



Restocking in the Forecast

A document describing how restocking of felled areas is handled in the 2011 Production Forecast.

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Background

During the period of a production forecast it is assumed that, as forest sub-components are harvested (whether clearfelled or removed in a LISS), the majority of these sub-components will subsequently be re-stocked with trees. In long-term forecasts, some of these sub-components may start to contribute to future growing stock volume, *etc.*, as the average tree size reaches the minimum measurable threshold (*i.e.* 7 cm dbh).

This document specifies how re-stocking will be applied by the forecast system taking account of the assumed management being applied to each sub-component and also the Forecast Type being run.

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](#)'. Restocking will be handled differently for each of these six forecast types. The proposals for each forecast type are laid out in the section '[Restocking and Forecast Types](#)' later in this document.

Types of Restocking

The Forecast Wizard allows for three types of restocking:

- Restocking the stands with a “like-for-like” description;
- Restocking according to a strategic regional prescription; or
- Restocking specified from the restock information in the Forest Design Plans.

Although only the “like-for-like” option is in scope for PF2011, this document will detail how the forecast system will ultimately handle each of these options.

Like-for-like restocking

This is arguably the simplest case and is the only option that will be implemented in PF2011. In like-for-like restocking, it is assumed that the existing sub-component will be replaced with the original species at the same spacing and yield class, and managed in generally the same way as in the past (*i.e.* under a no-thin regime, under a standard management table thinning regime, or as a LISS sub-component). The sub-component is assumed to be restocked at a clearly defined date, before or after the final removal year depending on the existing management type (*e.g.* a default of 2 years for a subcomponent managed under a clearfell and restock scenario).

Examples of like-for-like restocking are presented in Appendix 1.

'Strategic Regional' restocking

The facility for strategic regional restocking will only be implemented in the Forecast System after PF2011 has been published.

Under the strategic regional restocking option, the species and yield class assigned to the restocked component will be based on assumptions made about the species and yield class distributions and an average fallow period within the geographic region for which the forecast is being carried-out. In this way, restocking will be assumed to be carried out in order to reflect the proportions of species specified under the strategic regional assumptions. In order to achieve the specified proportions of species, it may be necessary for the Forecast System to sub-divide existing sub-components prior to the implementation of restocking.

The mechanisms for the specification of strategic regional assumptions, and any required sub-division of existing sub-components, can be found in the document ['Forecast Types'](#).

'Management Plans' restocking

The facility for management plans restocking will only be implemented in the Forecast System after PF2011 has been published.

Under the management plans restocking option, the species and yield class assigned to the restocked component, together with the intended planting year, as defined within Forester.

In the case of management systems which rely on restocking through natural regeneration, the 'planting year' may be the year in which the sub-component is assumed to have 'fully regenerated'.

Restocking and Forecast Types

Any of the six Forecast Types outlined in the document '[Forecast Types](#)' may be applied to the Public Forest Estate. However for NFI forecasts it is important to note that, due to the absence of reliable information regarding management intent, a Management Plans Forecast can only ever be realistically implemented as a Strategic Regional Forecast Type. Furthermore, the Quick Forecast Type is not relevant to NFI.

The restocking of Forecast sub-components will be required in all Forecast Types with the exception of Zero Intervention forecasts (which, by their nature, are assumed to be subject to no human intervention and within which the timing of regeneration cannot be reliably estimated). All other Forecast types can be restocked using any one of the types of restocking detailed on page 2 and as illustrated in Table 1.

Table 1: The permissible combinations of restocking type by Forecast Type.

Forecast Type	Allowable types of restocking		
	Like-for-like	Strategic Regional	Management Plans
Zero Intervention Forecast	Not permissible	Not permissible	Not permissible
Biological Potential Forecast	Allowable	Allowable	Allowable
Strategic Regional Forecast	Allowable	Allowable	Allowable
Management Plans Forecast	Allowable	Allowable	Allowable
Target Assortments Forecast	Allowable	Allowable	Allowable
Quick Forecast	Not appropriate	Not appropriate	Not appropriate

Restock calculations

Detailed examples of how restocking is handled by the Forecast System are presented in Appendix 1.

Restocking is only appropriate for certain land-use types within each Forecast Type. Permissible combinations are detailed in Appendix 2. Sub-components which are restocked within the period of the forecast will be assumed to achieve full stocking by a specified date and will be 'grown-on' as specified in Table 2.

Forecasts for the stocking of currently unstocked forest areas (LHP, PBU, PFA, and PFE) will be handled as a separate, supplementary calculation as part of the 2011 forecast exercise.

