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Wood Availability Forecast – Canterbury 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.

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1 INTRODUCTION

This report presents the findings of a wood availability study for the Canterbury 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 Canterbury 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 Canterbury wood supply region. Their feedback was considered in the final derived profiles.

There are around 8 318 ha of species other than radiata pine and Douglas-fir in the Canterbury region. The volumes from these species are not included in this regional wood availability forecast 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 2030 (calendar year estimates, 10-years only). After 2030, 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 2030. After 2030, 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
2021-2021	Harvest intentions	NDY, with max 20% increase/decrease
2022-2024	Harvest intentions	
2025-2030	Harvest intentions	20% increase/decrease
2030-2038	NDY	20% increase/decrease
2039-2044	NDY	NDY, 20% increase/decrease
2044-2055	NDY	NDY
2056-2056	NDY	20% increase/decrease
>2060	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 43 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 Canterbury 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.

A fundamental property of the forests in Canterbury (like many regions in New Zealand) is the large area of forests established during the early 1990s, followed by very little new planting after that period. The remaining forest area planted during the 1990s has now either been harvested or will be harvested in the next five to seven years. This is leading to record harvest levels in most regions. Once this harvesting has been completed, Scenario 3 lets the volume decline again.

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 2018 for Canterbury[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 56% 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 Canterbury region has a portion of the area (~34%) 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 Canterbury 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 56% of the area of the reported NEFD as at 1 April 2020.

[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 1.7% 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 Canterbury, adjustments were made to the 2015 NEFD radiata pine yield tables to align better with the large-scale owners' harvest intention projected yields.

Table 3-1:
Adjustment Applied to Radiata Pine Yield Tables

Ownership	Regime	Adjustment (%)
Small	Pruned	+6
Small	Unpruned	+2
Large	Pruned	+25
Large	Unpruned	+10

[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).

Canterbury is the only region where the large-scale and small-scale owners do not share the same yield tables, the rationale behind this is that most of the small-scale owners are located on the high productivity foothill compared to large-scale owners who mostly own forests on the lower productive plains.

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 48% of the total NEFD area. 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 Canterbury 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 1 767 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 areas are replanted into radiata pine.
    - One hundred percent of all pruned areas will be replanted into an unpruned regime.
  - Small-scale forest owners:
    - All areas are replanted into radiata pine.
    - Five percent of all pruned areas will be replanted as a pruned regime with 95% transferring to an unpruned regime.
- Three percent of the area of first rotation stands are not replanted.
- The total harvest for 2021 has been constrained to be no greater than 1.76 million m^3.
- The model assumes no future afforestation and deforestation.

4 WOOD AVAILABILITY FORECASTS FOR CANTERBURY

4.1 Canterbury Region Area Description

The Canterbury region has a plantation resource of 96 721 ha. Of this, 71 634 ha consists of radiata pine, and 16 770 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 63 142 ha.

The modelled resource consists entirely of radiata pine and Douglas-fir. Figure 4-1 shows the age-class distribution for the Canterbury estate by owner size. Large-scale owners held 48% of the modelled resources, and small-scale owners held 52%.

Figure 4-2 shows the age-class distribution for the Canterbury region by species. Most of the estate is radiata pine, of which 25% is recorded as managed under a pruned regime. A small amount of production thinning is undertaken in the Canterbury region, mostly by one of the large-scale owners and has been modelled where appropriate.

Figure 4-1:
Canterbury Modelled Age-class Distribution for All Species

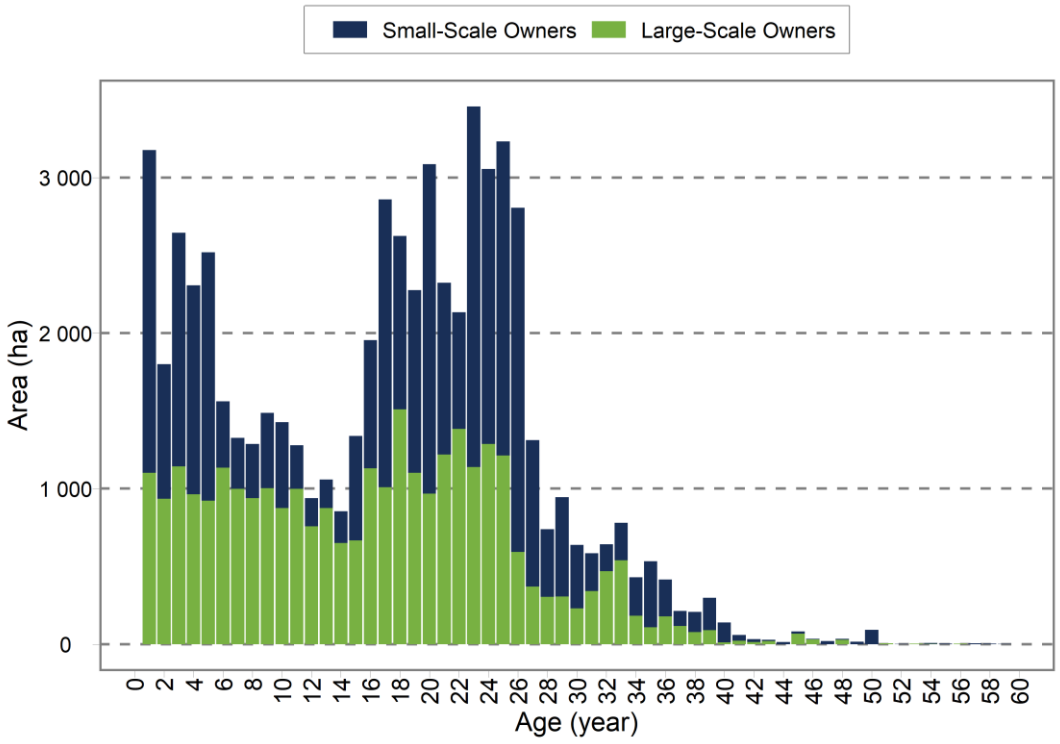
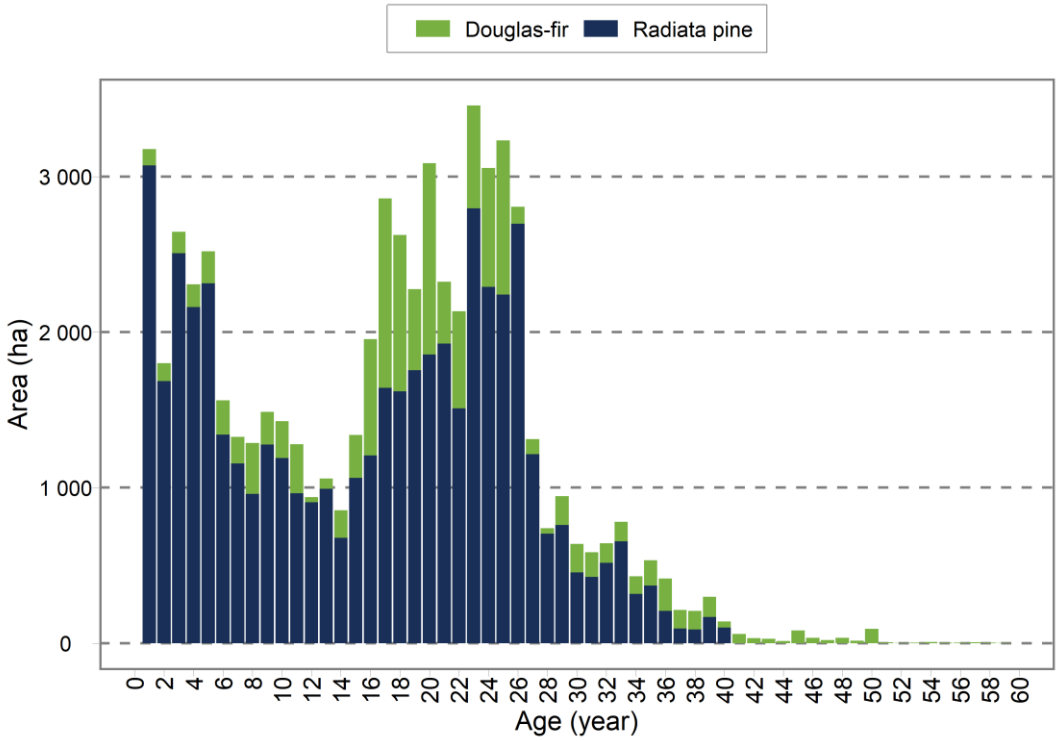


