumbria excl. Carlisle				
2017–21	55	131	10	186
2022–26	56	114	10	171
2027–31	59	97	11	156
2032–36	60	88	11	148
2037–41	63	89	11	152
2042–46	64	105	10	169
2047–51	66	116	10	182
2052–56	68	135	9	203
2057–61	68	144	8	212
2062–66	64	155	8	219
Northumberland				
2017–21	277	265	9	542
2022–26	273	243	9	516
2027–31	300	208	9	508
2032–36	323	174	10	498
2037–41	353	151	10	504
2042–46	381	151	11	532
2047–51	397	169	11	566
2052–56	401	204	10	605
2057–61	409	233	8	642
2062–66	398	249	7	647
Dumfries and Galloway				
2017–21	585	1,112	4	1,698
2022–26	542	1,078	4	1,620
2027–31	555	1,004	4	1,559
2032–36	570	903	4	1,473
2037–41	602	807	4	1,409
2042–46	633	776	4	1,409
2047–51	667	799	4	1,466
2052–56	696	863	4	1,559
2057–61	731	887	4	1,618
2062–66	749	894	3	1,643
Scottish Borders				
2017–21	169	622	5	792
2022–26	169	590	5	759
2027–31	171	523	5	694
2032–36	175	467	5	642
2037–41	185	491	5	677
2042–46	197	556	5	753
2047–51	196	605	4	801
2052–56	179	634	4	813
2057–61	183	645	4	828
2062–66	195	635	4	830

Table 11 cont'd 50-year forecast of coniferous net increment; average annual volumes within periods – Borderlands countries

Forecast period	FC	Private sector		Total
	volume (000m ³ obs)	volume (000m ³ obs)	SE%	volume (000m ³ obs)
Borderlands				
2017–21	1,152	2,191	3	3,343
2022–26	1,100	2,080	3	3,179
2027–31	1,145	1,875	3	3,021
2032–36	1,191	1,667	3	2,858
2037–41	1,275	1,576	3	2,851
2042–46	1,356	1,633	3	2,989
2047–51	1,415	1,742	3	3,158
2052–56	1,436	1,890	2	3,325
2057–61	1,484	1,964	2	3,448
2062–66	1,493	1,982	2	3,475
Borderlands England				
2017–21	397	456	6	854
2022–26	389	412	6	801
2027–31	420	348	6	768
2032–36	446	297	7	743
2037–41	488	278	7	765
2042–46	526	301	8	828
2047–51	552	338	7	891
2052–56	561	393	6	953
2057–61	569	432	6	1,001
2062–66	550	452	5	1,002
Borderlands Scotland				
2017–21	755	1,734	3	2,489
2022–26	711	1,668	3	2,379
2027–31	726	1,527	3	2,253
2032–36	745	1,370	3	2,115
2037–41	787	1,299	3	2,086
2042–46	830	1,332	3	2,162
2047–51	863	1,404	3	2,267
2052–56	875	1,497	3	2,372
2057–61	914	1,532	3	2,446
2062–66	943	1,529	2	2,473

Figure 7a 50-year forecast of average annual coniferous net increment in Borderlands England by district

