# CANTERBURY FOREST INDUSTRY AND WOOD AVAILABILITY FORECASTS

2007

Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere

#### ACKNOWLEDGEMENTS

The wood availability forecasts contained in this report were produced by Dr Bruce Manley, School of Forestry, University of Canterbury. The regional forest industry report was compiled by John Novis with forestry data and peer review provided by Paul Lane, Doris Chan, Judith Dennis, Bridget Geard, Ian Platt, and Geoff Cameron. Mike Plivelich prepared the map of the Canterbury forest industry. Dr Jaap Jasperse, Mike Candy, Sarah Vaughan and Claudia Riley provided editorial and publishing services.

The Ministry of Agriculture and Forestry thanks the forest owners, managers and consultants who provided the forest resource and harvesting intentions data that were essential for producing the wood availability forecasts, and for providing input at a workshop on an earlier version of the forecasts. Local forest, sawmill and nursery owners also assisted with information about their operations.

Cover photo and inside photos provided by Ian Platt, Senior Forestry Advisor, Ministry of Agriculture and Forestry.

#### ENQUIRIES

Any enquiries regarding the content of this report should be directed to John Novis (tel: +64 3 943 1708) or email: john.novis@maf.govt.nz.

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Published by
MAF Policy
Ministry of Agriculture and Forestry
Pastoral House
25 The Terrace
PO Box 2526
Wellington
New Zealand

Tel: 64 4 894 0100
Fax: 64 4 894 0742
Website: www.maf.govt.nz

ISBN 978-0-478-31172-3



#### DISCLAIMER

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# 1 INTRODUCTION

This publication provides new wood availability forecasts and associated commentary for the Canterbury region. Five forecasts have been prepared for radiata pine, and one for Douglas-fir. They have been prepared in co-operation with major forest owners and forest harvesting consultants.

Descriptive information is also provided on the plantation forest and wood processing industries in the region. Opportunities and constraints facing the regional forest industries are discussed.

The information contained in this report is intended to assist the forestry industries, planning practitioners, and infrastructure and service providers in assessing wood processing opportunities, resource management planning, and infrastructure issues. It will also assist the public in understanding the nature of the forest industry in Canterbury.

References to Canterbury and the Canterbury region involve the land areas of the Hurunui, Waimakariri, Christchurch City (including Banks Peninsula), Selwyn, Ashburton, Timaru, Mackenzie and Waimate Districts.

This report is one of a series of publications on regional forest industries and wood availability forecasts being produced by the Ministry of Agriculture and Forestry (MAF).

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

# OVERVIEW

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The Canterbury region saw some of the earliest tree planting and plantation forest establishment in New Zealand for shelter, amenity and the commercial production of timber.

The first recorded introduction of radiata pine to New Zealand was at Mt Peel Station in South Canterbury in 1859 (Burdon and Miller, 1992), and the first known milling of radiata pine was at Leslie Hills in North Canterbury in 1893 (Simpson, 1973). New Zealand's oldest plantation forestry company, the Selwyn Plantation Board Ltd, has roots that go back to the Canterbury Plantation Board which was formed in 1879 (Selywn Plantation Board Limited, 2007). The planting of Raincliff Forest began in 1890, and Hanmer Forest in 1902. Today there are 114 000 hectares of plantation forest in the region.

The plantation forest industry is now moving through a period of land use change on the Canterbury Plains with about 5000 hectares having been converted to pastoral agriculture or for subdivision in the last three years; another 9000 hectares across the region have been identified for conversion in coming years.

The wood availability forecasts indicate that over the next 10 years the available harvest volumes of radiata pine from all growers may remain at recent levels of about 800 000 cubic metres per year. However, within this total, the volume contributed by the large-scale forest owners may decrease from about 750 000 cubic metres per year to around 500 000 cubic metres per year. Increases in the available harvest volumes from the small-scale forest owners potentially compensate for this, but there is more uncertainty associated with both the timing of harvesting and the volumes realised from their resource than from the large-scale forest owners' resource. Actual harvest volumes are consequently likely to fluctuate over this ten-year period.

From about 2017 there is potential for the radiata pine harvest from all owners to increase to between 1.2 and 1.3 million cubic metres per year to at least 2035.

For Douglas-fir the forecast suggests that the available harvest volumes are also likely to remain static to 2015. Beyond 2025 there is potential for a significant increase in the harvested volumes from this resource.

The region has a modest range of wood processing industries, dominated in size by Carter Holt Harvey's medium density fibreboard (MDF) plant at Sefton, and in number by small to medium-scale sawmills (in a New Zealand context). A significant proportion of processed wood products is exported through the ports at Lyttelton and Timaru, while the volume of log exports has varied considerably over recent years.

The existing total wood processing capacity[1] of the regional sawmills and the MDF plant is estimated to be about 940 000 cubic metres (roundwood equivalent) per year. This is an estimate of the sum of the individual processing plants' roundwood input capacities. In practice the MDF plant sources about 25 percent of its fibre as chips from sawmills; the actual demand for roundwood – if all plants operated at 100 percent capacity – would be about 860 000 cubic metres per year.

Some logs are processed outside the region and some are exported, which suggests that there is no potential for installing additional wood processing capacity for the next

[1] Capacity is based on the "usual" number of working hours per day for a mill.

10 years unless logs are sourced from outside the region, or unless existing processors constantly operate well below capacity. Beyond the next ten years there is potential for additional investment in wood processing capacity: this will be driven by potential harvesting from the resource planted in the 1990s by a large number of small-scale forest owners. The pattern of harvesting from this resource is less certain than harvesting from the large-scale forest owners.

Key statistics for the Canterbury forest industry are listed in Table 2.1. A map of plantation forests and wood processing plants is provided in Figure 2.1.

The future development of the plantation forest industry is uncertain because of deforestation on the Canterbury Plains, and also because regional and district planning provisions potentially restrict forest establishment in water-short catchments and protect outstanding landscapes. These provisions cover extensive areas of the hill and high-country land that is generally regarded as the most suitable land in the region for plantation forestry.

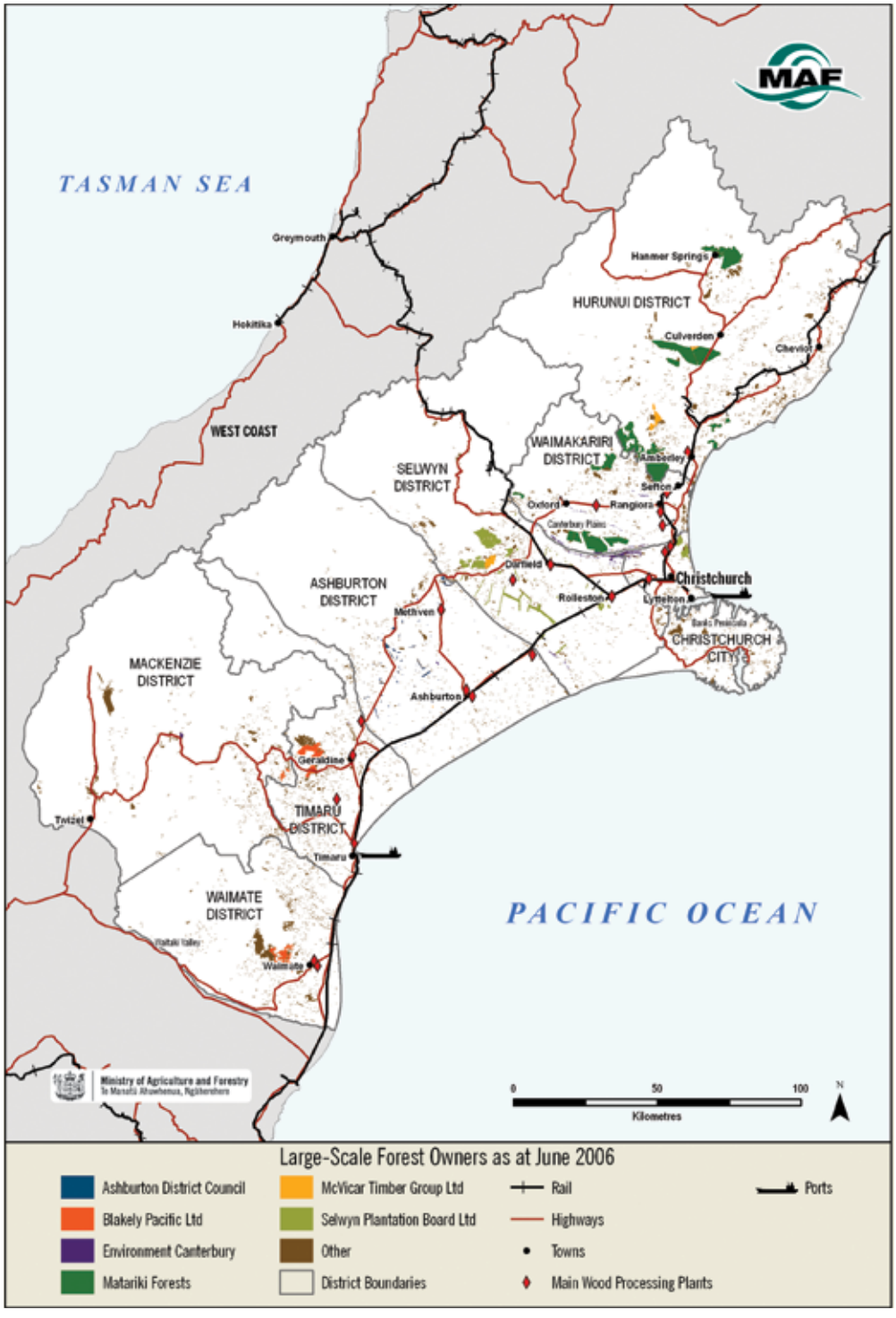
### TABLE 2.1: KEY STATISTICS FOR THE CANTERBURY FOREST INDUSTRY

| STATISTIC | VALUE |
|---|---|
| Stocked plantation forest area as at 1 April 2006 (ha) | 114 000 |
| Harvest – estimated roundwood removals – year ending March 2007 ($m^3$), provisional[1] | 1 010 000 |
| Area-weighted average age of plantation forest as at 1 April 2006 (years) | 14.28 |
| Sawn timber production – year ending March 2007 ($m^3$) | 228 000 |
| Estimated log input to sawmills – year ending March 2007 ($m^3$) | 413 000 |
| MDF annual production capacity ($m^3$) | 220 000 |
| Estimated wood processing capacity ($m^3$), roundwood[2] | 940 000 |
| Log exports – year ending June 2007 ($m^3$)[3] | 307 000 |
| Sawn timber exports – year ending June 2007 ($m^3$) | 155 000 |
| Direct employment (forestry and first stage processing) as at February 2006 (full-time equivalents) | 1 321 |

**Sources**
Ministry of Agriculture and Forestry, Wellington; and Carter Holt Harvey.

**Notes**
1. Estimated roundwood removals are derived from processing outputs and log exports. They do not account for inter-regional log flows. See discussion under Historical roundwood removals (Chapter 3) for further explanation.
2. This is an estimate of the sum of the individual processing plants' roundwood input capacities and does not take account of the MDF mill sourcing some fibre as chips from sawmills.
3. Log exports are unusually high due to forest conversions on the Canterbury Plains.

