Felling and Removals Forecasts

A document describing how volume fellings and removals are handled in the 2011 Production Forecast system.

Tom Jenkins

Robert Matthews

Ewan Mackie

Lesley Halsall

Background

A fellings and removals forecast is the fundamental output of the forecast system, consisting of estimated above-ground timber volume production over time. The fellings and removals forecast is equivalent to the 'volume forecast' produced in previous forecasts.

Fellings and removals forecasts have many applications, notably:

- The FC formally publishes a fellings and removals forecast for UK forests every 5 years. These forecasts support the strategic development of timber growing and wood processing industries.
- The FC commits to bring to market a specified volume of timber from the public forest estate for a rolling period of 5 years. The fellings and removals forecast is an essential piece of information informing this commitment and the level at which it is made.
- The FC uses the forecast to plan and manage operations at a tactical level. The forecast is also used to test and evaluate the options and outcomes of the design planning process.
- Local/bespoke fellings and removals forecasts are used to support timber growing and wood processing industries in terms of local investment and business planning.

Timber volume production will be estimated at sub-component level and amalgamated across the forecast extent.

The forecasts cover both publicly- and privately-owned woodlands.

Additionally:

- As part of the reporting of UK forestry statistics, estimates of actual timber production are compared with forecasts of a 5 year period.
- Forecasts inform the internationally reported statistics on forest management and timber production in the UK.
- Fellings and removals forecasts, in conjunction with growing stock and increment forecasts, are a strategic measure of the sustainability of intended forest management.
- Fellings and removals forecasts are an essential input to the modelling of carbon in harvested wood products, *e.g.* to inform international climate change negotiations.

- FC fellings and removals forecasts are an essential element of woodfuel forecasts, adopted by DECC.
- Fellings and removals forecasts are frequently referred to in research studies into rural development, land use, biomass resources and greenhouse gas balances, carried out by a range of institutes on behalf of government departments and other stakeholders.

Within the FC, fellings and removals forecasts are used directly to inform the management of the public estate through:

- Forest design planning process.
- Planning of operations.
- Control of the growing stock.
- Wider reporting (under UKWAS).

The calculation of a fellings and removals forecast involves four data sets:

- Data on areas of forest in terms of species composition, growth rates, stocking and age distribution.
- Data describing the intended management of forest areas.
- Estimates of stand growth and yield under different management regimes (usually obtained from models).
- A set of parameters to 'control' the forecast *e.g.* to specify the period over which the forecast is calculated and reported.

Appendix 1 contains a detailed example of how these data are used to calculate a volume production forecast for a forest component/sub-component[1]. Also included in the Appendix are descriptions of how these calculations might vary due to data and parameter settings *e.g.* thinning or no thinning, management coupe type.

For the Public Forest Estate (PFE), these data sets are obtained from the Forester database, with controlling parameters from the Forecast Wizard. For private woodlands, forecasting involves a more complex procedure based on National Forest

[1] Throughout this document, reference is made to 'sub-components'. A 'sub-component' is the smallest entity that can be identified in Forester, *i.e.* a portion of a component that has been split by a coupe boundary which does not match the boundary of the original sub-compartment containing the component.

Inventory (NFI) survey squares and a 'bulking up' procedure (documented elsewhere) requiring reference to the NFI woodland map. Forecasting for private woodlands uses a bespoke NFI forecast wizard.

Appendix 2 indicates how different Forestry Commission SCDB land-use codes are to be treated in the fellings and removals forecast while Appendix 3 provides similar information for NFI component types.

Forecast Types

It is possible to make very different assumptions about intended management of forest areas, depending on the purpose of the forecast. Different 'Forecast Types' can be specified addressing the main applications of forecasting.

The Forecast Wizard in Forester allows for six types of forecast, namely:

- Zero Intervention Forecast;
- Biological Potential Forecast;
- Strategic Regional Forecast;
- Management Plans Forecast;
- Target Assortments Forecast; and
- Quick Forecast.

Full details of these forecast types, including simple examples, can be found in the document '*Forecast Types*'.

Of the six Forecast Types listed above, only the Zero Intervention Forecast Type will have no associated fellings and removals forecast. In all other Forecast Types, volume production is calculated by the forecast system according to the detailed requirements of that Forecast Type, and is reported accordingly (see Appendix 2 for a summary relating to the Public Forest Estate land-use codes, Appendix 3 for a summary relating to NFI component types).

Restocking in the forecast

Standard forecasts usually cover a period of 20 years and it is unlikely that any sub-components re-stocked during the standard forecast period would have any further substantive volume production associated. However, forecasts for longer periods may

be required, and these will need to include timber volume production from any restock areas which achieve production within the period of the forecast.

The processes by which restocking is handled by the forecast system can be found in the document '*Restocking in the Forecast*'.

Historical timber production (Hindcasting)

In some situations it is necessary to estimate historical timber production (hindcasting) as well as forecasting future production. For example, this is likely to be needed where consistent estimates are required from an historical base year, such as 1990 as adopted in the Kyoto Protocol. The version of the forecast system currently under development does not address any requirements for such hindcasting. The system has, however, been designed in order to enable the facility for hindcasting to be incorporated in future versions of the software.

International reporting of timber volume production

Definitions for international forest resource reporting used by the Forestry Commission are taken from three closely related sources; National Forest Inventories: Pathways for Reporting (Tomppo *et al*., 2010), FRA 2010 Terms and Definitions (FAO, 2010) and Enquiry: State of Forests and Sustainable Forest Management in Europe 2011 (UN, 2010; also reproduced by the Forestry Commission, 2011).

International reporting distinguishes between "felled volume" [*i.e.* 'fellings (annual)'; Forestry Commission, 2011] and "volume removed from site" [*i.e.* 'removals'; Forestry Commission, 2011]. The forecast system should be able to report both types of volume. Felled volume equates to the conventional definition of a timber production forecast, while 'volume removed from site' involves a forecast (normally) in terms of roundwood and sawlogs as defined for Assortment option 2 above. The option also exists to report volume production of branchwood if required.

Definition of timber volume production

The conventional output of a timber volume production forecast consists of production in terms of standing overbark cubic volume to 7 cm top diameter overbark, *i.e.* including:

- stump,
- stemwood,
- 'utilisable' branch wood [*i.e.* sufficiently straight and with a minimum continuous length of 3 metres] to 7 cm top diameter overbark.

Conventions are found in section 3.5, page 56 of Matthews and Mackie (2006) and the Code of Sample Plot Procedure (1976, amended 1981) section 3.19[2]. One key convention defines utilisable (measurable) trees as having DBH 7 cm or greater.

By convention, the volume of dead trees is not included. There is interest amongst some users in obtaining forecasts of dead volume available for harvesting. This is complicated to estimate due to the stochastic nature of tree mortality, variations in the rate of degradation of non-living material, and the potential for accumulation of dead trees over several years. Provision of fellings and removals forecasts including elements of deadwood is not planned for the 2011 forecast.

For NFI, direct measurements of deadwood (standing and lying) are taken and will be reported on in 2015.

A user may specify a volume production forecast in terms of 'harvested' roundwood products (assortments) *i.e.* stemwood greater than or less than specified top diameters, see section 3.7, pages 59 to 63 of Matthews and Mackie (2006).

In the 2005 forecast system, assortment calculations were based on table 50, page 174 of Hamilton (1975, reproduced as table 34, page 218 of Matthews and Mackie, 2006), which considers overbark standing volumes to different top diameters with a minimum length of 3 metres. This means that the volume reported to a specified top diameter is based on the full standing stem length to that top diameter, provided the length(s) exceeds 3 metres, otherwise, the volume reported is 0 (zero). Volumes between two specified top diameters are calculated as simple differences.

[2] For readers with access to the FC intranet, the amended Code of Sample Plot Procedure is available on the Forest Research eConnect pages under 'Research'.

For the 2011 forecast system, it is proposed to offer greater flexibility in the reporting of volume assortments, with the three following options being available:

Assortment option 1

This is identical to reporting in the 2005 forecast system (see above) but including the additional reporting of stem volume between 7 cm top diameter overbark and tip.

Assortment option 2

This is based on specifying above-ground volume (stump, stemwood and utilisable branchwood) in terms of two main types of timber product (sawlogs and other roundwood volume), which allows the total above-ground volume to be categorised as:

- sawlog volume,
- roundwood volume,
- stem tip volume,
- stump volume,
- volume of bark associated with sawlogs,
- volume lost during conversion at point of harvest (*e.g.* chainsaw cuts),
- other volume (*i.e.* the remaining volume).

The estimation of volume in branchwood is specified in the document '*Growing Stock Biomass Forecasts*' (publication will follow).

Sawlog volume

Sawlog volume is specified in terms of the following parameters:

- Whether to be estimated and reported overbark or underbark, default is overbark.
- Minimum top diameter (overbark if volume is overbark, otherwise underbark), with a default value of 18 cm overbark.
- Maximum butt diameter (overbark if volume is overbark, otherwise underbark), with a default value of 300 cm overbark (in effect, no constraint).
- Fixed log length or full length to the specified top diameter.

