Otago and Southland Wood Availability Forecasts for the Period 2007–2040

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Disclaimer

Readers who plan to use these wood availability forecasts for planning or investment decisions are urged to thoroughly review the forecasts, or to engage the services of a professional forestry consultant who is able to interpret the forecasts in the context of specific planning or investment decisions.

While every effort has been made to ensure the accuracy of the information contained in this publication, the Ministry of Agriculture and Forestry (MAF) accepts no liability for any errors or omissions. The information does not necessarily represent the views of individual members of the National Exotic Forest Description (NEFD) Steering Committee nor the Ministry of Agriculture and Forestry.

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Contents

Summary

The Otago and Southland Wood Supply Region has a well-established forest growing and wood processing industry, with several forest owners now managing a third rotation crop. The region experienced strong growth in harvest volumes and processing activity during the 1990s and early 2000s. The industry was successful in attracting new investment for planting, sawmilling and remanufacturing. A key development was the establishment of a medium-density fibreboard (MDF) plant in 1997. The Mataura MDF plant processes much of the region's lower-quality logs and wood residues.

To assist with future regional forest industry planning, MAF has compiled wood availability forecasts for the Otago and Southland region, covering the period 2007 to 2040. These forecasts have been undertaken in association with the region's major forest growers. The forecasts show the range of harvest volumes potentially available from the planted forest estate of both large and small-scale growers. The forecasts are supply-based, but incorporate the long-term intentions of the larger owners. In interpreting these forecasts, users need to recognise that the ultimate determinant of harvesting activity at any particularly point in time is the demand for logs.

Readers who plan to use these wood availability forecasts for planning or investment decisions are urged to thoroughly review the forecasts, or to engage the services of a professional forestry consultant who is able to interpret the forecasts in the context of specific planning or investment decisions.

Otago

For Otago, the picture over the next 10 years is for relatively static radiata pine wood availability (from both large and small-scale growers). In the longer term, most of the growth in radiata log production will be from the small-grower estate. Production is projected to increase towards 2020. The large-grower estate has limited growth potential over the forecast period (2007–2040).

Douglas-fir production in Otago is dominated by the large growers and is projected to increase from the early 2020s. Increased availability after 2035 is possible from the small-grower resource. From 2027, production thinning is an important component of the potentially available volume.

Southland

For Southland, the forecasts indicate that little change is likely in the availability of radiata pine from large growers, during the forecast period. As in Otago, increased production is possible from the small-scale owners towards 2020.

The trends in Douglas-fir production mirror those in Otago. The resource is dominated by the large growers; while smaller growers are unlikely to contribute to production in a meaningful way until after 2035.

Combined Otago/Southland region

The forecasts indicate that the availability of radiata pine and Douglas-fir, from the Otago/Southland estate, will remain relatively static over the next decade (2007–2015). The forecasts indicate a flat supply curve, but it is important to recognise that short-term fluctuations are possible, due to changes in market conditions.

Looking further out, the forecasts show that an increase in wood supply is possible after 2015, with substantial increases in wood availability towards 2020.

After 2015, the combined Otago and Southland regional harvest has the potential to increase from the current level of about 1.5 million cubic metres, rising to around 2.8 million cubic metres after 2020. Most of the potential increase in wood availability during this period is from the small-scale forest growers who established forests during the 1990s. The actual timing of the harvest from these forests will depend on market conditions and the decisions of a large number of small-scale owners.

Market conditions and logistical constraints (availability of logging crews, transport capacity, and wood processing capacity) will limit how quickly the additional wood availability from small-scale owners' forests can be harvested towards 2020.

Some owners will be motivated to harvest early, while others may decide to grow their forests on longer. It is therefore likely that the harvesting of the post-1990 forest plantings will be spread out over an extended period. If log prices increased during this post-2015 period of more plentiful wood availability, harvesting rates could progressively rise to meet demand. Conversely, if log prices were to decline, then owners are likely to delay harvesting.

In the later part of the forecast period (after 2030), the total harvest is projected to decline. This is in line with the age structure of the resource. The timing (and level) of decrease will depend on the rate at which the region's 1990 forests are harvested.

While there is limited potential to increase harvest volumes over the next 10 years, there are opportunities to more fully utilise the available resource. Several mills have moved (or are moving) to process some of the lower-quality logs that are currently exported.

Other species

Radiata pine and Douglas-fir make up 90 percent (194 100 hectares) of the forest area in Otago and Southland (*A National Exotic Forest Description 2006,* MAF, 2007*)*. Species other than radiata pine and Douglas-fir have not been modelled in this analysis. There are about 21 600 hectares of other species in the two regions.

Eucalypts are the principal alternative species, and plantings total about 13 600 hectares. The majority of these plantings have been established in the Clutha and Southland Districts; and are being grown on a short-rotation basis for wood pulp production. The first of these short-rotation plantings reached harvest age in 2004, and production will progressively increase over the next five to seven years.

Introduction

These forecasts show the range of harvest volumes potentially available from the planted production forests in the Otago and Southland regions for the period 2007–2040.

The wood availability forecasts are based on each region's forest resource and the forecasting assumptions described later in this report. The forecasts have been developed by incorporating the harvesting intentions of the region's large-scale forest owners (those with 1000 hectares of forest or more):

- Blakely Pacific Limited;
- Cainard Forestry LLC;
- Calder Stewart Industries Limited;
- City Forests Limited;
- Craigpine Timber Company Limited;
- Ernslaw One Limited;
- Fulton Hogan Limited;
- Invercargill City Council;
- JPS / JPS II;
- Matariki Forests;
- PF Olsen Ltd (representing Evergrow Properties Ltd and Vela Forest Partnership);
- Southland District Council;
- South Wood Export Limited (including Southland Plantation Forest Company of New Zealand and Hardwood Forests Limited); and
- Wenita Forest Products Limited.

The forecasts incorporate the views of the region's forest managers and consultants. This feedback was critical for ensuring that the forecasts represent a realistic range of future wood availability scenarios.

Five scenarios have been modelled to indicate the potential range of future wood availability. A key issue is the timing of harvesting by the small-scale forest owners. Harvesting will be 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.

The scenarios indicate that there are many different ways for the forest estate in Otago and Southland to be harvested. It needs to be recognised that forests are managed to maximise the benefits to the enterprise that owns them. Each enterprise has its own harvest strategy based on the owners' objectives, market conditions and the forest estate that it owns or manages. Any changes in harvesting strategies by forest owners affect the age-structure and maturity of the forests they own. This in turn feeds back directly into future wood availability.

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 harvest intentions or changes in the resource description (areas and yields), a higher level of confidence can generally be attached to these figures than for the small-scale owner's estate. Not only are harvest intentions less clear for small-scale owners, their resource descriptions are likely to be less accurate.

Scenarios for radiata pine

Five 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.

To ensure the scenarios presented here are reasonable, they were developed in consultation with the NEFD Steering Committee and feedback was received from major forest owners and consultants in the Otago and Southland Wood Supply Region.

Scenario 1: Harvest all areas at age 30

All owners are assumed to harvest their trees at age 30. This scenario shows the potential future harvest in any given year, based on the area of radiata forest that reaches 30 years of age in that year.

Scenario 2: Large-scale owners harvest at stated intentions, small-scale owners harvest at age 30

Large-scale owners' wood availability is assumed to be at stated harvest intentions for 2005 to 2015. After 2015, the large-scale owners' wood availability is assumed not to decrease. Small-scale owners are assumed to harvest their forest holdings at age 30.

Scenario 3: Non-declining yield (NDY) – target rotation 30 years

Large-scale owners' wood availability is assumed to be at stated harvest intentions (as for Scenario 2). The total wood availability of radiata pine from the region is modelled to be non-declining in perpetuity.

Scenario 4: Split NDY – target rotation 30 years

This is the same as Scenario 3 except that the total wood availability of radiata pine from the region is allowed to step down from 2034 (at the end of the current rotation). Thereafter, an annual reduction of up to 10 percent was allowed before the yield was required to be non-declining for the next rotation (from 2037 on).

Scenario 5: Target rotation age variations

This is similar to Scenario 4 except target rotation ages of 28 and 32 years are also modelled.

Discussion on scenarios for radiata pine

With the exception of Scenario 1, the small-scale forest owners have been modelled separately from the large-scale owners. Future harvesting by small-scale owners is generally less certain than by large-scale owners.

Figure 1 uses the wood availability forecasts for the Otago region to show how wood availability varies under each scenario (radiata pine in Southland and the combined regions is not shown).

In Scenarios 1 and 2 (Figures 1a and 1b respectively), forests owned by small-scale owners are assumed to be harvested at age 30. In Scenario 1, all forests (large and small-scale) are harvested at 30 years. Both scenarios show the "potential" availability of mature forest in any given year. These scenarios directly reflect the area of forest in each age class in the Otago and Southland regions. For practical reasons, already described, it is unlikely that the future harvesting would occur this way. The two scenarios simply show the potential magnitude of harvesting under favourable market conditions in any given year.

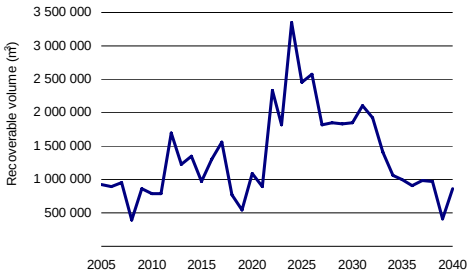
Scenarios 3 to 5 (Figures 1c and 1d respectively) are based on yield regulation. Under these scenarios, the future harvesting model is generally constrained to be non-declining: that is, each year the volume must either be the same or higher than in the previous year. Yield regulation provides a more orderly harvesting volume profile that takes logistical and market constraints into account, to some extent.

Scenarios 3 to 5 avoid the large year-to-year fluctuations seen in Scenario 1. A fundamental property of the forests in Otago and Southland (like many regions in New Zealand) is the large area of forests established during the 1990s. Scenarios 4 and 5 illustrate the harvesting of these forests by applying a non-declining yield constraint for the period 2006 to 2034. Then once the "bulge" of forests planted during the 1990s has been harvested, the model lets the volume decline again.

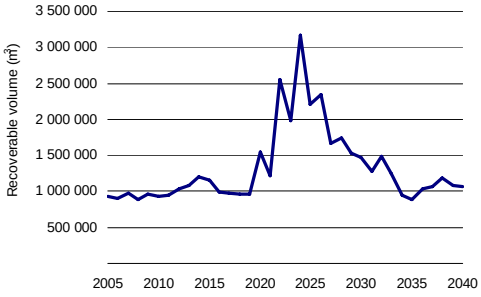
The main limitations of Scenarios 3 to 5 are that log prices and other market factors significantly determine harvesting in any given year. When log prices go up, harvesting will generally increase. When log prices fall, the level of harvesting will generally decrease. It is beyond the scope of this analysis to predict future timber prices.

Figure 1: Wood availability scenarios presented in this report for Otago radiata pine

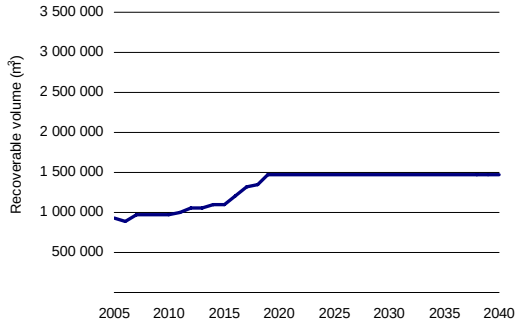
1a – Scenario 1 example: harvest all areas at age 30



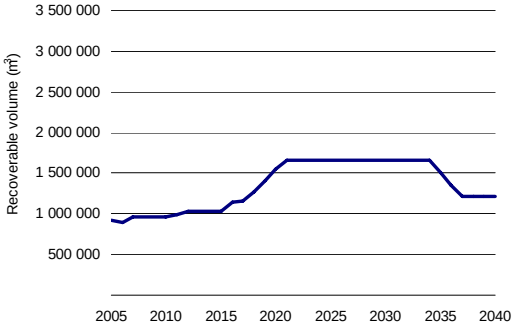
1b – Scenario 2 example: large-scale owners harvest at stated intentions, small-scale owners harvest at age 30



1c – Scenario 3 example: non-declining yield with target rotation 30 years



1d – Scenario 4 example: split non-declining yield with target rotation 30 years (Scenario 5 is the same concept except it shows wood availability profiles at varying harvesting ages)



Scenarios for other species

One scenario is presented for Douglas-fir (all owners). This is similar to Scenario 4 for radiata pine. It is based on the harvest intentions of large-scale owners for 2005 to 2015 with yield regulated in subsequent years. Target rotation age is 45 years for Douglas-fir.

Wood availability from other species has not been modelled.

Data

Method used to obtain area

Forest areas were obtained from *A National Exotic Forest Description as at 1 April 2005* (MAF, 2006). The area for the large-scale owners was used unadjusted. The area of the small-scale owners' estate was reduced by 15 percent. The small-scale owners' areas were reduced because they are generally reported on a gross area basis rather than as net stocked areas (excluding unplanted areas, areas not successfully established, streams and wetlands). Reductions were also made to the area of over-mature stands in the small-scale owner estate, as described later in the report.

Method used to develop yield tables

In 2006, new yield tables for Otago and Southland were developed in the following way:

- Large-scale forest owners provided yield tables for their forest estates.
- These were averaged on an area-weighted basis to get regional yield tables for each croptype.
- Yield tables for old radiata pine (age 16+ years, planted in 1989 and earlier) 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 provides the most accurate information available, as it is based predominantly on detailed inventory.
- Yield tables for young radiata pine croptypes (planted in 1990 and later) were also adjusted in consultation with large-scale owners.
- The yield tables developed for the large-scale owners' estate were also applied to the small-scale forest owners' estate.

Large-scale owners' harvest intentions

Large-scale owners were asked to provide details of their projected harvest volumes (by log grade and area) for the 2005 to 2015 period. The fifteen largest owners all provided yearly (31 December) summary data for the project. Including the harvest intentions data was critical, as it provides realistic, company projections as to wood availability over this period.

Wood availability forecasts for Otago

Otago region

The Otago region has a plantation resource of 127 900 hectares, spread across five territorial authorities – Central Otago, Clutha, Dunedin City, Queenstown-Lakes and Waitaki. The majority of the resource is concentrated in the Clutha District, with 83 200 hectares (1 April 2006).

Assumptions

The wood availability forecasts for Otago are based on the following assumptions:

- All areas are replanted, with a regeneration lag of one year. Replanting is as follows:
  - Large-scale forest owners – all areas are planted back into the same species and regime apart from about 7000 hectares of radiata pine that is replanted into Douglas-fir.
  - Small-scale forest owners – all areas are planted back into the same species and regime.

Based on a recent deforestation survey (*2006 Deforestation Intentions Survey*, Bruce Manley, 2006), the Otago and Southland regions are likely to experience a relatively low rate of deforestation between 2006 and 2020 (about 3900 hectares). This level of deforestation is not sufficient to warrant changes to the forecast models.

- The area awaiting replanting as at 31 March 2005 is included as area at age 0 (the area to be replanted in the 2005 planting season).
- The total volume of radiata pine harvested in 2005 and 2006 was 925 000 and 895 000 cubic metres respectively (MAF estimate).
- The total volume of Douglas-fir harvested in 2005 and 2006 was 66 000 and 94 000 cubic metres respectively (MAF estimate).
- It was assumed that any radiata pine forest in the small-scale owners' estate that was aged over 40 years would not be harvested. The area in the small-scale owners' estate that was aged 31 to 40 years was reviewed. Local knowledge was used to determine whether the forest was still standing and, if so, whether or not it was likely to be harvested. As a result of this exercise, the area data was reduced by 212 hectares (aged 31 to 40 years).

Scenario 1

In this scenario, all trees are harvested at age 30. This modelling approach views the Otago wood flow as unconstrained (or pure); meaning that wood availability reflects the age-class distribution of the resource. Figure 2 shows the age-class distribution of radiata pine in Otago, and Figure 3 shows the wood availability. The 2019 low point in wood availability (Figure 3) occurs because of planting conditions in 1989. Just 1167 hectares were planted in the 1989 season. These plantings were aged 16-years in the 2005 age-class distribution (Figure 2). Conversely, the 2024 high point in wood availability (Figure 3) occurs because of the large area planted in 1994 (6380 hectares), aged 11 in Figure 2.

Figure 3 indicates that wood availability does not have the potential to increase markedly for about 15 years.