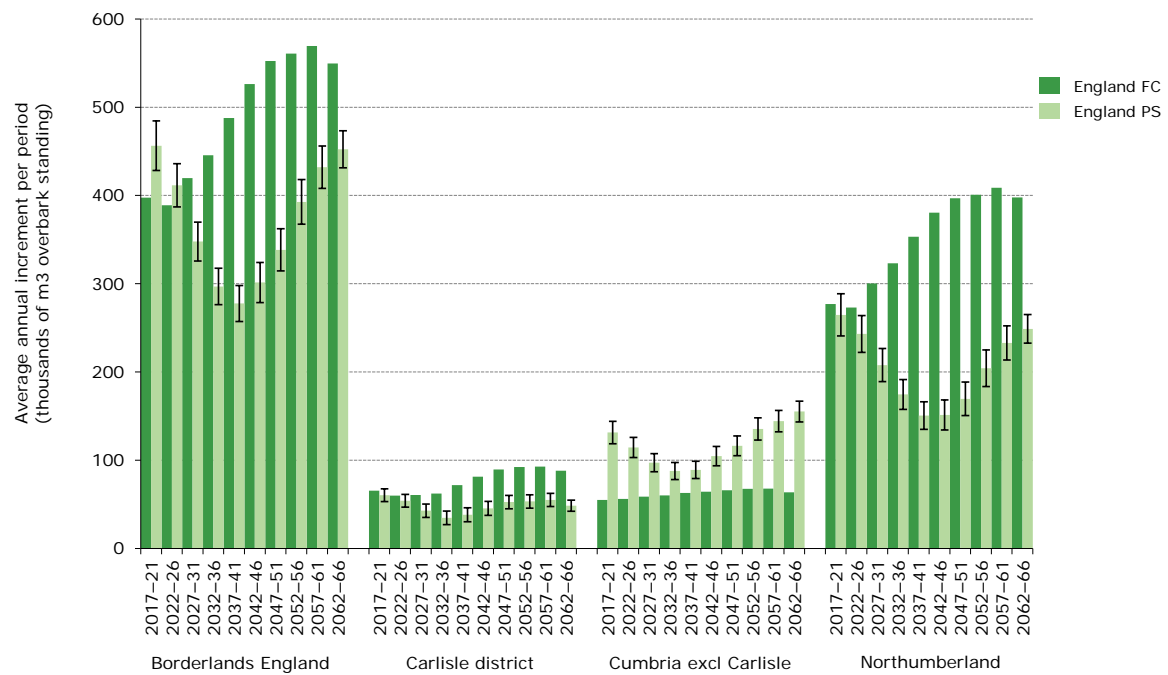


Figure 7b 50-year forecast of average annual coniferous net increment in Borderlands Scotland by district

