MARGULES GROOME

Ministry for Primary Industries

Wood Availability Forecast – Central North Island 2021

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PREFACE

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We trust our report proves useful to you and we would be pleased to provide assistance to you again on future assignments.

Dr Hamish Marshall
DIRECTOR

Jessica Brown
SENIOR CONSULTANT

Margules Groome Consulting Limited
Level 2, Fanshawe Street
AUCKLAND CBD, 1010
NEW ZEALAND
TEL: +64 9 918 1083
www.margulesgroome.com
NZCN: 5554706

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Appendix 1 – Central North Island Wood Availability Forecasts from 2021 to 2060

1   INTRODUCTION

This report presents the findings of a wood availability study for the Central North Island planted exotic forest estate. This is based on the Ministry for Primary Industries (MPI) National Exotic Forest Description (NEFD) as at 1 April 2020 which was rolled forward to January 2021. The forecasts then project annualised woodflows for 40 years thereafter. The study was commissioned by MPI with support from the major plantation forest owners in the region. The modelling, analysis, and report preparation for the study was undertaken by Margules Groome Consulting Ltd (Margules Groome).

Margules Groome prepared four scenarios for radiata pine wood availability and one for Douglas-fir availability. The scenarios indicate how the forest resource in the Central North Island region could be harvested from 2021 to 2060. The scenarios are based on the NEFD data which shows the available standing resource and potential yield for each stand. This was modelled to forecast regional log yield subject to a series of forecasting assumptions. Only radiata pine and Douglas-fir were included in the scenarios and wood availability forecasts. The forecasts for other exotic tree species are not included in the regional availability forecasts but are included in the New Zealand national forecasts.

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

▪ with 3 000 ha or more of forest in the region of interest; and

▪ with more than three age classes; and

▪ not a part of a syndicate.

In some regions, particularly those with only a few large-scale owners, some forest owners with just under 3 000 ha were also included.

In addition, discussions with forest managers and consultants were held to ensure the scenarios represented a realistic range of future wood availability.

The scenarios clearly show there are different ways for the regional resource to be harvested. The timing of each forest harvest is driven by a range of factors, including individual forest owner's objectives, forest age, log prices, demand by local wood processing plants, and perceptions about future log prices and future wood supply. A model can only predict how woodflows may occur subject to assumptions that drive individual forest harvest.

In examining the scenarios, it is important to recognise that forests are normally managed in a way that maximises the benefits to the owners, and such benefits are not easily modelled particularly as prevailing market conditions will change. Each owner has their own harvesting strategy based on the woodflow objectives and forest revenue. Any change in harvesting strategies by forest owners affects the age structure and maturity of the forests they own. This in turn feeds back into future wood availability.

A key issue is the timing of harvesting by small-scale forest owners. The harvest age can vary markedly, even between neighbouring properties. While the volumes forecasted by 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 owners than for the small-scale owners. Harvest intentions are less clear for small-scale owners who are more reactive, and resource descriptions tend to be 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 NEFD Steering Committee. Margules Groome undertook initial modelling of the scenarios, and these were presented to the major forest owners and consultants in the Central North Island wood supply region. Their feedback was considered in the final derived profiles.

There are around 13 956 ha of species other than radiata pine and Douglas-fir in the Central North Island region. The volumes from these species are not included in this regional wood availability forecasts but are included in a national forecast.

2.1   Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-scale Owners Harvest at Age 27

Large-scale owners' wood availability is based on stated harvest intentions for the period 2021 to 2032 (calendar year estimates, 10-years only). After 2032, the 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 27.

2.2   Scenario 2: Non-declining Yield (NDY) – Target Rotation 27 Years

Large-scale owners' wood availability is assumed to be at stated harvest intentions for the period 2021 to 2032. After 2032, the wood availability from large-scale owners is assumed not to decrease (as for Scenario 1). The total wood availability of radiata pine is also assumed to not decrease.

2.3   Scenario 3: Split NDY – Target Rotation 27 Years

This is the same as Scenario 2 except that the total wood availability of radiata pine from the region is allowed to increase and decrease by the following amounts for the given periods:

Year	Large-scale Owners	All
2021-2025	Harvest intentions	NDY
2024-2029	Harvest intentions	10% decrease
2029-2035	NDY	10% increase/decrease
>2035	NDY	NDY

2.4   Scenario 4 (A & B): Target Rotation Age Variations

These are the same as Scenario 3 except in Scenario 4A the target rotation age is decreased by two years and in 4B it is increased by two years.

2.5   Scenario for Douglas-fir

The large-scale resources are harvested at stated intentions up until 2031. After 2031, the wood availability from large-scale owners is modelled in a five-year period non-declining yield block (i.e. 2031-2035, 2036-2040, etc). The total wood availability of the combined estate is also modelled to be non-declining within each of the five-year period non-declining blocks. The harvest level for the first five-year non-declining block is set to be the same as in 2031. The target rotation is 38 years for the Douglas-fir stands.

2.6   Discussion of Radiata Pine Scenarios

In Scenario 1, the forests owned by small-scale owners are assumed to be harvested at age 27. The scenario shows the "potential" availability of mature forest from small-scale owners in any given year. This scenario directly reflects the area of forest in the small ownership category in each age class in the Central North Island 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 are based on yield regulation and avoid the large year-to-year fluctuations in volume seen in Scenario 1. 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 Scenario 2, the future harvesting is constrained to be non-declining (where possible): that is, each year the volume must either be the same or higher than in the previous year. However, this can lead to large fluctuations in the average rotation ages and is unlikely to be a realistic outcome.

The constraints placed on Scenario 3 are designed to keep the average rotation age close to the target rotation age while maintaining a more realistic flow of wood.

The main limitation of all scenarios is 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, yet it is important to note how prevailing market conditions will be a significant determinant in how the actual woodflows occur.

3   DATA AND METHODOLOGY

3.1   Development of Forest Areas

The forest areas were primarily sourced from the NEFD as at 1 April 2020.

A mapping study carried out by the University of Canterbury in 2020 for the Central North Island[1] showed that the small-scale owners' resource NEFD area was overstated (specifically those with less than 1 000 ha). Of the small-scale owners with less than 1 000 ha, the study showed a mapped area that was 76% of the area reported in the NEFD indicating a significant anomaly.

The likely error in the NEFD comes from data on forest owners with less than 40 ha. These owners were not surveyed in the NEFD process; instead, data for these forests is collected from three sources:

1.   New planting imputations from 1992 to 2006.

2.   A survey of small forest growers from 2004.

3.   Forests previously surveyed for the NEFD but which have dropped to below 40 hectares.

The Central North Island region has a portion of the area (~10%) which is assigned as either "new planting imputations" or from the "2004 Small Forest Owner Survey"; both were designed at the time to improve the accuracy of the NEFD.

The new planting imputation was estimated by subtracting the known new area planting (in the NEFD survey) from an estimate of total new planting calculated from the annual MPI nursery survey. The estimated new planting was calculated by dividing a nominal planting stocking (for radiata plantation development) into the total number of seedlings sold.

In 2004, AsureQuality ran a survey of small forest owners with less than 40 ha (2004 Small Forest Owner Survey). The survey results were subsequently included in the NEFD area statement alongside the New Planting Imputation.

It is Margules Groome's understanding that the NEFD does not currently have a process for harvesting and replanting of these areas as would typically occur in forest management. As such, these NEFD areas remain unchanged from 2004 which is highly unlikely in reality.

While much further work is required to improve the accuracy of small-scale forest ownership in New Zealand, to improve the area description for the purpose of wood availability forecasting in the Central North Island region, Margules Groome has made the following adjustments:

1.   The "New Planting Imputations" and "2004 Small Forest Owner Survey" areas have been reduced so that the total area of the small-scale owners' resource less than 1 000 ha is 76% of the area of the reported NEFD as at 1 April 2020.

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[1] Manley, B., Morgenroth, J., Xu, C. Map of the small-scale forest estate of New Zealand. New Zealand Journal of Forestry, May 2021, Vol 66, No. 1.

2. All standing forests derived from "New Planting Imputations" and "2004 Small Forest Owner Survey" with an age equal to or greater than 24 years were assumed to be harvested and removed from the NEFD data. The residual area (less 10.6% deforestation[2]) was assumed to have been replanted in equal amounts over the last five years.

The area for the small-scale owners with area between 1 000 ha and 3 000 ha, and large-scale owners was unadjusted for the purpose of modelling.

3.2 Development of Yield Tables

The 2015 NEFD yield tables were used for the wood availability forecasts. These yield tables supplied by MPI were originally developed in the following way:

- Large-scale forest owners provided yield tables for their forest estates.

- The large-scale owner yield 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 1990), and Douglas-fir were 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 adjusted based on consultation with large-scale owners.

- The area-weighted average regional yield tables developed for the large-scale owners' estate were applied to the small-scale forest owners' estate under the assumption that large-scale owner data is regionally representative across all sizes of forest owner.