Figure 2: Age-class distribution of Otago radiata pine – combined estate as at 1 April 2005

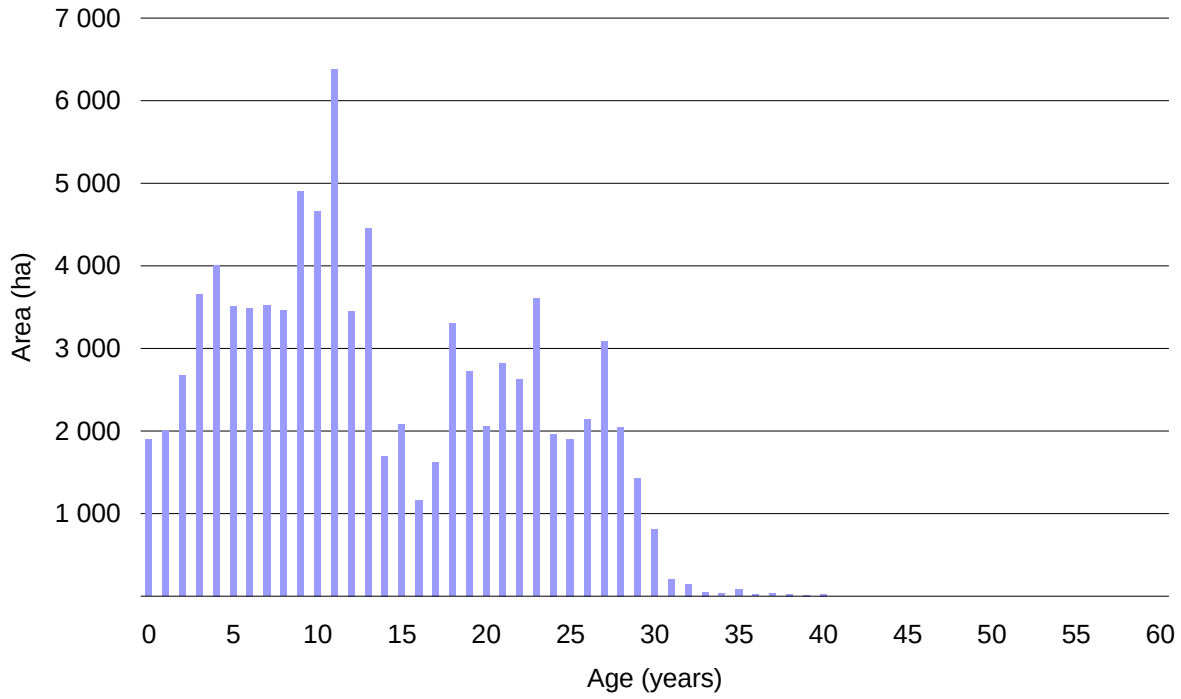
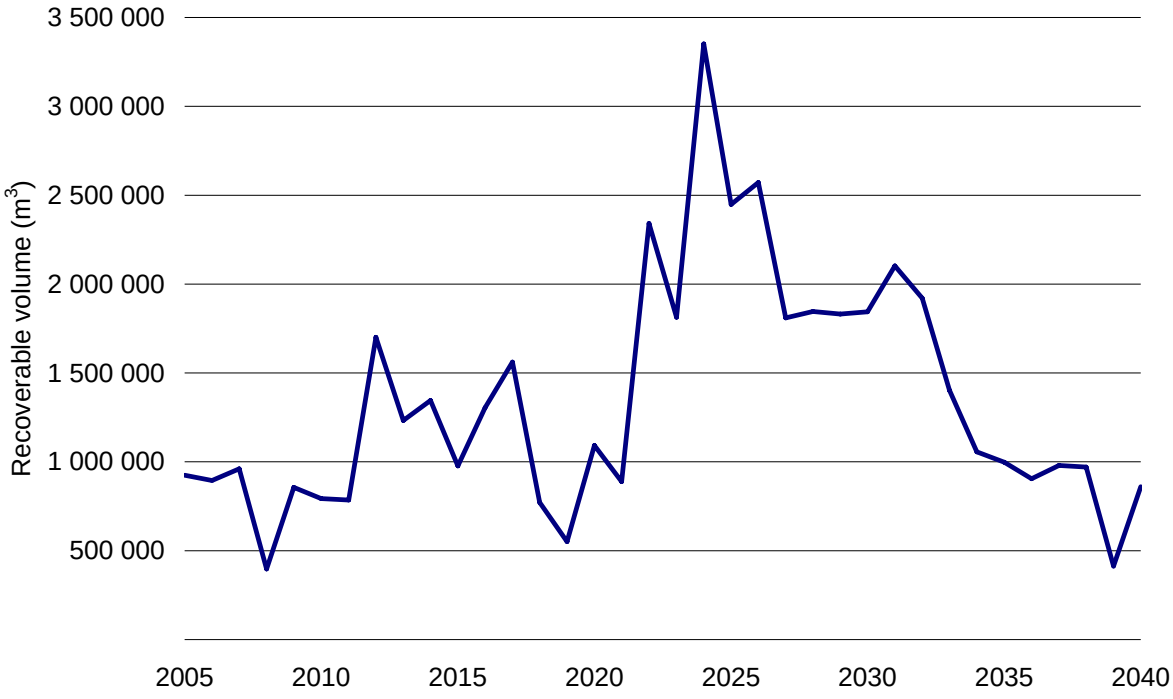


Figure 3: Otago radiata pine availability under scenario 1 (all trees harvested at age 30)



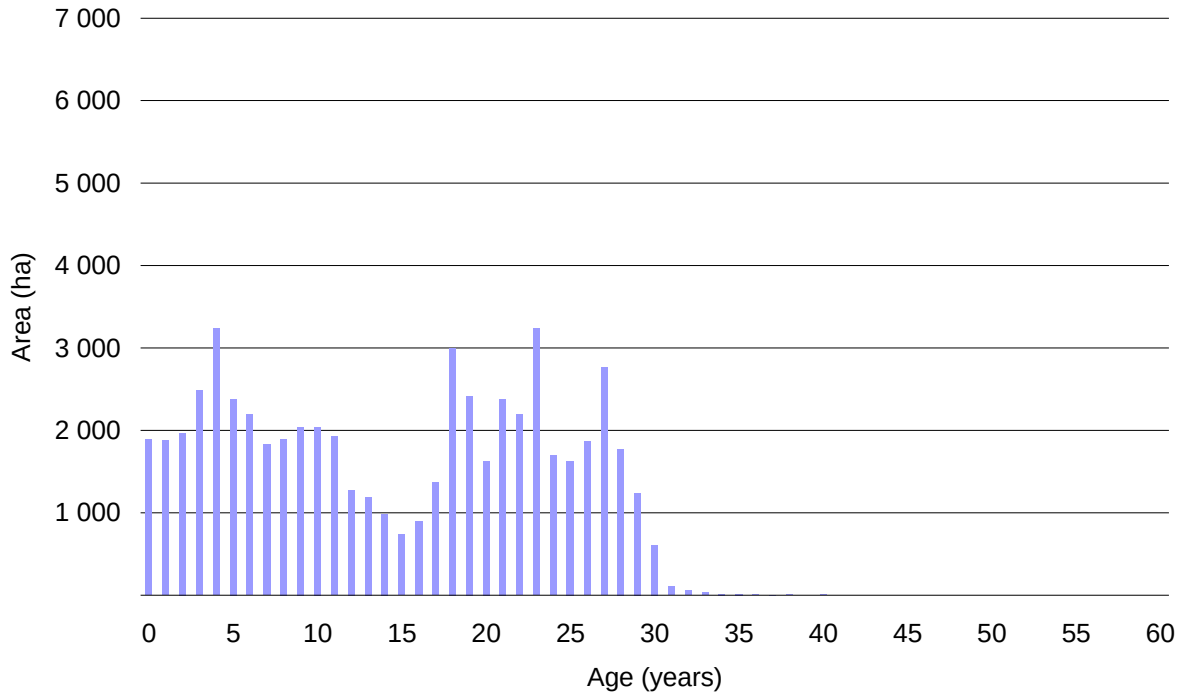
Scenario 2

In this scenario, large-scale owners harvest in line with their stated intentions and small-scale owners harvest their holdings at age 30.

Large-scale owners' estate

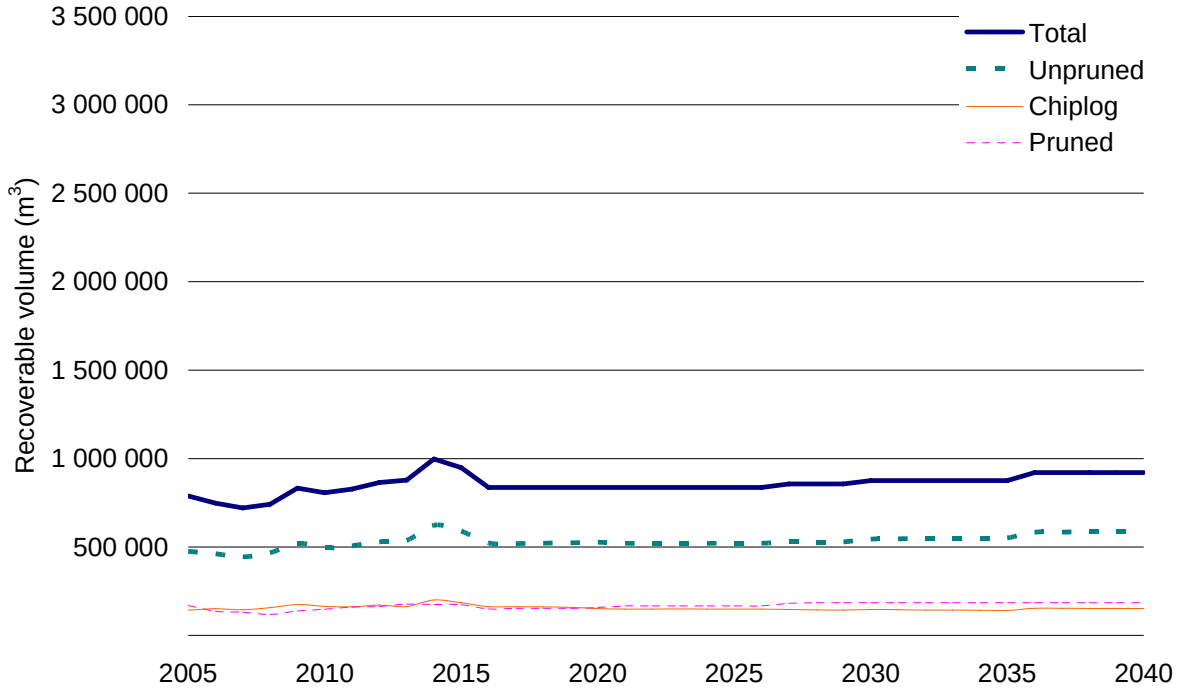
The age-class distribution of the large-scale owners' estate (Figure 4) shows that there is about 2000 hectares in most age-classes up to age 28. The area at age 0 is the area awaiting replanting as at 31 March 2005 (to be replanted in the 2005 planting season).

Figure 4: Age-class distribution of the Otago radiata pine estate – large-scale owners as at 1 April 2005



For this scenario, the availability of wood from large-scale owners is based on stated harvest intentions for 2005 to 2015. Thereafter the availability is constrained to be non-declining with a target rotation age of 30 years. The wood availability of large-scale owners (Figure 5) is forecast to be relatively static through the forecast period. Although there is replanting of some radiata pine area into Douglas-fir, the volume of radiata pine can be sustained. The higher yield (cubic metres per hectares) anticipated for younger stands and replanted stands compensates for the reduced area in radiata pine.

Figure 5: Otago radiata pine availability under scenario 2 – large-scale owners

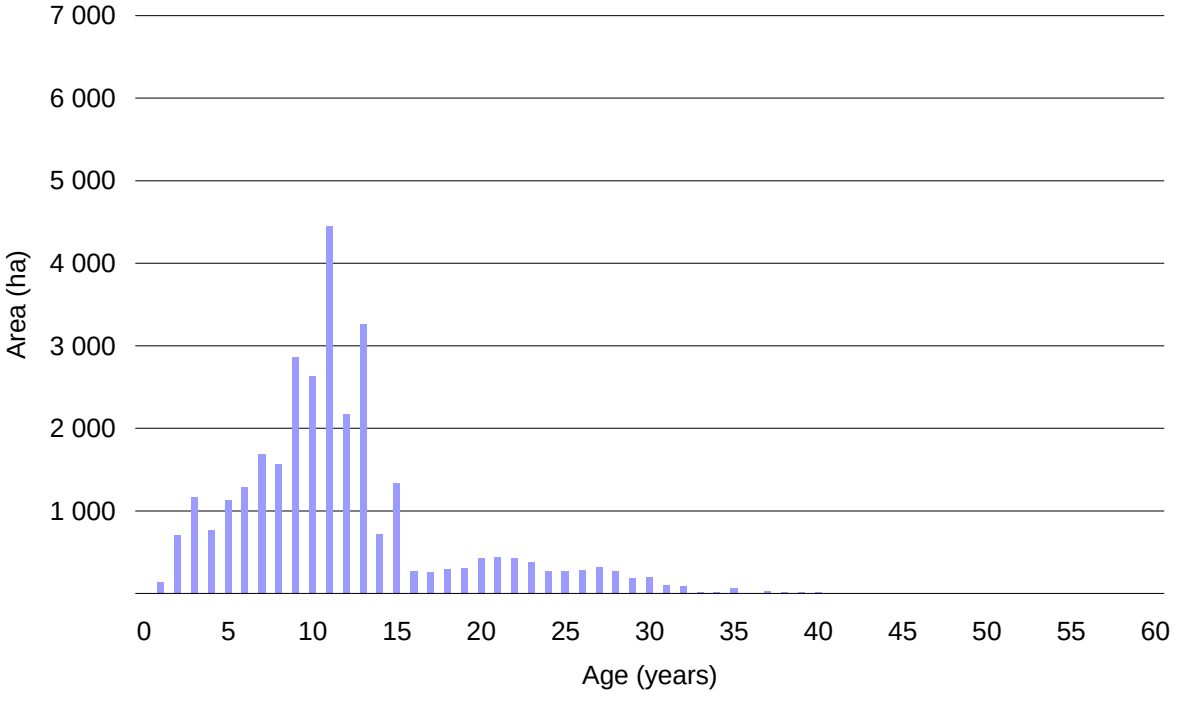


Small-scale owners' estate

The age-class distribution of the small-scale owners' estate (Figure 6) is very irregular, with over 2000 hectares in ages 9 to 13 years (planted in 1992 to 1996) and much less in all other age classes. The key issue is how to forecast the wood availability from this estate. In particular, will the large areas in ages 9 to 13 be harvested:

- at a fixed rotation age (Scenario 2);
- spread over many years (Scenario 3); or
- spread over an intermediate number of years (Scenario 4).

Figure 6: Age-class distribution of the Otago radiata pine estate – small-scale owners as at 1 April 2005

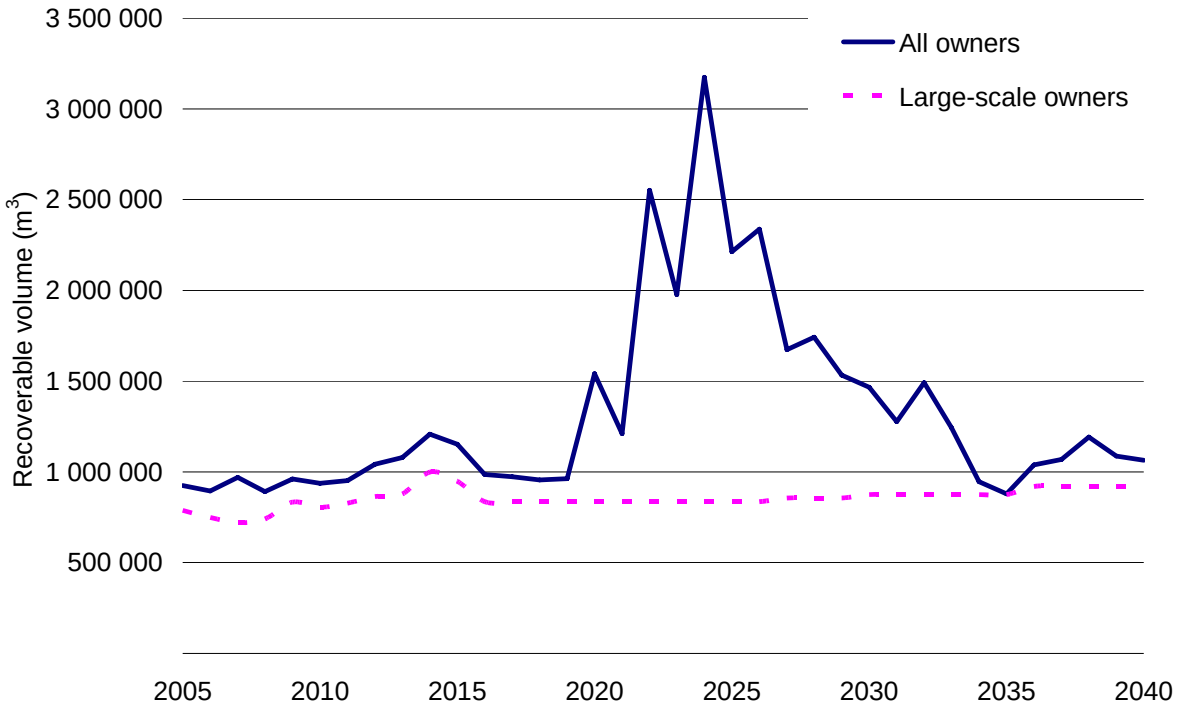


Combined estate

The wood availability from all owners in Otago is presented in Figure 7. The large-scale owners' resource is shown as the base load, and the data mirrors Figure 5. The fluctuation in the total volume harvested reflects the variation in the age-class distribution of the small-scale owners' estate, and the assumption that this estate is harvested at age 30.

The large increase in harvest volume after 2022 (Figure 7) reflects the maturing of the small-scale owners' estate. For example, the increase in 2022 is a consequence of the 3269 hectares planted by small-scale owners in 1992 (aged 13 in Figure 6) being harvested at age 30 years.

Figure 7: Otago radiata pine availability under scenario 2 – combined estate



Fluctuations in harvest volumes of the magnitude shown in Figure 7 would be impractical because of marketing and logistics realities. There would not be enough harvesting capacity (harvesting crews and equipment) to cut all the volume available during the peak period, and it would be difficult to get short-term sales contracts to cover this volume.

Scenario 3

The third scenario assumes a non-declining yield, with a target rotation age of 30 years. Figure 8 indicates that when the small-scale owners' estate is harvested to complement the large-scale owners' estate, the total volume (of radiata pine) only increases slightly through to 2017. The potentially available volume increases to 1.5 million cubic metres per year from 2021. An extra constraint was modelled, with the total volume increasing by no more than 10 percent annually. This simulates the logistical limitations of rapidly moving to a higher production volume.

This scenario is similar to the base case scenario adopted in the 2000 NEFD wood supply forecasts. However, it results in the small-scale owners' estate being harvested at rotation ages that differ markedly from 30 years (Figure 9).

