



Wood Availability Forecasts – Nelson & Marlborough 2014

Prepared for the Ministry for Primary Industries
by Indufor Asia Pacific Limited

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Ministry for Primary Industries Wood Availability Forecasts

A new series of Wood Availability Forecasts is being prepared by Indufor Asia Pacific, for the Ministry for Primary Industries (MPI), covering the period from 2014 to 2050. These forecasts are intended as a planning tool for the forest industry, councils, and infrastructure and service providers. New forecasts for all nine regional wood supply regions will be published over the next eighteen months, along with new national forecasts.

MPI is working in association with the National Exotic Forest Description (NEFD) Steering Committee to prepare the new regional and national wood availability forecasts. NEFD user surveys have emphasised that wood availability forecasts are the most used and valued product delivered under the NEFD programme. The previous regional and national forecasts were prepared between 2006 and 2010 and are available here: <http://www.mpi.govt.nz/news-and-resources/statistics-and-forecasting/forestry/>

Tables providing annual harvest volumes for each scenario are included in the appendix. The report will also be available on the Ministry's website.

MPI wishes to express its appreciation to the forest owners, managers and consultants of Nelson and Marlborough for their support in preparing these wood availability forecasts. The work would not be possible without this assistance.

Disclaimer

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ADDENDUM

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Under the section on data and methodology used to obtain forest areas it should also have been stated that areas of forest ages 20 and over, identified in the Small Forest Grower Survey, were removed. The Survey was undertaken in 2004 by AgriQuality (nowASUREQuality). There is now concern over the reliability of this resource information.

Details on the methods used by AgriQuality are available in the *Small Forest Grower Survey Report* (AgriQuality, NZ, 2005).



PREFACE

This report was prepared at the request of the Ministry for Primary Industries (the Client) by Indufor Asia Pacific Limited.

The project involved development of a series of regional and national wood availability forecasts for New Zealand's plantation estate.

This report may only be used for the purpose for which it was prepared and its use is restricted to consideration of its entire contents. The conclusions presented are subject to the assumptions and limiting conditions noted within.

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1. INTRODUCTION

This report presents the findings from a 2015 wood availability study of the Nelson & Marlborough planted forest estate. The study is based on the National Exotic Forest Description as at 1 April 2014. The study was undertaken by MPI, in association with the major plantation owners. The modelling supporting the study was undertaken by Indufor Asia Pacific Limited (Indufor).

Indufor prepared four production scenarios for radiata pine potential wood availability and one for Douglas-fir availability. The scenarios indicate how the maturing forest resource in Nelson & Marlborough could be harvested over the 2014 to 2050 period. The scenarios are based on the available resource in each region and a series of forecasting assumptions. Only radiata pine and Douglas-fir are included in the scenarios and wood availability forecasts. There are areas of other species but these are not included in the availability forecasts.

The forecasts incorporate the harvesting intentions of the region's large-scale forest owners. Large-scale owners are defined as:

- Those with 1000 ha of forest or more in the region of interest, and
- With more than three age-classes, and;
- Not a part of a syndicate.

There was also consultation with forest managers and consultants to ensure the scenarios represented a realistic range of future wood availability.

The scenarios clearly show there are different ways for the forest resource to be harvested. In examining the scenarios, it is important to recognise that forests are normally managed in a way that maximises the benefits to the enterprise that owns them. Each enterprise has its own harvesting strategy based on the owners' objectives and market conditions. Any change in harvesting strategies by forest owners affects the age-structure and maturity of the forests it owns. This in turn feeds back into future wood availability.

A key issue is the timing of harvesting by small-scale forest owners of their forests or woodlots. The harvest age can vary markedly, even between neighbouring properties. The timing of the harvest of these forests is driven by a range of factors, including individual forest owners' objectives, forest age, log prices, demand by local wood processing plants, and perceptions about future log prices and future wood supply.

There are different levels of uncertainty associated with the wood availability from each component of the estate. While the volumes forecast from larger forest owners are subject to alteration because of changes in harvesting intentions or changes in the resource description (for example, areas and yields), a higher level of confidence can generally be assumed for these forecasts than for the small-scale owner's estate. Not only are harvest intentions less clear for small-scale owners, the resource description is potentially less accurate.

2. SCENARIOS

Four wood availability scenarios have been modelled for radiata pine and one for Douglas-fir. These scenarios show the range of potential ways the forests in the region could be harvested in the future.

The scenarios were developed by the National Exotic Forest Description (NEFD) Steering Committee. Indufor undertook initial modelling of the scenarios, and these were presented to the major forest owners and consultants in the Nelson & Marlborough wood supply region. Their feedback was taken into account in the final derived profiles.

2.1 Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-scale Owners Harvest at Age 28

Large-scale owners' wood availability is based on stated harvest intentions for the period 2014 to 2023 (calendar year estimates). After 2023, a modelling assumption is that the wood availability from large-scale owners will not decrease.

Small-scale owners are assumed to harvest their forest holdings at age 28.

This is similar to scenario 2 in the 2006/07 Wood Availability Forecasts, although the target rotation age for small scale owners was 30 years in the earlier analysis.

2.2 Scenario 2: Non-declining Yield (NDY) – Target Rotation 28 years

Large-scale owners' wood availability is assumed to be at stated harvest intentions for the period 2014 to 2023. After 2023, the wood availability from large-scale owners is assumed not to decrease (as for scenario 1). The total wood availability of radiata pine from the region is modelled to be non-declining in perpetuity with a target rotation age of 28 years (30 years in scenario 3 in the 2006/07 Wood Availability Forecasts).

2.3 Scenario 3: Split NDY – Target Rotation 28 years

This is the same as scenario 2 except that the total wood availability of radiata pine from the region is allowed to decline after 2034 for a period of five years. Over this five year period, an annual change of up to 10% is allowed. The yield is then required to be non-declining from 2039.

2.4 Scenario 4: Target Rotation Age Variations

This is similar to scenario 3 except that target rotation ages of 26 and 30 years are also modelled (28 and 32 years in the 2006/07 Wood Availability Forecasts).

2.5 Discussion of the Scenarios - Radiata Pine

Figure 2-1A to Figure 2-1C illustrate the differences between Scenarios 1 to 3 (respectively) using the combined Nelson & Marlborough radiata pine resource as an example (more detailed discussion is provided in Section 4).

In scenario 1 (Figure 2-1A), the forests owned by small-scale owners are assumed to be harvested at age 28. The scenario shows the "potential" availability of mature forest from small owners in any given year. This scenario directly reflects the area of forest in the small ownership category in each age-class in the Nelson & Marlborough region. For practical reasons, it is unlikely that the future harvesting would occur this way. The intention of this scenario is to show the potential magnitude of harvesting under favourable market conditions in any given year.

Scenarios 2 and 3 (Figure 2-1B and Figure 2-1C, respectively) are based on yield regulation. Yield regulation refers to where, when, and how these recoverable volumes should be extracted, and provides a more orderly harvesting volume profile that, to some degree, reflects logistical and market constraints. Under these scenarios, the future harvesting model is generally

constrained to be non-declining: that is, each year the volume must either be the same or higher than in the previous year.

Scenarios 2 and 3 avoid the large year-to-year fluctuations in volume seen in scenario 1. A fundamental property of the forests in Nelson & Marlborough (like many regions in New Zealand) is the large area of forests established during the 1990s. Scenarios 3 and 4 illustrate the harvesting of these forests by applying a non-declining yield constraint for the period 2014 to 2034. Then once the “bulge” of forest area planted during the 1990s has been harvested, the model lets the volume decline again.

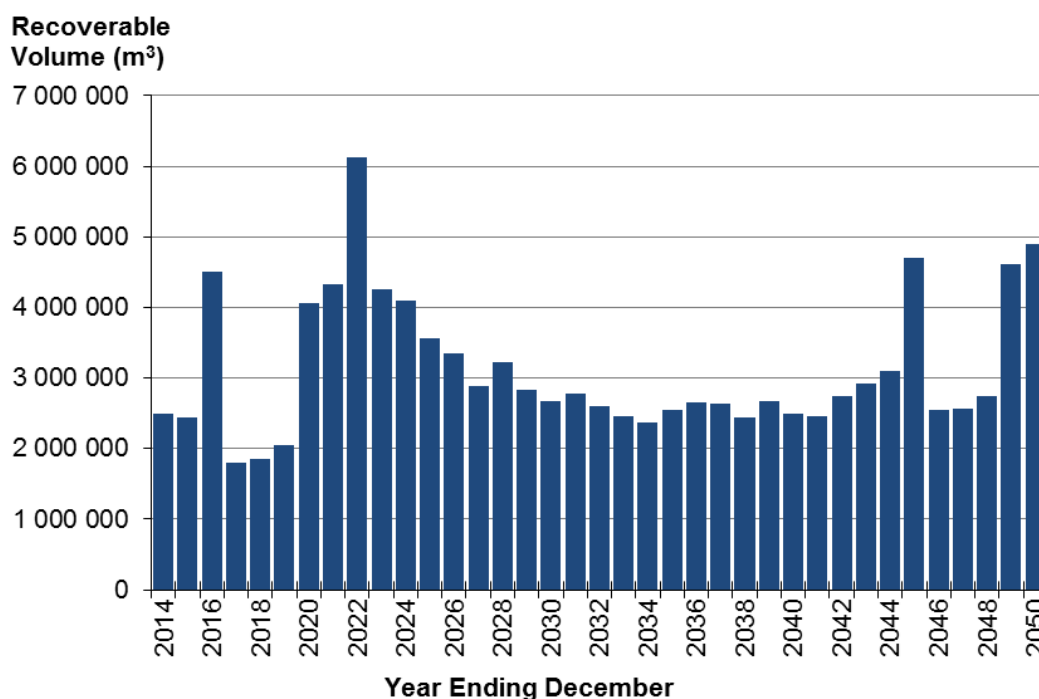
The main limitations of scenarios 2 to 4 are that log prices and other market factors are a significant determinant of harvesting in any given year. When log prices go up, harvesting will generally increase. When log prices fall, the level of harvesting will generally decrease. It is beyond the scope of this analysis to predict future log prices.

2.6 Scenario for Douglas-fir

One scenario is presented for Douglas-fir (all owners). It is based on the harvest intentions of large-scale owners for 2014 to 2023 with the yield regulated in subsequent years. After 2023, the wood availability from large-scale owners is modelled in a five-year period non-declining yield (NDY) block (i.e. 2024-2028, 2029-2033, etc). The total wood availability of the combined estate is also modelled to be non-declining within each of the five-year period NDY blocks. The harvest level for the first five-year NDY block is set to be the same as in 2023. The total wood availability from clearfell and production thinning operations can change by 100 000 m³ per year for the large-scale owners' estate and by 150 000 m³ per year for the combined estate. The target rotation age is 40 years for Douglas-fir (45 years was used in the 2006/07 forecasts).

Illustration of Wood Availability Scenarios (Combined Nelson & Marlborough Radiata Pine Forecasts)

Figure 2-1A: Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-Scale Owners Harvest at Age 28





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Figure 2-1B: Scenario 2: Large-Scale Owners Harvest at Stated Intentions. Overall Non-Declining Yield with a Target Rotation of 28 Years

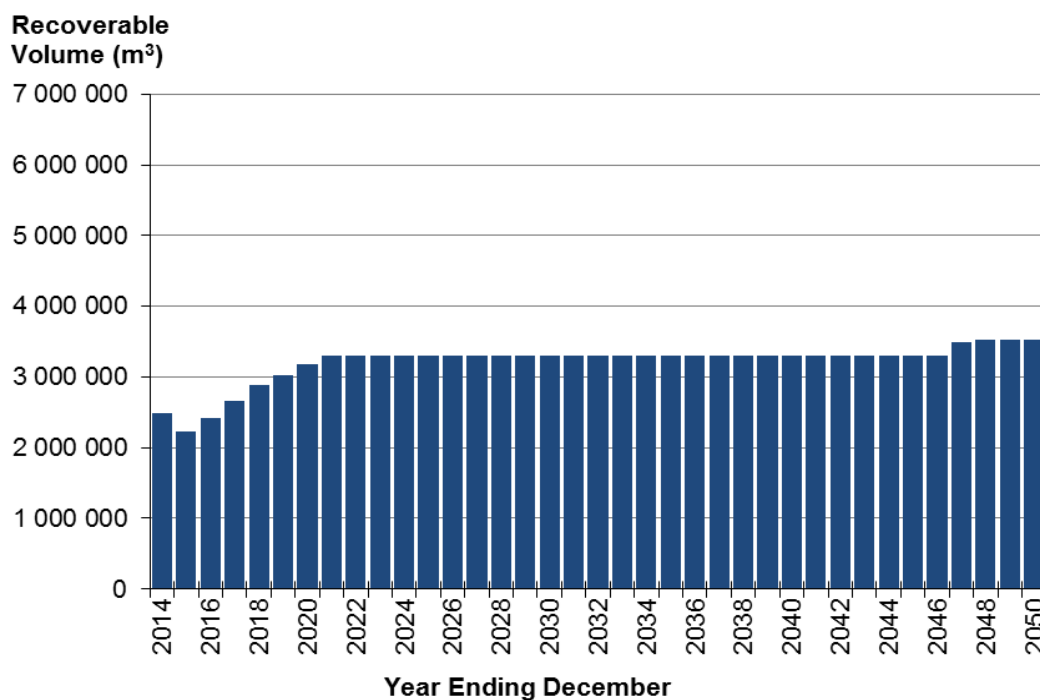
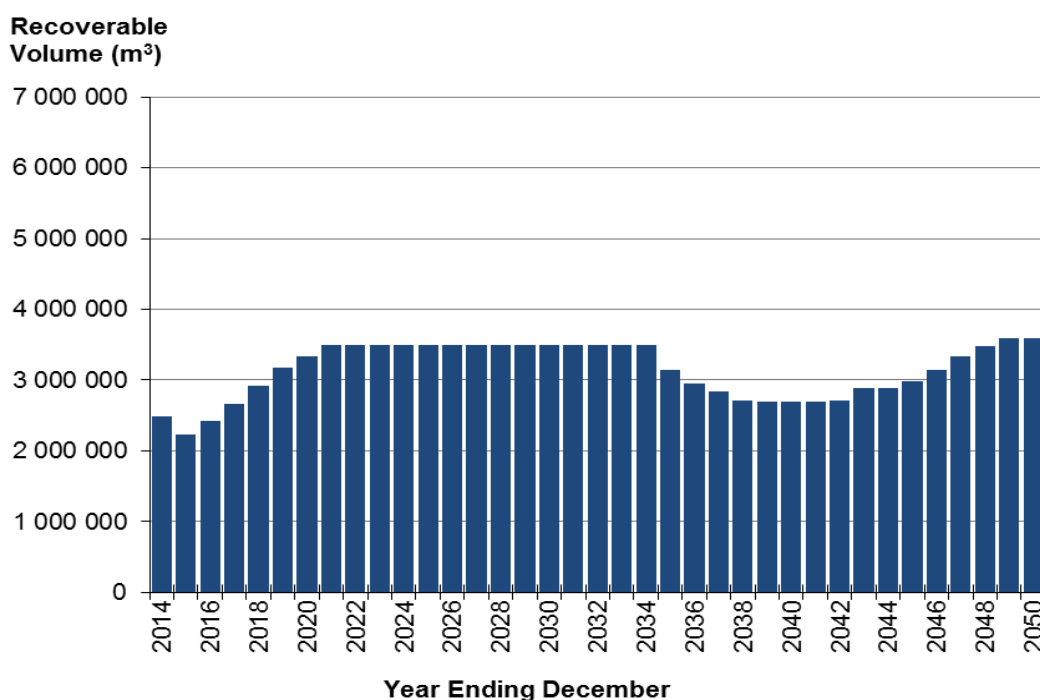


Figure 2-1C: Scenario 3: Large-scale Owners Harvest at Stated Intentions. Overall Split Non-Declining Yield with Target Rotation of 28 Years



3. DATA AND METHODOLOGY

3.1 Method Used to Obtain Forest Areas

The forest areas were sourced from A National Exotic Forest Description as at 1 April 2014 (MPI 2014). The area for the large-scale owners was unadjusted, while the area for the small-scale owners' estate was reduced by 15%.

This adjustment was made as small-scale owners generally report on a gross area basis rather than net stocked areas (excluding unplanted areas, areas not successfully established, streams, roads and wetlands).

In addition to this, reductions were made to the area of over-mature stands. For large-scale owners, areas older than 35 years of age were considered non-commercial and excluded. For small-scale owners, the maximum age was 40 years.

A further downwards adjustment of 5% was applied to all areas age 1 to 4 to reflect losses in stocked area due to factors such as erosion, slips, and various setbacks.

3.2 Method Used to Develop Yield Tables

For the 2006/07 WAF, new yield tables for Nelson & Marlborough were developed in the following way:

- Large-scale forest owners provided yield tables for their forest estates.
- These tables were averaged on an area-weighted basis to derive regional yield tables for each crop-type.
- The area-weighted average regional yield tables for "old" radiata pine (planted before 1989), and Douglas-fir were then calibrated to match the harvest intentions data provided by large-scale owners. The assumption is that the harvest intentions data is the most accurate information available, as it is based predominantly on detailed inventory.
- The area-weighted average regional yield tables for "young" radiata pine crop-types (planted in 1990 and later) were also adjusted based on consultation with large-scale owners.
- The area-weighted average regional yield tables developed for the large-scale owners' estate were also applied to the small-scale forest owners' estate.

For the latest forecasts the yield tables developed in 2006/07 were utilised, but were again calibrated to the harvest intentions information provided by large forest owners (essentially the process described in the third bullet point above was redone to derive yield tables that reflected yields expected by the large owners).

3.3 Large-Scale Owners' Harvest Intentions

Large-scale owners were asked to provide details of their projected harvest volumes (by log grade, area and average harvest age) for the 2014 to 2033 period. The 11 largest owners all provided yearly (31 December) summary data for the project. Inclusion of actual levels of intended harvest by the large owners is considered a critical step, as it provides the best estimate of future wood availability for the first ten years (2014-2023) of the forecast horizon.

The owners who provided harvest intentions were:

- Hancock Timber Resources Group (Tasman Bay)
- Global Forest Partners (Nelson Forests Ltd)
- Matariki Forests
- SCFNZ Ltd (Sunchang)

- CNBM Forest Products Ltd (China National Building Material)
- Timbergrow Limited
- Nelson Pine Industries Ltd
- Flight Timber (now New Forests)
- Manuka Island Trust
- Marlborough Regional Forestry
- Tasman District Council

3.4 Modelling Assumptions

The wood availability forecasts for the Nelson & Marlborough region are based on the following assumptions:

- All areas are replanted, with a regeneration lag of one year. Replanting is as follows:
 - All radiata pine areas are maintained as radiata pine.
 - Large-scale forest owners: Only 10% of all pruned areas will be replanted as a pruned regime, with 90% transferring to an unpruned regime.
 - Small-scale forest owners: 50% of all pruned areas will be replanted as a pruned regime with 50% transferring to an unpruned regime.
 - Douglas-fir: Only 10% of existing Douglas-fir will be replanted as Douglas-fir, with the rest transferring to radiata pine.
- Based on discussions with major forest owners and consultants in the region, it was determined that conversion of forests to other land uses was not being undertaken at a sufficient rate for it to be incorporated into the wood availability forecasts.
- The area awaiting replanting as at 31 March 2014 is included as area at age 0 (that is, the area to be replanted in the 2014 planting season).
- Total roundwood removals in the Nelson & Marlborough region were estimated to be 2.75 million m³ for the year ended 31 March 2014 (1.67 million m³ for Nelson, and 1.08 million m³ for Marlborough). This was used to derive the harvest level for the first year of the model.
- Radiata pine area in the large-scale owners' estate aged over 35 years is assumed to be non-commercial and therefore will not be harvested.
- Radiata pine area in the small-scale owners' estate aged over 40 years is assumed to be non-commercial and therefore will not be harvested.
- Douglas-fir stands over 60 years of age are assumed to not be harvested (all owners)

4. WOOD AVAILABILITY FORECASTS FOR NELSON

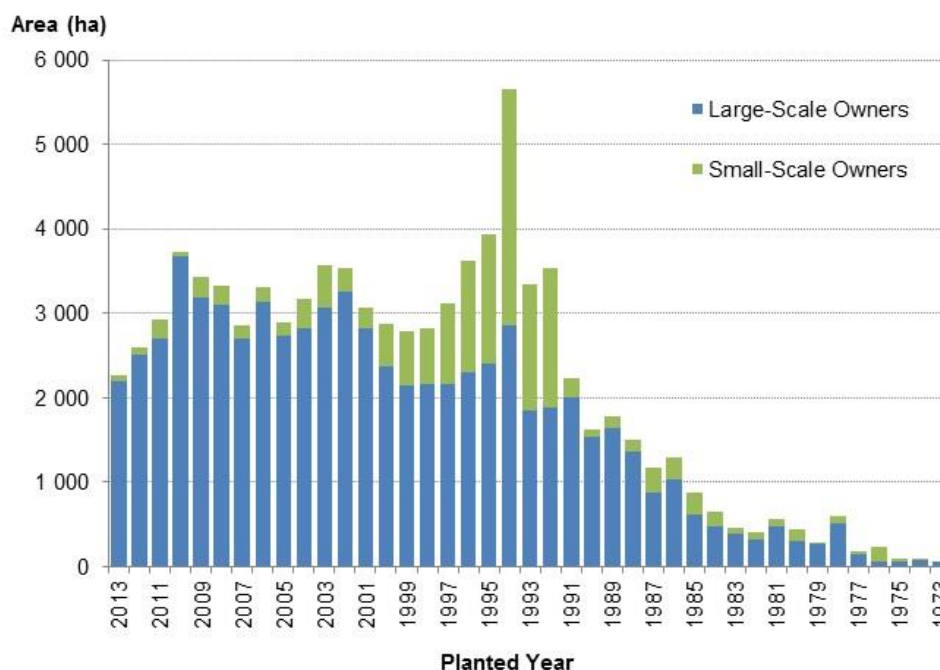
4.1 Nelson Region Area Description

The Nelson region has a plantation resource of 95 652 ha spread across two districts. Of this, 85 820 ha consists of radiata pine and 7 973 ha are Douglas-fir.