- If fixed log length, this is defined by the user, with a default value of 3 metres. (For example, under this rule, a 5 m length of sawlog material would result in only the lower 3 m being reported as sawlog volume, the remaining 2 m would be included in the 'roundwood' category.)
- If full length to the specified top diameter, the minimum length is defined by the user with a default value of 3 metres. (For example, under this rule, a 5 m length of sawlog material would all reported as sawlog volume, as it is greater than the 3 m minimum length defined by the user.)

Roundwood volume

Roundwood volume is specified in terms of the following parameters:

- Always estimated and reported overbark.
- Minimum top diameter, always 7 cm overbark.
- Always fixed length, as specified by the user, with a default value of 3 m.

Stem tip volume

This volume includes material, in trees of at least 7 cm DBH, between 7 cm top diameter overbark and the stem tip. This assortment category will also include the volume of any small diameter stemwood between the last roundwood length and 7 cm top diameter overbark.

Stump volume

Stump volume is estimated on the basis of a user-specified mean stump height, with a default value of 20 cm.

Volume of bark associated with sawlogs

This volume is estimated and reported to enable conversion between overbark and underbark volumes as required.

Volume lost during conversion at point of harvest

This generally involves small quantities of sawdust from chainsaw cuts, but is included for completeness as a component of non-recoverable volume.

Other volume

This assortment category includes all the volume not accounted for in the previous categories. This will primarily, and probably exclusively, consist of the volume in offcuts.

Assortment option 2 will be used in conjunction with forecasts involving reference to timber straightness scores, as specified in the document '*Straightness Forecasts*' (publication will follow).

Assortment option 3

This would provide most, if not all, of the functionality available via the ASORT model. The ASORT model affords greater flexibility in roundwood product specification than the other two assortment options. This option is not planned for development during 2011-12.

How timber volume production is reported

The forecast system estimates volume production for a sequence of individual years. These annual estimates are grouped and reported as a sequence of five-year periods. This is to allow for the fact that, although thinning and felling operations are specified by the user to occur in particular years, in practice the timing of these operations may vary by one or more years from that specified.

The forest design plan process recognises that the timing of harvesting may vary from that planned, and the use of five year periods, rather than individual years, has the effect of 'averaging out' the impact of such deviations.

Users are free to specify bespoke forecast reporting intervals (*e.g.* results reported as a sequence of six-year periods) if needed.

Scope of fellings and removals forecast

Volume production can be forecast for any forest areas that:

- contain living, standing trees of yield class 4 or above,

- contain windblown trees of yield class 4 or above,
- have been assigned the data and parameters needed for the calculations described in Appendix 1.

The forecast system methodology also includes a number of conventions which can be adopted in order to calculate volume production forecasts where some essential data items have not been specified by the user. These conventions effectively describe default settings for data and parameters which depend upon the type of forecast being calculated as described in detail in the document '*Forecast Types*'.

In the 2005 forecast system, sub-components assigned a storey code of 4 (subsidiary upper storey) were considered by convention to be non-forecastable, and were excluded from the forecast. The 2011 forecast system treats sub-components assigned to this type of storey in the same way as any other forest component. This is, however, only applicable to forecasts from the sub-compartment database and is not relevant to forecasts based on the NFI.

At present, volume forecasts cannot be calculated for forest areas containing coppice. The provision of such forecasts is not planned during the period 2011-2012.

Fellings and removals forecasts also exclude a number of areas where timber production is not identified as a significant objective, such as research areas, seed stands and coupes designated for minimum intervention. Users can also explicitly set forest sub-components to be non-forecastable.

Areas currently classed as 'felled' are not normally included in standard fellings and removals forecasts (20-year forecast) but do need to be accounted for in long term forecasts. This is considered in the section 'Restocking in the forecast' on page 4. The subject of restocking is fully described in the document '*Restocking in the Forecast*'.

Timber volume production and windblow

Forecasting volume production for windblown trees requires special treatment indicating that at a point in time, there is no further increment, and that the year of removal may not be the anticipated design plan fell year. In reality there may be some volume increment, but for the purposes of strategic forecasting increment is assumed to be zero.

The following method has been proposed to, and accepted by, GB Planners and will allow the forecast to reflect the majority of working practices throughout GB:

1. Calculate the standing volume as at the first year of the forecast[3]. Apply a volume reduction factor to recognise damage and degradation.
2. If the fell year associated with the management coupe is no more than five years in the future, allocate the adjusted volume to the year of fell associated with the management coupe.
3. If the fell year associated with the management coupe is more than five years in the future, allocate the adjusted volume to the year of next thinning, assuming this is no more than five years in the future.
4. If no operation is planned within five years, the adjusted volume is presented in a separate table and not included in the main fellings and removals forecast reports. This table to list the component / coupe combinations and the estimate of the adjusted volume.

Where there is significant windblow, it is likely that the Forest Design Plan will need revision to cover the clearance of the windblow and the rescheduling of the coupes planned for immediate volume production. The revised coupes would normally be designed to ensure that the windblow falls within category 2 above.

The restocking of windblown areas is considered in detail in the document '*Restocking in the Forecast*'.

Treatment of land planned for disposal from the PFE

Land currently forming part of the Public Forest Estate which is planned for disposal is included in the Forester database and denoted as such by allocation of a Disposal Year. Volume production from such areas (including resulting from restock) prior to the disposal year is included in the forecast for the Public Forest Estate. Although changes to the planned management of these areas may occur as a result of the ownership change, it is important that the anticipated volume production from the disposal year onwards is reported as part of the PS forecast.

[3] Ideally a new field will be added to the SCDB to hold the year of blow. The standing volume of the windblow component will be calculated as at the year of blow rather than as at the first year of the forecast.

Thinning at a young age

There may be occasions where thinnings are planned for removal before the standard management table age of first thinning, see ForestYield User Manual (Matthews *et al.*, 2011). The forecast system will return zero volume for such thinning events.

Thinning after the age of maximum Mean Annual Increment

During the period of stand development after mean annual increment has maximised, the maintenance of thinnings at marginal thinning intensity cannot be sustained without causing significant reductions in the growth and level of standing volume of the stand. As a result, the yield models suggest that the volume for removal in thinnings is progressively reduced in the period after maximisation of mean annual increment. According to paragraph 56 (page 10) of FC Booklet 16, Forest Management Tables (Bradley, Christie and Johnston, 1966),

> "*The annual thinning yield remains constant until a few years before the age of maximum mean annual increment, at which point the values begin to decline. ... they are of lesser importance and are likely to be used only when stands are being retained beyond the normal rotation age for reasons of amenity,* etc."

In other words, words the management table thinning intensity (MTI) declines post age of MMAI in line with CAI and is therefore less than 70% of stated yield class. In practical terms, this prevents stands from being 'thinned to extinction' before the scheduled felling date, where this is beyond the age of maximum MAI.

These later, albeit lighter thinnings, may be of greater relevance in contemporary forestry where long-term retention of stands is commonplace. However in the forecast we need to allow for modelling a management scenario where we try to preferentially remove one component of a mixture over a number of successive thinnings. The forecast system has the functionality to specify each thinning intervention.

- The intensity of these interventions (for 'silvicultural' thinning types) are specified in terms of an unadjusted percentage of the marginal thinning intensity.
- A user specifying (*e.g.*) 100% marginal thinning intensity on a 6-year (*i.e.* non-'standard') thinning cycle will therefore be expecting a fixed and known volume.

Consequently, the forecast system has been built without the feature that reduces the volume removed in thinning in the period following maximisation of mean annual increment removed. In other words, unless otherwise specified by the user, a fixed and known thinning volume is assumed to be removed at each thinning operation, with no reduction after the age of maximum MAI.

Thinning within the cycle prior to felling

Future thinnings at any stage within the forecast cycle are specified by the user as detailed below.

- The sub-component may be defined as 'no thin' in which case a no-thin model is selected and applied from that date forward.
- The standard tabulated thinning type, cycle and intensity can be applied to the sub-component (*e.g.* intermediate thinning type at the management table intensity (*i.e.* 100% MTI) on a fixed 5-year cycle from the tabulated age of first thinning).
- A bespoke thinning regime can be specified in terms of thinning type, cycle and intensity.

The forecast system does not apply a thinning if it is scheduled within one thinning cycle, less one year, of the clearfell date. The minimum no thin period is 2 years. So, if the final scheduled thinning cycle is 5 years, the 'no thin' period before final felling will be 4 years.

Handling inconsistent fell years

In some cases, sub-components may be assigned a fell year which is inconsistent with either base data or the forecast period (*i.e.* start year and finish year). Details of the situations in which this can occur are given in the table in Appendix 4. There are several options which can be adopted for handling inconsistent fell years in the forecast system:

- Option 1: Allocate zero volume to affected sub-components. Produce a separate report listing the sub-components and the area affected. The report should also list the possible reason(s) for an overdue fell year, as appropriate for the context.

- Option 2: Calculate volume for the specified fell year and include in a separate report along with areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.
- Option 3: Change the fell year to the first reporting year and include in a separate report along with areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.
- Option 4: Change the fell year to the first reporting year and allocate the volume to the start of the forecast (either the first year or first five years). The forecast error report should clearly flag volume/areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.

