



Wood Availability Forecasts – Hawke's Bay 2014

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

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Ministry for Primary Industries' Wood Availability Forecasts

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

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

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

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ADDENDUM

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

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



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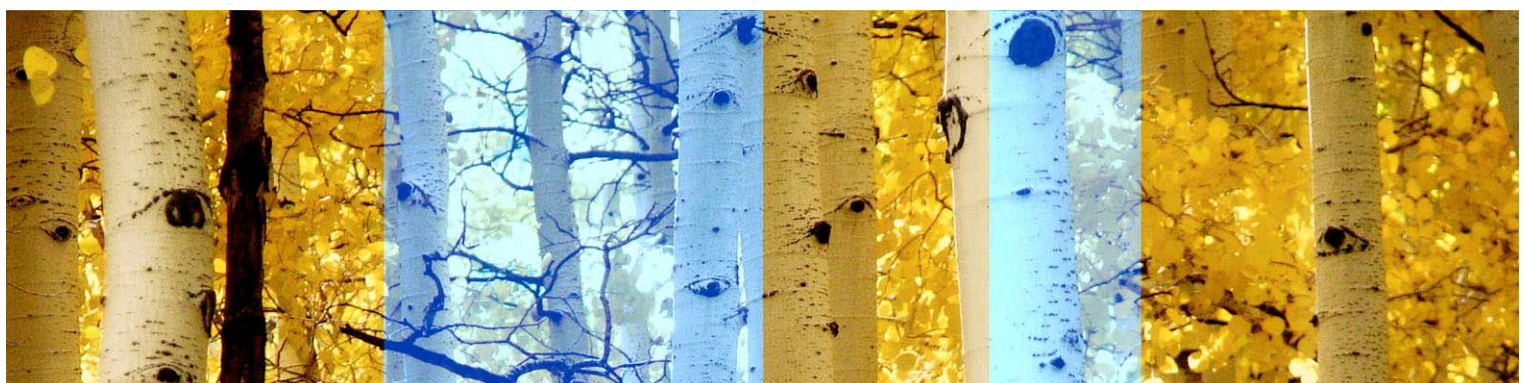
Wood Availability Forecasts – Hawke's Bay 2014

Report

21 May 2015

Auckland

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PREFACE

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

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

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

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DISCLAIMER

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TABLE OF CONTENTS

PREFACE	I
TABLE OF CONTENTS	II
1. INTRODUCTION	1
2. SCENARIOS	2
2.1 Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-scale Owners Harvest at Age 28	2
2.2 Scenario 2: Non-declining Yield (NDY) – Target Rotation 28 years	2
2.3 Scenario 3: Split NDY – Target Rotation 28 years	2
2.4 Scenario 4: Target Rotation Age Variations	2
2.5 Discussion of the Scenarios - Radiata Pine	2
2.6 Scenario for Douglas-fir	3
3. DATA	5
3.1 Method Used to Obtain Forest Areas	5
3.2 Method Used to Develop Yield Tables	5
3.3 Large-Scale Owners' Harvest Intentions	5
4. WOOD AVAILABILITY FORECASTS FOR HAWKES BAY	7
4.1 Hawke's Bay Region Overview	7
4.2 Assumptions	8
4.3 Scenario 1	8
4.3.1 Large-Scale Owners' Estate	9
4.3.2 Small-Scale Owners' Estate	10
4.3.3 Wood Availability from the Combined Estate for Scenario 1	11
4.4 Scenario 2	11
4.5 Scenario 3	13
4.6 Scenario 4	15
4.7 Douglas-fir	16
5. COMPARISON OF THE WOOD AVAILABILITY FORECASTS: 2008 VS 2014	19
6. CONCLUDING COMMENTS	22

Table of Figures

Figure 2-1A: Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-Scale Owners Harvest at Age 28	3
Figure 4-1: Hawke's Bay Age-class Distribution by Species – All Owners as at 1 April 2013	7
Figure 4-2: Hawke's Bay Age-class Distribution by Owner – All Species as at 1 April 2013	7
Figure 4-3: Hawke's Bay Age-class Distribution of Radiata Pine – All Owners Estate as at 1 April 2013	9

Figure 4-4: Hawke's Bay Age-class Distribution of Radiata Pine – Large-Scale Owners as at 1 April 2013	9
Figure 4-5: Hawke's Bay Radiata Pine Availability under Scenario 1 – Large-Scale Owners	10
Figure 4-6: Hawke's Bay Age-class Distribution of Radiata Pine – Small-Scale Owners as at 1 April 2013	10
Figure 4-7: Hawke's Bay Radiata Pine Availability under Scenario 1 – All Owners	11
Figure 4-8: Hawke's Bay Radiata Pine Availability under Scenario 2 – All Owners	12
Figure 4-9: Hawke's Bay Average Radiata Pine Clearfell Age under Scenario 2 – by Ownership Category	12
Figure 4-10: Hawke's Bay Radiata Pine Availability under Scenario 2 – by Log Grade (all owners)	13
Figure 4-11: Hawke's Bay Radiata Pine Availability under Scenario 3 – All Owners	14
Figure 4-12: Hawke's Bay Average Radiata Pine Clearfell Age under Scenario 3 – by Ownership Category	14
Figure 4-13: Hawke's Bay Radiata Pine Availability under Scenario 3 – by Log Grade (all owners)	15
Figure 4-14: Hawke's Bay Radiata Pine Availability by Target Rotation Age under Scenario 4 – All Owners	16
Figure 4-15: Hawke's Bay Average Radiata Pine Clearfell Age by Target Rotation Age under Scenario 4 – All Owners	16
Figure 4-16: Hawke's Bay Age-class Distribution of Douglas-fir – All Owners as at 1 April 2013	17
Figure 4-17: Hawke's Bay Douglas-fir Availability – Combined Estate (Includes Volumes from Production Thinning as well as Clearfell)	17
Figure 4-18: Hawke's Bay Average Douglas-fir Clearfell Age – All Owners	18
Figure 5-1: Wood Availability Forecasts (All Radiata Pine): 2008 vs 2014	19
Figure 5-2: Area Age-Class Comparisons: NEFD 2005 vs NEFD 2013	20
Figure 5-3: Unpruned Yield Tables: 2008 vs 2014 Wood Availability Forecasts	21
Figure 5-4: Pruned Yield Tables: 2008 vs 2014 Wood Availability Forecasts	21

1. INTRODUCTION

This report presents the findings from a 2014 wood availability study of the Hawke's Bay planted forest estate based on the Ministry for Primary Industries (MPI) National Exotic Forest Description (NEFD) as at 1 April 2013. The study was undertaken by MPI, in association with the major plantation owners. The modelling supporting the study was undertaken by Indufor Asia Pacific Limited (Indufor).

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

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

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

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

The scenarios clearly show there are different ways for the forest resource to be harvested. In examining the scenarios, it is important to recognise that forests are normally managed in a way that maximises the benefits to the enterprise that owns them. Each enterprise has its own harvesting strategy based on the owners' objectives and market conditions. Any change in harvesting strategies by forest owners affects the age-structures 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 of their forests or woodlots. The harvest age can vary markedly, even between neighbouring properties. The timing of the harvest of these forests is driven by a range of factors, including individual forest owners' objectives, forest age, log prices, demand by local wood processing plants, and perceptions about future log prices and future wood supply.

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

2. SCENARIOS

Four wood availability scenarios have been modelled for radiata pine. 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. Indufor 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 taken into account in the final derived profiles.

There are around 2 470 ha of species^[KT1] other than radiata pine and Douglas-fir in the Hawke's Bay region. The volumes from these species are not included in the wood availability forecasts.

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

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

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

This is similar to scenario 2 in the 2008 Wood Availability Forecasts, although the target rotation age for small scale owners was 30 years in the earlier analysis.

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

Large-scale owners' wood availability is assumed to be at stated harvest intentions for the period 2014 to 2023. After 2023, the wood availability from large-scale owners is assumed not to decrease (as for scenario 1). The total wood availability of radiata pine from the region is modelled to be non-declining in perpetuity with a target rotation age of 28 years (30 years in scenario 3 in the 2008 Wood Availability Forecasts).

2.3 Scenario 3: Split NDY – Target Rotation 28 years

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

2.4 Scenario 4: Target Rotation Age Variations

This is similar to scenario 3 except that target rotation ages of 26 and 30 years are also modelled (28 and 32 years in the 2008 Wood Availability Forecasts).

2.5 Discussion of the Scenarios - Radiata Pine

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

In scenario 1 (Figure 2-1A), the forests owned by small-scale owners are assumed to be harvested at age 28. The scenario shows the "potential" availability of mature forest from small-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 (Figure 2-1B and Figure 2-1C, respectively) are based on yield regulation. Yield regulation refers to where, when, and how these recoverable volumes should be extracted, and provides a more orderly harvesting volume profile that, to some degree, reflects logistical and market constraints. Under these scenarios, the future harvesting model is generally

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

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

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

2.6 Scenario for Douglas-fir

One scenario is presented for Douglas-fir (all owners). It is based on the harvest intentions of large-scale owners for 2014 to 2023 with the yield regulated in subsequent years. The target rotation age is 40 years for Douglas-fir (45 years was used in the 2008 forecasts).

Illustration of Wood Availability Scenarios (Hawke's Bay Radiata Pine Forecasts)

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

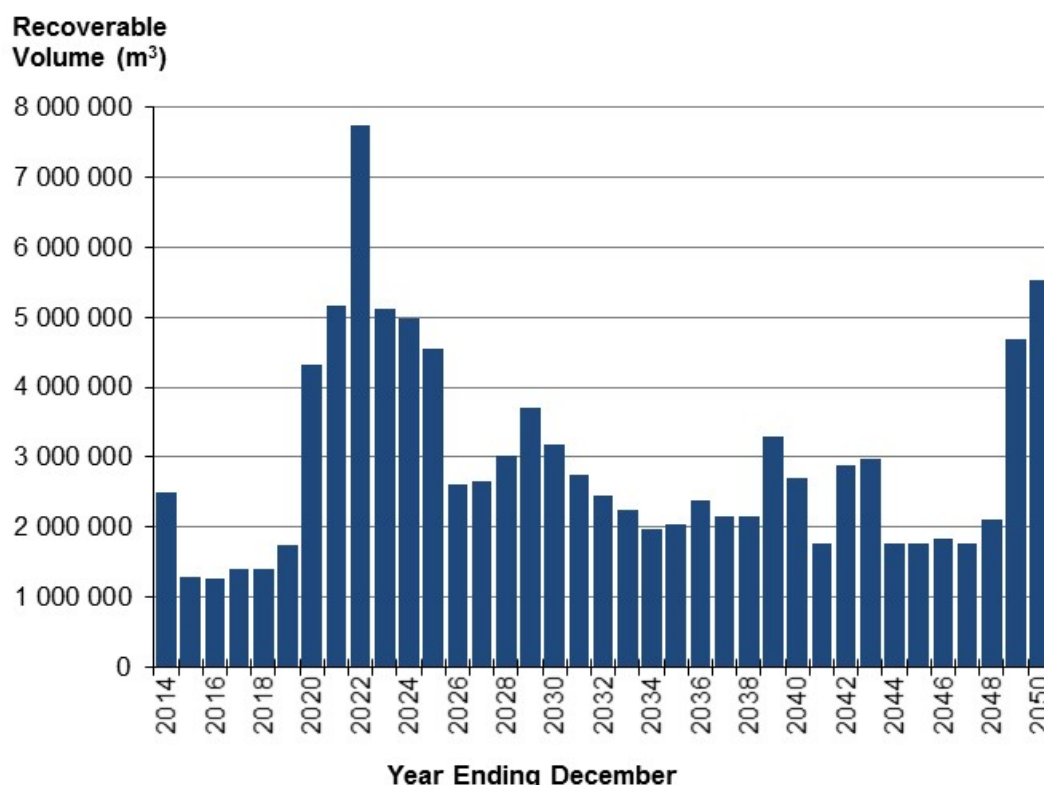


Figure 2-1B: Scenario 2: Large-Scale Owners Harvest at Stated Intentions. Overall Non-Declining Yield with a Target Rotation of 28 Years