Table 2: How restocking is specified for each Restocking Type.

Restocking Type	Date of restocking	Restock species	Initial spacing	Yield class	Management regime	Rotation length
Like-for-like	Two years following the previous clearance of the sub-component.	Same species as previously defined for the sub-component (<i>i.e.</i> replacing with like-for-like).	The default model spacing for the restock species, yield class and management regime.	Same yield class as previously defined for the sub-component (<i>i.e.</i> replacing with like-for-like).	Broadly the same as previously defined for the sub-component <i>i.e.</i> 'thin', 'no-thin' or 'LISS'.	Same rotation as previously defined for the sub-component (<i>i.e.</i> replacing with like-for-like).
Strategic Regional	Two years following the previous clearance of the sub-component.	Each sub-component will be restocked to reflect the proportion of area defined for each species within the strategic regional scenario being modelled. This may require the sub-division of each sub-component ¹ .	As defined for the species within the rule set for the strategic regional scenario being modelled. This may require the sub-division of each sub-component ¹ .	As defined for the species within the rule set for the strategic regional scenario being modelled. This may require the sub-division of each sub-component ¹ .	'Thin', 'no-thin' or 'LISS', as defined for the species within the rule set for the strategic regional scenario being modelled. This may require the sub-division of each sub-component ¹ .	As defined for the species within the rule set for the strategic regional scenario being modelled. This may require the sub-division of each sub-component ¹ .

¹ The sub-division of sub-components is specified in ['Forecast Types'](#).

Restocking Type	Date of restocking	Restock species	Initial spacing	Yield class	Management regime	Rotation length
Management Plans	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.	Defined through Forester as specified for the sub-component in the forest management/ forest design plan.

Reporting of restock

Areas which have been restocked during the period of the forecast will contribute to the relevant forecast outputs when the modelled growing stock in the restocked sub-component has achieved the specified minimum reportable mean tree dimensions. For specific details of reported forecast outputs, the reader is referred the related documents '[Felling and Removals Forecasts](#)', '[Straightness Forecasts](#)', '[Biomass Removals Forecasts](#)', '[Growing Stock Volume Forecasts](#)', '[Volume Increment Forecasts](#)', '[Growing Stock Biomass Forecasts](#)', and '[Growing Stock Carbon Forecasts](#)'.

Restocking the Restock

There may be situations where the rotation specified for a stand is so short relative to the forecast period that a sub-component may be restocked more than once. Where this occurs, the affected sub-components will be restocked for a second time in the same way as on the first occasion.

Initial priorities and future developments

The priority for PF2011 is to implement 'like-for-like' restocking for all forecast outputs in all included Forecast Types. 'Strategic regional' and 'Management plans' restocking will be implemented as soon as resources allow following the conclusion of the PF2011 reporting period.

Appendix 1 – Worked Examples

Example 1 – Non-forecastable sub-component, no restock undertaken

If a sub-component is non-forecastable (see Table A2.1) it will never be 'felled' by the forecast system and so will never be subject to restocking.

Example 2 – Simple clearfell PHF sub-component

These sub-components are restocked after a two year fallow period. The restocked sub-component shares the same characteristics as the previously felled sub-component. However, rather than replicating the specific thinning prescription/description recorded for the previous sub-component, *e.g.* specific thinning cycle and thinning intensity, if there is any record of thinning, *e.g.* PREVIOUSLY-THINNED = Y or THIN_IN_FUTURE = Y then the restocked sub-component is thinned on an appropriate 'standard' (Management Table) pattern. If there is no evidence of thinning in the xml record for the previous sub-component then the restock sub-component will be managed as no thin.

Consider a sub-component which has the following attributes (These attributes will be used in all examples):

- Species = Douglas fir
- Planting year = 1960
- Yield class = 14
- Area = 1 ha.

This is managed in the following way:

- Management type = clearfell (with MT thinning)
- Fell year = 2018 (implied rotation = 58 years).

Suppose the forecast period starts in 2011 and finishes in 2045. The sub-component(s) would be reported by the Forecast System as illustrated in Table A1.1.

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Table A1.1 Reporting restock for the example sub-component assuming clearfell.