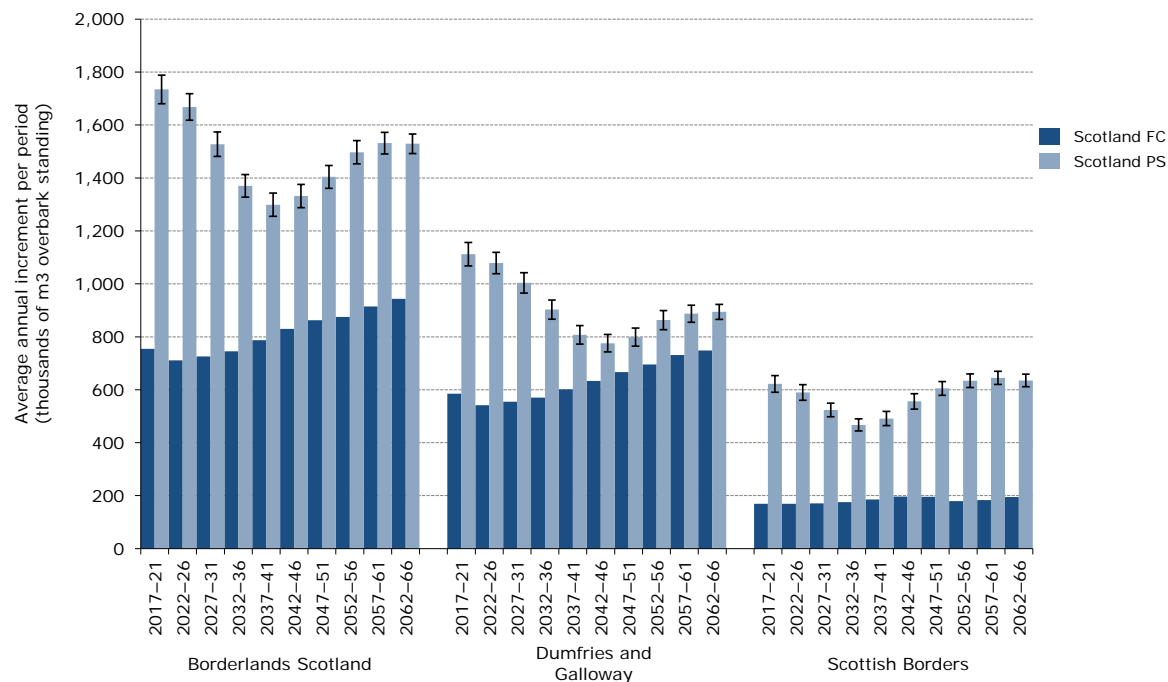
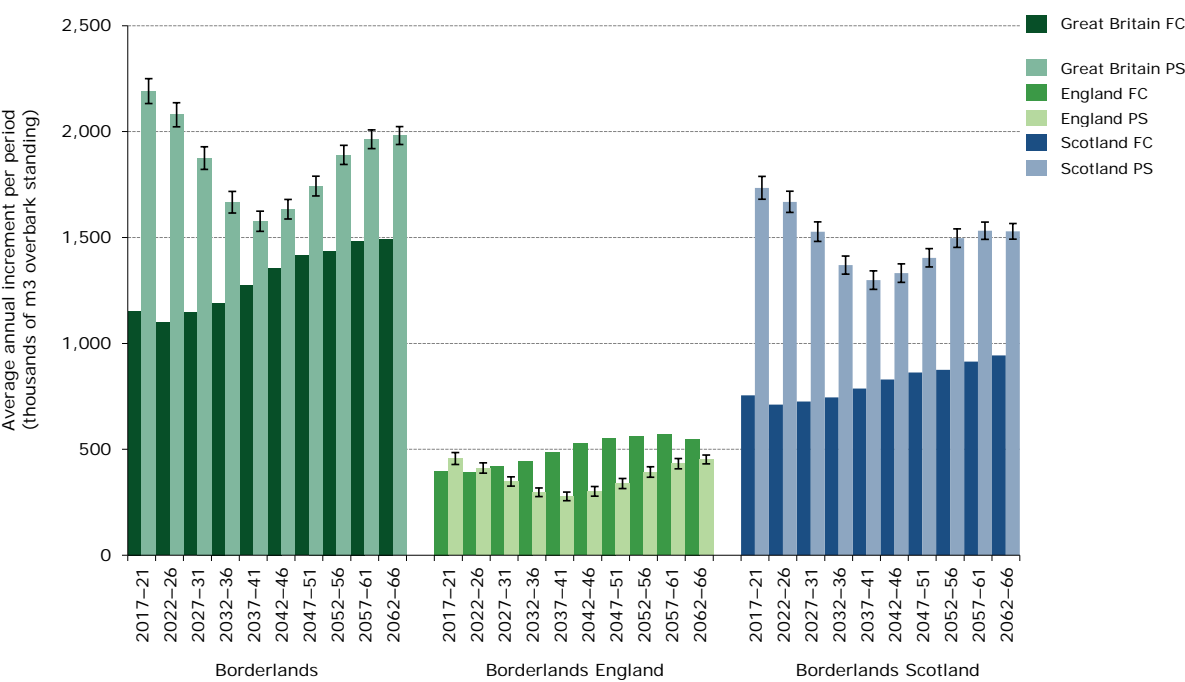
