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Wood Availability Forecast – Northland 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 Northland 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 1 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 Northland 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 Northland wood supply region. Their feedback was considered in the final derived profiles.

There are around 4 255 ha of species other than radiata pine and Douglas-fir in the Northland 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 26

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, with a target rotation age of 28. Small-scale owners are assumed to harvest their forest holdings at age 26.

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 26 and 28 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, with a target rotation age of 28 (as for Scenario 1). The total wood availability of radiata pine is also assumed to not decrease, with small-scale owners targeting a rotation age of 26.

2.3 Scenario 3: Split NDY – Target Rotation 26 and 28 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
2026-2039	Harvest intentions then NDY	20% increase/decrease
>2039	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 Northland 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 ages are decreased by two years and in Scenario 4B they are increased by two years.

2.5 Scenario for Douglas-fir

This scenario has been omitted from the forecast due to the Northland region having insignificant quantities of Douglas-fir resource (less than 10 ha).

2.6 Discussion of Radiata Pine Scenarios

In Scenario 1, the forests owned by small-scale owners are assumed to be harvested at age 26. 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 Northland 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 Northland (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 2020 for Northland[2] showed that the small-scale owners' resource NEFD area was understated (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 110% of the area reported in the NEFD indicating a significant anomaly. This is the opposite result to what was found in most other regions.

The likely error in the NEFD comes predominately 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 Northland region has a large portion of the area (~18%) 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 Northland region, Margules Groome has made the following adjustments:

[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.

1. The "New Planting Imputations" and "2004 Small Forest Owner Survey" areas have been adjusted so that the total area of the small-scale owners' resource less than 1 000 ha is 110% of the area of the reported NEFD as at 1 April 2020.
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 2.8% 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 2021 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 Northland, yields for unpruned regimes were adjusted up by 3% and yields for pruned regimes were adjusted down by 5% from the 2015 NEFD yield tables.

[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 56% of the total NEFD area. Inclusion of the actual intended harvest level 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 Northland 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 6 722 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 to an unpruned regime.
  - Small-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.
- The total harvest for 2021 has been constrained to be no greater than 4.11 million m^3.
- The model assumes no future afforestation and deforestation.

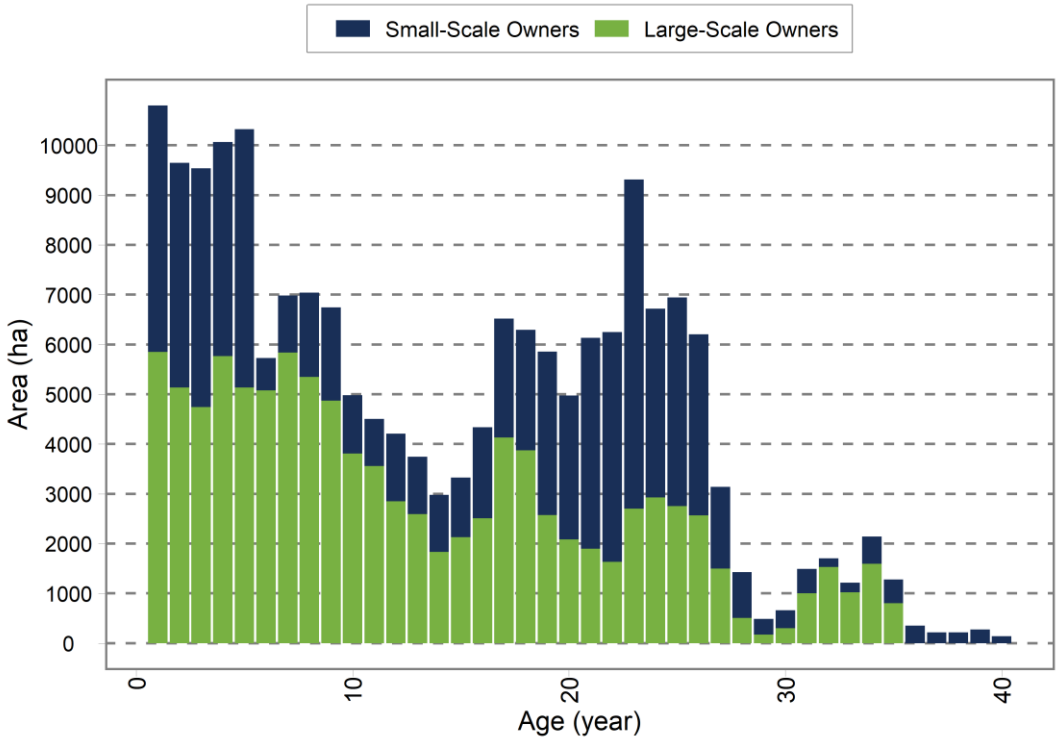
4 WOOD AVAILABILITY FORECASTS FOR NORTHLAND

4.1 Northland Region Area Description

The Northland region has a plantation resource of 188 586 ha. Of this, 184 321 ha consists of radiata pine, and 10 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 increases slightly to 189 081 ha.

The modelled resource consists entirely of radiata pine[4]. Figure 4-1 shows the age-class distribution for the Northland estate by owner size. Large-scale owners held 56% of the modelled resource, and small-scale owners held 44%. Almost the entire Northland estate is planted in radiata pine, of which 29% is recorded as managed under a pruned regime. There may be a small amount of production thinning undertaken in the Northland region, however the area is likely insignificant, and has not been included in the modelling of this region.