Reporting year	What is calculated and reported
2011-2018	The 'current' sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported. The sub-component has not yet been felled so there is no restock.
2018	The initial sub-component is forecast to be felled as specified. The clearfell volume is reported. There is a two year fallow period so the sub-component is not yet restocked.
2019	The two year fallow period means the sub-component is not yet restocked.
2020	The sub-component is restocked. The age of the stand is calculated as $2020 - 2020 = 0$ years. The sub-component is given a management type of 'clearfell' and is assumed to be subject to standard MT thinning. The rotation is specified as 58 years.
2021-2040	The restock sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported.
2041	The age of the restock sub-component is calculated as $2041 - 2020 = 21$ years. The restock sub-component is being managed on a 'standard' management table model which specifies the first thinning at 21 years. Therefore the timber volume produced and change in standing volume is calculated/reported.
2042-2045	The restock sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported.

Note: There may be exceptional circumstances where the prescription for the sub-component (*e.g.* a very high FUTURE_INTERMEDIATE_FRACTION_MTI or a very 'late' CLEARFELL_FELL_YEAR) cause a sub-component assigned a clearfell management type to have been thinned to extinction prior to the year of clearfell in a forecast. In this situation the assumption is made that the sub-component still has a management type of clearfell and, although there may be no trees left in the period between extinction and CLEARFELL_FELL_YEAR, the general clearfell restock rule applies and the sub-component is restocked at the CLEARFELL_FELL_YEAR + 2 years (fallow period).

There may also be situations where the rotation specified for a stand is so short relative to the forecast period that a sub-component may be restocked more than once.

Example 3 – Clearfell with seed trees

These sub-components are restocked in the "REMOVAL_YEAR_OF_SEEDS". There is no fallow period prior to restock. The restocked sub-component shares the same characteristics as the previously felled sub-component. However, as with clearfell sub-components, rather than replicating the specific thinning prescription recorded for the previous sub-component, *e.g.* specific thinning cycle and thinning intensity, if there is any record of thinning, *e.g.* PREVIOUSLY_THINNED = Y or THIN_IN_FUTURE = Y then the restocked sub-component is thinned on an appropriate 'standard' (Management Table) pattern. If there is no evidence of thinning in the xml record for the previous sub-component then the restock sub-component will be managed as no thin. For simplicity, and to avoid "over-modelling" of restock, the restock sub-component is *not* assumed to be managed as a clearfell with seed trees. Instead, a management type of simple clearfell is assumed.

The sub-component has the same stand attributes as for the Clearfell example. The sub-component is managed in the following way:

- Management type = clearfell with seed trees (with MT thinning)
- SEEDS_FELL_YEAR, *i.e.* the planned year that the majority of the trees are removed, leaving only seed trees, to allow regeneration = 2020 (main crop rotation = 60 years)
- NUMBER_OF_TREES_REMAINING, *i.e.* the number of seed trees left after the SEEDS_FELL_YEAR = 100.
- REMOVAL_YEAR_OF_SEEDS, *i.e.* the year in which the remaining seed trees are removed = 2040 (seed-tree rotation = 80 years).

Suppose the forecast period starts in 2011 and finishes in 2065. The sub-component(s) would be reported by the Forecast System as illustrated in Table A1.2.

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Table A1.2 Reporting restock for the example sub-component assuming clearfell with seed trees.

Reporting year	What is calculated and reported
2011-2019	The 'current' sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported.
2020	The majority of the sub-component is felled leaving the NUMBER_OF_TREES_REMAINING The area is <i>not</i> restocked in this year.
2021-2039	The 'initial' sub-component (composed of 100 seed trees) continues to "grow" during this period and is reported as standing volume (and increment?)
2040	The remaining (seed) trees composing the 'initial' sub-component are removed and reported as clearfell volume. The area <i>is</i> restocked in this year. The age of the stand is calculated as $2040 - 2040 = 0$ years. The sub-component is given a management type of 'clearfell' and is assumed to be subject to standard MT thinning. The rotation is specified as equal to the main crop rotation for the 'initial' sub-component, <i>i.e.</i> 60 years. The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.
2061	The age of the restock sub-component is calculated as $2061 - 2040 = 21$ years. The restock sub-component is being managed on a 'standard' management table model which specifies the first thinning at 21 years. Therefore the timber volume produced and change in standing volume is calculated/reported.
2062-2065	The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.

Note: There may be exceptional circumstances where the prescription for the sub-component (*e.g.* a very high FUTURE_INTERMEDIATE_FRACTION_MTI or a very 'late'

SEEDS_FELL_YEAR) cause a sub-component assigned a clearfell with seed trees management type to have been thinned to extinction prior to the year in which seed trees are removed in a forecast. In this situation the assumption is made that the sub-component still has a management type of clearfell with seed trees and, although there may be no trees left in the period between extinction and REMOVAL_YEAR_OF_SEEDS, the 'clearfell with seed trees' restock rule specified above applies and the sub-component is restocked in the specified REMOVAL_YEAR_OF_SEEDS.