After deductions described in Section 3.1 are applied to the NEFD area, the modelled area reduces to 88 496 ha.

The modelled resource consists of both radiata pine and Douglas-fir. Figure 4-1 shows the age-class distribution for the CNI estate by owner size. Some 81% of the modelled resource is held by large owners and 19% by small owners. Apart from a spike in planting occurring in 1994, the planted areas for age 1990 and younger are relatively consistent in the Nelson region when all owners are considered. When considering the small-owner resource only, a peak in planting is observed in the early 1990s.

Figure 4-1: Nelson Age-class Distribution by Owner – All Species as at 1 April 2014



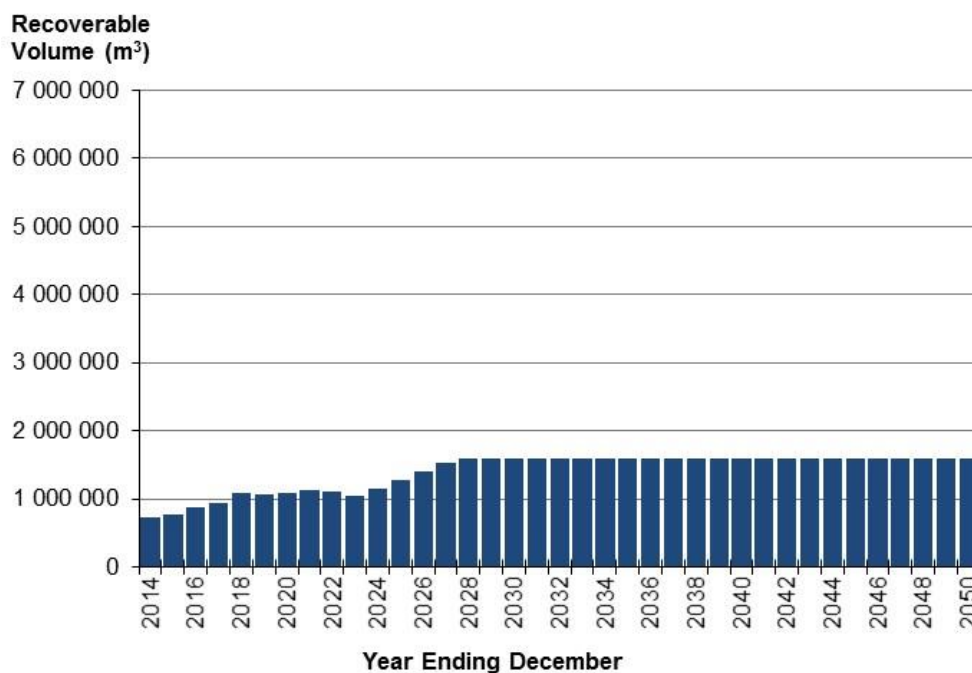
4.2 Scenario 1

For this scenario, the availability of wood from large-scale owners is based on their stated harvest intentions for 2014 to 2023. Thereafter the availability is constrained to be non-declining with a target rotation age of 28 years. The wood availability of large-scale owners (Figure 4-2) is forecast to be relatively static through the forecast period.



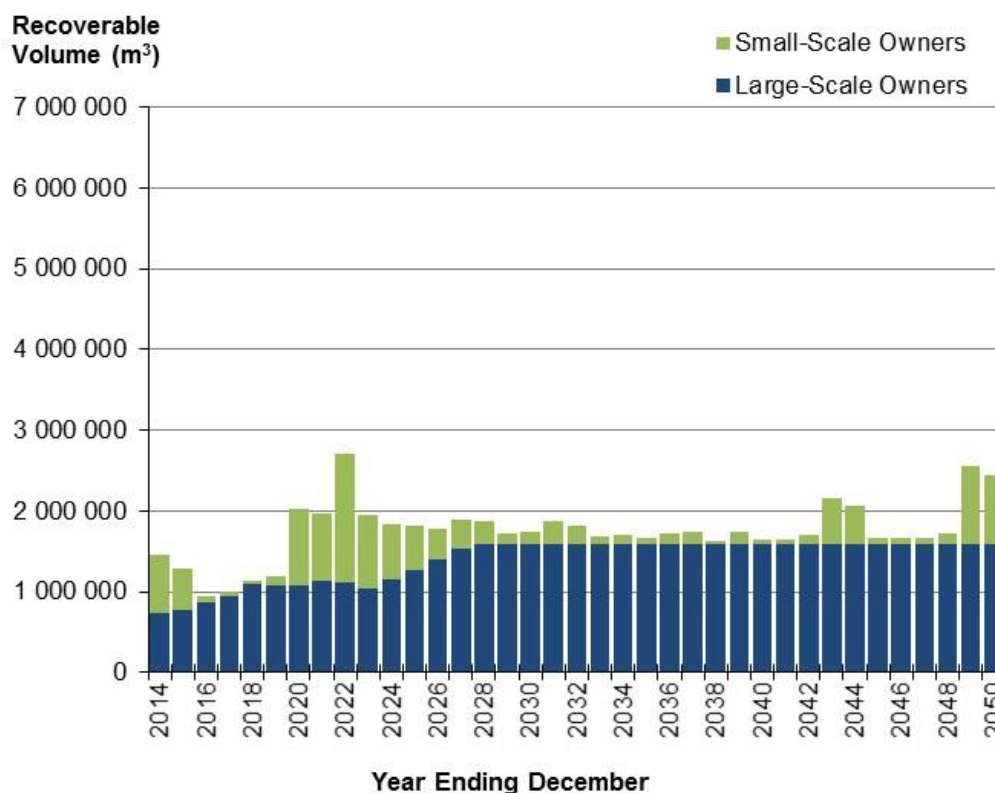
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Figure 4-2: Nelson Radiata Pine Availability under Scenario 1 – Large-Scale Owners



The wood availability from all owners in Nelson is presented in Figure 4-3. The large-scale owners' resource is shown as the "base" volume, and the forecasts match the volumes in Figure 4-2. The fluctuation in the total annual forecast volumes reflects the variation in the areas in each age-class of the small-scale owners' estate, and the assumption that this estate is harvested at age 28.

Figure 4-3: Nelson Radiata Pine Availability under Scenario 1 – All Owners



The large increase in harvest volume after 2019 (Figure 4-3) reflects the maturing of the small-scale owners' estate. For example, the increase in 2020 is a consequence of the 1 572 ha planted by small-scale owners in 1992 (Figure 4-1) being harvested at age 28 years.

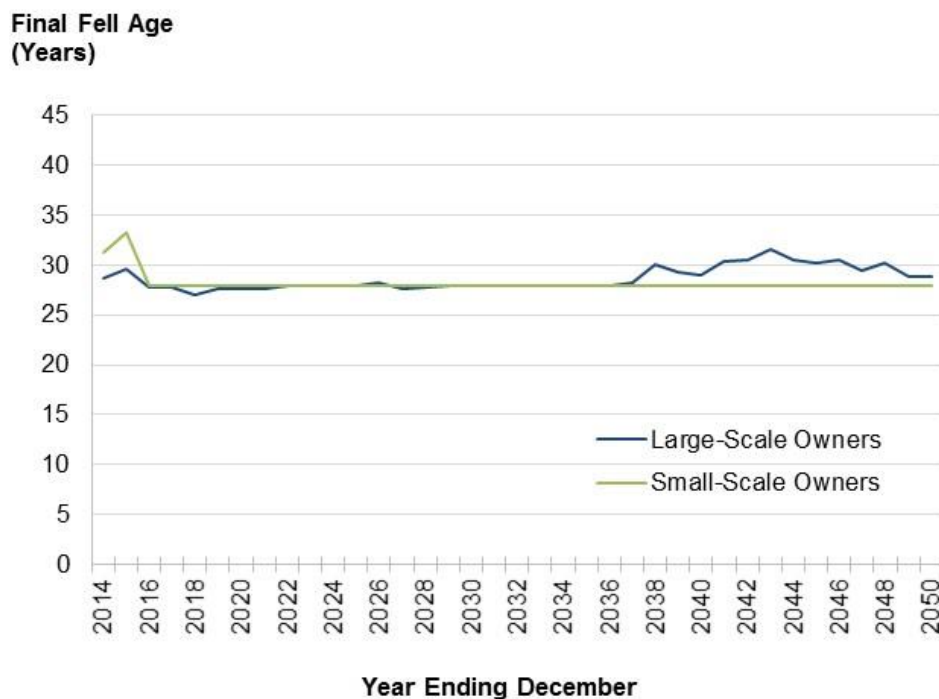
Fluctuations in harvest volumes of the magnitude shown in Figure 4-3 would be impractical due to operational constraints (for example: availability of harvest machinery, harvesting crews and transport operators) and market absorption constraints (for example: limited domestic wood processing capacity, levels of export demand).

Figure 4-4 shows that, apart from the near-term harvest (which is constrained to the intentions of the large scale owners), the harvest age settles at the target of 28 years.



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Figure 4-4: Nelson Average Radiata Pine Clearfell Age under Scenario 1 – by Ownership Category



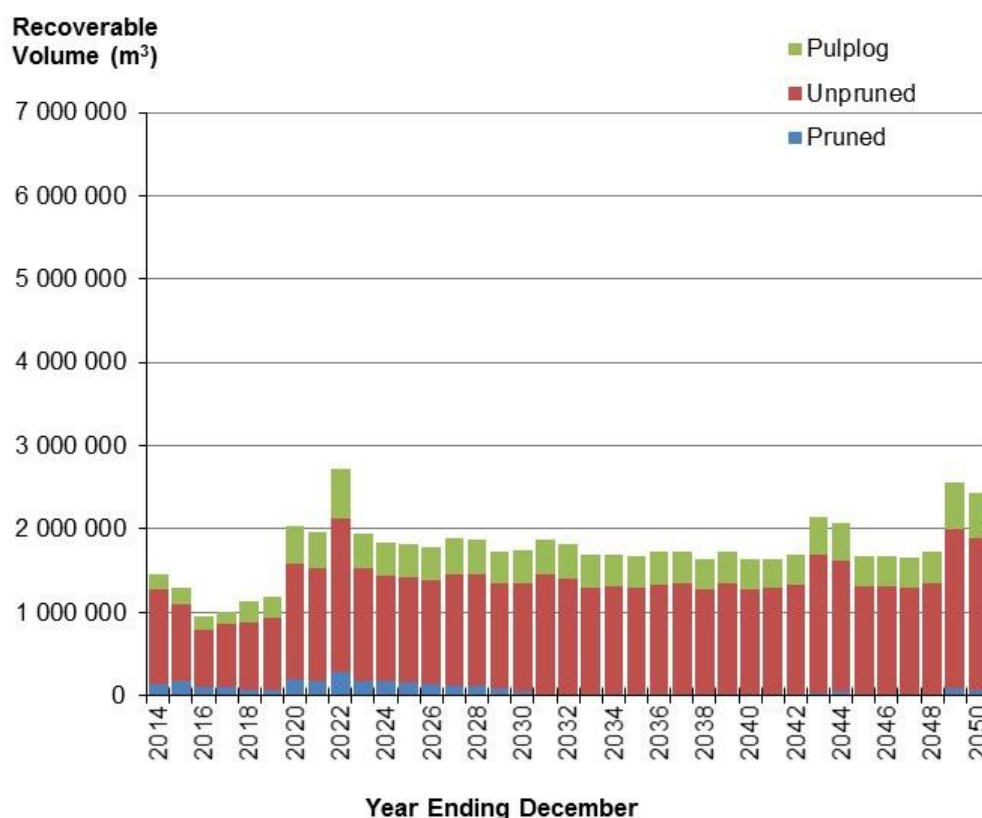
The harvest volumes forecast under scenario 1 are broken down by log grade in Figure 4-5. Of note is the declining availability of pruned log supply. This is a result of the assumed lack of re-



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establishment of pruned regimes after harvest (10% for large owners and 50% for small owners).

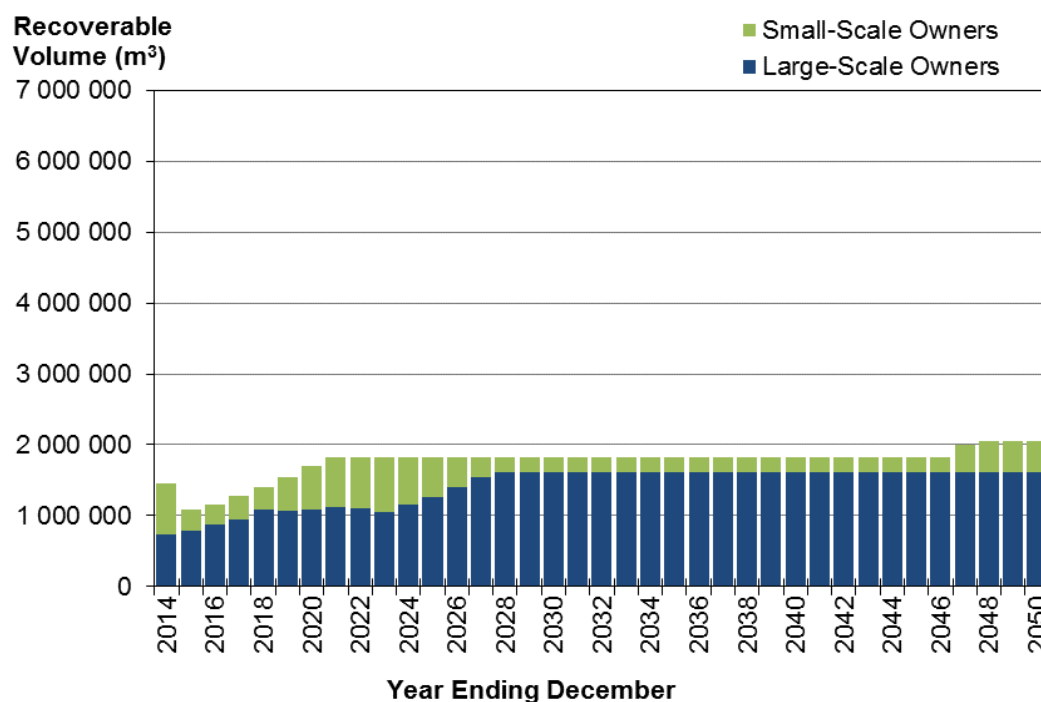
Figure 4-5: CNI Radiata Pine Availability under Scenario 1 – by Log Grade (All Owners)



4.3 Scenario 2

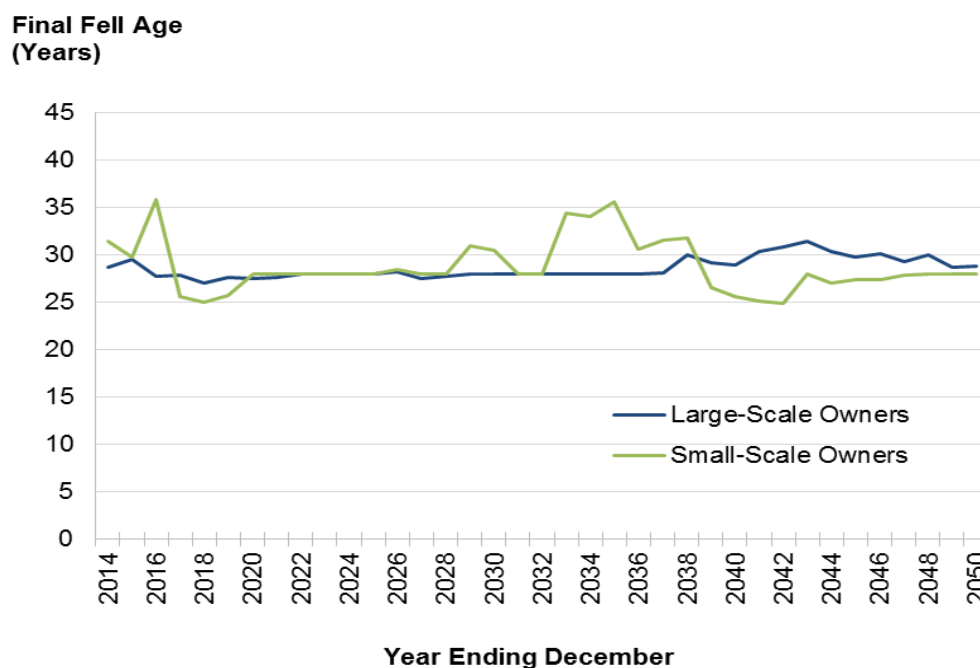
The second scenario assumes large-scale owners' resources are harvested as per their harvest intentions for the first 10 years, then a non-declining yield constraint is applied to the large-scale owners' estate after 2023. In addition, a non-declining yield constraint is applied to the total overall radiata pine estate, with a target rotation age of 28 years.

Figure 4-6: Nelson Radiata Pine Availability under Scenario 2 – All Owners



This scenario does at times require that the harvest age varies significantly from the target rotation of 28 years. This is especially the case for small-scale forest owners (Figure 4-7).

Figure 4-7: Nelson Average Radiata Pine Clearfell Age under Scenario 2 – by Ownership Category

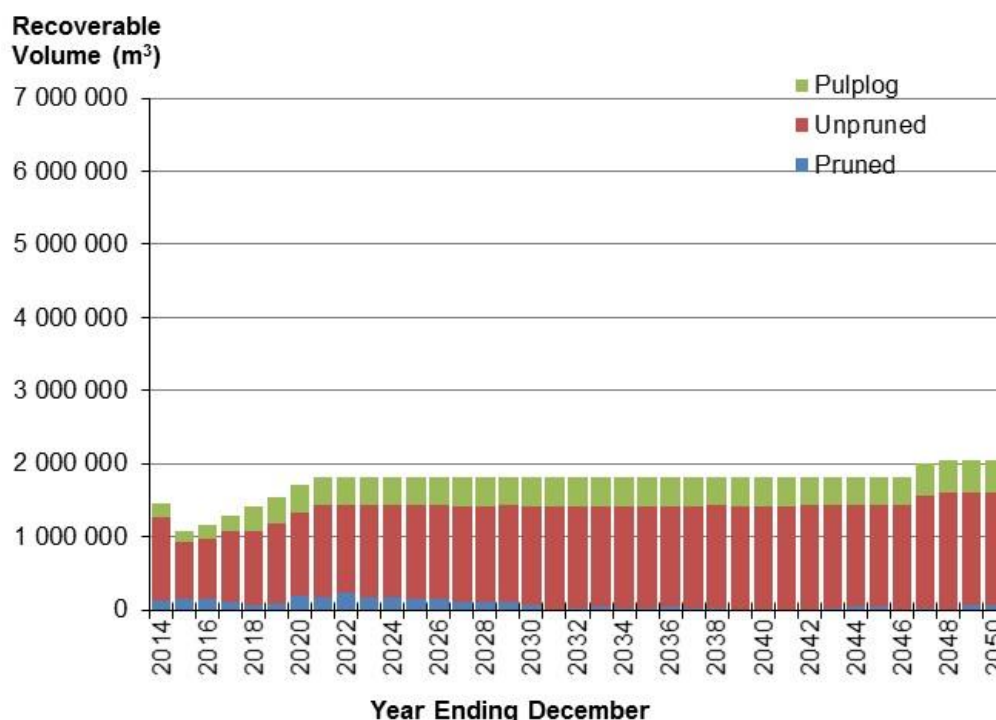


The harvest volumes forecast under scenario 2 are broken down by log grade in Figure 4-8.



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Figure 4-8: Nelson Radiata Pine Availability under Scenario 2 – by Log Grade (All Owners)



4.4 Scenario 3

The third scenario again assumes large owners' resources are harvested in line with their harvest intentions between 2014 and 2023, and then non-declining after 2023. However, the overall yield is based on a split non-declining yield, with a target rotation age of 28 years. A drop in the overall harvest volume is allowed after 2034 for a five-year period (between 2035 and 2039 of no more than 10% per year). This scenario gives a forecast wood availability that is different to scenario 2 (Figure 4-9). Wood availability increases from 1.1 million m³ in 2015 to 1.9 million m³ in 2021, and is maintained at this level until 2034. The small owner supply then reduces for a period of eight years, before increasing again from 2043 allowing the total harvest to attain around 2.0 million m³.