Figure 8: Otago radiata pine availability under scenario 3 – all owners

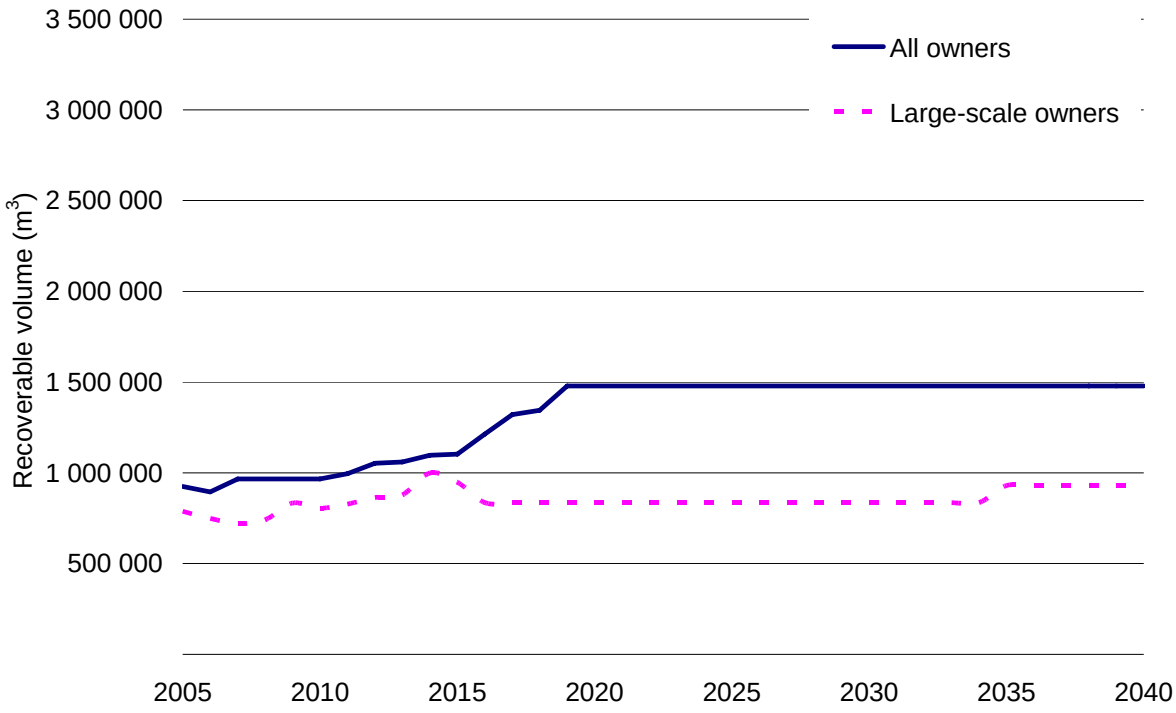
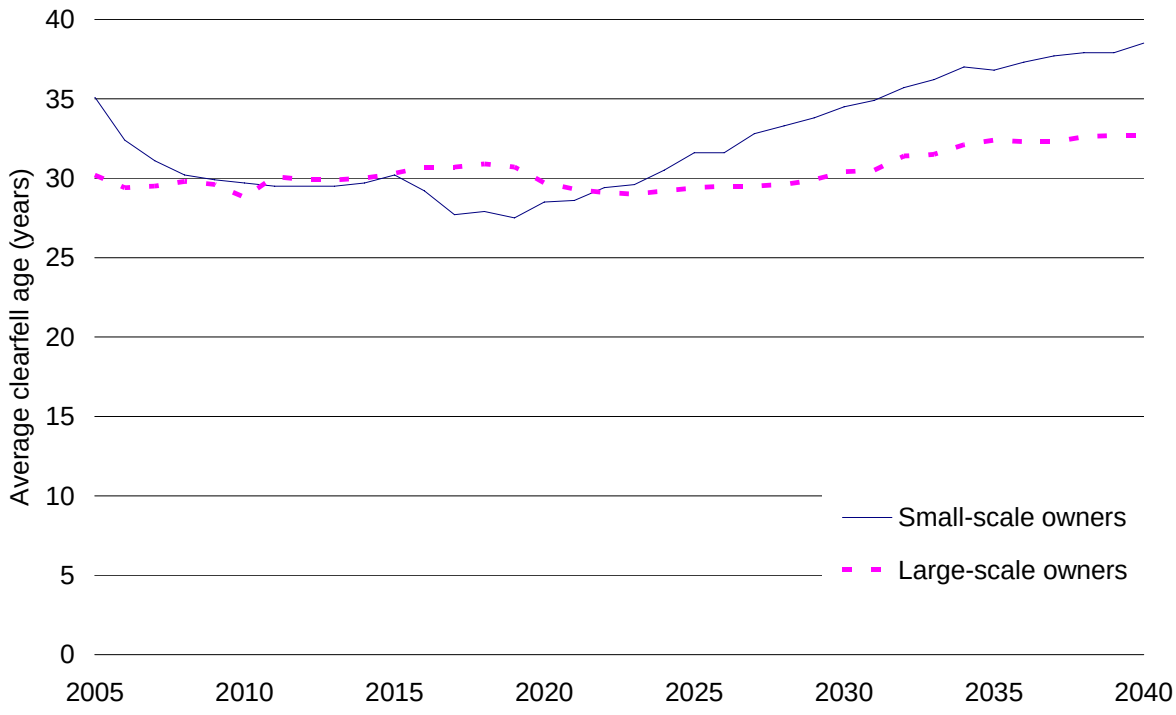


Figure 9: Average radiata pine clearfell age in Otago under scenario 3 – by ownership category



Scenario 4

The fourth scenario is based on a split non-declining yield, with a rotation age of 30 years. This scenario gives a forecast wood availability that is similar to scenario 3 through to 2021 (Figure 10). Wood availability increases to 1.7 million cubic metres per year from 2022 before reducing to 1.25 million cubic metres per year from 2037.

The main difference from scenario 3 is that the large area of young stands in the small-scale owners' estate is assumed to be harvested over a shorter period of time. The total volume was

modelled not to decrease between 2006 and 2034, that is, for the current rotation. Thereafter an annual reduction of up to 10 percent was assumed, with the yield to be non-declining for the next rotation (from 2037). As a consequence, the average clearfell age for small-scale owners stays closer to the target of 30 years than in scenario 3 (Figure 11).

The harvest volumes forecast under scenario 4 are broken down by log grade in Figure 12.

Figure 10: Otago radiata pine availability under scenario 4 – all owners

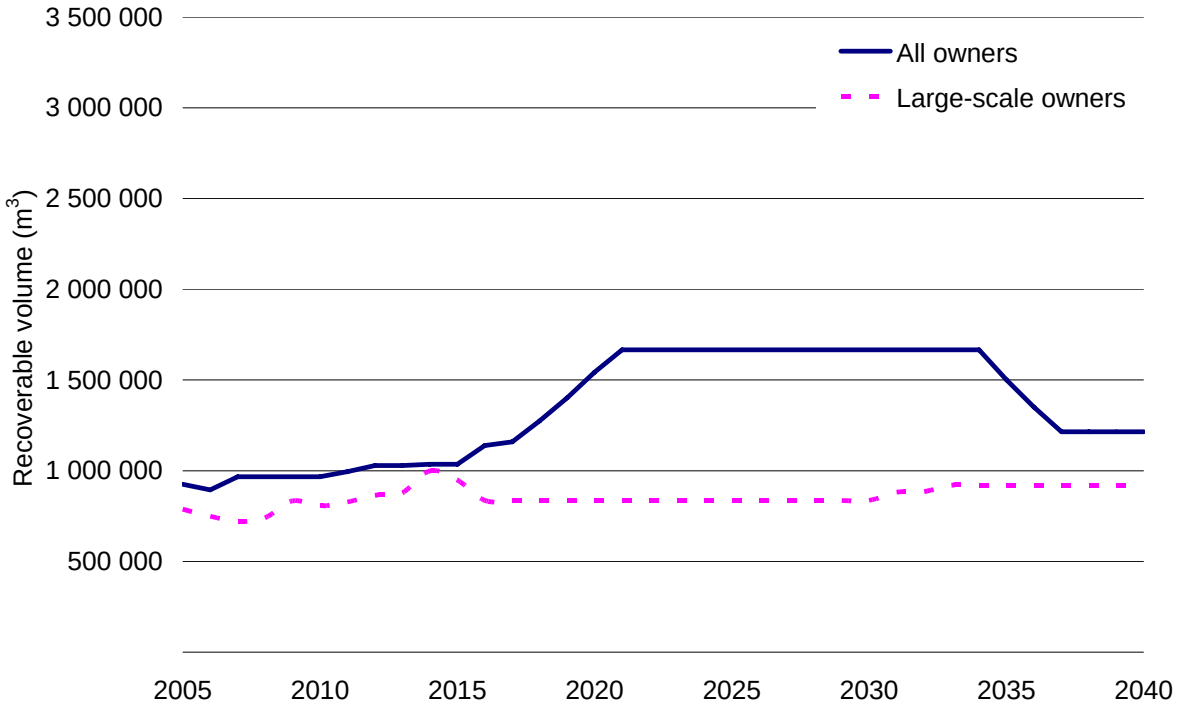


Figure 11: Average radiata pine clearfell age in Otago under scenario 4 – by ownership category

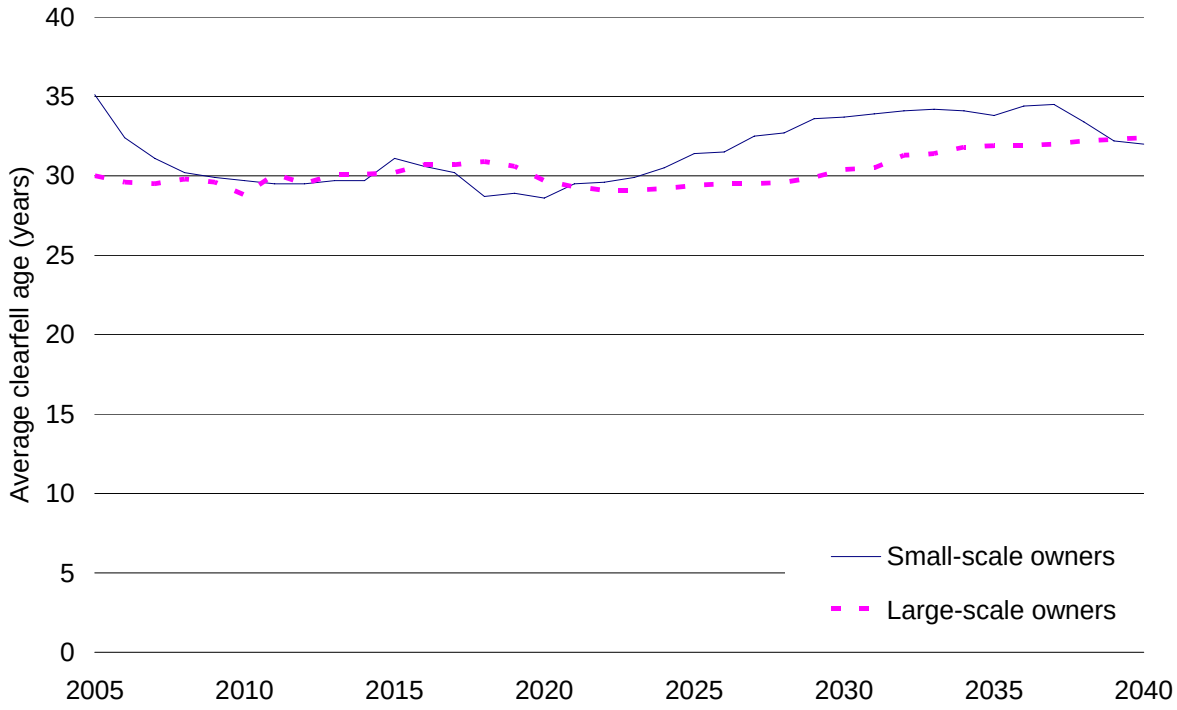
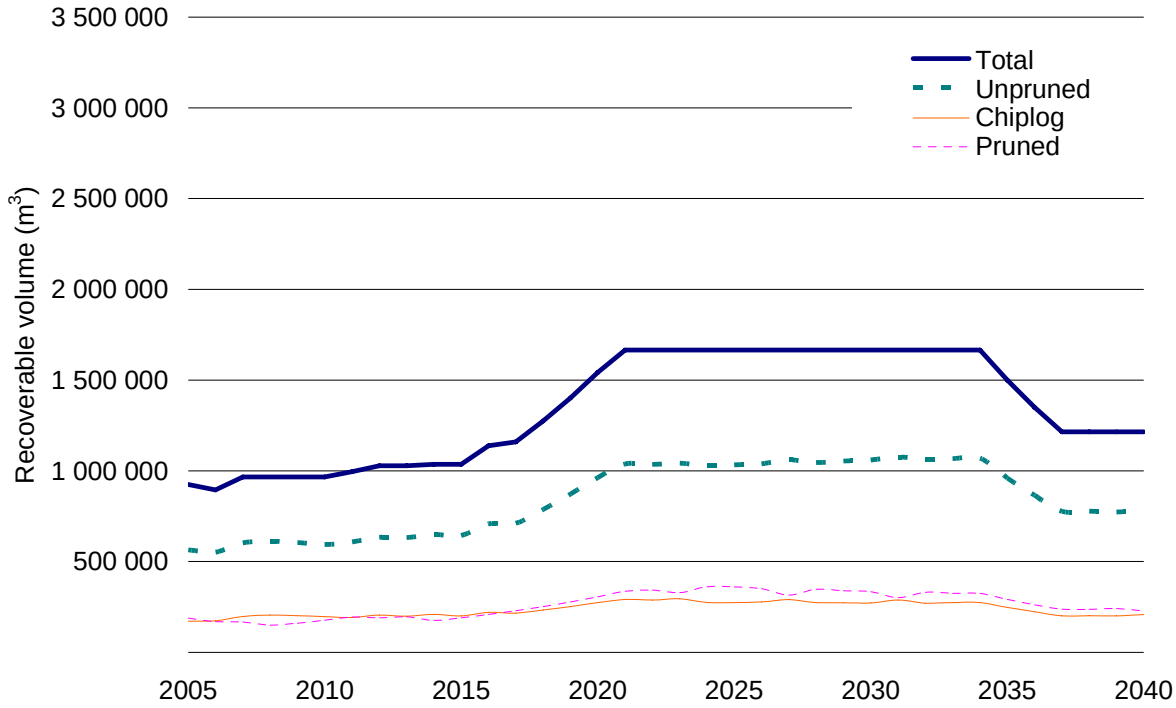


Figure 12: Otago radiata pine availability by log product under scenario 4 – all owners



Scenario 5

Different wood availability profiles are generated if the target rotation age is changed from 30 years to either 28 or 32 years (Figure 13). Because of the limitations imposed by the current age-class distribution and large-scale owners' stated harvest intentions, it takes some time to achieve separation of average clearfell age (Figure 14). The results indicate that the potential to markedly increase the wood harvest is limited prior to at least 2013.

Figure 13: Otago radiata pine availability by target rotation age under scenario 5 – all owners

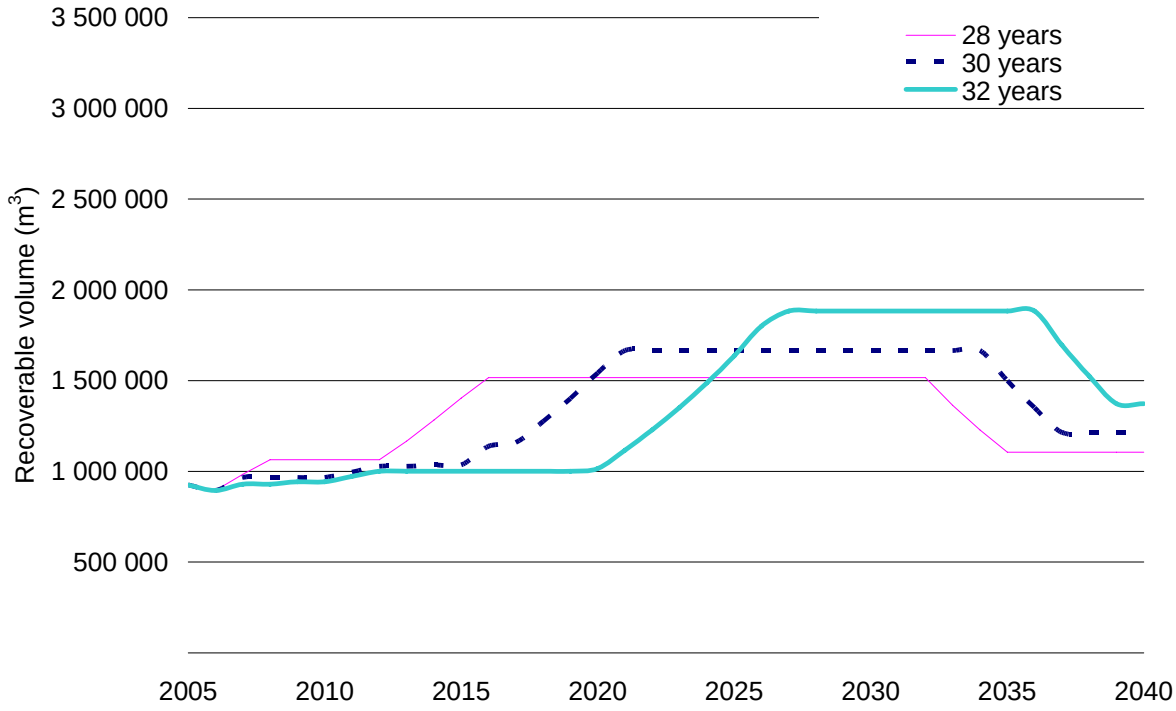
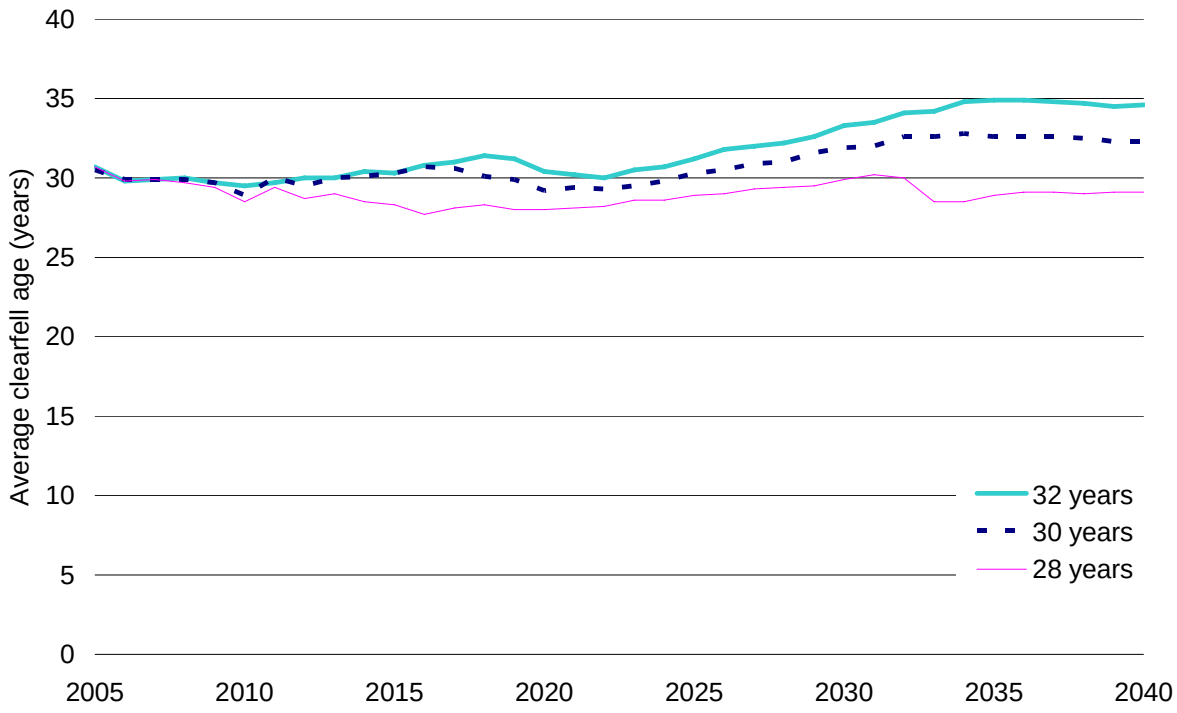


Figure 14: Average radiata pine clearfell age in Otago by target rotation age under scenario 5 – all owners