The choice of option may depend on the circumstances causing the fell year to be inconsistent. A specific option for handling each case is given in the table in Appendix 4.

Production class and forecasting

M1 is capable of calculating a yield class based on production class. To do this, M1 requires valid combinations of top height (H), basal area per hectare (A), mean DBH (D) and number of trees per hectare (N). All valid combinations ('triplets') of data include top height (H) and values for two other variables. Valid triplets are [H, A, N], [H, D, A] and [H, N, D]. All stand mensuration information for each sub-component should be passed to the forecast system. The forecast system should then pass all the values to M1, which will use inbuilt rules to assign a production class (local yield class), if possible, on the basis of the mensurational data received from the forecast system.

Error checking

Forecasts are reliant on data collected to agreed and consistent standards. Data collection is specified in the standard operating procedures (SOP's) published as the Survey Handbook (Forestry Commission, 2007) and the NFI Survey Manual (Forestry Commission, 2010). The field data are entered and stored in error-checked systems.

Whether forecasting from year zero or from an assessed growing stock point, the forecast input data must be subject to pre-forecast checks in order to ensure the validity of the forecast outputs. Although the data underpinning fellings and removals forecasts are stored in error-checked systems, the forecast system performs a series

of further checks using a supplementary programme module which has been given the development title of the 'Archangel device' and which was originally specified in the internal document "*Checking the validity of growing stock 'inventory point' data*" (Jenkins, 2011).

The Archangel device runs validation checks on the data being passed to the Forecast System, whether these data are describing initial stand conditions or a growing stock point, and either inserts missing values or (where there is not enough information to fill the gaps) recommends rejection of the sub-component being validated. Where missing values are inserted, the sub-component is included in the forecast calculations. Where this is impossible, the sub-component is not included in any subsequent forecast calculations until such time as valid data are recorded in the relevant source database (NFI or SCDB). The forecast system produces a report listing any rejected sub-components/areas which are not included in a forecast.

Fell volume and DBH percentage adjustments

Fell volume percentage adjustment and fell DBH percentage adjustment apply only forecast generated from the SCDB for the public forest estate. The adjustments are not applicable to the NFI forecast.

Adjustments are entered into the SCDB at Forest District level via the treatment editor and are applied to the forecast values of felling volume (N.B. not thinning volume) immediately prior to storage in the forecast output database. The percentage adjustment figures are designed to allow, at local level, a fine-tuning of the forecast output for the volume of final fellings where prior experience indicates that the forecast figure is likely to be at variance with actual production. Because of their dependence on the volume forecast, the percentage adjustment figures will also apply to biomass production forecasts and any other SCDB-based forecast driven by a clearfell event.

References

Bradley, R.T., J.M. Christie and D.R. Johnston (1966) FC Booklet 16. Forest Management Tables. HMSO, London. 218pp.

FAO (2010) Global Forest Resources Assessment 2010: Terms and Definitions. *Forest Resources Assessment Programme Working paper 177/E*. Rome 2010.

Forestry Commission (2007) *Survey Handbook (Third Edition).* Forestry Commission: Operational Support Unit, Edinburgh.

Forestry Commission (2010) *National Forest Inventory of Great Britain: Field Manual.* Forestry Commission: Inventory, Forecasting and Operational Support Unit (IFOS), Edinburgh.

Forestry Commission (2011) *Sustainable Forest Management Indicators 2010 - Appendix 2: MCPFE Terms and definitions. Terms & Definitions: Criterion 3.* http://www.forestry.gov.uk/website/sfmindic2010.nsf/0/6598EE01922C6E508025769D00389351?open&RestrictToCategory=1 (Accessed 6 January 2011)

Hamilton, G.J. (1975) Forest Mensuration Handbook. Forestry Commission Booklet No. 39. HMSO, London. 274pp.

Jenkins, T. A. R. (2011) *Checking the validity of growing stock 'inventory point' data.* Forest Research Internal Document: Forest Resources Evaluation Group, Alice Holt.

Matthews, R.W. and E.D. Mackie (2006) *Forest Mensuration: A Handbook for Practitioners*. Forestry Commission: Edinburgh. 330pp.

Tomppo, E., Gschwantner, Th., Lawrence, M. & McRoberts, R.E. (Eds.) (2010) *National Forest Inventories - Pathways for common reporting.* Springer, 612 pp. ISBN 978-90-481-3232-4

UN (2010) Enquiry: State of Forests and Sustainable Forest Management in Europe 2011. National Data Reporting Forms on Pan-European Indicators for Sustainable Forest Management. Quantitative indicators collected and/or validated through UNECE/FAO, Geneva.
United Nations, Geneva, 5 February 2010

List of Forecast System Technical Documentation

Forecast Types

Felling and Removals Forecasts (this document)
Biomass Removals Forecasts*

Growing Stock Volume Forecasts
Volume Increment Forecasts
Growing Stock Biomass Forecasts*
Growing Stock Carbon Forecasts*

Straightness Forecasts*

Restocking in the Forecast

*Publication of Forecast Technical Documentation detailing forecasts involving straightness, biomass and carbon will follow.

Appendix 1 – Worked Examples

The following worked examples are all based on the 'Management Plans Forecast Type' (see '*Forecast Types*'.) and make reference to the use of an 'appropriate growth model'. This is a growth model selected by M1 for each forest sub-component on the basis of tree species, yield class, initial spacing and broad thinning prescription, essentially 'thin' or 'no thin', based on the setting of the '<PREVIOUSLY_THINNED>' flag. It is therefore crucial that this flag is set appropriately for every forecastable sub-component.

The model is selected to reflect how the stand has been managed up to the point that the latest inventory assessment was made, or to the start of the forecast period, in order to determine the initial conditions in the model from which to 'grow' the forest sub-component on from the start of the projection. This is illustrated within each of the examples presented below.

The examples presented below differ in complexity and are based on a forest sub-component with the following standard characteristics.

- Scots pine
- yield class 8
- initial spacing 1.4 m
- planting year 1961
- previously thinned to management tables on a 5-year cycle
- fell at age 78 years (age of maximum MAI)
- windthrow hazard class (WHC) 3.

The forecast period is taken to be from 2012 to 2100.

The above information is coded in a plain text document written in machine-readable 'Extensible Markup Language' (XML) which is used as input by the Forecast System. The Forecast System takes the data contained within the XML file and passes it directly to the M1 growth and yield model *via* internal API (application programming interface) calls, receiving the growth and yield information by return – *i.e.* no intermediate files are written. It is therefore the information contained in the XML file which unambiguously specifies the forecast rules to be applied to each sub-component by the Forecast System and M1. Each sub-component is individually and sequentially processed by the Forecast System and M1, and the resultant outputs are amalgamated into the forecast by the Forecast System.

Example 1 – Standard clearfell, no growing stock estimate available

In addition to the standard characteristics defined for the forest sub-component, Example 1 is based on the additional assumption that:

- an estimate of growing stock is not available (*i.e.* that no growing stock assessment has been made or an assessment has not been entered into the SCDB).

The inputs defining the forecast type and duration applied to Example 1 are shown in Table A1.1.1. The inputs giving the physical description of the sub-component used in Example 1 are presented in Table A1.1.2. The inputs detailing the assumed historical and future management of the sub-component are presented in Table A1.1.3.

Table A1.1.1 The basic inputs defining the forecast.

XML tag expected by the Forecast System	Value read by Forecast System	Description
<FORECAST_TYPE>	**MANAGEMENT_PLANS**	A 'Management Plans' forecast type is being run.
<FIRST_YEAR_OF_PROJECTION>	**2012**	The first year of the forecast.
<LAST_YEAR_OF_PROJECTION>	**2100**	The final year of the forecast.

Table A1.1.2 The basic inputs specifying the physical description of the sub-component (given in the standard order within the <PHYSICAL_DESCRIPTION> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<SPECIES>	**SP**	Standard FC species code.
<WINDBLOWN>	**N**	Not windblown (N is the default setting).
<SUB_COMPONENT_AREA>	**10000**	The area of the sub-component in m^2. In this example the area of the sub-component is assumed to be 1 hectare.

XML tag expected by the Forecast System	Value read by Forecast System	Description
<WHC>	**3**	Windthrow hazard class. (If blank, defaults are used.)
<LAND_USE_CODE>	**PHF**	Standard SCDB land-use code (PHF = productive high forest).
<GYC>	**8**	General Yield Class ($m^3ha^{-1}yr^{-1}$).
<SPACING>	**1.4**	Initial planting spacing, in metres (square planting assumed)
<PLANTING_YEAR>	**1961**	Planting year.
<STOREY>	**1**	The storey containing the sub-component.

Table A1.1.3 The basic inputs specifying the historical and future management of the sub-component (given in the standard order within the <MANAGEMENT> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<CLEARFELL_FELL_YEAR>	**2039**	The clearfell year defined for the sub-component.
<PREVIOUSLY_THINNED>	**Y**	The sub-component has previously been thinned. A thinning-type yield model will therefore be applied in the period up to the start of the forecast (<FIRST_YEAR_OF_PROJECTION>).
<THIN_IN_FUTURE>	**Y**	The sub-component will be thinned. A thinning-type yield model will therefore be applied during the forecast.