As part of these forecasts, the 2015 NEFD yield tables were calibrated against the yields (m^3/ha) calculated from the large-scale owners' harvest intentions. In the case of Central North Island, no adjustments were made to the 2015 NEFD yield tables.

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[2] The deforestation assumption was sourced from the 2015-2016 Ministry for the Environment deforestation mapping report (Ministry for the Environment. 2018. Deforestation Mapping 2015 & 2016 – Final Report. Submitted by Indufor Asia Pacific for the Ministry for the Environment).

3.3   Large-scale Owners' Harvest Intentions

Large-scale owners were asked to provide details of their projected harvest volumes for all species for the period 2021 to 2041. The survey specifically asked for:

- Radiata pine:
  - Domestic grades – pruned, unpruned, pulp
  - Export grades – A, K, KI, KIS
  - Split by pruned/unpruned area if possible
- Other Species:
  - Douglas-fir domestic and export grades
  - Other Softwoods and Hardwood: Sawlog, pulp
- Additional questions to assist with modelling

The area covered by the large-scale owners covered 79% of the total inclusion of the actual levels of intended harvest by the large-scale owners is considered a critical step, as it provides the best estimate of future wood availability for the first twenty years (2021-2041) of the forecast horizon.

3.4   Modelling Assumptions

In addition to the modelling assumptions specific to each scenario, the wood availability forecast for the Central North Island region is based on the following modelling assumptions:

- 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 area in all estates aged over 60 years is assumed to be non-commercial and therefore will not be harvested.

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

- An area awaiting restocking of 20 691 ha is added to the model area based on MPI data. All areas are replanted, with a regeneration lag of one year. Replanting rules are as follows:

  — Large-scale forest owners:

    - All radiata areas are planted back into the radiata pine. Only 15% of the Douglas-fir is replanted into Douglas-fir with the remainder replanted in radiata pine.

    - Twenty five percent of all pruned areas will be replanted as a pruned regime with 75% transferring to an unpruned regime.

  — Small-scale forest owners:

    - All radiata pine areas are planted back into radiata pine. Only 15% of the Douglas-fir is replanted into Douglas-fir with the remainder replanted in radiata pine.

    - Fifty percent of all pruned areas will be replanted as a pruned regime with 50% transferring to an unpruned regime.

- The total harvest for 2021 has been constrained to be no greater than 12.83 million m^3.

- The model assumes no future afforestation and deforestation.

4   WOOD AVAILABILITY FORECASTS FOR CENTRAL NORTH ISLAND

4.1   Central North Island Region Area Description

The Central North Island region has a plantation resource of 564 448 ha. Of this, 534 738 ha consists of radiata pine, and 15 754 ha of Douglas-fir – as reported by the NEFD as at 1 April 2020. After adjustments are applied to the NEFD area (see Section 3.4), the modelled area reduces to 508 635 ha.

The modelled resource consists entirely of radiata pine and Douglas-fir. Figure 4-1 shows the age-class distribution for the Central North Island estate by owner size. Large-scale owners held 79% of the modelled resources, and small-scale owners held 21%.

Figure 4-2 shows the age-class distribution for the Central North Island by species. Most of the estate is radiata pine, of which 30% is recorded as managed under a pruned regime. A small amount of production thinning is undertaken in the Central North Island region, mostly by one of the large-scale owners and has been modelled where appropriate.

Figure 4-1:
Central North Island Modelled Age-class Distribution for All Species
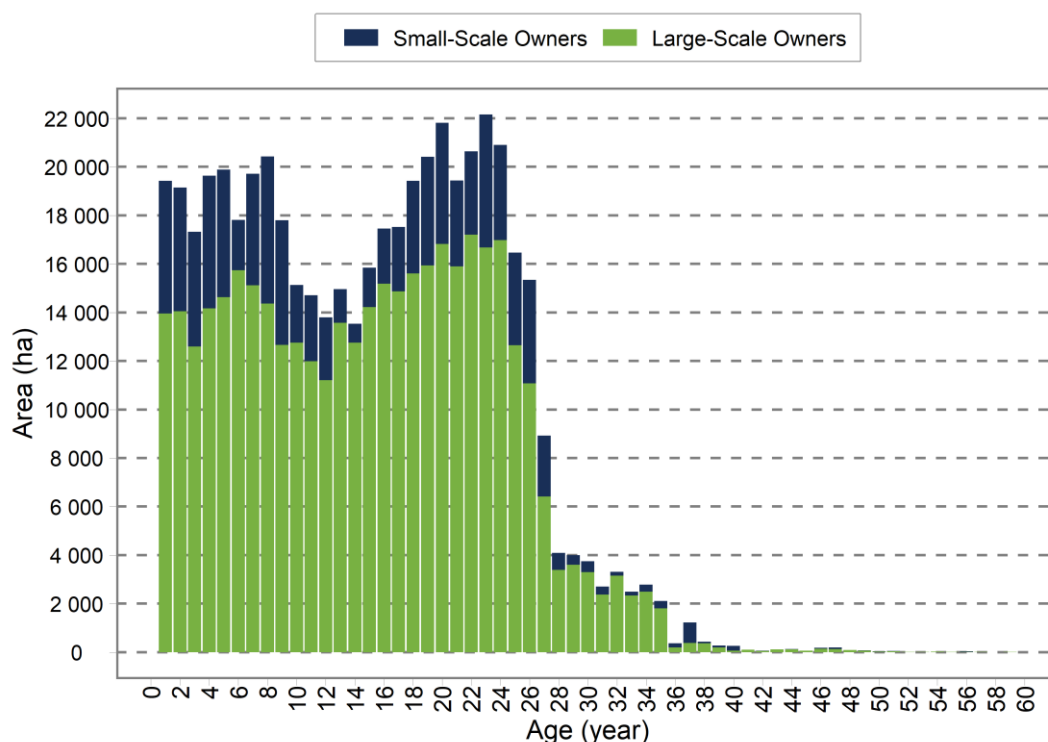
Figure 4-2:
Central North Island Modelled Age-class Distribution by Species
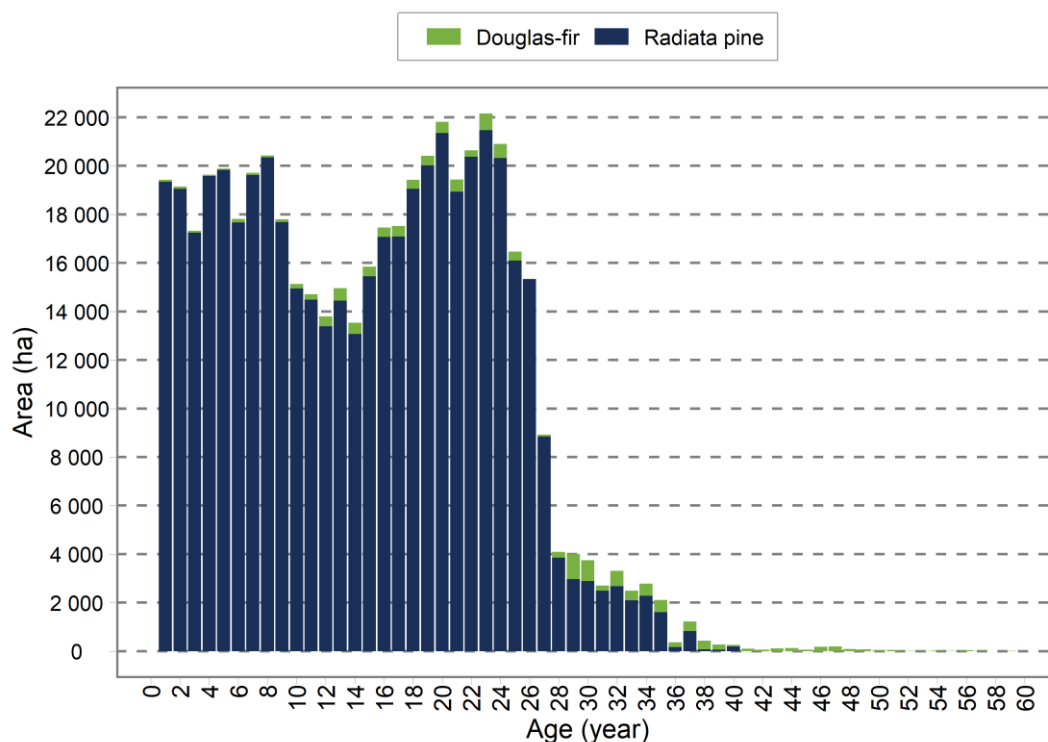
4.2 Scenario 1

In Scenario 1, large-scale owners are modelled to harvest according to their stated intentions and small-scale owners are modelled to harvest their forests at age 27. Figure 4-3 shows the age-class distribution for the Central North Island radiata pine estate for both large-scale and small-scale owners combined.