Figure 4-2:
Canterbury Modelled Age-class Distribution by Species



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 Canterbury radiata pine estate for both large-scale and small-scale owners combined.

The wood availability from all owners in Canterbury 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 year, 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:
Canterbury Age-class Distribution of Radiata Pine

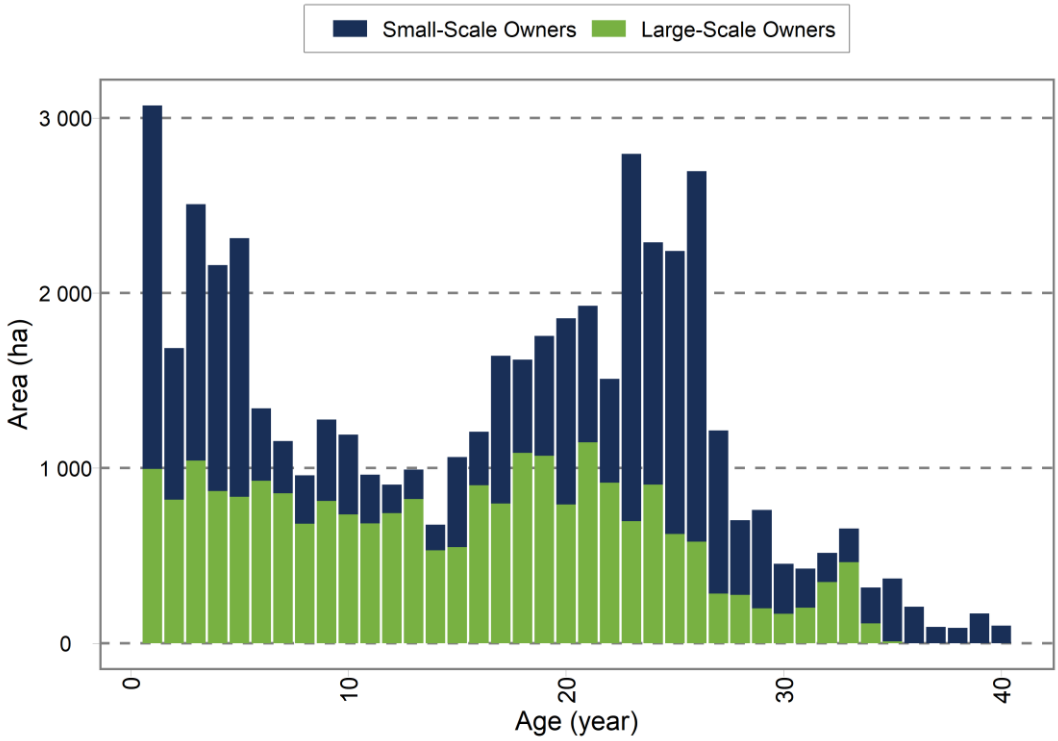
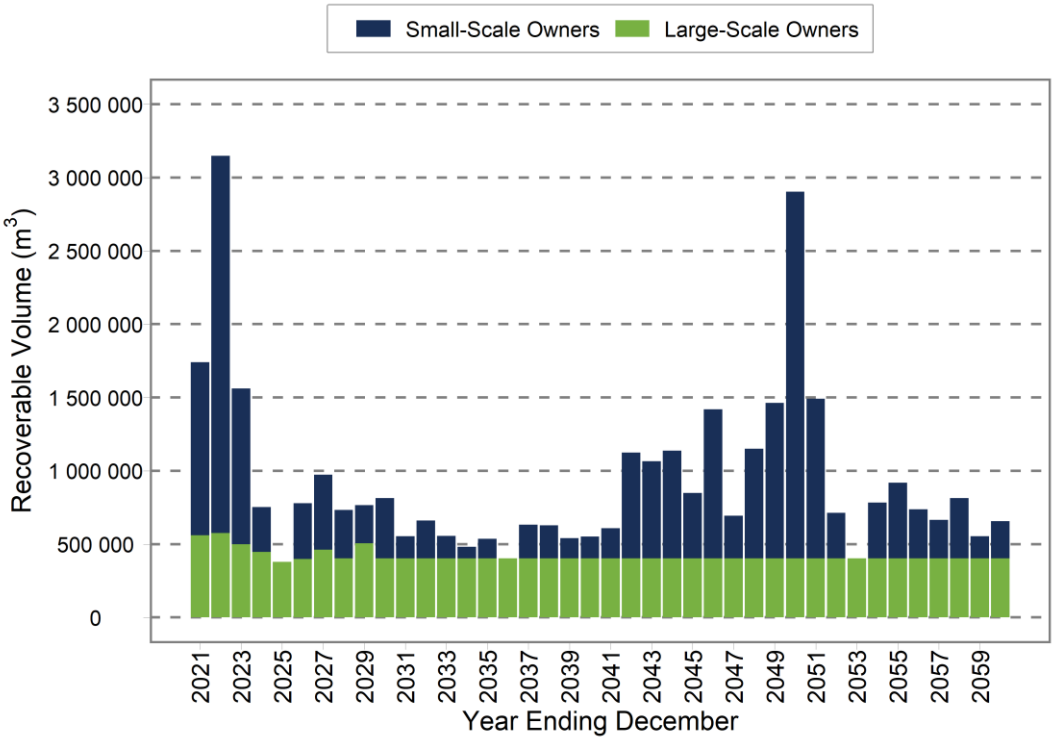


Figure 4-4:
Canterbury Radiata Pine Availability under Scenario 1



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 Canterbury region is just under 0.9 million m^3. This is a substantial drop from the current harvest levels of 1.6-1.7 million m^3 per year.

