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Wood Availability Forecast – Hawke's Bay 2021

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PREFACE

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The reports contain the regional and national wood availability forecasts for New Zealand plantation forestry estates. The release of this report is subject to the terms of the Disclaimer provided on the following page.

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 Hawke's Bay 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 Hawke's Bay 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 forecast.

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 Hawke's Bay wood supply region. Their feedback was considered in the final derived profiles.

There are around 3 838 ha of species other than radiata pine and Douglas-fir in the Hawke's Bay 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 2041 (calendar year estimates, 20-years only). After 2041, 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.

The total volume in this scenario has been capped at six million cubic metres per year for presentation purposes[1].

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 2041. After 2041, 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
2021-2026	Harvest intentions	NDY
2026-2040	Harvest intentions	10% increase/decrease
>2040	NDY	NDY

[1] For the purposes of graphical representation, illustrating smoothed peak periods, a maximum annual harvest level of 6 million m^3 was introduced. The limit is purely academic as the total annual harvest in the Hawke's Bay region is unlikely to ever reach this level.

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 Scenario 4B it is increased by two years.

2.5 Scenario for Douglas-fir

The large-scale resources are harvested at stated intentions up until 2022. The total Douglas-fir volume from large-scale owners is limited to 30 000 cubic metres per year.

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 Hawke's Bay 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 Hawke's Bay (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 the Hawke's Bay[2] 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 87% 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 Hawke's Bay region has a large portion of the area (~16%) 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 Hawke's Bay 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 87% of the area of the reported NEFD as at 1 April 2020.

[2] 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 11% deforestation[3]) 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 Hawke's Bay, no adjustments were made to the 2015 NEFD yield tables.

The production thinning yield tables for radiata pine were derived from the large-scale owners' harvest intention survey conducted in 2021.

[3] 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 55% 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 Hawke's Bay 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 1 332 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.
    - 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 areas are planted into 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 3.82 million m^3.
- The model assumes no future afforestation and deforestation.

4 WOOD AVAILABILITY FORECASTS FOR HAWKE'S BAY

4.1 Hawke's Bay Region Area Description

The Hawke's Bay region has a plantation resource of 131 994 ha. Of this, 127 673 ha consists of radiata pine, and 483 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 119 280 ha.

The modelled resource consists entirely of radiata pine and Douglas-fir. Figure 4-1 shows the age-class distribution for the Hawke's Bay estate by owner size. Large-scale owners held 55% of the modelled resources, and small-scale owners held 45%.

Figure 4-2 shows the age-class distribution for the Hawke's Bay by species. Most of the estate is radiata pine, of which 65% is recorded as managed under a pruned regime. A small amount of production thinning is undertaken in the Hawke's Bay region, mostly by one of the large-scale owners and has been modelled where appropriate.

Figure 4-1:
Hawke's Bay Modelled Age-class Distribution for All Species

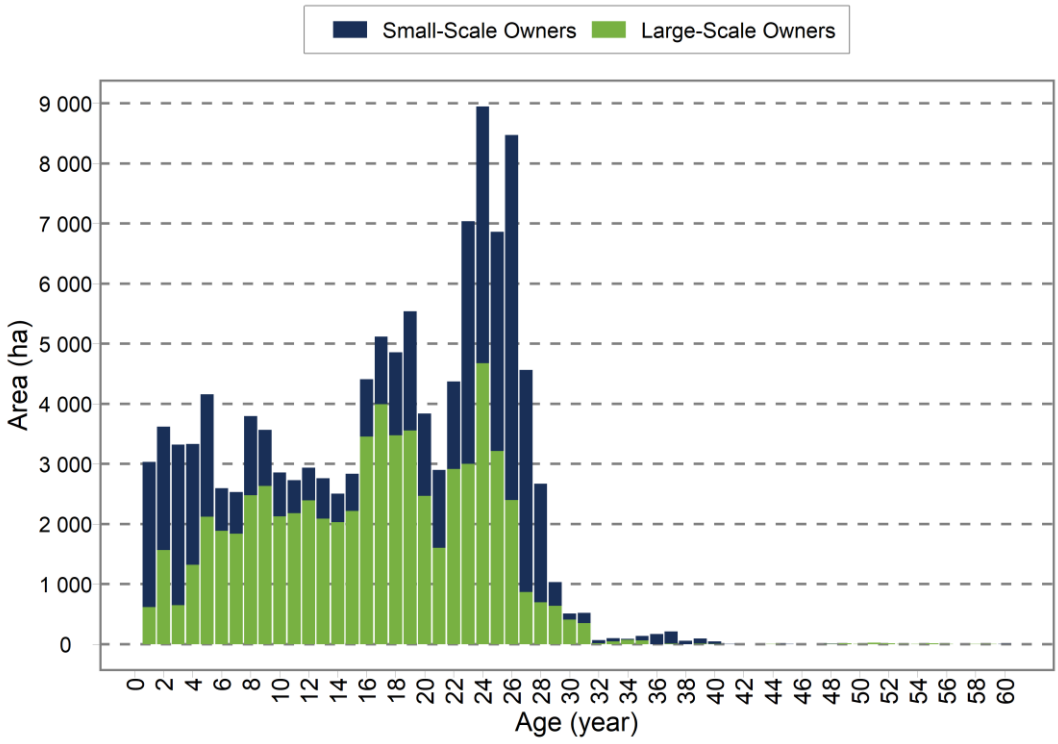
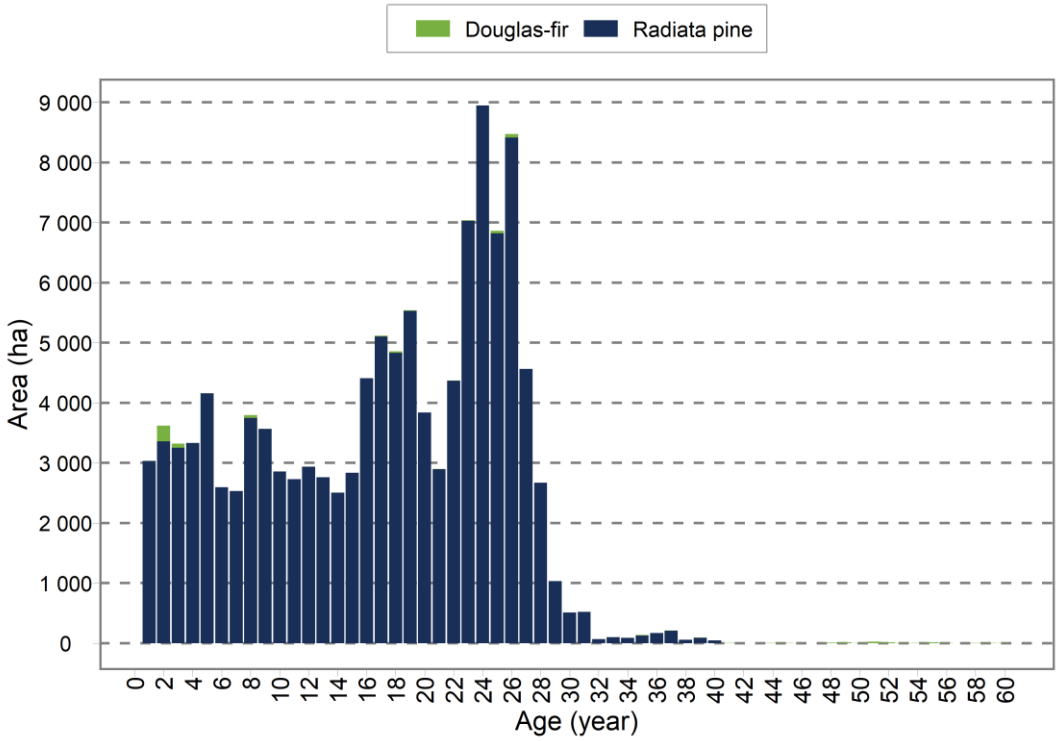