The wood availability from all owners in Central North Island under Scenario 1 is presented in Figure 4-4. The estate has the potential to generate a substantial increase in the amount of wood available over the next three to four years, coming mostly from the small-scale owner resource. This volume reduces substantially as the large plantings from the 1992 to 1995 period are harvested.

Figure 4-3:
Central North Island Age-class Distribution of Radiata Pine
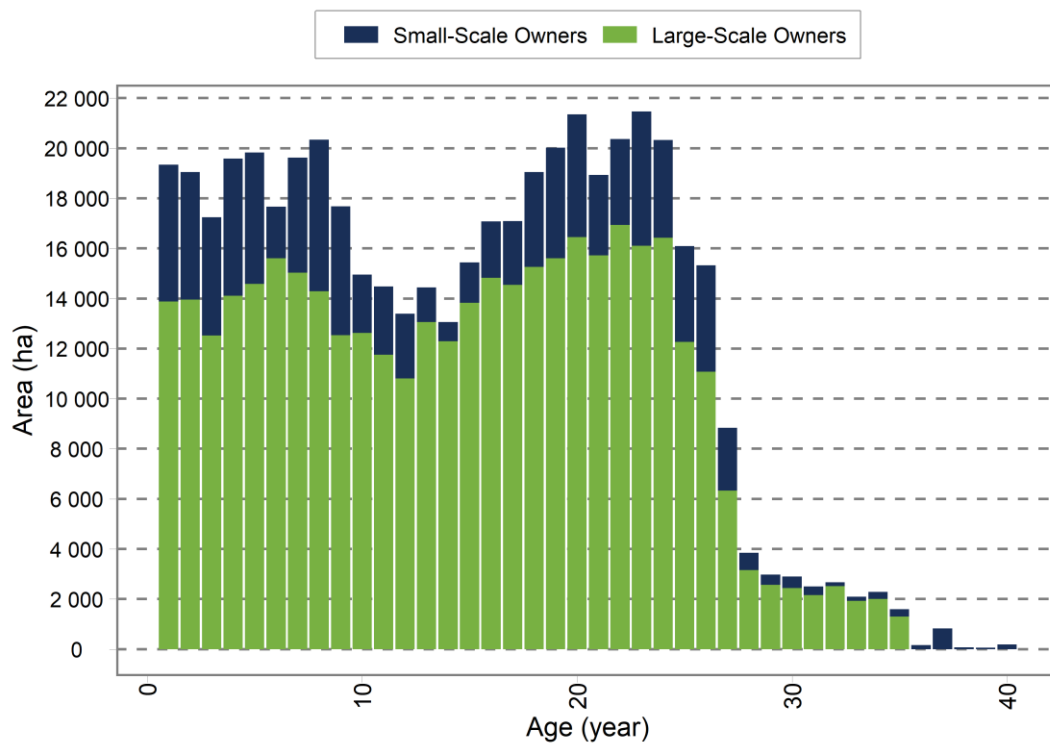
Figure 4-4:
Central North Island Radiata Pine Availability under Scenario 1
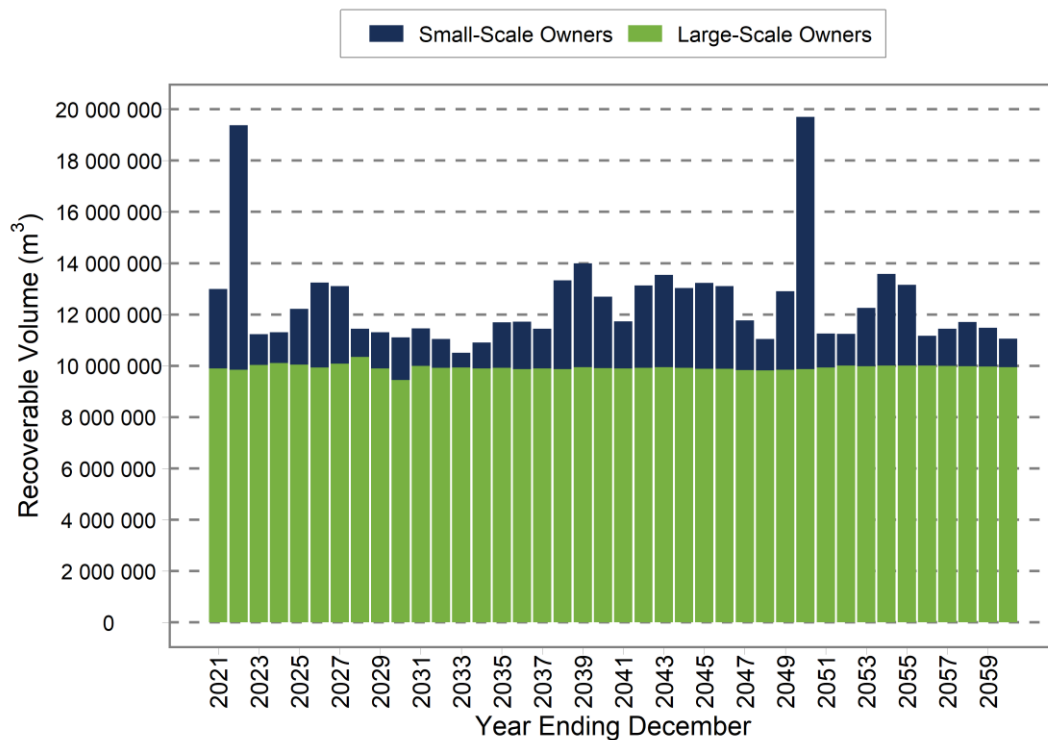
4.3 Scenario 2

Figure 4-5 shows the radiata pine availability for all owners under Scenario 2. The sustainable yield under a non-declining yield constraint for the Central North Island region is just under 12.5 million m^3 per year.

Figure 4-5:
Central North Island Radiata Pine Availability under Scenario 2
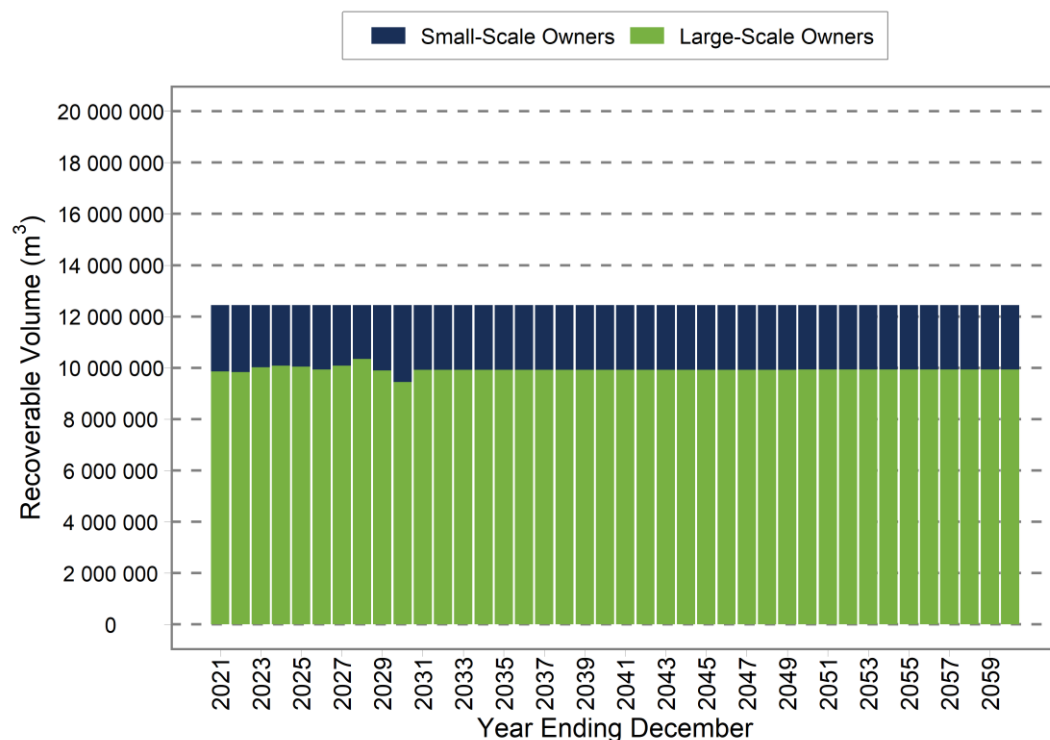
Figure 4-6 shows that the harvest age varies from the target rotation of 27 years for both forest owner types under the constraints of Scenario 2. The rotation age for the large and small-scale owners needs to increase slightly above the target rotation age of 27 in the period 2027-2037 to be able to maintain the non-declining yield.