Figure 4-5:
Canterbury Radiata Pine Availability under Scenario 2

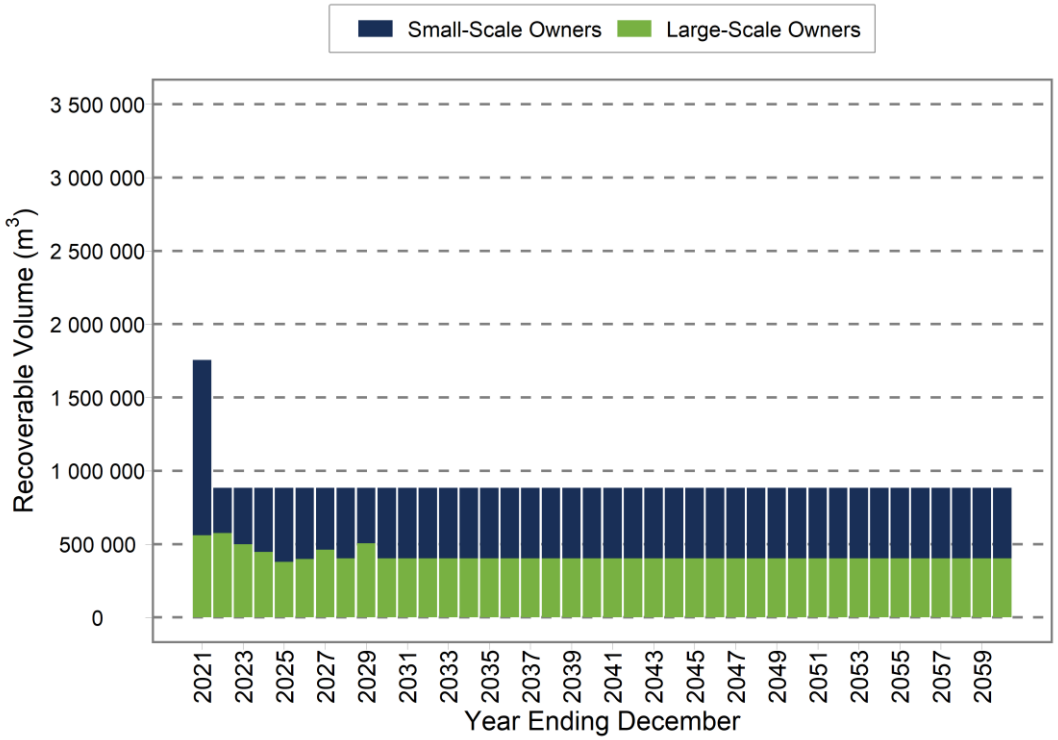
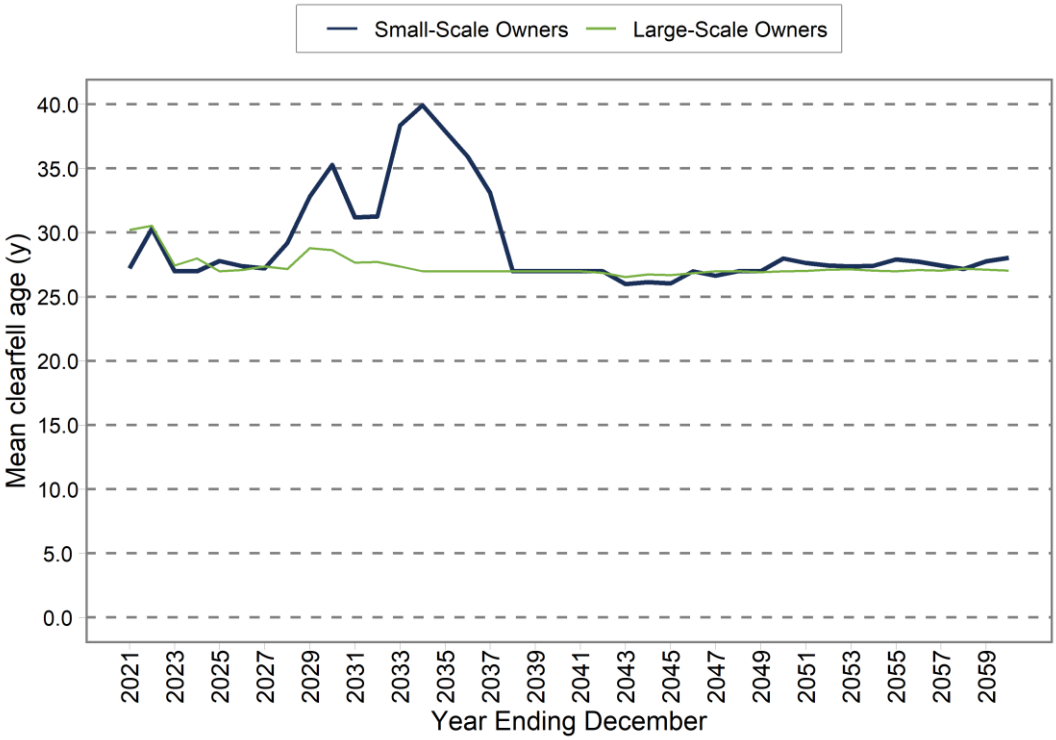


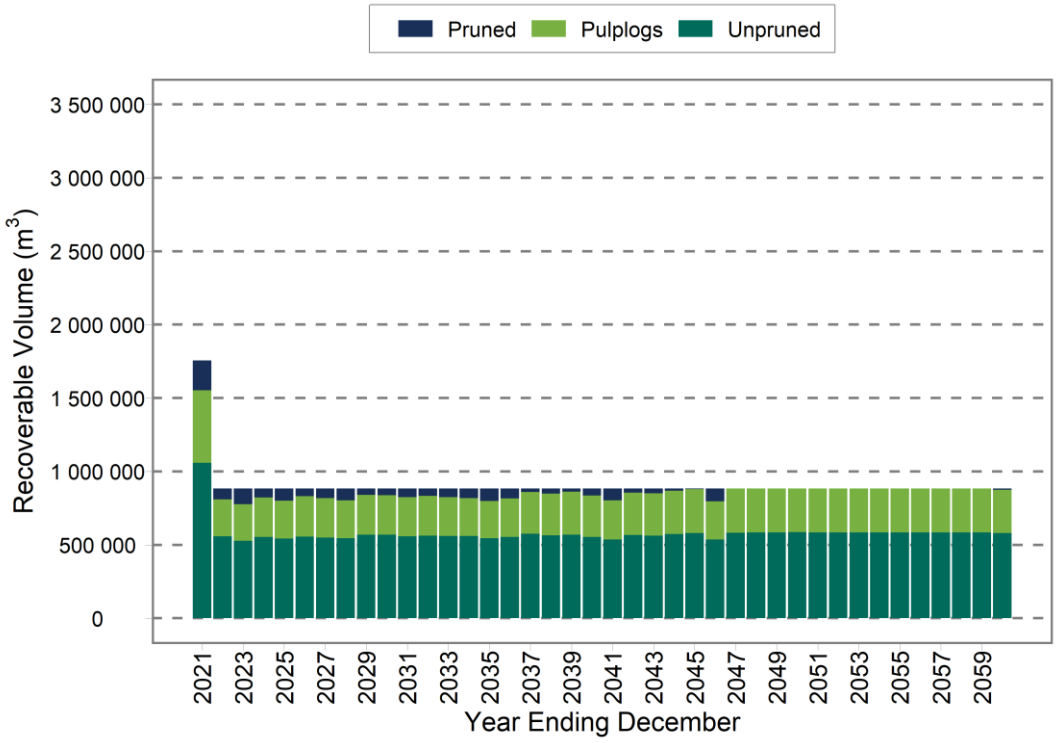
Figure 4-6 shows that the harvest age varies from the target rotation of 27 years for both forest owner types under the constraints of Scenario 2. The rotation age for the small-scale owners needs to increase well above the target rotation age of 27 in the period 2027 to 2043 to be able to maintain the non-declining yield.