There may also be situations where the rotation specified for a stand is so short relative to the forecast period that a sub-component may be restocked more than once.

Example 4 – LISS (repeated thinning)

Sub-components with this management type are restocked in the same year as the *third thinning before complete removal* of the previous/initial sub-component. There is therefore no fallow period as the restock sub-component is growing alongside the 'current' sub-component. The assumptions made for the characteristics of the restock sub-component depend on exactly which LISS management type has been applied (see also Examples 5 and 6)

This example involves LISS_TYPE sub-components which have been specified with 'conventional' periodic thinning (*e.g.* intermediate or neutral type with an associated intensity and cycle), and which may or may not have a specified value for FINAL_REMOVAL_YEAR. If the sub-component gets 'thinned to extinction' within the forecast period, or less than 3 thinning events past the forecast period, then restocking will occur. Restocking will occur in the year of the third thinning before final removal of the current/previous sub-component (*i.e.* the overstorey). The restock sub-component shares the same characteristics as the current/initial sub-component. For the sake of simplicity, and to avoid 'over-modelling' of restock, the restock sub-component is managed on a simple basis of thinning to extinction or specified final removal, as appropriate, *i.e.* the restock sub-component is assigned to a LISS_TYPE management type and the FINAL_REMOVAL_YEAR is given the value specified (or otherwise) for the initial sub-component. Intermediate thinning is assumed to take place at standard intensity, starting at the MT age.

The sub-component has the same stand attributes as for the Clearfell example. The sub-component is managed in the following way:

- Management type = LISS_TYPE
- Thinning records are of the 'conventional' types (*e.g.* intermediate, crown, neutral) with an associated intensity
- FINAL_REMOVAL_YEAR = 2050

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- THINNING_CYCLE = 5 years.

Suppose the forecast period starts in 2011 and finishes in 2045. Assuming the sub-component does not thin to extinction before the FINAL_REMOVAL_YEAR, it will be removed in 2050 (*i.e.* at FINAL_REMOVAL_YEAR). Restock therefore occurs at

$$2050 - 3 \times 5 = 2050 - 15 = 2035.$$

However, if the sub-component thins to extinction before the specified FINAL_REMOVAL_YEAR, *e.g.* in 2040, restock occurs in

$$2040 - 3 \times 5 = 2040 - 15 = 2025.$$

Taking the example of a restock year of 2025, the sub-component(s) would be reported by the Forecast System as illustrated in Table A1.3.

Table A1.3 Reporting restock for the example sub-component assuming LISS and conventional thinning.

Reporting year	What is calculated and reported
2011-2024	The 'current' sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported. Any volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.
2025	<p>The 'current' sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported. Any volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.</p> <p>The area is restocked in this year. The age of the restock sub-component is calculated as 2025 – 2025 = 0 years. The sub-component is given a management type of 'LISS_TYPE' and is assumed to be subject to standard MT thinning. The FINAL_REMOVAL_YEAR is effectively not set for the restock sub-component.</p>

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Reporting year	What is calculated and reported
2026-2039	<p>The 'current' sub-component is "grown" normally and the increase in timber volume <i>etc.</i> is reported. Any volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.</p> <p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.</p>
2040	<p>The 'initial' sub-component is removed and reported as thinning volume.</p> <p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.</p>
2041-2045	<p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model. The restock sub-component is being managed with thinning specified to start at MT age, which is 21 years, <i>i.e.</i> beyond the forecast period in this example.</p>

There may be situations where the removal age implied by the FINAL_REMOVAL_YEAR specified for a stand is so young relative to the forecast period (or extinction occurs so quickly) that a sub-component may be restocked more than once.

Example 5 – LISS (even numbers)

Components with this management type are restocked in the same year as the *third thinning before complete removal* of the previous/initial component. There is therefore no fallow period as the restock component is growing alongside the 'current' component. The assumptions made for the characteristics of the restock component depend on exactly which LISS management type has been applied (see also Examples 4 and 6).

For components of this type (*i.e.* where M1_ATC_TYPE is set to EVEN_NUMBERS) the restock will occur in the year of the third thinning before FINAL_REMOVAL_YEAR of the 'initial' component. The restock component shares the same characteristics as the current/initial component. For the sake of simplicity, and to avoid 'over-modelling' of restock, the restock component is managed on a simple basis of thinning to extinction or

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specified final removal, as appropriate, *i.e.* the restock component is assigned to a LISS_TYPE management type and without a value specified for FINAL_REMOVAL_YEAR. Intermediate thinning is assumed to take place at standard intensity, starting at the MT age.