Figure 4-6:
Central North Island Average Radiata Pine Clearfell Age under Scenario 2
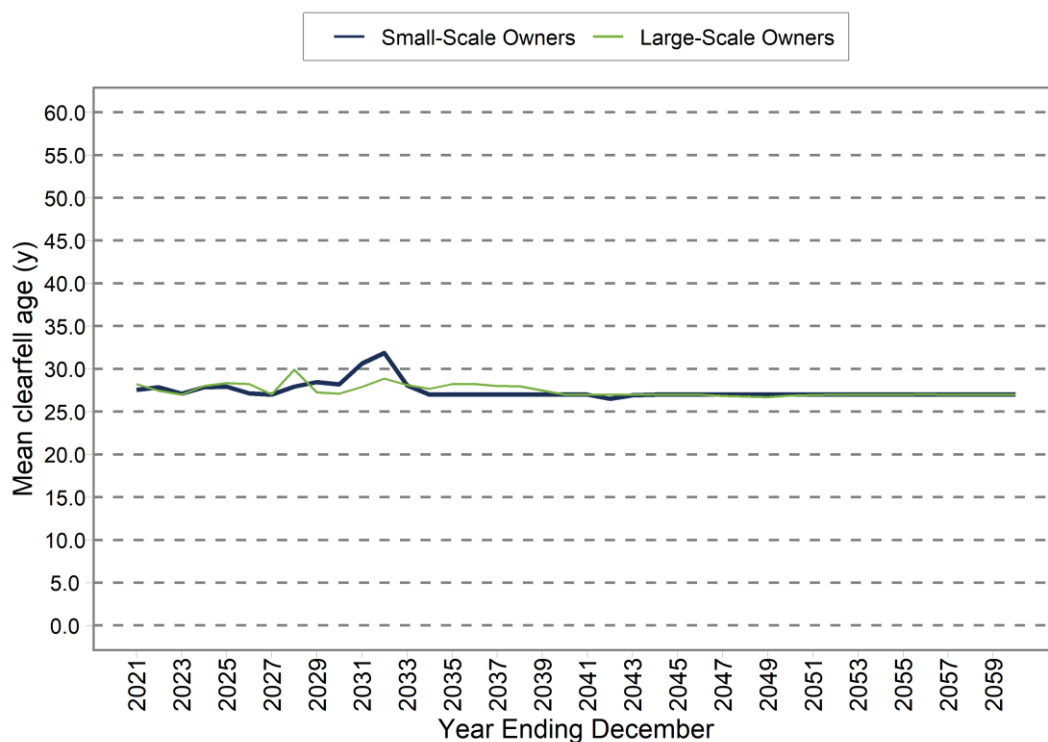
The harvest volume forecast under Scenario 2 is shown by log grade in Figure 4-7.

Figure 4-7:
Central North Island Radiata Pine Availability by Log Grade under Scenario 2
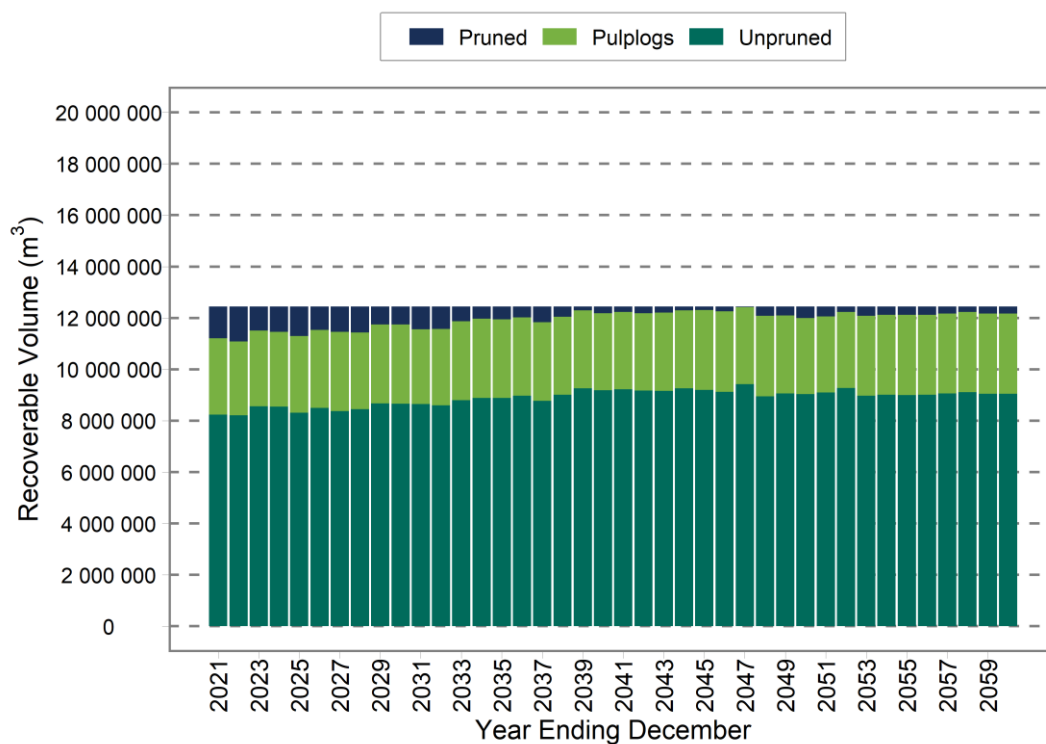
4.4   Scenario 3

The Scenario 3 model assumes large-scale owners' resources are harvested in-line with their harvesting intentions between 2021 and 2032, and then a non-declining yield constraint is applied after 2032. The total yield for all owners has been regulated in a manner that tries to maintain the target rotation age for both ownership types at around 27 years.

Figure 4-8 shows the radiata pine availability from all owners. The total volume increases to around 13 million m^3 per year for four years, then drops to around 12 million m^3 for a period of four years. After two years of the cut dropping to 11 million m^3 and below, the volume then increases back up to a sustainable annual cut of 12 million m^3.

Figure 4-9 shows the radiata pine average clearfell age by ownership. Under this scenario the average rotation age of small-scale owners' resource is maintained closer to the target rotation than in Scenario 2.

Figure 4-8:
Central North Island Radiata Pine Availability under Scenario 3

Figure 4-9:
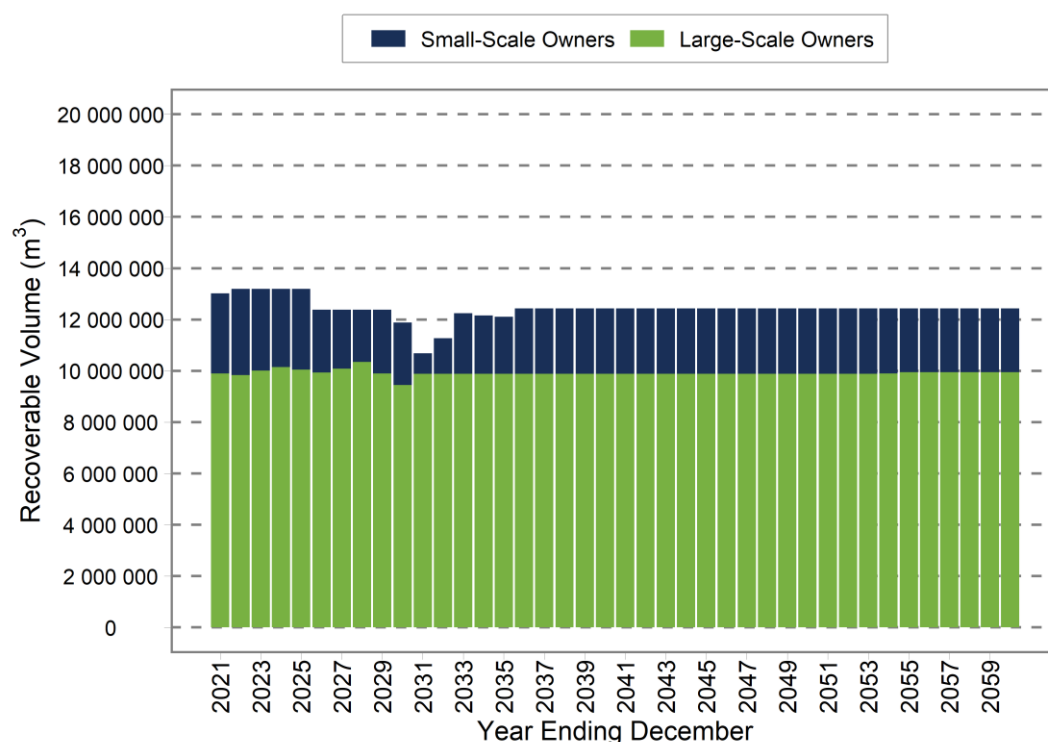**Central North Island Average Radiata Pine Clearfell Age under Scenario 3**
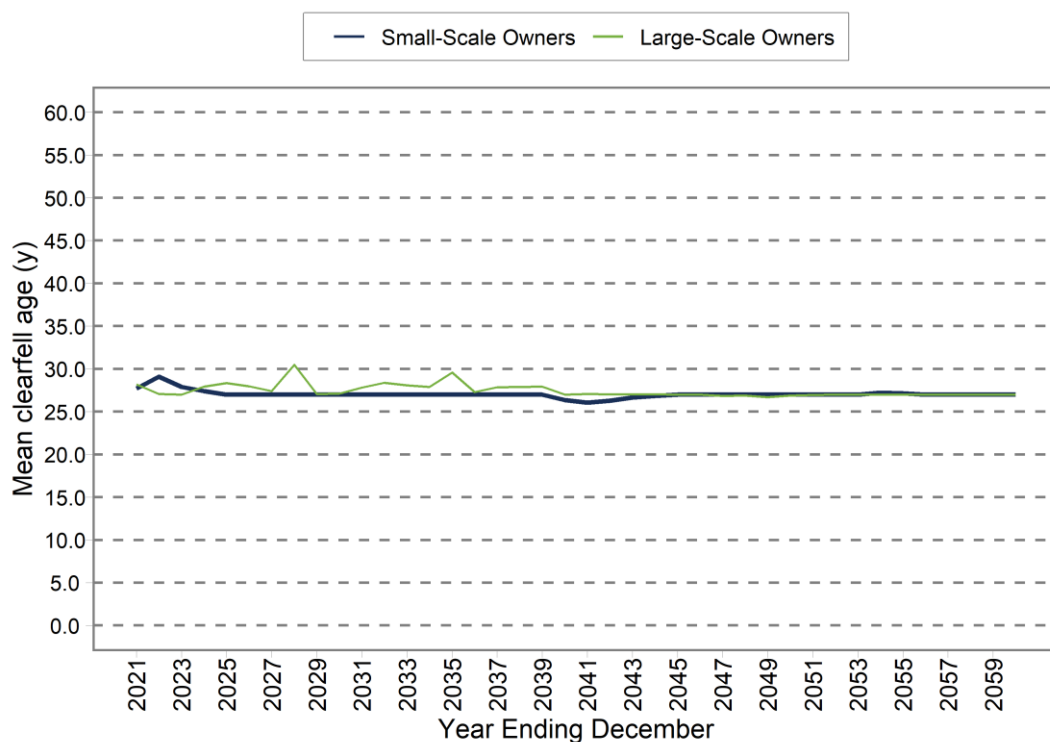
Figure 4-10 shows the radiata pine availability by log grade for all owners. Proportionally, the pruned volume reduces throughout the forecast period as areas of pruned forest are replanted into an unpruned regime.