Figure 4-6:
Canterbury 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:
Canterbury 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 2030, and then a non-declining yield constraint is applied after 2030. 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 decreases from its current level of over 1.7 million m^3 per year to an average annual harvest of 600 000 m^3 for 10 years, then increases to just over 1 million m^3 for a period of 12 years after which it drops again.

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:
Canterbury Radiata Pine Availability under Scenario 3

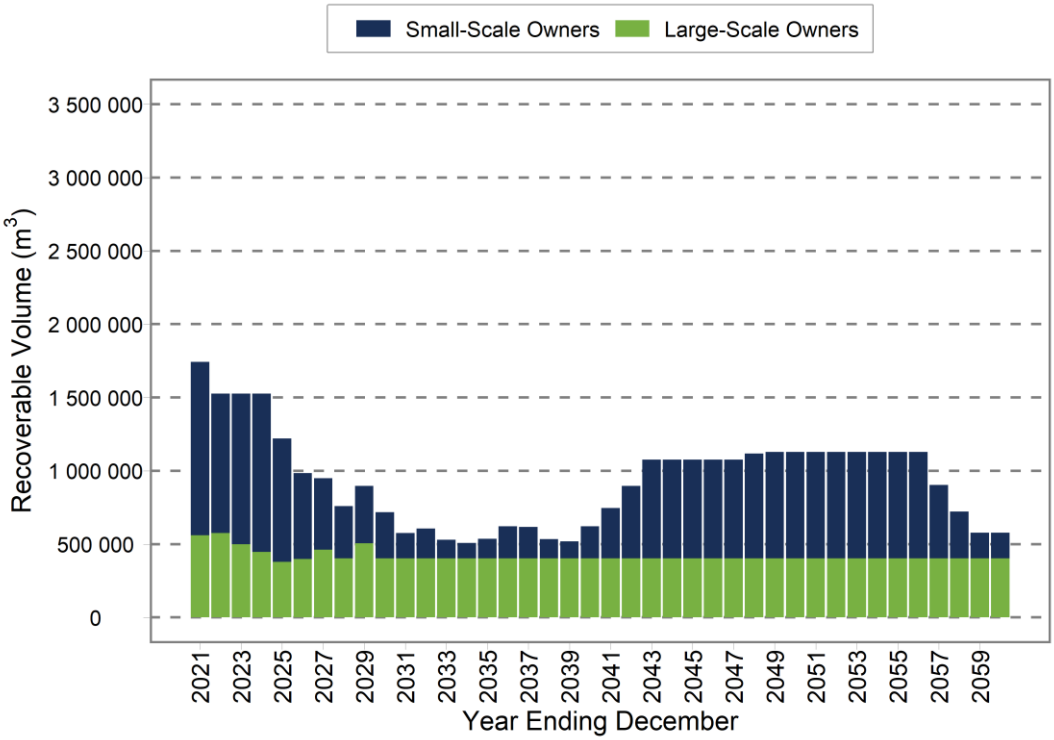


Figure 4-9:
Canterbury Average Radiata Pine Clearfell Age under Scenario 3

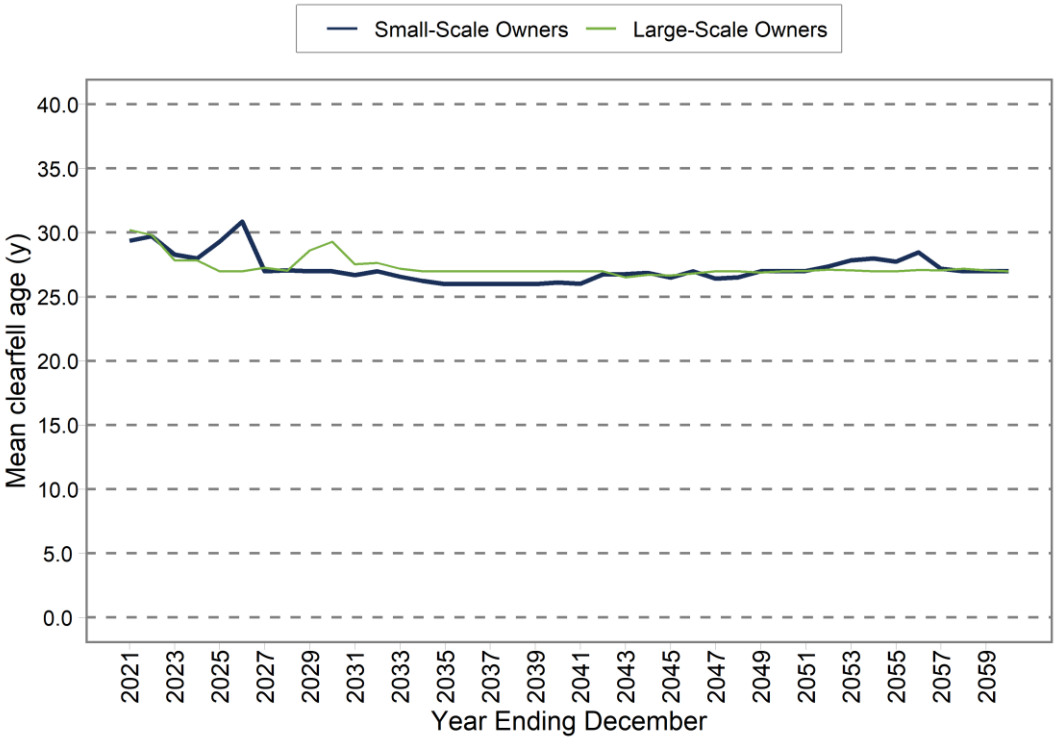
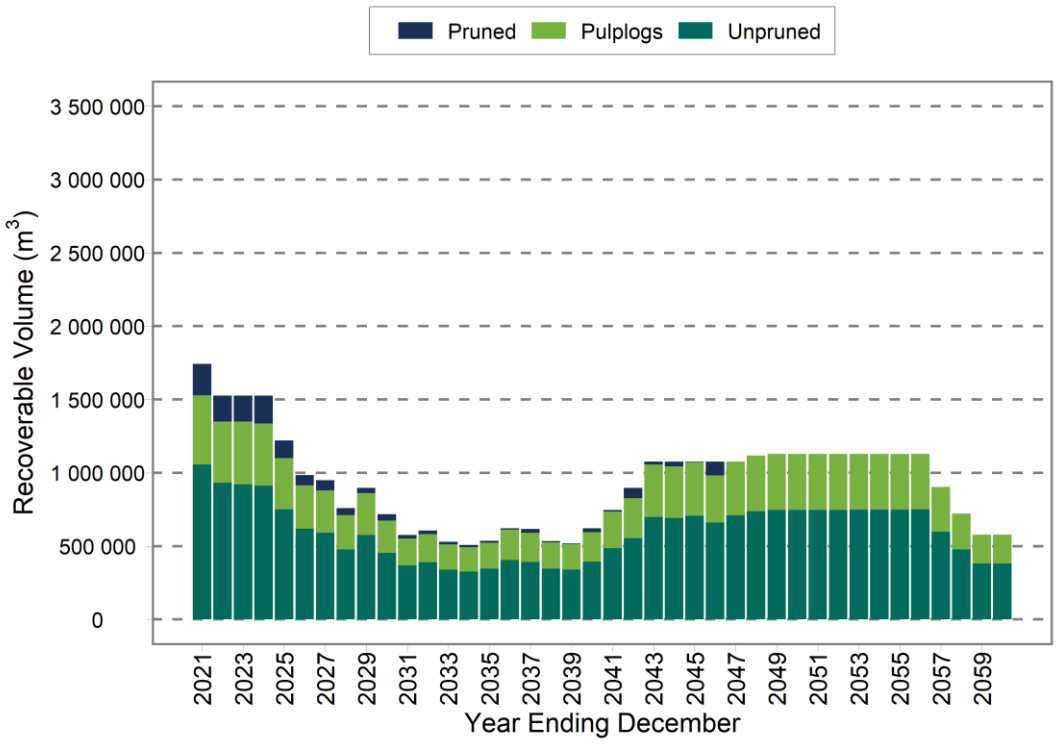


Figure 4-10 shows the radiata pine availability by log grade for all owners. Proportionally, the pruned volume reduces throughout the forecast period as areas of pruned forest are replanted into an unpruned regime.