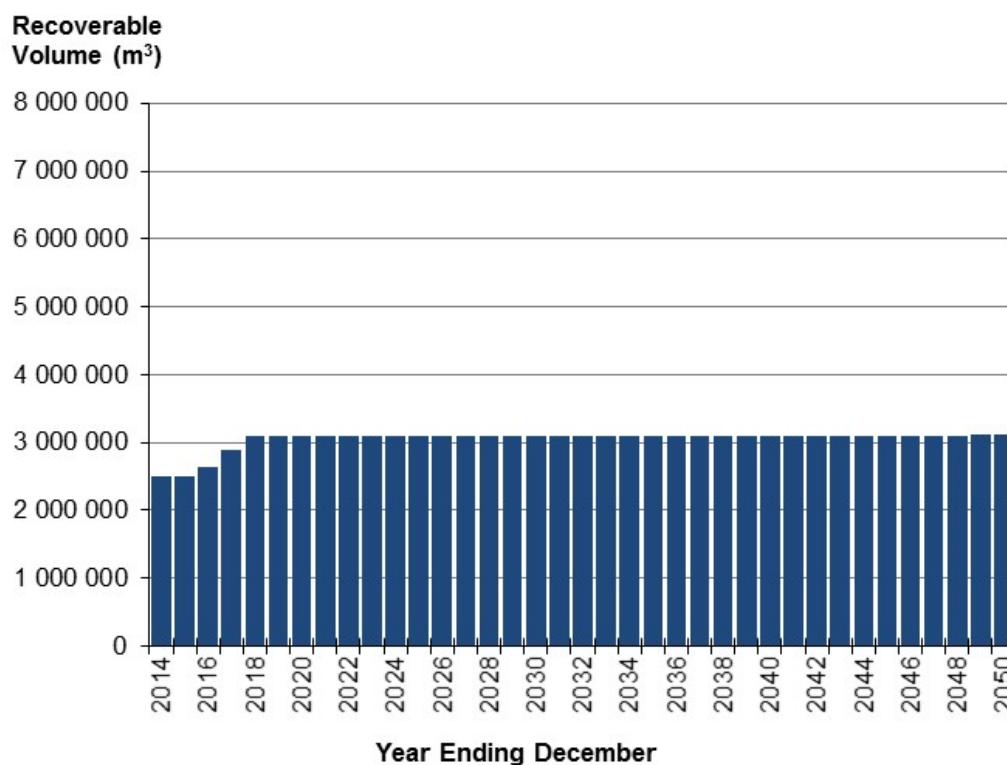
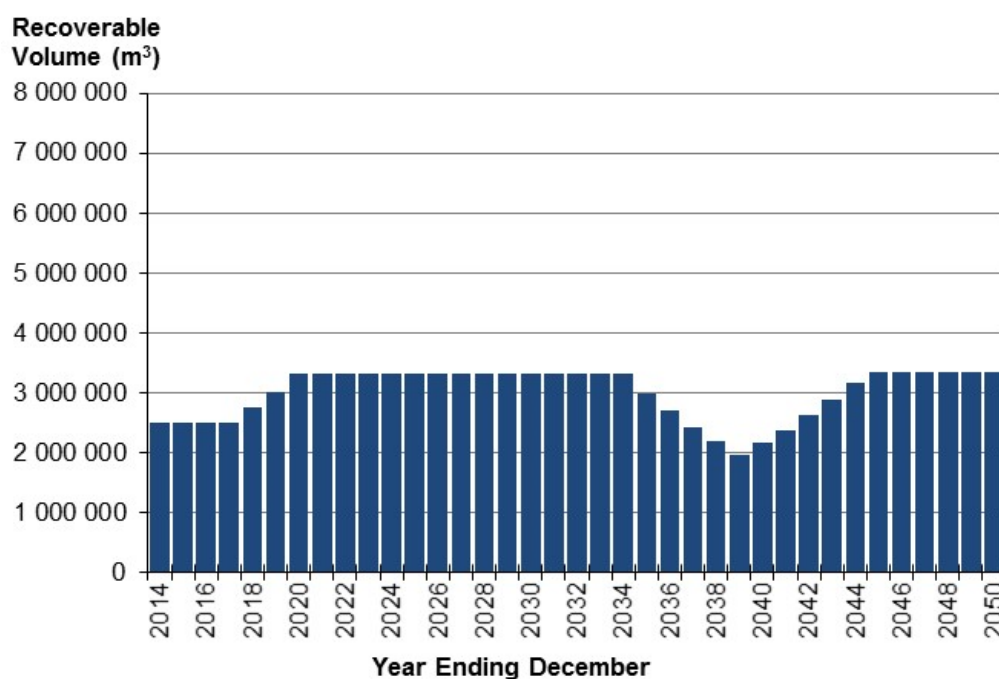


Figure 2-1C: Scenario 3: Large-scale Owners Harvest at Stated Intentions. Overall Split Non-Declining Yield with Target Rotation of 28 Years



3. DATA

3.1 Method Used to Obtain Forest Areas

The forest areas were sourced from the NEFD as at 1 April 2013 (MPI 2013). The area for the large-scale owners was unadjusted, while the area for the small-scale owners' estate was reduced by 15%.

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

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

3.2 Method Used to Develop Yield Tables

For the 2008 WAF, new yield tables for Hawke's Bay were developed in the following way:

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

For the latest forecasts, the yield tables developed in 2008 were utilised, and were again calibrated to the latest harvest intentions information provided by large forest owners (essentially the process described in the third bullet point above was replicated to derive yield tables that reflected yields expected by the large owners). However, due to the magnitude of the increase in the pruned yield tables compared to those used in 2008, and in relation to yield tables in comparable regions, a 5 percent reduction was applied to the 2014 calibrated yield tables.

The production thinning yield tables for radiata pine were derived from the large-scale owners harvest intention survey conducted in 2014.

3.3 Large-Scale Owners' Harvest Intentions

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



The large-scale owners who provided their harvest intentions are:

- Pan Pac Forest Products Ltd
- Matariki Forests Ltd
- Juken New Zealand Ltd
- Ernslaw One Ltd
- Ontario Teachers' Pension Plan Forest Investments (OTPP)

4. WOOD AVAILABILITY FORECASTS FOR HAWKES BAY

4.1 Hawke's Bay Region Overview

The Hawke's Bay region has a plantation resource of 131 700 ha, spread across four territorial authorities – Wairoa, Hastings, Napier, and Central Hawke's Bay. The majority of the resource is concentrated in the Hastings and Wairoa districts, with 55 400 ha and 60 400 ha respectively (as at 1 April 2013).

99% of the modelled resource consists of radiata pine with the remainder being Douglas-fir. Figure 4-1 shows the age-class distribution for the Hawke's Bay radiata pine and Douglas-fir estate for both large and small-scale owners combined.

53% of the modelled resource is held by large owners and 47% by small owners (Figure 4-2).

Figure 4-1: Hawke's Bay Age-class Distribution by Species – All Owners as at 1 April 2013

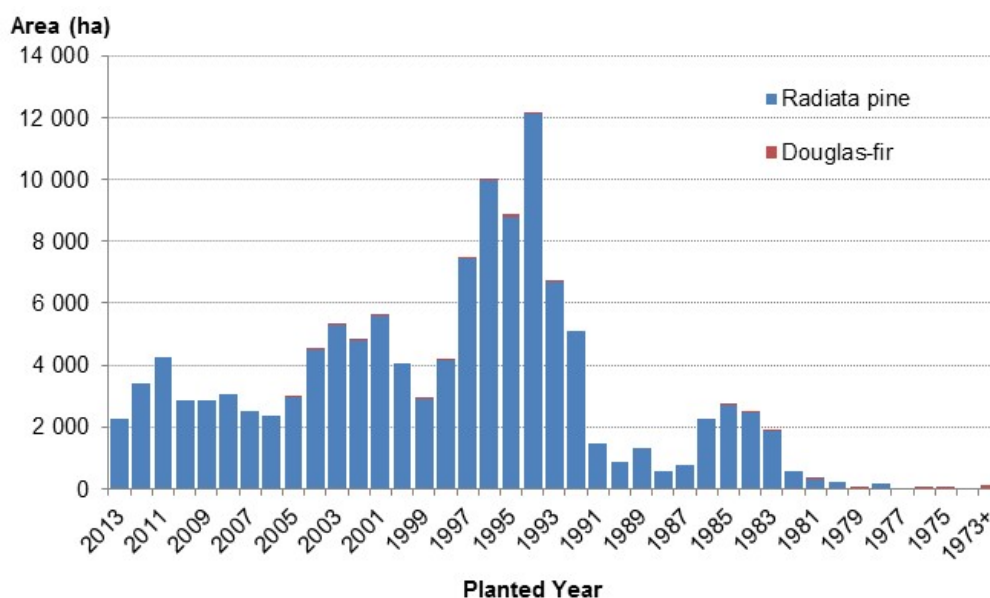
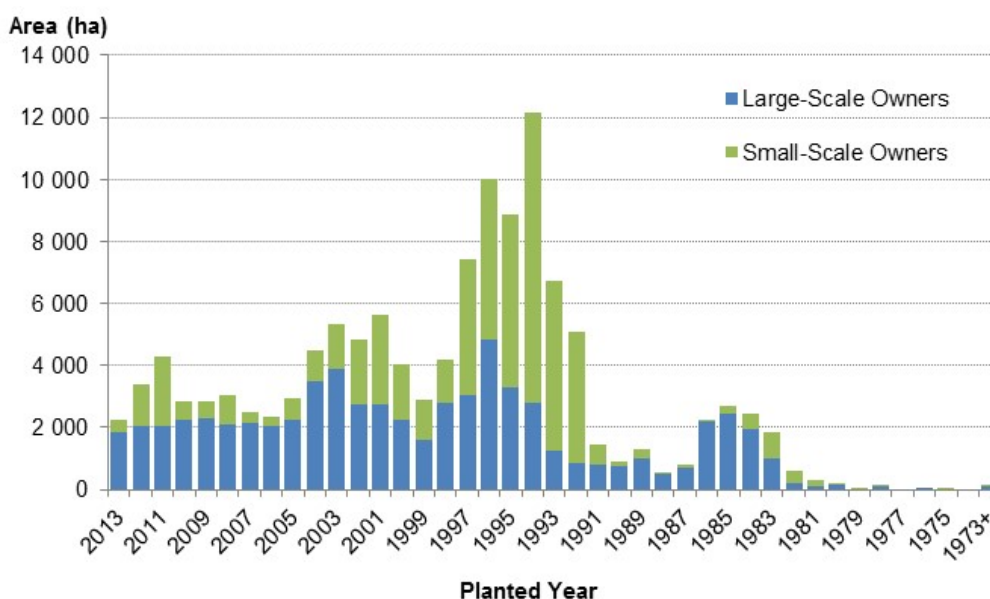