Figure 4-10:
Central North Island Radiata Pine Availability by Log Grade under Scenario 3
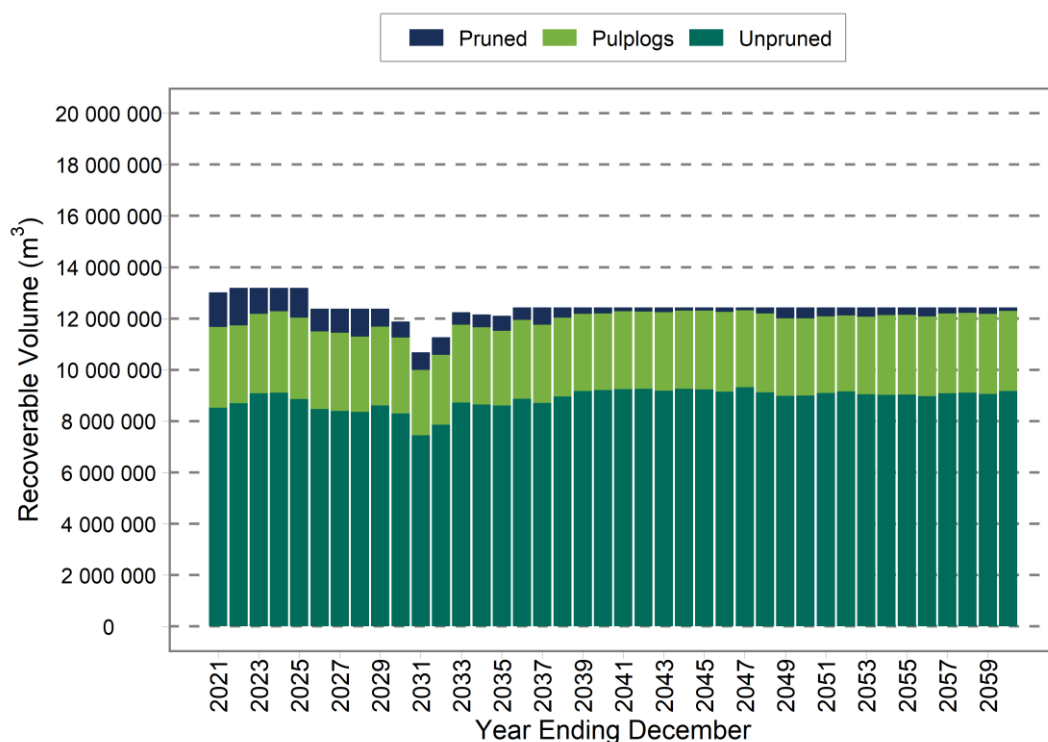
4.5   Scenario 4

In Scenario 4, target rotation ages of 25 or 29 years are used (rather than 27 years) and the same constraints are applied as in Scenario 3. Figure 4-11 shows the woodflows for the three different target rotations ages are not significantly different. The older target rotation age of 29 results in a slight delay in volume harvested (as expected) and can reach a peak of under 13 million m^3. A rotation age of 25 results in a much higher peak of over 14 million m^3/a, however, this requires the harvest levels to drop lower than a rotation age of 27 in the period between 2029-2031.

Figure 4-11:
Central North Island Radiata Pine Availability by Target Rotation Age under Scenario 4
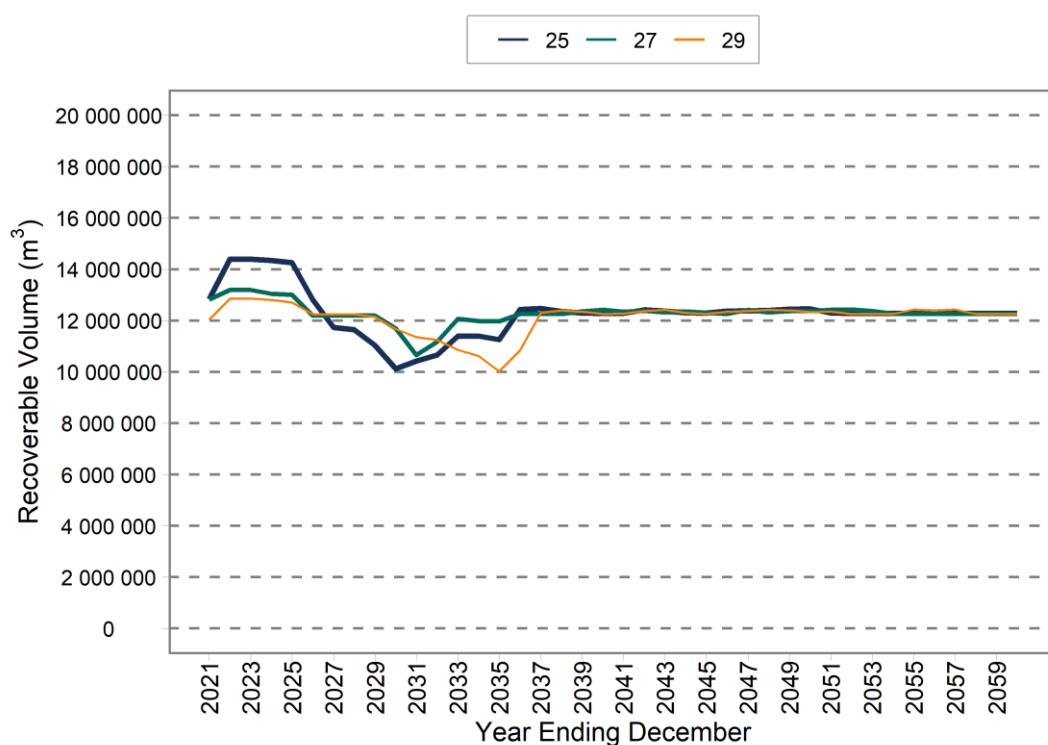
4.6   Douglas-fir

The area of Douglas-fir in the Central North Island is 15 754 ha. The age-class distribution of Douglas-fir in the Central North Island is uneven with a large area planted in the last couple of years by small-scale growers, as shown in Figure 4-12. The model requires 85% of Douglas-fir area to be replanted into radiata pine.