The sub-component has the same stand attributes as for the Clearfell example. The component is managed in the following way:

- Management type = LISS_TYPE
- M1_ATC_TYPE is set to EVEN_NUMBERS thinning
- The component has 370 standing trees in 2011
- FROM_THIS_YEAR is set to the start of the forecast period = 2011
- FINAL_REMOVAL_YEAR = 2031
- ATC_END_YEAR = FINAL_REMOVAL_YEAR
- THINNING_CYCLE = 5 years.

Suppose the forecast period starts in 2011 and finishes in 2045. Given a FINAL_REMOVAL_YEAR of 2031 and a thinning cycle of 5 years, restock should occur at

$$2031 - 3 \times 5 = 2031 - 15 = 2016.$$

The sub-component(s) would be reported by the Forecast System as illustrated in Table A1.4.

Table A1.4 Reporting restock for the example component assuming LISS (even numbers).

Reporting year	What is calculated and reported
2011	The 'current' component is thinned in this year and calculations proceed on the basis of 'even numbers' thinning (specified elsewhere).
2012-2015	The 'current' component is "grown" and thinned according to the 'even numbers' prescription. There are no thinnings specified during this period.

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Reporting year	What is calculated and reported
2016	<p>The current/initial component is thinned in this year. This is the third thinning prior to FINAL_REMOVAL_YEAR.</p> <p>The area is restocked in this year. The age of the restock component is calculated as $2016 - 2016 = 0$ years. The component is given a management type of 'LISS_TYPE' and is assumed to be subject to standard MT thinning. The FINAL_REMOVAL_YEAR is effectively not set for the restock component.</p>
2017-2030	<p>The 'current' component is "grown" according to the 'even numbers' prescription as specified, and the increase in timber volume <i>etc.</i> is reported. Any volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.</p> <p>The restock component is "grown" according to the prescription from an appropriate 'standard' model.</p>
2031	<p>This is the FINAL_REMOVAL_YEAR for the initial component. A final 'thinning' is carried out removing the remaining trees composing the component and reported as thinning volume.</p> <p>The restock component is "grown" according to the prescription from an appropriate 'standard' model.</p>
2032-2045	<p>The restock component is "grown" according to the prescription from an appropriate 'standard' model. There are two thinnings at age 21 ($2016 + 21 = 2037$) and age 26 ($2037 + 5 = 2042$).</p>

Note: There may be exceptional circumstances where the prescription for the component prior to EVEN_NUMBERS causes the component to have been thinned to extinction prior to the start of EVEN_NUMBERS thinnings. In this situation the assumption is made that the component still has a management type of LISS_TYPE with even numbers thinning and, although there may be no trees left in the period between extinction and FINAL_REMOVAL_YEAR, the even-numbers restock rule described above applies and the component is restocked at $FINAL_REMOVAL_YEAR - 3 \times \text{even numbers thinning cycle}$.

There may also be situations where the removal age implied by the FINAL_REMOVAL_YEAR specified for a stand is so young relative to the forecast period that a component may be restocked more than once.

Example 6 – LISS (target BA)

Sub-components with this management type are restocked in the same year as the *third thinning before complete removal* of the previous/initial sub-component. There is therefore no fallow period as the restock sub-component is growing alongside the 'current' sub-component. The assumptions made for the characteristics of the restock sub-component depend on exactly which LISS management type has been applied (see also Examples 4 and 5).

For sub-components of this type (*i.e.* where M1_ATC_TYPE has a value for TARGET_BASAL_AREA_RETAINED) the restock will occur 3 thinnings before the FINAL_REMOVAL_YEAR. The restock sub-component shares the same characteristics as the current/initial sub-component. For the sake of simplicity, and to avoid 'over-modelling' of restock, the restock sub-component is managed on a simple basis of thinning to extinction or specified final removal, as appropriate, *i.e.* the restock sub-component is assigned to a LISS_TYPE management type and without a value specified for FINAL_REMOVAL_YEAR. Intermediate thinning is assumed to take place at standard intensity, starting at the MT age.