Figure 4-1:
Northland Modelled Age-class Distribution for Radiata Pine



4.2 Scenario 1

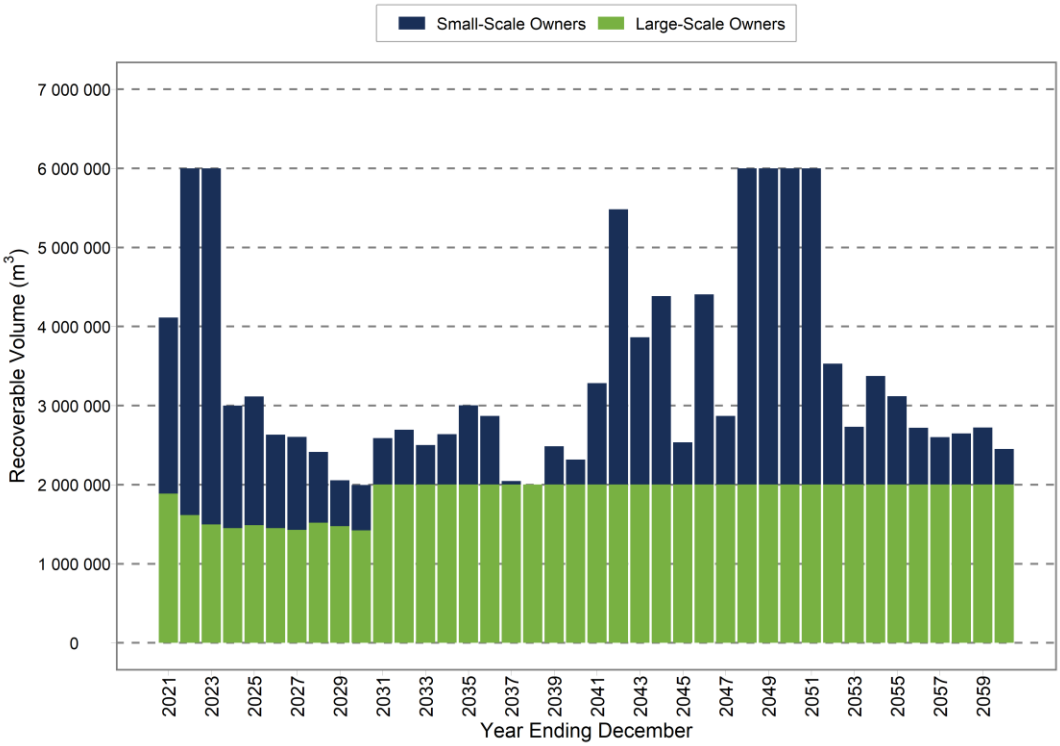
In Scenario 1, large-scale owners are modelled to harvest according to their stated intentions followed by a target average harvest age of 28 and small-scale owners are modelled to harvest their forests at age 26.

The wood availability from all owners in Northland under Scenario 1 is presented in Figure 4-2. The estate has the potential to generate a substantial increase in the

[4] The 6 ha of Douglas-fir remaining in the adjusted NEFD was not included in the modelling.

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 4-2:
Northland Radiata Pine Availability under Scenario 1



4.3 Scenario 2

Figure 4-3 shows the radiata pine availability for all owners under Scenario 2. The sustainable yield under a non-declining yield constraint for the Northland region is just under 3.3 million m^3 rising to just under 3.6 million m^3 from 2044.