In the absence of a growing stock estimate / inventory point, the forecast system starts modelling the sub-component from 1961 (the defined '<PLANTING_YEAR>'). An appropriate growth model is used to work out the development of the growing stock up to the time of first thinning. The actual 'base model' selected automatically within the forecast system is SP ('<SPECIES>'), general yield class 8 ('<GYC>'), 1.4 m initial spacing ('<SPACING>'), intermediate thin to MTI on a 5 year cycle ('<PREVIOUSLY_THINNED>') from age 29, which is the standard age of first thinning in the yield model. From this point, in 1990, thinnings take place at standard intensity every 5 years until 2012 (the final modelled thinning before the forecast will therefore take place at age 49 years, in 2010).

These periodic thinnings obviously result in removals from the growing stock. In this way, the forecast system estimates an initial growing stock for the forecast starting in 2012 ('<FIRST_YEAR_OF_PROJECTION>').

It is perhaps worth noting that if the example forest sub-component considered here had been a no-thin sub-component, then a no-thin model would initially be applied and no thinnings would be carried out in the period up to 2012.

From 2012 (the '<FIRST_YEAR_OF_PROJECTION>') onwards, the Forecast System instructs M1 to 'grow on' the sub-component by reference to the specified management prescription for the sub-component ('<THIN_IN_FUTURE>', '<CLEARFELL_FELL_YEAR>').

From 2012 onwards, the above-ground timber volume production is reported at each scheduled thinning event, and the growing stock is reduced accordingly to become the starting point for the next period of growth. This continues until 9 years before felling (*i.e.* a sub-component age of 69 years, in 2030). Note that M1 defaults to an assumption that there is a minimum of a 6 year no-thin period immediately in advance of the felling date.

The forest sub-component is felled in 2039, at age 78.

The fellings and removals forecast outputs for this sub-component are given in Table A1.1.4 (average annual felling volumes during each forecast reporting period) and Table A1.1.5 (total felling volume for each forecast reporting period). Note that no thinning operation is assumed to take place in 2035 due to its proximity to the planned clearfell year (2039).

Table A1.1.4 The outputs of the volume fellings and removals forecast for this single sub-component, expressed as annualised volumes. Note: no gross:net reduction factor has been applied.

	Forecast Period	All Species	All Conifers	All Broadleaves	Scots Pine
	2012-2016	1.12	1.12	0	1.12
Volume	2017-2021	0.56	0.56	0	0.56
in range	2022-2026	0.39	0.39	0	0.39
7-14cm	2027-2031	0.34	0.34	0	0.34
top diam	2032-2036	0	0	0	0
	2037-2099	0.18	0.18	0	0.18
	2012-2016	0.62	0.62	0	0.62
Volume	2017-2021	0.39	0.39	0	0.39
in range	2022-2026	0.28	0.28	0	0.28
14-16cm	2027-2031	0.17	0.17	0	0.17
top diam	2032-2036	0	0	0	0
	2037-2099	0.12	0.12	0	0.12
	2012-2016	0.78	0.78	0	0.78
Volume	2017-2021	0.62	0.62	0	0.62
in range	2022-2026	0.34	0.34	0	0.34
16-18cm	2027-2031	0.28	0.28	0	0.28
top diam	2032-2036	0	0	0	0
	2037-2099	0.12	0.12	0	0.12
	2012-2016	3.08	3.08	0	3.08
Volume	2017-2021	4.03	4.03	0	4.03
in range	2022-2026	4.59	4.59	0	4.59
18cm +	2027-2031	4.82	4.82	0	4.82
top diam	2032-2036	0	0	0	0
	2037-2099	5.48	5.48	0	5.48
	2012-2016	5.6	5.6	0	5.6
	2017-2021	5.6	5.6	0	5.6
Totals	2022-2026	5.6	5.6	0	5.6
	2027-2031	5.6	5.6	0	5.6
	2032-2036	0	0	0	0
	2037-2099	5.89	5.89	0	5.89

Table A1.1.5 The outputs of the fellings and removals forecast for this single sub-component, expressed as volume felled per hectare in each forecast period. Note: no gross:net reduction factor has been applied.

Forecast year	Stand age (years)	Scheduled production event	Fellings and removals forecast† (m^3 ha^{-1}, from M1)
2015	54	Thinning	28.0
2020	59	Thinning	28.0
2025	64	Thinning	28.0
2030	69	Thinning	28.0
2035	74	Thinning	0.0
2039	78	Felling	371.3

†The total fellings and removals volumes are calculated by multiplying each annualised value (from Table A1.1.4) by the length of the forecast period to which it relates.

Example 2 – Standard clearfell, growing stock estimate available

Example 2 is based on the additional assumption that:

- an estimate of growing stock was made in 2011 (see Table A1.2.1), the results of which were entered into the SCDB.

Table A1.2.1 The outputs of the fellings and removals forecast.

Growing stock assessment (April 2011)	
Top height	16.4 m
Number of stems per hectare	998.0 stems
Basal area per hectare	31.2 m^2 ha^{-1}
Average dbh	Not assessed – calculated by M1
Volume per hectare	Not assessed – estimated by M1

The inputs defining the forecast type and duration applied to Example 2 are shown in Table A1.2.2. The inputs giving the physical description of the sub-component used in Example 2 are presented in Table A1.2.3. The inputs detailing the assumed historical and future management of the sub-component are presented in Table A1.2.4.

Table A1.2.2 The basic inputs defining the forecast.

XML tag expected by the Forecast System	**Value read by Forecast System**	**Description**
<FORECAST_TYPE>	**MANAGEMENT_PLANS**	A 'Management Plans' forecast type is being run.
<FIRST_YEAR_OF_PROJECTION>	**2012**	The first year of the forecast.
<LAST_YEAR_OF_PROJECTION>	**2100**	The final year of the forecast.

Table A1.2.3 The basic inputs specifying the physical description of the sub-component (given in the standard order within the <PHYSICAL_DESCRIPTION> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<SPECIES>	**SP**	Standard FC species code.
<WINDBLOWN>	**N**	Not windblown (N is the default).
<SUB_COMPONENT_AREA>	**10000**	The area of the sub-component in m^2. In this example the area of the sub-component is assumed to be 1 hectare.
<WHC>	**3**	Windthrow hazard class. (If blank, defaults are used.)
<LAND_USE_CODE>	**PHF**	Standard SCDB land-use code (PHF = productive high forest).
<GYC>	**8**	General Yield Class ($m^3ha^{-1}yr^{-1}$).
<SPACING>	**1.4**	Initial planting spacing, in metres (square planting assumed)
<PLANTING_YEAR>	**1961**	Planting year.
<STOREY>	**1**	The storey containing the sub-component.
<TOP_HEIGHT>	**16.4**	The top height of the sub-component, in metres, from the last growing stock assessment.
<TOP_HEIGHT_YEAR>	**2011**	The year the in which top height was assessed.
<TOP_HEIGHT_BEFORE_THIN>	**N**	Was top height assessed immediately before thinning (N is the default).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<NUMBER_OF_TREES_Ha>	**998**	The average number of stems per hectare for the sub-component, from the last growing stock assessment.
<NUMBER_OF_TREES_YEAR>	**2011**	The year the in which the average number of stems per hectare was assessed.
<NUMBER_OF_TREES_BEFORE_THIN>	**N**	Was the average number of stems per hectare assessed immediately before thinning (N is the default).
<BASAL_AREA>	**31.2**	The basal area per hectare of the sub-component, in m^2ha^{-1}, from the last growing stock assessment.
<BASAL_AREA_YEAR>	**2011**	The year the in which the basal area per hectare was assessed.
<BASAL_AREA_BEFORE_THIN>	**N**	Was the basal area per hectare assessed immediately before thinning (N is the default).

Table A1.2.4 The basic inputs specifying the historical and future management of the sub-component (given in the standard order within the <MANAGEMENT> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<CLEARFELL_FELL_YEAR>	**2039**	The clearfell year defined for the sub-component.
<PREVIOUSLY_THINNED>	**Y**	The sub-component has previously been thinned. A thinning-type yield model will therefore be applied in the period up to the start of the forecast (<FIRST_YEAR_OF_PROJECTION>).
<THIN_IN_FUTURE>	**Y**	The sub-component will be thinned. A thinning-type yield model will therefore be applied during the forecast.

The forecast starts from the growing stock estimate provided in 2011 ('<TOP_HEIGHT_YEAR>', '<NUMBER_OF_TREES_YEAR>', '<BASAL_AREA_YEAR>'). The assessed top height ('<TOP_HEIGHT>') is passed to M1 by the Forecast System, to allow M1 to assign an appropriate yield class to the sub-component. If the assessed top height indicates that the existing yield class ('<GYC>') is incorrect, M1 will compute an updated yield class and will apply the correct yield model for the newly-estimated yield class. From 2011 to 2012, the forecast system grows the sub-component according to the management prescription originally specified for the sub-component.