## FIGURE 2.1: MAP OF THE CANTERBURY FOREST INDUSTRY




**Source**
Ministry of Agriculture and Forestry, Wellington.

# THE PLANTATION FOREST INDUSTRY 3

## NURSERIES

Canterbury has one major forest nursery and several small and/or specialised nurseries producing planting stock for the restocking of harvested areas and establishment of new forests.

### RANGIORA NURSERY

Rangiora Nursery is the major supplier of commercial forestry and shelter tree planting stock in Canterbury. Genetically improved radiata pine planting stock is produced as seedlings or rooted cuttings. Other popular commercial forest species such as Douglas-fir, redwoods and cypresses are also available. (www.rangioranursery.co.nz)

### SOUTHERN WOODS TREE NURSERY

Southern Woods Tree Nursery produces container-grown tree planting stock for shelter, commercial forestry, native revegetation, edible tree crops, animal fodder, specimen trees and hedges. The main commercial forestry tree stocks are genetically improved radiata pine, seedlings and clones of cypress species, clonal redwood, *Eucalyptus* species, and Douglas-fir. The nursery is located at Templeton. (www.southernwoods.co.nz)

### LAKEWAY NURSERY

Lakeway Nursery is located at Tinwald (Ashburton) and provides planting stock for shelter and woodlots, mainly to the local farming community. The principal species supplied are radiata pine, Douglas-fir, *Cupressus macrocarpa, C. arizonica,* alders, eucalypts and poplars. The nursery also supplies specimen and hedging trees.

### SOUTHERN CYPRESSES LTD

Southern Cypresses Ltd is a specialist cypress tree nursery growing and supplying open-ground planting stock. All planting stock is grown from cuttings. The nursery is located in Ohoka. (www.cypress.co.nz)

## FOREST OWNERS

Table 3.1 identifies the larger plantation forest owners and managers in the Canterbury region, and the total area owned by the small-scale forest owners.

### TABLE 3.1: OWNERS AND MANAGERS OF PLANTATION FORESTS IN CANTERBURY

| OWNER/MANAGER | STOCKED AREA (HECTARES) |
|---|---|
| Matariki Forests | 30 000 |
| Blakely Pacific Ltd | 13 300 |
| Selwyn Plantation Board Ltd | 7 600 |
| McVicar Timber Group Ltd | 3 000 |
| Environment Canterbury | 2 700 |
| New Zealand Redwood Company Ltd | 2 200 |
| Ashburton District Council | 2 150 |
| Warren Forestry | 1 400 |
| Small-scale forest owners | 51 550 |
| **Total** | **113 900** |

**Sources**
Individual forest owners and the Ministry of Agriculture and Forestry, 2007.

### › MATARIKI FORESTS

Matariki Forests is a New Zealand incorporated, unlimited liability, joint venture company. The shareholders are Rayonier Inc. (40 percent), the RREEF (Deutsche Bank Infrastructure Fund) (25 percent) and AMP (35 percent). Matariki Forests is New Zealand's third-largest forestry company, owning 143 000 hectares of forest nationally. In Canterbury, the company owns Eyrewell, Ashley, Mt Thomas, Omihi, Oxford, Balmoral and Hanmer Forests under forestry rights with Ngai Tahu, and managed by Rayonier. The total stocked forest area in Canterbury is about 30 000 hectares. (www.rayonier.com)

### › BLAKELY PACIFIC LIMITED

Blakely Pacific is a New Zealand forestry company with its roots in the Pacific northwest of the United States where its parent company, Port Blakely Tree Farms, resides. It manages a total area in New Zealand of 27 500 hectares of forest, with about 13 300 hectares being in the Canterbury forests of Geraldine, Raincliff, Saddlepeaks, Waimate and Pentland Hills. The forests are FSC-certified[2]. (www.blakely-pacific.co.nz)

### › SELWYN PLANTATION BOARD LIMITED

The Selwyn Plantation Board is a Council-Controlled Trading Organisation, with 61 percent of the shareholdings held by Selwyn Council Trading Enterprises Ltd and 39 percent held by Christchurch City Holdings Ltd. It has 7600 hectares of forests located on the coast (Chaneys and Bottle Lake), the foothills, and on the plains. All forests are FSC-certified. The Selwyn Plantation Board Limited has sold its forests on the Canterbury Plains south of the Selwyn River, and is converting those forests north of the Selwyn River to alternative land uses. (www.spbl.co.nz)

### › MCVICAR TIMBER GROUP LIMITED

The McVicar Timber Group is a privately owned sawmilling and forestry company based in Christchurch, with a plantation forest resource of about 3000 hectares. The group's four main forests are Glen Arlie, Cashmere, Hunua and Mt Allen. (www.mcvicar.co.nz)

### › ENVIRONMENT CANTERBURY

Environment Canterbury owns and manages approximately 2700 hectares of predominantly radiata pine forest. The forest is maintained for protection purposes where it forms a barrier between the active channels of several major rivers and the stopbanks. The majority of the forest is concentrated on the Waimakariri River with smaller areas associated with the Ashley, Rakaia, Ashburton, Opihi and Orari Rivers. There are some 165 hectares of mixed conifer forest at Lake Tekapo. While the forest's prime purpose is protection, it is also managed for production and recreation within the constraints of river management and very hard sites. (www.ecan.govt.nz)

### › NEW ZEALAND REDWOOD COMPANY

The New Zealand Redwood Company (NZRC) is a wholly owned subsidiary of Soper Wheeler Company. Soper Wheeler has been managing its timberlands in California for over 100 years. NZRC has approximately 1550 hectares of redwood plantation, 650 hectares of Douglas-fir and cypress plantations, and a further 1000 hectares of plantable land, all in North Canterbury. NZRC began planting in 2002. (www.nzredwood.co.nz)

### › ASHBURTON DISTRICT COUNCIL

The Ashburton District Council has been involved in forestry for well over a century. Initially plantings were

[2] FSC certified forests are certified by an independent third party as meeting Forest Stewardship Council standards of management.

undertaken to provide shelter although plantations are now managed for financial return. The total area of forests managed by the Council is 2150 hectares, all located within the Ashburton District. Most of the forests are located on the plains and vary in size: some are less than a hectare, while the largest is 260 hectares. (www.ashburtondc.govt.nz/services/forestry/)

### › WARREN FORESTRY

Warren Forestry provides multi-site, multi-species, joint-venture investment partnerships to the public. Seven partnerships have been established since 1994 and are known as Mt Noble, Amuri Hills, Six Hills, Insignis, Triple Ridge, Mt Whitnow and Seventh. In all, these partnerships own 35 joint venture plantations with hill country farmers who provide the land, totalling 1400 hectares. All are located in Canterbury, other than the Insignis venture and part of the Seventh which are both in Marlborough. Warren Forestry's focus is on radiata pine, Douglas-fir and cypress plantations. (www.warrenforestry.com)

### › OTHER FOREST OWNERS

Approximately 45 percent of Canterbury's plantation forest estate is held by some 2000 small-scale forest owners, mainly individuals, forestry partnerships and small companies, who mostly own less than 1000 hectares each. The impact of these small-scale forest owners on the development of the local industry has been highlighted in the wood availability forecasts, separate from the large-scale forest owners.

## »» SPECIES COMPOSITION

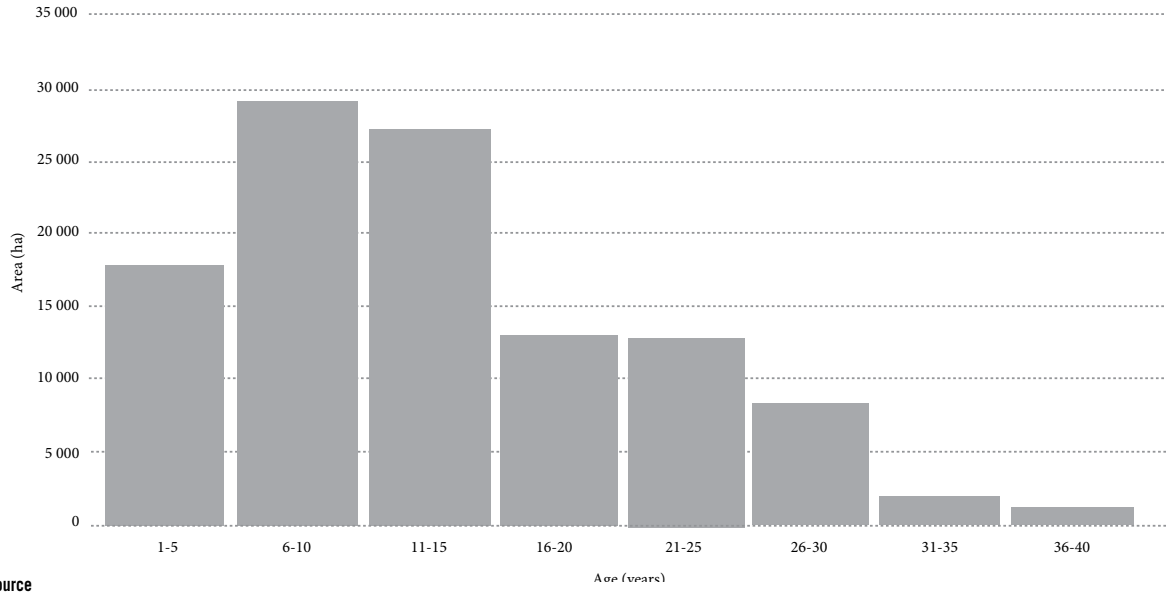
Within the Canterbury region radiata pine is the dominant plantation forest species, making up 76 percent of the total forest area. Douglas-fir is the next most common species making up 15 percent. The balance comprises cypresses, eucalypts and other softwood and hardwood species.

About 31 percent (35 000 hectares) of the radiata pine estate is, or is expected to be, pruned to a height of at least four metres. Approximately eight percent (9300 hectares) of pruned radiata pine is older than 25 years.

## »» AREA-AGE CLASS DISTRIBUTION

The Canterbury plantation forest area-age class distribution (Figure 3.1) shows the peak in new forest area planted during the mid to late 1990s. This potentially enables an increasing area to be harvested from about 2017.

## FIGURE 3.1: AREA-AGE CLASS DISTRIBUTION FOR CANTERBURY PLANTATION FORESTS (ALL SPECIES)




**Source**
Ministry of Agriculture and Forestry, 2007.

For detailed information on forest areas and age class distributions by species, refer to the publication *A National Exotic Forest Description as at 1 April 2006,* accessible at: http://www.maf.govt.nz.

## PLANTATION FOREST LOCATION

As shown in Table 3.2, the Hurunui District has a significantly greater area of plantation forests than other territorial authorities in the region, with the major forests of Hanmer, Balmoral, Omihi and most of Ashley located within its territorial boundary.