Figure 4-2: Hawke's Bay Age-class Distribution by Owner – All Species as at 1 April 2013



4.2 Assumptions

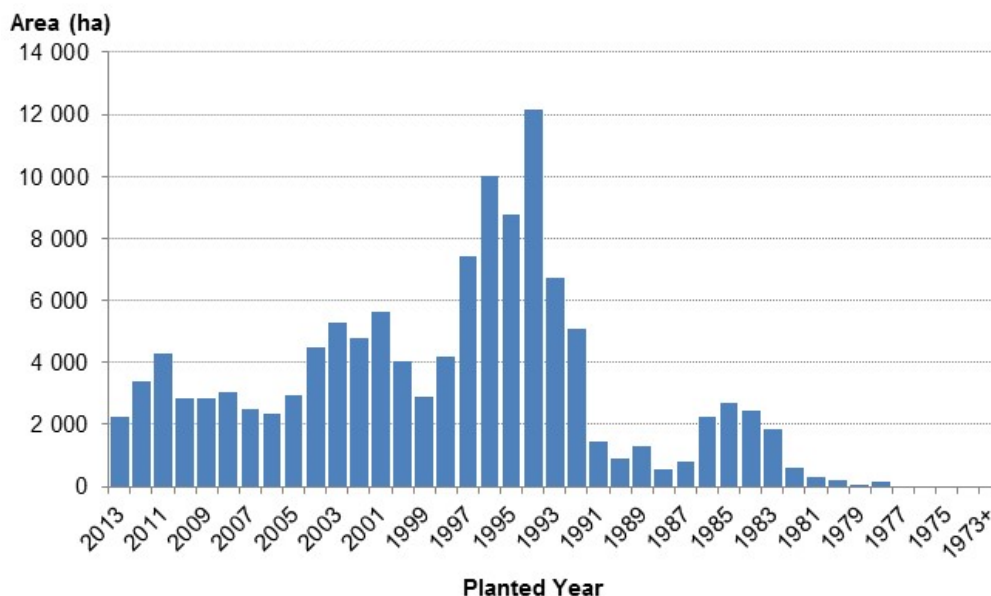
The wood availability forecasts for Hawke's Bay are based on the following assumptions:

- All areas are replanted, with a regeneration lag of one year. Replanting is as follows:
 - All radiata pine areas are maintained as radiata pine. Douglas-fir areas are replanted into radiata pine
 - Large-scale forest owners: 75% of all pruned areas will be replanted as a pruned regime with 25% transferring to an unpruned regime
 - Small-scale forest owners: 50% of all pruned areas will be replanted as a pruned regime with 50% transferring to an unpruned regime
- Based on discussions with major forest owners and consultants in the region, it was determined that conversion of forests to other land uses was not being undertaken at a sufficient rate for it to be incorporated into the wood availability forecasts.
- The area awaiting replanting as at 31 March 2013 is included as area at age 0 (that is, the area to be replanted in the 2013 planting season).
- Small-scale owner areas awaiting replanting as at 31 March 2012 are assumed to have been replanted in 2012 (small-scale owners are only surveyed every second year for the NEFD).
- Total roundwood removals in the Hawke's Bay region were estimated to be 2.50 million m³ for the year ended 31 March 2013. This was used to derive the harvest level for the first year of the model.
- Radiata pine area in the large-scale owners' estate aged over 35 years is assumed to be non-commercial and therefore will not be harvested.
- Radiata pine area in the small-scale owners' estate aged over 40 years is assumed to be non-commercial and therefore will not be harvested.

4.3 Scenario 1

In this scenario, large-scale owners harvest in line with their stated intentions and small-scale owners harvest their forests at age 28. Figure 4-3 shows the age-class distribution for the Hawke's Bay radiata pine estate for both large and small-scale owners combined.

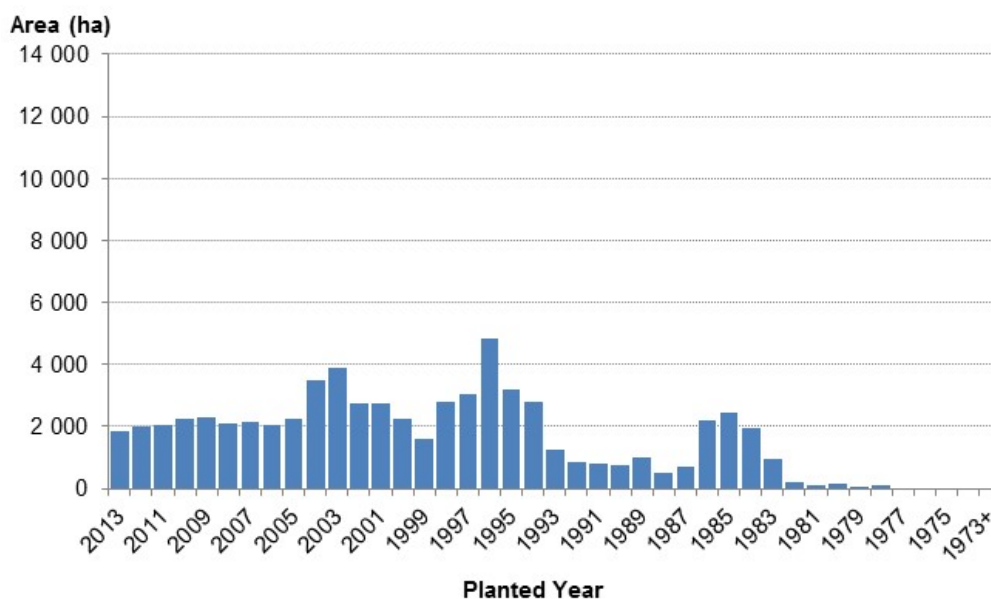
Figure 4-3: Hawke's Bay Age-class Distribution of Radiata Pine – All Owners Estate as at 1 April 2013



4.3.1 Large-Scale Owners' Estate

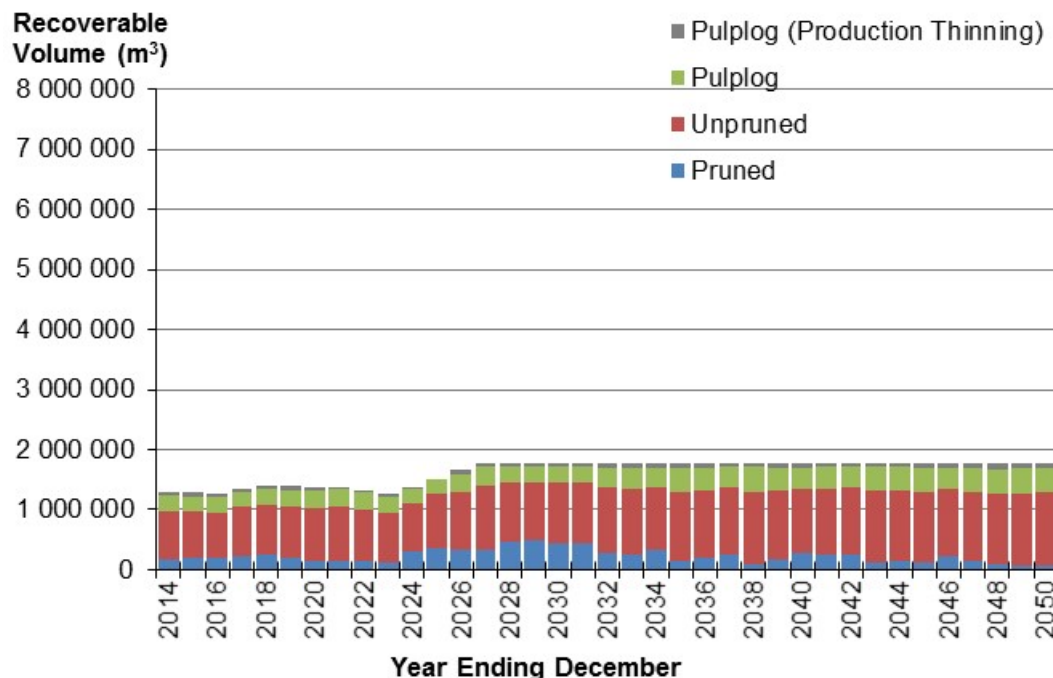
The age-class distribution of the large-scale owners' estate (Figure 4-4) shows there is relatively little area in age-classes 22 to 26 years because of limited planting in 1987 to 1991. Planting rates showed a peak in the mid-1990s. In addition, a total of 1 862 ha of large-scale owner bare land is awaiting replanting.

Figure 4-4: Hawke's Bay Age-class Distribution of Radiata Pine – Large-Scale Owners as at 1 April 2013



For this scenario, the availability of wood from large-scale owners is based on their stated harvest intentions for 2014 to 2023. Thereafter the availability is constrained to be non-declining with a target rotation age of 28 years. The wood availability of large-scale owners (Figure 4-5) is forecast to increase gradually from 1.3 million m³ in 2014 to 1.8 million m³ per year from 2028.