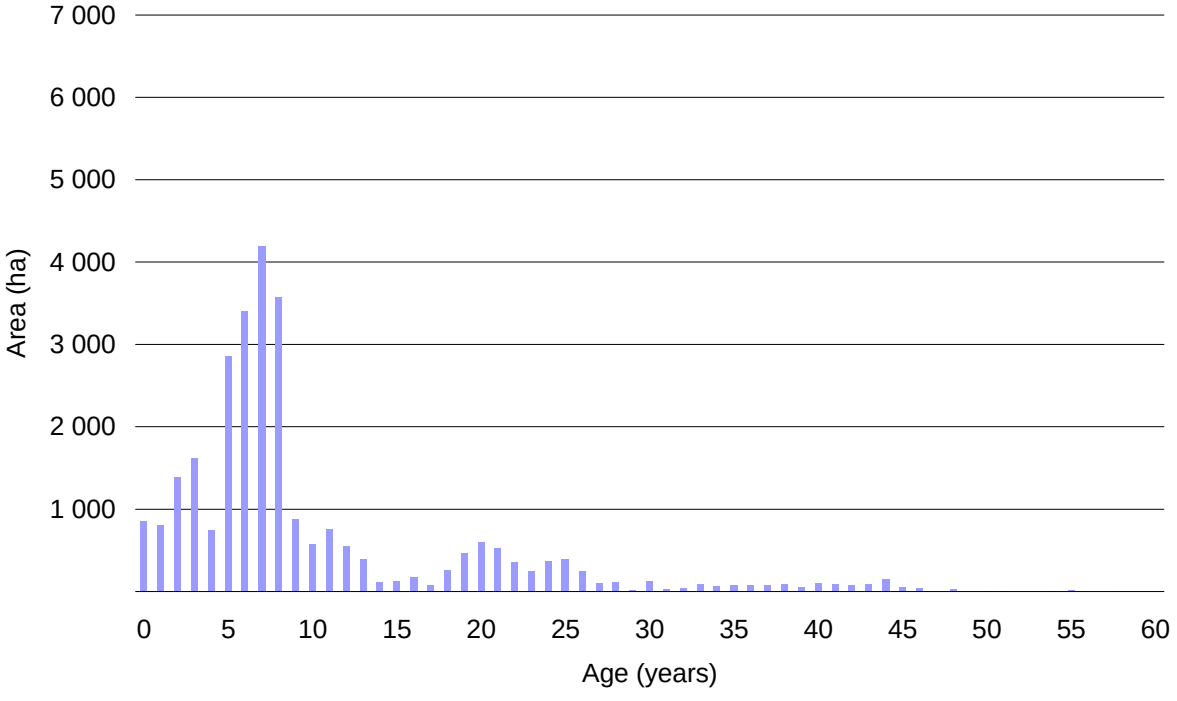


Scenarios for other species

Douglas-fir

The age-class distribution of Douglas-fir in Otago is far from uniform, as shown in Figure 15. Large areas of Douglas-fir were established from 1997 to 2000, mainly by large-scale forest owners. This imposes challenges for future yield regulation. To illustrate this, the wood availability graph for Douglas-fir has been extended to 2060 (rather than 2040 as in all other graphs).

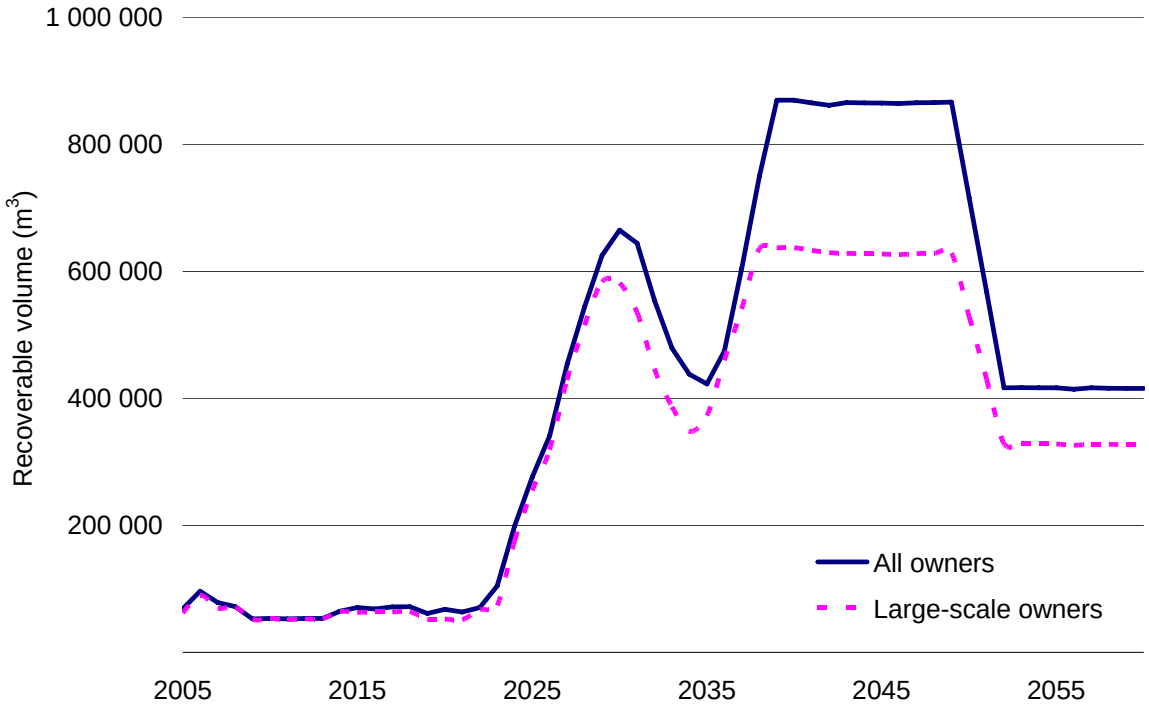
Figure 15: Age-class distribution of Otago Douglas-fir – combined estate as at 1 April 2005



The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2005 to 2015. From 2015 to 2049, clearfell volume is constrained to be non-declining – both for large-scale owners and for the combined estate. Clearfell volumes can change by 100 000 cubic metres per year for the large-scale owners' estate and by 150 000 cubic metres per year for the combined estate.

Figure 16 clearly shows how large-scale owners dominate the potential supply of this species. About 50 percent of the volume between 2027 and 2032 comes from production thinning.

Figure 16: Otago Douglas-fir availability – combined estate (volumes include production thinning as well as clear-fell)



Wood availability forecasts for Southland

Southland region

The Southland region has a plantation resource of 87 800 hectares, spread across three territorial authorities – Gore, Invercargill City and Southland District. The majority of the resource is concentrated in the Southland District, with 82 700 hectares (1 April 2006).

Assumptions

The wood availability forecasts for Southland are based on the following assumptions:

- All areas are replanted, with a regeneration lag of one year. Replanting is as follows:
  - Large-scale forest owners – all areas are planted back into the same species and regime.
  - Small-scale forest owners – all areas are planted back into the same species and regime.
- Based on a recent deforestation survey (*2006 Deforestation Intentions Survey*, Bruce Manley, 2006), the Otago and Southland regions are likely to experience a relatively low rate of deforestation between 2006 and 2020 (about 3900 hectares). This level of deforestation is not sufficient to warrant changes to the forecast models.
- The area awaiting replanting as at 31 March 2005 is included as area age 0 (the area to be replanted in the 2005 planting season).
- The total volume of radiata pine harvested in 2005 and 2006 was 507 000 and 527 000 cubic metres respectively (MAF estimate).
- The total volume of Douglas-fir harvested in 2005 and 2006 was 15 000 and 19 000 cubic metres respectively (MAF estimate).
- It was assumed that any radiata pine forest in the small-scale owners' estate that was aged over 40 years would not be harvested. The area in the small-scale owners' estate that was aged 31 to 40 years was reviewed. Local knowledge was used to determine whether the forest was still standing and, if so, whether or not it was likely to be harvested. As a result of this exercise, the area data was reduced by 175 hectares (aged 31 to 40 years).

Scenario 1

In this scenario, all trees are harvested at age 30. This modelling approach views the Southland wood flow as unconstrained (or pure); meaning that wood availability reflects the age-class distribution of the resource. Figure 17 shows the age-class distribution of radiata pine in Southland, and Figure 18 shows the wood availability. The 2021 low point in wood availability (Figure 18) occurs because of planting conditions in 1991. These plantings were aged 14 in the 2005 age-class distribution (Figure 17). Conversely, the 2024 high point in wood availability (Figure 18) occurs because of the large area planted in 1994, aged 11 in Figure 17.

Figure 17: Age-class distribution of Southland radiata pine – combined estate as at 1 April 2005

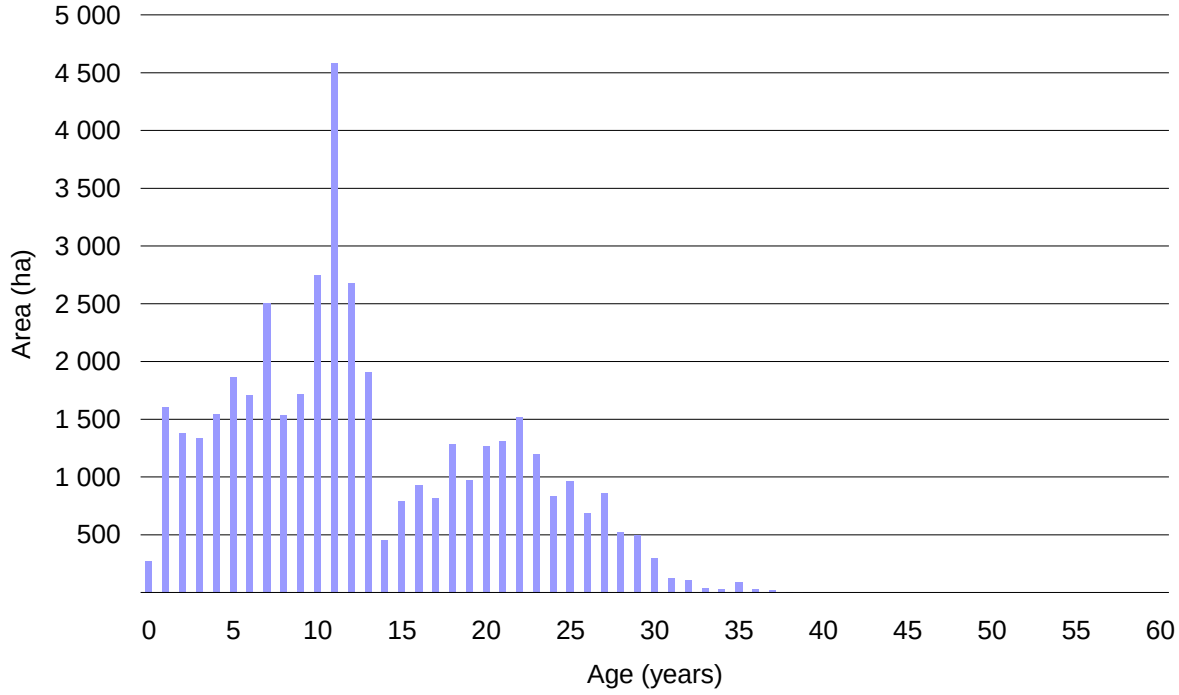
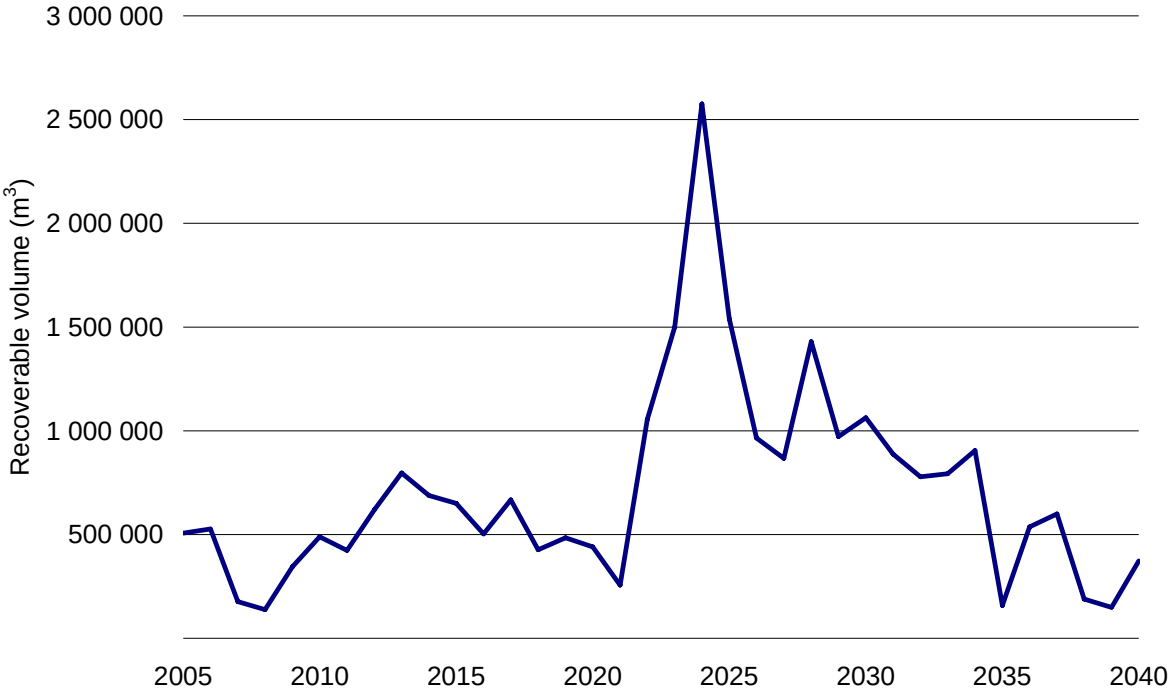


Figure 18: Southland radiata pine availability under scenario 1 – combined estate



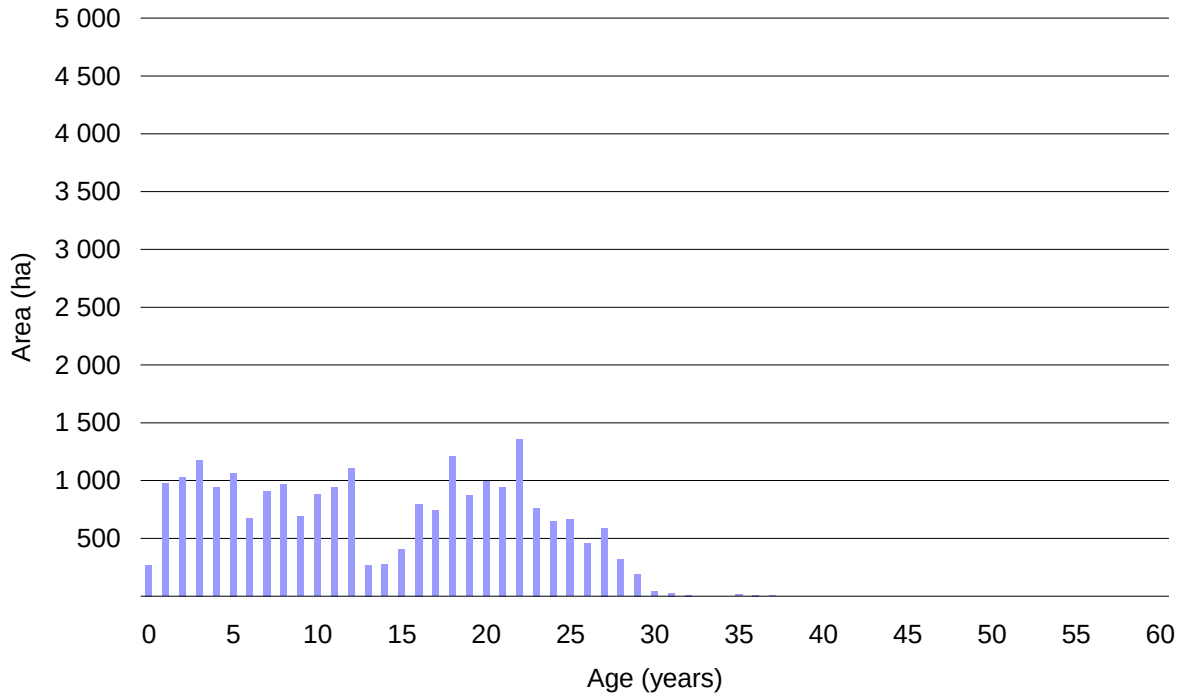
Scenario 2

In this scenario, large-scale owners' harvest in line with their intentions, and small-scale owners harvest at age 30.

Large-scale owners' estate

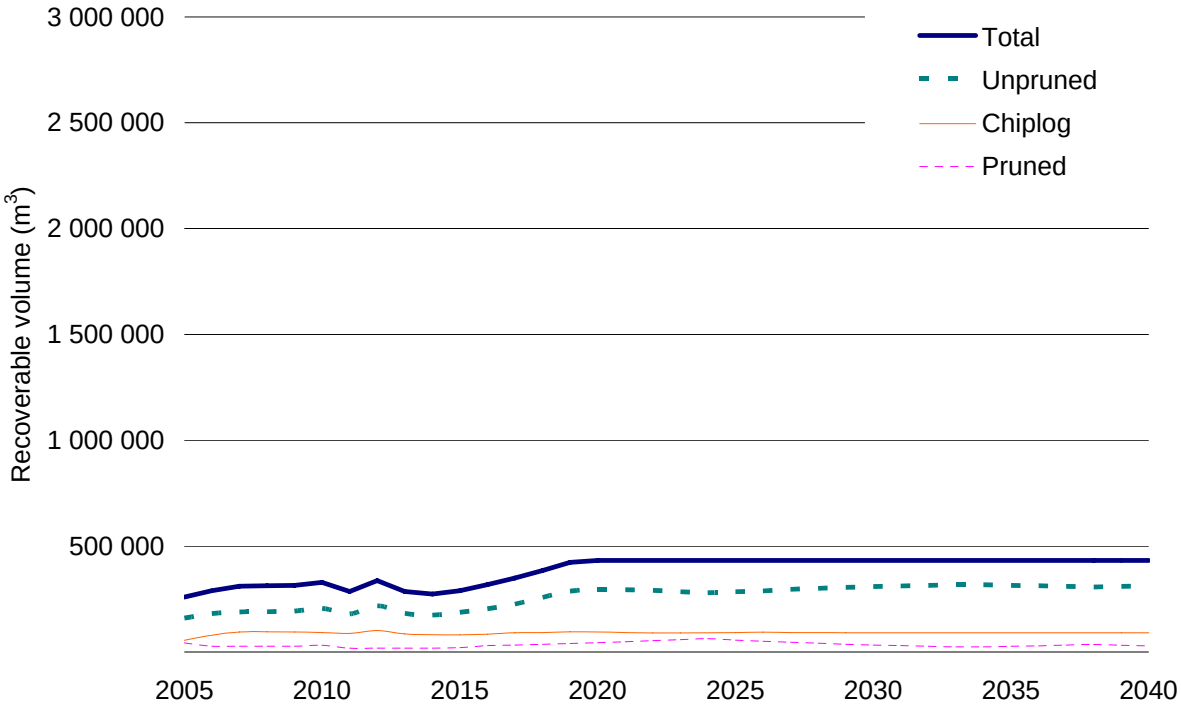
The age-class distribution of the large-scale owners' estate (Figure 19) shows a variable area in each age-class. The area at age 0 is the area awaiting replanting as at 31 March 2005 (to be replanted in the 2005 planting season).