### TABLE 3.2: PLANTATION FOREST AREAS BY TERRITORIAL AUTHORITIES AND SPECIES (HECTARES, AS AT 1 APRIL 2006)

| TERRITORIAL AUTHORITY | RADIATA PINE | DOUGLAS -FIR | OTHER SOFTWOODS | HARDWOODS | TOTAL |
|---|---|---|---|---|---|
| Hurunui District | 32 572 | 4 445 | 2 842 | 88 | 39 947 |
| Waimakariri District | 13 418 | 367 | 274 | 127 | 14 186 |
| Selwyn District | 12 698 | 1 619 | 474 | 91 | 14 882 |
| Christchurch City[1] | 7 584 | 158 | 1 369 | 1 077 | 10 188 |
| Ashburton District | 3 156 | 515 | 259 | 48 | 3 978 |
| Mackenzie District | 2 581 | 1 492 | 888 | 82 | 5 043 |
| Timaru District | 6 680 | 4 551 | 972 | 103 | 2 306 |
| Waimate District | 8 282 | 3 958 | 968 | 165 | 13 373 |
| **Region total** | **86 971** | **17 105** | **8 046** | **1 781** | **113 903** |

**Source**
Ministry of Agriculture and Forestry, 2007.

**Note**
1. Banks Peninsula District Council was disestablished in March 2006 and merged into Christchurch City.

## HISTORICAL ROUNDWOOD REMOVALS

Estimated annual roundwood removals (Table 3.3) are derived from wood processing production data and the export of logs. They do not take account of inter-regional log flows, for which data are not readily available.

### TABLE 3.3: ESTIMATED ROUNDWOOD REMOVALS IN CANTERBURY

| YEAR ENDED 31 MARCH | VOLUME ($M^3$) |
|---|---|
| 1990 | 400 000 |
| 1991 | 480 000 |
| 1992 | 480 000 |
| 1993 | 520 000 |
| 1994 | 640 000 |
| 1995 | 640 000 |
| 1996 | 690 000 |
| 1997 | 710 000 |
| 1998 | 660 000 |
| 1999 | 640 000 |
| 2000 | 800 000 |
| 2001 | 860 000 |
| 2002 | 960 000 |
| 2003 | 860 000 |
| 2004 | 880 000 |
| 2005 | 770 000 |
| 2006 | 830 000 |
| 2007 | 1 010 000 |

**Source**
Ministry of Agriculture and Forestry, Wellington.

The decrease of roundwood removals from 2002 to 2006 reflects the difficult trading period for log exports in particular. The decline in export production was associated with a generally strong New Zealand dollar against the United States dollar, international prices that were often depressed, and substantial increases in log shipping costs.

While these factors continue, the significant increase in roundwood removals estimated for 2007 is probably driven by land use changes. The provisional 2007 roundwood removals estimate is also higher than the volumes suggested by several of the wood availability forecast scenarios. These scenarios do not cover harvesting from shelterbelts or very small woodlots not included in the *National Exotic Forest Description as at 1 April 2006*.
Nor do they include any production thinnings that may supply the post and pole markets. All these sources of harvested volumes, plus any logs exported through Canterbury ports but grown outside the region, are included in the estimate of roundwood removals.

## HARVEST INTENTIONS SURVEY

A harvesting intention survey of Matariki Forests, Blakely Pacific Ltd, the Selwyn Plantation Board Ltd, Environment Canterbury, Ashburton District Council and Waimate District Council was undertaken in late 2006, and information was confirmed in July 2007. Data were provided on the actual level of harvest from these forests for 2005 and the expected harvest for 2006. The harvesting intentions for the next ten years were provided by species for pruned, unpruned and chiplogs, along with the area expected to be harvested.

Table 3.4 provides a summary of the harvest intentions data. For detailed data by log type see the Appendix. These figures make up the first ten years of the wood availability forecasts for the large-scale forests in Canterbury.

The harvest intentions of large-scale forest owners in Canterbury show an increase in volumes for 2006 and 2007 to reach around 800 000 cubic metres. This reflects land conversions on the Canterbury Plains from forest to pasture or for sub-division, with some forest owners looking to complete the process prior to the

commencement of the first Kyoto commitment period in 2008. Thereafter the intended harvest volumes decline over three years to around 550 000 cubic metres per year, reflecting the smaller areas harvested and strategies that see the area-weighted clearfell ages for pruned radiata pine increase from 28.3 years in 2006 to 30.5 years in 2015, and for unpruned radiata pine increase from 26.8 to 28.4 years.

### TABLE 3.4: HARVEST INTENTIONS SURVEY RESULTS

| YEAR ENDING 31 DECEMBER | RADIATA PINE ($M^3$) | DOUGLAS -FIR ($M^3$) | OTHER SOFT-WOODS ($M^3$) | HARDWOODS ($M^3$) | TOTAL VOLUME ($M^3$) | TOTAL AREA (HA) |
|---|---|---|---|---|---|---|
| 2005[1] | 738 000 | 6 000 | – | – | 744 000 | 2 038 |
| 2006[2] | 792 000 | 49 000 | 14 000 | – | 855 000 | 2 214 |
| 2007 | 742 000 | 45 000 | – | – | 787 000 | 1 956 |
| 2008 | 603 000 | 42 000 | – | – | 645 000 | 1 717 |
| 2009 | 601 000 | 42 000 | – | – | 643 000 | 1 731 |
| 2010 | 604 000 | 42 000 | – | – | 646 000 | 1 715 |
| 2011 | 503 000 | 46 000 | – | – | 549 000 | 1 392 |
| 2012 | 504 000 | 45 000 | – | – | 549 000 | 1 394 |
| 2013 | 509 000 | 45 000 | – | – | 554 000 | 1 408 |
| 2014 | 515 000 | 45 000 | – | – | 560 000 | 1 406 |
| 2015 | 525 000 | 45 000 | – | – | 570 000 | 1 422 |

**Sources**
Individual forest owners covered by the harvesting intentions survey.

**Notes**
1. Actual harvest.
2. Expected harvest.

## INDIGENOUS FORESTS

Canterbury has approximately 264 000 hectares of indigenous forest, mainly in the western, higher rainfall mountain areas of the Southern Alps. Native beech (*Nothofagus* species) dominates, with mountain beech the most common. About 186 000 hectares of indigenous forest are on Crown land managed by the Department of Conservation. The sale of indigenous timber from the conservation estate is prohibited by the Conservation Act 1987.

Before about 1000 AD, most of Canterbury was covered in tall forest or woody scrub below the sub-alpine timberline. During the first centuries of Polynesian settlement, most forest cover in the drier eastern areas was destroyed by fire. European settlement and farming further reduced the forest cover, particularly in North Canterbury.

Tall podocarp forest on Banks Peninsula and lowland black beech forest near Oxford were heavily milled to supply timber to Christchurch. By 1900 these forests were exhausted and Canterbury became dependent on podocarp timbers from the West Coast and elsewhere.

Timber supplies to Canterbury were dominated by West Coast indigenous timber until the mid-1970s, when timber harvest from local exotic plantation forests increased.

In recent years, only very small quantities of indigenous timber have been milled from private land in Canterbury: principally black beech from the only sustainable forest management plan approved for the region since the inception in 1993 of Part IIIA of the Forests Act 1949.

# 4 WOOD AVAILABILITY FORECASTS

This chapter describes the the range of harvest volumes potentially available from the plantation forests in the Canterbury region for the period 2007–2040.

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

- Matariki Forests;
- Blakely Pacific Limited;
- Selwyn Plantation Board Limited;
- Environment Canterbury;
- Ashburton District Council;
- Waimate District Council.

The forecasts also incorporate the views of the region's large-scale forest owners, 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. Timing 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 Canterbury to be harvested. It needs to be recognised that forests are managed to maximise the benefits to the enterprises that own 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-structures and maturities of the forests they own. These in turn feed back directly into future wood availability.

There are different levels of uncertainty associated with the wood availability from each component of the estate. The volumes forecast from the large-scale owners' forests are subject to change because of changes in harvest intentions or changes in the resource description (areas and yields). Yet, they have greater certainty than those forecast from the small-scale owners' estate. Not only are harvest intentions less clear for small-scale owners, their resource descriptions are also 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 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 National Exotic Forest Description (NEFD) Steering Committee, and feedback was received from major forest owners and consultants in the Canterbury wood supply region.

Listed years are assumed to be to 31 December. For example, 2005 indicates the 12 months to 31 December 2005.

### 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 pine 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 trees 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 NON-DECLINING YIELD – TARGET ROTATION 30 YEARS

This is the same as scenario 3 except that the total wood availability of radiata pine from the region is assumed to be non-declining for the current rotation (through to 2034). Thereafter, a reduction is allowed.

### › 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

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.

In scenarios 1 and 2 (Figures 4.1A and 4.1B, 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 age 30 years. Both scenarios show the "potential" availability of mature forest in any given year. They reflect directly the area of forest in each age class in the Canterbury region. 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 4.1C and 4.1D, 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.

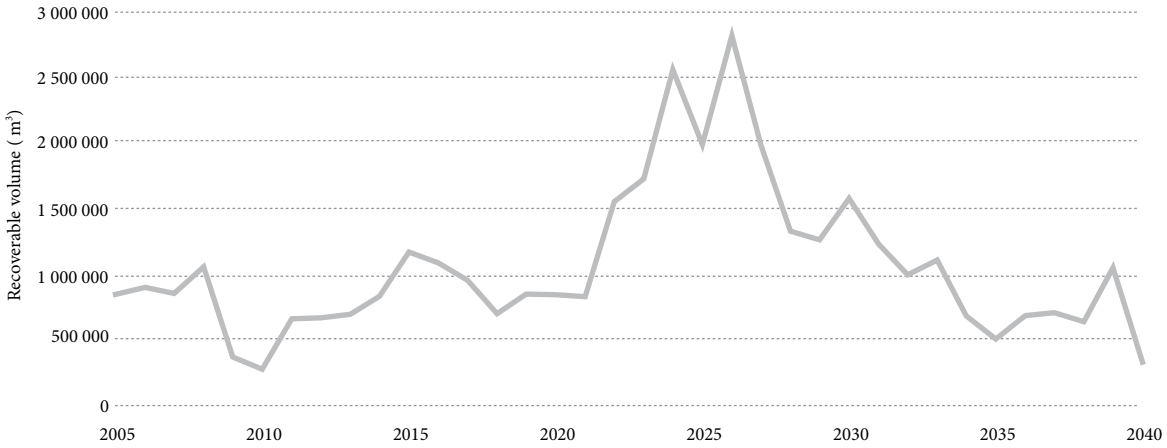
Scenarios 3 to 5 avoid the large year-to-year fluctuations seen in scenario 1. A fundamental property of the forests in Canterbury (like many regions in New Zealand) is the large area established during the 1990s. Scenarios 4 and 5 illustrate the harvesting of these forests by applying a non-declining 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 log prices.

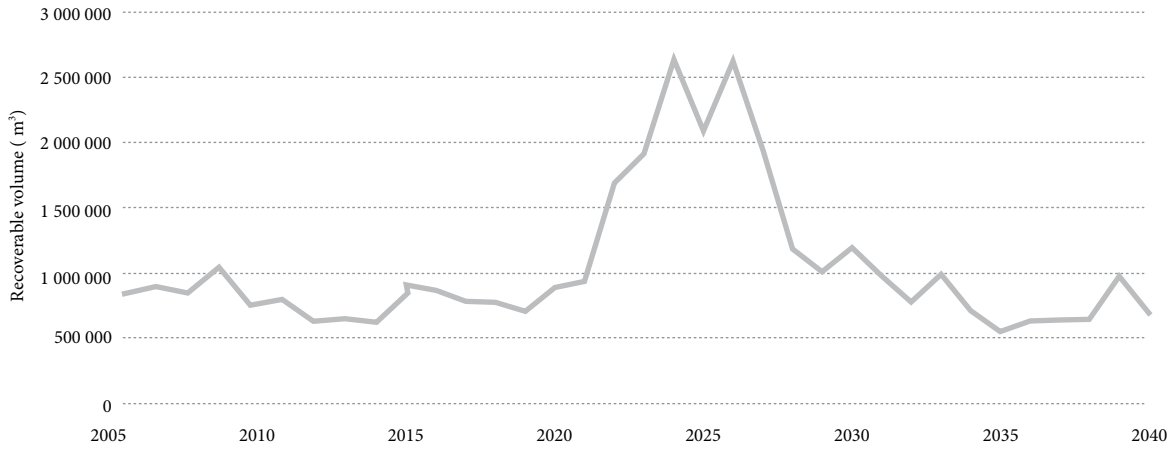
Figures 4.1A to 4.1D summarise the sequence of models that are presented in the remainder of this report.