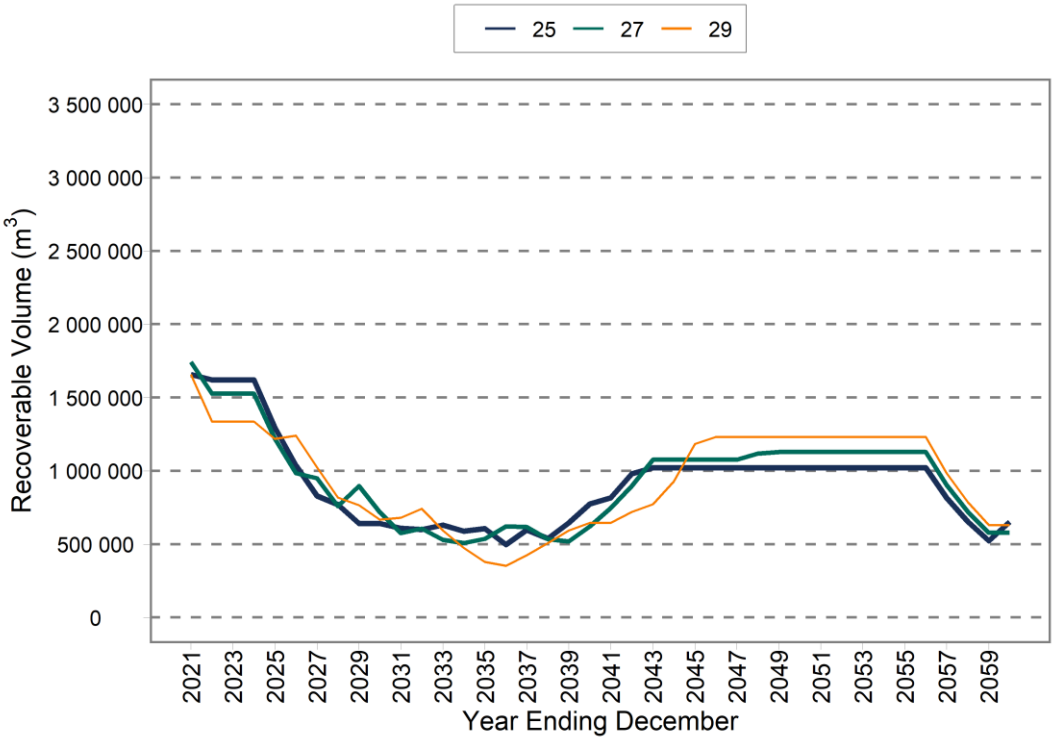
Figure 4-10:
Canterbury Radiata Pine Availability by Log Grade under Scenario 3



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 different. The older target rotation age of 29 results in a faster decrease in volume harvested (as expected). Likewise, a rotation age of 25 results in slightly higher volume in the earlier periods.

Figure 4-11:
Canterbury Radiata Pine Availability by Target Rotation Age under Scenario 4



4.6 Douglas-fir

The area of Douglas-fir in Canterbury is 16 770 ha. The age-class distribution of Douglas-fir in Canterbury 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 all 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 for Douglas-fir increases to a peak of approximately 230 000 m^3 per year (Figure 4-13).

The target rotation age is 43 years for Douglas-fir. The average clearfell age of the Douglas-fir estate in the Canterbury region is presented in Figure 4-14.