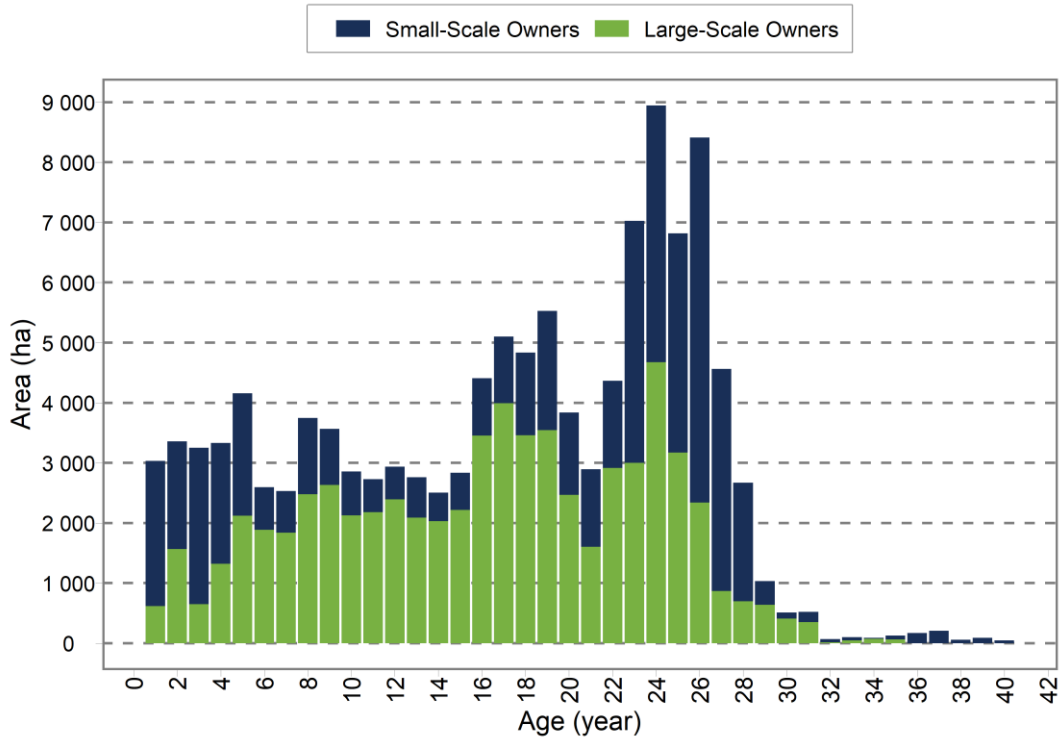
Figure 4-2:
Hawke's Bay Modelled Age-class Distribution by Species



4.2 Scenario 1

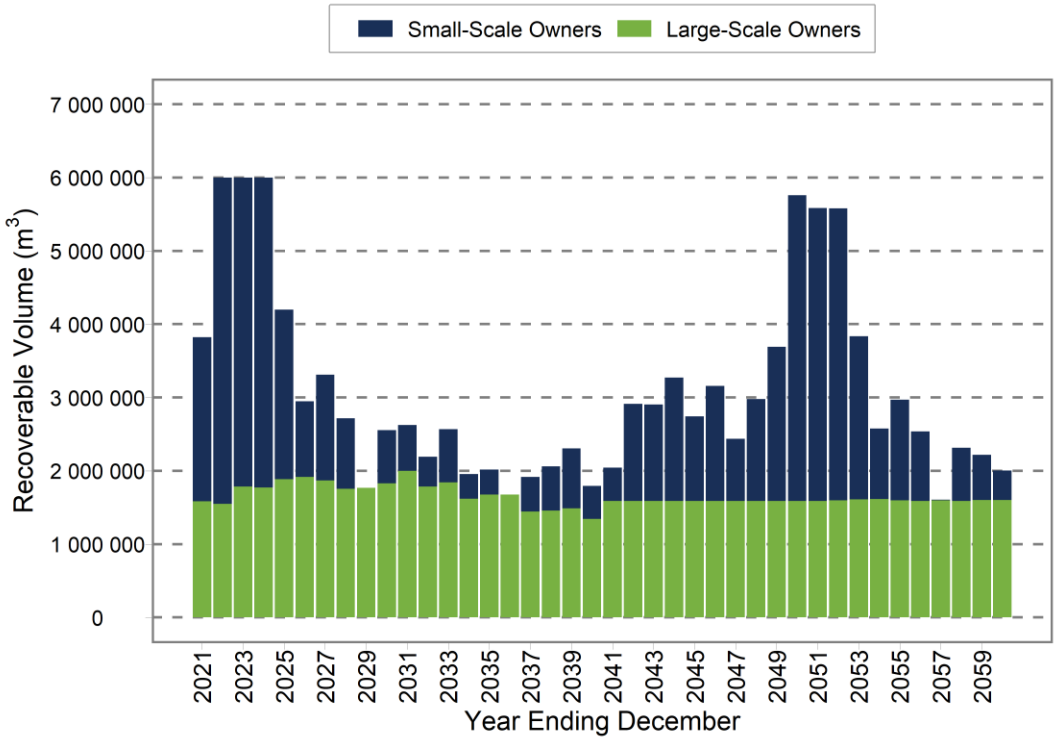
In Scenario 1, large-scale owners are modelled to harvest according to their stated intentions and small-scale owners are modelled to harvest their forests at age 27. Figure 4-3 shows the age-class distribution for the Hawke's Bay radiata pine estate for both large-scale and small-scale owners combined.

Figure 4-3:
Hawke's Bay Age-class Distribution of Radiata Pine



The wood availability from all owners in Hawke's Bay 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 in the 1992 to 1995 period are harvested.

Figure 4-4:
Hawke's Bay Radiata Pine Availability under Scenario 1



4.3 Scenario 2

The Hawke's Bay age-class distribution means that it is impossible to apply a non-declining yield constraint to the total volume harvested from the combined estate as the model becomes infeasible. To account for this, the non-declining yield constraint has been relaxed so that the volume can drop by 20% in 2030 and again in 2039 before resuming non-declining yield. Figure 4-5 shows the radiata pine availability for all owners under Scenario 2.