## FIGURE 4.1: THE SEQUENCE OF WOOD AVAILABILITY SCENARIOS PRESENTED IN THIS REPORT FOR RADIATA PINE

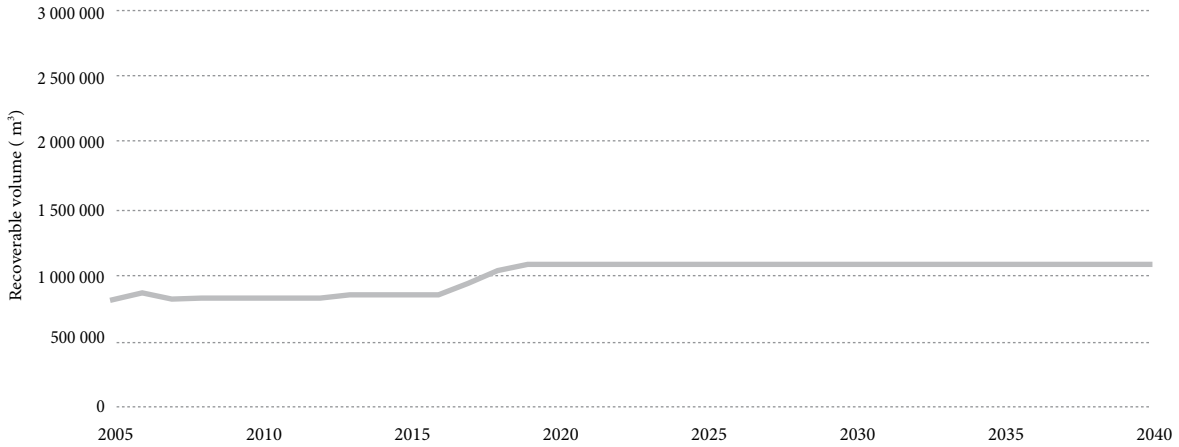
### 4.1A – SCENARIO 1 EXAMPLE: HARVEST ALL TREES AT AGE 30



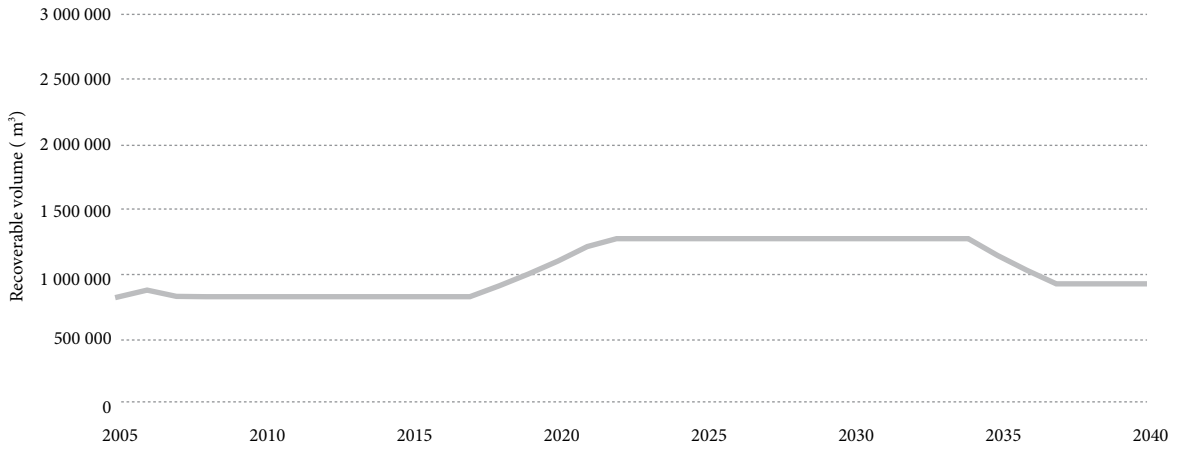

### 4.1B – SCENARIO 2 EXAMPLE: LARGE-SCALE OWNERS HARVEST AT STATED INTENTIONS, SMALL-SCALE OWNERS HARVEST TREES AT AGE 30



› 4.1C – SCENARIO 3 EXAMPLE: NON-DECLINING YIELD WITH TARGET ROTATION 30 YEARS




› 4.1D – SCENARIO 4 EXAMPLE: SPLIT NON-DECLINING YIELD WITH TARGET ROTATION 30 YEARS (SCENARIO 5 IS THE SAME AS SCENARIO 4 EXCEPT IT SHOWS WOOD AVAILABILITY PROFILES OF 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 40-45 years for Douglas-fir.

Wood availability from other species has not been modelled. The *NEFD as at 1 April 2006* records 9827 hectares of other species in Canterbury, but the large majority of this resource is less than 21 years old and is unlikely to be harvested within the next ten years. In addition, markets are not well established for some of these species.

### TABLE 4.1: AREAS OF SPECIES OTHER THAN RADIATA PINE AND DOUGLAS-FIR IN CANTERBURY

| | AREA (HECTARES) AGE 21-40 YEARS | TOTAL AREA (HECTARES) |
|---|---|---|
| Cypress species | 0 | 161 |
| Other softwoods | 2 507 | 7 885 |
| Eucalypts | 14 | 38 |
| Other hardwoods | 133 | 1 743 |
| **Total** | **2 654** | **9 827** |

**Source**
Ministry of Agriculture and Forestry, 2007.

## DATA

### METHOD USED TO OBTAIN FOREST AREAS

Forest areas were obtained from the *NEFD as at 1 April 2005*. Changes were made to:

- Reflect the regime split in the harvest intentions data, with 3300 hectares in the large-scale owners' estate transferred from the old pruned croptype into the old unpruned croptype.
- Reduce the area in the small-scale owners' estate by 15 percent, because they generally report on a gross area rather than a net stocked area basis (which excludes unplanted areas, areas not successfully established, streams, wetlands, etc.).
- Reduce the area-age classes 1-15 years in the large-scale owners' estate by 5 percent, following advice from owners.
- Allow for intended clearance and deforestation (without commercial harvest), with the removal of a further area of 2200 hectares in the large-scale owners' estate.

### METHOD USED TO DEVELOP YIELD TABLES

In 2006, new yield tables for Canterbury were developed in the following manner:

- 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 provide the most accurate information available, as they are 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 planned harvest volumes by log grades and areas from 2005 to 2015. These harvest intentions were included to provide the most realistic wood availability forecasts over this period.

## WOOD AVAILABILITY FORECASTS FOR CANTERBURY

### ASSUMPTIONS

The wood availability forecasts for Canterbury are based on the following assumptions.

- **REPLANTING**

  All the area that is harvested is replanted (with a regeneration lag of one year) apart from 7000 hectares in the large-scale owners' estate that is intended to be deforested. (This is in addition to the 2200 hectares intended for clearance and deforestation).

  Areas are planted back into the same species and regime.

  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).

- **HARVEST BY YEAR**

  The total volumes of radiata pine harvested by large-scale owners and the estimated volumes harvested by small-scale owners in 2005–2007 are shown in Table 4.2.

### TABLE 4.2: VOLUMES OF RADIATA PINE HARVESTED IN 2005–2007

| HARVEST YEAR | LARGE-SCALE OWNERS ($M^3$) | SMALL-SCALE OWNERS ($M^3$)[1] |
|---|---|---|
| 2005 | 740 000 | 90 000 |
| 2006 | 790 000 | 90 000 |
| 2007 | 740 000 | 90 000 |

**Note**
1. Industry estimates of harvesting from small-scale owners ranged from 80 000 to 100 000 cubic metres per year. For the purposes of modelling wood availability it was assumed 90 000 cubic metres were harvested for the years 2005–2007.

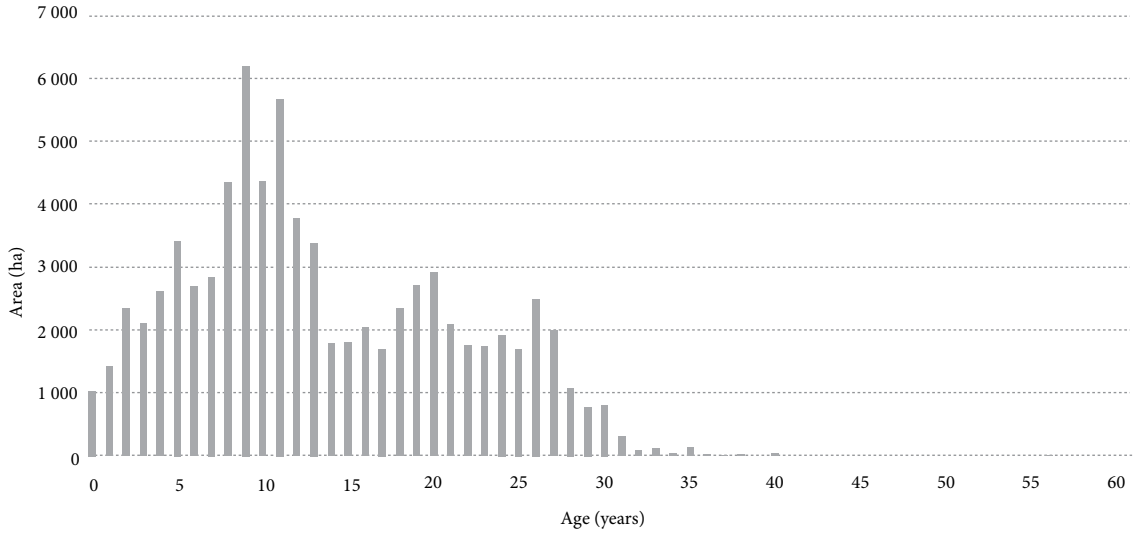
- **OVERMATURE STANDS**

  The area in the small-scale owners' estate that was age 41 years or older (534 hectares total) was excluded on the assumption that this will not be harvested.