The main difference from scenario 2 is that the large area of young stands in the small-scale owners' estate is assumed to be harvested over a shorter period of time, although the total volume was modelled not to decrease between 2014 and 2034.

A consequence of there being more flexibility over when the small-scale owner estate is harvested is that the average clearfell age for small-scale owners generally stays closer to the target of 28 years than in scenario 2 (Figure 4-10), albeit still with some fluctuations in the early 2030s.

Figure 4-9: Nelson Radiata Pine Availability under Scenario 3 – All Owners

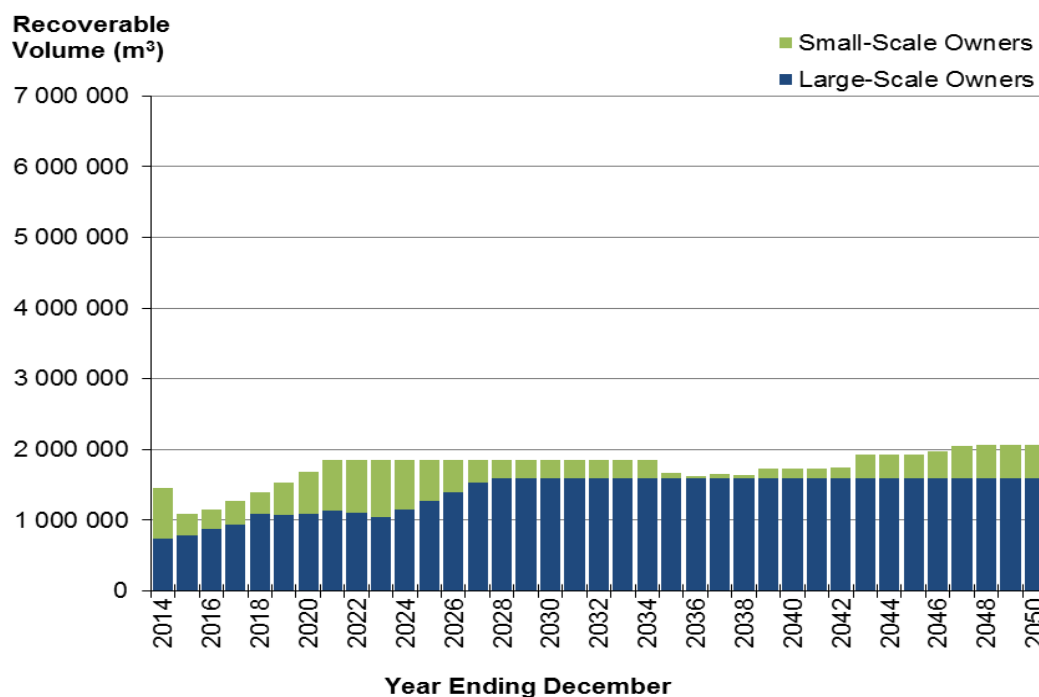
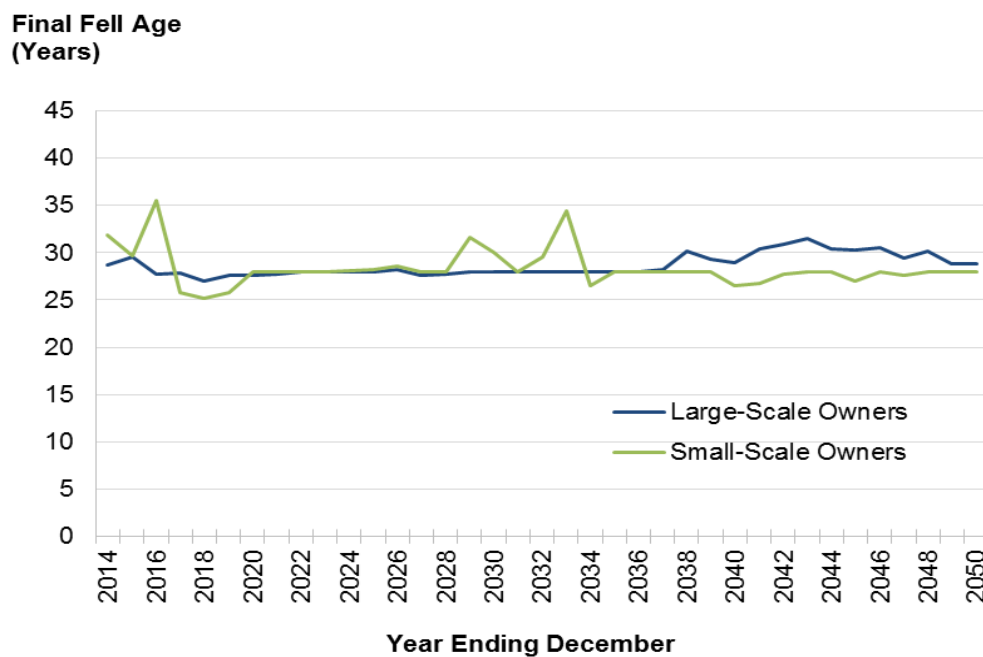
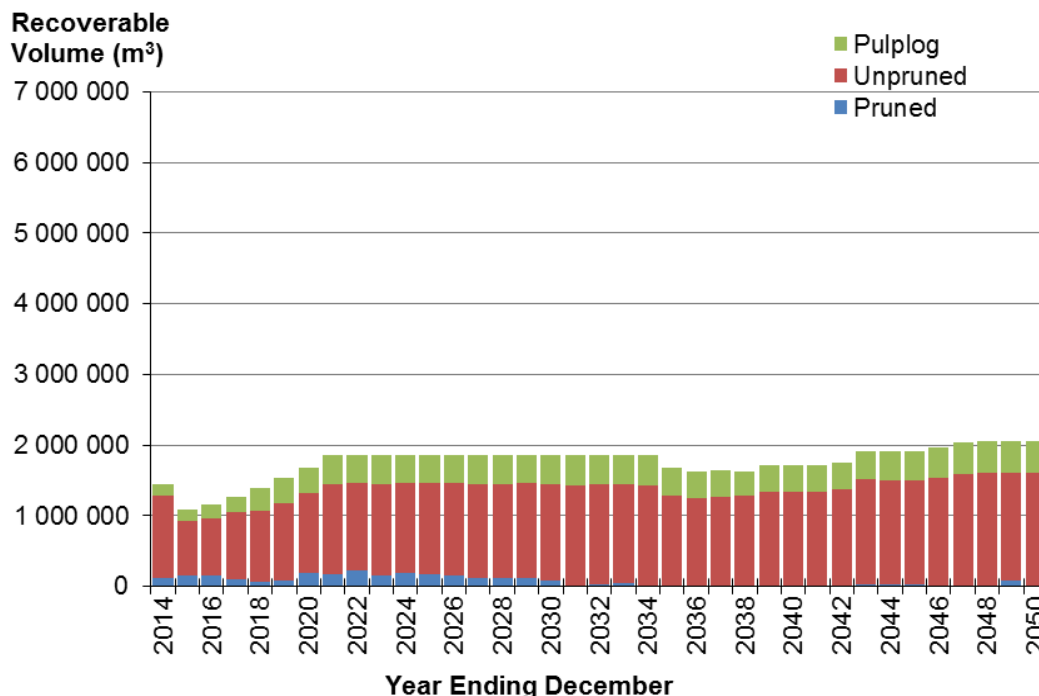


Figure 4-10: Nelson Average Radiata Pine Clearfell Age under Scenario 3 – by Ownership Category



The harvest volumes forecast under scenario 3 are shown by log grade in Figure 4-11.

Figure 4-11: Nelson Radiata Pine Availability under Scenario 3 – by Log Grade (All Owners)



4.5 Scenario 4

In this scenario, target rotation ages of 26 or 30 years are used (rather 28 years) and the same constraints are applied as in scenario 3 (Figure 4-12).

The harvest ages are somewhat constrained for the first ten years by the large-scale owners' harvest intentions and the requirement for a non-declining yield for the large owner's estate as well as the overall radiata pine estate. These constraints are partially relaxed for the 26 and 30 year target rotations to allow these rotation lengths to be more closely matched. Figure 4-13 illustrates however the difficulty in achieving the desired rotation lengths within the overall harvesting constraints imposed by the scenario.



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Figure 4-12: Nelson Radiata Pine Availability by Target Rotation Age under Scenario 4 – All Owners

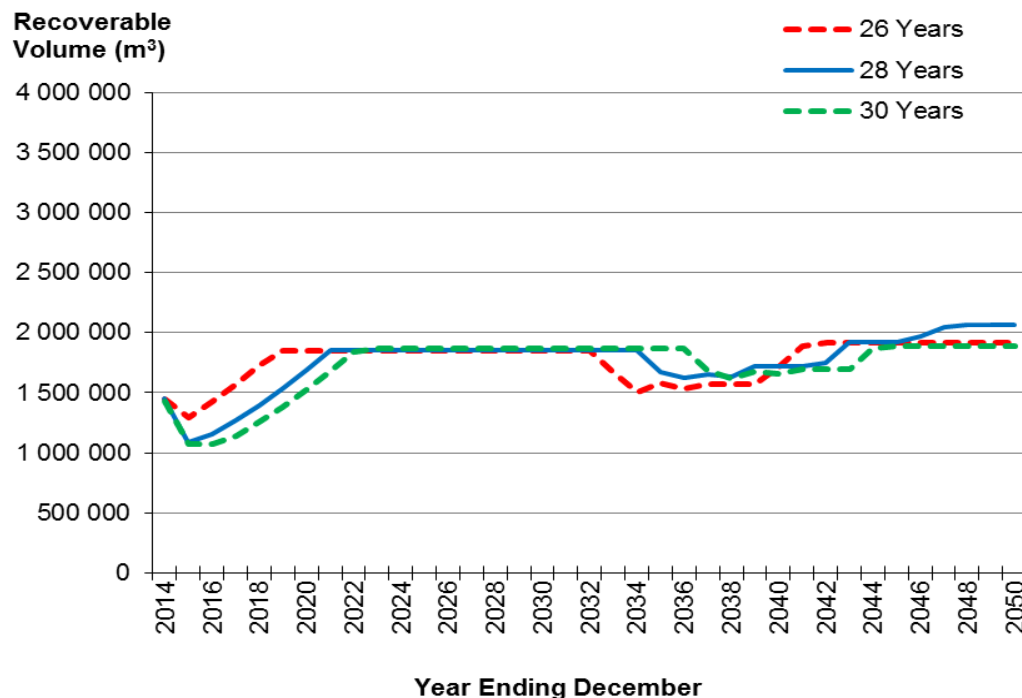
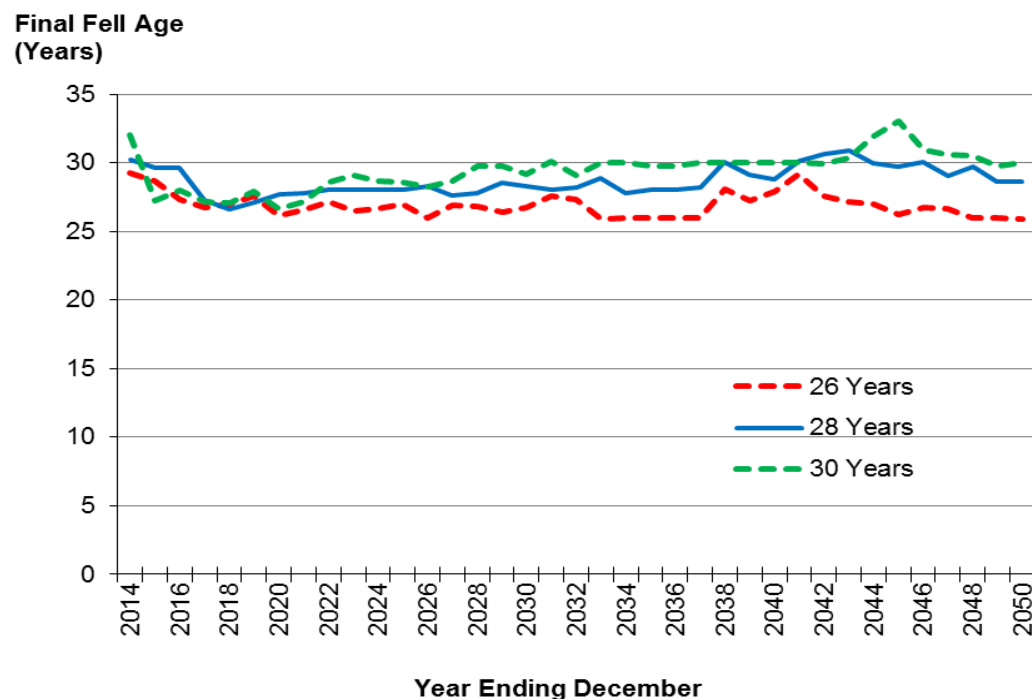


Figure 4-13: Nelson Average Radiata Pine Clearfell Age by Target Rotation Age under Scenario 4 – All Owners



4.6 Douglas-fir

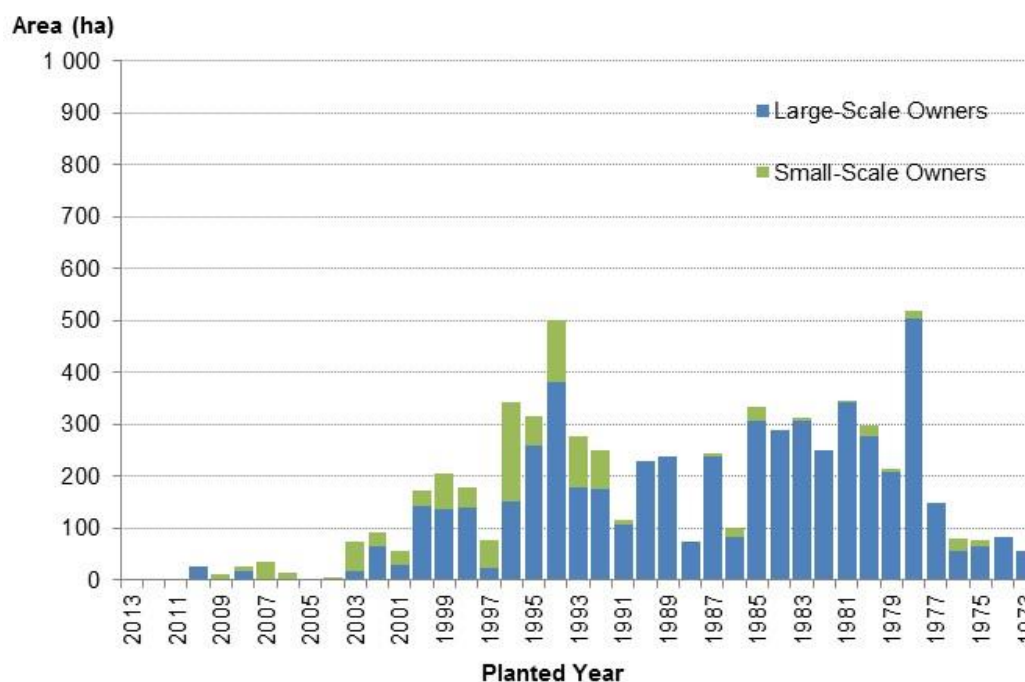
The age-class distribution of Douglas-fir in Nelson is shown in Figure 4-14.



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The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2014 to 2023. After 2023, the wood availability from large-scale owners is modelled in five-year period non-declining yield (NDY) blocks (i.e. 2024-2028, 2029-2033, etc). The total wood availability of the combined estate is also modelled to be non-declining within each of the five-year period NDY blocks (Figure 4-15). The harvest level for the first five-year NDY block is set to be the same as in 2023.

Figure 4-14: Nelson Age-class Distribution of Douglas-fir – All Owners as at 1 April 2014



The target rotation age is 40 years for Douglas-fir. Figure 4-16 shows that the modelled average age sits reasonably close to this target.

Figure 4-15: Nelson Douglas-fir Availability – All Owners

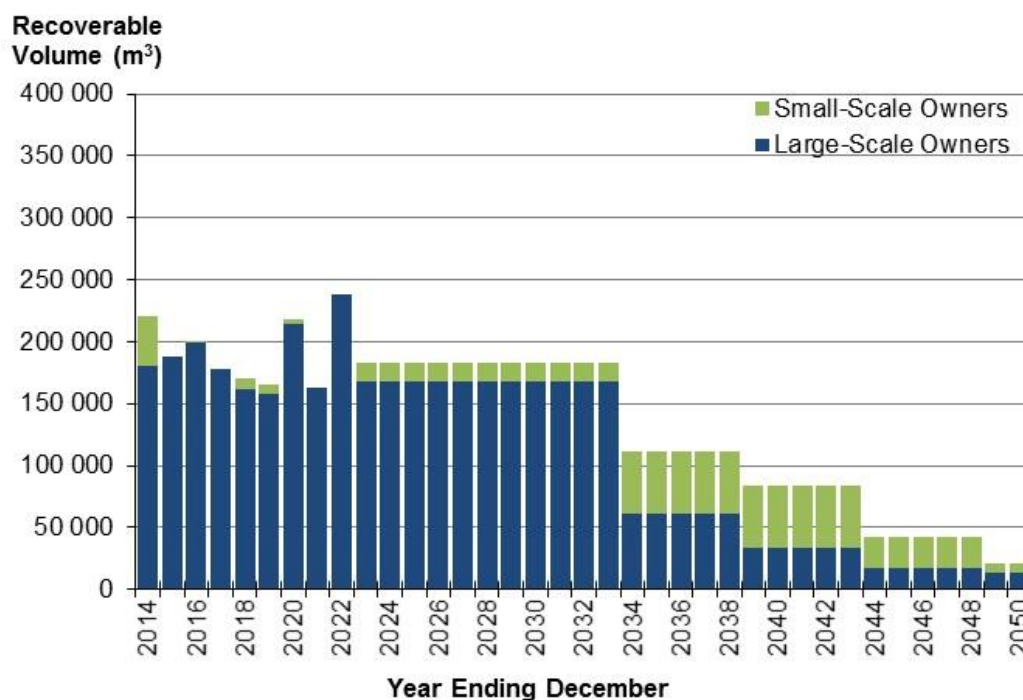
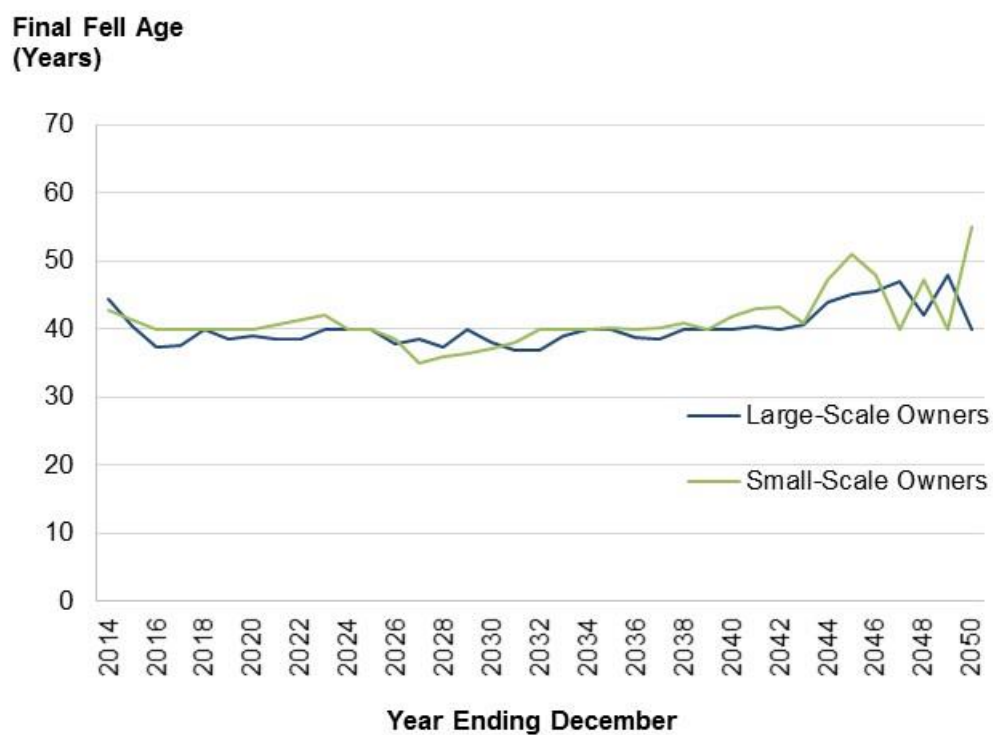


Figure 4-16: Nelson Average Douglas-fir Clearfell Age – by Ownership Category

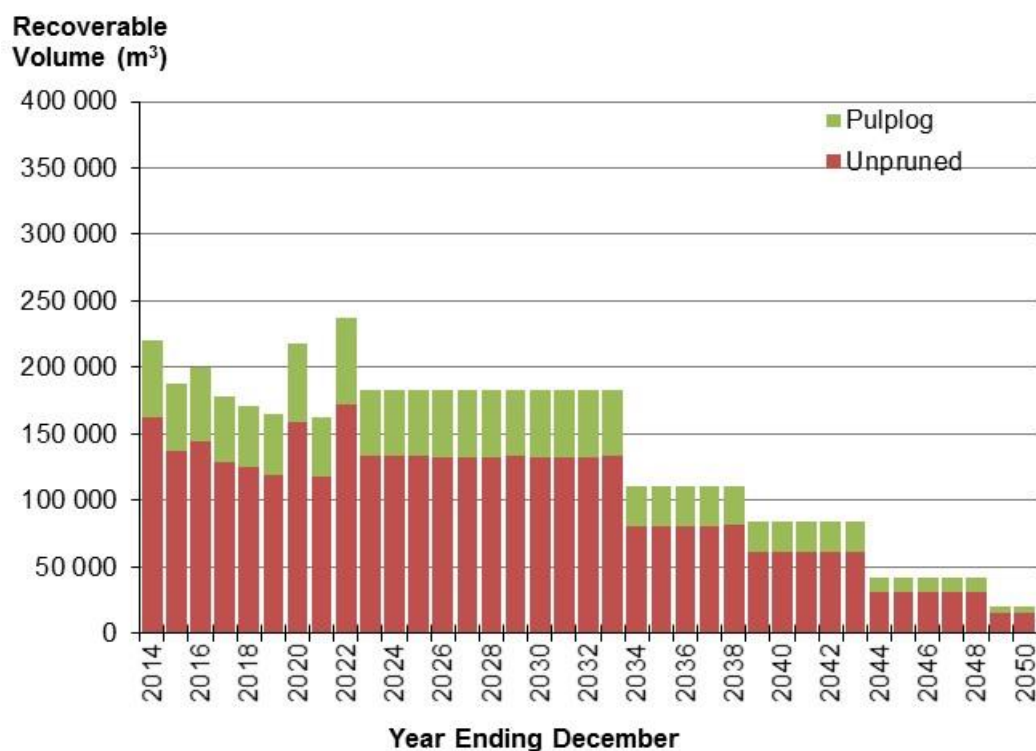


The harvest volumes forecast under the Douglas-fir scenario are shown by log grade in Figure 4-17.