The forest sub-component considered in Example 2 involves a thinning prescription (*i.e.* '<PREVIOUSLY_THINNED>' = 'Y'). However, in this instance, no thinnings are scheduled by the chosen model between 2011 (the year in which the growing stock assessment was made) and 2012 ('<FIRST_YEAR_OF_PROJECTION>').

It is perhaps worth noting that if the example forest sub-component considered here had been a no-thin sub-component (*i.e.* '<PREVIOUSLY_THINNED>' = 'N'), then a no-thin model would initially be applied and no thinnings would be carried out in the period up to 2012.

From 2012 (the '<FIRST_YEAR_OF_PROJECTION>') onwards, the Forecast System instructs M1 to 'grow on' the sub-component by reference to the specified management prescription for the sub-component ('<THIN_IN_FUTURE>', '<CLEARFELL_FELL_YEAR>').

From 2012 onwards, the above-ground timber volume production is therefore reported at each scheduled thinning event, and the growing stock is reduced accordingly to become the starting point for the next period of growth. This continues until 9 years before felling (*i.e.* a sub-component age of 69 years, in 2030). Note that M1 defaults to an assumption that there is a minimum of a 6 year no-thin period immediately in advance of the felling date.

The forest sub-component is felled in 2039, at age 78.

The fellings and removals forecast outputs for this sub-component are given in Table A1.2.5 (average annual felling volumes during each forecast reporting period) and Table A1.2.6 (total felling volume for each forecast reporting period). Note that no thinning operation is assumed to take place in 2035 due to its proximity to the planned clearfell year (2039).

Table A1.2.5 The outputs of the volume fellings and removals forecast for this single sub-component, expressed as annualised volumes. Note: no gross:net reduction factor has been applied.

	Forecast Period	All Species	All Conifers	All Broadleaves	Scots Pine
	2012-2016	1.68	1.68	0	1.68
Volume	2017-2021	1.12	1.12	0	1.12
in range	2022-2026	0.78	0.78	0	0.78
7-14cm	2027-2031	0.56	0.56	0	0.56
top diam	2032-2036	0	0	0	0
	2037-2099	0.31	0.31	0	0.31
	2012-2016	1.01	1.01	0	1.01
Volume	2017-2021	0.78	0.78	0	0.78
in range	2022-2026	0.56	0.56	0	0.56
14-16cm	2027-2031	0.39	0.39	0	0.39
top diam	2032-2036	0	0	0	0
	2037-2099	0.19	0.19	0	0.19
	2012-2016	1.06	1.06	0	1.06
Volume	2017-2021	0.95	0.95	0	0.95
in range	2022-2026	0.78	0.78	0	0.78
16-18cm	2027-2031	0.62	0.62	0	0.62
top diam	2032-2036	0	0	0	0
	2037-2099	0.31	0.31	0	0.31
	2012-2016	1.85	1.85	0	1.85
Volume	2017-2021	2.74	2.74	0	2.74
in range	2022-2026	3.47	3.47	0	3.47
18cm +	2027-2031	4.03	4.03	0	4.03
top diam	2032-2036	0	0	0	0
	2037-2099	5.37	5.37	0	5.37
	2012-2016	5.6	5.6	0	5.6
	2017-2021	5.6	5.6	0	5.6
Totals	2022-2026	5.6	5.6	0	5.6
	2027-2031	5.6	5.6	0	5.6
	2032-2036	0	0	0	0
	2037-2099	6.17	6.17	0	6.17

Table A1.2.6 The outputs of the fellings and removals forecast for this single sub-component, expressed as volume felled per hectare in each forecast period. Note: no gross:net reduction factor has been applied.

Forecast year	Stand age (years)	Scheduled production event	Fellings and removals forecast† (m^3 ha^{-1}, from M1)
2015	54	Thinning	28.0
2020	59	Thinning	28.0
2025	64	Thinning	28.0
2030	69	Thinning	28.0
2035	74	Thinning	0.0
2039	78	Felling	388.7

†The total fellings and removals volumes are calculated by multiplying each annualised value (from Table A1.2.5) by the length of the forecast period to which it relates.

It should be immediately apparent that the thinning volumes and dates are identical to those presented in Example 1. This is because, in the absence of any information to the contrary, the thinning regime (age of first thinning, thinning type, thinning intensity and thinning cycle) is assumed to be identical to the first example. The final felling volume is, however, higher in the second example. This reflects the fact that M1 has 'grown' the stand from the growing stock estimate, taken in April 2011, which indicated that the stand contained more volume at that date than would have been suggested by the 'standard' model. All relevant values in the growth model were therefore adjusted in order to take account of the actual assessed stocking, giving a more accurate fellings and removals forecast than in Example 1.

Example 3 – Standard clearfell (moving to LISS management), no growing stock estimate available

In addition to the standard characteristics defined for the forest sub-component, Example 3 is based on the additional assumption that:

- an estimate of growing stock is not available (*i.e.* that no growing stock assessment has been made or an assessment has not been entered into the SCDB)
- the stand was previously thinned to management tables on a 5-year cycle, with LISS management (shelterwood) introduced in 2016 on a 10-year thinning cycle
- LISS final removal year is 2046.

The inputs defining the forecast type and duration applied to Example 3 are shown in Table A1.3.1. The inputs giving the physical description of the sub-component used in Example 3 are presented in Table A1.3.2. The inputs detailing the assumed historical and future management of the sub-component are presented in Table A1.3.3.

Table A1.3.1 The basic inputs defining the forecast.

XML tag expected by the Forecast System	Value read by Forecast System	Description
<FORECAST_TYPE>	**MANAGEMENT_PLANS**	A 'Management Plans' forecast type is being run.
<FIRST_YEAR_OF_PROJECTION>	**2012**	The first year of the forecast.
<LAST_YEAR_OF_PROJECTION>	**2100**	The final year of the forecast.

Table A1.3.2 The basic inputs specifying the physical description of the sub-component (given in the standard order within the <PHYSICAL_DESCRIPTION> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<SPECIES>	**SP**	Standard FC species code.
<WINDBLOWN>	**N**	Not windblown (N is the default setting).
<SUB_COMPONENT_AREA>	**10000**	The area of the sub-component in m^2. In this example the area of the sub-component is assumed to be 1 hectare.
<WHC>	**3**	Windthrow hazard class. (If blank, defaults are used.)
<LAND_USE_CODE>	**PHF**	Standard SCDB land-use code (PHF = productive high forest).
<GYC>	**8**	General Yield Class ($m^3ha^{-1}yr^{-1}$).
<SPACING>	**1.4**	Initial planting spacing, in metres (square planting assumed)
<PLANTING_YEAR>	**1961**	Planting year.
<STOREY>	**1**	The storey containing the sub-component.

Table A1.3.3 The basic inputs specifying the historical and future management of the sub-component (given in the standard order within the <MANAGEMENT> section of the XML file).

XML tag expected by the Forecast System	Value read by Forecast System	Description
<FINAL_REMOVAL_YEAR>	**2046**	The final removal year defined for this '<LISS_TYPE>' sub-component.
<PREVIOUSLY_THINNED>	**Y**	The sub-component has previously been thinned. A thinning-type yield model will therefore be applied in the period up to the start of the forecast (<FIRST_YEAR_OF_PROJECTION>).
<FROM_THIS_YEAR>	**2016**	The sub-component will be thinned from this date according to a bespoke thinning regime.

XML tag expected by the Forecast System	Value read by Forecast System	Description
<LISS>	**Y**	A LISS-type thinning will be applied.
<THINNING_CYCLE>	**10**	The LISS thinning cycle will be 10 years.
<EVEN_NUMBERS />		This null entry within the nested '<FUTURE_THINNING_TYPE>', '<FUTURE_NEUTRAL>' and '<M1_ATC_TYPE>' sections of the XML file indicates that equal numbers of trees will be removed at each thinning intervention.
<ATC_END_YEAR>	**2046**	The alternative to clearfelling (ATC) end year for this sub-component is 2045.

The forecast system starts modelling the sub-component from 1961 (the defined '<PLANTING_YEAR>'). An appropriate growth model is used to work out the development of the growing stock up to the time of first thinning. The actual 'base model' selected automatically within the forecast system is SP ('<SPECIES>'), general yield class 8 ('<GYC>'), 1.4 m initial spacing ('<SPACING>'), intermediate thin to MTI on a 5 year cycle ('<PREVIOUSLY_THINNED>') from age 29, which is the standard age of first thinning in the yield model. From this point, in 1990, thinnings take place at standard intensity every 5 years until 2012 (the final modelled thinning before the forecast will therefore take place at age 49 years, in 2010).

These periodic thinnings obviously result in removals from the growing stock. In this way, the forecast system estimates an initial growing stock for the forecast starting in 2012 ('<FIRST_YEAR_OF_PROJECTION>').

It is perhaps worth noting that if the example forest sub-component considered here had been a no-thin sub-component, then a no-thin model would initially be applied and no thinnings would be carried out in the period up to 2012.