Figure 4-5:
Hawke's Bay Radiata Pine Availability under Scenario 2

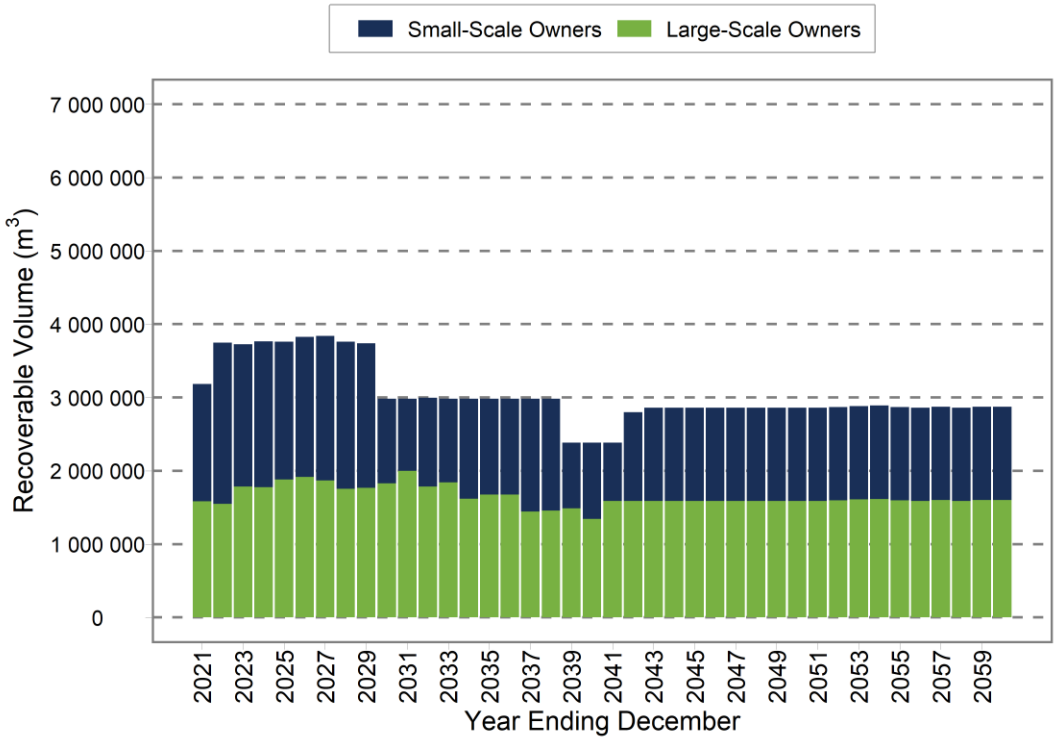
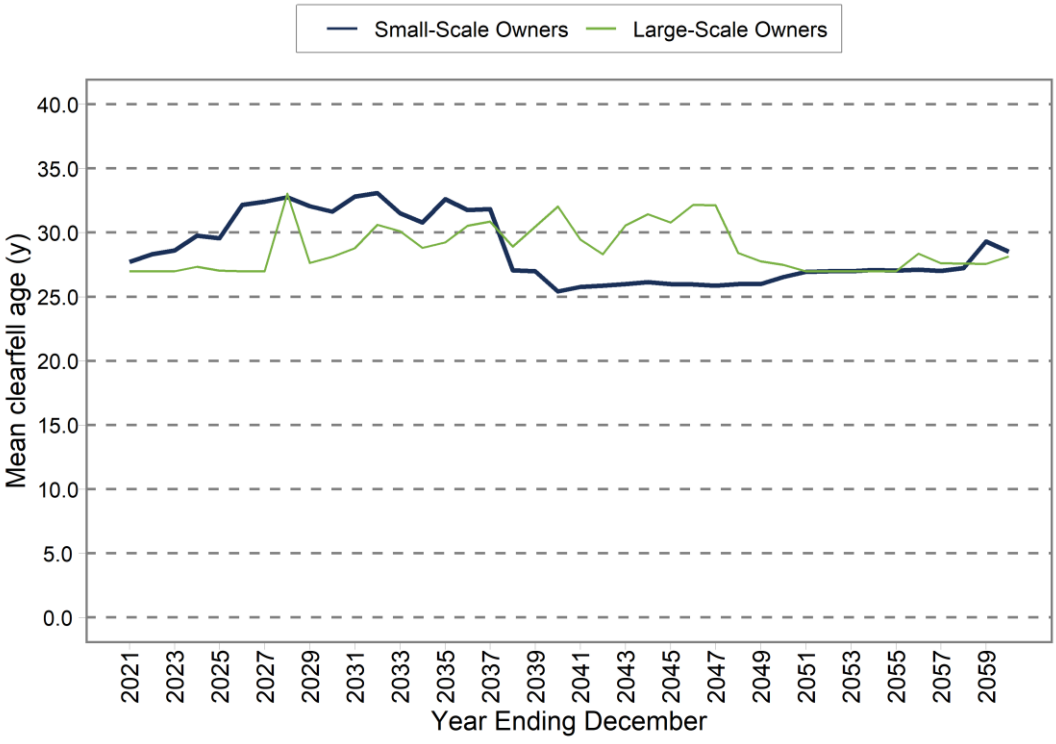


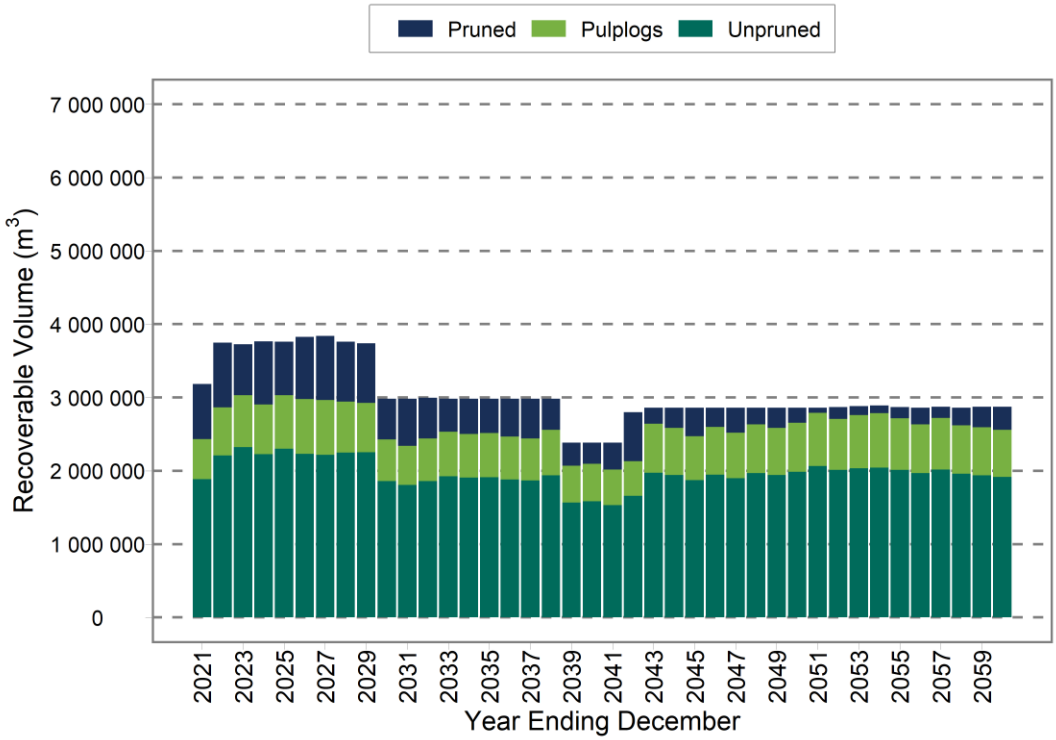
Figure 4-6 shows that the harvest age varies from the target rotation of 27 years for both forest owner types under the constraints of Scenario 2.