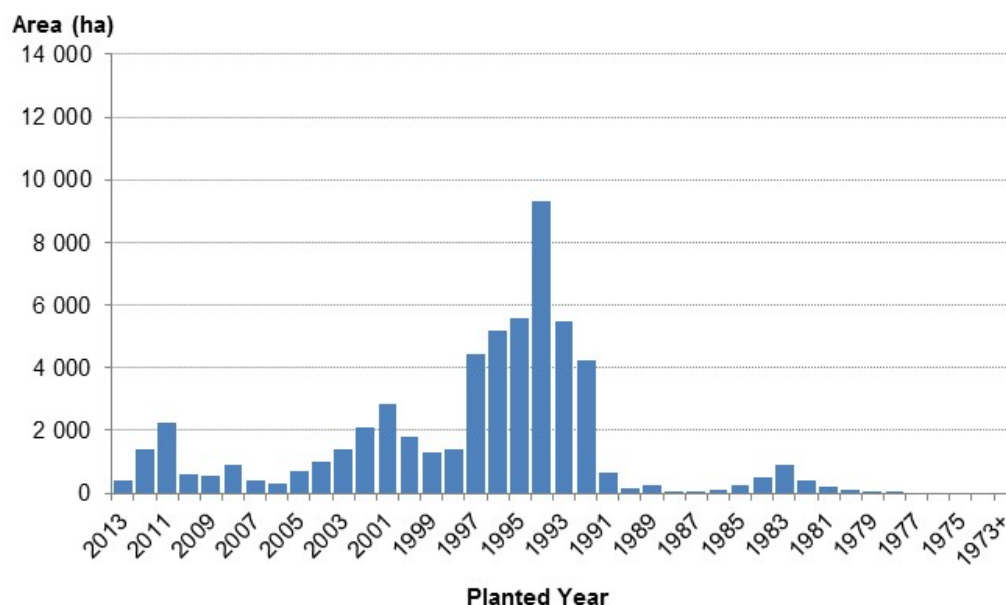
Figure 4-5: Hawke's Bay Radiata Pine Availability under Scenario 1 – Large-Scale Owners



4.3.2 Small-Scale Owners' Estate

The age-class distribution of the small-scale owners' estate (Figure 4-6) is very irregular, with more than 4 000 ha planted each year between 1992 and 1997 (currently 16 to 21 years old) and much less area in all other age-classes. The wood availability from this estate is significantly influenced by the timing of the harvest of the large area aged 16 to 21.

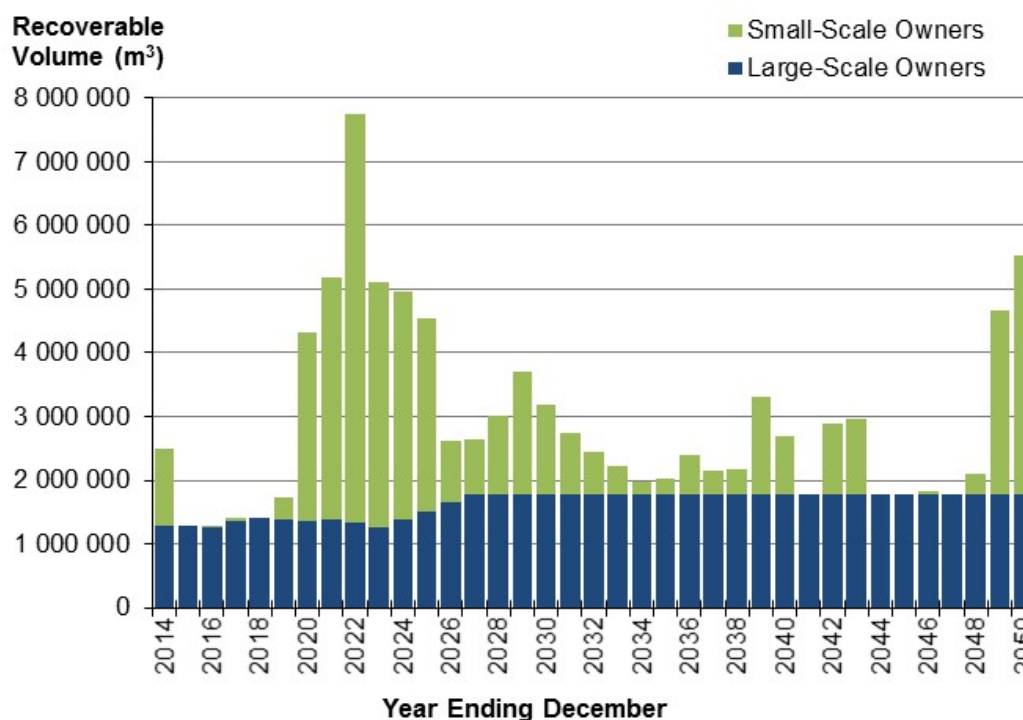
Figure 4-6: Hawke's Bay Age-class Distribution of Radiata Pine – Small-Scale Owners as at 1 April 2013



4.3.3 Wood Availability from the Combined Estate for Scenario 1

The wood availability from all owners in Hawke's Bay is presented in Figure 4-7. The large-scale owners' resource is shown as the "base" volume, and the forecasts match the volumes in Figure 4-5. The fluctuation in the total annual forecast volumes reflects the variation in the areas in each age-class of the small-scale owners' estate, and the assumption that this estate is harvested at age 28.

Figure 4-7: Hawke's Bay Radiata Pine Availability under Scenario 1 – All Owners



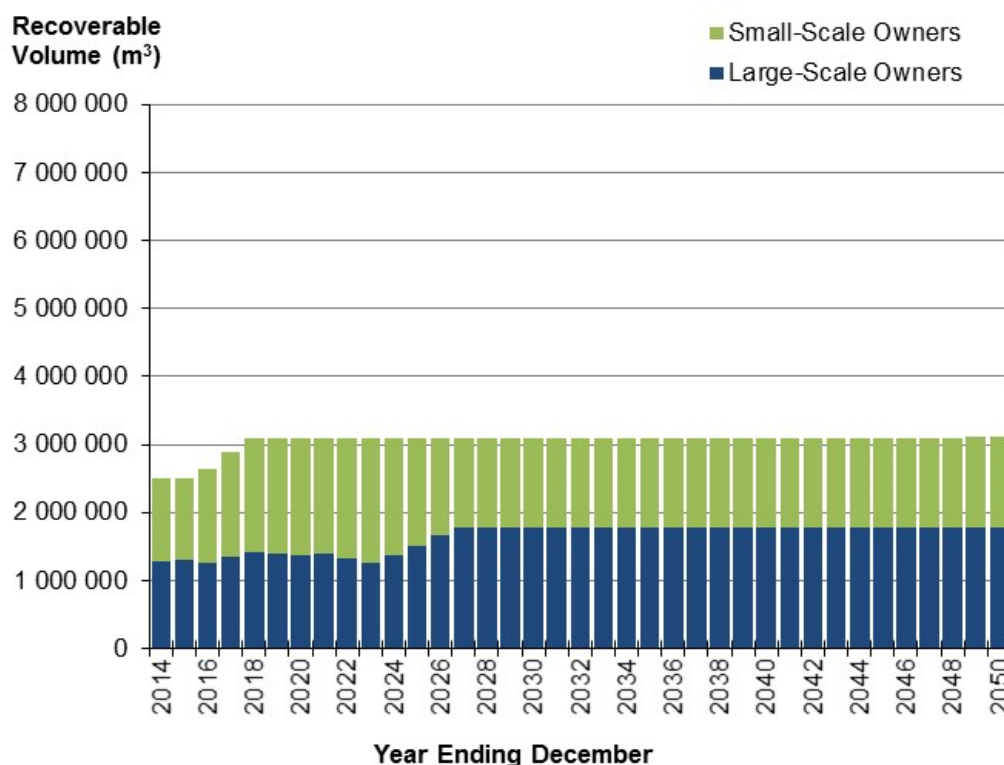
The large increase in harvest volume after 2019 (Figure 4-7) reflects the maturing of the small-scale owners' estate. For example, the increase in 2020 is a consequence of the 4 254 ha planted by small-scale owners in 1992 (Figure 4-6) being harvested at age 28 years.

Fluctuations in harvest volumes of the magnitude shown in Figure 4-7 would be impractical due to operational constraints (for example: availability of harvest machinery, harvesting crews and transport operators) and market absorption constraints (for example: limited domestic wood processing capacity, levels of export demand).

4.4 Scenario 2

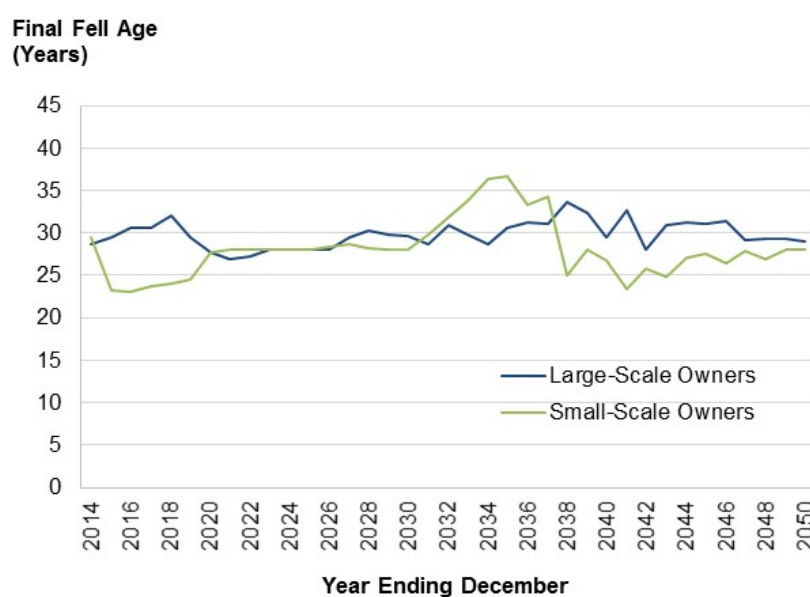
The second scenario assumes large-scale owners' resources are harvested as per their harvest intentions for the first 10 years, then a non-declining yield constraint is applied to the large-scale owners' estate after 2023. In addition, a non-declining yield constraint is applied to the total overall radiata pine estate, with a target rotation age of 28 years. Figure 4-8 indicates that a gradual increase in the harvest from the small-scale owners' estate could occur through to 2023 (from 1.2 million m³ to 1.8 million m³).

Figure 4-8: Hawke's Bay Radiata Pine Availability under Scenario 2 – All Owners



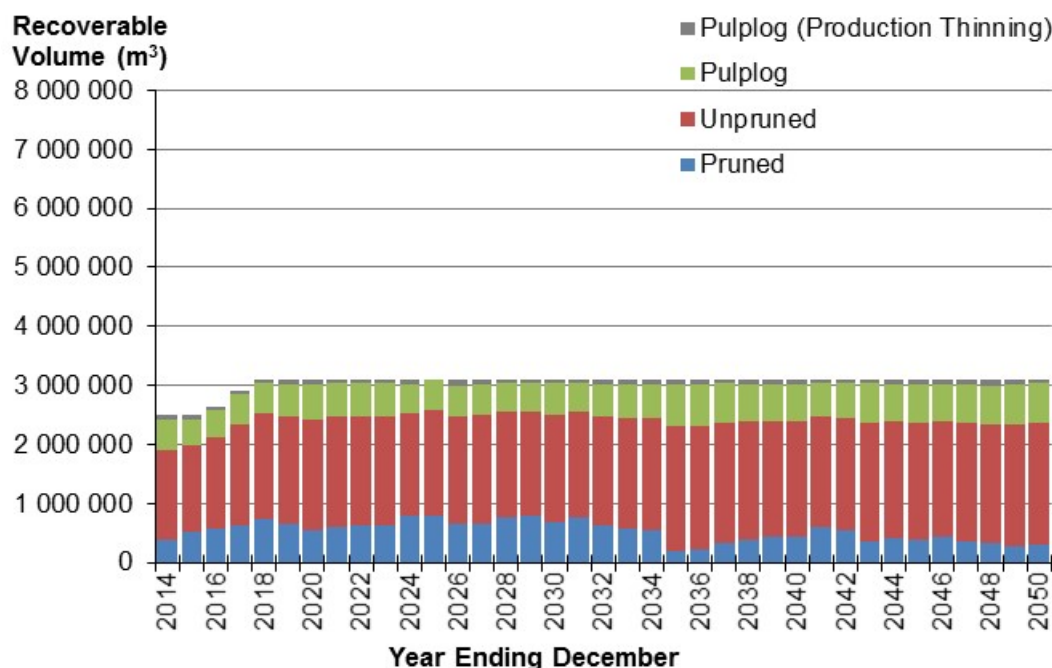
This scenario does at times require that the harvest age varies significantly from the target rotation of 28 years. This is especially the case for small-scale forest owners (Figure 4-9).