Figure 4-3:
Northland Radiata Pine Availability under Scenario 2

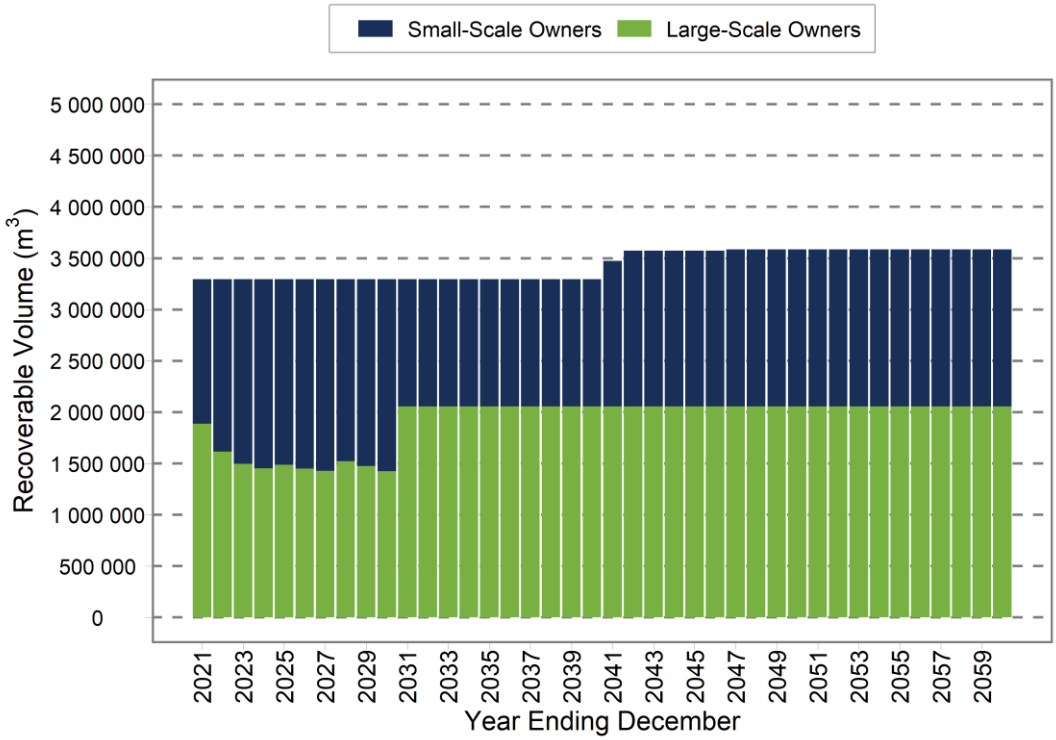
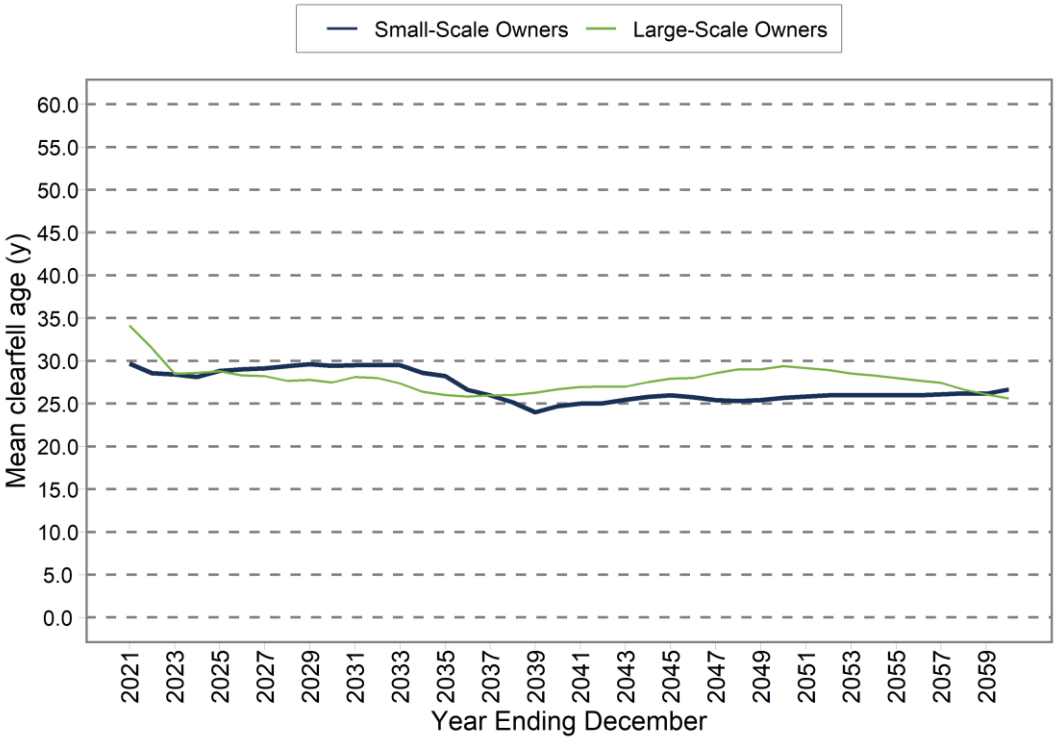


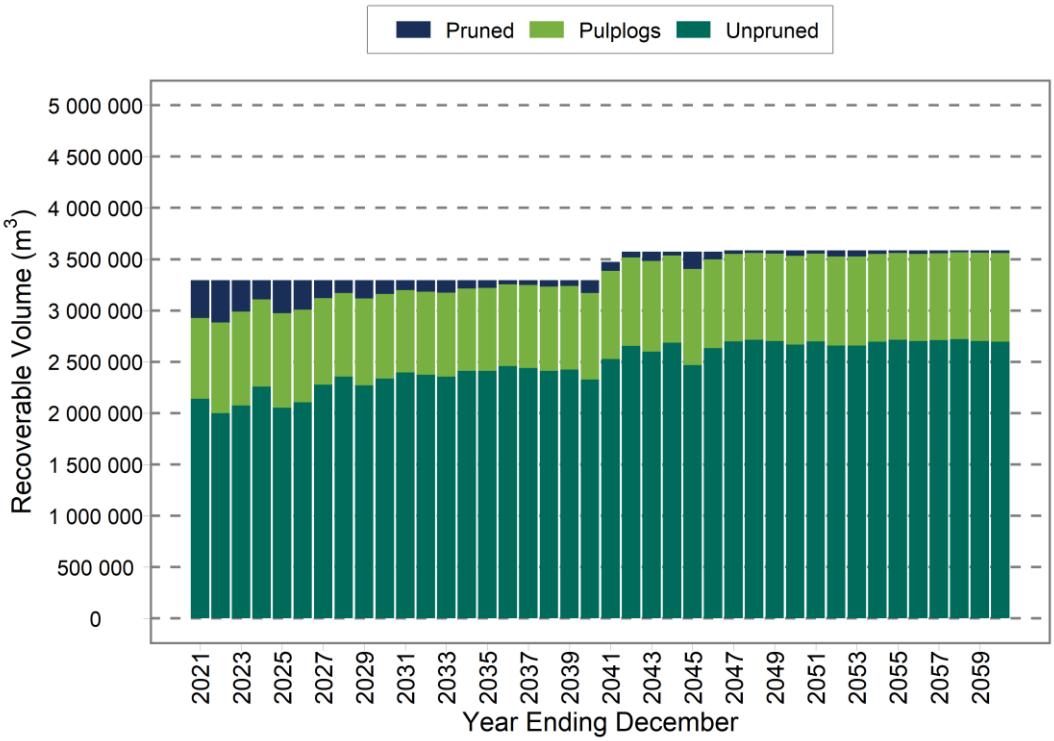
Figure 4-4 shows that the harvest age varies from the target rotation ages of 28 (large-scale owners) and 26 years (small-scale owners) for both forest owner types under the constraints of Scenario 2.

Figure 4-4:
Northland Average Radiata Pine Clearfell Age under Scenario 2



The harvest volume forecast under Scenario 2 is shown by log grade in Figure 4-5.