Figure 4-6:
Hawke's Bay 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:
Hawke's Bay 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 2041, and then a non-declining yield constraint is applied after 2041. 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 4.5 million m^3 per year for six years, then drops to around 2 million m^3 for a period of five years. The volume then increases back up to a sustainable annual cut of just under 3 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:
Hawke's Bay Radiata Pine Availability under Scenario 3

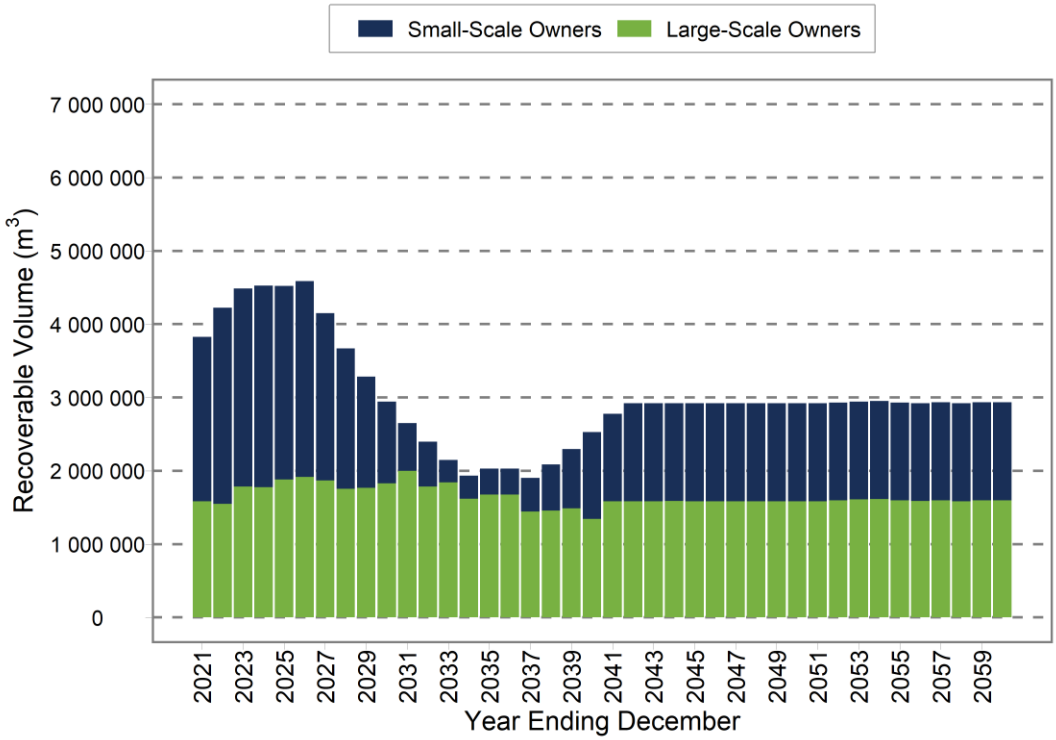


Figure 4-9:
Hawke's Bay Average Radiata Pine Clearfell Age under Scenario 3

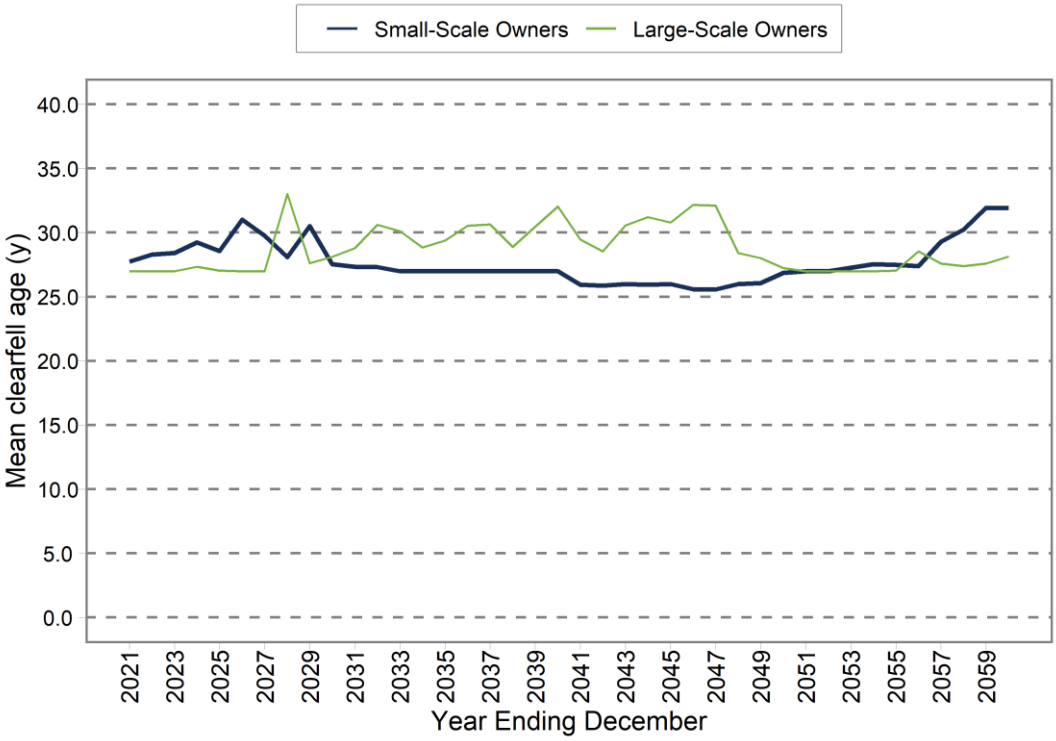
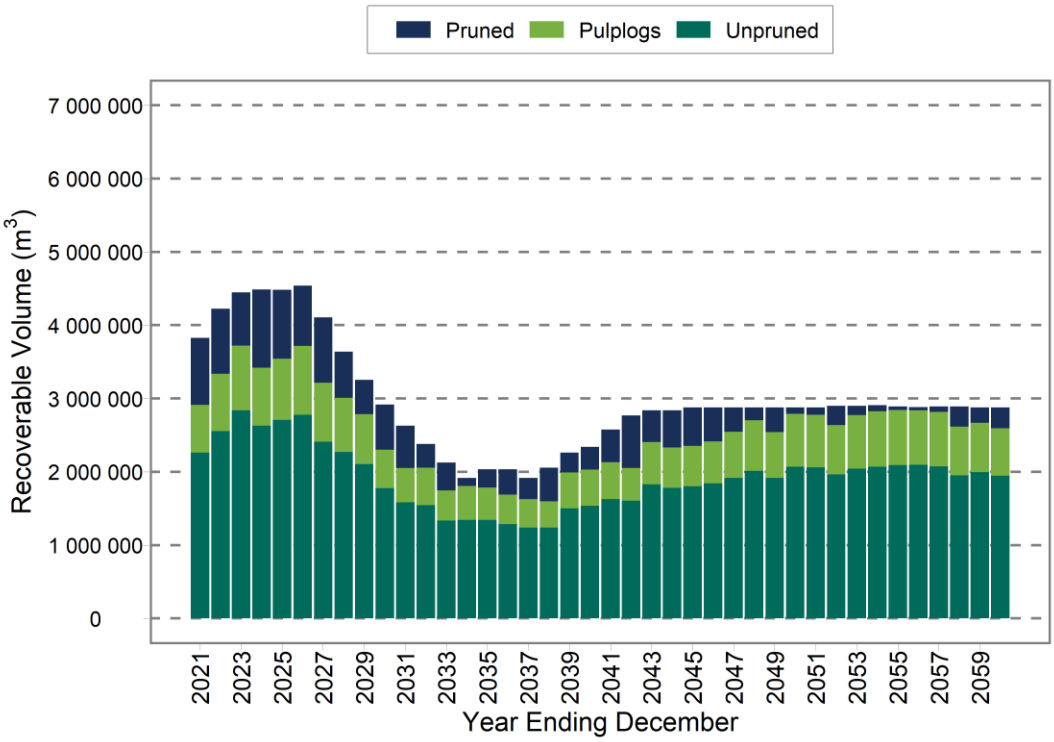