The sub-component has the same stand attributes as for the Clearfell example. The sub-component is managed in the following way:

- Management type = LISS_TYPE
- M1_ATC_TYPE is set to TARGET_BASAL_AREA_RETAINED
- FROM_THIS_YEAR is set to = 2018
- FINAL_REMOVAL_YEAR = 2038
- THINNING_CYCLE (for 'initial' sub-component) = 7 years

Suppose the forecast period starts in 2011 and finishes in 2045. Given a FINAL_REMOVAL_YEAR of 2038 and a thinning cycle of 7 years, restock should occur at

$$2038 - 3 \times 7 = 2038 - 21 = 2017.$$

The sub-component(s) would be reported by the Forecast System as illustrated in Table A1.5.

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Table A1.5 Reporting restock for the example sub-component assuming LISS (target basal area).

Reporting year	What is calculated and reported
2011-2016	The 'current' sub-component is "grown" on and the increase in timber volume <i>etc.</i> is reported. The sub-component is thinned or not thinned, according to whatever management prescription applies prior to 2018 (<i>i.e.</i> when thinning starts to take place on the basis of target basal area retained).
2017	<p>The 'current' sub-component is "grown" on and the increase in timber volume <i>etc.</i> is reported. The sub-component is thinned or not thinned, according to whatever management prescription applies prior to 2018 (<i>i.e.</i> when thinning starts to take place on the basis of target basal area retained).</p> <p>The area is restocked in this year. The age of the restock sub-component is calculated as 2017 – 2017 = 0 years. The sub-component is given a management type of 'LISS_TYPE' and is assumed to be subject to standard MT thinning. The FINAL_REMOVAL_YEAR is effectively not set for the restock sub-component.</p>
2018	<p>The 'current' sub-component is "grown" on and the increase in timber volume <i>etc.</i> is reported. The sub-component is thinned according to target basal area retained for the first time.</p> <p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.</p>
2019-2037	<p>The 'current' sub-component is "grown" on and the increase in timber volume <i>etc.</i> is reported. The sub-component is thinned according to target basal area retained on the specified thinning cycle of 7 years.</p> <p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model.</p>

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Reporting year	What is calculated and reported
2038	<p>This is the FINAL_REMOVAL_YEAR for the initial sub-component. A final 'thinning' is carried out removing the remaining trees composing the sub-component and reported as thinning volume.</p> <p>The restock sub-component is "grown" according to the prescription from an appropriate 'standard' model. This is the MT age of first thinning so the sub-component receives its first thinning this year. Volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.</p>
2039-2045	<p>The restock sub-component is "grown on" and the increase in timber volume <i>etc.</i> is reported.</p> <p>Intermediate thinnings at standard intensity are carried out on a 5 year cycle (having started at MT age). Any volume from thinnings and consequent impacts on standing volume <i>etc.</i> are calculated and reported.</p>

Note: There may be exceptional circumstances where the prescription for the sub-component prior to thinning according to TARGET_BASAL_AREA_RETAINED causes the sub-component to have been thinned to extinction prior to the start of target basal area thinnings. In this situation the assumption is made that the sub-component still has a management type of LISS_TYPE with target basal area thinning and, although there may be no trees left in the period between extinction and FINAL_REMOVAL_YEAR, the target basal area restock rule described above applies and the sub-component is restocked at FINAL_REMOVAL_YEAR – 3 x 'target basal area retained thinning cycle'

There may also be situations where the removal age implied by the FINAL_REMOVAL_YEAR specified for a stand is so young relative to the forecast period that a sub-component may be restocked more than once.

Appendix 2 – Restocking by land use type (for current stands in the Public Forest Estate)

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 restocking treatment is the same for all Forecast Types.

Land Use Group	Restocking in the Forecast	Notes
Agriculture (AGR)	Not passed to the forecast system. No restocking is applied to current components with this land-use code.	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 restocking is applied to current components with these land-use codes.	Sub-components designated as commercial recreation should be excluded from the forecast.
Estate Management (EMM, EMO, EMR)	Not passed to the forecast system. No restocking is applied to current components with these land-use codes.	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 restocking is applied to current components with these land-use codes.	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.
Forest Recreation (FRC, FRE, FRO)	Not passed to the forecast system. No restocking is applied to current components with these land-use codes.	Sub-components designated as forest recreation should be excluded from the forecast.
Plantable Land (LHP)	Not passed to the forecast system. No restocking is applied to current components with this land-use code.	Forecasts for stocking of unstocked forest areas will be handled as a separate, supplementary calculation as part of the 2011 forecast exercise.