Figure 4-12:
Canterbury Age-class Distribution of Douglas-fir

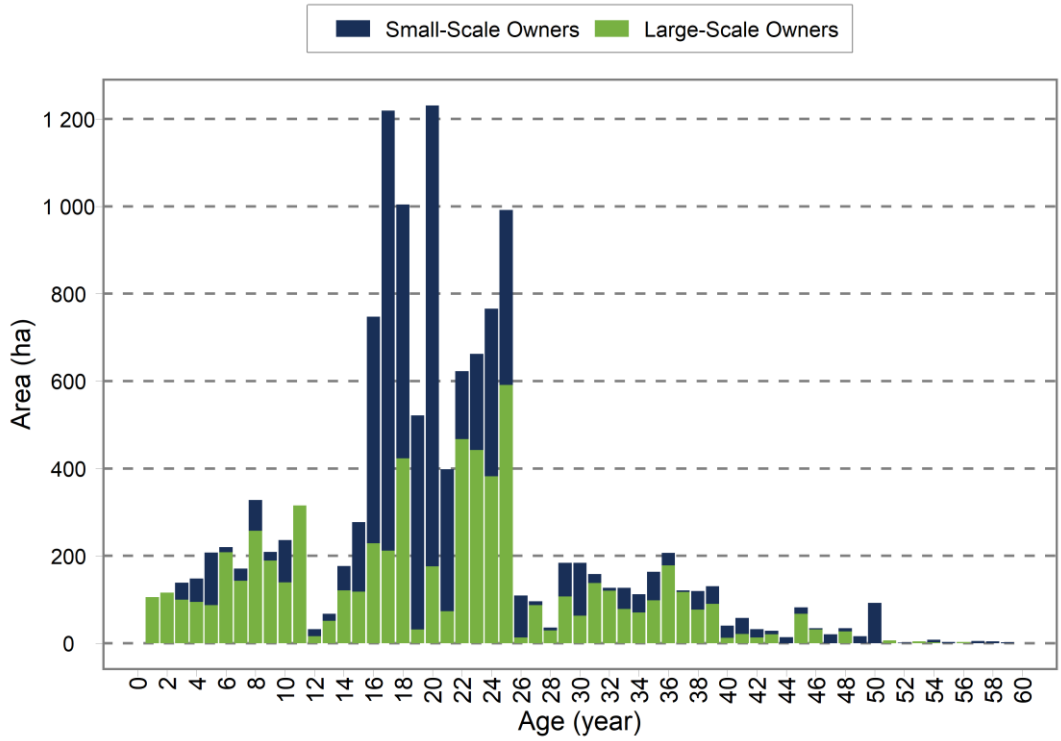


Figure 4-13:
Canterbury Douglas-fir Availability

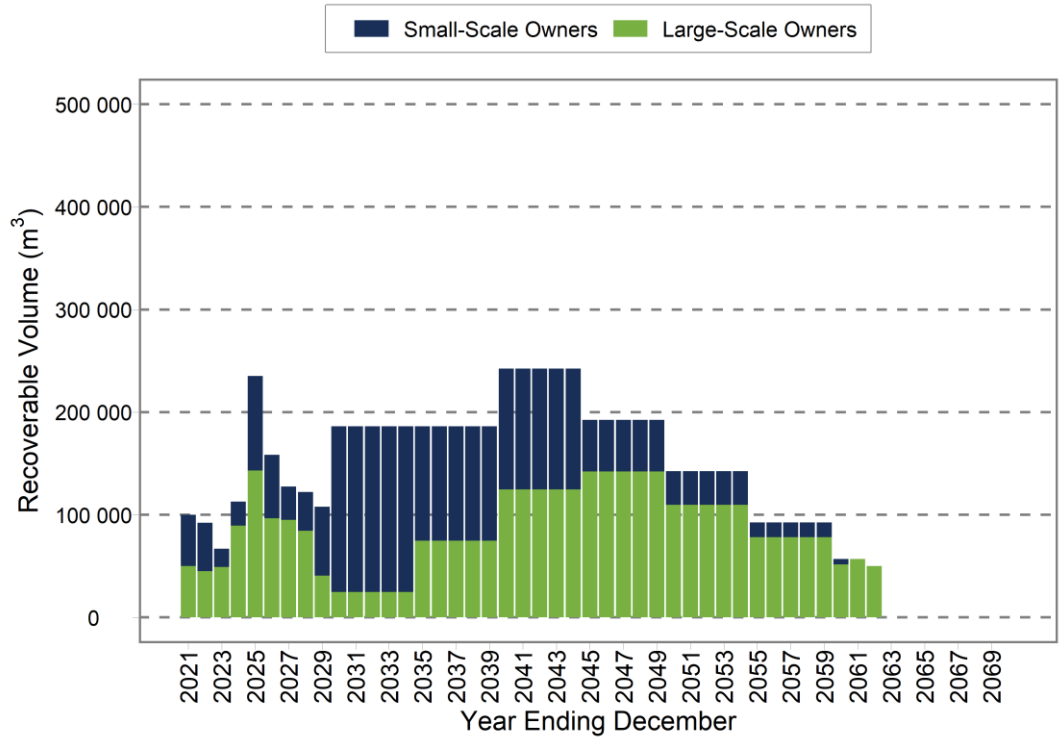
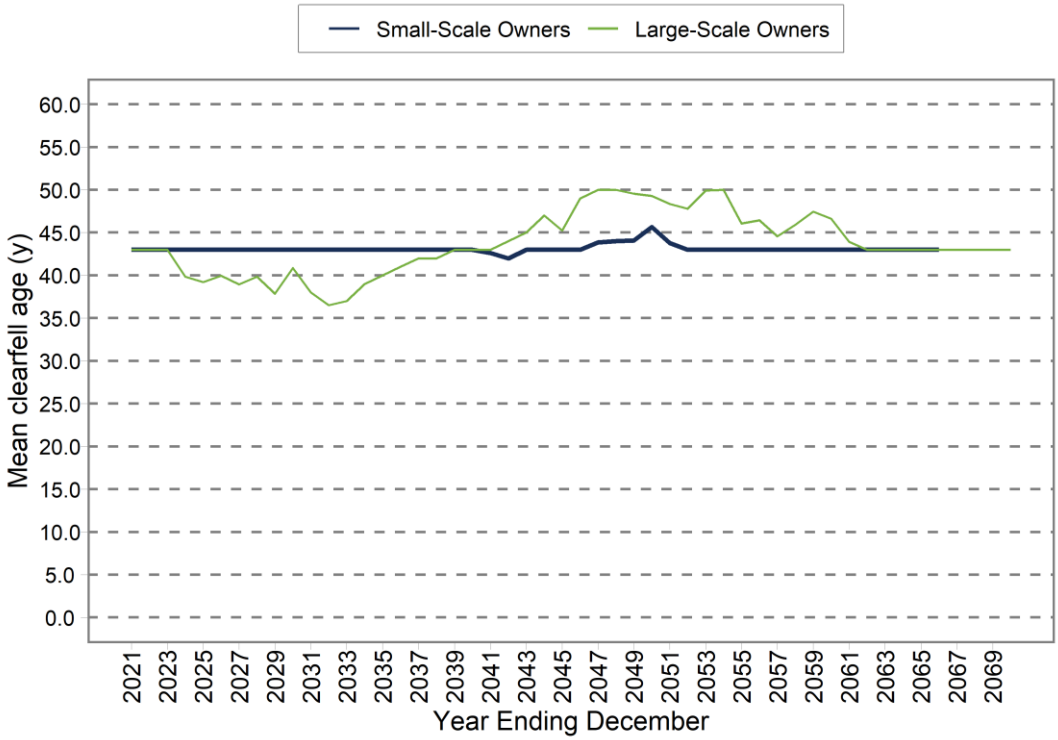


Figure 4-14:
Canterbury Average Douglas-fir Clearfell Age



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 Canterbury region under Scenario 2 has reduced from 1 million m^3 to 0.9 million m^3. The difference in the first year and last ten years of the forecast could account for this drop.