Figure 4-10 shows the radiata pine availability by log grade for all owners. Proportionally, the pruned volume reduces throughout the forecast period as areas of pruned forest are replanted into an unpruned regime.

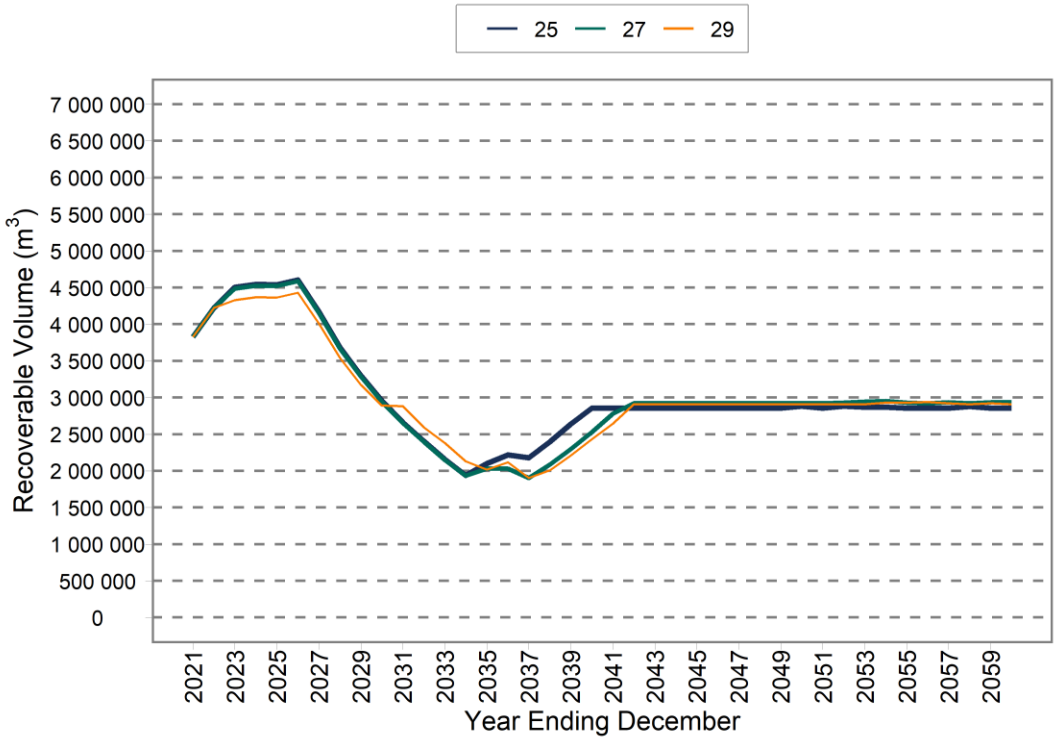
Figure 4-10:
Hawke's Bay Radiata Pine Availability by Log Grade under Scenario 3



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), particularly in the first five years. Likewise, a rotation age of 25 results in an earlier recovery from woodflow decline.

Figure 4-11:
Hawke's Bay Radiata Pine Availability by Target Rotation Age under Scenario 4



4.6 Douglas-fir

The area of Douglas-fir in Hawke's Bay is 483 ha. The age-class distribution of Douglas-fir in Hawke's Bay 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 2022. From 2023, the wood availability from large-scale owners is limited to an upper limit of 30 000 m^3 per year (Figure 4-13).

The target rotation age is 40 years for Douglas-fir. The average clearfell age of the Douglas-fir estate in the Hawke's Bay region is presented in Figure 4-14.