Figure 4-5:
Northland Radiata Pine Availability by Log Grade under Scenario 2



4.4 Scenario 3

Scenario 3 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 from 2030. The total yield for all owners has been regulated in a manner that tries to maintain the target rotation age for small-scale owner at around 26 years and large-scale owners at around 28 years.

Figure 4-6 shows the radiata pine availability from all owners. The total volume increases to around 4.1 million m^3 per year for six years, then drops to around 2.1 million m^3 before gradually increasing back up to a sustainable annual cut of just over 3.6 million m^3.

Figure 4-7 shows the radiata pine average clearfell age by ownership under Scenario 3. Under this scenario the average rotation age of small-scale owners' resource is maintained closer to the target rotation than in Scenario 2.

Figure 4-6:
Northland Radiata Pine Availability under Scenario 3

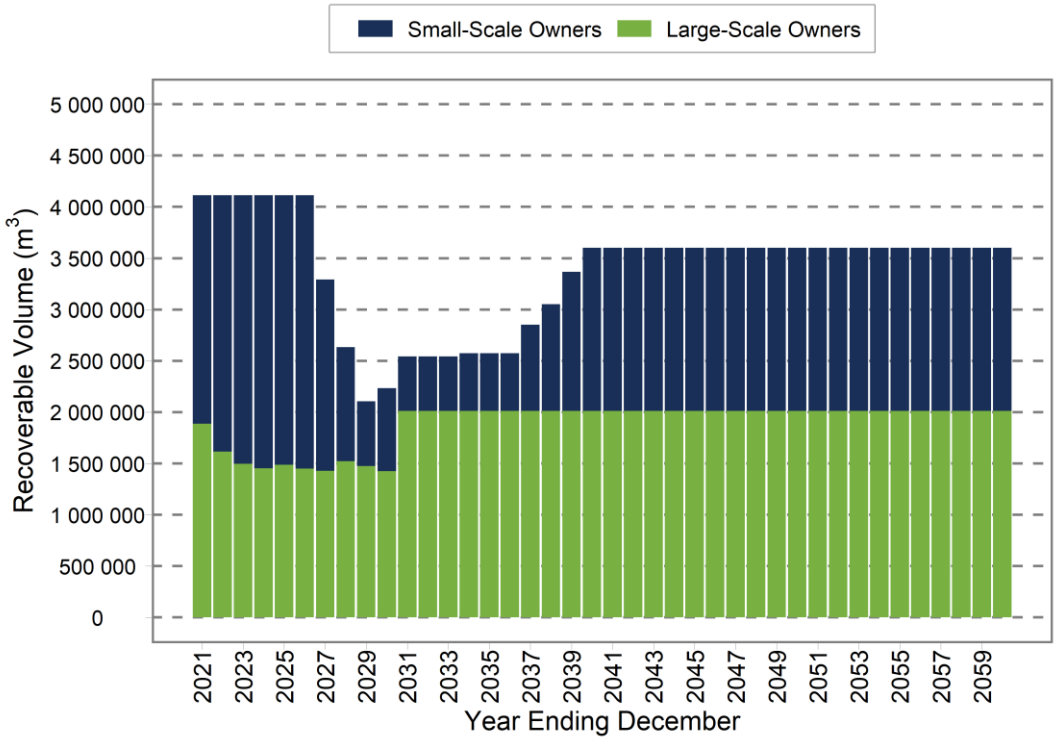


Figure 4-7:
Northland Average Radiata Pine Clearfell Age under Scenario 3