The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2021 to 2031. From 2032, the wood availability is kept at a constant volume for five-year periods, between the five-year periods the volume for large-scale owners can decrease or increase by up to 100 000 m^3 (Figure 4-13)

The target rotation age is 38 years for Douglas-fir. The average clearfell age of the Douglas-fir estate in the Central North Island region is presented in Figure 4-14.

Figure 4-12:
Central North Island Age-class Distribution of Douglas-fir
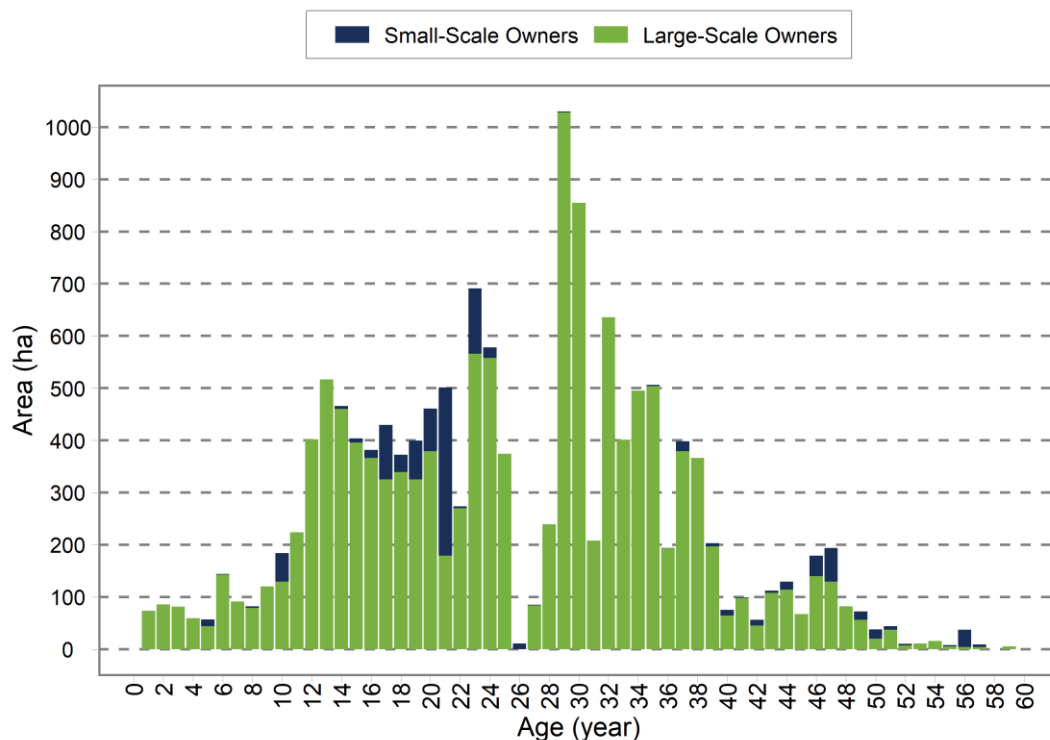
Figure 4-13:
Central North Island Douglas-fir Availability
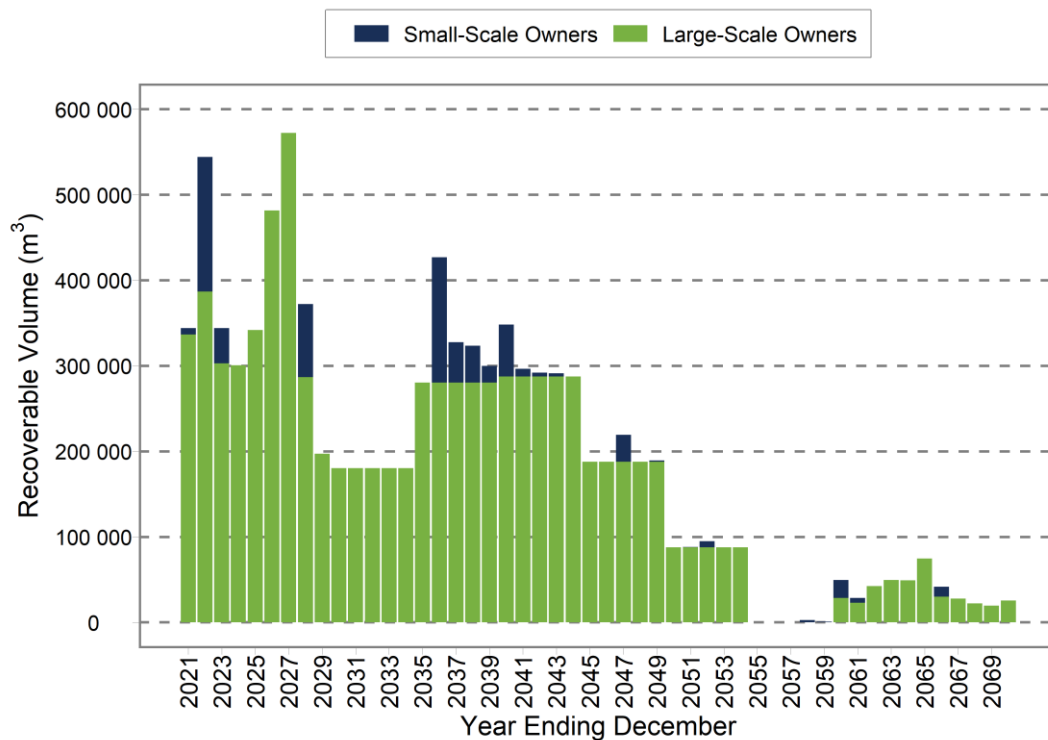
Figure 4-14:
Central North Island Average Douglas-fir Clearfell Age
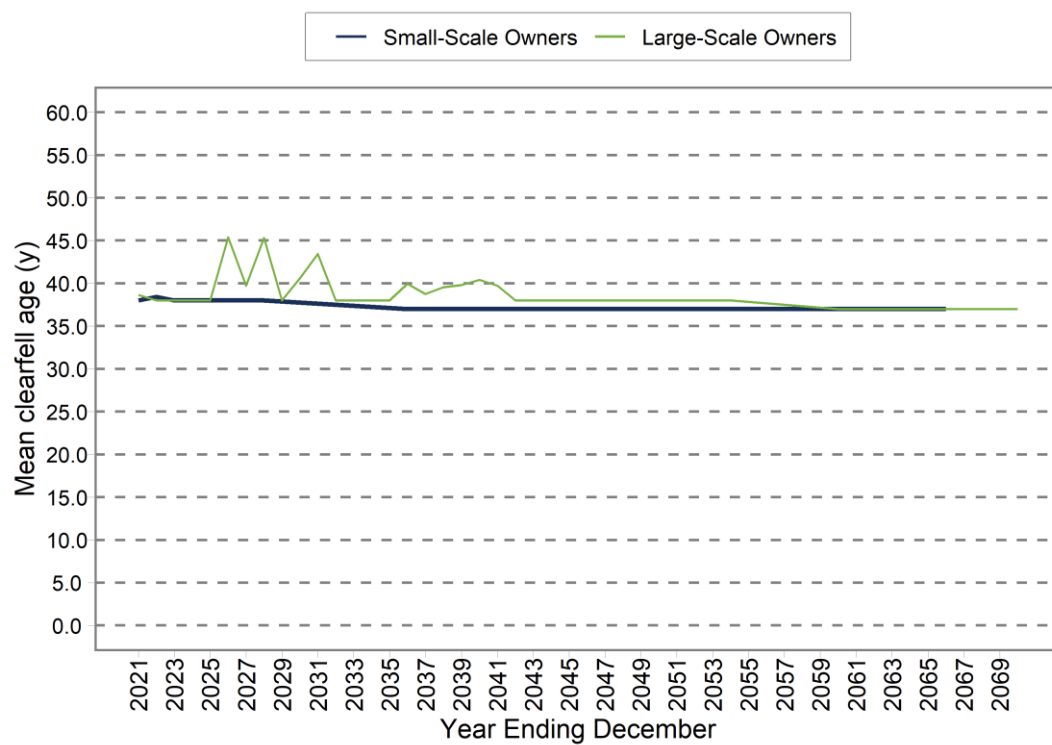
5 COMPARISON TO PREVIOUS FORECAST

The results of the 2021 wood availability forecasts were compared with the previous forecasts undertaken in 2014. The comparison is based on Scenario 2 (Figure 5-1) and Scenario 3 (Figure 5-2).

The long-term sustainable cut from the Central North Island under Scenario 2 has reduced from 13.1 million m^3 to 12.4 million m^3. This is likely caused by a small reduction of the total area available and the increasing in the rotation age by three years.

In Scenario 3, the difference in the woodflow is more marked. To maintain a target rotation age around 27 for both ownership types in these forecasts, the volume harvested is substantially higher for the first six years, with the harvest dropping to its lowest levels approximately five years earlier than the previous forecast.