Figure 4-9: Hawke's Bay Average Radiata Pine Clearfell Age under Scenario 2 – by Ownership Category



The harvest volumes forecast under scenario 2 are broken down by log grade in Figure 4-10.

Figure 4-10: Hawke's Bay Radiata Pine Availability under Scenario 2 – by Log Grade (all owners)



4.5 Scenario 3

The third scenario again assumes large owners' resources are harvested in line with their harvest intentions between 2014 and 2023, and then non-declining after 2023. However, the overall yield is based on a split non-declining yield, with a target rotation age of 28 years. A drop in the overall harvest volume is allowed after 2034 for a five-year period (between 2035 and 2039 of no more than 10% per year). This scenario gives a forecast wood availability that is different to scenario 2 (Figure 4-11). Wood availability increases from 2.50 million m³ in 2014 to 3.3 million m³ in 2020, and is maintained at this level until 2034. Harvest volumes then dip to around 2.0 million m³ per year in 2039 before returning to 3.3 million m³ per year from 2045.

The main difference from scenario 2 is that the large area of young stands in the small-scale owners' estate is harvested over a shorter period of time, at a higher level of harvest (through to 2034). A consequence is that the average clearfell age for small-scale owners stays closer to the target of 28 years than in scenario 2 (Figure 4-12).

Figure 4-11: Hawke's Bay Radiata Pine Availability under Scenario 3 – All Owners

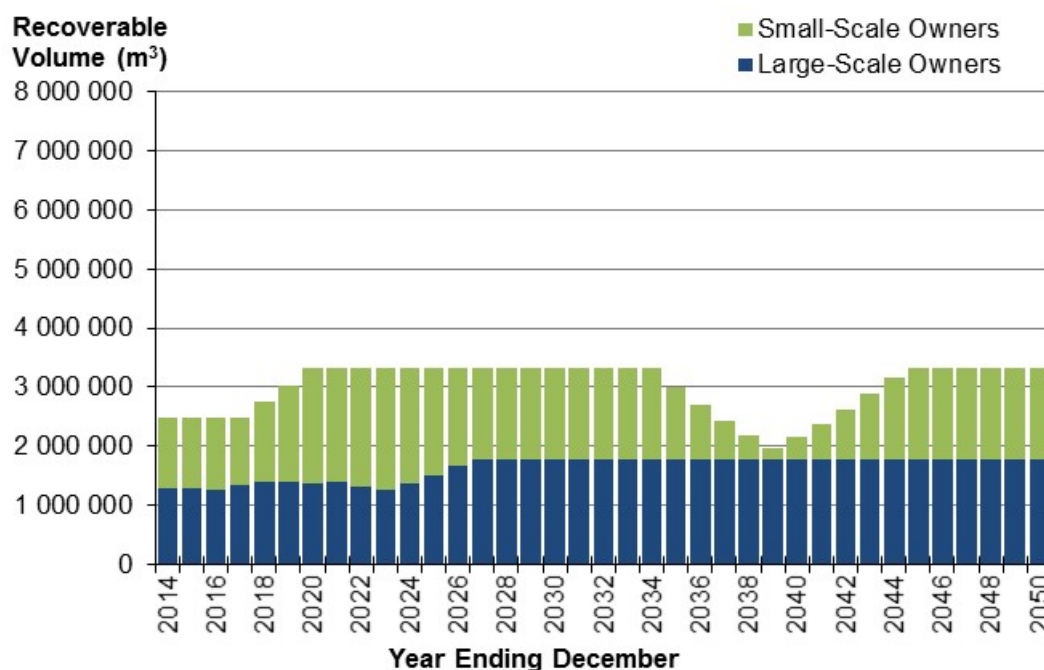
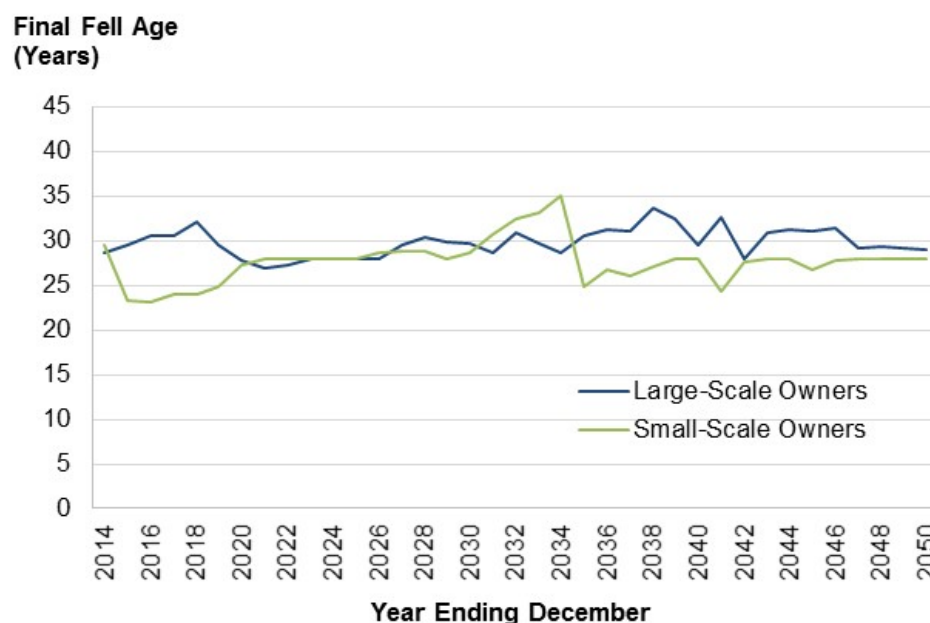
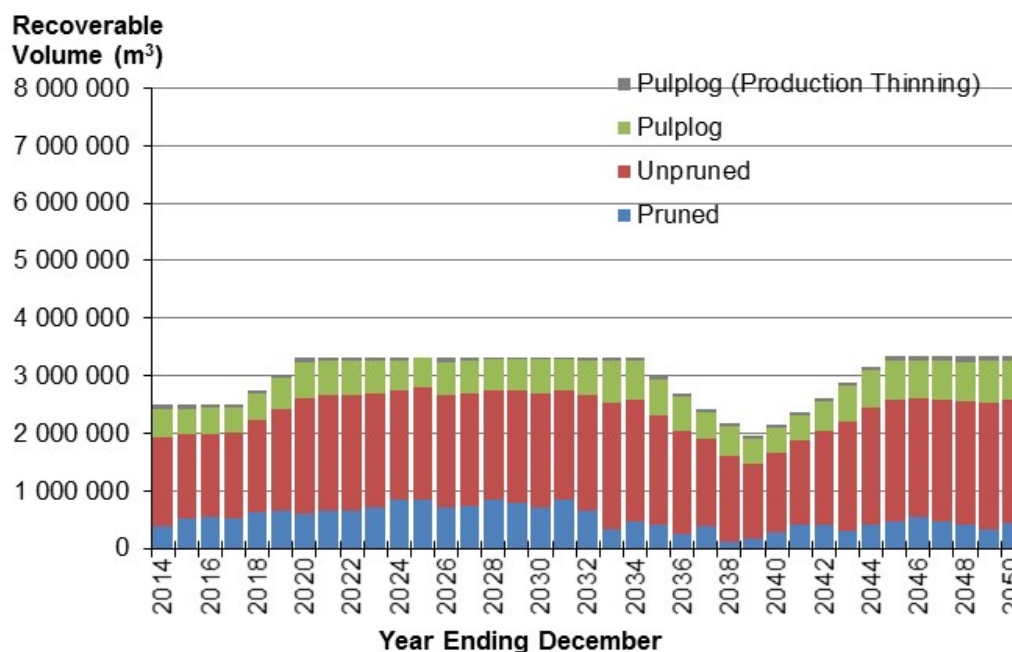


Figure 4-12: Hawke's Bay Average Radiata Pine Clearfell Age under Scenario 3 – by Ownership Category



The harvest volumes forecast under scenario 3 are broken down by log grade in Figure 4-13.

Figure 4-13: Hawke's Bay Radiata Pine Availability under Scenario 3 – by Log Grade (all owners)



4.6 Scenario 4

Target rotation ages of 26 or 30 years are used (rather than 28 years) and the same constraints are applied as in scenario 3 (Figure 4-14).

The harvest ages are somewhat constrained for the first ten years by the large-scale owners' harvest intentions and the requirement for a non-declining yield for the large owner's estate as well as the overall radiata pine estate. These constraints are slightly relaxed for the 26 and 30 year target rotations to allow the actual harvesting ages to more closely match the target rotation ages. Figure 4-15 still illustrates however the difficulty in achieving the desired rotation lengths within the overall harvesting constraints imposed by the scenario.