Figure 4-12:
Hawke's Bay Age-class Distribution of Douglas-fir

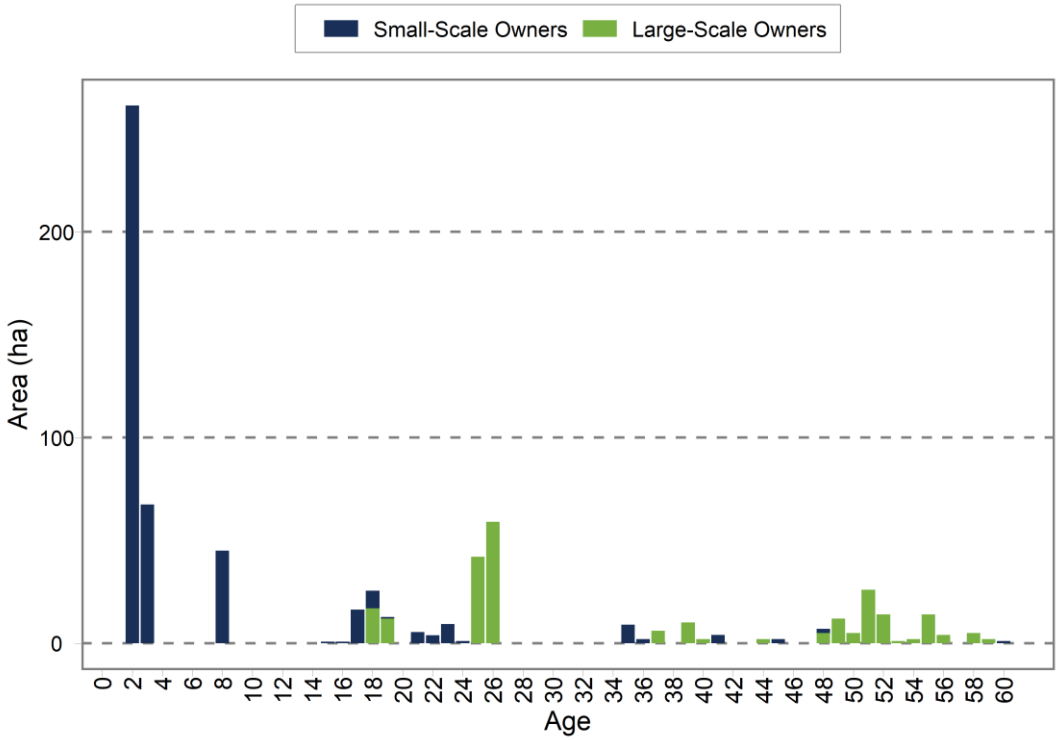


Figure 4-13:
Hawke's Bay Douglas-fir Availability

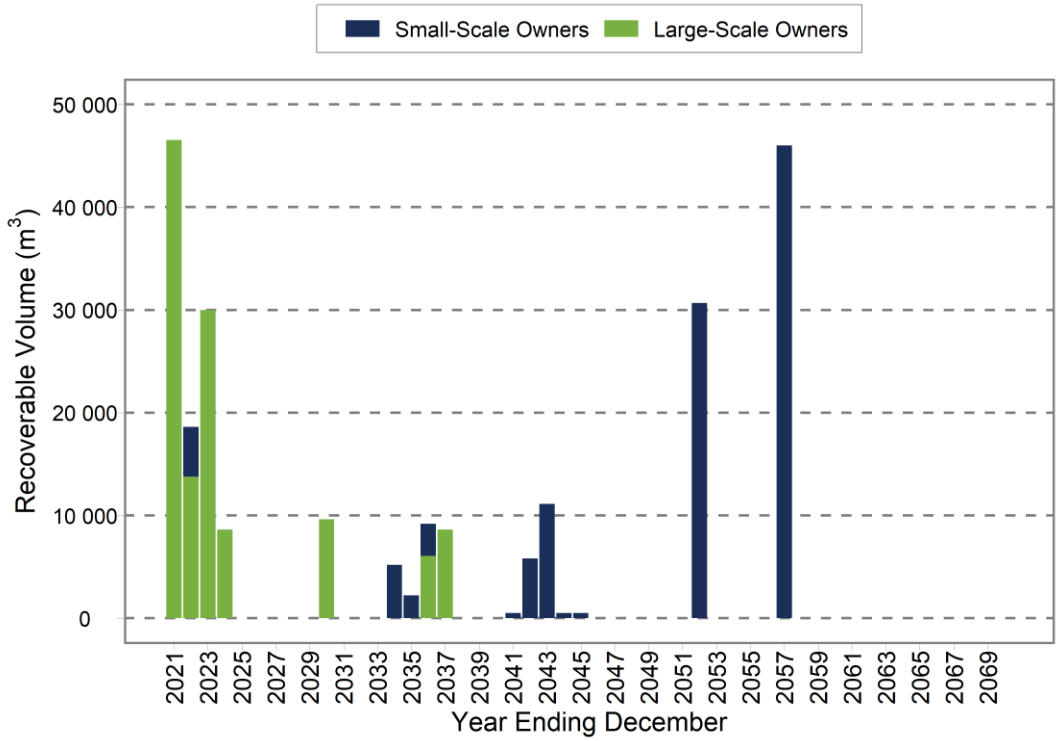
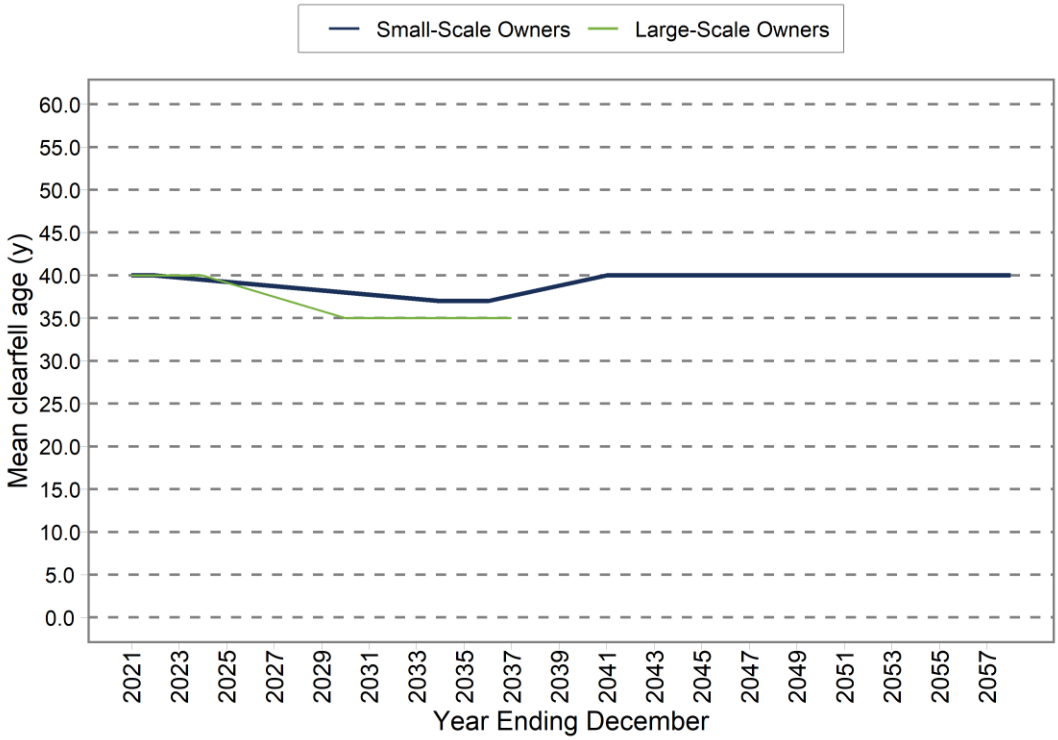


Figure 4-14:
Hawke's Bay Average Douglas-fir Clearfell Age



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 inability to apply non-declining yield constraint in Scenario 2 makes it difficult to make a direct comparison between the 2014 and 2021 analyses. Overall, the long-term sustainable cut from the Hawke's Bay under Scenario 2 has changed little between 2014 and 2021 (except for the periods when the non-declining yield constraint is relaxed).