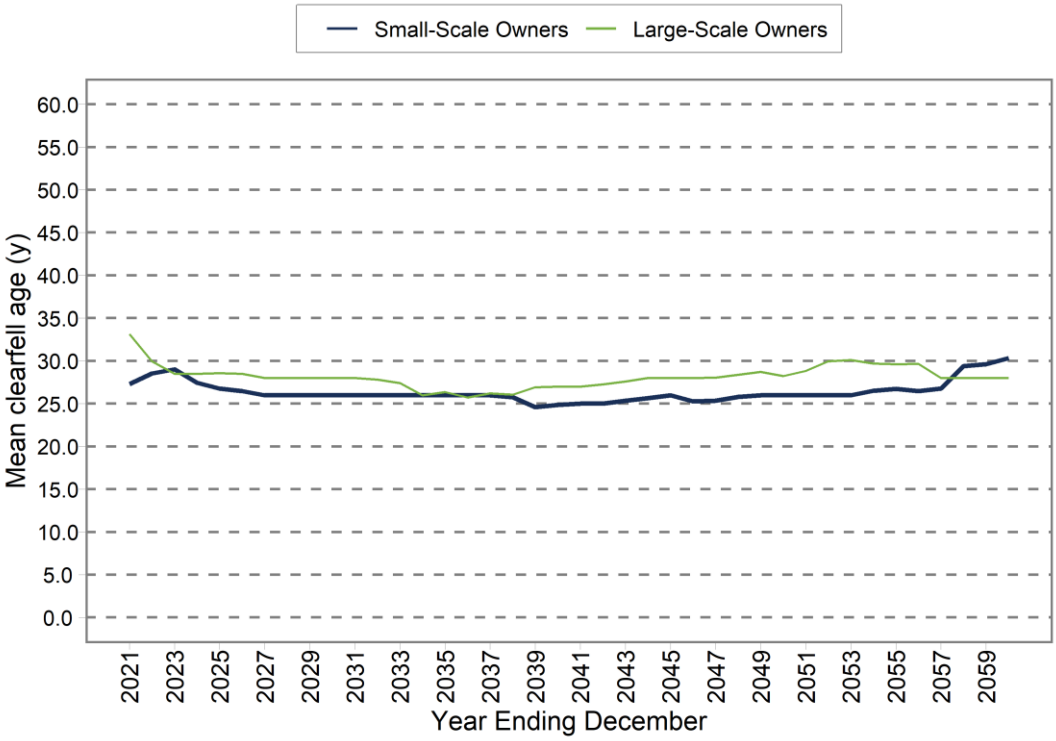
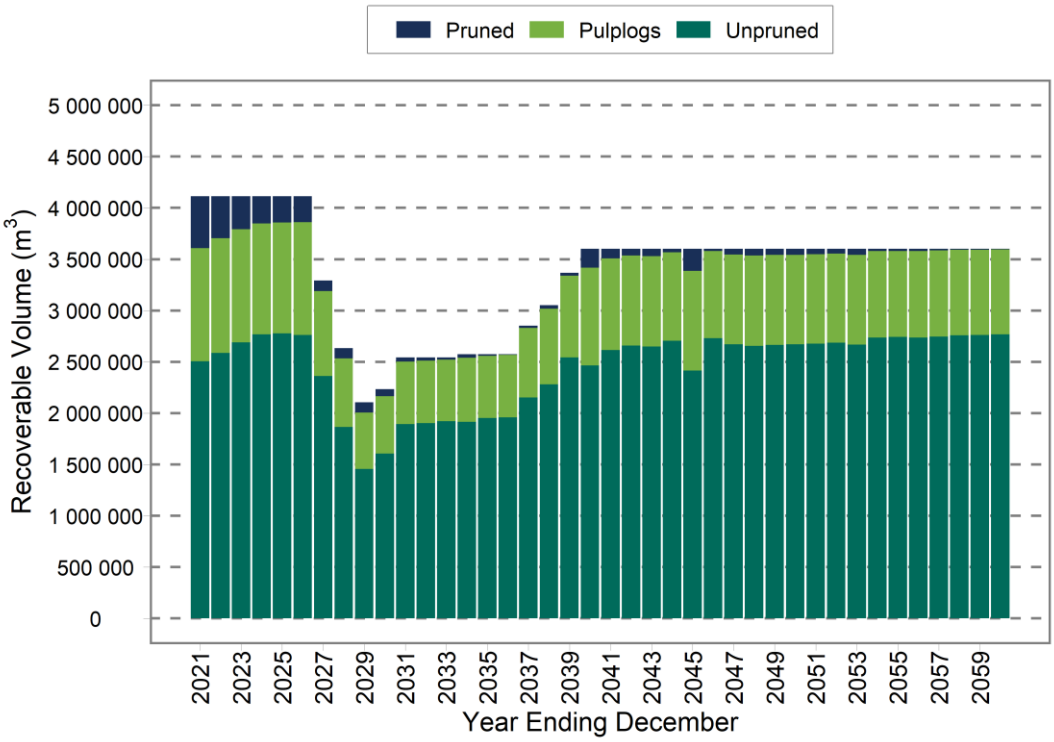


Figure 4-8 shows the radiata pine availability by log grade for all owners. Proportionally, the pruned volume reduces throughout the forecast period as areas of pruned forest are replanted into an unpruned regime.

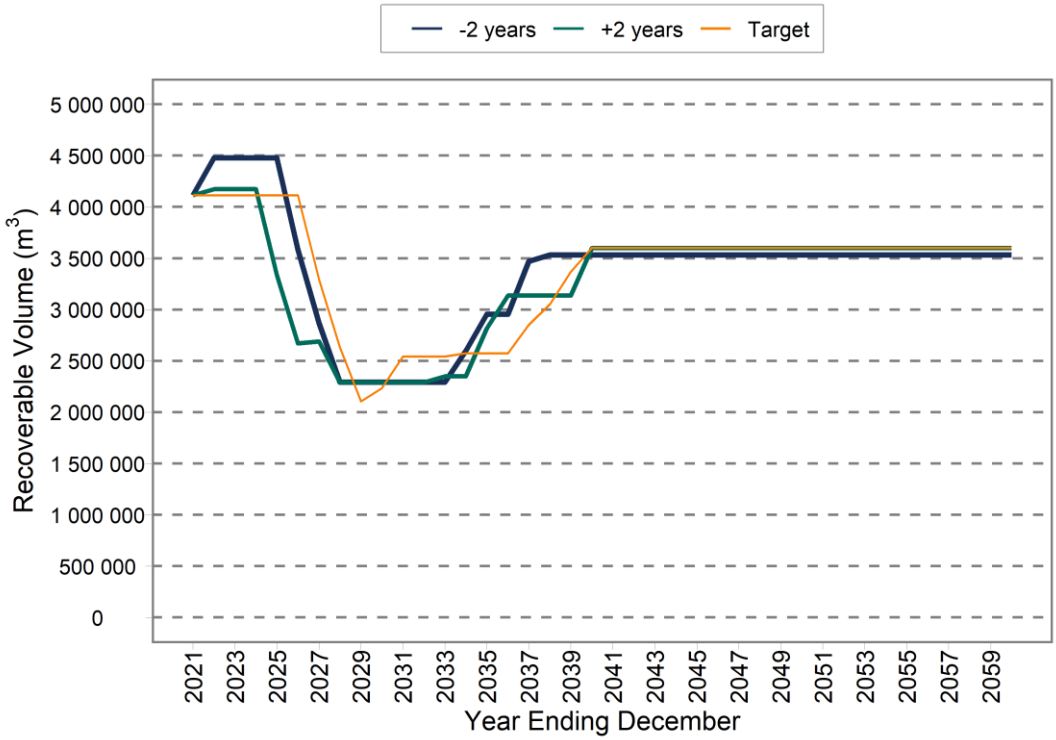
Figure 4-8:
Northland Radiata Pine Availability by Log Grade under Scenario 3



4.5 Scenario 4

In Scenario 4, target rotation ages of plus and minus two years from the target rotation area are used (target rotation ages of 24 and 28 are used for small-scale owners and 26 and 30 are used for large-scale owners) and the same constraints are applied as in Scenario 3. Figure 4-9 shows the woodflows for the three different target rotations ages are not significantly different. The older target rotation ages of 28 and 30 result in a slight delay in volume harvested (as expected), particularly in the first five years. Likewise, the lower rotation ages of 24 and 26 result in an earlier recovery from woodflow decline.