Figure 5-1:
Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 2
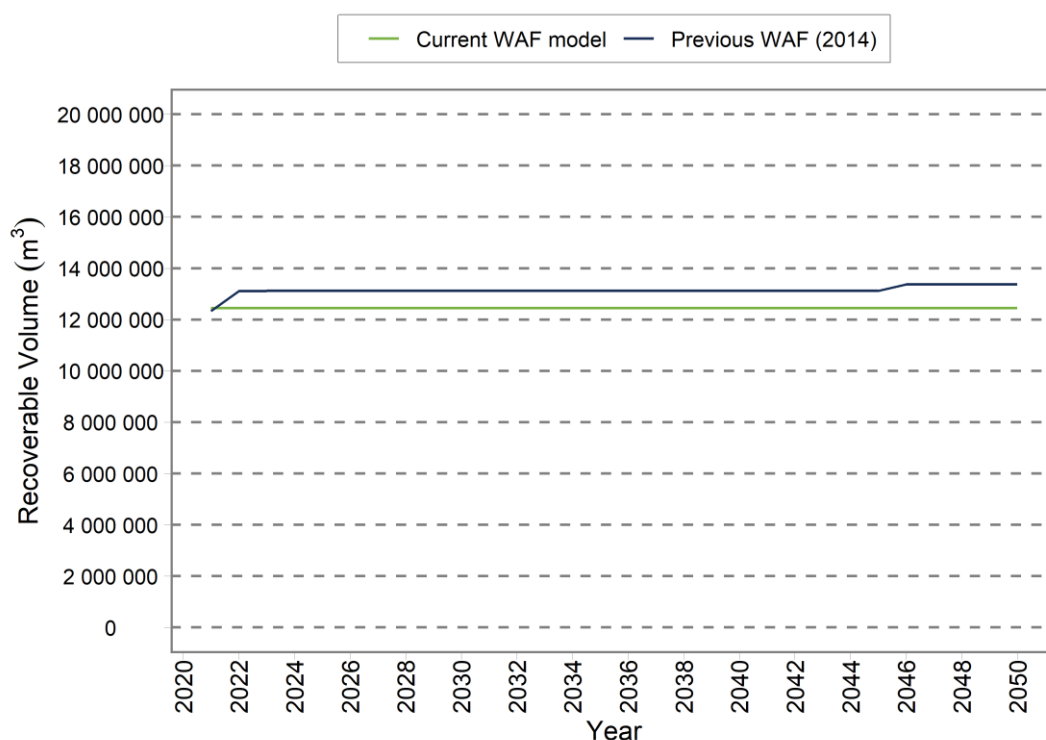
Figure 5-2:
Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 3
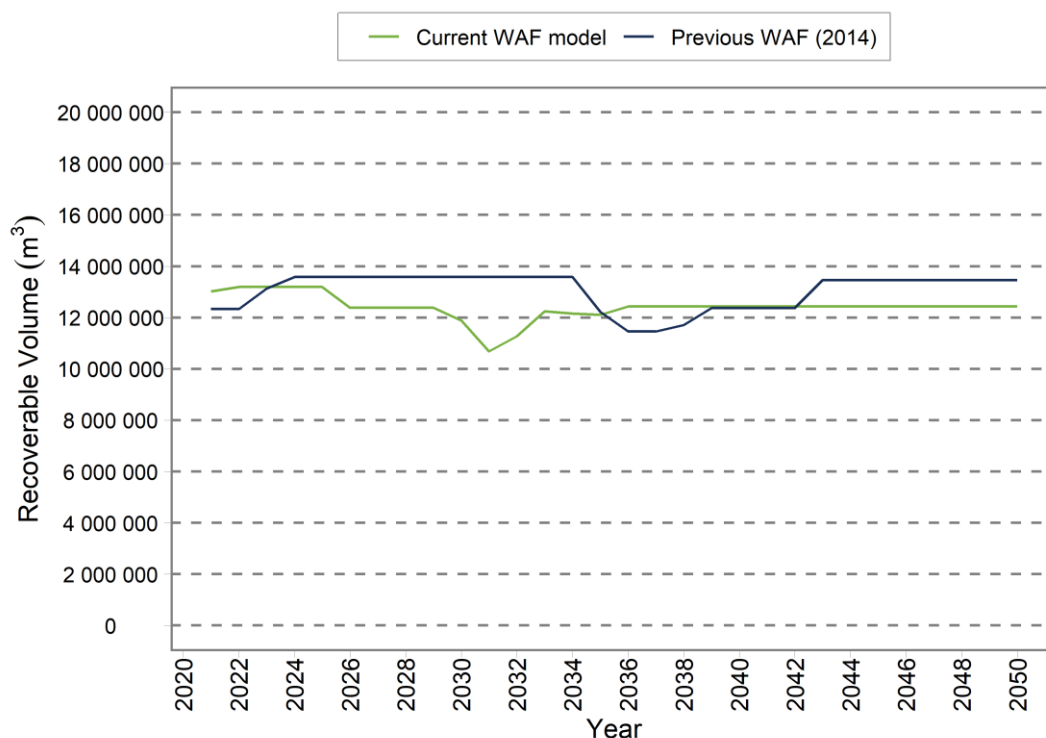
The factors contributing to the variations include the following (refer to Table 5-1):

- The total model area has dropped by 5% in 2021 compared to 2014. Over 4 800 ha of the resource area was removed from this forecast as it was over 35 years old and considered non-commercial. Also, the New Zealand Carbon Farms Ltd area was removed from this forecast and a 24% reduction was applied to owners of less than 1 000 ha (the reduction applied in 2014 was 15%).

- There are now greater proportions of the estate described by the higher yielding yield tables derived from stands planted in 1990 and thereafter. Just under 17 111 ha of forest planted before 1990 is now remaining in the Central North Island.

- The radiata pine's target rotation age for the 2014 forecast was 28 years, whereas the target rotation for the 2021 forecast is 27 years. The decrease in rotation age was based on results obtained from large forest owners harvest intention survey.

Table 5-1:
Key Differences between 2014 and 2021 WAF

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	532 895	508 625	-5
Average Age (years)	N/A	14.5	N/A
Productivity (m^3/ha at age 30)	626	647	3
Clearfell Age Target (years)	28	27	-4
Annual Sustainable Harvest (million m^3)	13	12.4	-5

The "Productivity" is the area weight average yield from the yield tables at a reference age. The "Annual Sustainable Harvest" is the annual harvest as determined in Scenario 2. "N/A" indicates where the previous wood availability report does not provide that parameter.

6 CONCLUSION

Wood availability from the Central North Island wood supply region is expected to continue to increase in the next couple of years to a maximum of 13 million m^3/a. This increase is required to complete the harvesting at an average rotation age of around 27 years. Once the peak of harvesting has been completed, the volume will likely decrease to a low of just under 11 million m^3/a then rebound to a sustainable cut of 12.3 million m^3/a.

Market conditions (e.g. demand from China) and logistical constraints (e.g. trucking and port constraints) will determine the actual rate of harvest increase, and the peak that is reached. The supply is dominated by the large-scale owners which remains largely consistent throughout the forecast period. The drop in the forecast that occurs 2030-2031 is mostly due to a drop in the availability of wood from the small-scale owners.

The increase in wood availability in the next couple of years is largely driven by the small-scale owner resource, however, the confidence around the NEFD age-class distribution and area for these owners is low. Margules Groome has made some adjustment to areas of the owners with less than 1 000 ha – this is to account for a recent mapping study showing a likely over-prediction of NEFD area for this group of forest owners in the region. This uncertainty will impact the wood availability from the Central North Island region, particularly in the short term.

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Appendix - CNI Wood Availability Forecasts for the Period 2021-2060

Table 1: Central North Island Wood Avaliability under Scenario 1
(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and target harvest age of 27 years)

Year Ending December	Large-Scale Owners (000 m^3)	Small-Scale Owners (000 m^3)	All Owners (000 m^3)
2021	9 892	3 102	12 994
2022	9 842	9 536	19 377
2023	10 038	1 197	11 235
2024	10 111	1 194	11 305
2025	10 043	2 180	12 224
2026	9 937	3 310	13 247
2027	10 090	3 014	13 104
2028	10 345	1 098	11 442
2029	9 899	1 403	11 303
2030	9 444	1 659	11 103
2031	9 993	1 470	11 463
2032	9 918	1 128	11 046
2033	9 932	571	10 503
2034	9 895	1 008	10 903
2035	9 923	1 770	11 693
2036	9 876	1 848	11 724
2037	9 894	1 554	11 447
2038	9 877	3 449	13 326
2039	9 943	4 050	13 993
2040	9 911	2 779	12 690
2041	9 902	1 832	11 734
2042	9 918	3 216	13 134
2043	9 949	3 592	13 542
2044	9 926	3 102	13 028
2045	9 888	3 343	13 232
2046	9 882	3 223	13 105
2047	9 836	1 941	11 777
2048	9 826	1 217	11 044
2049	9 845	3 058	12 903
2050	9 866	9 836	19 702
2051	9 941	1 317	11 258
2052	10 005	1 244	11 249
2053	9 983	2 278	12 261
2054	10 005	3 572	13 577
2055	10 005	3 153	13 159
2056	10 005	1 163	11 169
2057	9 997	1 454	11 451
2058	9 985	1 718	11 704
2059	9 971	1 508	11 479
2060	9 947	1 113	11 060