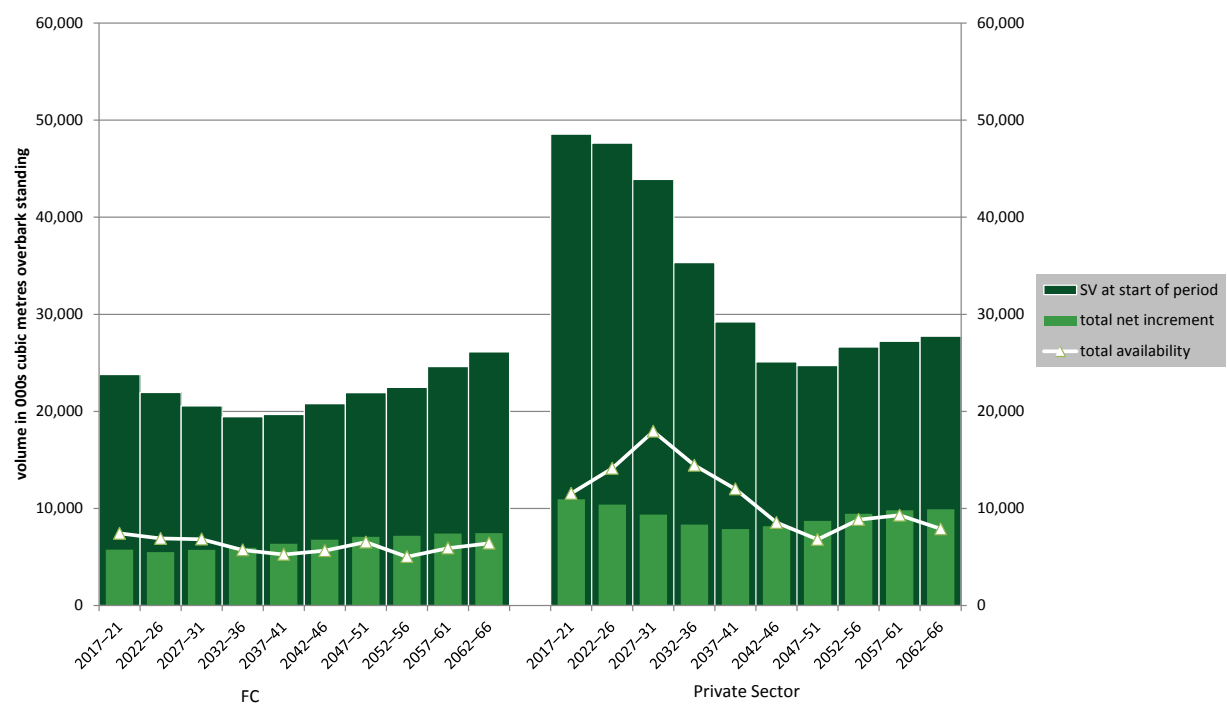