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Figure 4-17: Nelson Douglas-fir Availability – by Log Grade (All Owners)



5. WOOD AVAILABILITY FORECASTS FOR MARLBOROUGH

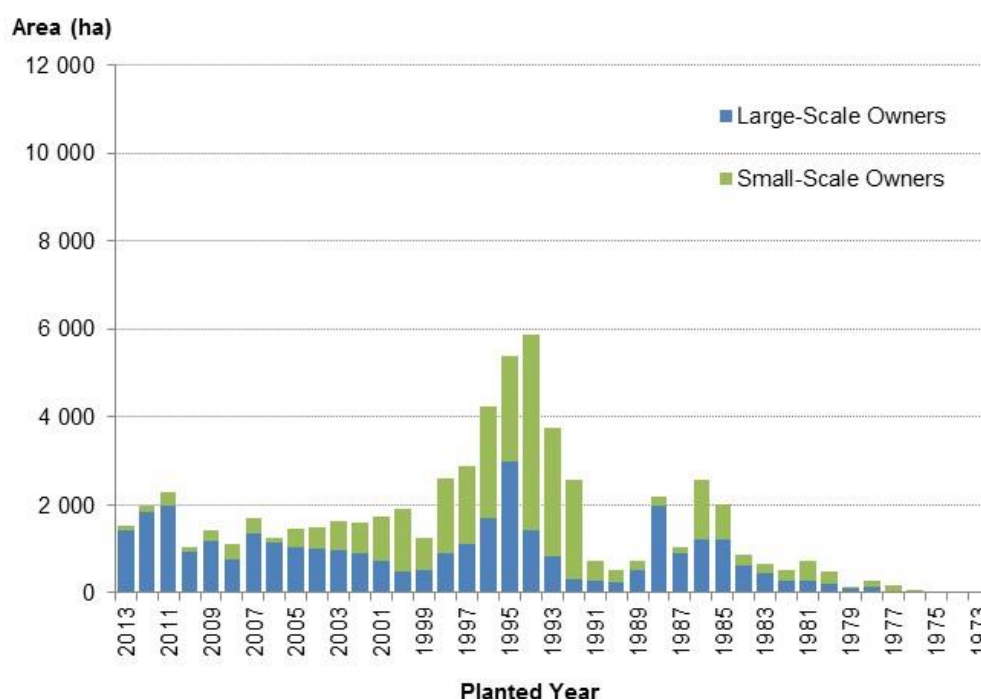
5.1 Marlborough Region Description

The Marlborough region has a plantation resource of 73 602 ha, spread across two territorial authorities – Marlborough and Kaikoura Districts. Of this, 70 317 ha consists of radiata pine and 2 133 ha are Douglas-fir.

After deductions described in Section 3.1 are applied to the NEFD area, the modelled area reduces to 65 629 ha.

The modelled resource consists of both radiata pine and Douglas-fir. Figure 5-1 shows the age-class distribution for the Marlborough estate by owner size. Some 53% of the modelled resource is held by large owners and 47% by small owners. As is the case with many other New Zealand regions, the age-class distribution highlights the peak in planting activity that occurred in the 1990s, particularly in the small owner resource. This has implications for the forecasted wood availability from the region.

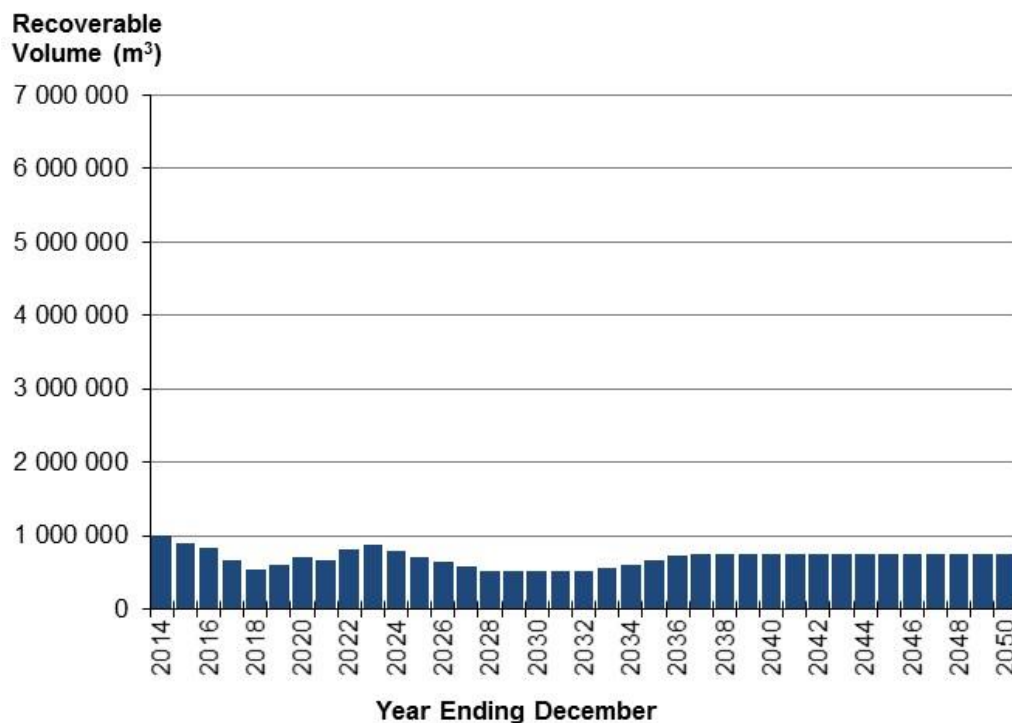
Figure 5-1: Marlborough Age-class Distribution by Owner – All Species as at 1 April 2014



5.2 Scenario 1

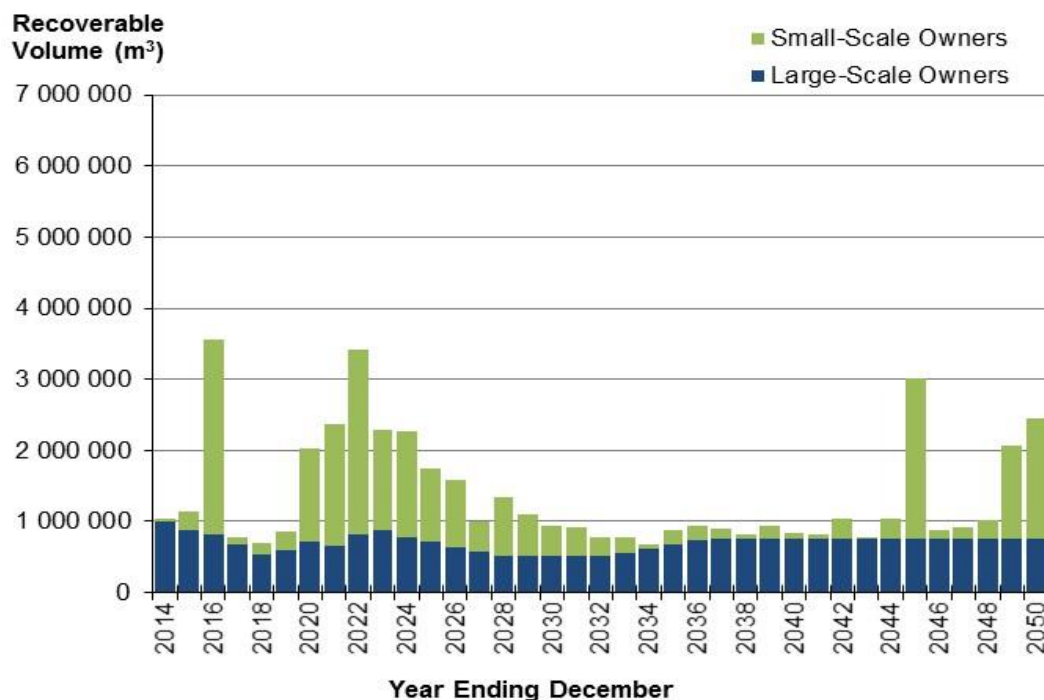
For this scenario, the availability of wood from large-scale owners is based on their stated harvest intentions for 2014 to 2023. Scenario 1 then specifies that the availability is constrained to be non-declining from this point with a target rotation age of 28 years. However, due to the highly uneven age-class distribution of the Marlborough resource, it was not possible to apply these constraints and obtain a feasible solution. The NDY constraint was therefore partially relaxed through to 2028. The resulting wood-flow is shown in Figure 5-2.

Figure 5-2: Marlborough Radiata Pine Availability under Scenario 1– Large-Scale Owners



The wood availability from all owners in Marlborough is presented in Figure 5-3. The large-scale owners' resource is shown as the base volume, and the forecast matches Figure 5-2. The fluctuation in the total volume harvested reflects the uneven age-class distribution of the small-scale owners' estate, and the assumption that this estate is harvested at age 28.

Figure 5-3: Marlborough Radiata Pine Availability under Scenario 1 – All Owners





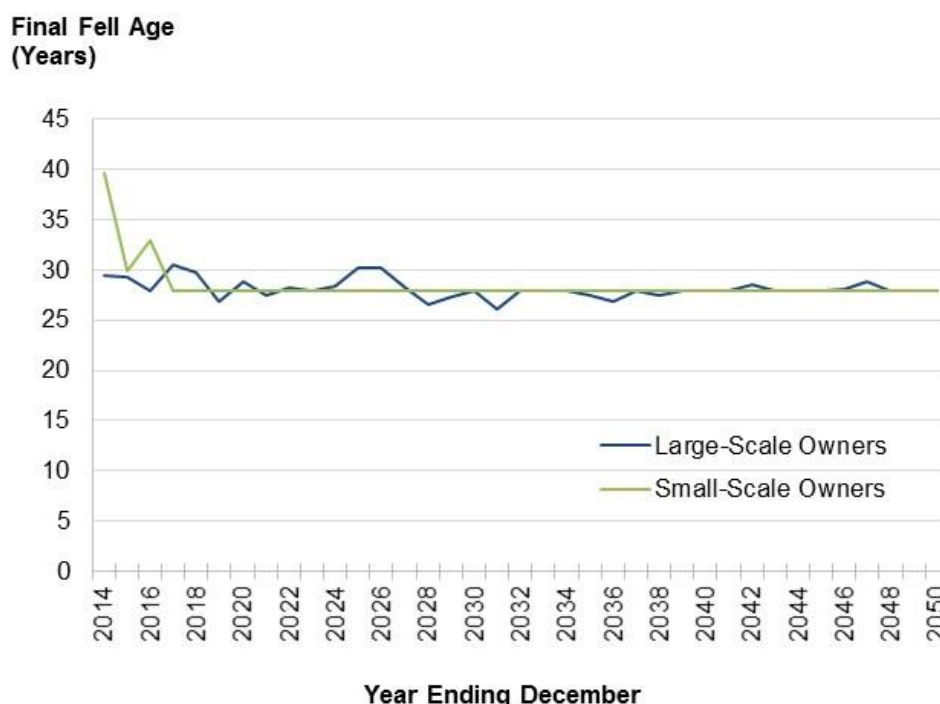
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The high level of harvest occurring in 2016 represents areas of the small-owner resource that are already over the target rotation age of 28 years, and which must be harvested by 2016 in order to keep the harvest age below the maximum allowable of age 40 years. The large increase in small owner resource occurring from 2020 onwards is a consequence of the high levels of 1990s plantings reaching maturity.

Volume fluctuations of the magnitude shown in Figure 5-3 would be impractical because of the challenges that arise from harvest operation constraints (for example, limited harvest machinery, harvesting crews, and transport operators) and market constraints (for example, limited domestic wood processing facilities). There would not be enough harvesting capacity (harvesting crews and equipment) to cut all the volume available during the peak period, and it would be difficult to get short-term sales contracts to cover this volume.

Figure 5-4 shows that, apart from the near-term harvest (which is constrained to the intentions of the large scale owners, and due to the presence of age-classes already older than age 28), the harvest age settles at the target of 28 years.

Figure 5-4: Marlborough Average Radiata Pine Clearfell Age under Scenario 1 – by Ownership Category



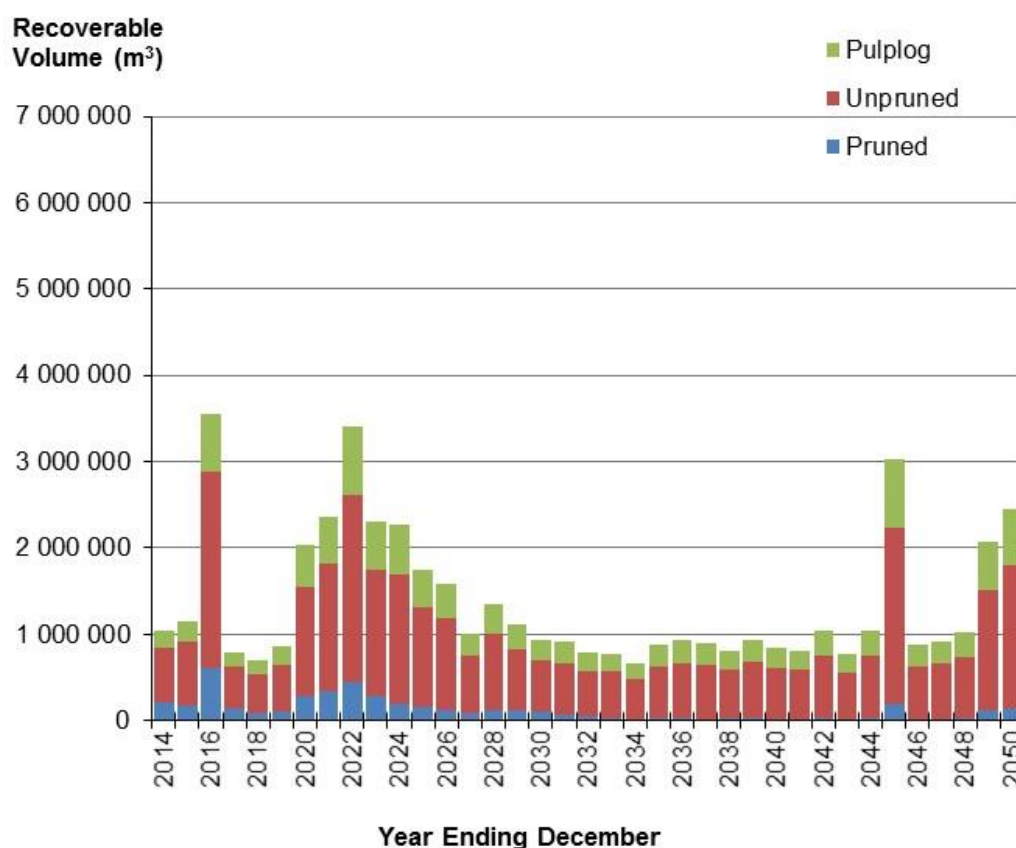
The harvest volumes forecast under scenario 1 are broken down by log grade in Figure 5-5. Of note is the declining availability of pruned log supply. This is a result of the assumed lack of re-



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establishment of pruned regimes after harvest (10% for large owners and 50% for small owners).

Figure 5-5: Marlborough Radiata Pine Availability under Scenario 1 – by Log Grade (All Owners)



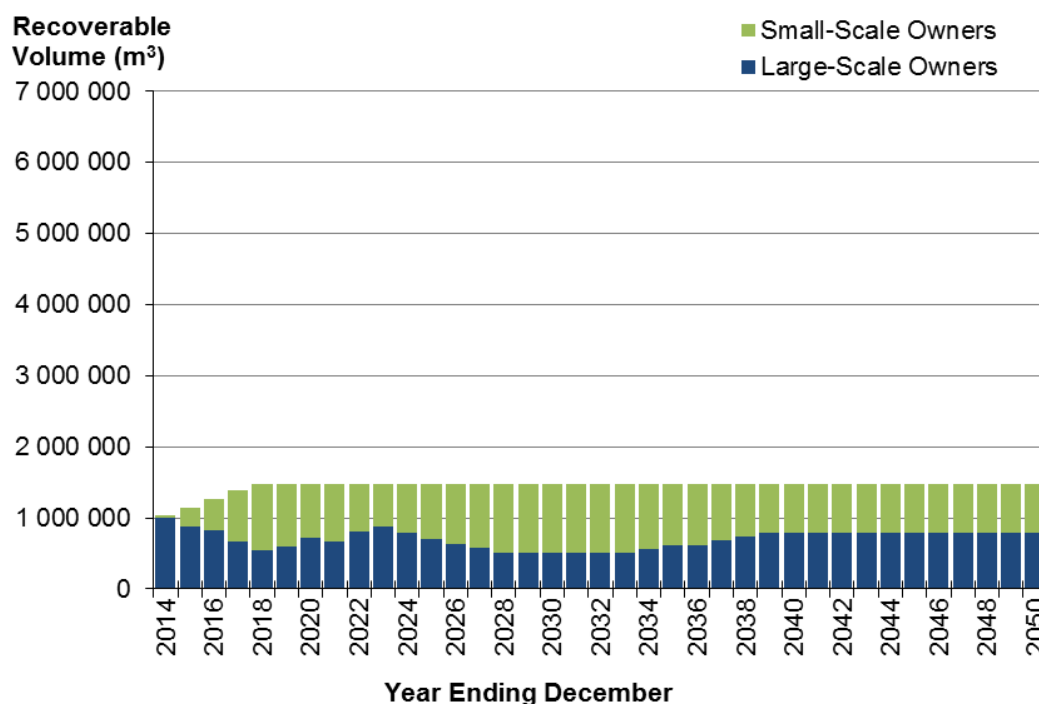
5.3 Scenario 2

The second scenario assumes large-scale owners harvest as per their intentions for the first 10 years, then a non-declining yield constraint is applied to the large-scale owners' estate after 2023. In addition, a non-declining yield constraint is also applied to the total radiata pine volume, with a target rotation age of 28 years. Figure 5-6 highlights that the volume from the large-scale owner resource generally declines over the next ten years, and longer term, more than half of the Marlborough region supply will arise from the small-scale owner resource.