Figure 4-14: Hawke's Bay Radiata Pine Availability by Target Rotation Age under Scenario 4 – All Owners

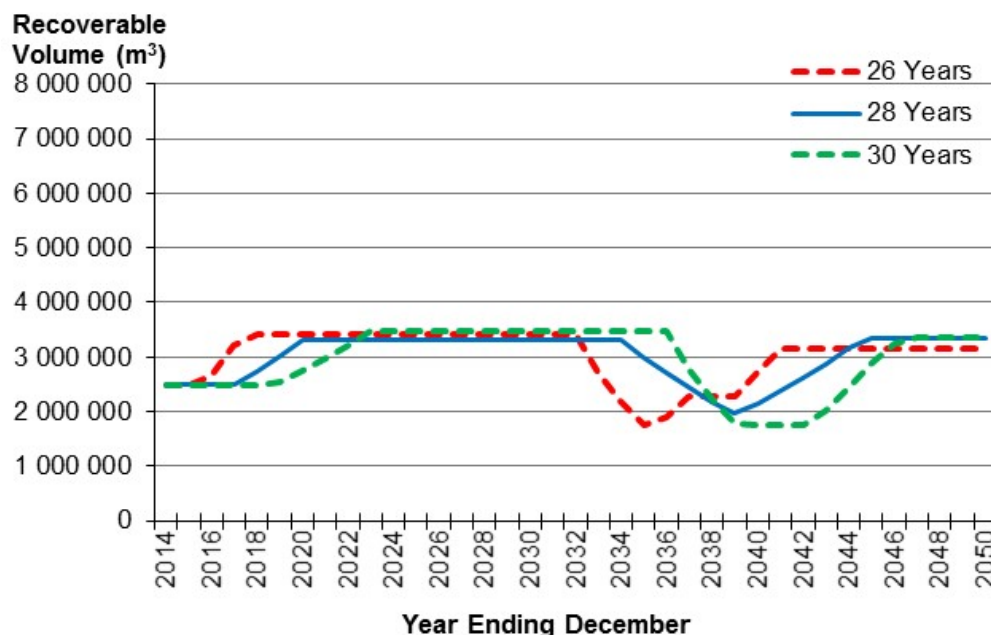
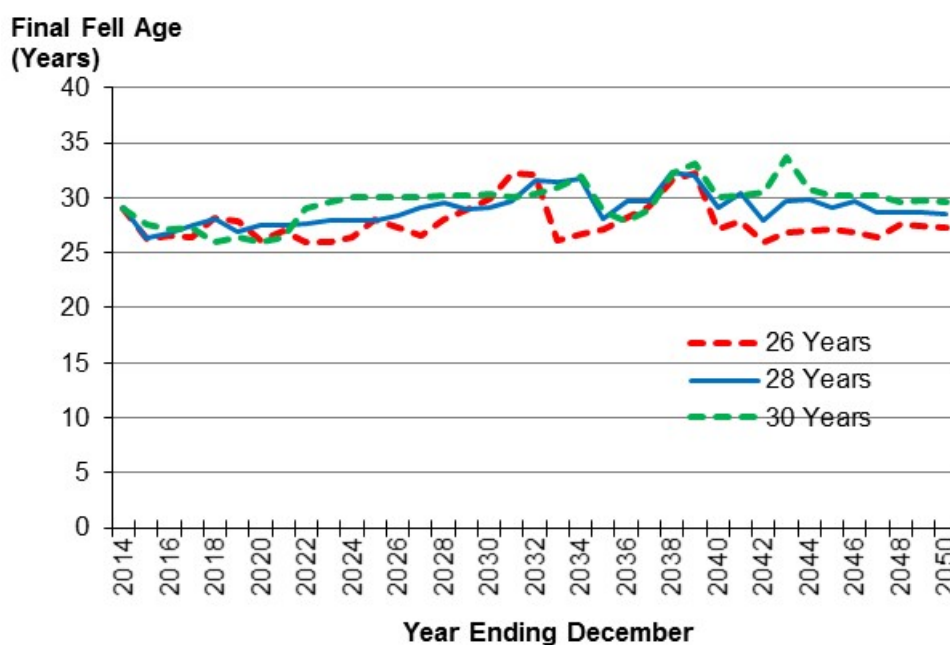


Figure 4-15: Hawke's Bay Average Radiata Pine Clearfell Age by Target Rotation Age under Scenario 4 – All Owners



4.7 Douglas-fir

The area of Douglas-fir in Hawke's Bay is less than 1 000 ha. The age-class distribution of Douglas-fir in Hawke's Bay is far from uniform, as shown in Figure 4-16.

The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2014 to 2023. After 2023, the wood availability from large-scale owners is limited to an upper limit of 30 000 m³ per year (Figure 4-17).

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 4-18.

Figure 4-16: Hawke's Bay Age-class Distribution of Douglas-fir – All Owners as at 1 April 2013

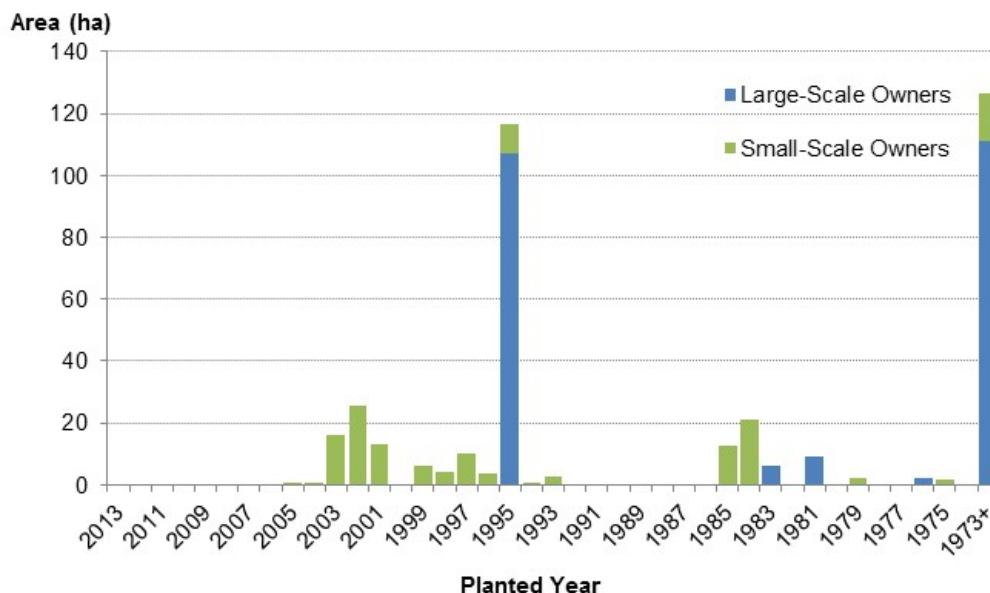


Figure 4-17: Hawke's Bay Douglas-fir Availability – Combined Estate (Includes Volumes from Production Thinning as well as Clearfell)

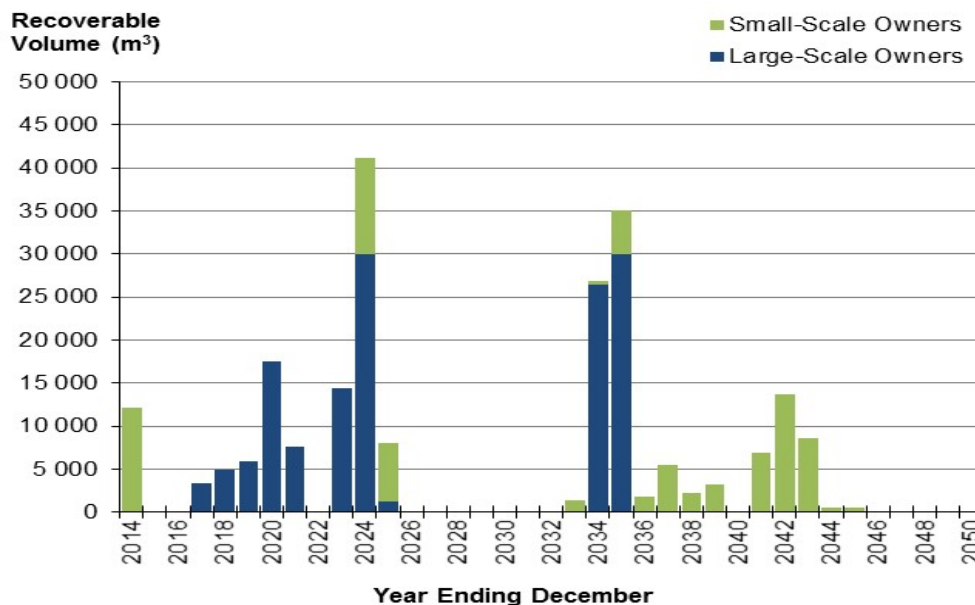
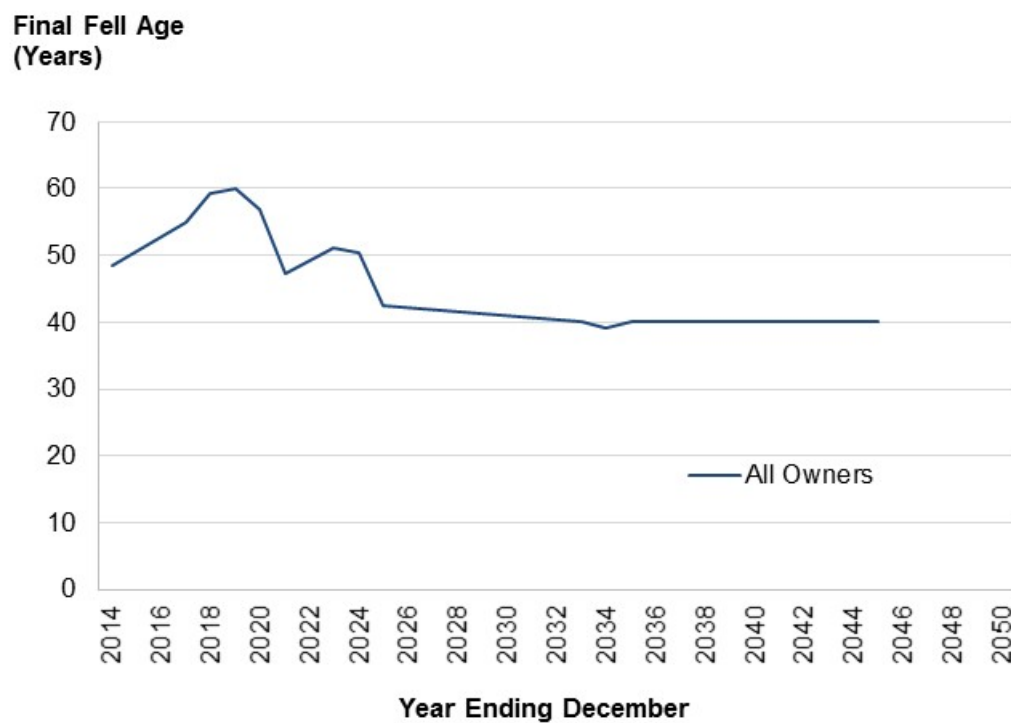