Figure 7c 50-year forecast of average annual coniferous net increment in Borderlands by country



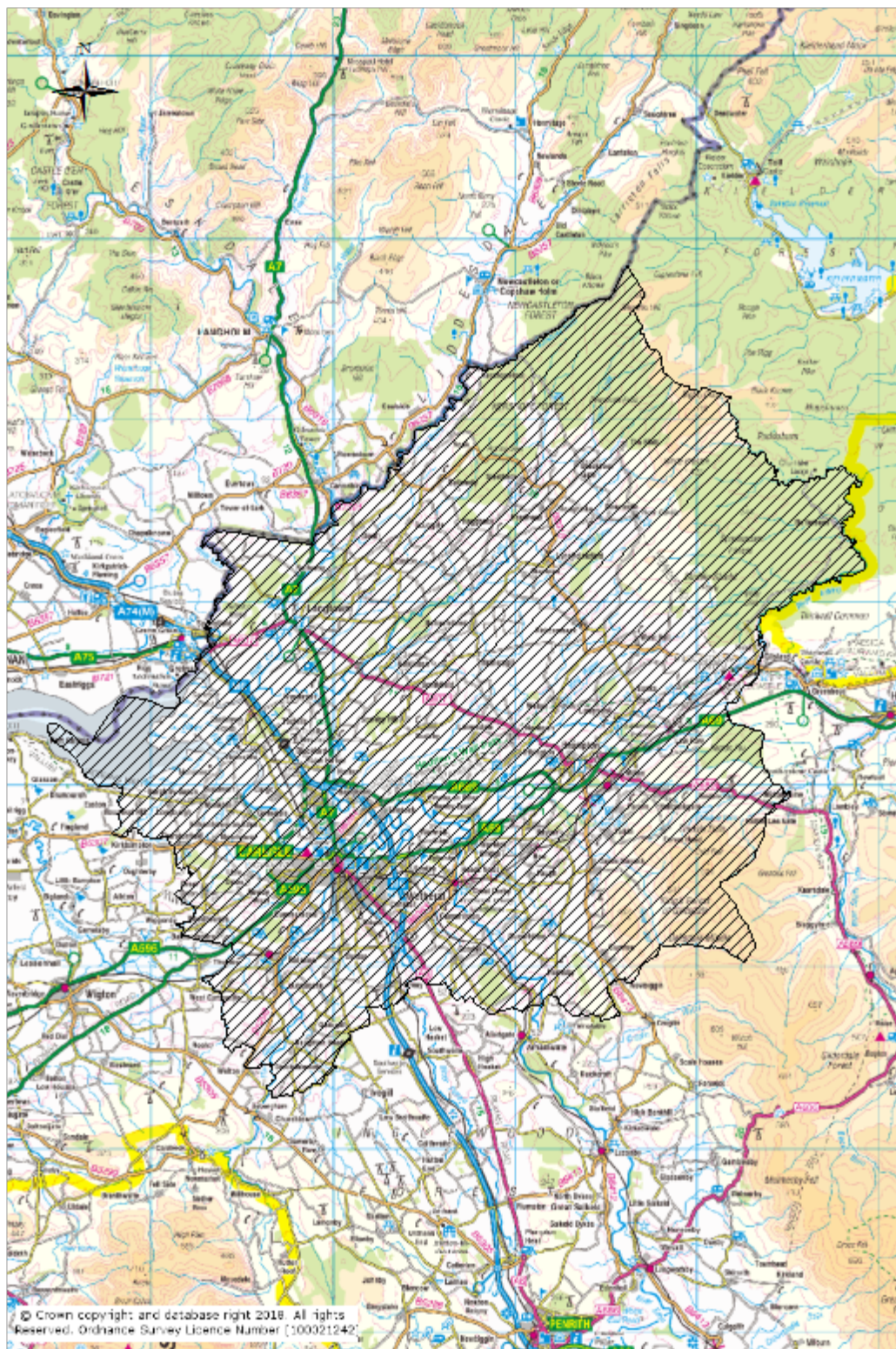
50-year forecast of standing volume, net increment and availability