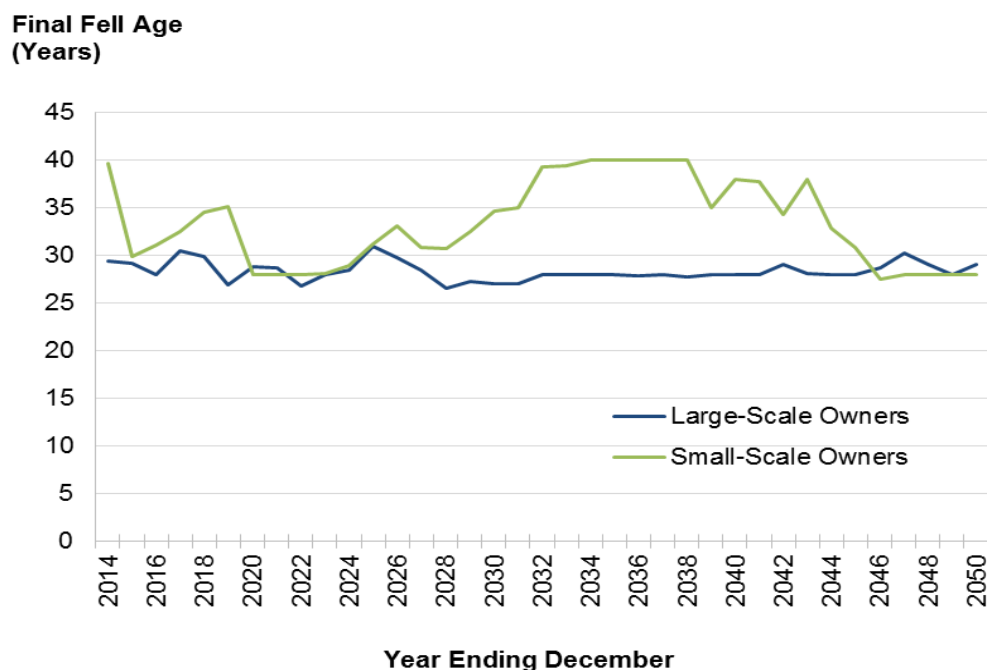
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Figure 5-6: Marlborough Radiata Pine Availability under Scenario 2 – All Owners



This scenario does at times require that the harvest age varies significantly from the target rotation age of 28 years. This is especially the case for small-scale forest owners (Figure 5-7).

Figure 5-7: Marlborough Average Radiata Pine Clearfell Age under Scenario 2 – by Ownership Category

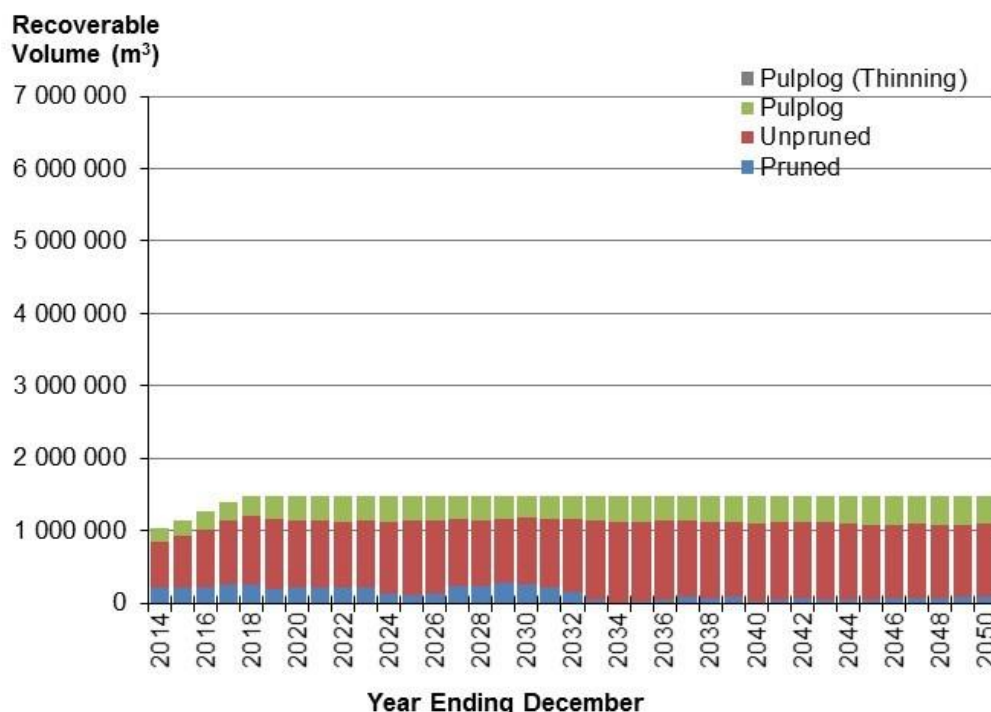


The harvest volumes forecast under scenario 2 are broken down by log grade in Figure 5-8.



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Figure 5-8: Marlborough Radiata Pine Availability under Scenario 2 – by Log Grade (All Owners)



5.4 Scenario 3

The third scenario again assumes large owners' resources are harvested in line with their harvest intentions between 2014 and 2023, and then non-declining after 2023. However, the overall yield is based on a split non-declining yield, with a target rotation age of 28 years. A drop in the overall harvest volume is allowed after 2034 for a five-year period (between 2035 and 2039) (of no more than 10% per year). This scenario gives forecast wood availability that is similar to scenario 2 through to 2017 (Figure 5-9). Thereafter total volume is maintained though to 2034 at a level slightly higher than scenario 2, before reducing to a lower level before increasing again in the late 2040s.

The main difference from scenario 2 is that the large area of young stands in the small-scale owners' estate is assumed to be harvested over a shorter period of time, although the total volume was modelled not to decrease between 2014 and 2034.

Despite a more flexible harvest level being allowed in this scenario, average harvest age for the small-scale owner estate still at times varies significantly from the target of 28 years (Figure 5-10). The variance is however less than for scenario 2.



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Figure 5-9: Marlborough Radiata Pine Availability under Scenario 3 – All Owners

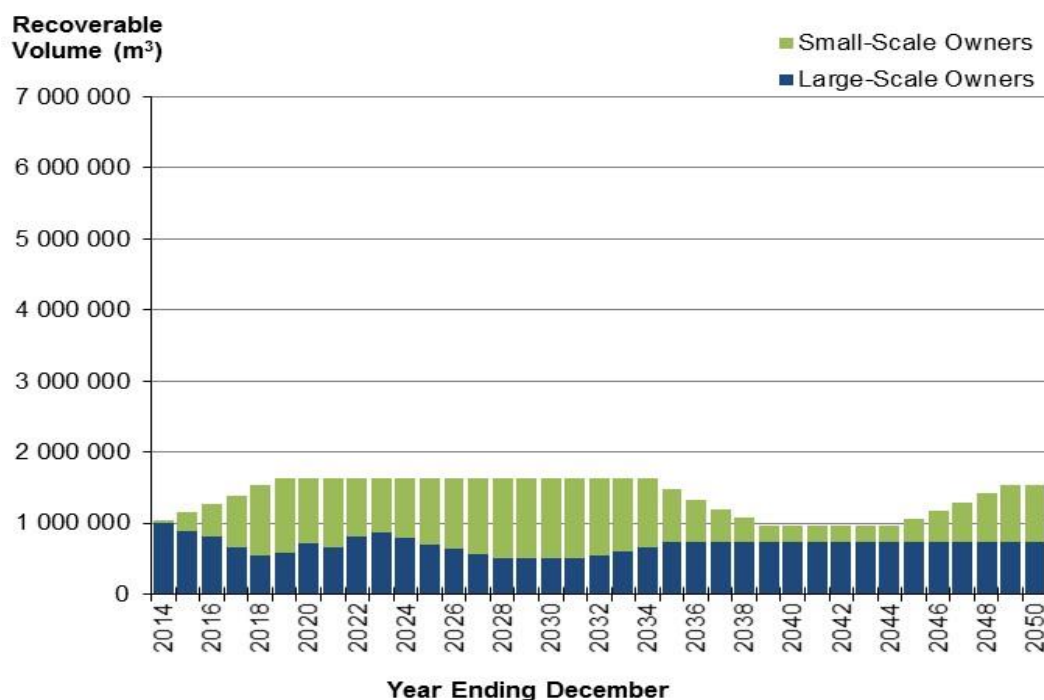
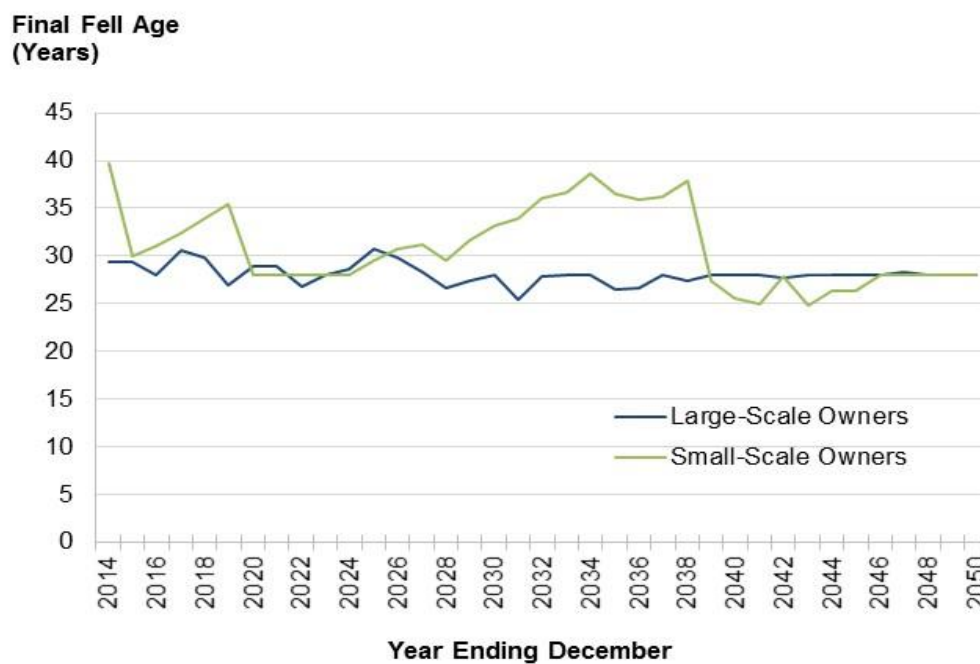


Figure 5-10: Marlborough Average Radiata Pine Clearfell Age under Scenario 3 – by Ownership Category

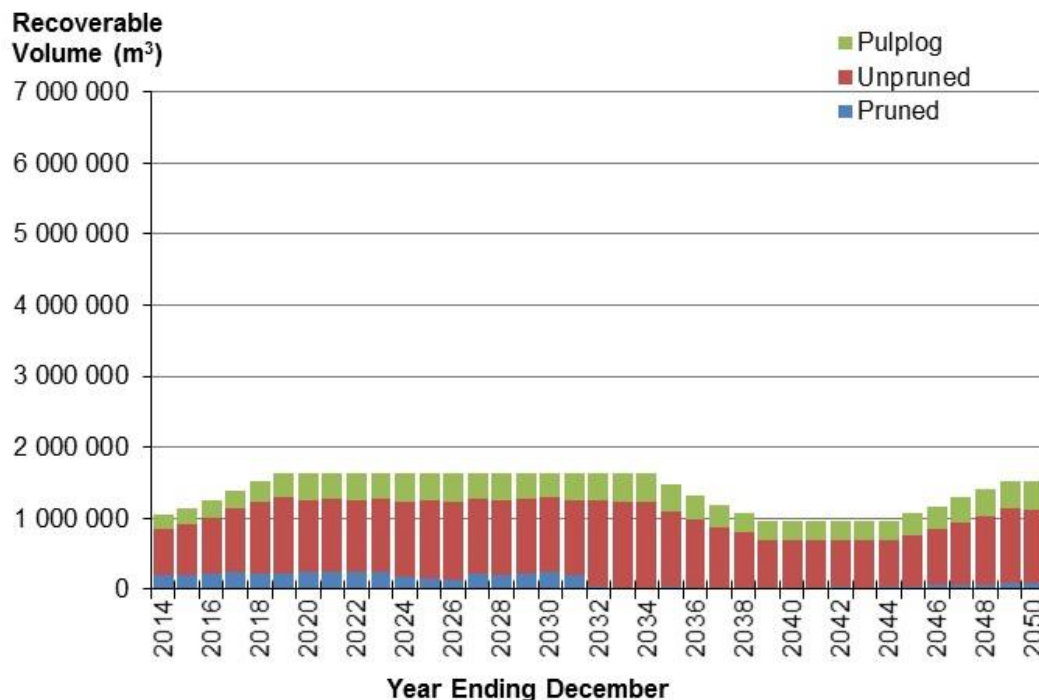


The harvest volumes forecast under Scenario 3 are broken down by log grade in Figure 5-11.



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Figure 5-11: Marlborough Radiata Pine Availability Under Scenario 3 – by Log Grade (All Owners)



5.5 Scenario 4

Target rotation ages of 26 or 30 years are used (rather 28 years) and the same constraints are applied as Scenario 3 (Figure 5-12).

Because of the limitations imposed by the current age-class distribution and large-scale owners' stated harvest intentions, it takes some time to achieve separation of average clearfell age (Figure 5-13).



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Figure 5-12: Marlborough Radiata Pine Availability by Target Rotation Age under Scenario 4 – All Owners

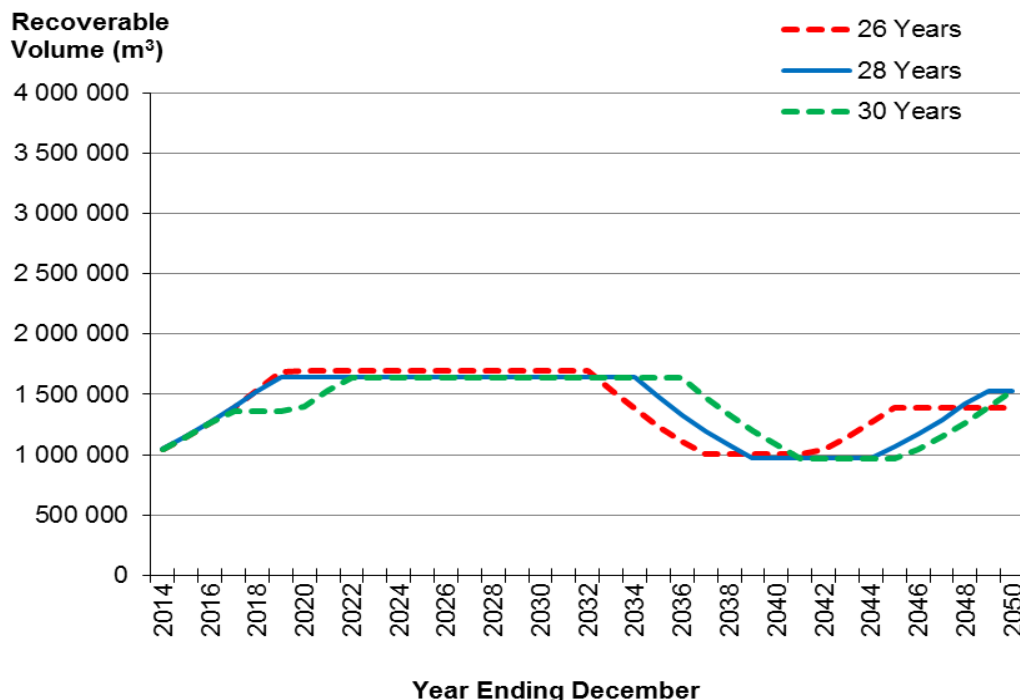
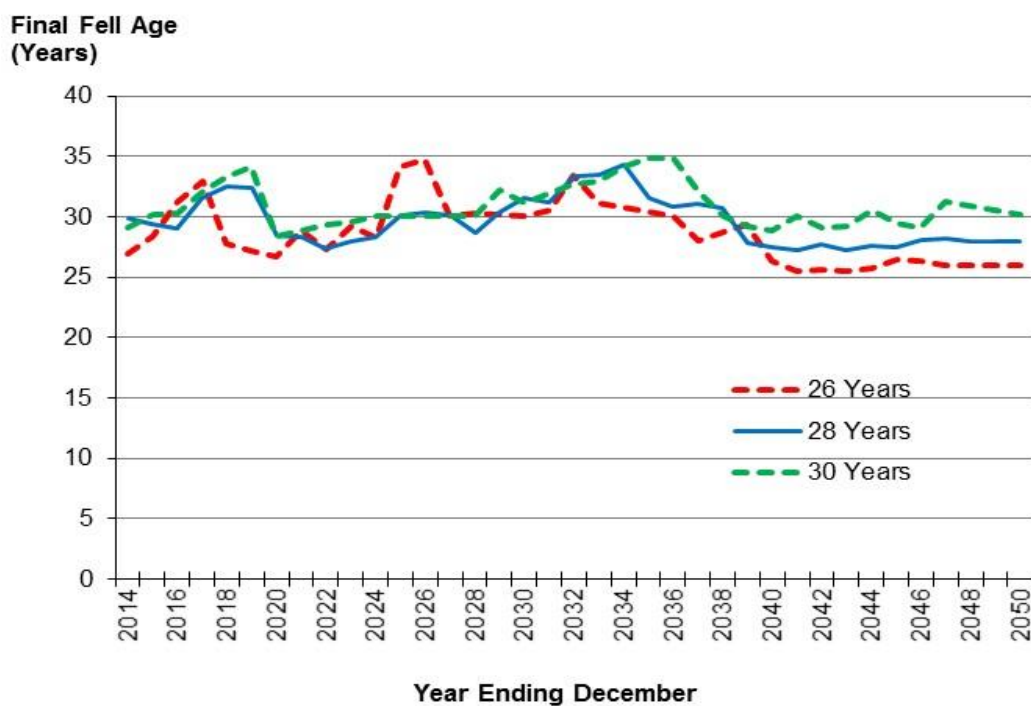


Figure 5-13: Marlborough Average Radiata Pine Clearfell Age by Target Rotation Age under Scenario 4 – All Owners



5.6 Douglas-fir

The age-class distribution of Douglas-fir in Marlborough is shown in Figure 5-14. The distribution is bi-modal with the majority of the area planted in the 1980s or the late 1990s. This age-class structure imposes challenges for yield regulation.

Figure 5-14: Marlborough Age-class Distribution of Douglas-fir – All Owners Estate as at 1 April 2014

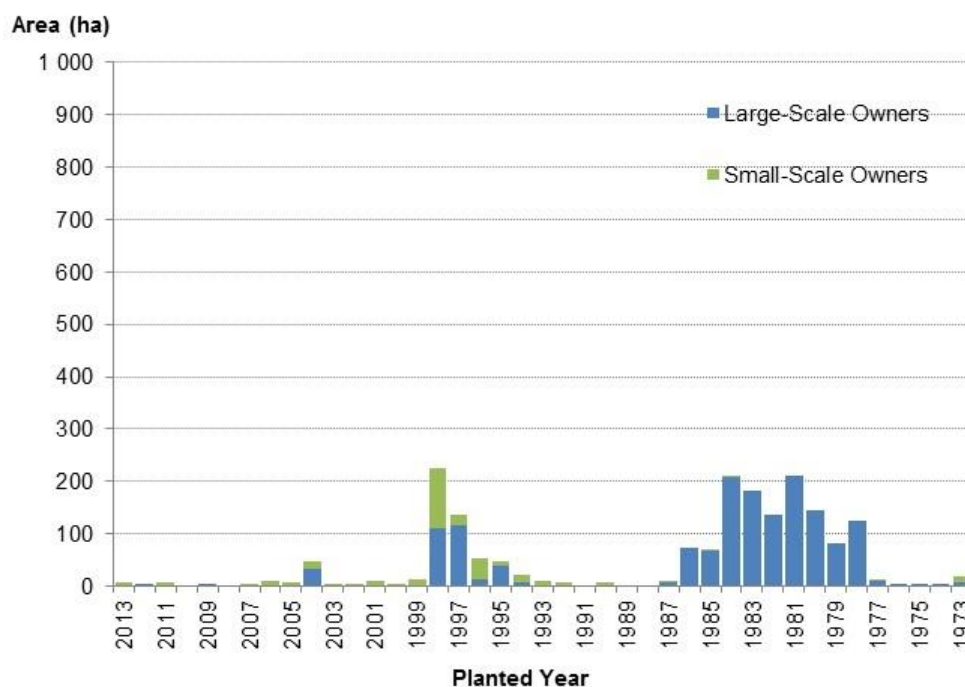
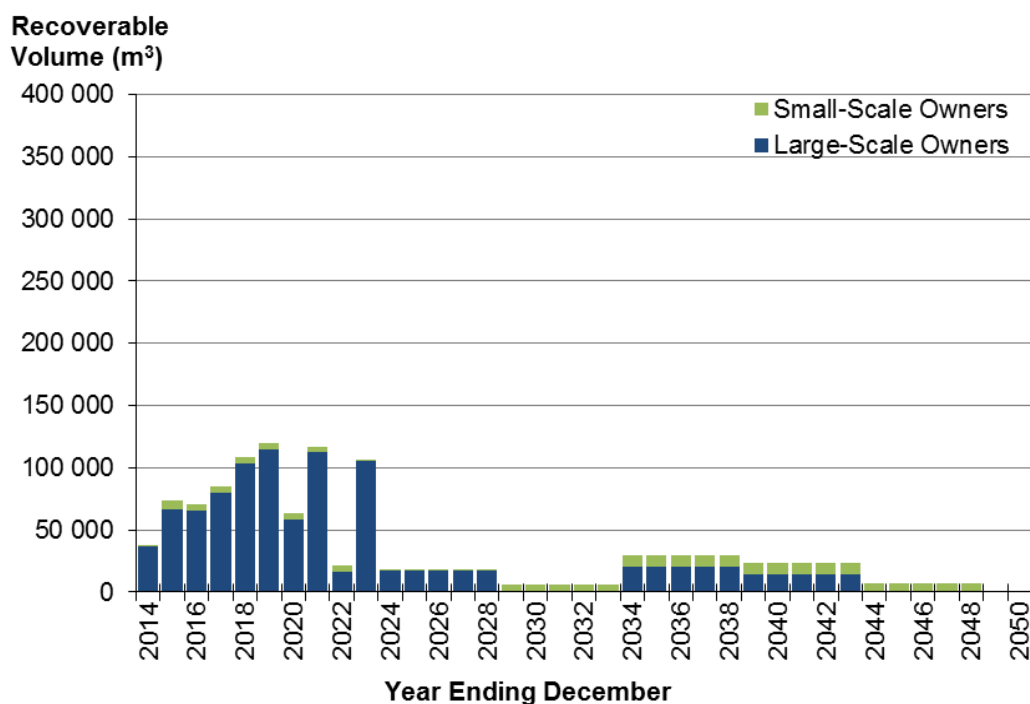