In Scenario 3, the difference in the woodflow is 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

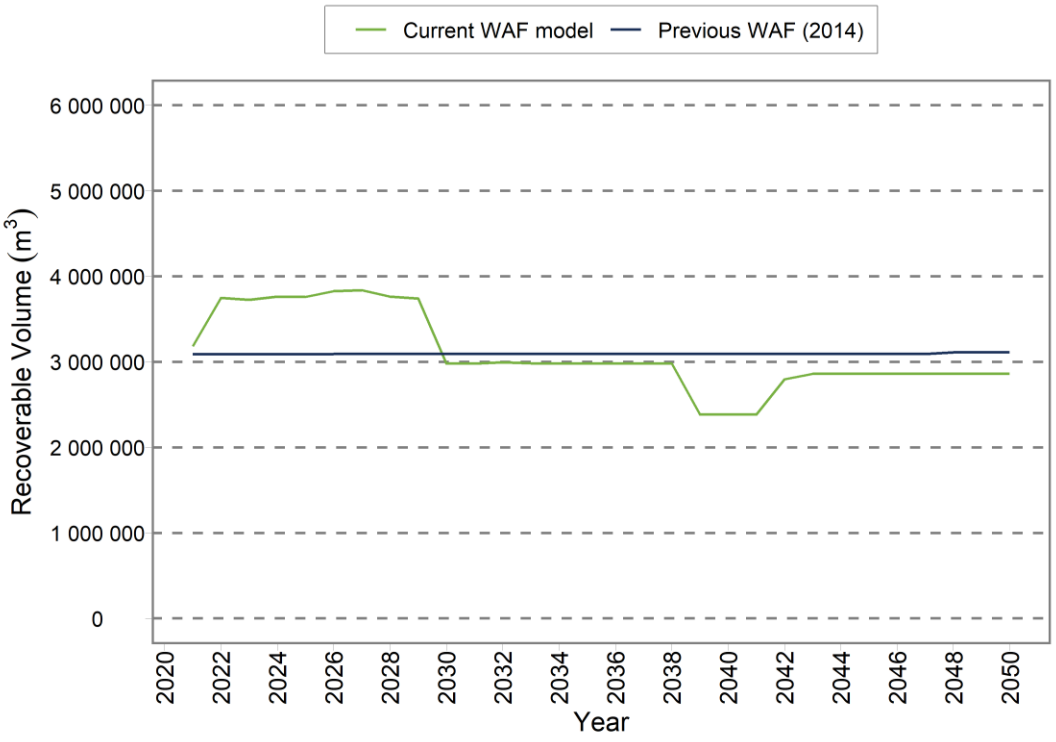
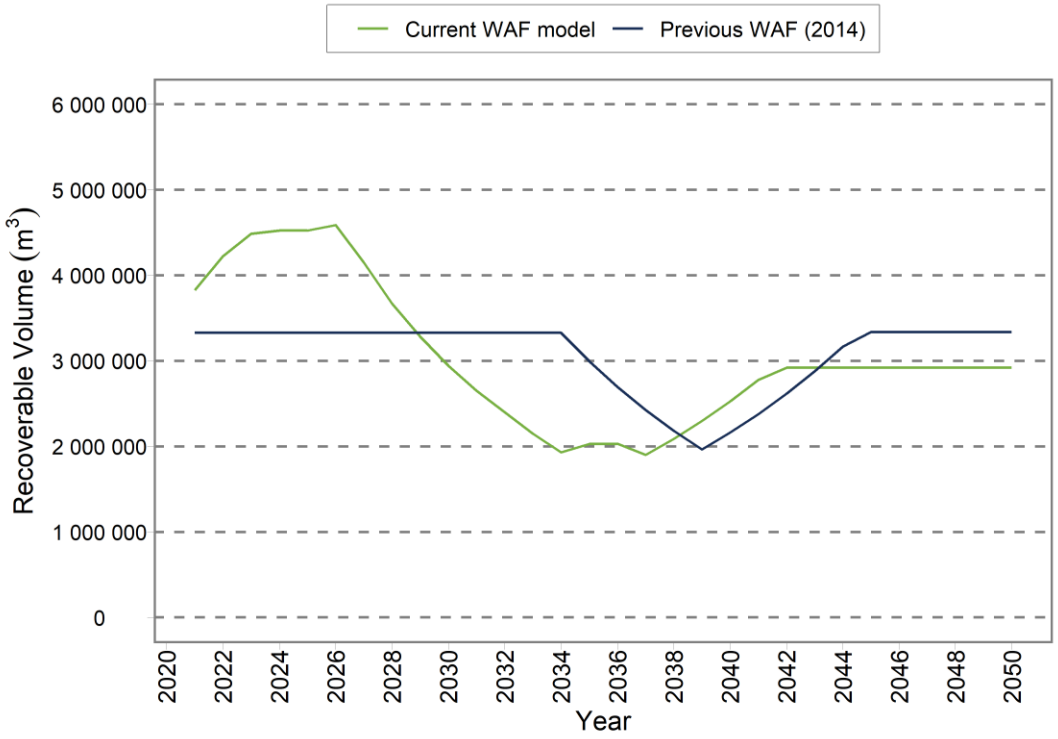


Figure 5-2:
Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 3



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

- The total model area has dropped by 4% in 2021, largely due to the percentage reduction in small-scale owner resource area (see Section 3.1).
- There has been some maturing of the Hawke's Bay resource; the average age has increased from 13.2 years in 2014, to 14.7 years in 2021.
- 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 1 500 ha of forest planted before 1990 is now remaining in the Hawke's Bay.
- 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.

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

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	123 851	119 280	-4
Average Age (years)	14.7	16.8	14
Productivity (m^3/ha at age 30)	742	738.4	0
Clearfell Age Target (years)	28	27	-4
Annual Sustainable Harvest (million m^3)	3.1	~ 3.0	-3

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.

6 CONCLUSION

Wood availability from the Hawke's Bay wood supply region is expected to continue to increase in the next couple of years to a maximum of 4.5 million m^3/a. This increase 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 2 million m^3/a then rebound to a sustainable cut of just under 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. Any delay of the harvest will lead to an increase in the average rotation age, particularly for the small-scale owner resource.

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 Hawke's Bay region, particularly in the short term.

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Appendix - Hawke's Bay Wood Availability Forecasts for the Period 2021-2060

Table 1: Hawke's Bay 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	1 586	2 238	3 824
2022	1 550	4 450	6 000
2023	1 785	4 215	6 000
2024	1 773	4 227	6 000
2025	1 884	2 313	4 197
2026	1 917	1 030	2 946
2027	1 870	1 441	3 311
2028	1 755	960	2 714
2029	1 769	0	1 769
2030	1 830	723	2 554
2031	1 999	624	2 623
2032	1 784	406	2 190
2033	1 843	722	2 566
2034	1 620	337	1 957
2035	1 678	339	2 017
2036	1 675	0	1 675
2037	1 443	474	1 917
2038	1 456	604	2 060
2039	1 488	818	2 306
2040	1 346	450	1 796
2041	1 587	455	2 042
2042	1 587	1 327	2 914
2043	1 587	1 317	2 903
2044	1 587	1 684	3 271
2045	1 587	1 158	2 745
2046	1 587	1 570	3 157
2047	1 587	849	2 436
2048	1 587	1 392	2 979
2049	1 587	2 104	3 691
2050	1 587	4 172	5 759
2051	1 587	3 997	5 584
2052	1 596	3 984	5 580
2053	1 610	2 225	3 835
2054	1 617	961	2 577
2055	1 597	1 373	2 969
2056	1 589	948	2 537
2057	1 599	5	1 605
2058	1 587	728	2 315
2059	1 600	619	2 219
2060	1 600	403	2 003