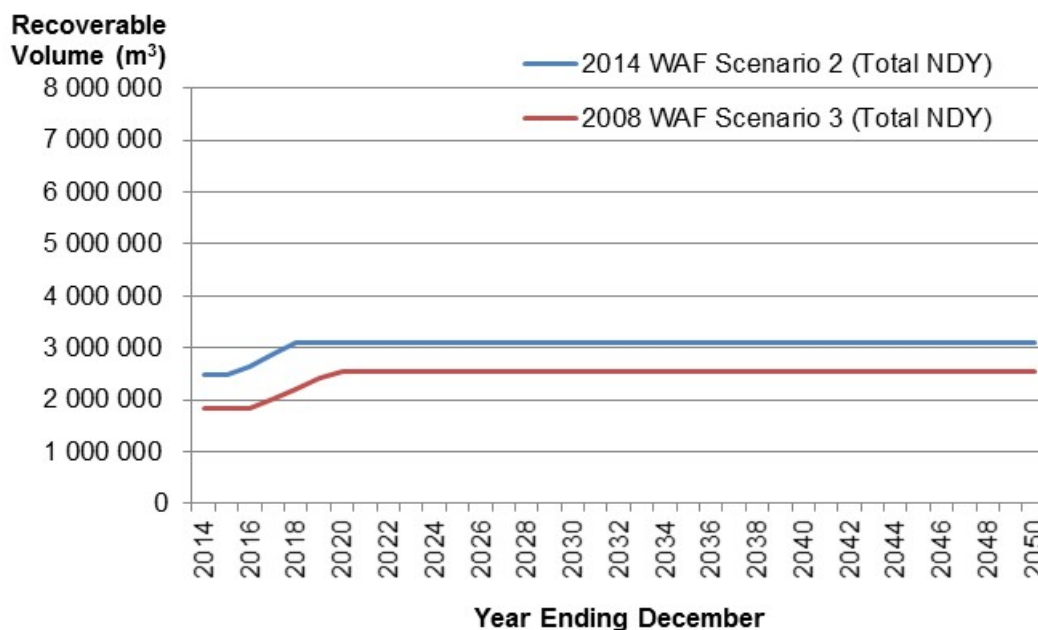
Figure 4-18: Hawke's Bay Average Douglas-fir Clearfell Age – All Owners



5. COMPARISON OF THE WOOD AVAILABILITY FORECASTS: 2008 VS 2014

The results of the 2014 wood availability forecasts were compared with the previous forecasts, undertaken in 2008 (Figure 5-1). The comparison is based on Scenario 2 (which is equivalent to the Scenario 3 in the 2008 forecasts). It can be seen that the wood availability projected from the 2014 forecasts settles at a level around 0.5 million m³ higher than that projected in the 2008 forecasts (a 21% increase).

Figure 5-1: Wood Availability Forecasts (All Radiata Pine): 2008 vs 2014



There are several factors that are contributing to the variations. These factors include (refer Table 5-1):

- There has been some maturing of the Hawke's Bay resource; the average age has increased from 13.2 years in 2005, to 14.7 years in 2013. A comparison of the area-age class distribution at each reporting date is shown in Figure 5-2.
- The calibrated 2014 yield tables vary by -2% (unpruned) and +20% (pruned) from the equivalent yield tables used in the 2008 forecasts (see Figure 5-3 and Figure 5-4). Discussions with forest owners indicate that the increase in pruned yields will be due to a combination of improved genetic material, higher final crop stockings, and additional areas being harvested on more fertile, ex-pasture areas.
- There are now greater proportions of the estate described by the higher yielding post-1989 yield tables.
- Furthermore, radiata pine's target rotation age for the 2008 forecasts was 30 years, whereas the target rotation for the 2014 forecasts is 28 years. This allows the forests to be cut earlier and sustain a higher non-declining yield.

Table 5-1: Key Differences between 2008 and 2014 WAF

Item	2008 WAF	2014 WAF	Change
Stocked Area (ha)	123 851	123 416	-0.4%
Average Age (years)	13.2	14.7	11.3%
Productivity (m ³ /ha @ age 30)	621	742	19.5%
CF Age Target (years)	30	28	-6.7%
Harvested Volume (million m ³)	91.4	112.5	23.1%
Harvested Area (ha)	128 826	159 469	23.8%
Annual Sustainable Harvest (million m ³)	2.6	3.1	20.8%

Figure 5-2: Area Age-Class Comparisons: NEFD 2005 vs NEFD 2013

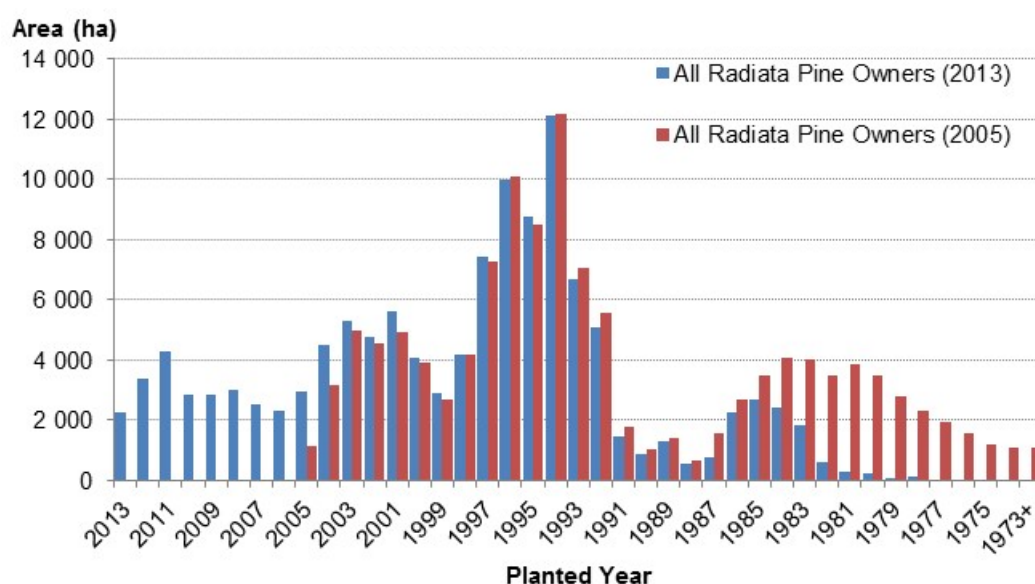
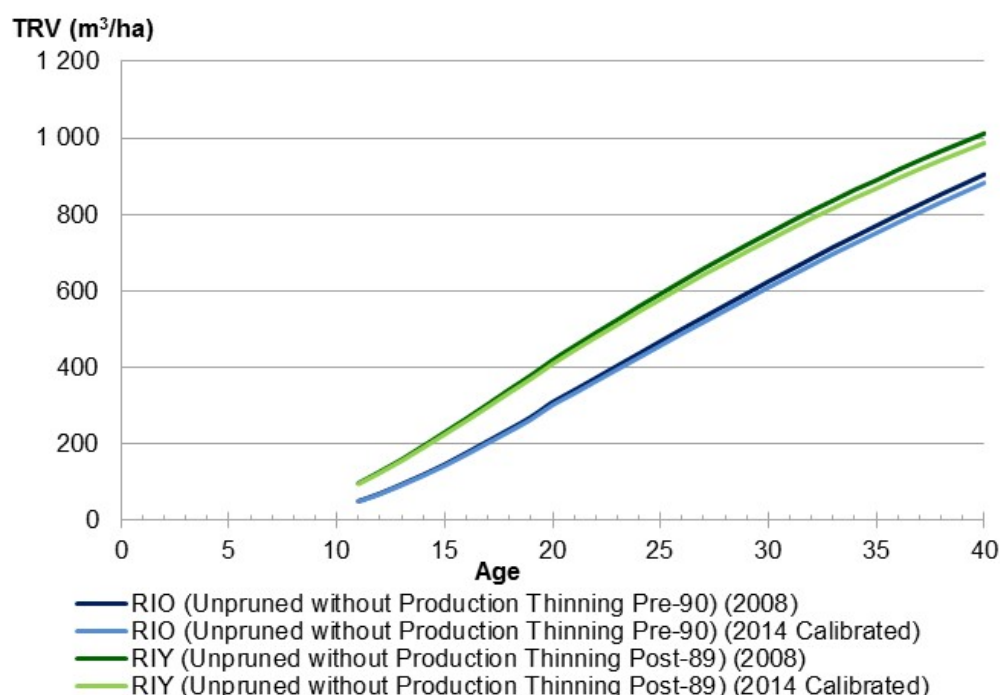


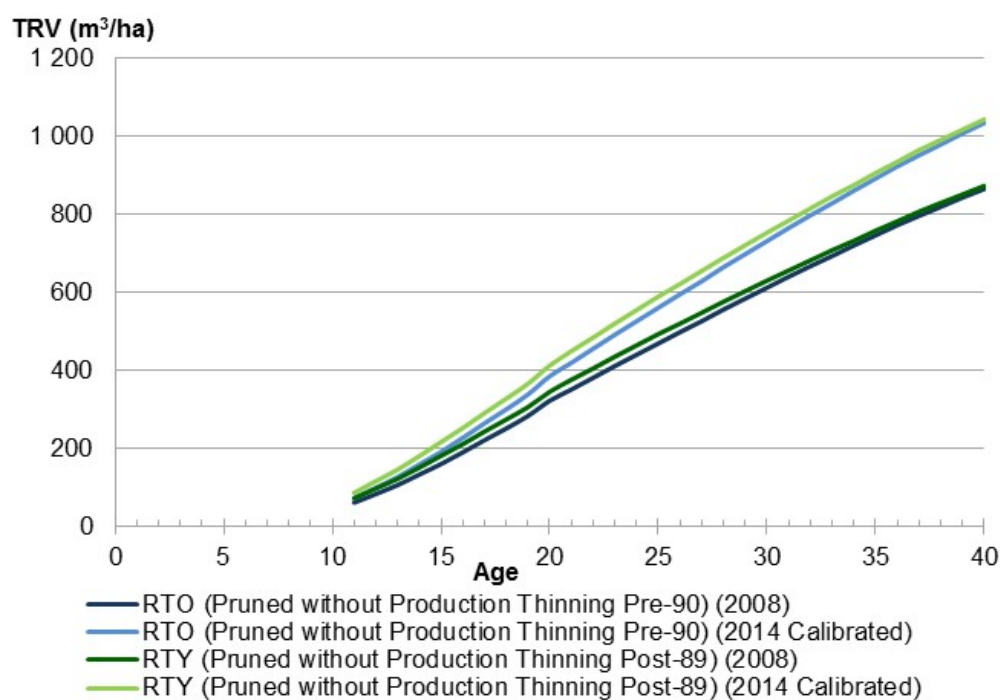
Figure 5-3: Unpruned Yield Tables: 2008 vs 2014 Wood Availability Forecasts



Note: RIO (2008) is incorrectly referenced on the MPI website as RMO

RIY (2008) is incorrectly referenced on the MPI website as RMY

Figure 5-4: Pruned Yield Tables: 2008 vs 2014 Wood Availability Forecasts



Note: RTO (2008) is incorrectly referenced on the MPI website as RIY

RTY (2008) is incorrectly referenced on the MPI website as RIO

6. CONCLUDING COMMENTS

Wood availability from the Hawke's Bay wood supply region's planted forest resource is expected to increase in the near future. Between 2014 and 2018, moderate volume increases are possible and thereafter sustained radiata pine annual harvests of around 3.1 million m³ are can be achieved.

Scenario 3 showed that the harvest level could increase to 3.3 million m³, and be sustained until 2034.