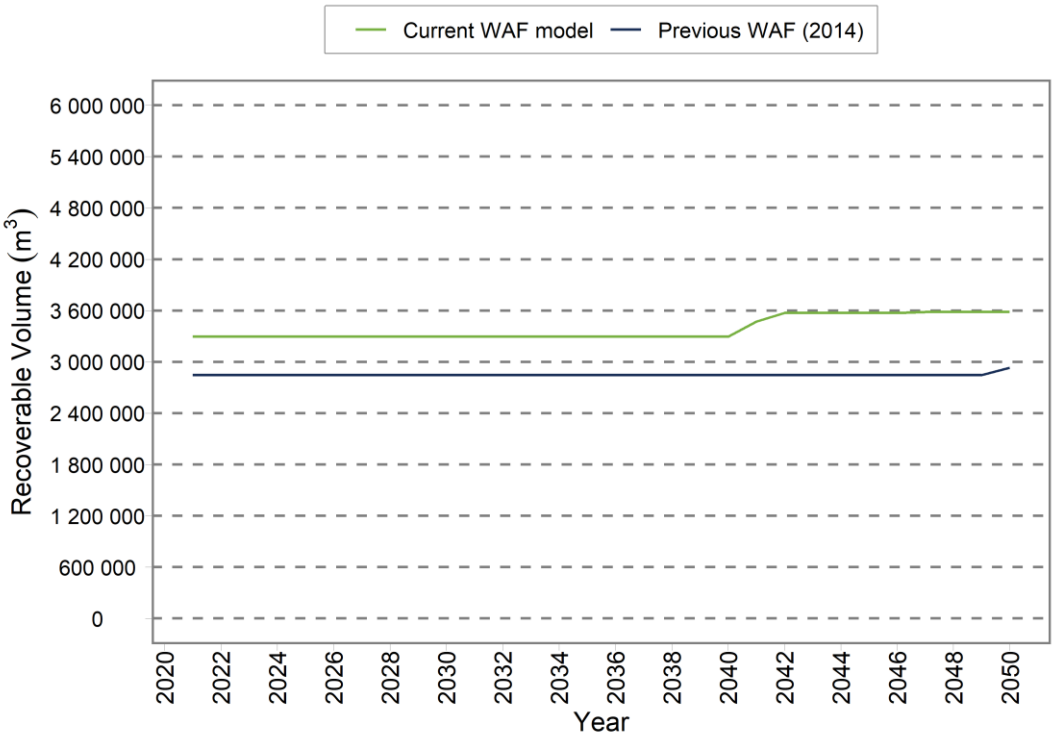
Figure 4-9:
Northland Radiata Pine Availability by Target Rotation Age under Scenario 4



5 COMPARISON TO PREVIOUS FORECAST

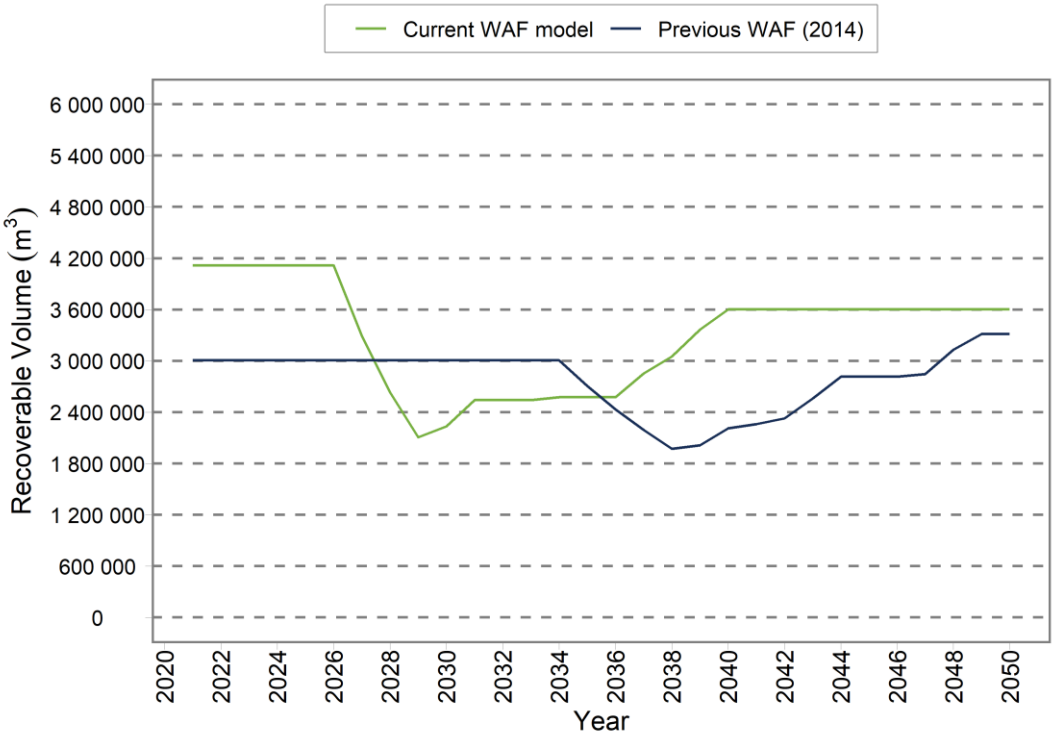
The results of the 2021 wood availability forecasts were compared with the previous forecasts undertaken in 2014. The comparison is based on Scenario 2 (Figure 5-1) and Scenario 3 (Figure 5-2). Overall, the long-term sustainable cut from the Northland region under Scenario 2 has increased between 2014 and 2021, likely due to the increase in area associated with the small-scale owner resource.