Figure 8 50-year summary of softwood standing volume, net increment and availability by sector in the Borderlands



Appendix 1 - Maps

Map 2 Carlisle District



Map 3 Cumbria excluding Carlisle District



Map 4 Northumberland

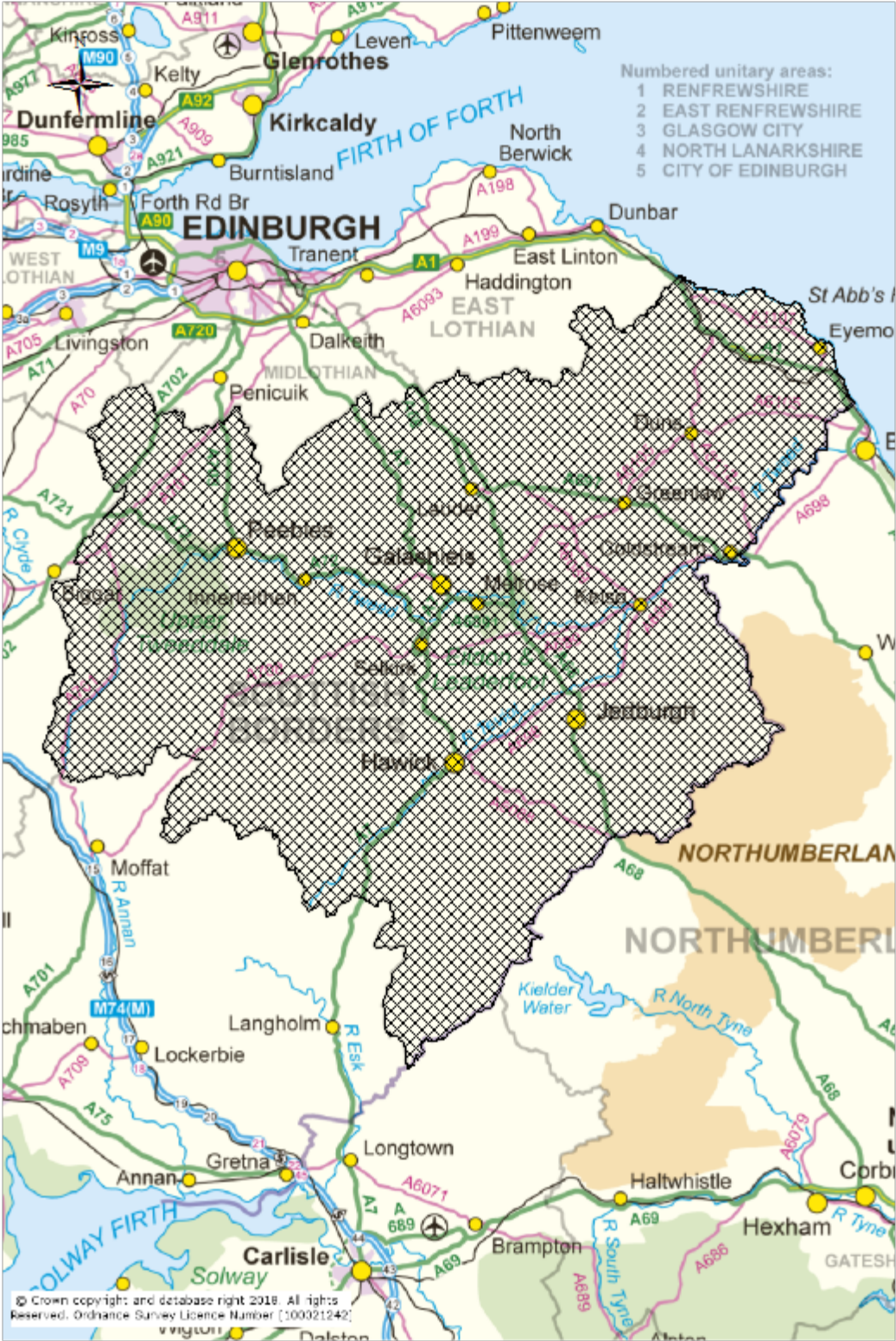


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Map 5 Dumfries and Galloway



Map 6 Scottish Borders



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.
Age class	A grouping of trees into specific age ranges for classification purposes.
Area (forest/woodland)	Forest and woodland area can be defined in net or gross terms. Net area is the land actually covered by trees (in the National Forest Inventory that is to the drip line of the canopy). Gross area includes both the area covered by trees and the open spaces (<0.5 hectare) within (e.g. rides, glades, ponds).
Biological potential	A term applied to forecast scenarios with the objective of maximising timber production. It typically involves felling stands in the year of maximum MAI and management table thinning. It may not take account of factors that constrain thinning and felling (e.g. wind risk or pest attack). The forecast results set out in this report involve constraints on thinning and times of felling to take account of wind risk.
Broadleaves	Trees and shrubs that belong to the angiosperm division of the plant kingdom (as distinct from the gymnosperm division that includes conifers). Most in the UK have laminar leaves and are deciduous. Sometimes referred to as 'hardwoods'.
Clearfelling	Cutting down of an area of woodland (if it is within a larger area of woodland it is typically a felling greater than 0.25 hectare). Sometimes a scatter or small clumps of trees may be left standing within the felled area.
Conifers	Trees and shrubs that belong to the gymnosperm division of the plant kingdom (as distinct from the angiosperm division that includes broadleaves). Conifers mostly have needles or scale-like leaves and are usually evergreen. Sometimes referred to as 'softwoods'.
Cumulative volume production	The total volume of timber that is forecast to be produced over the entire forecast period, including any overdue timber.
DAMS (Detailed Aspect Methodology Score)	A measure of exposure at a particular location. Can be used as a proxy indicator of the risk of catastrophic wind damage to a stand of trees. May be used to influence decisions on thinning and timing of clearfelling where wind is a risk factor.
DBH (diameter at breast height)	The diameter on the stem of a tree at 'breast height', defined as 1.3 m from ground level.
Dothistroma needle blight	A disease of conifers (especially pine) which causes defoliation, losses in yield and, in severe cases, tree death. Also known as red band needle blight.
Felling plan	A spatial and temporal plan of harvesting activities within a forest or woodland.
Forest (or woodland)	Land predominately covered in trees (defined as land under stands of trees with a canopy cover of at least 20%, or the ability to achieve this, and with a minimum area of 0.5 hectare and minimum width of 20 m), whether in large tracts (generally called forests) or smaller areas known by a variety of terms (including woods, copses, spinneys or shelterbelts).