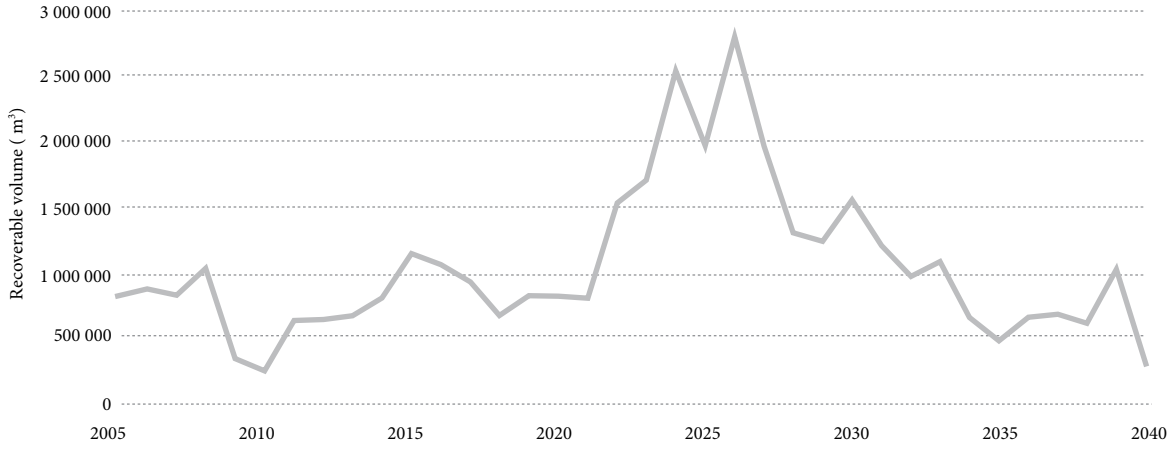
### SCENARIO 1

In this scenario, all trees are harvested at age 30, indicating the "pure" (unconstrained) availability of wood from Canterbury. This means wood availability reflects the age-class distribution. Figure 4.2 shows the age-class distribution of radiata pine in Canterbury, and Figure 4.3 shows the wood availability. The low point of 30-year-old trees in 2018 in Figure 4.3 occurs because of the small area (1714 hectares) at age 17 (planted in 1988) in Figure 4.2. Conversely, the high point at 2026 (Figure 4.3) occurs because of the large area (6246 hectares) at age 9 (planted in 1996) in Figure 4.2.

### FIGURE 4.2: AGE-CLASS DISTRIBUTION OF CANTERBURY RADIATA PINE – COMBINED ESTATE AS AT 1 APRIL 2005




### FIGURE 4.3: CANTERBURY 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 state intentions to 2015 and small-scale owners harvest trees at age 30.

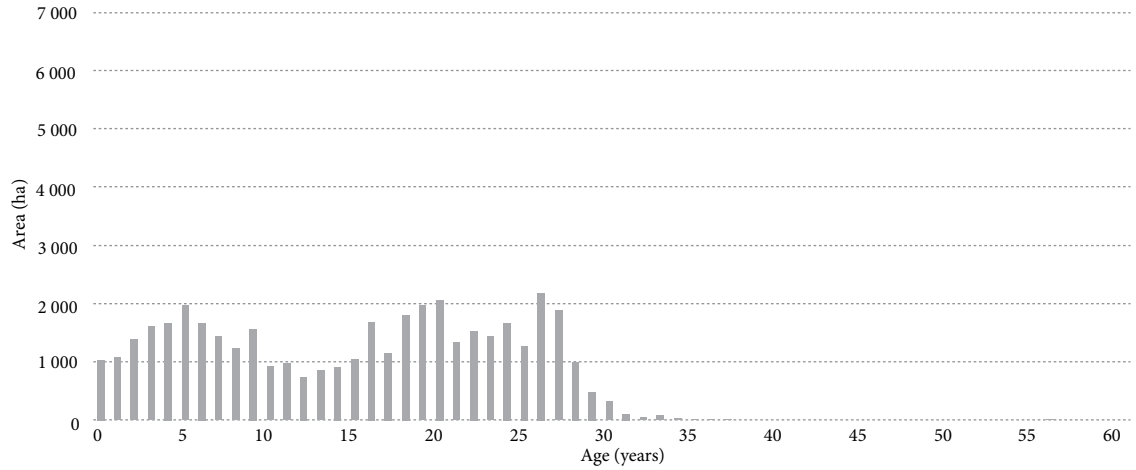
#### LARGE-SCALE OWNERS' ESTATE

The age-class distribution of the large-scale owners' estate (Figure 4.4) shows some variation in the area of age-classes. The area at age 0 is the area awaiting replanting as at 31 March 2005 (to be replanted in the 2005 planting season).

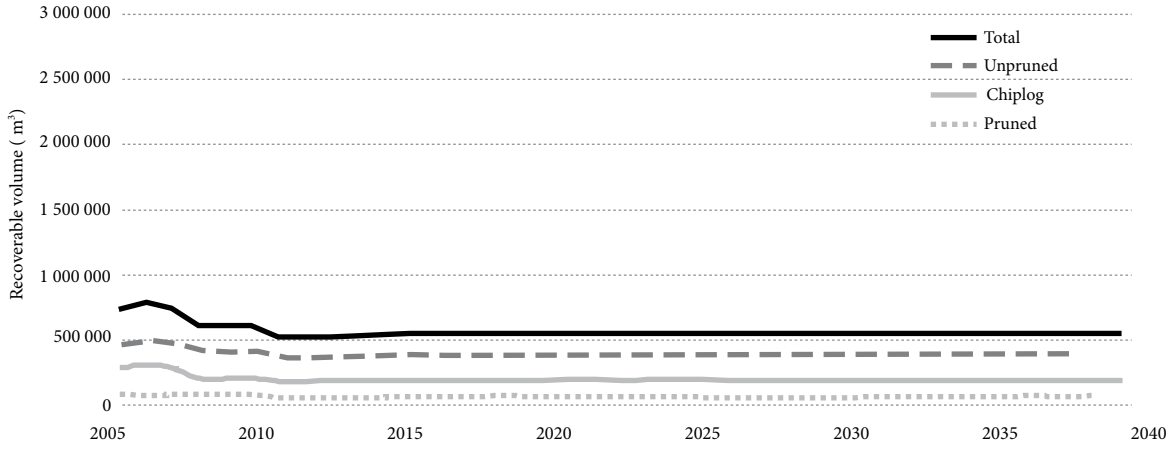
For this scenario, the availability of wood from large-scale owners is based on stated harvest intentions for 2005 to 2015. Thereafter the availability is constrained to be non-declining with a target rotation age of 30 years.
The wood availability of large-scale owners (Figure 4.5) is forecast to decline initially, but increase marginally from 2011.

Their high volumes in 2005 to 2007 are partially a result of areas being harvested for deforestation.

### FIGURE 4.4: AGE-CLASS DISTRIBUTION OF THE CANTERBURY RADIATA PINE ESTATE – LARGE-SCALE OWNERS AS AT 1 APRIL 2005




### FIGURE 4.5: CANTERBURY RADIATA PINE AVAILABILITY UNDER SCENARIO 2 – LARGE-SCALE OWNERS



#### SMALL-SCALE OWNERS' ESTATE

The age-class distribution of the small-scale owners' estate (Figure 4.6) is very irregular, with over 2500 hectares in ages 8 to 13 years (planted in 1992 to 1997) and much less in all other age classes. Forecasting the wood availability from this estate depends on how the large areas in ages 8 to 13 will be harvested:

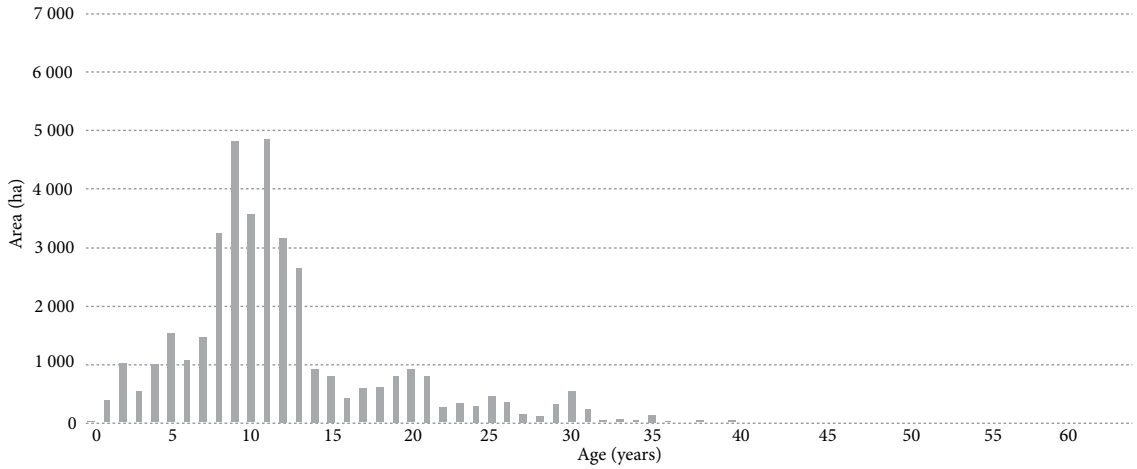
- at a fixed rotation age (scenario 2);
- spread over many years (scenario 3);
- spread over an intermediate number of years (scenario 4).

#### COMBINED ESTATE

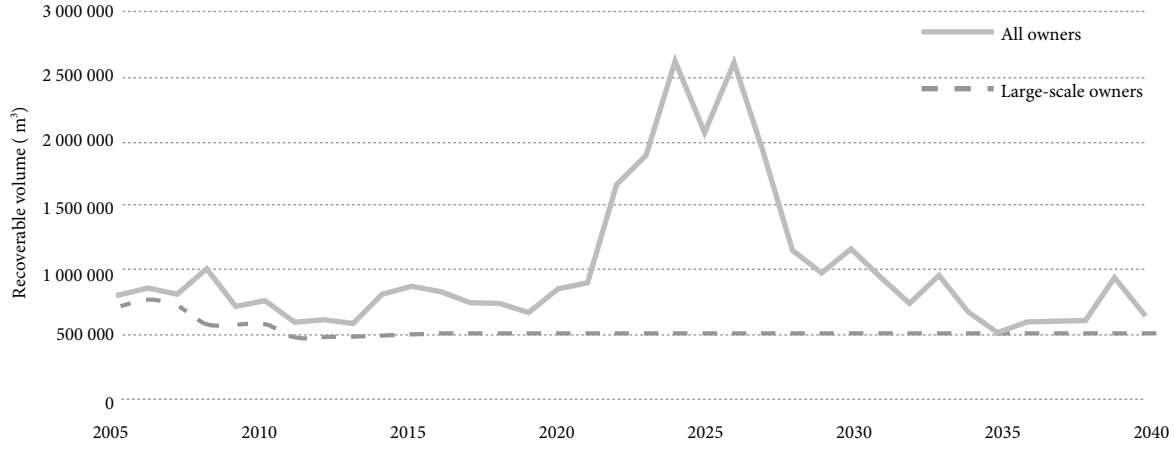
The wood availability from all owners is presented in Figure 4.7. For the large-scale owners' estate, it is the same as in Figure 4.5. The entire small-scale owners' estate is assumed to be harvested at age 30. The fluctuations in the total volume harvested reflect the variation in the age-class distribution of the small-scale owners' estate.

The large increase in volume from 2022 (Figure 4.7) occurs when the large areas from the small-scale owners' estate in young age classes (8-13) are harvested.

### FIGURE 4.6: AGE-CLASS DISTRIBUTION OF THE CANTERBURY RADIATA PINE ESTATE – SMALL-SCALE OWNERS AS AT 1 APRIL 2005




### FIGURE 4.7: CANTERBURY RADIATA PINE AVAILABILITY UNDER SCENARIO 2 – COMBINED ESTATE



For example, the increase in 2022 is a consequence of the 2565 hectares planted by small-scale owners in 1992 (age 13 in Figure 4.6) being harvested at age 30 years.

Fluctuations in harvest volumes of the magnitude shown in Figure 4.7 would be impractical because of marketing and logistics realities. However, the increase in volume in 2008 indicates the potential for an increased harvest from the small-scale owners' estate in the near future.