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



In Scenario 3, the difference in the woodflow is marked. To maintain a target rotation age around 26 for small-scale owners and the 28 for large-scale owners, the volume harvested is substantially higher for the first six years with the harvest dropping to its lowest levels approximately nine years earlier than the previous forecast. The long-term sustainable harvest level is then also higher, sooner than previously forecast.

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 increased by 10% in 2021, largely due to the percentage increase in small-scale owner resource area (see Section 3.1).
- There has been a reduction in average age of the Northland resource; the average age has decreased from 16.8 years in 2014, to 14.2 years in 2021.
- There are now greater proportions of the estate described by the higher yielding yield tables derived from stands planted after 1989 and managed under an unpruned regime. Just under 9 027 ha of forest planted before 1990 is now remaining in the Northland region, less than 5% of the total area.
- The radiata pine's target rotation age for the 2014 forecast was 28 years, whereas the target rotation for the 2021 forecast has been split and is 28 for large-scale owners and has been reduced to 26 for small-scale owners.

Table 5-1:
Key Differences Between 2014 and 2021 WAF for Radiata Pine

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	168 648	184 891	10
Average Age (years)	16.8	14.2	-15
Yield Table Productivity (m^3/ha at age 28)	N/A	508	N/A
Yield Table Productivity (m^3/ha at age 30 – Pruned/Unpruned)	492 / 546	482 / 577	-2 / 6
Clearfell Age Target (years)	28	28 / 26	0 / -7
Annual Sustainable Harvest (million m^3)	2.8	3.6	29

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 Northland wood supply region is expected to continue to increase in the next couple of years to a maximum of 4.1 million m^3/a. This increase is required to complete the harvesting of the areas planted during the record afforestation years of 1992 to 1995 at an average rotation age of around 26 years for small-scale owners and 28 years for large-scale owners. Once the peak of harvesting has been completed, the volume will likely decrease to a low of around 2.1 million m^3/a then rebounds gradually to a sustainable cut of just over 3.6 million m^3/a.

The previous Wood Availability Forecast was unable to account for the harvesting of significant areas of young stands from the small grower resource during the mid to late 2010s. The main driver at that time was the increase in export log prices. The harvest volume in Northland has exceeded expectations, and this can be seen in the comparison of the updated Scenario 3 forecast and the previous forecast.

Market conditions (e.g. demand from China) and logistical constraints (e.g. trucking and port constraints) will determine the actual harvest peak that is reached and the timing and rate of the subsequent decline. Any delay of the harvest will lead to an increase in the average rotation age, particularly for the small-scale owner resource.

The peak 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 under-prediction of NEFD area for this group of forest owners in the region. This uncertainty will impact the actual wood availability from the Northland region, particularly in the short term.

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

Table 1: Northland Wood Avaliability under Scenario 1

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and target harvest of age 26 (small-scale owners) and 28 (large-scale owners) years)

Year Ending December	Large-Scale Owners ($000\ m^3$)	Small-Scale Owners ($000\ m^3$)	All Owners ($000\ m^3$)
2021	1 888	2 226	4 114
2022	1 616	4 384	6 000
2023	1 497	4 503	6 000
2024	1 452	1 575	3 027
2025	1 488	1 625	3 114
2026	1 449	1 176	2 625
2027	1 428	1 151	2 579
2028	1 521	918	2 439
2029	1 475	581	2 055
2030	1 424	572	1 996
2031	2 013	587	2 600
2032	2 013	704	2 717
2033	2 013	500	2 513
2034	2 013	638	2 651
2035	2 013	1 003	3 016
2036	2 013	0	2 013
2037	2 013	834	2 847
2038	2 013	0	2 013
2039	2 013	524	2 537
2040	2 013	317	2 329
2041	2 013	2 148	4 161
2042	2 013	1 975	3 987
2043	2 013	2 157	4 169
2044	2 013	2 166	4 179
2045	2 013	2 137	4 150
2046	2 013	482	2 495
2047	2 013	1 920	3 932
2048	2 013	3 785	5 798
2049	2 013	3 987	6 000
2050	2 013	3 987	6 000
2051	2 013	3 529	5 542
2052	2 013	1 181	3 194
2053	2 013	1 433	3 446
2054	2 013	1 447	3 460
2055	2 013	1 100	3 113
2056	2 013	722	2 735
2057	2 013	707	2 720
2058	2 013	645	2 658
2059	2 013	757	2 770
2060	2 013	532	2 545