In Scenario 3, the difference in the woodflow is more marked. The current harvest volume is over 600 000 m^3 higher than the 2014 forecast. The current forecast drops crossing the previous forecast in 2026. To maintain a target rotation age around 27 for both ownership types in these forecasts, the volume harvested have to be at a level much lower than the previous forecast until 2040 where the forecasts cross over again.

Figure 5-1:
Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 2

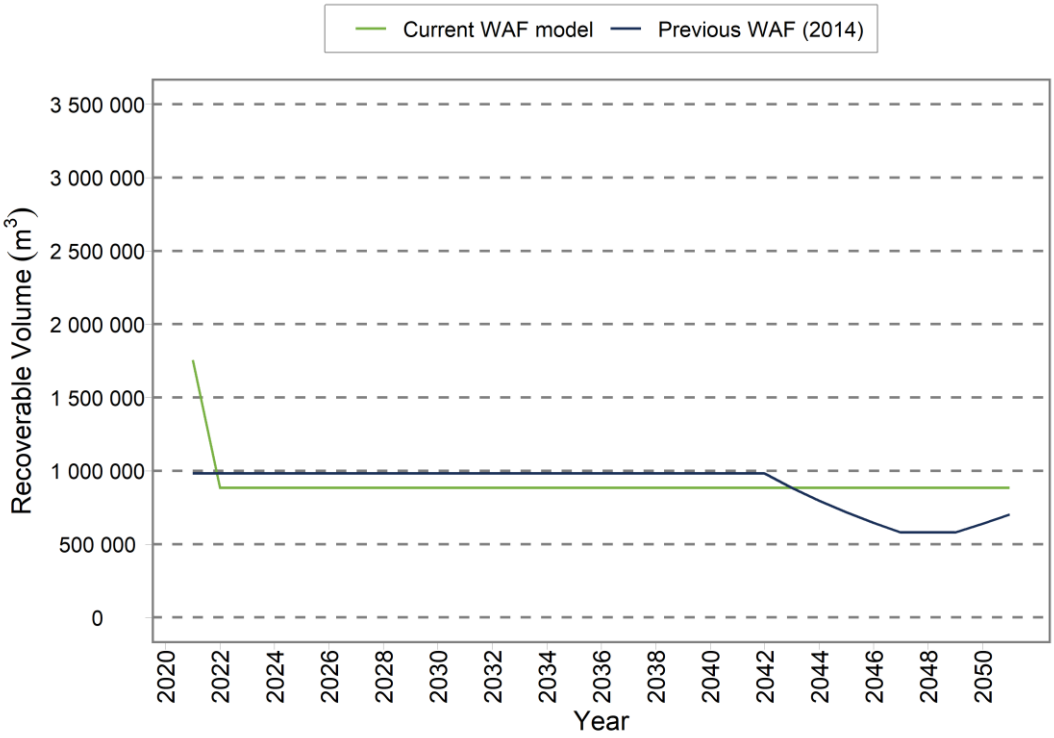
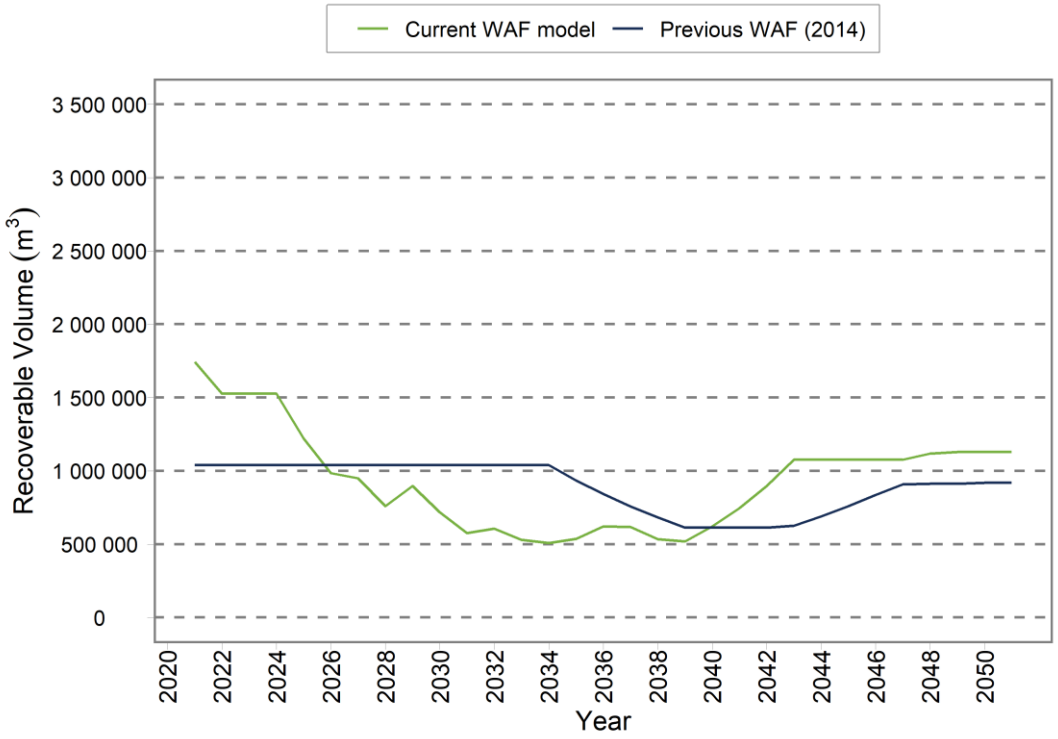


Figure 5-2:
Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 3



The factors contributing to the variations include the following (refer to Table 5-1):

- The total model area has dropped by over 5 000 ha from 2014 to 2021. There has been more than a 700 ha drop in the NEFD area. The removal of the New Zealand Carbon Farms Ltd owner forest has contributed substantially to this drop in model area.
- 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 1 435 ha of forest planted before 1990 is now remaining in the Canterbury region.
- 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 the large-scale forest owners' harvest intentions survey.

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

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	68 784	63 142	-5
Average Age (years)	N/A	15.9	N/A
Productivity (m^3/ha at age 30)	633	658	4
Clearfell Age Target (years)	28	27	11
Annual Sustainable Harvest (million m^3)	1.1	0.9	-18

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 Canterbury wood supply region is expected to continue to decrease quickly from its current levels. This decrease is required to complete the harvesting at an average rotation age of around 27 years for the areas planted during the record afforestation years of 1992 to 1995. Once the peak of harvesting has been completed, the volume will likely decrease to a low of around 600 000 m^3/a then rebound to a sustainable cut of just over 1 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 or decrease.