From 2012 (the '<FIRST_YEAR_OF_PROJECTION>') onwards, the Forecast System instructs M1 to 'grow on' the sub-component by reference to the specified LISS management prescription (specified by '<FROM_THIS_YEAR>', '<LISS>', '<THINNING_CYCLE>', '<EVEN_NUMBERS />', '<ATC_END_YEAR>', and '<FINAL_REMOVAL_YEAR>').

From 2012 onwards, the above-ground timber volume production is reported at each scheduled thinning event and, within M1, the growing stock is reduced accordingly to

become the starting point for the next period of growth. The first LISS thinning event is scheduled to take place in 2016. Because M1 defaults to an assumption that there is a minimum of a 6 year no-thin period immediately in advance of any bespoke thinning date, the 2014 thinning, defined in the standard management tables for this species/Yield Class combination is ignored. The defined bespoke (shelterwood) thinning continues until the final thinning event (*i.e.* a sub-component age of 75 years, in 2036).

The forest sub-component is felled in 2046, the <ATC_END_YEAR>, at age 85.

The fellings and removals forecast outputs for this LISS (shelterwood-type) sub-component are given in Table A1.2.5 (average annual felling volumes during each forecast reporting period) and Table A1.3.5 (total felling volume for each forecast reporting period) Note: years with no fellings and removals forecast outputs are not included).

Table A1.3.4 The outputs of the volume fellings and removals forecast for this single sub-component, expressed as annualised volumes. Note: no gross:net reduction factor has been applied.

	Forecast Period	All Species	All Conifers	All Broadleaves	Scots Pine
	2012-2016	1.54	1.54	0	1.54
Volume	2017-2021	0	0	0	0
in range	2022-2026	1.18	1.18	0	1.18
7-14cm	2027-2031	0	0	0	0
top diam	2032-2036	1.08	1.08	0	1.08
	2037-2099	0.08	0.08	0	0.08
	2012-2016	0.9	0.9	0	0.9
Volume	2017-2021	0	0	0	0
in range	2022-2026	0.59	0.59	0	0.59
14-16cm	2027-2031	0	0	0	0
top diam	2032-2036	0.54	0.54	0	0.54
	2037-2099	0.05	0.05	0	0.05
	2012-2016	1.15	1.15	0	1.15
Volume	2017-2021	0	0	0	0
in range	2022-2026	0.98	0.98	0	0.98
16-18cm	2027-2031	0	0	0	0
top diam	2032-2036	1.08	1.08	0	1.08
	2037-2099	0.05	0.05	0	0.05
	2012-2016	9.22	9.22	0	9.22
Volume	2017-2021	0	0	0	0
in range	2022-2026	16.93	16.93	0	16.93
18cm +	2027-2031	0	0	0	0
top diam	2032-2036	24.28	24.28	0	24.28
	2037-2099	2.47	2.47	0	2.47
	2012-2016	12.81	12.81	0	12.81
	2017-2021	0	0	0	0
Totals	2022-2026	19.69	19.69	0	19.69
	2027-2031	0	0	0	0
	2032-2036	26.98	26.98	0	26.98
	2037-2099	2.66	2.66	0	2.66

Table A1.3.5 The outputs of the fellings and removals forecast for this single sub-component, expressed as total volume (to 7 cm top diameter) felled per hectare during each forecast period. Note: no gross:net reduction factor has been applied.

Forecast year	Stand age (years)	Scheduled production event	Fellings and removals forecast† (m^3 ha^{-1}, from M1)
2016	55	Shelterwood thinning	64.1
2026	65	Shelterwood thinning	98.4
2036	75	Shelterwood thinning	134.9
2046	85	Shelterwood thinning	167.4

†The total fellings and removals volumes are calculated by multiplying each annualised value (from Table A1.3.4) by the length of the forecast period to which it relates.

Appendix 2 – Land-uses in the Public Forest Estate where fellings and removals volume may be estimated (for current stands)

The details in this section are written assuming that all the data held in Forester are present and valid. The treatment of missing and invalid data is described in detail in a separate low-level specification table, which was produced to guide the development of the Forecast System software. More information about the applicability of Land-Use Codes can be found in Table 4.3-1 ('*Land Use Codes in the SCDB*') in the Survey Handbook (Forestry Commission, 2007).

Table A2.1: Land-Use Codes for which treatment in fellings and removals volume forecasts is the same for all Forecast Types.

Land Use Group	Fellings and Removals Volume	Notes
Agriculture (AGR)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as agricultural land should be excluded irrespective of whether a species has been allocated to the component.
Commercial Recreation (CRC, CRH)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as commercial recreation should be excluded from the forecast.
Estate Management (EMM, EMO, EMR)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as estate management should be excluded from the forecast.
Forest Management (FMC, FMD, FMN, FMQ, FMW)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as Christmas trees (FMC), deer glades (FMD), nursery (FMN), quarries (FMQ), and unplanted (FMW) should be excluded from the forecast. An area report for FMC is, however, produced by direct analysis of SCDB.

Land Use Group	Fellings and Removals Volume	Notes
Forest Recreation (FRC, FRE, FRO)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as forest recreation should be excluded from the forecast.
Plantable Land (LHP)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Forecasts for stocking of unstocked forest areas will be handled as a separate, supplementary calculation as part of the 2011 forecast exercise.
Miscellaneous (MAS, MOW)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as miscellaneous should be excluded from the forecast including archaeological sites which take priority over woodland.
Non-plantation (NAR)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as non-plantation 'arboreta' (NAR) should be excluded from the forecast. An area report is, however, produced by direct analysis of SCDB.
Open (OPN)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Open land (OPN) cannot have an associated species code in the SCDB; however it may have up to 20% tree cover in practice.
Plantation (PBU, PFA, PFE)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Forecasts for stocking of burnt (PBU), failed (PFA) and felled (PFE) unstocked forest areas will be handled as a separate, supplementary calculation as part of the 2011 forecast exercise.
Plantation (PWC)	Not passed to the forecast system. No fellings and removals volume is estimated for current components.	Sub-components designated as plantation worked coppice (PWC) should be excluded from the forecast. An area report is, however, produced by direct analysis of SCDB.
Unplantable (UNP)	Not passed to the forecast system. No fellings and removals volume is not estimated for current components.	Unplantable land (UNP) cannot have an associated species code in the SCDB; however it may have up to 20% tree cover in practice.

Table A2.2: Zero Intervention Forecast Type: fellings and removals volume forecasts for the Land-Use Codes not included in Table A2.1.

Land Use Group	Fellings and Removals Volume	Notes
Forest Management (FMR, FMS)	No fellings and removals volume is estimated for current components.	Sub-components designated as non-plantation research (FMR) and seed orchard (FMS) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Non-plantation (NAO)	No fellings and removals volume is estimated for current components.	Applicable to New Forest only. Sub-components designated as non-plantation 'ancient and ornamental' (NAO) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PHF, PRP, PSS)	No fellings and removals volume is estimated for current components.	All sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PIB)	No fellings and removals volume is estimated for current components.	Sub-components designated as intruded broadleaves (PIB) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PWB)	No fellings and removals volume is estimated for current components.	Sub-components designated as windblow (PWB) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).

Table A2.3: Biological Potential Forecast (All Sub-Types): fellings and removals volume forecasts for the Land-Use Codes not included in Table A2.1.

Land Use Group	Fellings and Removals Volume	Notes
Forest Management (FMR, FMS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as non-plantation research (FMR) and seed orchard (FMS), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Non-plantation (NAO:)	A fellings and removals volume is estimated for current components.	Applicable to New Forest only. All forecast outputs are produced for all sub-components designated as non-plantation 'ancient and ornamental' (NAO), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PHF, PRP, PSS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PIB, PWB)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as intruded broadleaves (PIB) and windblow (PWB), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".

Table A2.4: Strategic Regional Forecast Type: fellings and removals volume forecasts for the Land-Use Codes not included in Table A2.1.

Land Use Group	Fellings and Removals Volume	Notes
Forest Management (FMR, FMS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as non-plantation research (FMR) and seed orchard (FMS), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Non-plantation (NAO:)	A fellings and removals volume is estimated for current components.	Applicable to New Forest only. All forecast outputs are produced for all sub-components designated as non-plantation 'ancient and ornamental' (NAO), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PHF, PRP, PSS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PIB, PWB)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as intruded broadleaves (PIB) and windblow (PWB), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".

Table A2.5: Management Plans Forecast Type: fellings and removals volume forecasts for the Land-Use Codes not included in Table A2.1.

Land Use Group	Fellings and Removals Volume	Notes
Forest Management (FMR, FMS)	No fellings and removals volume is estimated for current components.	Sub-components designated as non-plantation research (FMR) and seed orchard (FMS) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Non-plantation (NAO)	Fellings and removals volume is estimated for current components.	Applicable to New Forest only. Sub-components designated as non-plantation 'ancient and ornamental' (NAO) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PHF, PRP, PSS)	Fellings and removals volume is estimated for current components.	All sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP) are passed to the forecast system. However, only those sub-components for which the FORECAST_FLAG is set to "F" are included in forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PIB)	No fellings and removals volume is estimated for current components.	Sub-components designated as intruded broadleaves (PIB) are passed to the forecast system but are excluded from forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts).
Plantation (PWB)	Fellings and removals volume is estimated for current components.	Sub-components designated as windblow (PWB) are passed to the forecast system and are included in forecasts of production (*i.e.* felling and removals, biomass production and straightness forecasts) irrespective of whether the FORECAST_FLAG is set to "F" or "N" (*i.e.* the presumption is that windblow will always be 'harvested').