### › SCENARIO 3

The third scenario indicates a non-declining yield, with a target rotation age of 30 years. Figure 4.8 indicates that when the small-scale owners' estate is harvested to complement the large-scale owners' estate, the total volume (of radiata pine) has the potential to stay at current levels through to 2016. The potentially available volume increases to 1.1 million cubic metres per year from 2019. 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.

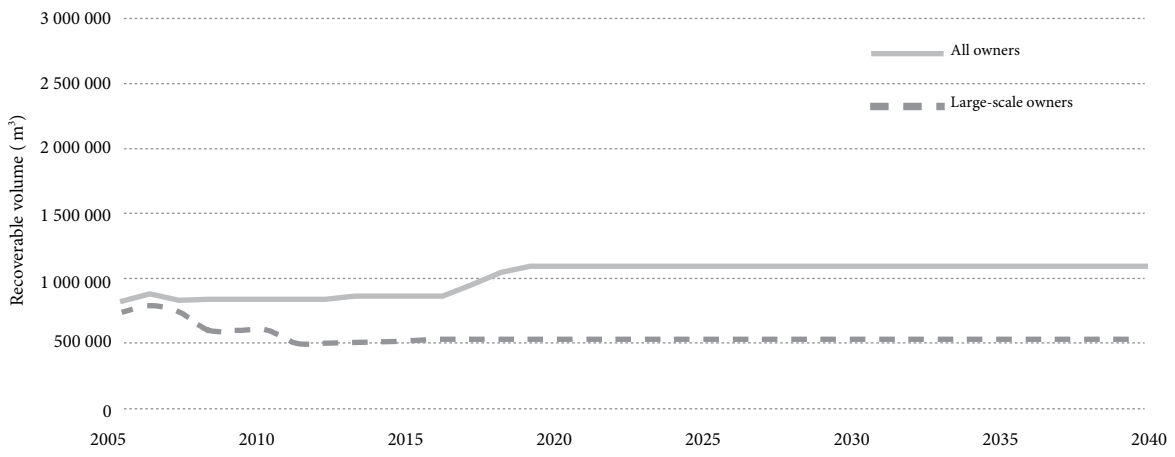
This scenario is similar to the base case scenario adopted in the *National Exotic Forest Description 2000* wood supply forecasts. However, it results in the small-scale owners' estate being harvested at rotation ages that differ markedly from 30 years (Figure 4.9).

### › SCENARIO 4

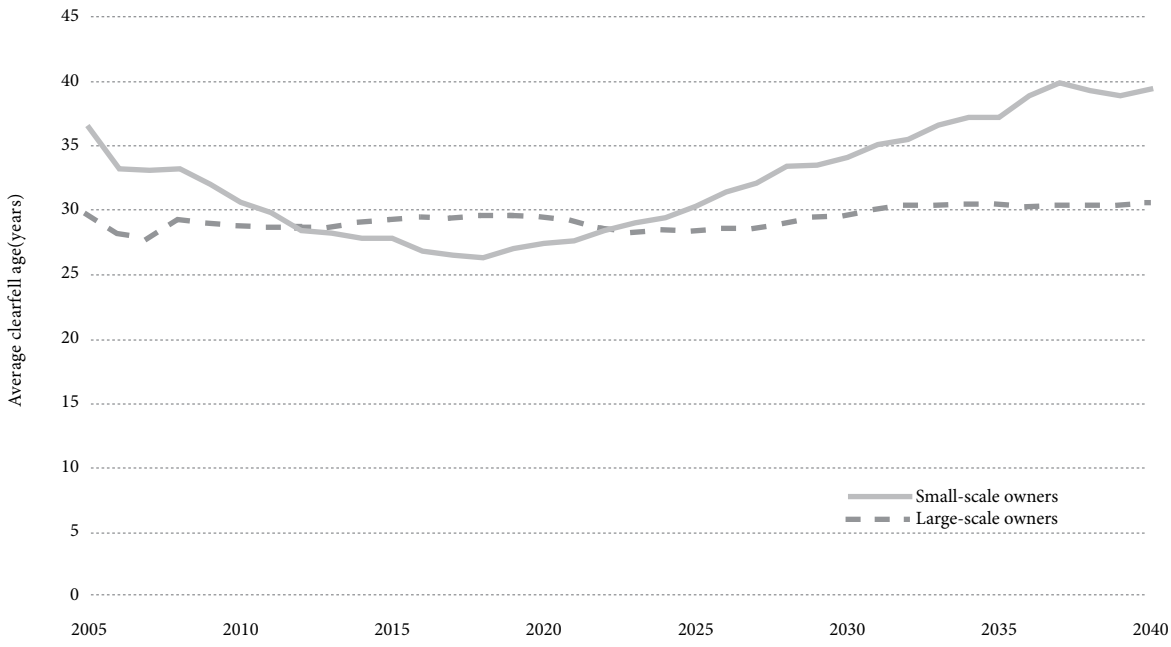
The fourth scenario is based on a split non-declining yield, with a rotation age of 30 years. It gives a forecast wood availability (Figure 4.10) that is similar to scenario 3 initially. Wood availability increases to 1.25 million cubic metres per year from 2021 before reducing to 0.93 million cubic 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 to be non-declining from 2006 to 2034; that is, for the current rotation. Thereafter an annual reduction of up to 10 percent was allowed, 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 (Figure 4.11) than in scenario 3 (Figure 4.9).

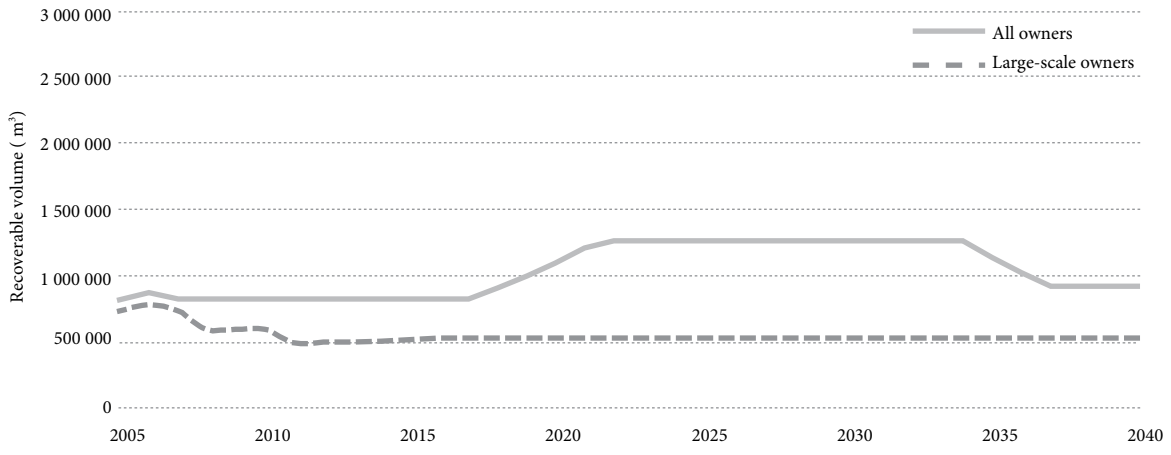
**FIGURE 4.8: CANTERBURY RADIATA PINE AVAILABILITY UNDER SCENARIO 3**



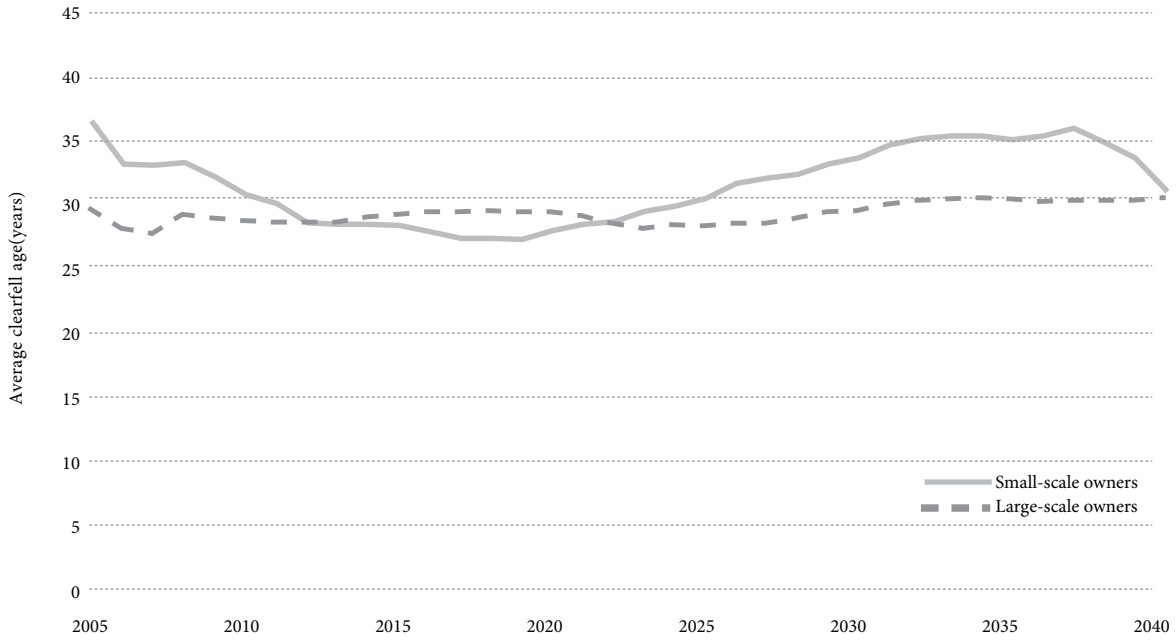
## FIGURE 4.9: AVERAGE RADIATA PINE CLEARFELL AGE BY OWNERSHIP CATEGORY UNDER SCENARIO 3




## FIGURE 4.10: CANTERBURY RADIATA PINE AVAILABILITY UNDER SCENARIO 4

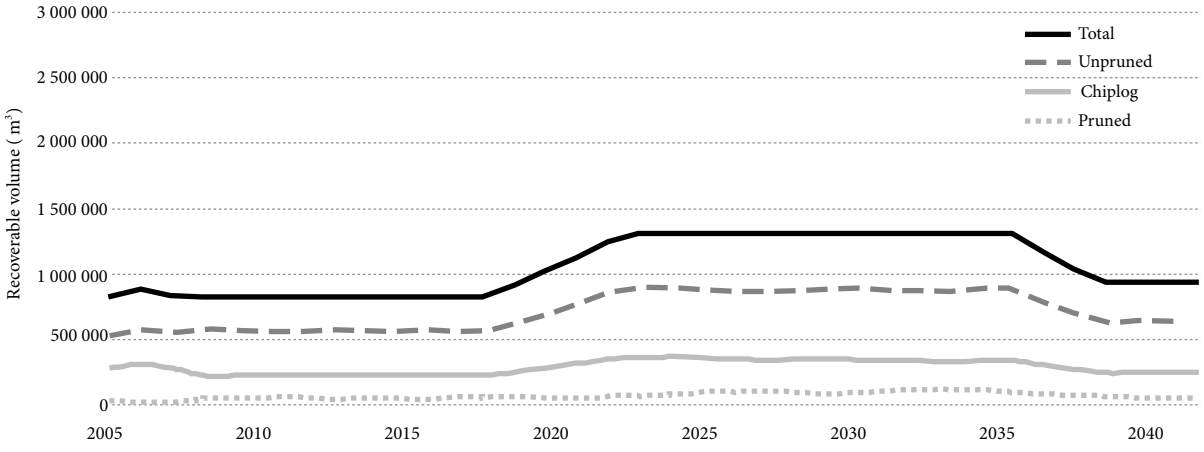


### FIGURE 4.11: AVERAGE RADIATA PINE CLEARFELL AGE BY OWNERSHIP CATEGORY UNDER SCENARIO 4




The total volume forecast for scenario 4 is broken down by log grade in Figure 4.12.