Figure 19: Age-class distribution of the Southland radiata pine estate – large-scale owners as at 1 April 2005



For this scenario the availability of wood from large-scale forest owners is based on stated harvest intentions for 2005 to 2015. Thereafter the availability is constrained to be non-declining with a target rotation age of 30 years. The wood volume available from large-scale owners (Figure 20) is forecast to fluctuate around 300 000 cubic metres per year until 2016, before increasing to over 400 000 cubic metres per year from 2019.

Figure 20: Southland radiata pine availability under scenario 2 – large-scale owners

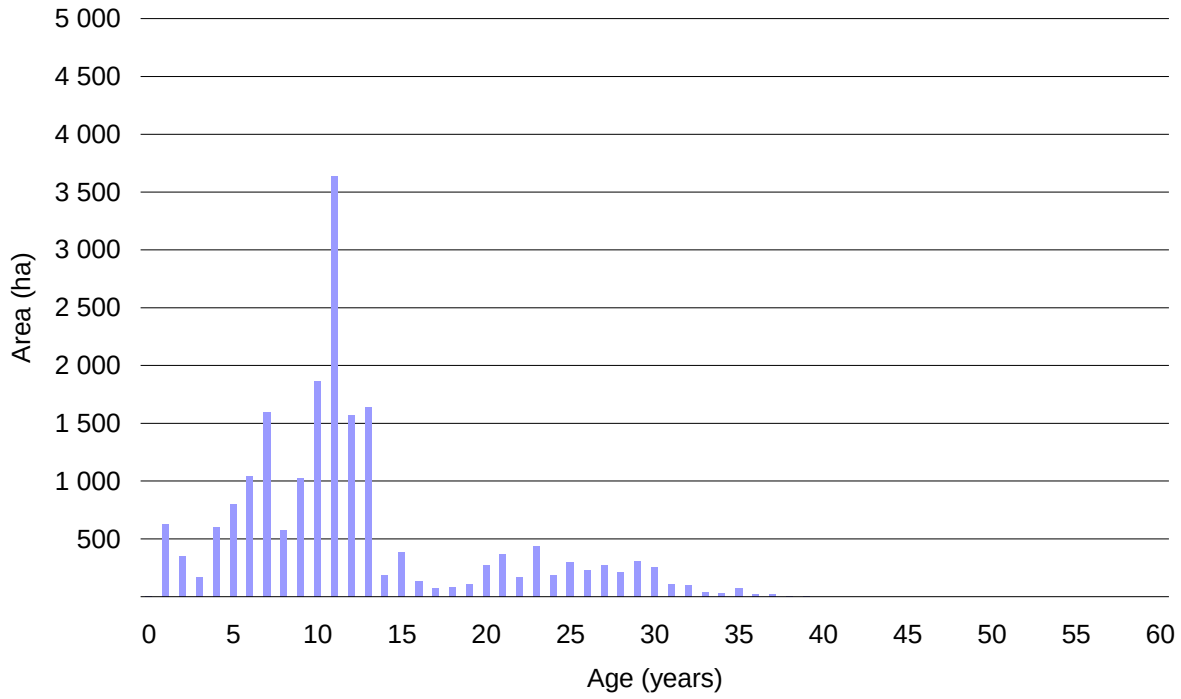


Small-scale owners' estate

The age-class distribution of the small-scale owners' estate (Figure 21) is very irregular, with over 1500 hectares in ages 10 to 13 years (planted in 1992 to 1995) and aged 7 (planted in 1998). Plantings have been significantly lower in all other age-classes. The key issue is how to forecast the availability from this estate. In particular, will the large areas in ages 7 to 13 be harvested:

- at a fixed rotation age (Scenario 2);
- spread over many years (Scenario 3); or
- spread over an intermediate number of years (Scenario 4).

Figure 21: Age-class distribution of the Southland radiata pine estate – small-scale owners as at 1 April 2005

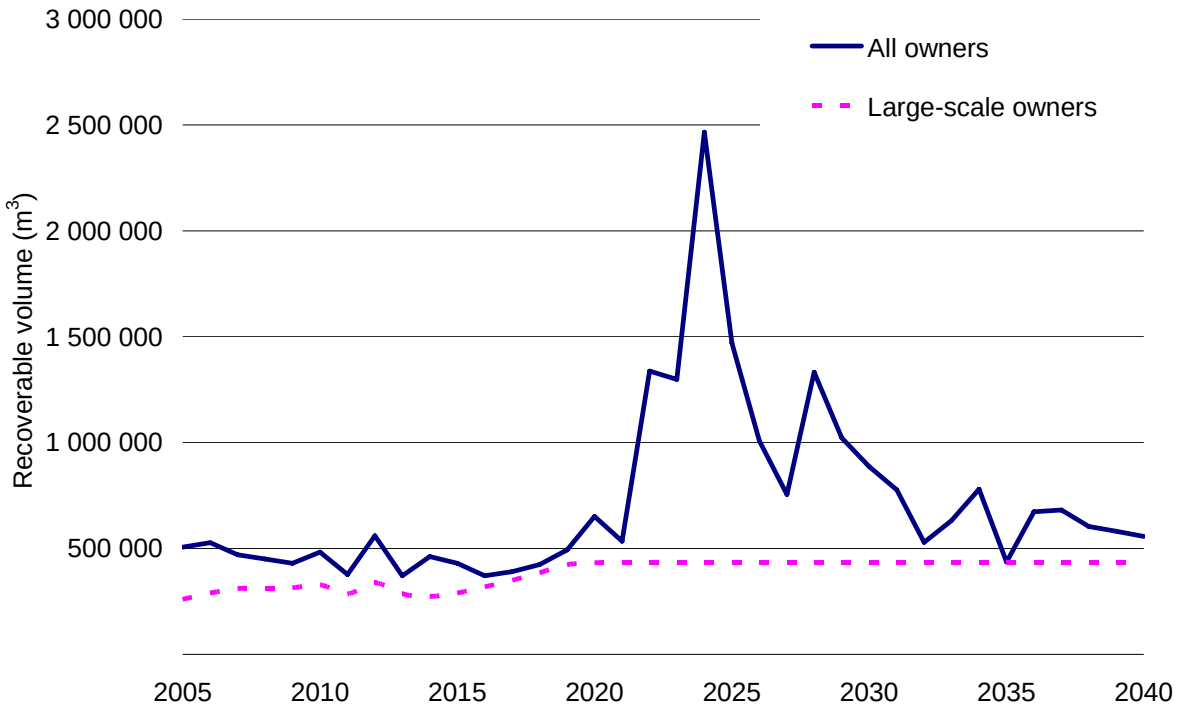


Combined estate

The wood availability from all owners in Southland is presented in Figure 22. The large-scale owners' resource is shown as the base load, and the data mirrors Figure 20. The fluctuation in the total volume harvested reflects the variation in the age-class distribution of the small-scale owners' estate, and the assumption that this estate is harvested at age 30.

The large increase in harvest volume after 2022 (Figure 22) reflects the maturing of the small-scale owners' estate. For example, the increase in 2022 is a consequence of the 1638 hectares planted by small-scale owners in 1992 (aged 13 in Figure 21) being harvested at age 30 years. The spike in 2024 is caused by the harvest of 3636 hectares planted by small-scale owners in 1994 (aged 11 in Figure 21).

Figure 22: Southland radiata pine availability under scenario 2 – combined estate



Volume fluctuations of the magnitude shown in Figure 22 would be impractical because of marketing and logistics realities. There would not be enough harvesting capacity (harvesting crews and equipment) to cut all the volume available during the peak period, and it would be difficult to get short-term sales contracts to cover this volume.

Scenario 3

The third scenario is based on non-declining yield, and a target rotation age of 30 years. Figure 23 indicates that there is the potential for the total radiata pine volume (from the combined large owner and small-scale owner estate) to increase to over 850 000 cubic metres per year from 2023. However it also indicates that wood availability is only 450 000 cubic metres per year from 2007 to 2016. The drop from 2006 to 2007 is a consequence of the current level of harvest from the small-scale estate not being sustainable over the next 10 years.

This scenario is similar to the base case scenario adopted in the 2000 NEFD wood supply forecasts. However, it results in the small-scale owners' estate being harvested at rotation ages that differ markedly from 30 years (Figure 24).

Figure 23: Southland radiata pine availability under scenario 3 – all owners

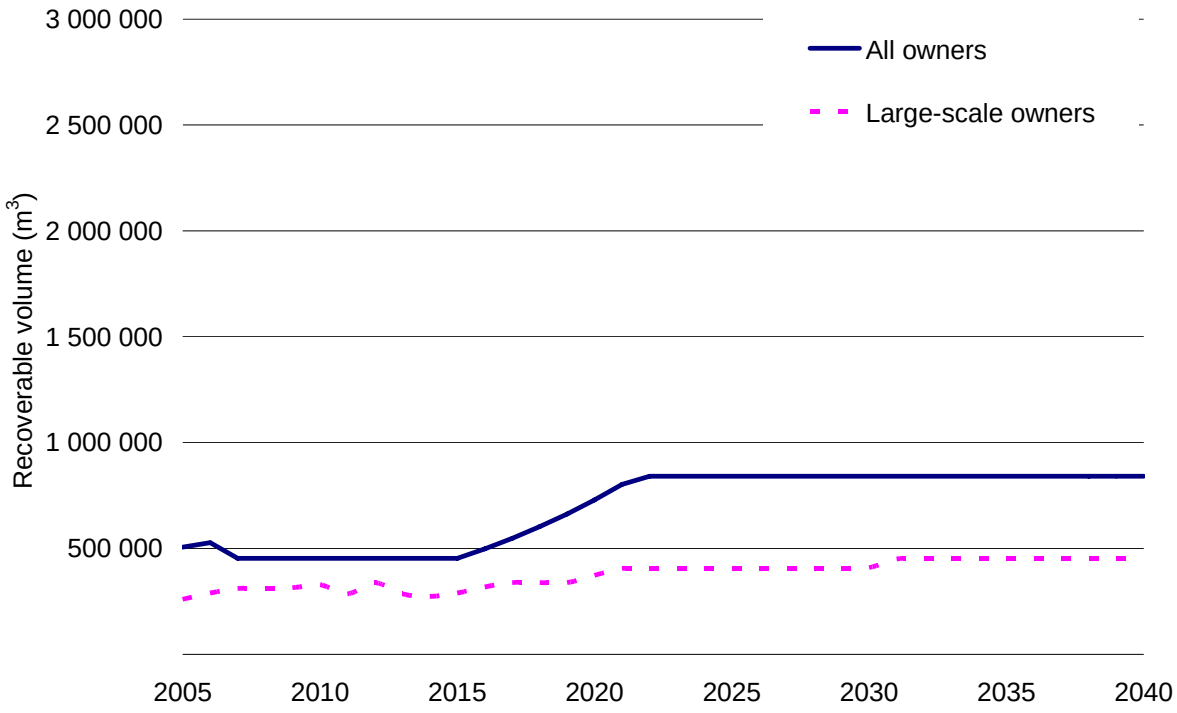
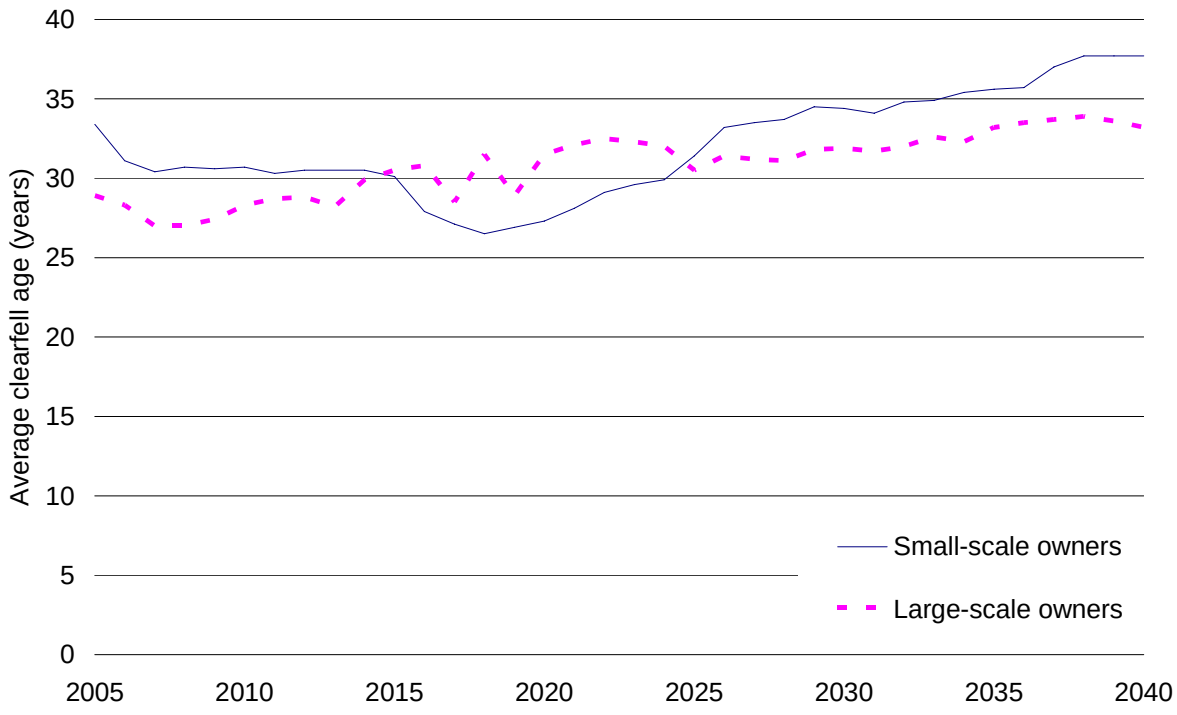


Figure 24: Average radiata pine clearfell age in Southland under scenario 3 – by ownership category



Scenario 4

The fourth scenario is based on a split non-declining yield, with a target rotation age of 30 years. This scenario gives a similar forecast of wood availability to scenario 3 through to 2023. Thereafter, there is an increase to over 1 million cubic metres per year from 2025 (Figure 25), with a subsequent reduction to 750 000 cubic metres per year from 2037 on. The main difference from Scenario 3 is that the large area of young stands in the small-scale owners' estate is assumed to be harvested over a shorter period of time. As a consequence, the

average clearfell age for small-scale owners stays closer to the target of 30 years than in Scenario 3 (Figure 26).

The harvest volumes forecast under scenario 4 are broken down by log grade in Figure 27.

Figure 25: Southland radiata pine availability under scenario 4 – all owners

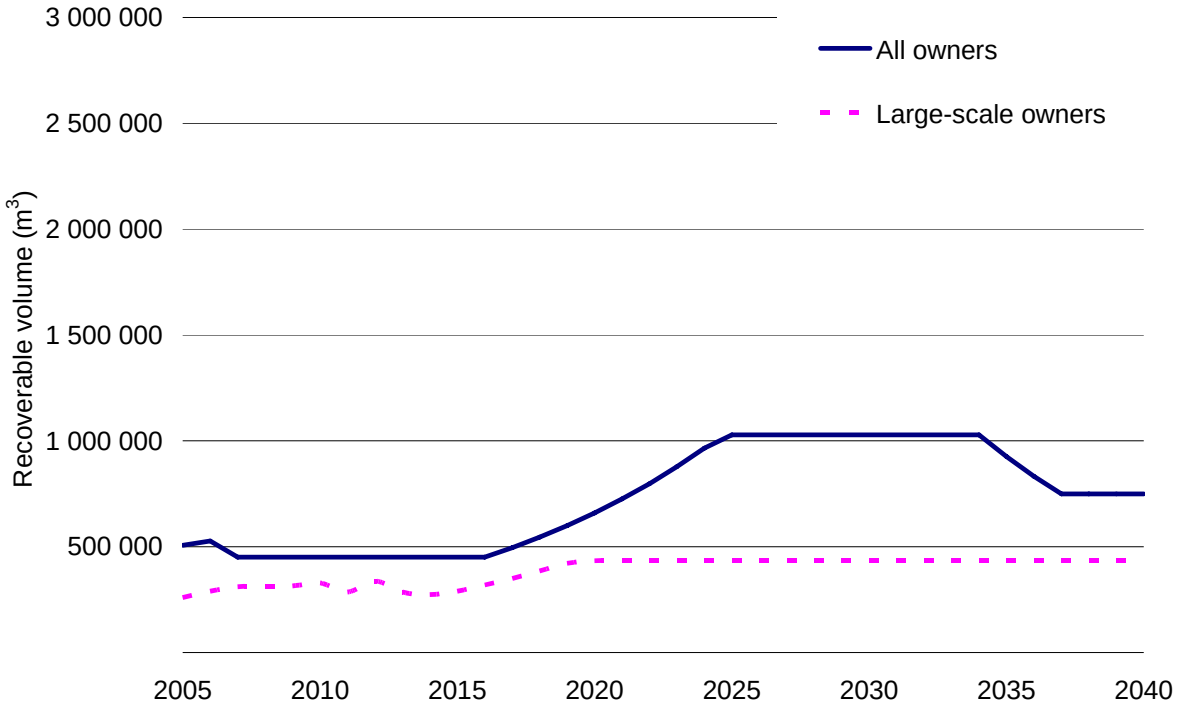


Figure 26: Average radiata pine clearfell age in Southland under scenario 4 – by ownership category