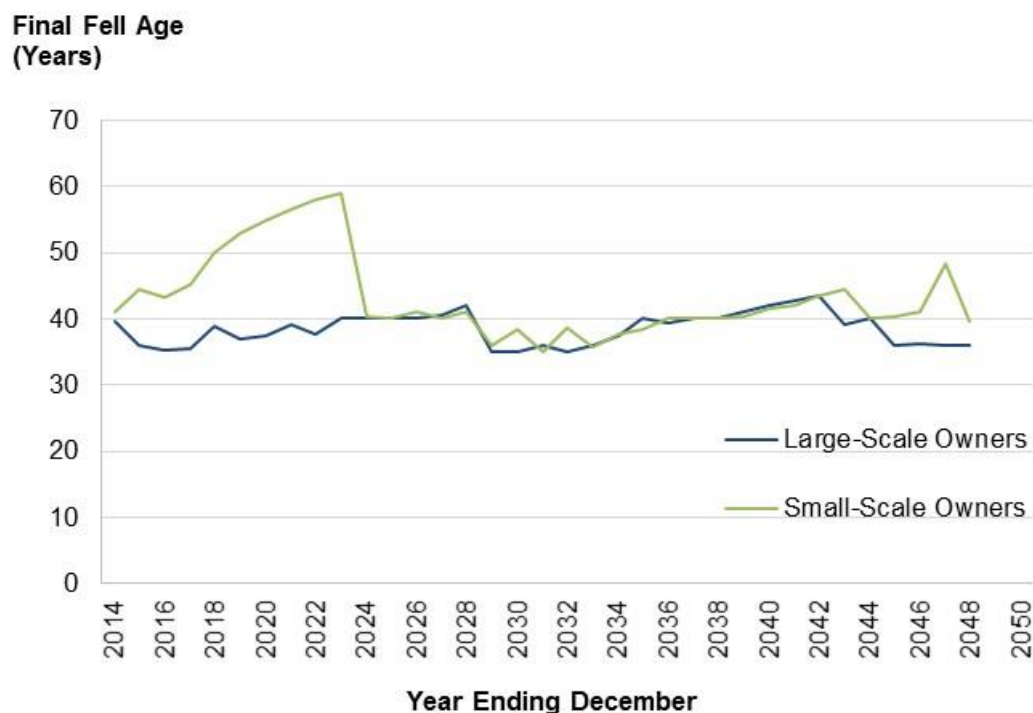
Figure 5-15 shows the derived wood-flow forecast for Marlborough Douglas-fir. The harvest for the large-scale owners' estate is based on intentions for 2014 to 2023. After 2023, the wood availability from large-scale owners is modelled in five-year period non-declining yield (NDY) blocks (i.e. 2024-2028, 2029-2033, etc). The total wood availability of the combined estate is also modelled to be non-declining within each of the five-year period NDY blocks. The harvest level for the first five-year NDY block is set to be the same as in 2023.

While there are reasonable volumes of Douglas-fir forecast to be harvested over the next ten years, longer term Figure 5-15 highlights the declining availability of this species due to the current age class structure, and the low levels of replanting.

Figure 5-15: Marlborough Douglas-fir Availability – All Owners



The target rotation age is 40 years for Douglas-fir. Figure 4-16 shows that the modelled average age sits reasonably close to this target for the large owner estate, but there is significant variance to this average in the small owner estate (in order to achieve a feasible output).





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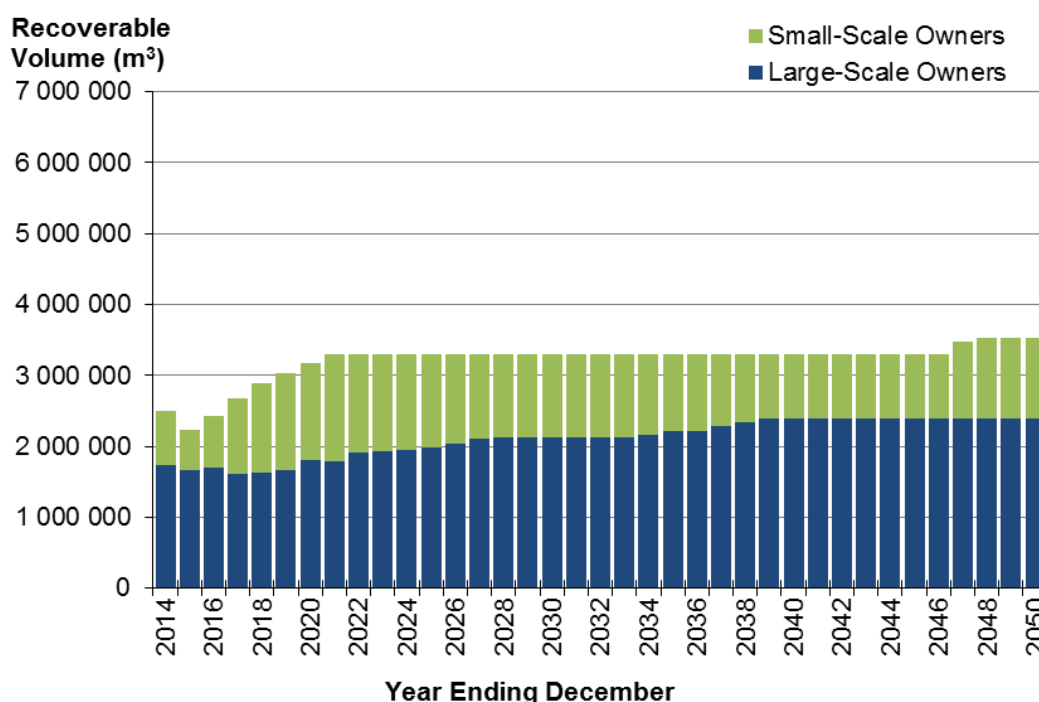
6. WOOD AVAILABILITY FORECASTS FOR THE COMBINED NELSON & MARLBOROUGH ESTATE

The combined radiata pine forecasts for Nelson & Marlborough are presented for scenario 2 (Figure 6-1 and Figure 6-2), scenario 3 (Figure 6-3 and Figure 6-4) and scenario 4 (Figure 6-5).

6.1 Scenario 2

The second scenario is based on a non-declining yield, and a target rotation of 28 years. Figure 6-1 indicates that wood availability from the Nelson & Marlborough region will increase from 2016, although this is largely driven by an increase in harvest volumes from small-scale forest owners.

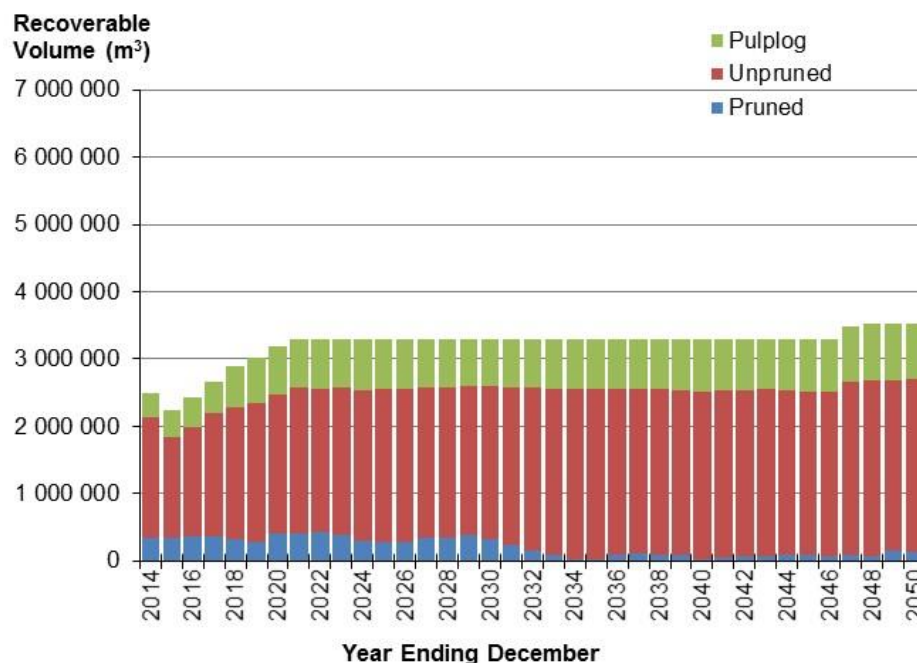
Figure 6-1: Nelson & Marlborough Radiata Pine Availability under Scenario 2 – by Ownership Size





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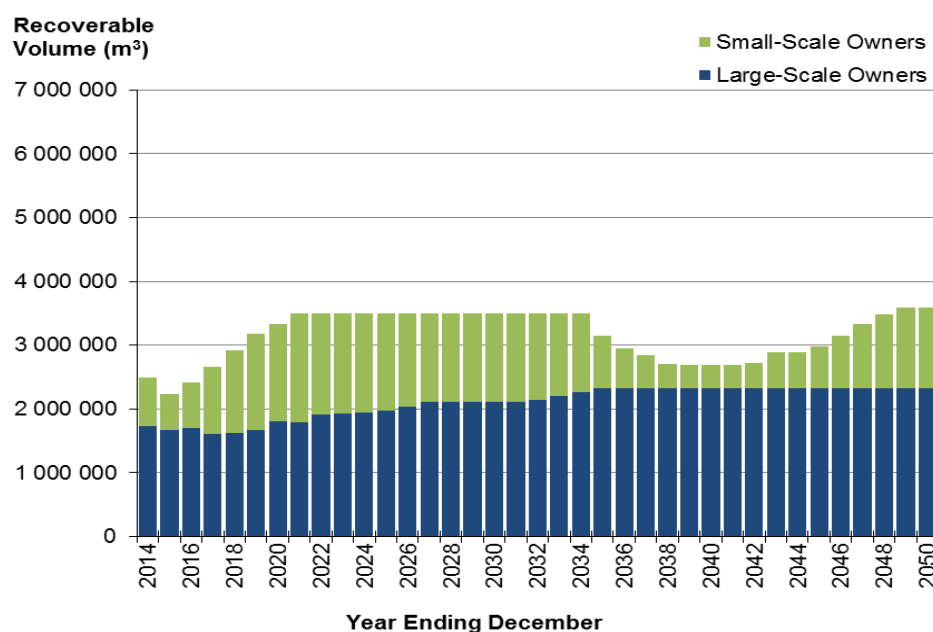
Figure 6-2: Nelson & Marlborough Radiata Pine Availability under Scenario 2 – by Log Type (All Owners)



6.2 Scenario 3

The third scenario is based on a split non-declining yield, with a target rotation age of 28 years (Figure 6-3 and Figure 6-4).

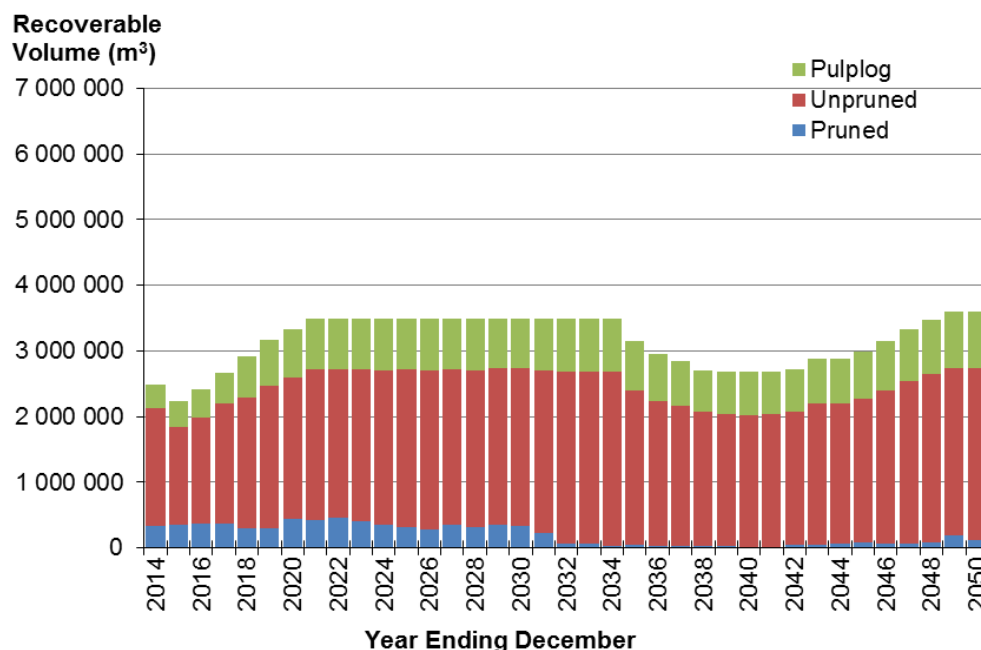
Figure 6-3: Nelson & Marlborough Radiata Pine Availability under Scenario 3 – by Ownership Size





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Figure 6-4: Nelson & Marlborough Radiata Pine Availability under Scenario 3 – by Log Type (All Owners)

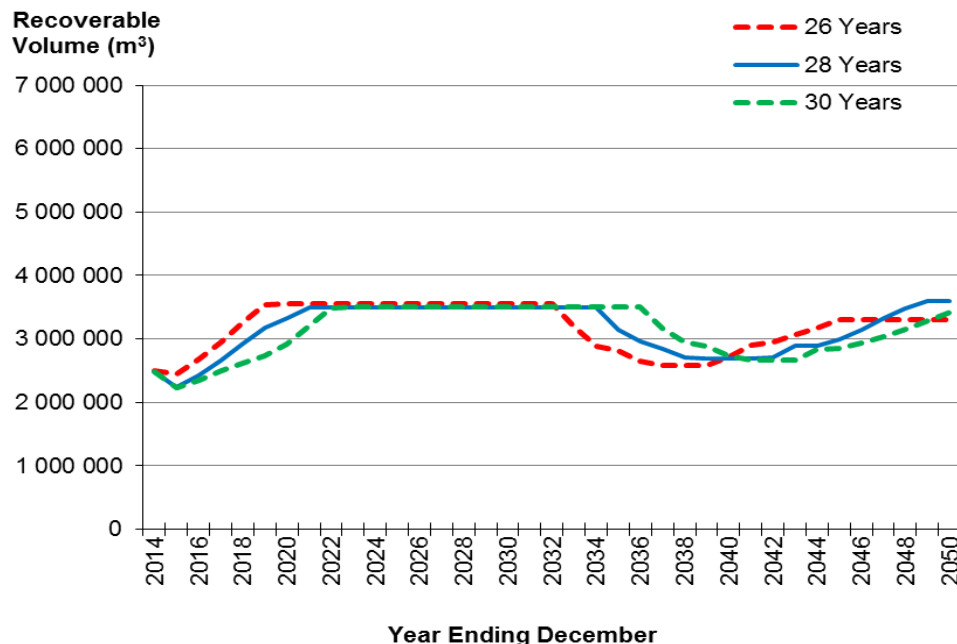


6.3 Scenario 4

Different wood availability profiles are generated if the target rotation age is altered from 28 years to either 26 or 30 years.

Figure 6-5 indicates a band of possible wood availability profiles. The harvest ages are somewhat constrained for the first ten years by the large-scale owners' harvest intentions and the requirement for a non-declining yield for the large owner's estate as well as the overall radiata pine estate. These constraints are loosened somewhat for the 26 and 30 year target rotations to allow these rotation lengths to be more closely matched.

Figure 6-5: Nelson & Marlborough Radiata Pine Availability by Target Rotation Age under Scenario 4



6.4 Douglas-fir

Figure 6-6 and Figure 6-7 show the combined Nelson & Marlborough Douglas-fir wood availability. Supply gradually dissipates due to the age-class distribution of the existing resource, and the replanting of Douglas-fir areas into radiata pine.

Figure 6-6: Nelson & Marlborough Douglas-fir Availability – by Ownership Size

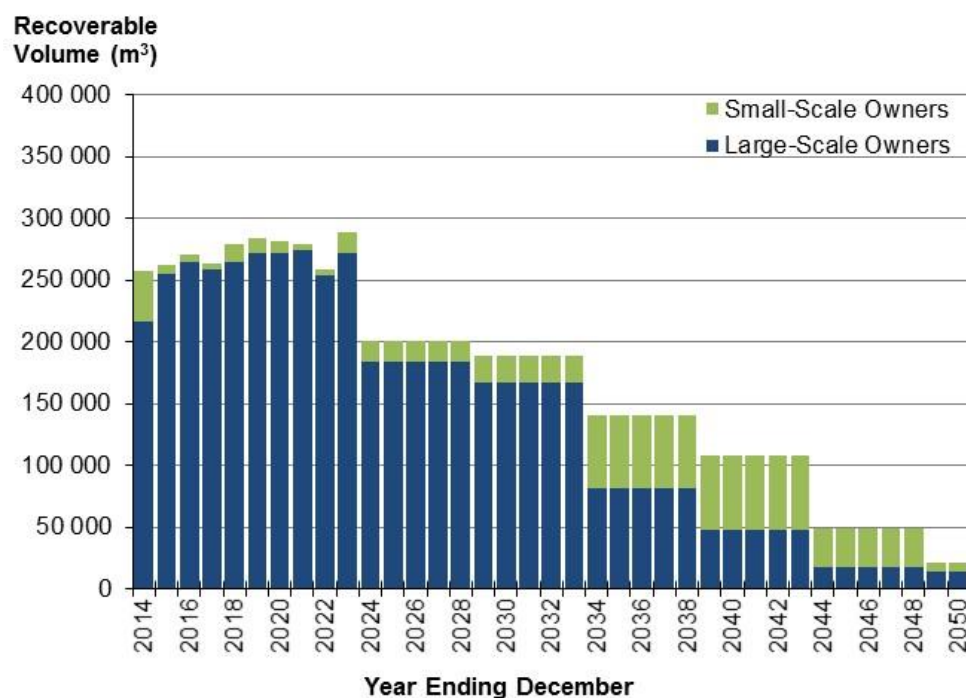
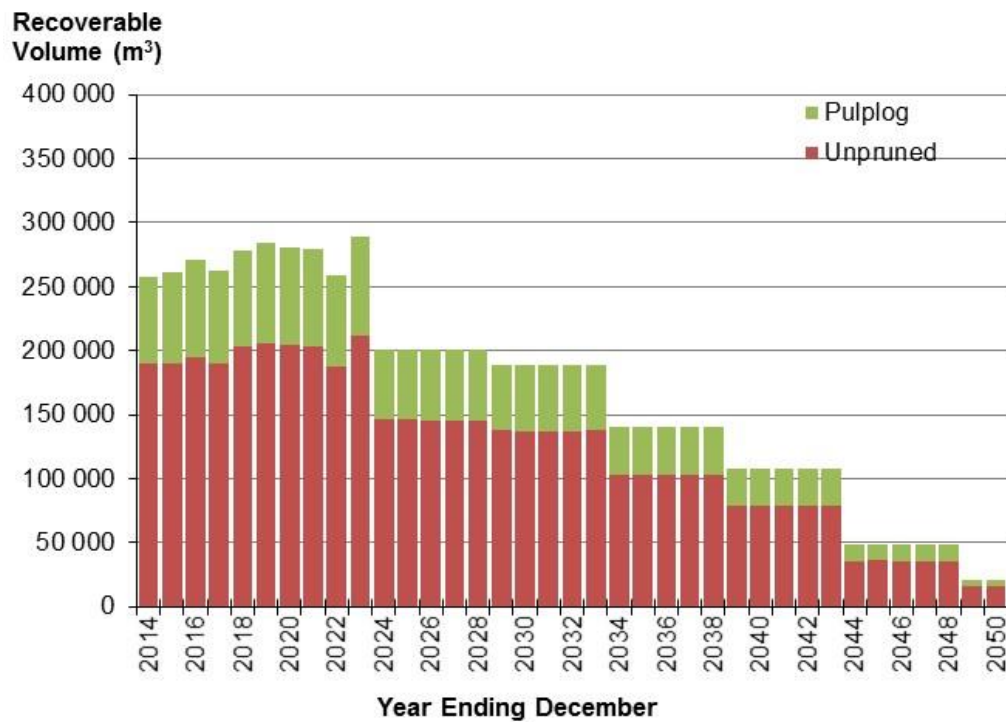


Figure 6-7: Nelson & Marlborough Douglas-fir Availability – by Log Grade (All Owners)



7. COMPARISON TO PREVIOUS FORECASTS

The results of the 2014 wood availability forecasts were compared with the previous forecasts, undertaken in 2006 for each region (Figure 7-1 and Figure 7-2). The comparison is based on Scenario 2 (which is equivalent to Scenario 3 in the 2006 forecasts). For Nelson, the latest forecast is generally similar although settling at a long term harvest level 5% lower than the 2006 forecast. The latest Marlborough forecast increases more rapidly than the 2006 forecast, and shows a long term sustainable harvest nearly 14% higher than the 2006 forecast.