### FIGURE 4.12: CANTERBURY RADIATA PINE AVAILABILITY BY LOG GRADE 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 4.13). 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 4.14).

No increase was assumed from 2008 to 2019 for the 32-year variation in order to get separation in harvest volumes.

Figure 4.13 shows that there is the potential for a significant increase in the Canterbury harvest volumes some time after 2015. However, there is a range of possibilities for both the timing of the increase and the level of the potential harvest volume.

**FIGURE 4.13: CANTERBURY RADIATA PINE AVAILABILITY BY TARGET ROTATION AGE UNDER SCENARIO 5**

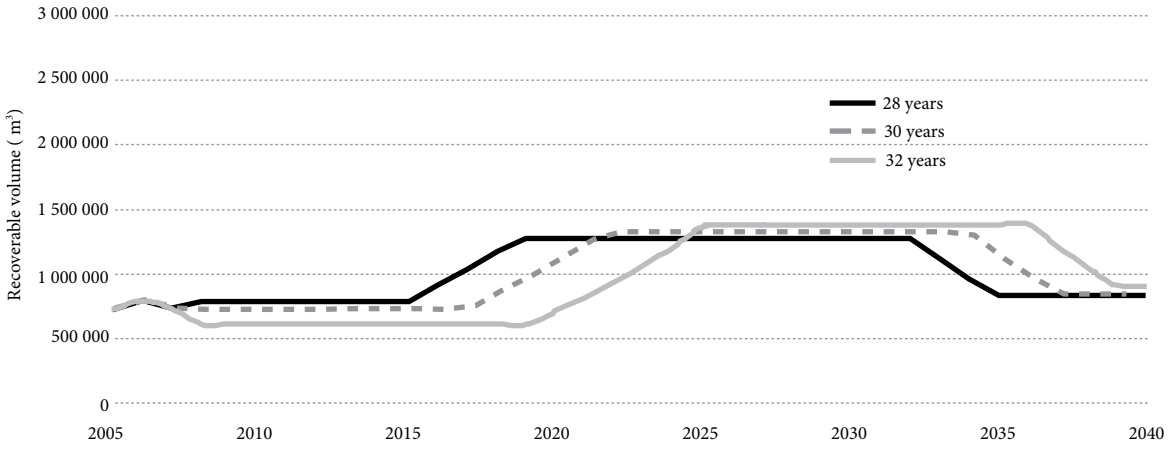
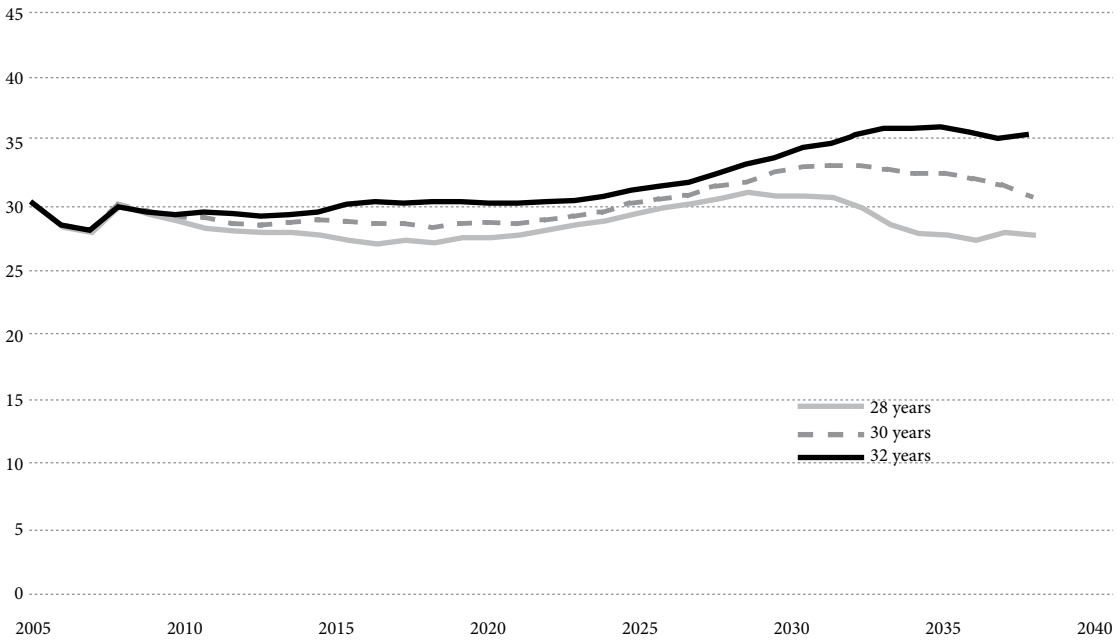



**FIGURE 4.14: AVERAGE RADIATA PINE CLEARFELL AGE IN CANTERBURY BY TARGET ROTATION AGE UNDER SCENARIO 5**



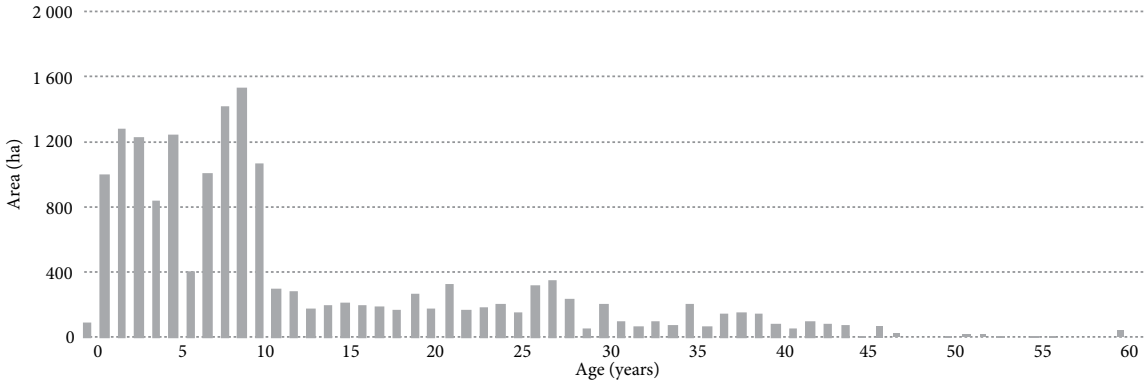
## › SCENARIOS FOR OTHER SPECIES

### DOUGLAS-FIR

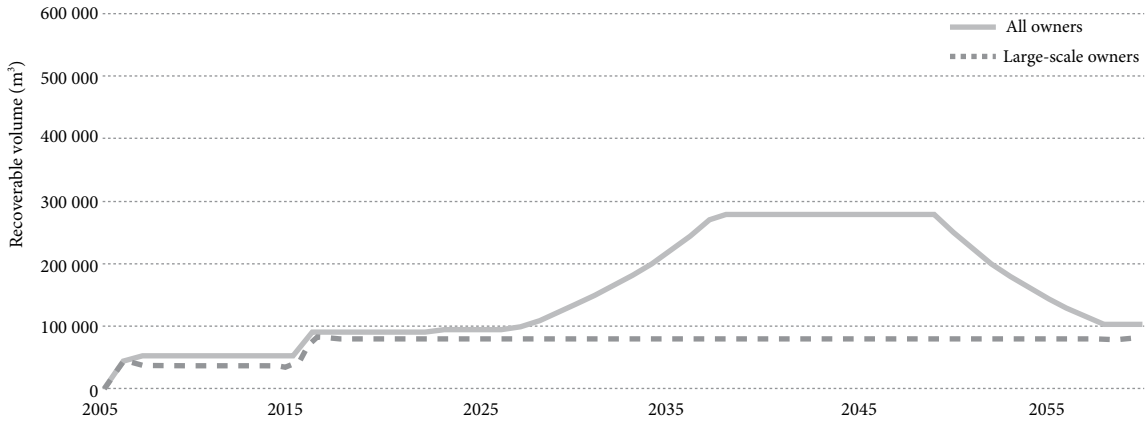
There are about 15 000 hectares of Douglas-fir in Canterbury. The age-class distribution of Douglas-fir is far from uniform (Figure 4.15). The majority of the young resource (age 10 years or younger) is in the small-scale owners' estate.

Results are presented in Figure 4.16 for a split non-declining yield (as for radiata pine, scenario 4). The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2005 to 2015, with non-declining yield thereafter. The harvest from the combined estate is required to be non-declining through to 2049 with changes (up or down) limited to 10 percent per year.

### FIGURE 4.15: AGE-CLASS DISTRIBUTION OF CANTERBURY DOUGLAS-FIR – COMBINED ESTATE AS AT 1 APRIL 2005




### FIGURE 4.16: CANTERBURY DOUGLAS-FIR AVAILABILITY – COMBINED ESTATE AS AT 1 APRIL 2005



# 5 THE WOOD PROCESSING INDUSTRY

## SAWMILLING

The sawmilling industry is based around a number of mostly small-scale operations located throughout the region. Those fixed mills (as opposed to portable mills) with annual production levels above 500 cubic metres of sawn timber are listed in Table 5.1.

The total installed sawmill capacity in Canterbury is estimated to be in the order of 348 000 cubic metres of sawn timber per year (2006), based on mills' usual hours of operation.

### TABLE 5.1: SAWMILLS OPERATING IN CANTERBURY

| SAWMILL | LOCATION |
|---|---|
| **A. Production level: 50 000–100 000 $m^3$ sawn timber per annum** | |
| SRS New Zealand | Rolleston |
| **B. Production level: 25 000–49 999 $m^3$ sawn timber per annum** | |
| Hunter Hills Lumber | Waimate |
| McAlpines Sawmilling Ltd | Rangiora |
| McVicar Timber Group Ltd | Harewood |
| **C. Production level: 10 000–24 999 $m^3$ sawn timber per annum** | |
| Ashburton Timber Co. (1990) Ltd | Ashburton |
| Mitchell Bros. Sawmillers | Darfield |
| Stoneyhurst Sawmilling Co. Ltd | Belfast |
| Sutherland Timber | Kaiapoi |
| **D. Production level: 5 000–9 999 $m^3$ sawn timber per annum** | |
| Arundel Lumber Co. Ltd | Arundel |
| Mt Hutt Lumber | Methven |
| Selwyn Sawmills Ltd | Hororata |
| **E. Production level: 500–4 999 $m^3$ sawn timber per annum** | |
| Adams Sawmilling Co. Ltd | Ashburton |
| AIS Sawmill | Oxford |
| A W Scott Ltd | Rakaia |
| Basher, H.C. & Sons Ltd | Amberley |
| Bennetts Sawmill | Bennetts (Oxford) |
| Scotts Timber | Geraldine |
| Waimate Timber | Waimate |
| Waitohi Timber | Temuka |
| Wilson Bros. Timber Ltd | Timaru |

**Sources**
Individual sawmillers.

### › SRS NEW ZEALAND

SRS New Zealand established a new sawmill at Rolleston in 2001, processing locally grown radiata pine. Sawn timber is exported to Asian countries for packaging and furniture or assembled into pallets, bins and cable drums for the domestic market. SRS New Zealand has ISO9001:2000 and ISPM15 certification. (www.srs.co.nz)

### › HUNTER HILLS LUMBER

The Hunter Hills Lumber sawmill was established in 2002 and is located in Waimate. It processes locally grown radiata pine and Douglas-fir, as well as other higher-grade pruned logs sourced from further afield. The sawn timber is sold on both the domestic market and the international lumber market. Currently products are exported to Australia, Asia, the Middle East and North America.