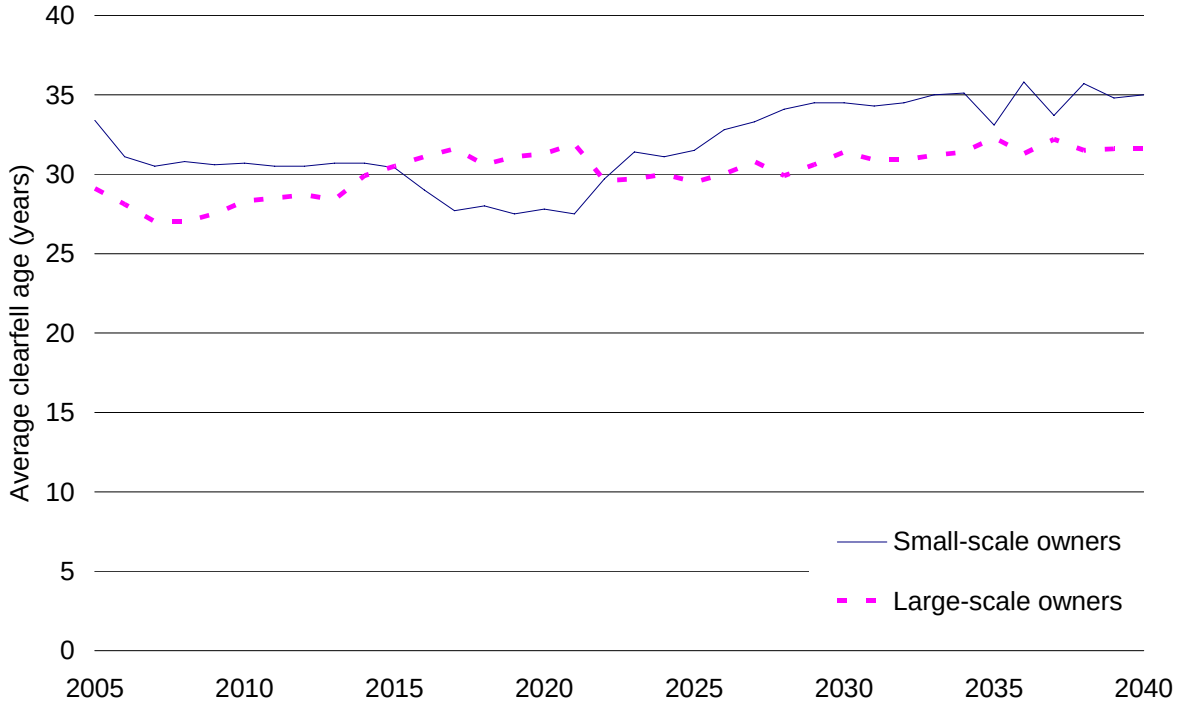
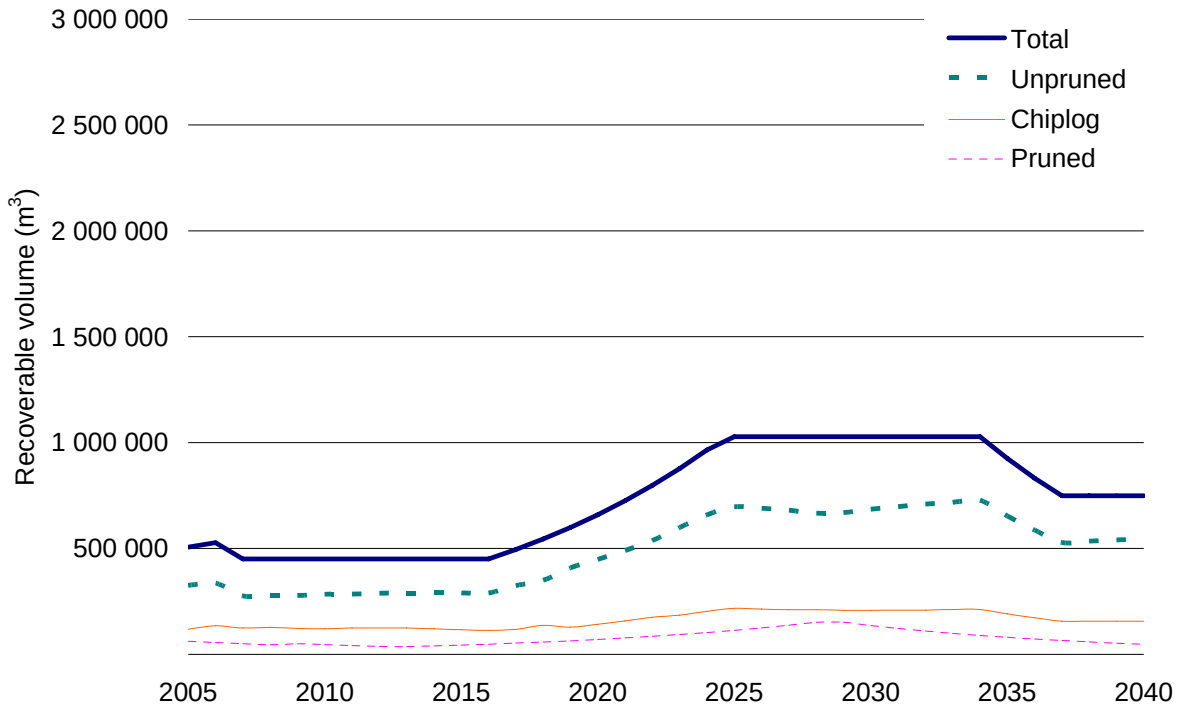


Figure 27: Southland radiata pine availability by log product under scenario 4



Scenario 5

Different wood availability profiles are generated if the target rotation age is changed from 30 years to either 28 or 32 years (Figure 28). To get separation in harvest volumes from 2006 onwards, the annual increase allowed for the 32 year rotation (over the 2005 to 2019 period) was limited to 1 percent, rather than 10 percent.

Figure 28: Southland radiata pine availability by target rotation age under scenario 5

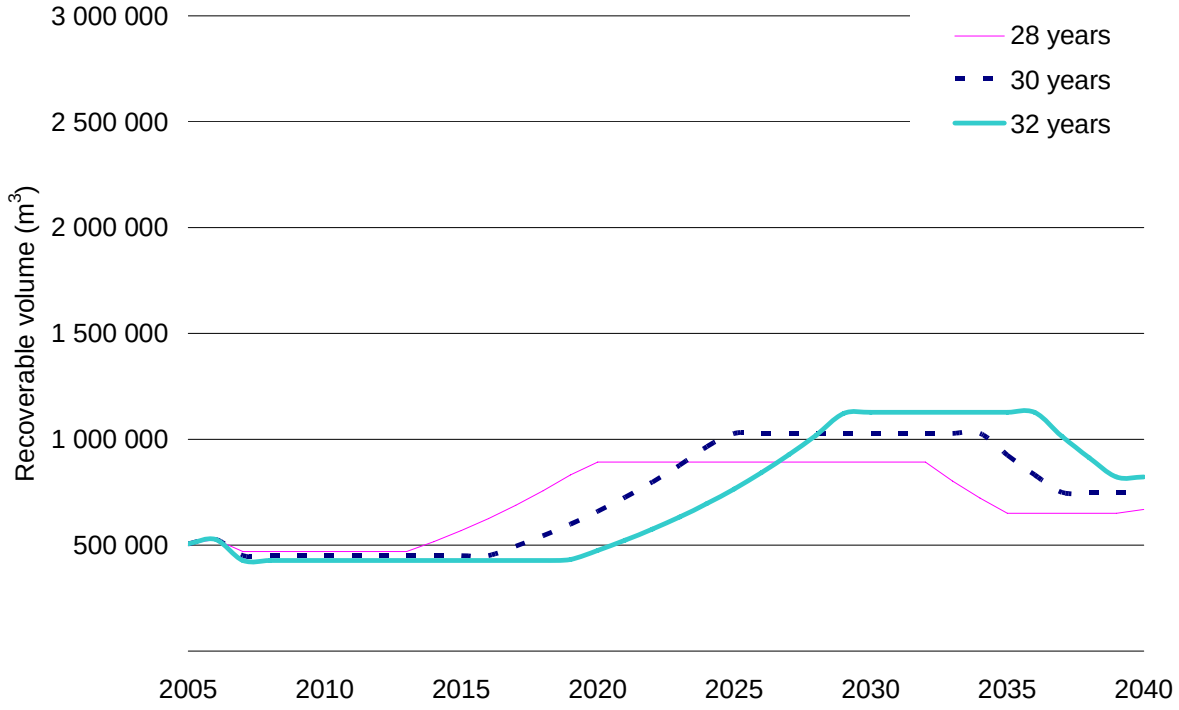
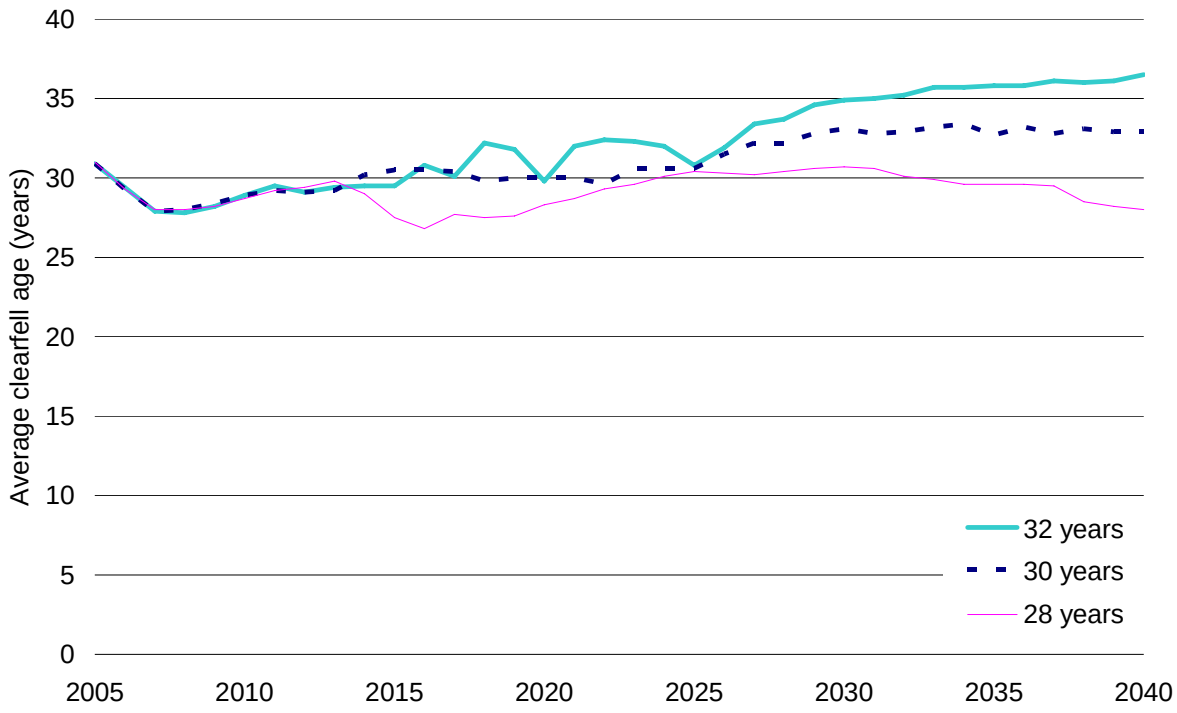


Figure 29: Average radiata pine clearfell age in Southland by target rotation age under scenario 5

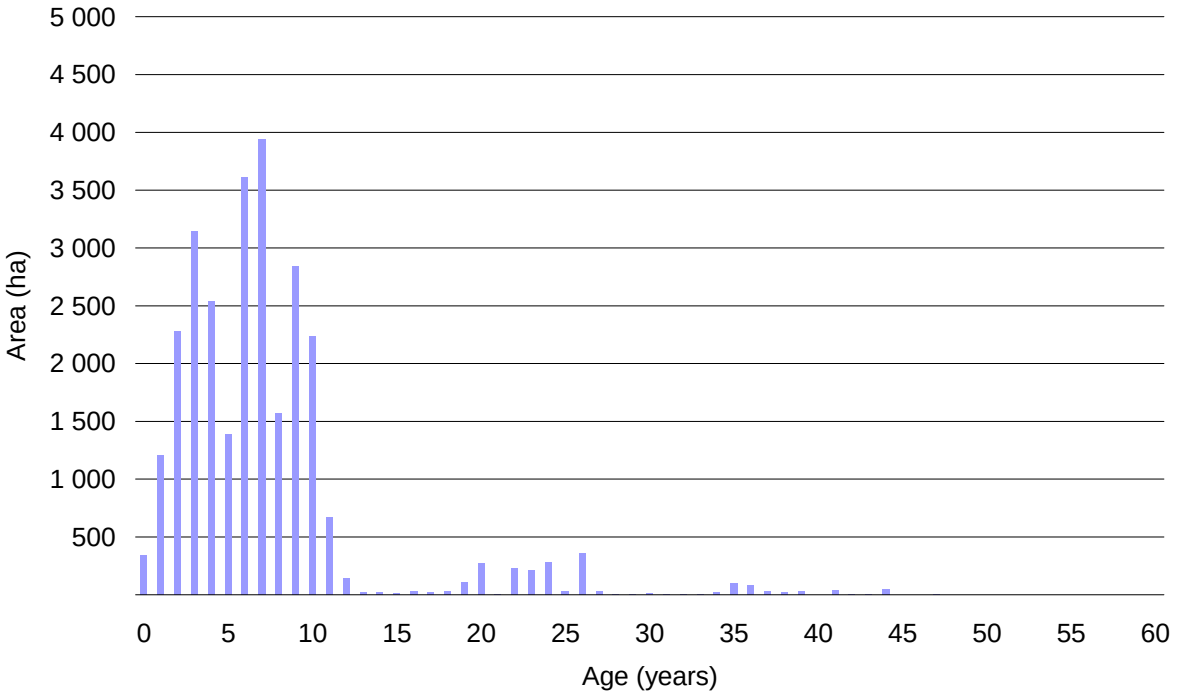


Scenarios for other species

Douglas-fir

The age-class distribution of Douglas-fir in Southland is far from uniform (Figure 30). Large areas of Douglas-fir were established from 1995 to 2003. This age class structure imposes challenges for yield regulation.

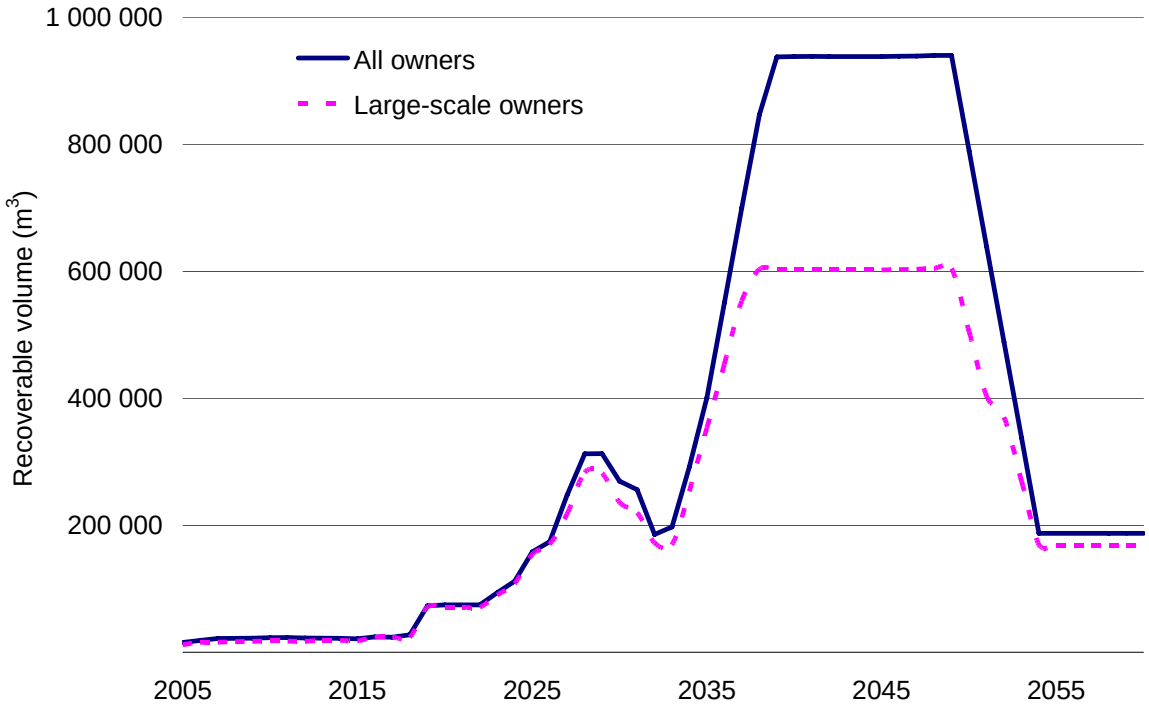
Figure 30: Age-class distribution of Southland Douglas-fir - combined estate as at 1 April 2005



The Douglas-fir harvest for the large-scale forest owners' estate is based on harvesting intentions for the period 2005 to 2015. From 2015 to 2049 clearfell volume is constrained to be non-declining – both for large-scale owners and for the combined estate. Clearfell volumes can change by 100 000 cubic metres per year for the large-scale owners' estate and by 150 000 cubic metres per year for the combined estate.

Figure 31 clearly shows the potential for an increase in the supply of this species in the long term. Over 50 percent of the volume between 2025 and 2032 will come from production thinning.

Figure 31: Southland Douglas-fir availability – combined estate (volumes include production thinning as well as clear-fell)



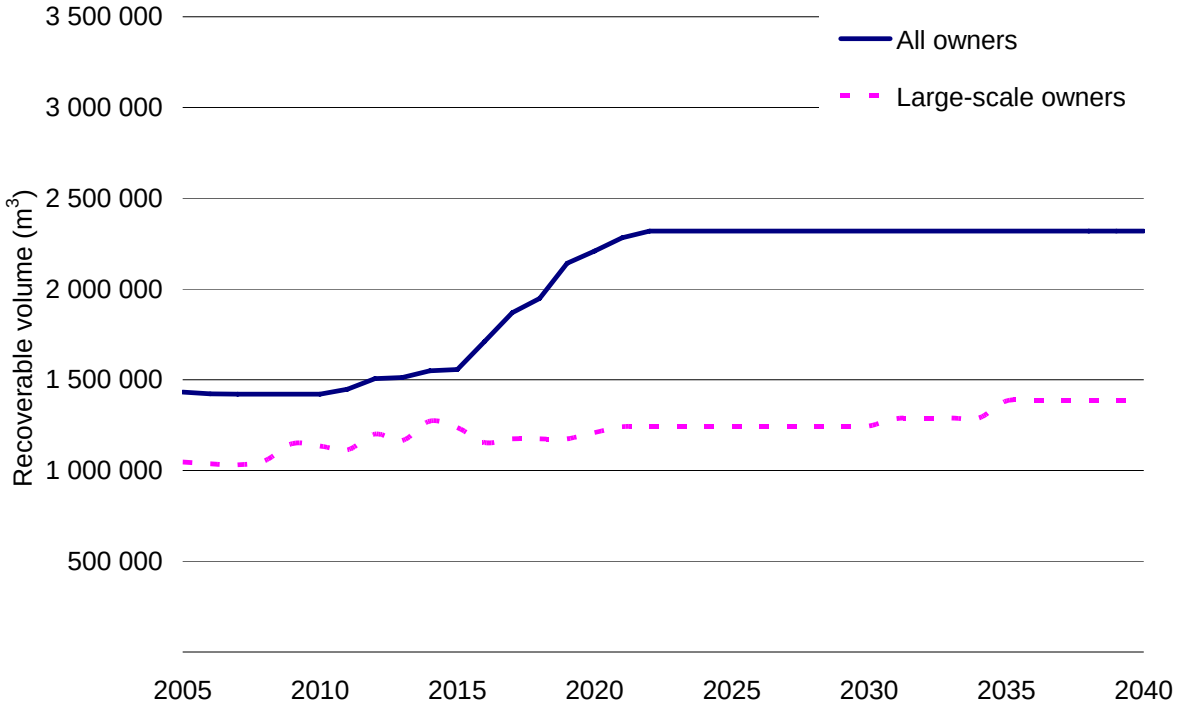
Wood availability forecasts for the combined Otago and Southland estate

The combined radiata pine forecasts for Otago and Southland are presented for Scenario 3 (Figure 32), Scenario 4 (Figures 33, 34 and 35) and Scenario 5 (Figure 36).