Figure 7-1: Wood Availability Forecasts (All Radiata Pine): 2006 vs 2014 - Nelson

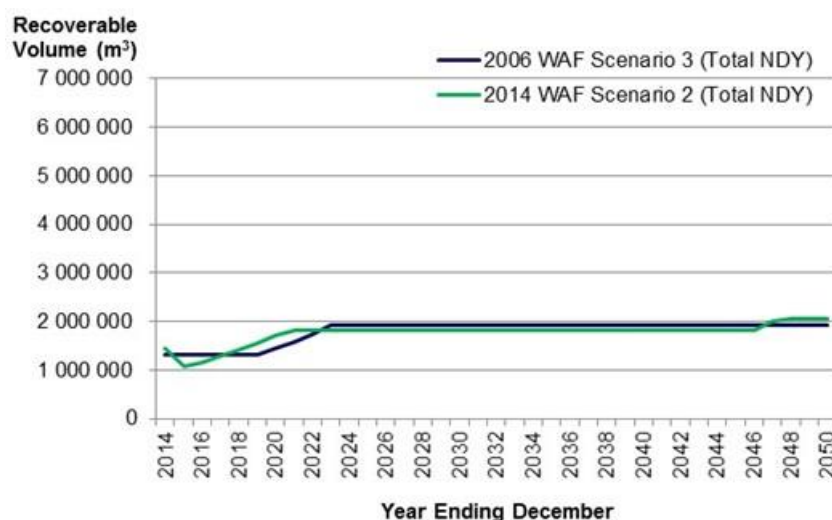


Figure 7-2: Wood Availability Forecasts (All Radiata Pine): 2006 vs 2014 - Marlborough

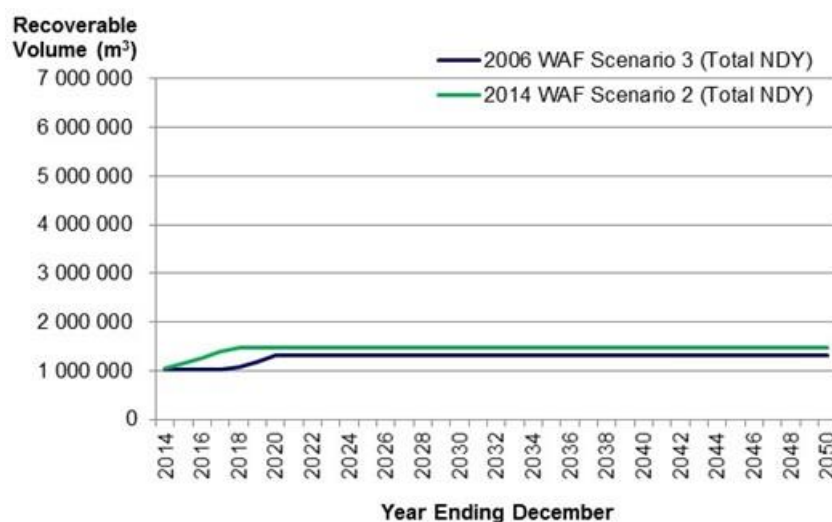


Table 7-1 and Table 7-2 compare area and yield measures from the 2006 and 2014 WAFs for Nelson and Marlborough, respectively. For both regions the following trends are apparent:

- A decline in stocked area since the 2006 WAF (6% Nelson and 4% Marlborough)
- A move in area from the lower yielding pruned to higher yielding unpruned croptypes
- A move in area from the lower yielding pre-90 to higher yielding post-89 croptypes.
- An increase in productivity across all croptype groups, with the increase being higher in Marlborough than Nelson.

The other key change since the 2006 WAF has been a reduction in the target rotation age from 30 years to 28 years.

Combined, these factors result in a lower long term harvest level for Nelson (Figure 7-1) and an increased harvest from Marlborough (Figure 7-2). For the combined Nelson & Marlborough region, the long term, harvest level is 4% higher than that predicted in the 2006 forecast.

Table 7-1: Area by Croptype and Croptype Yields – Nelson (Radiata pine)

Croptype Group	Yield Tables (age 28 TRV)			Area (ha)		
	2006 WAF	2014 WAF	% Change in TRV	2006 WAF	2014 WAF	% Change in Area
By Regime						
Pruned	471	562	19%	36 529	20 034	-45%
Unpruned	599	639	7%	50 341	61 613	22%
				86 870	81 647	-6%
By Maturity Class						
Pre-90	496	530	7%	33 661	7 035	-79%
Post-89	576	628	9%	53 209	74 612	40%
				86 870	81 647	-6%

Table 7-2: Area by Croptype and Croptype Yields – Marlborough (Radiata pine)

Croptype Group	Yield Tables (age 28 TRV)			Area (ha)		
	2006 WAF	2014 WAF	% Change in TRV	2006 WAF	2014 WAF	% Change in Area
By Regime						
Pruned	487	575	18%	47 349	33 599	-29%
Unpruned	509	610	20%	19 169	30 083	57%
				66 518	63 682	-4%
By Maturity Class						
Pre-90	474	560	18%	25 756	11 187	-57%
Post-89	507	598	18%	40 762	52 495	29%
				66 518	63 682	-4%

Figure 7-3 compares the area-age-class distribution between the NEFD data used in 2006 and 2014. As well as the normal removal of the oldest age-classes due to harvesting, and the addition of younger age-classes through planting, there is evidence of reductions in area of other age-classes due to land conversion and wind damage.

Figure 7-3: Area Age-Class Comparisons: NEFD 2006 vs NEFD 2014 - Nelson

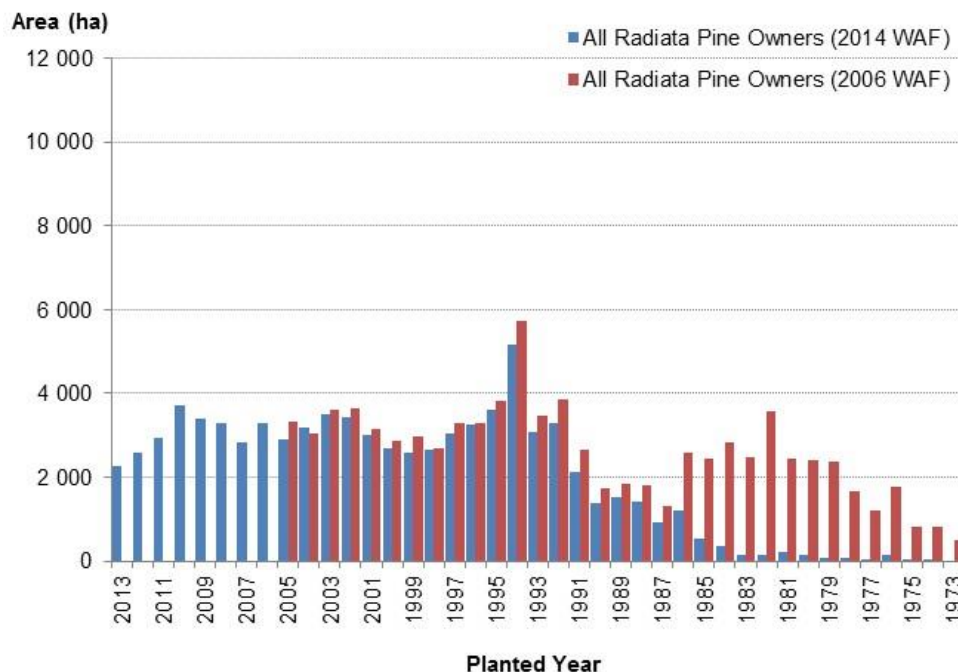
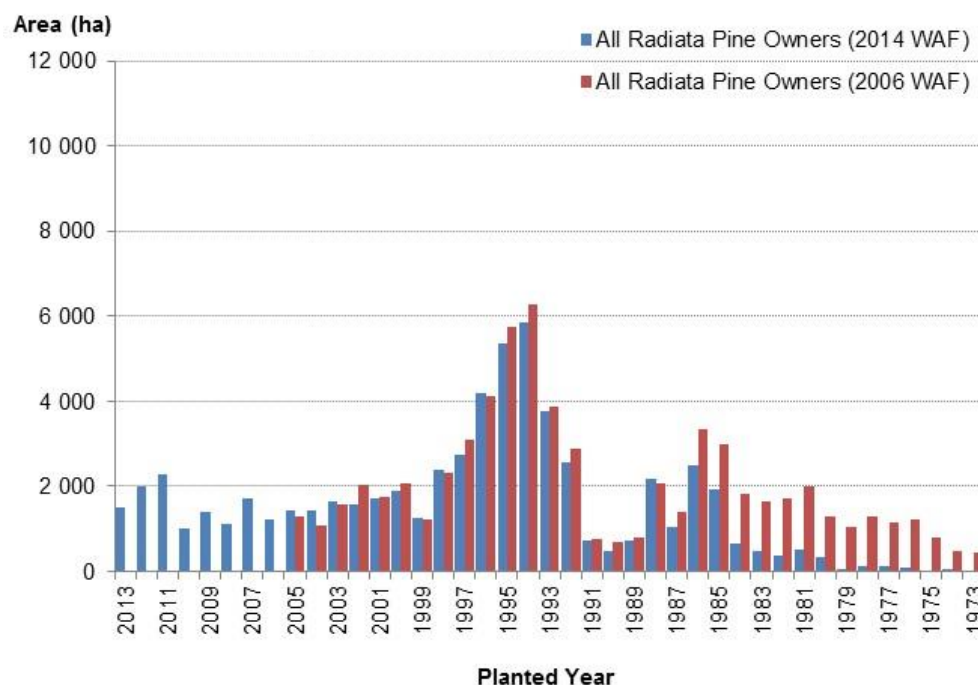


Figure 7-4: Area Age-Class Comparisons: NEFD 2006 vs NEFD 2014 - Marlborough



8. CONCLUDING COMMENTS

Under scenario 2, the wood availability from the Nelson & Marlborough wood supply regions' planted forest resource has the potential to increase from current levels of around 2.5 million m³, to 3.3 million m³ by 2021. Of the 3.3 million m³, Nelson contributes 1.8 million m³, and Marlborough 1.5 million m³.

Scenario 3 shows that a harvest at a higher level could be attained through the 2020s and early 2030s (3.5 million m³ per annum), but this cannot be sustained beyond 2035 at which time it reduces below 2.7 million m³, before increasing again to 3.5 million m³.

As shown in Scenario 4, if a an average harvest age of 26 years rather than 28 years is targeted, then the long term harvest level of 3.3-3.5 million m³ can be reached around two years earlier (2019 instead of 2021). Conversely, if the average harvest age is 30 years, then this harvest level is reached two years later (2023).

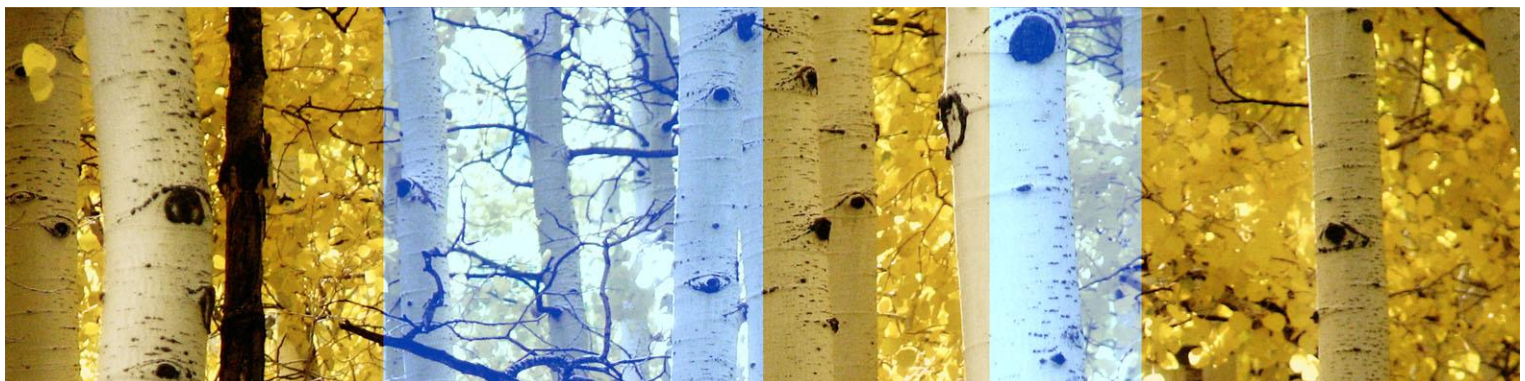
A large proportion of the the potential increase in wood availability will come from the region's small-scale forest owners who established forests during the 1990s. Market conditions and logistical constraints will determine the actual rate of harvest increase, and to what level is reached.



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Appendix – Nelson and Marlborough Wood Availability Forecasts for the Period 2014 to 2050

Nelson Wood Availability under Scenario 1 (Figures 4.2 and 4.3)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and small-scale owners harvest at age 28 years).

Year Ending December

	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	735	714	1 448
2015	778	512	1 290
2016	875	69	943
2017	937	67	1 004
2018	1 088	52	1 140
2019	1 071	124	1 195
2020	1 086	942	2 028
2021	1 128	832	1 961
2022	1 108	1 605	2 713
2023	1 048	901	1 949
2024	1 153	676	1 829
2025	1 268	551	1 819
2026	1 395	380	1 775
2027	1 534	351	1 885
2028	1 595	284	1 878
2029	1 595	126	1 721
2030	1 595	153	1 747
2031	1 595	279	1 874
2032	1 595	221	1 815
2033	1 595	91	1 686
2034	1 595	105	1 699
2035	1 595	80	1 674
2036	1 595	124	1 719
2037	1 595	142	1 737
2038	1 595	38	1 632
2039	1 595	139	1 734
2040	1 595	48	1 643
2041	1 595	48	1 642
2042	1 595	106	1 700
2043	1 595	557	2 152
2044	1 595	470	2 065
2045	1 595	81	1 676
2046	1 595	78	1 672
2047	1 595	63	1 658
2048	1 595	131	1 725
2049	1 595	960	2 554
2050	1 595	843	2 438

Notes:
m³ cubic metres
IB inside bark.

Nelson Wood Availability under Scenario 2 (Figure 4.6)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield).

Year Ending December

	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	735	714	1 448
2015	778	308	1 086
2016	875	288	1 162
2017	937	342	1 279
2018	1 088	318	1 406
2019	1 071	476	1 547
2020	1 086	616	1 702
2021	1 128	696	1 824
2022	1 108	716	1 824
2023	1 048	776	1 824
2024	1 153	672	1 824
2025	1 268	556	1 824
2026	1 395	429	1 824
2027	1 534	290	1 824
2028	1 604	220	1 824
2029	1 604	220	1 824
2030	1 604	220	1 824
2031	1 604	220	1 824
2032	1 604	220	1 824
2033	1 604	220	1 824
2034	1 604	220	1 824
2035	1 604	220	1 824
2036	1 604	220	1 824
2037	1 604	220	1 824
2038	1 604	220	1 824
2039	1 604	220	1 824
2040	1 604	220	1 824
2041	1 604	220	1 824
2042	1 604	220	1 824
2043	1 604	220	1 824
2044	1 604	220	1 824
2045	1 604	220	1 824
2046	1 604	220	1 824
2047	1 604	403	2 007
2048	1 604	447	2 051
2049	1 604	447	2 051
2050	1 604	447	2 051

Notes:
m³ cubic metres
IB inside bark.

Nelson Wood Availability under Scenario 3 (Figures 4.9 and 4.11)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield).

Year Ending December	Large-Scale Owners (000 m ³ IB)	Small- Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)	Pruned (000 m ³ IB)	Unpruned (000 m ³ IB)	Chip Logs (000 m ³ IB)	Total (000 m ³ IB)
2014	735	714	1 448	120	1 162	166	1 448
2015	778	308	1 086	148	771	168	1 086
2016	875	278	1 153	154	815	184	1 153
2017	937	331	1 268	110	949	209	1 268
2018	1 088	307	1 395	65	1 004	326	1 395
2019	1 071	464	1 534	75	1 108	351	1 534
2020	1 086	602	1 688	194	1 130	364	1 688
2021	1 128	728	1 857	180	1 274	403	1 857
2022	1 108	748	1 857	221	1 242	394	1 857
2023	1 048	809	1 857	149	1 304	403	1 857
2024	1 153	704	1 857	183	1 276	398	1 857
2025	1 268	588	1 857	166	1 291	400	1 857
2026	1 395	462	1 857	155	1 303	398	1 857
2027	1 534	322	1 857	114	1 329	413	1 857
2028	1 594	263	1 857	118	1 328	410	1 857
2029	1 594	263	1 857	124	1 333	400	1 857
2030	1 594	263	1 857	80	1 369	408	1 857
2031	1 594	263	1 857	16	1 420	421	1 857
2032	1 594	263	1 857	24	1 415	417	1 857
2033	1 594	263	1 857	47	1 403	407	1 857
2034	1 594	263	1 857	10	1 422	425	1 857
2035	1 594	77	1 671	13	1 279	379	1 671
2036	1 594	31	1 625	7	1 249	369	1 625
2037	1 594	54	1 647	12	1 264	372	1 647
2038	1 594	38	1 632	5	1 272	355	1 632
2039	1 594	129	1 723	8	1 333	382	1 723
2040	1 594	129	1 723	9	1 328	385	1 723
2041	1 594	129	1 723	1	1 346	375	1 723
2042	1 594	152	1 746	11	1 361	374	1 746
2043	1 594	327	1 920	24	1 489	407	1 920
2044	1 594	327	1 920	37	1 470	414	1 920
2045	1 594	327	1 920	36	1 467	417	1 920
2046	1 594	379	1 972	12	1 532	429	1 972
2047	1 594	449	2 042	12	1 577	454	2 042
2048	1 594	469	2 063	11	1 600	452	2 063
2049	1 594	469	2 063	90	1 523	450	2 063
2050	1 594	469	2 063	16	1 586	461	2 063

Notes:
m³ cubic metres
IB inside bark.

Nelson Wood Availability under Scenario 4 (Figures 4.12 and 4.13)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 26, 28 and 30 years).

Year Ending December	Recoverable Volume target age 26 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 28 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 30 (000 m ³ IB)	Average Age (Years)
2014	1 448	29.2	1 448	30.3	1 431	32.0
2015	1 295	28.6	1 086	29.6	1 073	27.3
2016	1 424	27.3	1 153	29.6	1 073	28.0
2017	1 566	26.7	1 268	27.3	1 142	27.2
2018	1 723	27.0	1 395	26.6	1 256	27.1
2019	1 848	27.5	1 534	27.1	1 382	27.9
2020	1 848	26.2	1 688	27.7	1 520	26.7
2021	1 848	26.5	1 857	27.8	1 672	27.2
2022	1 848	27.1	1 857	28.0	1 839	28.6
2023	1 848	26.5	1 857	28.0	1 869	29.1
2024	1 848	26.6	1 857	28.0	1 869	28.6
2025	1 848	27.0	1 857	28.1	1 869	28.5
2026	1 848	26.0	1 857	28.3	1 869	28.2
2027	1 848	26.9	1 857	27.6	1 869	28.6
2028	1 848	26.8	1 857	27.8	1 869	29.8
2029	1 848	26.4	1 857	28.5	1 869	29.8
2030	1 848	26.7	1 857	28.3	1 869	29.2
2031	1 848	27.6	1 857	28.0	1 869	30.1
2032	1 848	27.3	1 857	28.2	1 869	29.1
2033	1 663	25.9	1 857	28.9	1 869	30.0
2034	1 499	26.0	1 857	27.8	1 869	30.0
2035	1 579	26.0	1 671	28.0	1 869	29.7
2036	1 532	26.0	1 625	28.0	1 869	29.8
2037	1 570	26.0	1 647	28.2	1 682	30.0
2038	1 570	28.1	1 632	30.0	1 619	30.0
2039	1 570	27.2	1 723	29.2	1 679	30.0
2040	1 718	27.9	1 723	28.8	1 661	30.0
2041	1 890	29.2	1 723	30.2	1 698	30.0
2042	1 916	27.6	1 746	30.6	1 698	30.0
2043	1 916	27.2	1 920	30.8	1 698	30.3
2044	1 916	27.0	1 920	30.0	1 868	31.9
2045	1 916	26.2	1 920	29.7	1 885	33.0
2046	1 916	26.7	1 972	30.0	1 885	30.9
2047	1 916	26.6	2 042	29.0	1 885	30.6
2048	1 916	26.0	2 063	29.7	1 885	30.5
2049	1 916	26.0	2 063	28.6	1 885	29.8
2050	1 916	25.9	2 063	28.6	1 885	30.0

Notes:

m³ cubic metres

IB inside bark.