Notes: m^3 = cubic metres inside bark

Table 2: Northland 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	1 888	1 406	3 294
2022	1 616	1 678	3 294
2023	1 497	1 797	3 294
2024	1 452	1 843	3 294
2025	1 488	1 806	3 294
2026	1 449	1 845	3 294
2027	1 428	1 866	3 294
2028	1 521	1 774	3 294
2029	1 475	1 820	3 294
2030	1 424	1 871	3 294
2031	2 056	1 239	3 294
2032	2 056	1 239	3 294
2033	2 056	1 239	3 294
2034	2 056	1 239	3 294
2035	2 056	1 239	3 294
2036	2 056	1 239	3 294
2037	2 056	1 239	3 294
2038	2 056	1 239	3 294
2039	2 056	1 239	3 294
2040	2 056	1 239	3 294
2041	2 056	1 417	3 472
2042	2 056	1 516	3 572
2043	2 056	1 516	3 572
2044	2 056	1 516	3 572
2045	2 056	1 516	3 572
2046	2 056	1 516	3 572
2047	2 056	1 530	3 585
2048	2 056	1 530	3 585
2049	2 056	1 530	3 585
2050	2 056	1 530	3 585
2051	2 056	1 530	3 585
2052	2 056	1 530	3 585
2053	2 056	1 530	3 585
2054	2 056	1 530	3 585
2055	2 056	1 530	3 585
2056	2 056	1 530	3 585
2057	2 056	1 530	3 585
2058	2 056	1 530	3 585
2059	2 056	1 530	3 585
2060	2 056	1 530	3 585

Notes: m^3 = cubic metres inside bark

Table 3: Northland 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	1 888	2 226	4 114	505	2 507	1 102
2022	1 616	2 498	4 114	411	2 588	1 115
2023	1 497	2 617	4 114	323	2 689	1 102
2024	1 452	2 662	4 114	266	2 767	1 082
2025	1 488	2 626	4 114	256	2 776	1 082
2026	1 449	2 665	4 114	254	2 762	1 098
2027	1 428	1 863	3 291	101	2 363	827
2028	1 521	1 112	2 633	101	1 864	669
2029	1 475	632	2 106	100	1 458	549
2030	1 424	810	2 234	68	1 606	560
2031	2 013	529	2 542	38	1 894	609
2032	2 013	529	2 542	32	1 903	607
2033	2 013	529	2 542	21	1 922	598
2034	2 013	561	2 574	35	1 916	623
2035	2 013	561	2 574	15	1 953	606
2036	2 013	561	2 574	6	1 960	608
2037	2 013	839	2 852	21	2 153	678
2038	2 013	1 039	3 052	35	2 281	736
2039	2 013	1 354	3 367	28	2 541	798
2040	2 013	1 588	3 601	184	2 466	951
2041	2 013	1 588	3 601	92	2 615	893
2042	2 013	1 588	3 601	66	2 658	877
2043	2 013	1 588	3 601	71	2 649	881
2044	2 013	1 588	3 601	35	2 707	859
2045	2 013	1 588	3 601	213	2 414	974
2046	2 013	1 588	3 601	23	2 730	849
2047	2 013	1 588	3 601	57	2 672	872
2048	2 013	1 588	3 601	66	2 656	879
2049	2 013	1 588	3 601	60	2 666	875
2050	2 013	1 588	3 601	57	2 670	873
2051	2 013	1 588	3 601	53	2 678	870
2052	2 013	1 588	3 601	48	2 686	867
2053	2 013	1 588	3 601	59	2 667	874
2054	2 013	1 588	3 601	23	2 736	842
2055	2 013	1 588	3 601	20	2 744	837
2056	2 013	1 588	3 601	21	2 738	842
2057	2 013	1 588	3 601	14	2 745	842
2058	2 013	1 588	3 601	9	2 759	833
2059	2 013	1 588	3 601	8	2 762	831
2060	2 013	1 588	3 601	5	2 767	829

Notes: m^3 = cubic metres inside bark

Table 4: Northland 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 26/28,
- 2 years and + 2 years)

Year Ending December	Recoverable Volume Target Age - 2 (000 m^3)	Average Age (Years)	Recoverable Volume Target Age (000 m^3)	Average Age (Years)	Recoverable Volume Target Age + 2 (000 m^3)	Average Age (Years)
2021	4 114	29	4 114	30	4 114	28
2022	4 479	28	4 114	29	4 174	28
2023	4 479	28	4 114	29	4 174	28
2024	4 479	27	4 114	28	4 174	28
2025	4 479	27	4 114	27	3 339	28
2026	3 583	26	4 114	27	2 671	28
2027	2 866	26	3 291	27	2 691	28
2028	2 293	27	2 633	27	2 289	28
2029	2 293	27	2 106	27	2 289	28
2030	2 293	26	2 234	27	2 289	28
2031	2 293	26	2 542	28	2 289	29
2032	2 293	26	2 542	27	2 289	29
2033	2 293	26	2 542	27	2 348	29
2034	2 596	26	2 574	26	2 348	29
2035	2 955	25	2 574	26	2 818	28
2036	2 955	25	2 574	26	3 138	28
2037	3 470	25	2 852	26	3 138	27
2038	3 532	25	3 052	26	3 138	27
2039	3 532	25	3 367	26	3 138	28
2040	3 532	25	3 601	26	3 597	28
2041	3 532	25	3 601	26	3 597	28
2042	3 532	25	3 601	26	3 597	28
2043	3 532	25	3 601	27	3 597	28
2044	3 532	25	3 601	27	3 597	28
2045	3 532	25	3 601	27	3 597	28
2046	3 532	25	3 601	27	3 597	29
2047	3 532	25	3 601	27	3 597	29
2048	3 532	25	3 601	27	3 597	29
2049	3 532	27	3 601	28	3 597	29
2050	3 532	27	3 601	27	3 597	29
2051	3 532	27	3 601	28	3 597	29
2052	3 532	27	3 601	28	3 597	29
2053	3 532	27	3 601	28	3 597	29
2054	3 532	27	3 601	28	3 597	29
2055	3 532	27	3 601	28	3 597	29
2056	3 532	27	3 601	28	3 597	29
2057	3 532	26	3 601	27	3 597	29
2058	3 532	25	3 601	29	3 597	29
2059	3 532	25	3 601	29	3 597	29
2060	3 532	25	3 601	29	3 597	29

Notes: m^3 = cubic metres inside bark