Scenario 3

The third scenario is based on non-declining yield, and a target rotation of 30 years. Figure 32 indicates that wood availability from the Otago and Southland regions will increase only marginally over the next 10 years. This scenario shows there is potential for wood availability to increase after 2016.

Figure 32: Otago and Southland combined wood availability under scenario 3 – split by ownership category



Scenario 4

The fourth scenario is based on a split non-declining yield, with a target rotation age of 30 years. The results of this scenario are similar to scenario 3 until 2021 (Figures 33–35).

Figure 33: Otago and Southland combined wood availability under scenario 4 – all owners

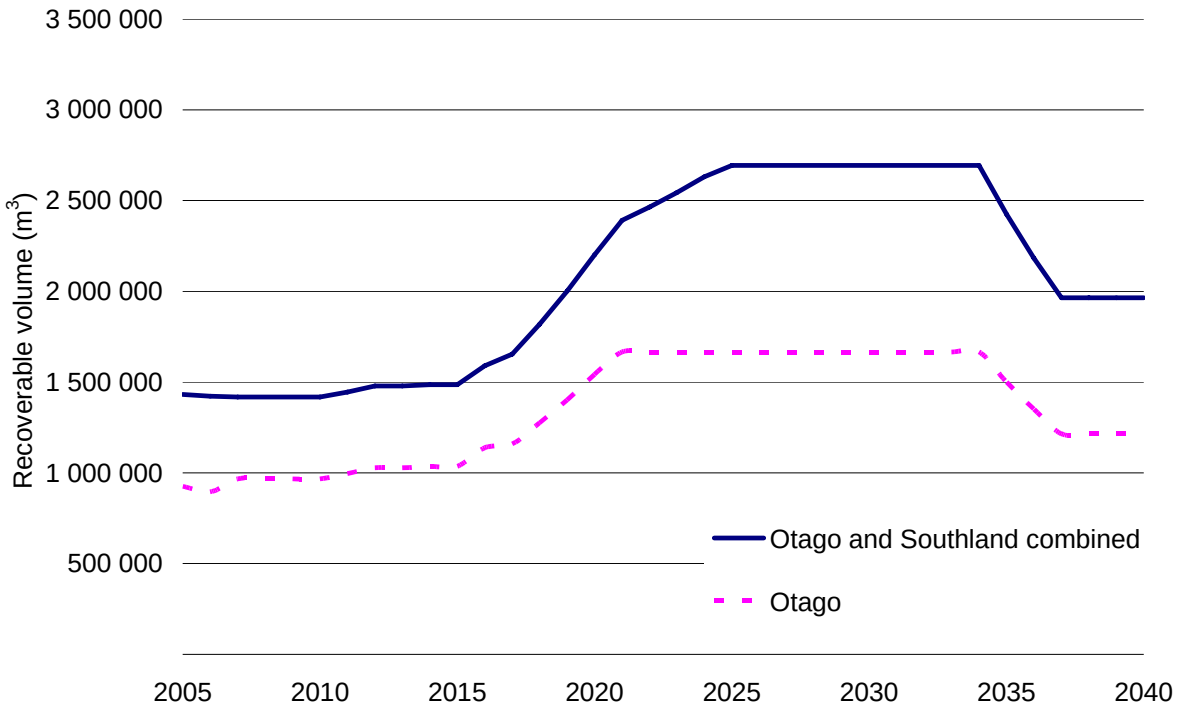


Figure 34: Otago and Southland combined wood availability under scenario 4 – split by ownership category

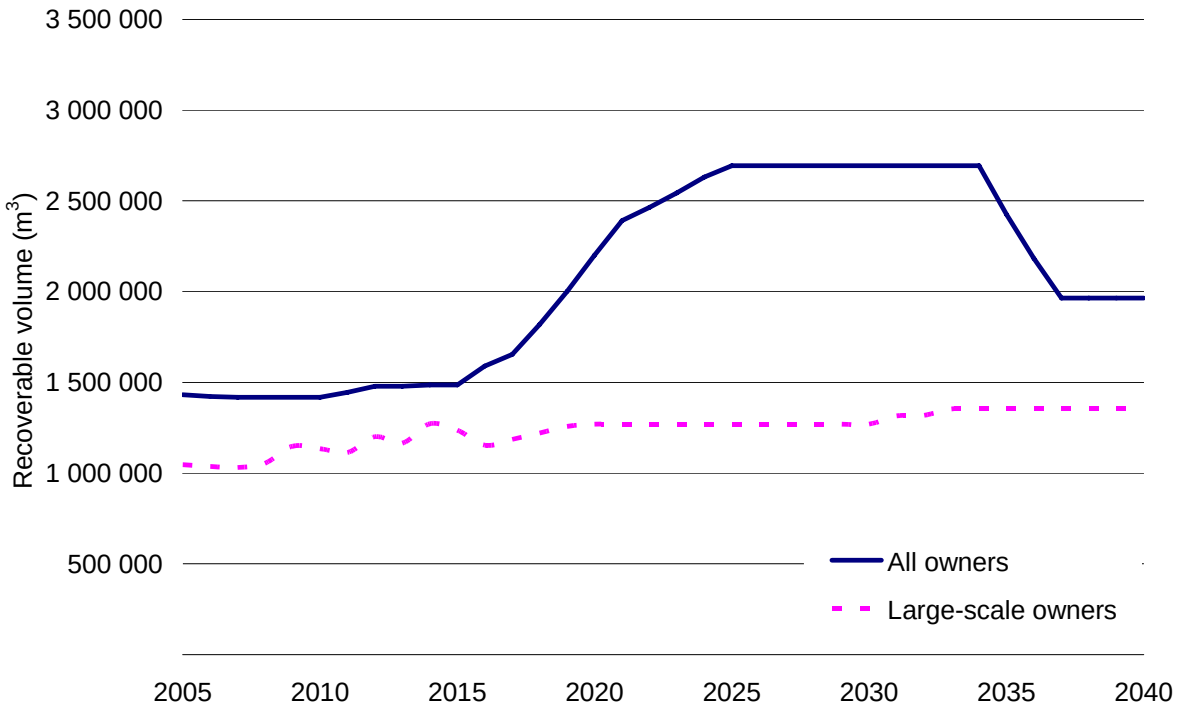
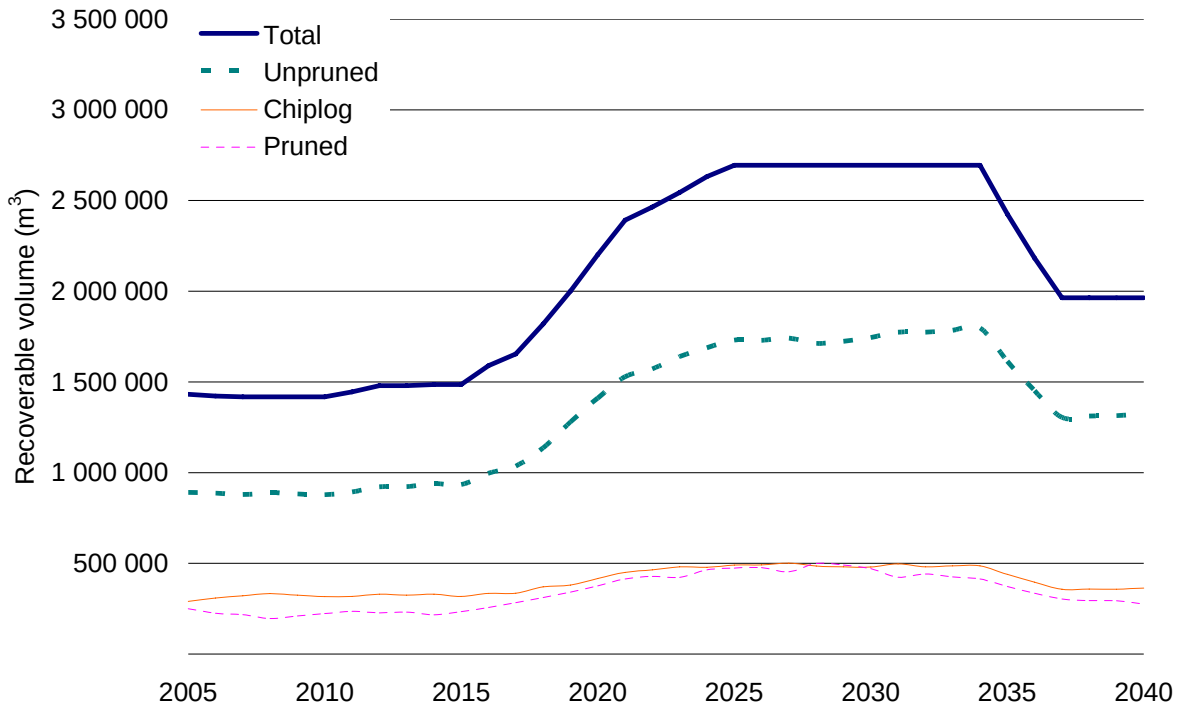


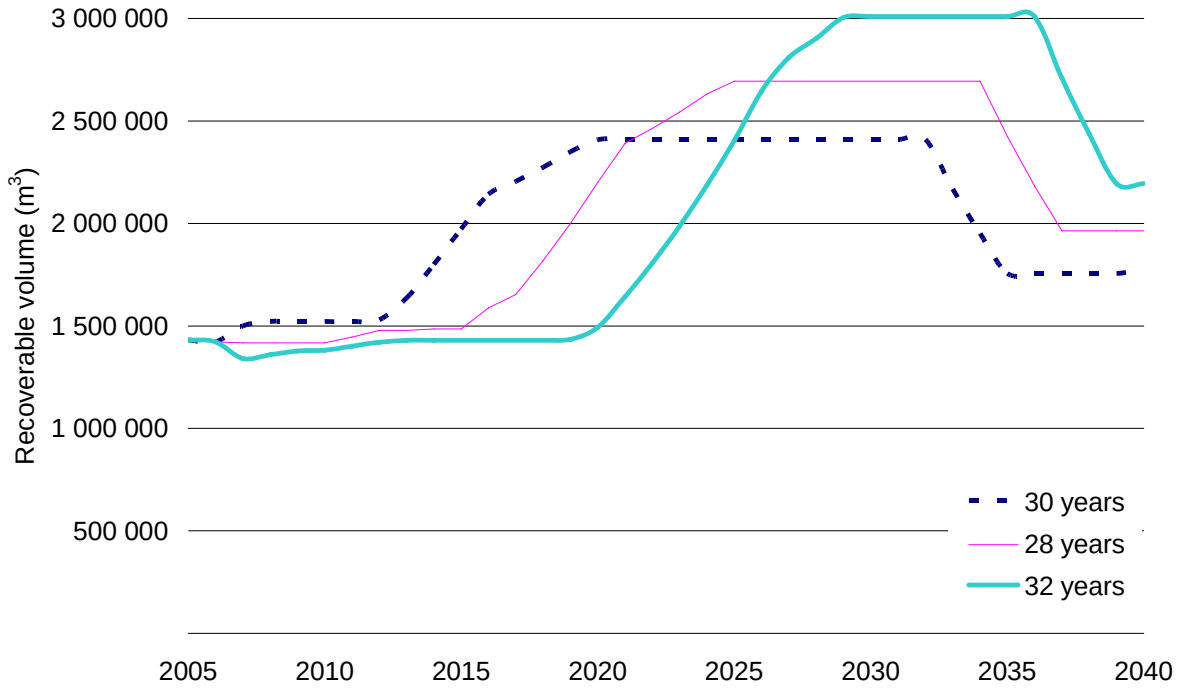
Figure 35: Otago and Southland combined wood availability under scenario 4 – by log product



Scenario 5

Different wood availability profiles are generated if the target rotation age is modified. Figure 36 indicates a band of possible wood availability profiles. A common feature is the limited potential for increase through to 2012. After this there is the opportunity for a substantial increase as the large area planted by small-scale owners in the 1990s matures and is available for harvest.

Figure 36: Otago and Southland combined wood availability under scenario 5 – different target rotation ages



Concluding comments

Wood availability from the Otago and Southland Wood Supply Region's planted forest resource will be relatively static for the next decade. After 2015, increases in wood availability are expected to result in increased log supply with the potential for significant volume increases leading up to 2020.

Most of the potential increase in wood availability from 2016 on will come from the region's small-scale forest growers who established forests during the 1990s. The actual timing of the harvest from these forests will depend on market conditions and the decisions by many small-scale owners.

After 2015, the combined Otago and Southland regional harvest has the potential to increase from the current level of about 1.5 million cubic metres to about 2.8 million cubic metres from around 2020.

Market conditions and logistical constraints (availability of logging crews, transport capacity and wood processing capacity) will limit how quickly the additional wood availability from small-scale owners' forests can be harvested towards 2020.

Some owners will be motivated to harvest early while others may decide to grow their forests on longer. Therefore the harvesting of the post-1990 forest plantings is likely to be spread out over a long period. If log prices increased during this post-2015 period of more plentiful wood availability, harvesting rates could quickly rise to meet demand. Likewise, low log prices would lead to delayed harvesting.

Depending on the rate of harvesting from the region's post-1990 forests, wood availability is expected to decrease after 2030. This will result in a drop in log volumes once the post-1990s forests have been harvested.

The Ministry of Agriculture and Forestry is currently finalising a report on the Otago and Southland Forestry Industry, in association with the Southern Wood Council and the major growers and processors in the region. This report will contain the wood availability forecasts discussed in this paper, along with a description of the region's forests, wood processing industries and infrastructure. The report will also describe the opportunities and constraints facing the forest industry in the south of New Zealand. This report is expected to be published by March 2008.

Appendix: Wood availability forecasts survey results and supporting tables

Table		Corresponds to:
Table 1	Otago harvest intentions survey results, large-scale owners	N/A
Table 2	Otago radiata pine availability under Scenario 1, for all owners	Figure 3
Table 3	Otago radiata pine availability under Scenario 2	Figure 7
Table 4	Otago radiata pine availability under Scenario 3	Figure 8
Table 5	Otago radiata pine availability under Scenario 4, by log grade, for all owners	Figure 12
Table 6	Otago radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners	Figure 14, Figure 15
Table 7	Wood availability and average clearfell age for other species (Douglas-fir) in Otago	Figure 16
Table 8	Southland harvest intentions survey results, large-scale owners	N/A
Table 9	Southland radiata pine availability under Scenario 1, for all owners	Figure 18
Table 10	Southland radiata pine availability under Scenario 2	Figure 22
Table 11	Southland radiata pine availability under Scenario 3	Figure 23
Table 12	Southland radiata pine availability under Scenario 4, by log grade, for all owners	Figure 27
Table 13	Southland radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners	Figure 29, Figure 30
Table 14	Wood availability and average clearfell age for other species (Douglas-fir) in Southland	Figure 31
Table 15	Combined Otago and Southland radiata pine availability under Scenario 4, by log grade for all owners	Figure 35
Table 16	Combined Otago and Southland radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners	Figure 36

Table 1: Otago harvest intentions survey results, large-scale owners

	Actual harvest 2004	Expected harvest 2005	Harvest intentions for subsequent 10 years									
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Radiata pine												
Pruned (m^3)	154 615	168 994	136 488	130 605	119 315	137 908	147 855	160 093	162 843	177 152	174 148	172 675
Unpruned (m^3)	412 269	475 183	459 632	439 993	441 303	518 738	518 547	505 897	543 104	556 409	620 431	584 082
Pulp (m^3)	126 321	143 572	151 570	149 588	180 117	176 414	139 821	160 616	157 986	144 560	203 266	190 757
Total (m^3)	693 205	787 750	747 689	720 186	740 735	833 060	806 222	826 606	863 934	878 121	997 845	947 514
Area radiata (ha)	2 127	2 410	2 435	2 379	2 045	2 015	1 786	1 748	1 722	1 742	1 985	1 965
Douglas-fir												
Unpruned (m^3)	46 502	51 044	76 889	59 112	59 337	43 699	42 417	42 498	42 510	42 508	42 509	40 940
Pulp (m^3)	9 968	9 060	11 200	8 389	8 164	5 551	5 333	5 252	5 241	5 242	5 241	5 060
Total (m^3)	56 471	60 104	88 089	67 501	67 501	49 250	47 750	47 750	47 751	47 750	47 750	46 000
Other species												
Unpruned (m^3)	10 294	12 972	14 825	16 154	15 396	11 032	7 200	7 200	7 200	7 200	8 970	13 254
Pulp (m^3)	5 615	7 590	9 446	9 648	8 905	4 552	3 600	3 600	3 600	28 600	185 073	47 950
Total (m^3)	15 909	20 563	24 271	25 802	24 301	15 584	10 800	10 800	10 800	35 800	194 043	61 204
Total all species (m^3)	765 585	868 417	860 049	813 489	832 537	897 894	864 772	885 156	922 485	961 671	1 239 638	1 054 718

Target clearfell age (volume weighted average) for radiate pine: 29 years.

Table 2: Otago radiata pine availability under Scenario 1, for all owners

Scenario 1 assumes an unconstrained cut.

Year ending December	Recoverable volume (000 m^3 i.b.)
2005	925
2006	895
2007	961
2008	398
2009	856
2010	793
2011	785
2012	1 701
2013	1 232
2014	1 345
2015	977
2016	1 305
2017	1 561
2018	772
2019	551
2020	1 092
2021	889
2022	2 341
2023	1 814
2024	3 352
2025	2 448
2026	2 572
2027	1 811
2028	1 846
2029	1 832
2030	1 844
2031	2 103
2032	1 921
2033	1 403
2034	1 057
2035	998
2036	904
2037	980
2038	970
2039	413
2040	860

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 3: Otago radiata pine availability under Scenario 2

Scenario 2 assumes that large-scale owners cut at stated intentions, and small-scale owners cut at 30 years.