Land Use Group	Restocking in the Forecast	Notes
Miscellaneous (MAS, MOW)	Not passed to the forecast system. No restocking is applied to current components with these land-use codes.	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 restocking is applied to current components with this land-use code.	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 restocking is applied to current components with this land-use code.	Open land (OPN) cannot have an associated species code in the SCDB; however it may have up to 20% tree cover in practice. By definition, no restocking is ever undertaken on open land.
Plantation (PBU, PFA, PFE)	Not passed to the forecast system. No restocking is applied to current components with these land-use codes.	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 restocking is applied to current components with this land-use code.	Areas 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 restocking is applied to current components with this land-use code.	Unplantable land (UNP) cannot have an associated species code in the SCDB; however it may have up to 20% tree cover in practice. By definition, no restocking is ever undertaken on unplantable land.

Table A2.2: Zero Intervention Forecast Type: restocking treatment for Land-Use Codes not included in Table A2.1.

Land Use Group	Restocking in the Forecast	Notes
Forest Management (FMR, FMS)	Although passed to the forecast system, components with these land-use codes will never be felled. No restocking is applied to current components with these land-use codes.	Sub-components designated as non-plantation research (FMR) and seed orchard (FMS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Non-plantation (NAO)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Applicable to New Forest only. Sub-components designated as non-plantation 'ancient and ornamental' (NAO) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PHF, PRP, PSS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All sub-components designated as high forest (PHF), research plantations (PRP) and seed stands (PSS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PIB)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Sub-components designated as intruded broadleaves (PIB) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PWB)	Passed to the forecast system for processing. Restocking will be applied to current components with this land-use code.	Sub-components designated as windblow (PWB) are passed to the forecast system. Although excluded from forecasts of production, these sub-components will require restocking following the assumed clearance of the windblow. On restock, the land use code is effectively changed to PHF by the Forecast System. The restocked PWB sub-components will subsequently follow a strict no thinning management regime and will be clearfelled at the age of maximum MAI (for a no thin regime).

Table A2.3: Biological Potential Forecast (All Sub-Types): restocking treatment for Land-Use Codes not included in Table A2.1.

Land Use Group	Restocking in the Forecast	Notes
Forest Management (FMR, FMS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as non-plantation research (FMR) and seed orchard (FMS), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under all Biological Potential Forecast Sub-Types.
Non-plantation (NAO:)	Passed to the forecast system for processing. Restocking will be applied to current components with this land-use code.	Applicable to New Forest only. All forecast outputs are produced for all sub-components designated as non-plantation 'ancient and ornamental' (NAO), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under all Biological Potential Forecast Sub-Types.
Plantation (PHF, PRP, PSS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under all Biological Potential Forecast Sub-Types.
Plantation (PIB, PWB)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as intruded broadleaves (PIB) and windblow (PWB), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under all Biological Potential Forecast Sub-Types.

Table A2.4: Strategic Regional Forecast Type: restocking treatment for the Land-Use Codes not included in Table A2.1.

Land Use Group	Restocking in the Forecast	Notes
Forest Management (FMR, FMS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as non-plantation research (FMR) and seed orchard (FMS), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under the Strategic Regional Forecast Type.
Non-plantation (NAO:)	Passed to the forecast system for processing. Restocking will be applied to current components with this land-use code.	Applicable to New Forest only. All forecast outputs are produced for all sub-components designated as non-plantation 'ancient and ornamental' (NAO), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under the Strategic Regional Forecast Type.
Plantation (PHF, PRP, PSS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as high forest (PHF), seed stands (PSS) and research plantations (PRP), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under the Strategic Regional Forecast Type.
Plantation (PIB, PWB)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all sub-components designated as intruded broadleaves (PIB) and windblow (PWB), <i>i.e.</i> all sub-components are forced to have a FORECAST_FLAG of "F". Restocking of these sub-components will therefore be required under the Strategic Regional Forecast Type.

Table A2.5: Management Plans Forecast Type: restocking treatment for the Land-Use Codes not included in Table A2.1.

Land Use Group	Restocking in the Forecast	Notes
Forest Management (FMR, FMS)	Although passed to the forecast system, components with these land-use codes will never be felled. No restocking is applied to current components with these land-use codes.	Sub-components designated as non-plantation research (FMR) and seed orchard (FMS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Non-plantation (NAO)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Applicable to New Forest only. Sub-components designated as non-plantation 'ancient and ornamental' (NAO) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PHF, PRP, PSS)	Passed to the forecast system for processing. Restocking will be applied to current components with these land-use codes.	All sub-components designated as high forest (PHF), research plantations (PRP) and seed stands (PSS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PIB)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Sub-components designated as intruded broadleaves (PIB) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PWB)	Passed to the forecast system for processing. Restocking will be applied to current components with this land-use code.	Sub-components designated as windblow (PWB) are passed to the forecast system. Although excluded from forecasts of production, these sub-components will require restocking following the assumed clearance of the windblow. On restock, the land use code is effectively changed to PHF by the Forecast System. The restocked PWB sub-components will subsequently follow a strict no thinning management regime and will be clearfelled at the age of maximum MAI (for a no thin regime).