Table A2.6: Quick Forecast Type: fellings and removals volume forecasts for the Land-Use Codes not included in Table A2.1.

Land Use Group	Fellings and Removals Volume	Notes
Forest Management (FMR, FMS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as non-plantation research (FMR) and seed orchard (FMS), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Non-plantation (NAO:)	A fellings and removals volume is estimated for current components.	Applicable to New Forest only. All forecast outputs are produced for all sub-components designated as non-plantation 'ancient and ornamental' (NAO), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PHF, PRP, PSS)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".
Plantation (PIB, PWB)	A fellings and removals volume is estimated for current components.	All forecast outputs are produced for all sub-components designated as intruded broadleaves (PIB) and windblow (PWB), *i.e.* all sub-components are forced to have a FORECAST_FLAG of "F".

Appendix 3 – NFI Forester component types where fellings and removals volume may be estimated (for current stands)

The details in this section are written assuming that all the data held in the NFI Forester are present and valid. The treatment of missing and invalid data is described in detail in a separate low-level specification table, which was produced to guide the development of the Forecast System software.

Table A3.1: Zero Intervention Forecast Type: fellings and removals volume forecasts for NFI Forester component types.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand	No fellings and removals volume is estimated for current components.	Outputs are not produced for volume and biomass production, nor for straightness. Outputs are produced for standing volume, biomass and carbon and also volume increment.
Young	No fellings and removals volume is estimated for current components.	Outputs are not produced for volume and biomass production, nor for straightness. Outputs are produced for standing volume, biomass and carbon and also volume increment.
Thicket	No fellings and removals volume is estimated for current components.	Outputs are not produced for volume and biomass production, nor for straightness. Outputs are produced for standing volume, biomass and carbon and also volume increment.

NFI Land Use Group	Fellings and Removals Volume	Notes
Windblow	The component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. No fellings and removals volume is estimated for current components.	The component is assumed to become windblow in the ASSESSMENT_YEAR. Under the zero intervention forecast type, no volume is produced and no restocking takes place. Consequently reporting for Windblow consists of a separate report of the volume associated with the Windblow component(s) just for the ASSESSMENT_YEAR. The volume is neither harvested nor 'grown on' and no restocking is allowed for. The volume associated with Windblow sub-components in the ASSESSMENT_YEAR is obtained from the calculations carried out for the strategic regional forecast type up to the ASSESSMENT_YEAR, therefore no further calculations are required for Windblow as part of a zero intervention forecast.
Stand (STATUS = DEAD) Young (STATUS = DEAD) Thicket (STATUS = DEAD) Windblow (STATUS = DEAD)	The component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. No fellings and removals volume is estimated for current components.	The component is assumed to become DEAD in the ASSESSMENT_YEAR. Under the zero intervention forecast type, no volume is produced and no restocking takes place. Consequently reporting for DEAD Stand components consists of a separate report of the volume associated with the DEAD Stand component(s) just for the ASSESSMENT_YEAR. The volume is neither harvested nor 'grown on' and no restocking is allowed for. The volume associated with DEAD Stand components in the ASSESSMENT_YEAR is obtained from the calculations carried out for the strategic regional forecast type up to the ASSESSMENT_YEAR, therefore no further calculations are required for DEAD components as part of a zero intervention forecast.

Table A3.2: Biological Potential Forecast (All Sub-Types): fellings and removals volume forecasts for NFI Forester component types.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Young	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Thicket	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Windblow	Effectively restock components only (*i.e.* following clearance of windblow). Assume NFI_BASIC_TYPE changes to "Stand" and NFI_LAND_USE_CODE changes to PHF on restock. Restock components will follow strict no thinning and felling at time of maximum MAI (for no thin regime).	The sub-component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. (In many cases this means calculating the growing stock in the ASSESSMENT_YEAR, without 'growing on'.) However, the sub-component is assumed to become windblow in the ASSESSMENT_YEAR. Volume production is based on the quantity that would be clearfelled in the ASSESSMENT_YEAR, subject to a discount factor. However, under a strategic regional forecast, this volume is assumed to be removed in conjunction with a scheduled harvesting event as specified in the strategic regional prescription. The treatment is different under a biological potential forecast, with harvesting assumed to occur in year NOW. This means that all forecast calculations for Windblow components up to the ASSESSMENT_YEAR are covered under strategic regional prescriptions and the only relevant calculations from the year NOW concern restock.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand (STATUS = DEAD) Young (STATUS = DEAD) Thicket (STATUS = DEAD) Windblow (STATUS = DEAD)	Effectively restock components only (*i.e.* following clearance of dead trees). Assume NFI_BASIC_TYPE changes to "Stand" and NFI_LAND_USE_CODE changes to PHF on restock. Restock components will follow strict no thinning and felling at time of maximum MAI (for no thin regime).	The component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. (In many cases this means calculating the growing stock in the ASSESSMENT_YEAR, without 'growing on'.) However, the component is assumed to become DEAD in the ASSESSMENT_YEAR. Volume production is based on the quantity that would be clearfelled in the ASSESSMENT_YEAR, subject to the same discount factor as used for live Windblow (NFI_WINDBLOW_ADJUSTMENT). However, under a strategic regional forecast, this volume is assumed to be removed in conjunction with a scheduled harvesting event as specified in the strategic regional prescription. The treatment is different under a biological potential forecast, with harvesting assumed to occur at NOW. This means that all forecast calculations for DEAD components up to the ASSESSMENT_YEAR are covered under strategic regional prescriptions and the only relevant calculations from NOW concern restock.

Table A3.3: Strategic Regional Forecast Type **and** Management Plans Forecast Type: fellings and removals volume forecasts for NFI Forester component types.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Young	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Thicket	All forecast outputs are produced.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Windblow	All forecast outputs are produced. All sub-components are included in volume production, biomass production and straightness forecast outputs for windblow, i.e. the presumption is that windblow will be 'harvested'.	The sub-component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. (In many cases this means calculating the growing stock in the ASSESSMENT_YEAR, without 'growing on'.) However, the sub-component is assumed to become windblow in the ASSESSMENT_YEAR. Volume production is based on the quantity that would be clearfelled in the ASSESSMENT_YEAR, subject to a discount factor. However, this volume is assumed to be removed in conjunction with a scheduled harvesting event as specified in the Startegic regional management plan. 1. If an associated fell year or final removal year is no more than five years later than the ASSESSMENT_YEAR, allocate the (discounted) volume to this year. 2. If an associated fell year or final removal year is more than five years later than the ASSESSMENT_YEAR, allocate the (discounted) volume to the year of next thinning, assuming this is no more than five years later than the ASSESSMENT_YEAR. 3. If no operation is planned within five years of the ASSESSMENT_YEAR, the (discounted) volume is presented in a separate table and not included in the main volume forecast reports. This table should list the component / coupe combinations and the estimate of the (discounted) volume.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand (STATUS = DEAD) Young (STATUS = DEAD) Thicket (STATUS = DEAD) Windblow (STATUS = DEAD)	All forecast outputs are produced. All sub-components are included in volume production, biomass production and straightness forecast outputs for windblow, i.e. the presumption is that the DEAD trees will be 'harvested'.	The component is 'grown' up to the ASSESSMENT_YEAR according to the strategic regional forecast type. (In many cases this means calculating the growing stock in the ASSESSMENT_YEAR, without 'growing on'.) However, the sub-component is assumed to become DEAD in the ASSESSMENT_YEAR. Volume production is based on the quantity that would be clearfelled in the ASSESSMENT_YEAR, subject to the same discount factor as used for Windblow (NFI_WINDBLOW_ADJUSTMENT) . However, this volume is assumed to be removed in conjunction with a scheduled harvesting event as specified in the Strategic regional management plan. 1. If an associated fell year or final removal year is no more than five years later than the ASSESSMENT_YEAR, allocate the (discounted) volume to this year. 2. If an associated fell year or final removal year is more than five years later than the ASSESSMENT_YEAR, allocate the (discounted) volume to the year of next thinning, assuming this is no more than five years later than the ASSESSMENT_YEAR. 3. If no operation is planned within five years of the ASSESSMENT_YEAR, the (discounted) volume is presented in a separate table and not included in the main volume forecast reports. This table should list the component / coupe combinations and the estimate of the (discounted) volume.

Table A3.4: Quick Forecast Type: fellings and removals volume forecasts for NFI Forester component types.

NFI Land Use Group	Fellings and Removals Volume	Notes
Stand, Young, Thicket, and Windblow (Irrespective of STATUS)	The Quick Forecast Type is not relevant to NFI forecasts.	This Forecast Type is only relevant to the Public Forest Estate.