Year ending December	Recoverable volume		
	Large-scale owners (000 m^3 i.b.)	Small-scale owners (000 m^3 i.b.)	All owners (000 m^3 i.b.)
2005	788	137	925
2006	748	147	895
2007	720	250	970
2008	741	151	892
2009	833	128	961
2010	806	131	937
2011	827	126	953
2012	864	178	1 042
2013	878	201	1 079
2014	998	210	1 208
2015	948	204	1 152
2016	836	150	986
2017	836	138	974
2018	836	120	956
2019	836	126	962
2020	836	705	1 541
2021	836	374	1 210
2022	836	1 716	2 552
2023	836	1 142	1 978
2024	836	2 339	3 175
2025	836	1 377	2 213
2026	836	1 502	2 338
2027	856	817	1 673
2028	856	886	1 743
2029	856	677	1 534
2030	875	591	1 466
2031	875	402	1 277
2032	875	617	1 492
2033	875	368	1 243
2034	875	71	946
2035	875	4	879
2036	920	119	1 039
2037	920	148	1 068
2038	920	271	1 191
2039	920	167	1 087
2040	920	144	1 064

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 4: Otago radiata pine availability under Scenario 3

Scenario 3 assumes a non-declining yield with target rotation of 30 years.

	Recoverable volume		
Year ending December	Large-scale owners (000 m^3 i.b.)	Small-scale owners (000 m^3 i.b.)	All owners (000 m^3 i.b.)
2005	788	137	925
2006	748	147	895
2007	720	247	967
2008	741	226	967
2009	833	134	967
2010	806	161	967
2011	827	168	995
2012	864	189	1 053
2013	878	181	1 059
2014	998	98	1 096
2015	948	155	1 103
2016	836	378	1 214
2017	836	485	1 320
2018	836	509	1 345
2019	836	643	1 479
2020	836	643	1 479
2021	836	643	1 479
2022	836	643	1 479
2023	836	643	1 479
2024	836	643	1 479
2025	836	643	1 479
2026	836	643	1 479
2027	836	643	1 479
2028	836	643	1 479
2029	836	643	1 479
2030	836	643	1 479
2031	836	643	1 479
2032	836	643	1 479
2033	836	643	1 479
2034	836	643	1 479
2035	930	549	1 479
2036	930	549	1 479
2037	930	549	1 479
2038	930	549	1 479
2039	930	549	1 479
2040	930	549	1 479

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 5: Otago radiata pine availability under Scenario 4, by log grade for all owners

Scenario 4 assumes a split non-declining yield with target rotation of 30 years.

Year ending December	Recoverable volume by log type			
	Total (000 m^3 i.b.)	Pruned logs (000 m^3 i.b.)	Unpruned logs (000 m^3 i.b.)	Chip logs (000 m^3 i.b.)
2005	925	189	565	172
2006	895	170	552	174
2007	967	167	603	197
2008	967	150	611	206
2009	967	160	605	202
2010	967	177	594	197
2011	995	194	609	193
2012	1 028	190	633	205
2013	1 028	196	633	199
2014	1 035	176	649	209
2015	1 035	190	643	201
2016	1 139	209	708	221
2017	1 158	230	711	217
2018	1 274	253	787	234
2019	1 402	278	871	252
2020	1 542	306	963	274
2021	1 666	336	1 038	292
2022	1 666	343	1 035	288
2023	1 666	329	1 042	295
2024	1 666	362	1 029	275
2025	1 666	361	1 033	274
2026	1 666	351	1 039	278
2027	1 666	316	1 061	291
2028	1 666	348	1 046	274
2029	1 666	340	1 054	273
2030	1 666	334	1 059	272
2031	1 666	301	1 076	289
2032	1 666	331	1 065	271
2033	1 666	325	1 067	275
2034	1 666	324	1 069	274
2035	1 500	292	961	248
2036	1 350	263	865	224
2037	1 215	238	777	201
2038	1 215	237	777	202
2039	1 215	242	774	201
2040	1 215	228	780	207

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 6: Otago radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners

Scenario 5 assumes a split non-declining yield with target rotations of 28, 30 and 32 years.

	28-year rotation		30-year rotation		32-year rotation	
Year ending December	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)
2005	925	31	925	31	925	31
2006	895	30	895	30	895	30
2007	985	30	967	30	929	30
2008	1 064	30	967	30	929	30
2009	1 064	29	967	30	943	30
2010	1 064	29	967	29	943	30
2011	1 064	29	995	30	973	30
2012	1 064	29	1 028	30	1 001	30
2013	1 166	29	1 028	30	1 001	30
2014	1 283	29	1 035	30	1 001	30
2015	1 404	28	1 035	30	1 001	30
2016	1 517	28	1 139	31	1 001	31
2017	1 517	28	1 158	31	1 001	31
2018	1 517	28	1 274	30	1 001	31
2019	1 517	28	1 402	30	1 001	31
2020	1 517	28	1 542	29	1 016	30
2021	1 517	28	1 666	29	1 118	30
2022	1 517	28	1 666	29	1 229	30
2023	1 517	29	1 666	30	1 352	31
2024	1 517	29	1 666	30	1 488	31
2025	1 517	29	1 666	30	1 636	31
2026	1 517	29	1 666	31	1 800	32
2027	1 517	29	1 666	31	1 883	32
2028	1 517	29	1 666	31	1 883	32
2029	1 517	30	1 666	32	1 883	33
2030	1 517	30	1 666	32	1 883	33
2031	1 517	30	1 666	32	1 883	34
2032	1 517	30	1 666	33	1 883	34
2033	1 365	29	1 666	33	1 883	34
2034	1 228	29	1 666	33	1 883	35
2035	1 106	29	1 500	33	1 883	35
2036	1 106	29	1 350	33	1 883	35
2037	1 106	29	1 215	33	1 695	35
2038	1 106	29	1 215	33	1 525	35
2039	1 106	29	1 215	32	1 373	35
2040	1 106	29	1 215	32	1 373	35

Note

i.b. denotes inside bark, ie, the recoverable volume of wood excluding bark.

Table 7: Wood availability and average clearfell age for other species (Douglas-fir) in Otago

Year ending December	Recoverable volume (000 m^3 i.b.)	Average age (years)
2005	68	50
2006	96	46
2007	78	46
2008	72	46
2009	53	46
2010	53	46
2011	53	46
2012	53	46
2013	53	46
2014	65	46
2015	71	46
2016	68	46
2017	72	46
2018	72	46
2019	61	46
2020	68	46
2021	63	46
2022	71	46
2023	105	46
2024	199	46
2025	276	46
2026	341	46
2027	454	46
2028	545	46
2029	625	46
2030	664	46
2031	644	46
2032	554	46
2033	479	46
2034	438	46
2035	423	46
2036	474	46
2037	605	46
2038	749	46
2039	869	46
2040	869	46

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 8: Southland harvest intentions survey results, large-scale owners

	Actual harvest 2004	Expected harvest 2005	Harvest intentions for subsequent 10 years									
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Radiata pine												
Pruned (m^3)	45 058	42 936	26 199	26 644	26 474	29 179	32 009	17 113	17 980	17 758	18 710	21 371
Unpruned (m^3)	124 409	171 310	178 913	195 788	196 733	195 953	207 121	178 152	212 719	176 514	167 416	174 435
Pulp (m^3)	41 067	44 867	84 184	88 604	89 874	89 949	90 029	90 282	106 711	92 010	86 811	93 685
Total (m^3)	210 534	259 113	289 297	311 037	313 082	315 082	329 159	285 546	337 410	286 282	272 937	289 491
Area radiata (ha)	456	619	669	694	697	699	744	636	748	642	608	643
Douglas-fir												
Unpruned (m^3)	4 997	9 623	12 687	12 687	12 687	12 687	12 687	12 903	12 903	15 192	13 298	17 268
Pulp (m^3)	75	118	2 237	2 237	2 237	2 237	2 237	18 947	18 947	19 129	19 007	19 597
Total (m^3)	5 071	9 741	14 924	14 924	14 924	14 924	14 924	31 850	31 850	34 321	32 305	36 865
Other species												
Unpruned (m^3)	1 014	1 422	0	0	0	0	0	0	0	0	0	0
Pulp (m^3)	14 050	54 989	70 000	100 000	150 000	180 000	220 000	250 000	250 000	225 000	70 000	207 000
Total (m^3)	15 064	56 410	70 000	100 000	150 000	180 000	220 000	250 000	250 000	225 000	70 000	207 000
Total all species (m^3)	230 669	325 264	374 221	425 961	478 006	510 006	564 084	567 396	619 260	545 603	375 242	533 356

Target clearfell age (volume weighted average) for radiate pine: 29 years.

Table 9: Southland radiata pine availability under Scenario 1, for all owners

Scenario 1 assumes an unconstrained cut.

Year ending December	Recoverable volume (000 m^3 i.b.)
2005	507
2006	527
2007	176
2008	137
2009	345
2010	489
2011	424
2012	619
2013	797
2014	688
2015	650
2016	503
2017	667
2018	426
2019	484
2020	441
2021	256
2022	1 055
2023	1 499
2024	2 576
2025	1 540
2026	965
2027	867
2028	1 429
2029	972
2030	1 063
2031	888
2032	778
2033	794
2034	905
2035	158
2036	537
2037	599
2038	189
2039	149
2040	373

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 10: Southland radiata pine availability under Scenario 2

Scenario 2 assumes that large-scale owners cut at stated intentions, and small-scale owners cut at 30 years.

Year ending December	Recoverable volume		
	Large-scale owners (000 m^3 i.b.)	Small-scale owners (000 m^3 i.b.)	All owners (000 m^3 i.b.)
2005	259	248	507
2006	289	238	527
2007	311	159	470
2008	313	137	450
2009	315	115	430
2010	329	154	483
2011	286	91	377
2012	337	223	560
2013	286	85	371
2014	273	189	462
2015	289	141	430
2016	318	53	371
2017	350	41	390
2018	385	40	424
2019	423	70	493
2020	433	219	652
2021	433	102	535
2022	433	905	1 338
2023	433	866	1 299
2024	433	2 033	2 466
2025	433	1 038	1 471
2026	433	575	1 008
2027	433	321	754
2028	433	900	1 333
2029	433	589	1 022
2030	433	454	887
2031	433	344	777
2032	433	96	529
2033	433	199	632
2034	433	347	780
2035	433	4	436
2036	433	240	673
2037	433	249	682
2038	433	171	604
2039	433	149	582
2040	433	124	557

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 11: Southland radiata pine availability under Scenario 3

Scenario 3 assumes a non-declining yield with target rotation of 30 years.

	Recoverable volume		
Year ending December	Large-scale owners (000 m^3 i.b.)	Small-scale owners (000 m^3 i.b.)	All owners (000 m^3 i.b.)
2005	259	248	507
2006	289	238	527
2007	311	142	453
2008	313	140	453
2009	315	138	453
2010	329	124	453
2011	286	167	453
2012	337	116	453
2013	286	167	453
2014	273	180	453
2015	289	164	453
2016	318	180	498
2017	339	209	548
2018	339	264	603
2019	339	324	663
2020	373	357	730
2021	406	397	803
2022	406	435	841
2023	406	435	841
2024	406	435	841
2025	406	435	841
2026	406	435	841
2027	406	435	841
2028	406	435	841
2029	406	435	841
2030	409	431	841
2031	450	390	841
2032	453	387	841
2033	453	387	841
2034	453	387	841
2035	453	387	841
2036	453	387	841
2037	453	387	841
2038	453	387	841
2039	453	387	841
2040	453	387	841

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 12: Southland radiata pine availability under Scenario 4, by log grade for all owners

Scenario 4 assumes a split non-declining yield with target rotation of 30 years.

Year ending December	Recoverable volume by log type			
	Total (000 m^3 i.b.)	Pruned logs (000 m^3 i.b.)	Unpruned logs (000 m^3 i.b.)	Chip logs (000 m^3 i.b.)
2005	507	62	326	119
2006	527	56	336	135
2007	450	50	276	124
2008	450	45	278	127
2009	450	50	278	123
2010	450	46	284	121
2011	450	42	285	125
2012	450	37	289	124
2013	450	36	290	125
2014	450	40	290	121
2015	450	44	291	116
2016	450	48	289	113
2017	495	53	324	118
2018	545	58	350	137
2019	599	64	408	128
2020	659	71	448	142
2021	725	78	490	158
2022	798	85	537	175
2023	878	94	598	186
2024	965	103	659	204
2025	1 028	114	697	217
2026	1 028	125	690	214
2027	1 028	137	681	210
2028	1 028	151	667	211
2029	1 028	151	670	208
2030	1 028	136	685	208
2031	1 028	123	698	208
2032	1 028	110	709	209
2033	1 028	99	718	211
2034	1 028	89	727	212
2035	925	80	654	191
2036	833	72	587	173
2037	749	65	528	156
2038	749	59	534	156
2039	749	53	540	156
2040	749	47	545	156

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 13: Southland radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners

Scenario 5 assumes a split non-declining yield with target rotations of 28, 30 and 32 years.

	28-year rotation		30-year rotation		32-year rotation	
Year ending December	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)
2005	507	31	507	31	507	31
2006	527	29	527	29	527	29
2007	470	28	450	28	428	28
2008	470	28	450	28	428	28
2009	470	28	450	28	428	28
2010	470	29	450	29	428	29
2011	470	29	450	29	428	30
2012	470	29	450	29	428	29
2013	470	30	450	29	428	29
2014	517	29	450	30	428	30
2015	569	28	450	31	428	30
2016	626	27	450	31	428	31
2017	688	28	495	30	428	30
2018	757	28	545	30	428	32
2019	833	28	599	30	433	32
2020	892	28	659	30	476	30
2021	892	29	725	30	523	32
2022	892	29	798	30	576	32
2023	892	30	878	31	633	32
2024	892	30	965	31	697	32
2025	892	30	1 028	31	766	31
2026	892	30	1 028	32	843	32
2027	892	30	1 028	32	927	33
2028	892	30	1 028	32	1 020	34
2029	892	31	1 028	33	1 122	35
2030	892	31	1 028	33	1 127	35
2031	892	31	1 028	33	1 127	35
2032	892	30	1 028	33	1 127	35
2033	803	30	1 028	33	1 127	36
2034	723	30	1 028	33	1 127	36
2035	650	30	925	33	1 127	36
2036	650	30	833	33	1 127	36
2037	650	30	749	33	1 014	36
2038	650	29	749	33	913	36
2039	650	28	749	33	822	36
2040	668	28	749	33	822	37

Note

i.b. denotes inside bark, ie, the recoverable volume of wood excluding bark.

Table 14: Wood availability and average clearfell age for other species (Douglas-fir) in Southland

Year ending December	Recoverable volume (000 m^3 i.b.)	Average age (years)
2005	15	45
2006	19	43
2007	22	47
2008	22	46
2009	22	46
2010	23	46
2011	23	46
2012	23	46
2013	22	46
2014	22	46
2015	21	46
2016	24	46
2017	24	46
2018	28	46
2019	73	46
2020	75	46
2021	75	46
2022	75	46
2023	94	46
2024	112	46
2025	158	46
2026	174	46
2027	247	46
2028	312	46
2029	313	46
2030	269	46
2031	256	46
2032	185	46
2033	197	46
2034	291	46
2035	401	46
2036	550	46
2037	700	46
2038	846	46
2039	937	46
2040	938	46

Note
i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 15: Combined Otago and Southland radiata pine availability under Scenario 4, by log grade for all owners

Scenario 4 assumes a split non-declining yield with a target rotation of 30 years.

Year ending December	Recoverable volume by log type			
	Total (000 m^3 i.b.)	Pruned logs (000 m^3 i.b.)	Unpruned logs (000 m^3 i.b.)	Chip logs (000 m^3 i.b.)
2005	1 432	251	891	290
2006	1 422	226	887	309
2007	1 418	217	879	322
2008	1 418	195	889	333
2009	1 418	210	883	325
2010	1 418	223	878	317
2011	1 445	236	893	317
2012	1 479	228	922	330
2013	1 479	232	923	324
2014	1 486	216	939	330
2015	1 486	234	934	318
2016	1 589	257	997	334
2017	1 654	283	1 035	335
2018	1 819	311	1 136	371
2019	2 001	342	1 280	380
2020	2 201	376	1 410	416
2021	2 392	414	1 528	450
2022	2 464	428	1 572	464
2023	2 544	423	1 640	481
2024	2 632	465	1 688	479
2025	2 694	474	1 730	491
2026	2 694	476	1 729	492
2027	2 694	453	1 742	501
2028	2 694	499	1 712	485
2029	2 694	491	1 724	480
2030	2 694	471	1 745	480
2031	2 694	424	1 774	497
2032	2 694	441	1 775	480
2033	2 694	425	1 785	486
2034	2 694	414	1 797	486
2035	2 425	372	1 614	440
2036	2 182	335	1 452	397
2037	1 964	304	1 305	357
2038	1 964	295	1 312	358
2039	1 964	294	1 314	357
2040	1 964	276	1 326	364

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.

Table 16: Combined Otago and Southland radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners

Scenario 5 assumes a split non-declining yield with target rotations of 28, 30 and 32 years.

	28-year rotation		30-year rotation		32-year rotation	
Year ending December	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)	Recoverable volume (000 m^3 i.b.)	Average age (years)
2005	1 432	31	1 432	31	1 432	31
2006	1 422	30	1 422	30	1 422	30
2007	1 499	29	1 418	29	1 341	29
2008	1 522	29	1 418	29	1 359	29
2009	1 522	29	1 418	29	1 378	29
2010	1 522	29	1 418	29	1 381	29
2011	1 522	29	1 445	30	1 401	30
2012	1 530	29	1 479	29	1 420	30
2013	1 636	29	1 479	30	1 430	30
2014	1 800	29	1 486	30	1 430	30
2015	1 972	28	1 486	30	1 430	30
2016	2 142	27	1 589	31	1 430	31
2017	2 205	28	1 654	31	1 430	31
2018	2 274	28	1 819	30	1 430	32
2019	2 350	28	2 001	30	1 435	31
2020	2 409	28	2 201	29	1 493	30
2021	2 409	28	2 392	30	1 643	31
2022	2 409	29	2 464	29	1 807	31
2023	2 409	29	2 544	30	1 987	31
2024	2 409	29	2 632	30	2 186	31
2025	2 409	29	2 694	30	2 405	31
2026	2 409	29	2 694	31	2 645	32
2027	2 409	30	2 694	31	2 810	32
2028	2 409	30	2 694	31	2 903	33
2029	2 409	30	2 694	32	3 005	33
2030	2 409	30	2 694	32	3 010	34
2031	2 409	30	2 694	32	3 010	34
2032	2 409	30	2 694	33	3 010	34
2033	2 168	29	2 694	33	3 010	35
2034	1 951	29	2 694	33	3 010	35
2035	1 756	29	2 425	33	3 010	35
2036	1 756	29	2 182	33	3 010	35
2037	1 756	29	1 964	33	2 709	35
2038	1 756	29	1 964	33	2 438	35
2039	1 756	29	1 964	33	2 194	35
2040	1 774	29	1 964	33	2 194	35

Note

i.b. denotes inside bark: the recoverable volume of wood excluding bark.