The decrease 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 Canterbury region, particularly in the short term.

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

Table 1: Canterbury 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	561	1 180	1 741
2022	577	2 571	3 148
2023	500	1 061	1 561
2024	446	308	754
2025	380	0	380
2026	399	380	779
2027	462	512	974
2028	402	332	734
2029	505	261	766
2030	403	410	813
2031	403	151	554
2032	403	259	661
2033	403	153	556
2034	403	79	482
2035	403	134	537
2036	403	0	403
2037	403	230	633
2038	403	225	628
2039	403	138	541
2040	403	149	552
2041	403	205	608
2042	403	722	1 125
2043	403	662	1 064
2044	403	735	1 138
2045	403	445	848
2046	403	1 018	1 420
2047	403	291	694
2048	403	749	1 152
2049	403	1 061	1 464
2050	403	2 501	2 904
2051	403	1 088	1 491
2052	403	312	714
2053	403	0	403
2054	403	381	783
2055	403	515	918
2056	403	334	737
2057	403	262	665
2058	403	412	815
2059	403	152	555
2060	403	255	657

Notes: m^3 = cubic metres inside bark

Table 2: Canterbury 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 m^3)	Small-Scale Owners (000 m^3)	All Owners (000 m^3)
2021	561	1 196	1 757
2022	577	306	883
2023	500	383	883
2024	446	437	883
2025	380	503	883
2026	399	484	883
2027	462	421	883
2028	402	481	883
2029	505	378	883
2030	403	480	883
2031	403	480	883
2032	403	480	883
2033	403	480	883
2034	403	480	883
2035	403	480	883
2036	403	480	883
2037	403	480	883
2038	403	480	883
2039	403	480	883
2040	403	480	883
2041	403	480	883
2042	403	480	883
2043	403	480	883
2044	403	480	883
2045	403	480	883
2046	403	480	883
2047	403	480	883
2048	403	480	883
2049	403	480	883
2050	403	480	883
2051	403	480	883
2052	403	480	883
2053	403	480	883
2054	403	480	883
2055	403	480	883
2056	403	480	883
2057	403	480	883
2058	403	480	883
2059	403	480	883
2060	403	480	883

Notes: m^3 = cubic metres inside bark

Table 3: Canterbury 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	561	1 181	1 742	213	1 057	472
2022	577	949	1 526	177	932	416
2023	500	1 026	1 526	177	922	427
2024	446	1 080	1 526	191	912	423
2025	380	841	1 221	121	750	350
2026	399	585	984	69	619	296
2027	462	487	950	70	591	289
2028	402	358	760	48	477	235
2029	505	393	898	36	576	286
2030	402	316	718	45	453	220
2031	402	172	575	23	368	184
2032	402	205	607	24	389	194
2033	402	127	529	18	340	171
2034	402	106	509	16	327	166
2035	402	134	537	12	347	177
2036	402	219	622	9	404	208
2037	402	214	617	25	392	199
2038	402	132	534	9	347	178
2039	402	116	519	5	339	175
2040	402	220	622	27	395	200
2041	402	344	747	12	485	250
2042	402	494	896	70	554	273
2043	402	673	1 076	19	699	357
2044	402	673	1 076	33	692	351
2045	402	673	1 076	3	707	365
2046	402	673	1 076	93	661	322
2047	402	673	1 076	0	709	366
2048	402	715	1 118	0	737	381
2049	402	726	1 128	0	745	383
2050	402	726	1 128	0	746	383
2051	402	726	1 128	0	746	383
2052	402	726	1 128	0	747	381
2053	402	726	1 128	0	748	380
2054	402	726	1 128	0	749	380
2055	402	726	1 128	0	748	380
2056	402	726	1 128	0	750	379
2057	402	500	903	0	597	306
2058	402	320	722	0	478	245
2059	402	175	578	0	382	196
2060	402	175	578	0	382	196

Notes: m^3 = cubic metres inside bark

Table 4: Canterbury 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	1 657	28	1 742	30	1 657	30
2022	1 621	28	1 526	30	1 337	29
2023	1 621	27	1 526	28	1 337	29
2024	1 621	29	1 526	28	1 337	29
2025	1 297	28	1 221	29	1 218	29
2026	1 037	28	984	29	1 239	28
2027	830	29	950	27	1 024	28
2028	771	26	760	27	819	28
2029	641	27	898	28	766	28
2030	642	26	718	28	668	28
2031	609	27	575	27	681	28
2032	599	25	607	27	742	28
2033	630	25	529	27	593	29
2034	588	25	509	27	475	28
2035	606	25	537	27	380	28
2036	498	25	622	27	353	29
2037	597	25	617	27	424	29
2038	538	25	534	27	509	29
2039	646	25	519	27	594	29
2040	775	25	622	27	645	29
2041	817	25	747	27	645	29
2042	980	25	896	27	720	29
2043	1 022	25	1 076	27	773	29
2044	1 022	25	1 076	27	927	29
2045	1 022	25	1 076	27	1 183	29
2046	1 022	25	1 076	27	1 231	29
2047	1 022	25	1 076	27	1 231	29
2048	1 022	25	1 118	27	1 231	29
2049	1 022	25	1 128	27	1 231	29
2050	1 022	25	1 128	27	1 231	29
2051	1 022	25	1 128	27	1 231	29
2052	1 022	26	1 128	27	1 231	29
2053	1 022	26	1 128	28	1 231	29
2054	1 022	27	1 128	28	1 231	29
2055	1 022	26	1 128	27	1 231	29
2056	1 022	28	1 128	28	1 231	29
2057	817	25	903	27	985	29
2058	654	25	722	27	788	29
2059	523	25	578	27	630	29
2060	652	25	578	27	630	29

Notes: m^3 = cubic metres inside bark

Table 5: Canterbury Wood Avaliability for Douglas-fir

(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 43 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	50	50	100	43
2022	45	65	110	43
2023	49	0	49	43
2024	90	0	90	40
2025	143	0	143	39
2026	97	0	97	40
2027	95	0	95	39
2028	84	0	84	40
2029	41	2	43	38
2030	31	63	93	42
2031	31	63	93	41
2032	31	63	93	41
2033	31	63	93	41
2034	31	63	93	42
2035	81	63	143	41
2036	81	63	143	42
2037	81	63	143	42
2038	81	63	143	42
2039	81	63	143	43
2040	53	296	348	43
2041	53	296	348	43
2042	53	296	348	42
2043	53	296	348	43
2044	53	296	348	44
2045	97	202	298	44
2046	97	202	298	45
2047	97	202	298	46
2048	97	202	298	46
2049	97	202	298	46
2050	147	102	248	48
2051	147	102	248	46
2052	147	102	248	46
2053	147	102	248	47
2054	147	102	248	47
2055	197	2	198	46
2056	197	2	198	46
2057	197	2	198	45
2058	197	2	198	46
2059	197	2	198	47
2060	148	0	148	47

Notes: m^3 = cubic metres inside bark