Appendix 4

The table on the following pages details situations in which sub-components may be assigned a fell year which is inconsistent with either base data or the forecast period. There are four options which can be adopted for handling inconsistent fell years in the forecast system:

- Option 1: Allocate zero volume to affected sub-components. Produce a separate report listing the sub-components and the area affected. The report should also list the possible reason(s) for an overdue fell year, as appropriate for the context.
- Option 2: Calculate volume for the specified fell year and include in a separate report along with areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.
- Option 3: Change the fell year to the first reporting year and include in a separate report along with areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.
- Option 4: Change the fell year to the first reporting year and allocate the volume to the start of the forecast (either the first year or first five years). The forecast error report should clearly flag volume/areas/components affected. The report should also list the possible reason(s) for overdue fell year, as appropriate for the context.

The choice of option implemented may depend on the circumstances causing the fell year to be inconsistent. These are detailed below.

Forecast Type	FC/ PS	Description	Forecast Methodology
Management plans forecast	FC	A design plan fell year, or LISS final removal year, is before the first reporting year for the forecast component. This has occurred because the fell year has been entered erroneously.	There is no way to differentiate between the different circumstances leading to this outcome. Option 2 recommended. If the sub-component is windblown then treat in the same way, *i.e.* Option 2 recommended.
Management plans forecast	FC	A design plan fell year, or LISS final removal year, is before the first reporting year for the forecast component. The component has actually been felled but the stand description and associated design plan fell year have not been updated. This can occur sometimes because a decision is taken to not update design plan details until periodic formal review.	
Management plans forecast	FC	A design plan fell year, or LISS final removal year, is before the first reporting year for the forecast component. The component has actually been felled and restocked. The stand description has been updated but the associated design plan fell year has not been updated. This can occur sometimes because a decision is taken to not update design plan details until periodic formal review.	
Management plans forecast	FC	A design plan fell year, or LISS final removal year, is before the first reporting year for the forecast component. This may occur when a design plan coupe is actually partially felled but the felling has not been completed. It is recommended to split the coupe to reflect the different fell years, but this may not always be done.	
Management plans forecast	FC	A design plan fell year, or LISS final removal year, is before the first reporting year for the forecast component. This may occur when production is switched from one coupe to another coupe for operational reasons, but the felling years are not updated. In some cases, this may result in coupes having a fell year earlier than the current year. See note 1 for an example.	

Forecast Type	FC/ PS	Description	Forecast Methodology
Management plans forecast	FC/ PS	A fell year, or LISS final removal year, has been assigned correctly to a sub-component but the fell year implies a “young” fell age, typically less than 10 years and often somewhat older. The forecast system cannot calculate production volumes for “young” stands because the M1 model can only make projections of volume from a specified minimum age. (This is because M1 refers to growth and yield relationships in the Booklet 48 yield tables, which do not represent early years.) The minimum age from which M1 can calculate volume depends on species, yield class and initial spacing (i.e. the yield table that needs to be referred to). Note that this situation can sometimes occur even when the fell year is later than the start of the forecast period, e.g. • Planting year is 2005. • Fell year is 2017. • Implied fell age is 12 years. • Start of forecast period is 2011. • Age from which M1 can start projection (in this example) is 20 years. • Year from which forecast system can start reporting volumes is 2005 + 20 years, i.e. 2025.	Option 1 recommended If the sub-component is windblown then treat in the same way, *i.e.* Option 1 recommended.

Forecast Type	FC/ PS	Description	Forecast Methodology
Management plans forecast	PS	A Management plans forecast for the PS would require surveyors to obtain the intended management prescription for each section/component in each surveyed NFI inventory square. Suppose an NFI square was surveyed in 2010 and found to contain one component with age 50 years and an intended fell year of 2012. Suppose the data from this square were to be used as part of the inputs for running a PS Management plans forecast in 2013. The forecast system would register that this component was surveyed in 2010 and scheduled for felling in 2012. However, there is no way to confirm whether or not the stand was felled at the time that was originally assigned. (Note that currently there are no plans to develop PS Management plans forecasts based directly on the intended management of specific NFI squares and relevant data on management prescriptions are not being collected.)	Option 2 recommended. If the sub-component is windblown then treat in the same way, *i.e.* Option 2 recommended.
Strategic regional forecast (including 2005 PS forecast assumptions)	PS	The fell age assigned to a component implies a fell year that is before the first reporting year. This can occur because there is no way of ensuring that the assigned fell age is always consistent with the current age of all components.	Option 2 recommended. If the sub-component is windblown then treat in the same way, *i.e.* Option 2 recommended.

Forecast Type	FC/ PS	Description	Forecast Methodology
Strategic regional forecast (including 2005 PS forecast assumptions)	PS	**Special case.** As above but, in addition, the sub-component data includes a growing stock assessment with an assessment year that is later than the fell year implied by the assigned fell age. *Therefore it is known that the sub-component has not been felled at the assigned fell age/year*. Note that the sub-component might still have been felled before the start of the forecast period, but there is no way of knowing this.	Work out the number of years between the assessment year and the start of the forecast period. If this is less than 5 years, then Option 4 recommended; otherwise Option 3 recommended. If sub-component is classified as windblown then Option 3 is always recommended.
Zero intervention	FC/ PS	No fell year will be assigned so an inconsistent fell year cannot occur.	Cannot occur.
Quick forecast	FC	The fell year for the quick forecast is error-checked by the forecast wizard and therefore an inconsistent fell year cannot occur.	Cannot occur.
Biological potential forecast	FC/ PS	The fell age (or LISS final removal age) assigned to a component implies a fell year that is before the first reporting year. This can occur because there is no way of ensuring that the assigned fell age is always consistent with the current age of all components. (Note: This is a Biological potential forecast, the optimum fell age has been missed, so should fell immediately.)	Option 2 recommended. If the sub-component is windblown then treat in the same way, *i.e.* Option 2 recommended.

Forecast Type	FC/ PS	Description	Forecast Methodology
Biological potential forecast	FC/ PS	**Special case.** As above but, in addition, the sub-component data includes a growing stock assessment with an assessment year that is later than the fell year implied by the assigned fell age. *Therefore it is known that the sub-component has not been felled at the assigned fell age/year*. Note that the sub-component might still have been felled before the start of the forecast period, but there is no way of knowing this. (Note: This is a Biological potential forecast, the optimum fell age has been missed, so should fell immediately.)	Work out the number of years between the assessment year and the start of the forecast period. If this is less than 5 years, then Option 4 recommended; otherwise Option 3 recommended. If sub-component is classified as windblown then Option 3 is always recommended.
Target assortment forecast	FC/ PS	The fell age (or LISS final removal age) assigned to a component implies a fell year that is before the first reporting year. This can occur because there is no way of ensuring that the assigned fell age is always consistent with the current age of all components. (Note that the Target assortment forecast type is not being implemented as part of Forecast 2011.) (Note that the aim is to achieve a target assortment, the target fell age has been missed, so should fell immediately.)	Option 2 recommended. If the sub-component is windblown then treat in the same way, i.e. Option 2 recommended.

Forecast Type	FC/ PS	Description	Forecast Methodology
Target assortment forecast	FC/ PS	**Special case.** As above but, in addition, the sub-component data includes a growing stock assessment with an assessment year that is later than the fell year implied by the assigned fell age. *Therefore it is known that the sub-component has not been felled at the assigned fell age/year*. Note that the sub-component might still have been felled before the start of the forecast period, but there is no way of knowing this. (Note that the aim is to achieve a target assortment, the target fell age has been missed, so should fell immediately.)	Work out the number of years between the assessment year and the start of the forecast period. If this is less than 5 years, then Option 4 recommended; otherwise Option 3 recommended. If sub-component is classified as windblown then Option 3 is always recommended.

Note 1 to Table

An important special case involves incidents of major windblow when coupe switching can cover very large areas and it can take time for fell years to be updated. As an example, consider two coupes within a forest district. Coupe 1 has a fell year of 2012 assigned, while coupe 2 has a fell year of 2025 assigned. Suppose that coupe 2 is windblown in 2011. Consequently, it is decided to harvest coupe 2 in 2012 as a substitute for coupe 1, whilst coupe 1 is re-scheduled for felling in 2025 (*i.e.* the two coupes have been 'switched' in terms of the felling schedule). Although these decisions have been taken and implemented, it takes time to update the database with revised fell years – suppose this still has not been done by 2013. If a forecast is run in 2013 and the data not updated, the forecast will apply a fell year of 2025 to coupe 2, even though it was in fact harvested in 2012 – this error will not be reported because there is now way the forecast system can register the problem. The forecast will also still apply a fell year of 2012 to coupe 1 – but the current year is now 2013 and the forecast system will register that the fell year is before the start of the forecast period. (OGB 32 includes a mandatory requirement for districts to update sub-component records within a short period after harvesting, e.g. by assigning a land use code of PFE or, if restocking has occurred, PHF with an updated fell year.) It should be stressed that this is just one significant example of problems that can arise if base data (including fell years) are not maintained or updated in a timely fashion.