Notes: m^3 = cubic metres inside bark

Table 2: Hawke's Bay 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	1 586	1 599	3 184
2022	1 550	2 197	3 747
2023	1 785	1 942	3 727
2024	1 777	1 987	3 764
2025	1 880	1 881	3 761
2026	1 917	1 910	3 827
2027	1 870	1 968	3 838
2028	1 755	2 009	3 763
2029	1 769	1 971	3 740
2030	1 830	1 151	2 981
2031	1 999	983	2 981
2032	1 784	1 211	2 994
2033	1 843	1 139	2 983
2034	1 620	1 361	2 981
2035	1 678	1 306	2 983
2036	1 675	1 306	2 981
2037	1 443	1 538	2 981
2038	1 456	1 526	2 981
2039	1 488	897	2 385
2040	1 346	1 040	2 385
2041	1 587	798	2 385
2042	1 587	1 211	2 797
2043	1 587	1 272	2 859
2044	1 587	1 272	2 860
2045	1 587	1 272	2 859
2046	1 587	1 272	2 859
2047	1 587	1 272	2 859
2048	1 587	1 272	2 859
2049	1 587	1 272	2 859
2050	1 587	1 272	2 859
2051	1 587	1 272	2 859
2052	1 596	1 272	2 868
2053	1 610	1 272	2 882
2054	1 617	1 272	2 889
2055	1 597	1 272	2 869
2056	1 589	1 272	2 861
2057	1 600	1 272	2 872
2058	1 587	1 272	2 859
2059	1 600	1 272	2 872
2060	1 600	1 272	2 872

Notes: m^3 = cubic metres inside bark

Table 3: Hawke's Bay 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	1 586	2 240	3 826	930	2 251	645
2022	1 550	2 673	4 224	1 014	2 480	730
2023	1 785	2 703	4 488	954	2 728	806
2024	1 777	2 748	4 526	1 027	2 684	814
2025	1 880	2 642	4 522	943	2 732	847
2026	1 917	2 671	4 588	1 061	2 664	863
2027	1 870	2 280	4 150	900	2 431	819
2028	1 755	1 917	3 672	790	2 198	683
2029	1 769	1 516	3 285	699	1 987	599
2030	1 830	1 114	2 944	567	1 826	552
2031	1 999	651	2 650	593	1 593	464
2032	1 784	614	2 398	367	1 535	496
2033	1 843	304	2 148	203	1 459	486
2034	1 620	312	1 932	216	1 293	423
2035	1 678	352	2 030	155	1 401	475
2036	1 675	356	2 032	248	1 347	437
2037	1 443	459	1 903	225	1 265	412
2038	1 456	632	2 088	363	1 318	407
2039	1 488	809	2 297	235	1 550	512
2040	1 346	1 181	2 526	260	1 704	563
2041	1 586	1 193	2 779	480	1 757	542
2042	1 586	1 334	2 920	684	1 738	499
2043	1 586	1 334	2 920	258	1 995	667
2044	1 587	1 334	2 921	250	2 000	671
2045	1 586	1 334	2 921	406	1 906	608
2046	1 586	1 334	2 921	278	1 983	660
2047	1 586	1 334	2 920	363	1 932	626
2048	1 586	1 334	2 920	186	2 039	695
2049	1 586	1 334	2 921	356	1 938	627
2050	1 586	1 334	2 920	65	2 113	742
2051	1 586	1 334	2 920	27	2 136	757
2052	1 595	1 334	2 930	154	2 059	717
2053	1 609	1 334	2 943	93	2 096	754
2054	1 616	1 334	2 950	24	2 138	788
2055	1 596	1 334	2 930	34	2 132	764
2056	1 588	1 334	2 923	139	2 068	715
2057	1 599	1 334	2 933	223	2 017	693
2058	1 586	1 334	2 920	236	2 009	675
2059	1 599	1 334	2 933	337	1 948	648
2060	1 599	1 334	2 934	380	1 922	631

Notes: m^3 = cubic metres inside bark

Table 4: Hawke's Bay 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	3 826	25	3 826	27	3 826	29
2022	4 224	26	4 224	28	4 224	29
2023	4 506	28	4 488	28	4 330	29
2024	4 544	29	4 526	28	4 367	29
2025	4 540	29	4 522	28	4 364	29
2026	4 606	29	4 588	29	4 430	29
2027	4 167	27	4 150	28	4 008	29
2028	3 686	33	3 672	30	3 544	29
2029	3 298	30	3 285	29	3 170	29
2030	2 956	28	2 944	28	2 893	29
2031	2 661	29	2 650	28	2 884	29
2032	2 408	27	2 398	30	2 596	29
2033	2 157	28	2 148	30	2 382	29
2034	1 940	30	1 932	29	2 131	29
2035	2 101	29	2 030	29	2 016	29
2036	2 218	30	2 032	30	2 117	29
2037	2 180	29	1 903	30	1 905	29
2038	2 397	28	2 088	28	2 010	31
2039	2 637	27	2 297	29	2 211	33
2040	2 854	25	2 526	30	2 432	30
2041	2 855	28	2 779	28	2 644	29
2042	2 854	28	2 920	27	2 908	28
2043	2 854	27	2 920	28	2 908	28
2044	2 855	28	2 921	29	2 908	29
2045	2 854	29	2 921	29	2 908	30
2046	2 855	27	2 921	29	2 909	30
2047	2 854	26	2 920	29	2 908	29
2048	2 854	26	2 920	27	2 908	29
2049	2 854	26	2 921	27	2 908	28
2050	2 884	26	2 920	27	2 908	28
2051	2 856	25	2 920	27	2 908	29
2052	2 884	26	2 930	27	2 908	28
2053	2 869	25	2 943	27	2 908	29
2054	2 869	27	2 950	27	2 930	29
2055	2 854	26	2 930	27	2 931	29
2056	2 854	27	2 923	28	2 938	29
2057	2 854	29	2 933	28	2 923	29
2058	2 880	28	2 920	29	2 910	29
2059	2 856	29	2 933	30	2 921	29
2060	2 854	28	2 934	30	2 908	31

Notes: m^3 = cubic metres inside bark

Table 5: Hawke's Bay Wood Avaliability for Douglas-fir

(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 40 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	47	6	53	40
2022	14	5	19	40
2023	30	0	30	40
2024	9	0	9	40
2025	0	0	0	0
2026	0	0	0	0
2027	0	0	0	0
2028	0	0	0	0
2029	0	0	0	0
2030	10	0	10	35
2031	0	0	0	0
2032	0	0	0	0
2033	0	0	0	0
2034	0	5	5	37
2035	0	2	2	37
2036	6	3	9	36
2037	9	0	9	35
2038	0	0	0	0
2039	0	0	0	0
2040	0	0	0	0
2041	0	1	1	40
2042	0	6	6	40
2043	0	11	11	40
2044	0	1	1	40
2045	0	1	1	40
2046	0	0	0	0
2047	0	0	0	0
2048	0	0	0	0
2049	0	0	0	0
2050	0	0	0	0
2051	0	0	0	0
2052	0	31	31	40
2053	0	0	0	0
2054	0	0	0	0
2055	0	0	0	0
2056	0	0	0	0
2057	0	46	46	40
2058	0	178	178	40
2059	0	0	0	0
2060	0	0	0	0

Notes: m^3 = cubic metres inside bark