Forest management plan	A holistic spatial and temporal plan stating the objectives of management together with details of forestry proposals over a period of five years and outlining intentions over a minimum total of 10 years. Such plans allow managers to communicate proposals and demonstrate sustainable forest management. They can be used to authorise thinning, felling and other management operations.
Forest Service	An agency within the Department of Agriculture and Rural Development (DARD) in Northern Ireland responsible for the regulation of forestry and the management of state forests in Northern Ireland.
Forestry Commission	The government department responsible for regulating forestry, implementing forestry policy and managing state forests in England and Scotland. Forestry policy is devolved, with the exception of common issues addressed on a GB or UK basis, such as international forestry, plant health and forestry standards.
Forestry Commission (FC) estate	Forests, woodlands, open land and other property managed by the Forestry Commission.
Great Britain (GB)	England, Scotland and Wales.
Increment	The increase in volume of a tree or a stand over a year or annualised over a specified period measured either in m ³ per year or in m ³ per hectare per year. See also Mean Annual Increment (MAI).
Like-for-like (restocking)	The restocking of areas of felled trees with trees of the same species and yield class.
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 while also maintaining maximum cumulative volume production.
Mean annual increment (MAI)	The average rate of volume production up to a given year, expressed in m ³ per hectare per year. In even-aged stands it is calculated by dividing cumulative volume production by age.
Mensuration	The study of the measurement of lengths, areas, volumes and related quantities. Forest mensuration is concerned with the measurement of trees, woodlands and forests, including standing and felled timber.
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.
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.
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.
Softwood	The wood of coniferous trees or the conifers themselves.
Stand	A distinct area of woodland, generally composed of a uniform group of trees in terms of species composition and spatial distribution, and age and size class distribution.
Standard error (SE)	The measure of the margin of error associated with an estimate as a result of sampling from a population with statistical variability. Larger standard errors indicate less precision in the estimate. Standard errors in this report are quoted in relative terms (i.e. as percentages of the value of the estimate).
Standing volume	The live stemwood and usable branchwood of trees (up to 7 cm top diameter). It excludes roots, below ground stump material, small branches, foliage and deadwood. For Private sector woodland only, it also excludes trees in woodlands of less than 0.5 hectare. Usually expressed as m ³ overbark standing (m ³ obs).
Stemwood	The woody material forming the above ground main growing shoot(s) of a tree or stand of trees. The stem includes all woody volume above ground with a diameter greater than 7 cm overbark. Stemwood includes wood in major branches where there is at least 3 m of straight length to 7 cm top diameter.
Sustainable forest management	The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity and vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national and global levels, and that does not cause damage to other ecosystems.
Terminal height	The top height of a stand at which wind damage is expected to reach a level necessitating clearfelling.
Thinning	The periodic harvesting of trees in a woodland, involving the removal of some trees for commercial use and the retention of others for future production or long-term retention.
Thinning plan	A spatial and temporal plan of harvesting activities within a forest or woodland.
Top diameter	The diameter of the smaller (top) end of a length of stemwood, branchwood or log, often used to define different categories of wood products (e.g. sawlogs, roundwood, pulp) and merchantable timber.
Top height	The mean total height of the 100 largest dbh trees per hectare.
UK (United Kingdom)	Great Britain and Northern Ireland.
Windthrow	Uprooting of trees by the wind. Windthrow can be endemic – i.e. that caused by frequently recurring peak winds – or catastrophic – an infrequent occurrence associated with exceptionally strong winds where large areas/numbers of trees are blown down.
Woodland	see Forest.
Yield class (YC)	An index used in the UK of the potential productivity of even-aged stands of trees based on maximum MAI. It reflects the potential productivity of the site for the tree species growing on it.

NFI national reports and papers

This inventory report is one of a series of publications reporting the outputs of the Forestry Commission National Forest Inventory. It forms part of the 50-year forecast of timber availability series, which includes the following reports:

- 50-year forecast of softwood timber availability (2014)
- 50-year forecast of hardwood timber availability (2014)

Supporting technical documentation for this report is available in:

- National Forest Inventory survey methodology
- National Forest Inventory forecasts methodology overview
- Interpreting National Forest Inventory timber volume forecasts

The woodland map and areas derived from it can be found in:

- National Forest Inventory woodland area statistics (for Great Britain, England, Scotland and Wales).

Full details are available from the [NFI web pages](#).

The National Forest Inventory supports sustainable forest management in Great Britain. For more information see The [UK Forestry Standard](#) and its supporting Guidelines.

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More information about the National Forest Inventory publications is available from the [NFI web pages](#).

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