Notes: m³ = cubic metres inside bark

Table 2: Central North Island Wood Avaliability under Scenario 2
(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 m³)	Small-Scale Owners (000 m³)	All Owners (000 m³)
2021	9 862	2 578	12 440
2022	9 832	2 608	12 440
2023	10 017	2 423	12 440
2024	10 086	2 354	12 440
2025	10 043	2 397	12 440
2026	9 937	2 503	12 440
2027	10 090	2 350	12 440
2028	10 345	2 095	12 440
2029	9 899	2 541	12 440
2030	9 446	2 994	12 440
2031	9 921	2 519	12 440
2032	9 921	2 519	12 440
2033	9 921	2 519	12 440
2034	9 921	2 519	12 440
2035	9 921	2 519	12 440
2036	9 921	2 519	12 440
2037	9 921	2 519	12 440
2038	9 921	2 519	12 440
2039	9 921	2 519	12 440
2040	9 921	2 519	12 440
2041	9 921	2 519	12 440
2042	9 921	2 519	12 440
2043	9 921	2 519	12 440
2044	9 921	2 519	12 440
2045	9 921	2 519	12 440
2046	9 921	2 519	12 440
2047	9 921	2 519	12 440
2048	9 921	2 519	12 440
2049	9 921	2 519	12 440
2050	9 928	2 512	12 440
2051	9 939	2 501	12 440
2052	9 939	2 501	12 440
2053	9 939	2 501	12 440
2054	9 939	2 501	12 440
2055	9 939	2 501	12 440
2056	9 939	2 501	12 440
2057	9 939	2 501	12 440
2058	9 939	2 501	12 440
2059	9 939	2 501	12 440
2060	9 939	2 501	12 440

Notes: m³ = cubic metres inside bark

Table 3: Central North Island Wood Avaliability under Scenario 3

(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)	Small-Scale Owners (000 m^3)	All Owners (000 m^3)	Pruned (000 m^3)	Unpruned (000 m^3)	Pulp Logs (000 m^3)
2021	9 892	3 125	13 017	1 351	8 520	3 146
2022	9 832	3 362	13 194	1 455	8 701	3 038
2023	10 007	3 187	13 194	1 015	9 090	3 089
2024	10 151	3 043	13 194	909	9 113	3 171
2025	10 043	3 151	13 194	1 156	8 864	3 174
2026	9 937	2 443	12 380	880	8 474	3 026
2027	10 090	2 290	12 380	930	8 403	3 047
2028	10 345	2 035	12 380	1 079	8 365	2 935
2029	9 899	2 481	12 380	693	8 614	3 073
2030	9 446	2 432	11 877	624	8 295	2 959
2031	9 882	808	10 690	690	7 453	2 547
2032	9 882	1 386	11 268	685	7 860	2 723
2033	9 882	2 368	12 250	496	8 724	3 030
2034	9 882	2 280	12 162	504	8 652	3 006
2035	9 882	2 220	12 102	577	8 617	2 908
2036	9 882	2 556	12 437	497	8 868	3 072
2037	9 882	2 556	12 437	676	8 712	3 049
2038	9 882	2 556	12 437	408	8 962	3 068
2039	9 882	2 556	12 437	257	9 173	3 007
2040	9 882	2 556	12 437	248	9 205	2 985
2041	9 882	2 556	12 437	150	9 242	3 045
2042	9 882	2 556	12 437	164	9 260	3 013
2043	9 882	2 556	12 437	193	9 188	3 056
2044	9 882	2 556	12 437	136	9 259	3 042
2045	9 882	2 556	12 437	129	9 241	3 068
2046	9 882	2 556	12 437	175	9 147	3 116
2047	9 882	2 556	12 437	118	9 319	3 001
2048	9 882	2 556	12 437	248	9 125	3 064
2049	9 882	2 556	12 437	424	8 986	3 027
2050	9 882	2 556	12 437	431	8 999	3 007
2051	9 882	2 556	12 437	357	9 102	2 978
2052	9 882	2 556	12 437	314	9 157	2 966
2053	9 882	2 556	12 437	365	9 051	3 021
2054	9 897	2 541	12 437	307	9 017	3 113
2055	9 950	2 488	12 437	288	9 031	3 119
2056	9 950	2 488	12 437	352	8 978	3 108
2057	9 950	2 488	12 437	238	9 087	3 113
2058	9 950	2 488	12 437	218	9 105	3 115
2059	9 950	2 488	12 437	261	9 057	3 120
2060	9 950	2 488	12 437	146	9 168	3 123

Notes: m³ = cubic metres inside bark

Table 4: Central North Island Wood Avaliability under Scenario 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 with target rotation ages of 25, 27 and 29 years)

Year Ending December	Recoverable Volume Target Age 25 (000 m^3)	Average Age (Years)	Recoverable Volume Target Age 27 (000 m^3)	Average Age (Years)	Recoverable Volume Target Age 29 (000 m^3)	Average Age (Years)
2021	13 019	26	13 017	28	12 223	29
2022	14 432	27	13 194	28	12 891	29
2023	14 432	26	13 194	27	12 891	28
2024	14 432	27	13 194	28	12 891	28
2025	14 432	28	13 194	28	12 891	28
2026	12 989	26	12 380	28	12 427	28
2027	11 917	28	12 380	27	12 427	28
2028	11 821	29	12 380	30	12 427	28
2029	11 219	29	12 380	27	12 327	28
2030	10 303	27	11 877	27	11 851	28
2031	10 476	27	10 690	28	11 540	29
2032	10 843	27	11 268	28	11 424	29
2033	11 578	29	12 250	28	11 038	29
2034	11 582	28	12 162	28	10 799	29
2035	11 444	27	12 102	29	10 126	29
2036	12 467	26	12 437	27	10 940	29
2037	12 467	26	12 437	28	12 444	28
2038	12 467	30	12 437	28	12 444	28
2039	12 467	26	12 437	28	12 444	28
2040	12 467	25	12 437	27	12 444	28
2041	12 467	26	12 437	27	12 444	28
2042	12 467	27	12 437	27	12 444	28
2043	12 467	26	12 437	27	12 444	28
2044	12 467	26	12 437	27	12 444	28
2045	12 467	25	12 437	27	12 444	29
2046	12 467	27	12 437	27	12 444	28
2047	12 467	29	12 437	27	12 444	29
2048	12 467	25	12 437	27	12 444	29
2049	12 467	25	12 437	27	12 444	29
2050	12 467	25	12 437	27	12 444	29
2051	12 467	25	12 437	27	12 444	29
2052	12 467	25	12 437	27	12 444	29
2053	12 467	26	12 437	27	12 444	29
2054	12 467	26	12 437	27	12 444	29
2055	12 467	29	12 437	27	12 444	29
2056	12 467	27	12 437	27	12 444	29
2057	12 467	26	12 437	27	12 444	29
2058	12 467	26	12 437	27	12 444	29
2059	12 467	25	12 437	27	12 444	29
2060	12 467	25	12 437	27	12 444	29

Notes: m³ = cubic metres inside bark

Table 5: Central North Island Wood Avaliability for Douglas-fir
(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 38 years)

Year Ending December	Large-Scale Owners (000 m^3)	Small-Scale Owners (000 m^3)	All Owners (000 m^3)	Average Age (Years)
2021	337	7	344	39
2022	387	157	544	38
2023	303	41	344	38
2024	301	0	301	38
2025	342	0	342	38
2026	482	0	482	45
2027	572	0	572	40
2028	287	85	372	44
2029	197	0	197	38
2030	180	0	180	41
2031	180	0	180	43
2032	180	0	180	38
2033	180	0	180	38
2034	180	0	180	38
2035	280	0	280	38
2036	280	147	427	39
2037	280	47	328	38
2038	280	43	323	39
2039	280	19	300	40
2040	288	60	348	40
2041	288	9	297	40
2042	288	4	292	38
2043	288	3	291	38
2044	288	0	288	38
2045	188	0	188	38
2046	188	0	188	38
2047	188	32	219	38
2048	188	0	188	38
2049	188	2	189	38
2050	88	0	88	38
2051	88	1	88	38
2052	88	7	95	38
2053	88	0	88	38
2054	88	0	88	38
2055	0	0	0	0
2056	0	0	0	0
2057	0	0	0	0
2058	0	3	3	37
2059	0	1	1	37
2060	28	21	50	37

Notes: m³ = cubic metres inside bark