Nelson Wood Availability under Scenario 5 for Douglas-fir (Figure 4.15)

(Assumes that large-scale owners harvest at stated intentions with yield regulated in subsequent years and a target rotation of 40 years).

Year Ending December	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)	Average Age (Years)
2014	180	40	221	44.1
2015	188	0	188	40.4
2016	199	0	200	37.3
2017	178	0	178	37.6
2018	161	9	170	40.0
2019	158	7	165	38.4
2020	214	4	218	39.0
2021	162	0	162	38.4
2022	238	0	238	38.5
2023	167	16	183	40.2
2024	167	16	183	40.0
2025	167	16	183	40.0
2026	167	16	183	37.8
2027	167	16	183	38.1
2028	167	16	183	37.2
2029	167	16	183	39.7
2030	167	16	183	37.9
2031	167	16	183	36.9
2032	167	16	183	37.2
2033	167	16	183	38.9
2034	61	50	111	40.0
2035	61	50	111	40.0
2036	61	50	111	39.3
2037	61	50	111	39.3
2038	61	50	111	40.4
2039	34	50	84	40.0
2040	34	50	84	41.1
2041	34	50	84	41.8
2042	34	50	84	41.9
2043	34	50	84	40.7
2044	17	25	42	45.9
2045	17	25	42	48.6
2046	17	25	42	46.8
2047	17	25	42	42.8
2048	17	25	42	45.1
2049	14	7	21	45.2
2050	14	7	21	45.3

Notes:
m³ cubic metres
IB inside bark.

Marlborough Wood Availability under Scenario 1 (Figures 5.2 and 5.3)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and small-scale owners harvest at age 28 years).

Year Ending December

	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	995	50	1 045
2015	885	265	1 150
2016	821	2 736	3 557
2017	668	118	786
2018	540	163	703
2019	590	271	861
2020	714	1 314	2 028
2021	661	1 705	2 366
2022	810	2 603	3 413
2023	874	1 424	2 298
2024	787	1 475	2 262
2025	708	1 031	1 739
2026	637	943	1 580
2027	574	430	1 003
2028	516	834	1 350
2029	516	591	1 107
2030	516	414	930
2031	516	393	909
2032	516	269	786
2033	551	227	778
2034	606	62	668
2035	667	205	872
2036	734	200	934
2037	752	148	901
2038	752	62	815
2039	752	186	938
2040	752	92	845
2041	752	56	808
2042	752	288	1 041
2043	752	23	775
2044	752	288	1 040
2045	752	2 270	3 022
2046	752	127	879
2047	752	162	914
2048	752	271	1 023
2049	752	1 310	2 062
2050	752	1 700	2 452

Notes:
m³ cubic metres
IB inside bark.

Marlborough Wood Availability under Scenario 2 (Figure 5.6)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield).

Year Ending December

	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	995	50	1 045
2015	885	265	1 150
2016	821	443	1 264
2017	668	723	1 391
2018	540	937	1 478
2019	590	888	1 478
2020	714	764	1 478
2021	661	816	1 478
2022	810	667	1 478
2023	874	603	1 478
2024	787	691	1 478
2025	708	769	1 478
2026	637	840	1 478
2027	574	904	1 478
2028	516	961	1 478
2029	516	961	1 478
2030	516	961	1 478
2031	516	961	1 478
2032	516	961	1 478
2033	516	961	1 478
2034	559	919	1 478
2035	615	863	1 478
2036	615	863	1 478
2037	676	801	1 478
2038	744	734	1 478
2039	785	693	1 478
2040	785	693	1 478
2041	785	693	1 478
2042	785	693	1 478
2043	785	693	1 478
2044	785	693	1 478
2045	785	693	1 478
2046	785	693	1 478
2047	785	693	1 478
2048	785	693	1 478
2049	785	693	1 478
2050	785	693	1 478

Notes:
m³ cubic metres
IB inside bark.

Marlborough Wood Availability under Scenario 3 (Figures 5.9 and 5.11)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield).

Year Ending December	Large- Scale Owners (000 m ³ IB)	Small- Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)	Pruned (000 m ³ IB)	Unpruned (000 m ³ IB)	Chip Logs (000 m ³ IB)	Total (000 m ³ IB)
2014	995	50	1 045	208	641	195	1 045
2015	885	265	1 150	201	720	229	1 150
2016	821	443	1 264	222	788	254	1 264
2017	668	723	1 391	252	880	259	1 391
2018	540	990	1 530	233	993	303	1 530
2019	590	1 050	1 640	229	1 063	348	1 640
2020	714	926	1 640	251	1 015	374	1 640
2021	661	979	1 640	248	1 019	373	1 640
2022	810	830	1 640	243	1 012	385	1 640
2023	874	766	1 640	250	1 017	372	1 640
2024	787	853	1 640	170	1 070	400	1 640
2025	708	932	1 640	148	1 107	385	1 640
2026	637	1 003	1 640	127	1 112	401	1 640
2027	574	1 066	1 640	232	1 045	363	1 640
2028	516	1 124	1 640	193	1 053	393	1 640
2029	516	1 124	1 640	231	1 042	367	1 640
2030	516	1 124	1 640	257	1 035	348	1 640
2031	516	1 124	1 640	204	1 061	376	1 640
2032	550	1 090	1 640	47	1 201	392	1 640
2033	606	1 035	1 640	25	1 215	400	1 640
2034	666	974	1 640	12	1 231	397	1 640
2035	733	743	1 476	35	1 061	380	1 476
2036	733	596	1 328	30	950	349	1 328
2037	733	463	1 196	18	866	311	1 196
2038	733	343	1 076	29	768	279	1 076
2039	733	236	968	29	673	267	968
2040	733	236	968	7	682	280	968
2041	733	236	968	12	677	280	968
2042	733	236	968	37	666	266	968
2043	733	236	968	16	675	278	968
2044	733	236	968	37	665	267	968
2045	733	333	1 065	46	727	293	1 065
2046	733	439	1 172	61	800	311	1 172
2047	733	556	1 289	63	884	343	1 289
2048	733	685	1 418	66	972	380	1 418
2049	733	799	1 532	99	1 033	400	1 532
2050	733	799	1 532	98	1 034	400	1 532

Notes:
m³ cubic metres
IB inside bark.

Marlborough Wood Availability under Scenario 4 (Figures 5.12 and 5.13)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 26, 28 and 30 years).

Year Ending December	Recoverable Volume target age 26 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 28 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 30 (000 m ³ IB)	Average Age (Years)
2014	1 045	26.9	1 045	29.9	1 045	29.1
2015	1 150	28.3	1 150	29.4	1 150	30.2
2016	1 264	31.3	1 264	29.1	1 264	30.3
2017	1 391	32.9	1 391	31.5	1 357	32.0
2018	1 530	27.8	1 530	32.5	1 357	33.3
2019	1 683	27.2	1 640	32.4	1 357	34.2
2020	1 699	26.7	1 640	28.4	1 396	28.3
2021	1 699	28.8	1 640	28.3	1 535	28.8
2022	1 699	27.3	1 640	27.4	1 642	29.3
2023	1 699	29.2	1 640	28.0	1 642	29.5
2024	1 699	28.3	1 640	28.3	1 642	30.0
2025	1 699	34.2	1 640	30.1	1 642	30.0
2026	1 699	34.7	1 640	30.4	1 642	30.0
2027	1 699	30.0	1 640	30.1	1 642	30.0
2028	1 699	30.3	1 640	28.6	1 642	30.1
2029	1 699	30.2	1 640	30.3	1 642	32.2
2030	1 699	30.1	1 640	31.5	1 642	31.1
2031	1 699	30.5	1 640	31.2	1 642	32.0
2032	1 699	33.4	1 640	33.3	1 642	32.7
2033	1 529	31.2	1 640	33.5	1 642	32.9
2034	1 376	30.8	1 640	34.3	1 642	34.1
2035	1 238	30.4	1 476	31.5	1 642	34.9
2036	1 115	30.1	1 328	30.8	1 642	34.8
2037	1 003	28.0	1 196	31.1	1 477	32.1
2038	1 003	28.8	1 076	30.8	1 330	30.1
2039	1 003	29.4	968	27.8	1 197	29.2
2040	1 003	26.3	968	27.4	1 077	28.8
2041	1 003	25.5	968	27.3	969	30.0
2042	1 041	25.6	968	27.7	969	29.1
2043	1 145	25.5	968	27.2	969	29.2
2044	1 260	25.7	968	27.6	969	30.5
2045	1 386	26.5	1 065	27.5	969	29.4
2046	1 386	26.4	1 172	28.0	1 047	29.1
2047	1 386	26.0	1 289	28.2	1 152	31.2
2048	1 386	26.0	1 418	28.0	1 267	30.9
2049	1 386	26.0	1 532	28.0	1 394	30.5
2050	1 386	26.0	1 532	28.0	1 533	30.1

Notes:

m³ cubic metres

IB inside bark.

Marlborough Wood Availability under Scenario 5 for Douglas-fir (Figure 5.15)

(Assumes that large-scale owners harvest at stated intentions with yield regulated in subsequent years and a target rotation of 40 years).

Year Ending December	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)	Average Age (Years)
2014	36	0	36	39.6
2015	67	7	73	36.8
2016	66	5	71	35.8
2017	80	5	85	36.0
2018	103	5	108	39.3
2019	114	5	119	37.6
2020	58	5	63	38.7
2021	112	5	117	39.8
2022	16	5	21	42.5
2023	105	0	105	40.1
2024	17	1	17	40.0
2025	17	1	17	40.0
2026	17	1	17	40.0
2027	17	1	17	40.6
2028	17	1	17	42.0
2029	0	5	6	35.9
2030	0	5	6	38.2
2031	0	5	6	35.0
2032	0	5	6	38.6
2033	0	5	6	35.8
2034	20	10	30	37.5
2035	20	10	30	39.5
2036	20	10	30	39.6
2037	20	10	30	40.0
2038	20	10	30	40.0
2039	14	10	24	40.7
2040	14	10	24	41.8
2041	14	10	24	42.4
2042	14	10	24	43.5
2043	14	10	24	41.2
2044	0	6	6	40.0
2045	0	6	6	40.1
2046	0	6	6	40.7
2047	0	6	6	47.8
2048	0	6	6	39.4
2049	0	0	0	
2050	0	0	0	

Notes:

m³ cubic metres

IB inside bark.

Nelson & Marlborough Wood Availability under Scenario 1 (no Figure in report)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and small-scale owners harvest at age 28 years).

**Year Ending
December**

	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	1 729	764	2 493
2015	1 663	777	2 493
2016	1 696	2 804	4 500
2017	1 604	186	1 790
2018	1 628	215	1 843
2019	1 660	395	2 056
2020	1 799	2 256	4 056
2021	1 790	2 537	4 327
2022	1 918	4 208	6 126
2023	1 922	2 325	4 248
2024	1 940	2 151	4 091
2025	1 976	1 583	3 559
2026	2 032	1 323	3 355
2027	2 108	781	2 888
2028	2 111	1 117	3 228
2029	2 111	717	2 827
2030	2 111	567	2 678
2031	2 111	672	2 783
2032	2 111	490	2 601
2033	2 146	318	2 464
2034	2 201	166	2 367
2035	2 262	285	2 547
2036	2 328	325	2 653
2037	2 347	291	2 637
2038	2 347	100	2 447
2039	2 347	325	2 672
2040	2 347	141	2 488
2041	2 347	104	2 450
2042	2 347	394	2 741
2043	2 347	580	2 927
2044	2 347	758	3 105
2045	2 347	2 351	4 698
2046	2 347	204	2 551
2047	2 347	226	2 573
2048	2 347	401	2 748
2049	2 347	2 270	4 617
2050	2 347	2 543	4 890

Notes:

m³ cubic metres

IB inside bark.

Nelson & Marlborough Wood Availability under Scenario 2 (Figure 6.1)

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield).

Year Ending December	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)
2014	1 729	764	2 493
2015	1 663	573	2 236
2016	1 696	731	2 427
2017	1 604	1 065	2 669
2018	1 628	1 256	2 884
2019	1 660	1 364	3 025
2020	1 799	1 380	3 179
2021	1 790	1 512	3 302
2022	1 918	1 383	3 302
2023	1 922	1 380	3 302
2024	1 940	1 362	3 302
2025	1 976	1 326	3 302
2026	2 032	1 270	3 302
2027	2 108	1 194	3 302
2028	2 120	1 182	3 302
2029	2 120	1 182	3 302
2030	2 120	1 182	3 302
2031	2 120	1 182	3 302
2032	2 120	1 182	3 302
2033	2 120	1 182	3 302
2034	2 163	1 139	3 302
2035	2 219	1 083	3 302
2036	2 219	1 083	3 302
2037	2 280	1 022	3 302
2038	2 348	954	3 302
2039	2 389	913	3 302
2040	2 389	913	3 302
2041	2 389	913	3 302
2042	2 389	913	3 302
2043	2 389	913	3 302
2044	2 389	913	3 302
2045	2 389	913	3 302
2046	2 389	913	3 302
2047	2 389	1 096	3 484
2048	2 389	1 140	3 529
2049	2 389	1 140	3 529
2050	2 389	1 140	3 529

Notes:

m³ cubic metres

IB inside bark.

Nelson & Marlborough Wood Availability under Scenario 3 (Figures 6.3 and 6.-4)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield).

Year Ending December	Large- Scale Owners (000 m³ IB)	Small- Scale Owners (000 m³ IB)	All Owners (000 m³ IB)	Pruned (000 m³ IB)	Unpruned (000 m³ IB)	Chip Logs (000 m³ IB)	Total (000 m³ IB)
2014	1 729	764	2 493	328	1 803	362	2 493
2015	1 663	573	2 236	349	1 490	397	2 236
2016	1 696	722	2 417	376	1 604	437	2 417
2017	1 604	1 055	2 659	363	1 828	468	2 659
2018	1 628	1 297	2 925	299	1 997	629	2 925
2019	1 660	1 514	3 174	304	2 171	699	3 174
2020	1 799	1 528	3 328	445	2 145	738	3 328
2021	1 790	1 707	3 497	428	2 293	776	3 497
2022	1 918	1 578	3 497	464	2 254	779	3 497
2023	1 922	1 574	3 497	399	2 322	775	3 497
2024	1 940	1 557	3 497	353	2 346	798	3 497
2025	1 976	1 520	3 497	314	2 397	785	3 497
2026	2032	1 464	3 497	283	2 415	799	3 497
2027	2 108	1 389	3 497	346	2 375	776	3 497
2028	2 110	1 387	3 497	312	2 381	804	3 497
2029	2 110	1 387	3 497	355	2 375	767	3 497
2030	2 110	1 387	3 497	337	2 404	756	3 497
2031	2 110	1 387	3 497	219	2 481	796	3 497
2032	2 144	1 352	3 497	72	2 616	809	3 497
2033	2 199	1 297	3 497	72	2 618	807	3 497
2034	2 260	1 237	3 497	22	2 653	822	3 497
2035	2 326	821	3 147	48	2 340	758	3 147
2036	2 326	627	2 954	37	2 199	718	2 954
2037	2 326	517	2 843	30	2 130	683	2 843
2038	2 326	381	2 708	33	2 040	634	2 708
2039	2 326	365	2 691	36	2 006	649	2 691
2040	2 326	365	2 691	16	2 010	665	2 691
2041	2 326	365	2 691	13	2 023	655	2 691
2042	2 326	388	2 714	48	2 027	640	2 714
2043	2 326	562	2 889	40	2 164	685	2 889
2044	2 326	562	2 889	73	2 135	680	2 889
2045	2 326	659	2 986	82	2 194	710	2 986
2046	2 326	818	3 144	72	2 332	740	3 144
2047	2 326	1 005	3 331	75	2 460	796	3 331
2048	2 326	1 154	3 481	77	2 572	832	3 481
2049	2 326	1 268	3 595	189	2 555	850	3 595
2050	2 326	1 268	3 595	114	2 620	861	3 595

Notes:
m³ cubic metres
IB inside bark.

Nelson & Marlborough Wood Availability under Scenario 4 (Figure 6.5)

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 26, 28 and 30 years).

Year Ending December	Recoverable Volume target age 26 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 28 (000 m ³ IB)	Average Age (Years)	Recoverable Volume target age 30 (000 m ³ IB)	Average Age (Years)
2014	2 493	28.2	2 493	30.1	2 476	30.8
2015	2 444	28.5	2 236	29.5	2 223	28.8
2016	2 688	29.2	2 417	29.3	2 338	29.2
2017	2 957	29.6	2 659	29.5	2 499	29.8
2018	3 253	27.4	2 925	29.7	2 613	30.3
2019	3 531	27.4	3 174	29.8	2 738	31.0
2020	3 547	26.4	3 328	28.0	2 915	27.5
2021	3 547	27.6	3 497	28.1	3 207	28.0
2022	3 547	27.2	3 497	27.7	3 481	28.9
2023	3 547	27.8	3 497	28.0	3 511	29.3
2024	3 547	27.4	3 497	28.1	3 511	29.3
2025	3 547	30.4	3 497	29.0	3 511	29.2
2026	3 547	30.2	3 497	29.3	3 511	29.1
2027	3 547	28.4	3 497	28.8	3 511	29.3
2028	3 547	28.5	3 497	28.2	3 511	29.9
2029	3 547	28.2	3 497	29.3	3 511	30.9
2030	3 547	28.3	3 497	29.8	3 511	30.1
2031	3 547	29.0	3 497	29.5	3 511	31.0
2032	3 547	30.2	3 497	30.6	3 511	30.8
2033	3 192	28.4	3 497	31.1	3 511	31.4
2034	2 875	28.3	3 497	30.9	3 511	31.9
2035	2 818	27.9	3 147	29.7	3 511	32.1
2036	2 647	27.7	2 954	29.3	3 511	32.1
2037	2 573	26.8	2 843	29.5	3 159	31.0
2038	2 573	28.4	2 708	30.3	2 949	30.0
2039	2 573	28.1	2 691	28.7	2 876	29.7
2040	2 721	27.3	2 691	28.3	2 738	29.5
2041	2 893	27.9	2 691	29.1	2 668	30.0
2042	2 957	26.9	2 714	29.6	2 668	29.7
2043	3 061	26.5	2 889	29.6	2 668	29.9
2044	3 175	26.5	2 889	29.2	2 837	31.4
2045	3 301	26.3	2 986	28.9	2 854	31.8
2046	3 301	26.6	3 144	29.3	2 932	30.3
2047	3 301	26.4	3 331	28.7	3 037	30.9
2048	3 301	26.0	3 481	29.0	3 152	30.6
2049	3 301	26.0	3 595	28.4	3 279	30.1
2050	3 301	25.9	3 595	28.4	3 418	30.0

Notes:
m³ cubic metres
IB inside bark.

Nelson & Marlborough Wood Availability for Douglas-fir (Figure 6.6)

(Assumes that large-scale owners harvest at stated intentions with yield regulated in subsequent years and a target rotation of 40 years).

Year Ending December	Large-Scale Owners (000 m ³ IB)	Small-Scale Owners (000 m ³ IB)	All Owners (000 m ³ IB)	Average Age (Years)
2014	217	40	257	43.5
2015	255	7	262	39.4
2016	265	5	270	36.9
2017	258	5	263	37.1
2018	265	14	279	39.7
2019	272	12	284	38.1
2020	272	9	281	39.0
2021	274	5	279	39.0
2022	254	5	259	38.8
2023	272	16	289	40.1
2024	184	17	201	40.0
2025	184	17	201	40.0
2026	184	17	201	38.0
2027	184	17	201	38.3
2028	184	17	201	37.6
2029	167	22	189	39.6
2030	167	22	189	37.9
2031	167	22	189	36.8
2032	167	22	189	37.2
2033	167	22	189	38.8
2034	81	60	141	39.5
2035	81	60	141	39.9
2036	81	60	141	39.4
2037	81	60	141	39.4
2038	81	60	141	40.3
2039	48	60	108	40.2
2040	48	60	108	41.3
2041	48	60	108	42.0
2042	48	60	108	42.3
2043	48	60	108	40.8
2044	17	31	48	45.1
2045	17	31	48	47.5
2046	17	31	48	46.0
2047	17	31	48	43.5
2048	17	31	48	44.3
2049	14	7	21	45.2
2050	14	7	21	45.3

Notes:
m³ cubic metres
IB inside bark.