Table A2.6: Quick Forecast Type: restocking treatment for the Land-Use Codes not included in Table A2.1.

Land Use Group	Restocking in the Forecast	Notes
Forest Management (FMR, FMS)	Although passed to the forecast system, components with these land-use codes will never be felled. No restocking is applied to current components with these land-use codes.	Sub-components designated as non-plantation research (FMR) and seed orchard (FMS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Non-plantation (NAO)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Applicable to New Forest only. Sub-components designated as non-plantation 'ancient and ornamental' (NAO) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PHF, PRP, PSS)	Passed to the forecast system for processing. No restocking is applied to current components with this land-use code.	All sub-components designated as high forest (PHF), research plantations (PRP) and seed stands (PSS) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PIB)	Although passed to the forecast system, components with this land-use code will never be felled. No restocking is applied to current components with this land-use code.	Sub-components designated as intruded broadleaves (PIB) are passed to the forecast system but, because these are excluded from forecasts of production, restocking will never be required under this Forecast Type.
Plantation (PWB)	Passed to the forecast system for processing. No restocking is applied to current components with this land-use code.	Sub-components designated as windblow (PWB) are passed to the forecast system but are excluded from forecasts of production. Restocking will never be required under this Forecast Type.

Appendix 3 – NFI Forester component types where felling 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: restocking treatment for NFI Forester component types.

NFI Land Use Group	Restocking in the Forecast	Notes
Stand	No felling and removals volume is estimated for current components. No restocking is applied to current components with this land-use code.	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 felling and removals volume is estimated for current components. No restocking is applied to current components with this land-use code.	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 felling and removals volume is estimated for current components. No restocking is applied to current components with this land-use code.	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	Restocking in the Forecast	Notes
Windblow	<p>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. . No restocking is applied to current components with this land-use code.</p>	<p>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.</p>
<p>Stand (STATUS = DEAD)</p> <p>Young (STATUS = DEAD)</p> <p>Thicket (STATUS = DEAD)</p> <p>Windblow (STATUS = DEAD)</p>	<p>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. . No restocking is applied to current components with this land-use code.</p>	<p>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.</p>

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

NFI Land Use Group	Restocking in the Forecast	Notes
Stand	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Young	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Thicket	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Windblow	Effectively restock components only (<i>i.e.</i> 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	Restocking in the Forecast	Notes
<p>Stand (STATUS = DEAD)</p> <p>Young (STATUS = DEAD)</p> <p>Thicket (STATUS = DEAD)</p> <p>Windblow (STATUS = DEAD)</p>	<p>Effectively restock components only (<i>i.e.</i> 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).</p>	<p>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.</p> <p>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.</p>

Table A3.3: Strategic Regional Forecast Type **and** Management Plans Forecast Type: restocking treatment for NFI Forester component types.

NFI Land Use Group	Restocking in the Forecast	Notes
Stand	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Young	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.
Thicket	All forecast outputs are produced. Restocking will be applied to current components with these land-use codes.	All forecast outputs are produced for all NFI components designated as 'Stand', where STATUS = (A)LIVE.

NFI Land Use Group	Restocking in the Forecast	Notes
Windblow	All forecast outputs are produced. All sub-components are included in volume production, biomass production and straightness forecast outputs for windblow, <i>i.e.</i> the presumption is that windblow will be 'harvested'.	<p>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.</p> <p>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 Strategic regional management plan.</p> <ol style="list-style-type: none"> 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	Restocking in the Forecast	Notes
<p>Stand (STATUS = DEAD)</p> <p>Young (STATUS = DEAD)</p> <p>Thicket (STATUS = DEAD)</p> <p>Windblow (STATUS = DEAD)</p>	<p>All forecast outputs are produced. All sub-components are included in volume production, biomass production and straightness forecast outputs for windblow, <i>i.e.</i> the presumption is that the DEAD trees will be 'harvested'. Restocking will be applied to current components with these land-use codes.</p>	<p>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.</p> <p>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.</p> <ol style="list-style-type: none"> 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: restocking treatment for NFI Forester component types.

NFI Land Use Group	Restocking in the Forecast	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.