A more variable target clearfell age allows the harvest profile to be extended or retracted (Scenario 4a and 4b), although the periods of sustained harvest are at a similar level.

A significant portion of the potential increase in wood availability from 2015 onwards will come from the region's small-scale forest owners who established forests during the 1990s. Market conditions and logistical constraints will determine the actual rate of harvest increase, and to what level is reached.

Furthermore, the area information from the NEFD as at 1 April 2013 has reported some variations from the NEFD as at 1 April 2005, which was used in the 2008 forecasts. MPI has applied a consistent methodology and approach in compiling the NEFD data in both 2005 and 2013. Therefore, these area variances are more likely due to how the forest owners have responded to the MPI survey. Indufor has relied on the area descriptions provided in the NEFD as at 1 April 2013 without further investigating these area variations.

Appendix – Hawke’s Bay Wood Availability Forecasts for the Period 2014 to 2050

Table 1: Hawke’s Bay Wood Availability under Scenario 1

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

Year Ending December	Large-Scale Owners (000 m3 IB)	Small-Scale Owners (000 m3 IB)	All Owners (000 m3 IB)
2014	1 280	1 215	2 495
2015	1 298	0	1 298
2016	1 260	3	1 264
2017	1 348	62	1 410
2018	1 406	0	1 406
2019	1 394	341	1 735
2020	1 366	2 957	4 323
2021	1 385	3 788	5 172
2022	1 327	6 424	7 750
2023	1 253	3 860	5 113
2024	1 379	3 595	4 973
2025	1 516	3 030	4 547
2026	1 668	938	2 606
2027	1 769	885	2 654
2028	1 769	1 242	3 011
2029	1 769	1 940	3 709
2030	1 769	1 414	3 183
2031	1 769	968	2 737
2032	1 769	676	2 445
2033	1 769	466	2 234
2034	1 769	208	1 977
2035	1 769	263	2 032
2036	1 769	623	2 391
2037	1 769	385	2 154
2038	1 769	393	2 162
2039	1 769	1 529	3 298
2040	1 769	934	2 703
2041	1 769	0	1 769
2042	1 769	1 117	2 886
2043	1 769	1 205	2 974
2044	1 769	0	1 769
2045	1 769	0	1 769
2046	1 769	65	1 834
2047	1 769	0	1 769
2048	1 769	335	2 104
2049	1 769	2 908	4 677
2050	1 769	3 752	5 521

Notes:
m3 cubic metres
IB inside bark.

Table 2: Hawke's Bay Wood Availability under Scenario 2

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

Year Ending December	Large-Scale Owners (000 m3 IB)	Small-Scale Owners (000 m3 IB)	All Owners (000 m3 IB)
2014	1 280	1 215	2 495
2015	1 298	1 197	2 495
2016	1 260	1 373	2 633
2017	1 348	1 549	2 897
2018	1 406	1 684	3 090
2019	1 394	1 696	3 090
2020	1 366	1 724	3 090
2021	1 385	1 706	3 090
2022	1 327	1 764	3 090
2023	1 253	1 837	3 090
2024	1 379	1 712	3 090
2025	1 516	1 574	3 090
2026	1 668	1 422	3 090
2027	1 769	1 322	3 090
2028	1 769	1 322	3 090
2029	1 769	1 322	3 090
2030	1 769	1 322	3 090
2031	1 769	1 322	3 090
2032	1 769	1 322	3 090
2033	1 769	1 322	3 090
2034	1 769	1 322	3 090
2035	1 769	1 322	3 090
2036	1 769	1 322	3 090
2037	1 769	1 322	3 090
2038	1 769	1 322	3 090
2039	1 769	1 322	3 090
2040	1 769	1 322	3 090
2041	1 769	1 322	3 090
2042	1 769	1 322	3 090
2043	1 769	1 322	3 090
2044	1 769	1 322	3 090
2045	1 769	1 322	3 090
2046	1 769	1 322	3 090
2047	1 769	1 322	3 090
2048	1 769	1 322	3 090
2049	1 769	1 342	3 111
2050	1 769	1 342	3 111

Notes:
m3 cubic metres
IB inside bark.

Table 3: Hawke's Bay Wood Availability 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 m3 IB)	Small- Scale Owners (000 m3 IB)	All Owners (000 m3 IB)	Pruned (000 m3 IB)	Unpruned (000 m3 IB)	Chip Logs (000 m3 IB)	Total (000 m3 IB)
2014	1 280	1 215	2 495	379	1 539	577	2 495
2015	1 298	1 197	2 495	532	1 456	506	2 495
2016	1 260	1 235	2 495	534	1 465	496	2 495
2017	1 348	1 147	2 495	528	1 478	489	2 495
2018	1 406	1 338	2 744	639	1 588	517	2 744
2019	1 394	1 625	3 019	649	1 778	592	3 019
2020	1 366	1 954	3 321	606	2 018	697	3 321
2021	1 385	1 944	3 329	663	2 009	657	3 329
2022	1 327	2 002	3 329	669	2 006	654	3 329
2023	1 253	2 076	3 329	705	1 985	639	3 329
2024	1 379	1 950	3 329	851	1 886	591	3 329
2025	1 516	1 812	3 329	859	1 933	538	3 329
2026	1 668	1 661	3 329	716	1 954	659	3 329
2027	1 769	1 560	3 329	737	1 962	631	3 329
2028	1 769	1 560	3 329	838	1 909	582	3 329
2029	1 769	1 560	3 329	800	1 934	595	3 329
2030	1 769	1 560	3 329	711	1 988	630	3 329
2031	1 769	1 560	3 329	838	1 910	581	3 329
2032	1 769	1 560	3 329	652	2 010	666	3 329
2033	1 769	1 560	3 329	337	2 192	800	3 329
2034	1 769	1 560	3 329	454	2 121	755	3 329
2035	1 769	1 227	2 996	418	1 900	677	2 996
2036	1 769	928	2 696	241	1 791	665	2 696
2037	1 769	658	2 427	382	1 516	529	2 427
2038	1 769	415	2 184	126	1 488	569	2 184
2039	1 769	197	1 966	176	1 292	498	1 966
2040	1 769	393	2 162	274	1 374	514	2 162
2041	1 769	610	2 378	414	1 461	503	2 378
2042	1 769	847	2 616	405	1 643	568	2 616
2043	1 769	1 109	2 878	293	1 900	685	2 878
2044	1 769	1 397	3 166	424	2 031	710	3 166
2045	1 769	1 568	3 337	462	2 127	748	3 337
2046	1 769	1 568	3 337	552	2 067	717	3 337
2047	1 769	1 568	3 337	465	2 124	749	3 337
2048	1 769	1 568	3 337	408	2 143	786	3 337
2049	1 769	1 568	3 337	321	2 206	810	3 337
2050	1 769	1 568	3 337	448	2 135	755	3 337

Notes:
m3 cubic metres
IB inside bark.

Table 4: Hawke's Bay Wood Availability 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 and 30 years).

Year Ending December	Recoverable Volume target age 26 (000 m3 IB)	Average Age (Years)	Recoverable Volume target age 28 (000 m3 IB)	Average Age (Years)	Recoverable Volume target age 30 (000 m3 IB)	Average Age (Years)
2014	2 495	29.0	2 495	29.1	2 495	29.0
2015	2 495	26.3	2 495	26.4	2 495	27.5
2016	2 668	26.5	2 495	26.8	2 495	27.1
2017	3 201	26.4	2 495	27.5	2 495	27.3
2018	3 409	28.1	2 744	28.1	2 495	25.9
2019	3 409	27.9	3 019	27.0	2 550	26.4
2020	3 409	26.1	3 321	27.5	2 754	26.0
2021	3 409	27.0	3 329	27.6	2 974	26.4
2022	3 409	26.0	3 329	27.7	3 212	29.1
2023	3 409	26.0	3 329	28.0	3 469	29.6
2024	3 409	26.5	3 329	28.0	3 469	30.0
2025	3 409	27.9	3 329	28.0	3 469	30.0
2026	3 409	27.3	3 329	28.4	3 469	30.0
2027	3 409	26.5	3 329	29.2	3 469	30.0
2028	3 409	28.0	3 329	29.6	3 469	30.2
2029	3 409	28.9	3 329	29.0	3 469	30.2
2030	3 409	29.9	3 329	29.1	3 469	30.3
2031	3 409	32.3	3 329	29.6	3 469	30.0
2032	3 409	32.1	3 329	31.6	3 469	30.3
2033	2 727	26.2	3 329	31.4	3 469	30.9
2034	2 182	26.7	3 329	31.7	3 469	31.9
2035	1 745	27.1	2 996	28.1	3 469	28.7
2036	1 888	28.1	2 696	29.7	3 469	27.9
2037	2 266	29.2	2 427	29.7	2 775	28.9
2038	2 266	31.6	2 184	32.3	2 220	32.2
2039	2 266	32.2	1 966	32.0	1 776	33.1
2040	2 719	27.1	2 162	29.2	1 765	30.0
2041	3 167	27.8	2 378	30.4	1 765	30.3
2042	3 167	26.0	2 616	27.9	1 765	30.5
2043	3 167	26.8	2 878	29.7	2 017	33.7
2044	3 167	27.0	3 166	29.8	2 420	30.8
2045	3 167	27.1	3 337	29.0	2 904	30.1
2046	3 167	26.9	3 337	29.7	3 235	30.2
2047	3 167	26.4	3 337	28.6	3 371	30.3
2048	3 167	27.5	3 337	28.7	3 371	29.7
2049	3 167	27.4	3 337	28.6	3 371	29.7
2050	3 167	27.3	3 337	28.5	3 371	29.6

Notes:
m3 cubic metres
IB inside bark.

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

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

Year Ending December	Large- Scale Owners (000 m3 IB)	Small- Scale Owners (000 m3 IB)	All Owners (000 m3 IB)	Average Age (Years)
2014	0	12	12	48.5
2015	0	0	0	
2016	0	0	0	
2017	3	0	3	55.0
2018	5	0	5	59.3
2019	6	0	6	60.0
2020	17	0	17	56.8
2021	8	0	8	47.2
2022	0	0	0	
2023	14	0	14	51.2
2024	30	11	41	50.4
2025	1	7	8	42.4
2026	0	0	0	
2027	0	0	0	
2028	0	0	0	
2029	0	0	0	
2030	0	0	0	
2031	0	0	0	
2032	0	0	0	
2033	0	1	1	40.0
2034	26	0	27	39.0
2035	30	5	35	40.0
2036	0	2	2	40.0
2037	0	5	5	40.0
2038	0	2	2	40.0
2039	0	3	3	40.0
2040	0	0	0	
2041	0	7	7	40.0
2042	0	14	14	40.0
2043	0	9	9	40.0
2044	0	0	0	40.0
2045	0	0	0	40.0
2046	0	0	0	
2047	0	0	0	
2048	0	0	0	
2049	0	0	0	
2050	0	0	0	

Notes:
m3 cubic metres
IB inside bark.



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