A range of products is offered including sawn and finished, kiln-dried and green lumber. Treatment options include H1.2, boron, H3.1 and wet CCA.

### › MCALPINES SAWMILLING LIMITED

McAlpines is one of the three largest privately-owned sawmilling, timber and building materials groups in New Zealand. Sawmills are located at Rangiora, Nelson and Rotorua, with the Rangiora and Rotorua mills having FSC chain of custody certification. In addition to the domestic market, high-quality wet-treated and kiln-dried radiata pine is exported to Australia for the building, furniture and re-manufacturing industries. (www.mcalpines.co.nz)

### › MCVICAR TIMBER GROUP LIMITED

McVicar Timber Group is a privately owned sawmilling and forestry company based in Christchurch. It operates two sawmills, one located in Christchurch and one in Australia. The Christchurch mill supplies the domestic market and exports to Australia, Asia and North America. (www.mcvicar.co.nz)

### › ASHBURTON TIMBER CO. (1990) LIMITED

The Ashburton Timber Co. processes radiata pine. Most of the timber products are sold to Asian markets, with some treated timber sold locally. The sawmill is located at the northern end of Ashburton.

### › MITCHELL BROS. SAWMILLERS

Established in 1946 at Darfield, Mitchell Bros. Sawmillers supply structural treated timber to the local market through ITM Darfield, and more widely to a number of South Island centres. Structural timber grades are also exported to Australia. The mill processes radiata pine only.

### › STONEYHURST SAWMILLING CO. LIMITED

Stoneyhurst Sawmillling Co. is a privately owned company that is located at Belfast. The mill processes radiata pine and Douglas-fir for the domestic market, and exports to Australia and Asian countries.

### › SUTHERLAND TIMBER

A family-owned sawmilling business that was established 50 years ago, Sutherland Timber processes radiata pine and Douglas-fir. Timber products are sold on the domestic market and exported to Australia, the United States of America, and Taiwan. Sutherland Timber is located at Kaiapoi.

## »» VENEER AND PANEL PRODUCTS

### › CARTER HOLT HARVEY – MDF

The Carter Holt Harvey's medium density fibreboard (MDF) plant at Sefton (near Rangiora) was the first MDF facility in New Zealand and in the Southern Hemisphere, starting production in 1976.

In 1994 a second production line increased annual production capacity to 220 000 cubic metres of panel products. The plant utilises a significant proportion of the Canterbury log harvest, although about a quarter of the wood fibre is sourced as chip wood – mostly from Canterbury sawmills, and some from the larger mills on the West Coast.

The MDF is marketed under the Customwood brand, with a wide range of thicknesses and densities available. It is sold on both the domestic and export markets. (www.chh.co.nz)

### › GUNNS NEW ZEALAND PTY LIMITED

Gunns New Zealand is part of the Gunns Limited Group, an Australian forestry company. Gunns New Zealand produces veneer from mostly FSC-certified radiata pine at its Hornby site. About 95 percent of the annual production of 5.3 million square metres of veneer is exported and is used primarily in furniture manufacturing. (www.gunnsveneers.co.nz)

## »» PRODUCTION AND EXPORT DATA

### › SAWN TIMBER PRODUCTION

Sawn timber production in Canterbury has increased by about 110 percent since 1990, as Table 5.2 shows. This reflects the increase in the log harvest, and upgrading and expansion of sawmill capacity over this period.

**»» TABLE 5.2: SAWN TIMBER PRODUCTION IN CANTERBURY**

| YEAR ENDED 31 MARCH | INDIGENOUS FORESTS ($M^3$) | PLANTATION FORESTS ($M^3$) | TOTAL ($M^3$) |
|---|---|---|---|
| 1990 | 5 | 108 763 | 108 768 |
| 1991 | 9 | 140 917 | 140 926 |
| 1992 | 10 | 129 085 | 129 095 |
| 1993 | 32 | 131 908 | 131 940 |
| 1994 | 1 304 | 153 662 | 154 966 |
| 1995 | 1 708 | 155 792 | 157 500 |
| 1996 | 2 293 | 142 523 | 144 816 |
| 1997 | 883 | 161 509 | 162 392 |
| 1998 | 235 | 150 687 | 150 922 |
| 1999 | 406 | 159 951 | 160 357 |
| 2000 | 24 | 212 249 | 212 273 |
| 2001 | 11 | 232 285 | 232 296 |
| 2002 | 43 | 217 461 | 217 504 |
| 2003 | 415 | 210 423 | 210 838 |
| 2004 | 52 | 214 272 | 214 324 |
| 2005 | 126 | 229 907 | 230 033 |
| 2006 | 23 | 213 343 | 213 366 |
| 2007 | 115 | 228 229 | 228 344 |

**Source**
Ministry of Agriculture and Forestry, Wellington.

### › SAWN TIMBER EXPORTS

As shown in Table 5.3, export volumes of sawn timber from the Canterbury region have increased by 325 percent since 1990.

### TABLE 5.3: SAWN TIMBER EXPORTS FROM CANTERBURY PORTS

| YEAR ENDED 31 DECEMBER | LYTTELTON PORT ($M^3$) | PRIMEPORT TIMARU ($M^3$) | TOTAL ($M^3$) |
|---|---|---|---|
| 1990 | 23 000 | 12 000 | 35 000 |
| 1991 | 42 000 | 18 000 | 60 000 |
| 1992 | 45 000 | 20 000 | 65 000 |
| 1993 | 55 000 | 14 000 | 69 000 |
| 1994 | 51 000 | 14 000 | 65 000 |
| 1995 | 44 000 | 15 000 | 59 000 |
| 1996 | 55 000 | 13 000 | 68 000 |
| 1997 | 77 000 | 3 000 | 80 000 |
| 1998 | 96 000 | 1 000 | 97 000 |
| 1999 | 123 840 | 1 325 | 125 165 |
| 2000 | 126 070 | 2 672 | 128 742 |
| 2001 | 106 312 | 534 | 106 846 |
| 2002 | 120 418 | 12 094 | 132 512 |
| 2003 | 105 031 | 4 205 | 109 236 |
| 2004 | 138 255 | 5 209 | 143 464 |
| 2005 | 135 101 | 14 563 | 149 664 |
| 2006 | 137 351 | 11 465 | 148 816 |
| 2007 (provisional, to June 2007) | 123 324 | 31 567 | 154 891 |

**Source**
Ministry of Agriculture and Forestry, Wellington.

### TABLE 5.4: LOG EXPORTS FROM CANTERBURY PORTS

| YEAR ENDED 31 DECEMBER | LYTTELTON PORT ($M^3$) | PRIMEPORT TIMARU ($M^3$) | TOTAL ($M^3$) |
|---|---|---|---|
| 1990 | – | – | – |
| 1991 | – | 10 187 | 10 187 |
| 1992 | – | 36 903 | 36 903 |
| 1993 | – | 145 680 | 145 680 |
| 1994 | 112 | 44 334 | 44 446 |
| 1995 | 19 700 | 47 771 | 67 471 |
| 1996 | 64 977 | 42 057 | 107 034 |
| 1997 | 72 462 | 11 668 | 84 130 |
| 1998 | 1 567 | – | 1 567 |
| 1999 | 32 070 | 31 127 | 63 197 |
| 2000 | 55 588 | 34 589 | 90 177 |
| 2001 | 173 529 | 56 522 | 230 051 |
| 2002 | 128 680 | 69 764 | 198 444 |
| 2003 | 136 135 | 33 629 | 169 764 |
| 2004 | 65 008 | 40 434 | 105 442 |
| 2005 | 62 512 | 92 178 | 154 690 |
| 2006 | 148 687 | 128 256 | 276 943 |

**Source**
Ministry of Agriculture and Forestry, Wellington.

## LOG EXPORTS

Demand for export logs is variable (Table 5.4) and in recent years the high exchange rate against the United States dollar and high shipping costs have depressed log exports from New Zealand. In Canterbury, log exports for the last few years have been boosted by forest-to-pasture conversions on the Canterbury Plains.

# 6 FORESTRY RESEARCH, EDUCATION AND TRAINING

## SCION AND ENSIS

Scion, formerly the Forest Research Institute, is focused on research that extends sustainable forestry practices to delivering new ways of creating plant-based biomaterials; and new manufacturing processes as a basis for sustaining the consumer markets of the future. Of the 322 permanent staff, 17 are based in Christchurch and are located on the University of Canterbury campus and the rest are located in Rotorua.

Scion and Australia's CSIRO have formed an unincorporated joint venture known as Ensis, which is the principal means through which Scion provides research and development to the forestry and forest products sectors. The biomaterials research is not part of the Ensis joint venture.

All Christchurch staff are part of Ensis and are located in one of three business units: Forests and Environment, Forest Biosecurity and Protection, and Wood Quality. Areas of research include sustainable forest management, forest soils and nutrition, application of biosolids to forests, wood quality, structure and properties of wood and wood composite materials, indigenous forest ecology, indigenous forest management and restoration, wilding conifer/pine control, biodiversity in plantation forests, forest insect pest ecology and management, forest and rural fire behaviour and management, and social research with the community (fire, waste and biosecurity). (www.scionresearch.com)

## LANDCARE RESEARCH

Manaaki Whenua – Landcare Research is an environmental research organisation with about 390 staff nationally. The largest of nine research sites is located at Lincoln.

Research is organised into two portfolios: Biological Systems, and Environment and Society, each comprising five science teams. The Biological Systems science teams are Biodiversity and Conservation, Biosystematics, Ecosystem Processes, Pest Control Technologies, and Wildlife Ecology and Epidemiology. The Environment and Society science teams are Built Environments, Global Change Processes, Informatics, Soils and Landscapes, and Sustainability and Society.

Research specifically focused on the forestry sector includes:

- biocontrol of weeds in forests;
- silvicultural systems for sustainable indigenous forestry;
- environmental effects of plantation forestry – including impacts on soils, water, erosion and sediment yield;
- remote sensing, GIS analysis and modelling for forest management purposes;
- pest management in forests.

(www.landcareresearch.co.nz)

## NEW ZEALAND SCHOOL OF FORESTRY

The School of Forestry at the University of Canterbury offers the only professional forestry degree programmes in New Zealand. These are:

- Bachelor of Forestry Science;
- Bachelor of Forest Engineering;
- Postgraduate Diploma in Forestry;
- Master of Forestry Science;
- PhD in Forestry.

In addition to research undertaken by staff, research programmes are offered as part of the postgraduate and undergraduate degrees. The School of Forestry also interacts with the Wood Technology Research Centre at the University. (www.fore.canterbury.ac.nz)

### FITEC

FITEC (Forest Industries Training Education Council) is the forest industry-owned training organisation covering:

- forest establishment, silviculture and harvesting;
- solid wood processing;
- pulp and paper converting;
- wood panel manufacturing;
- forest health and biosecurity; and
- credit and finance.

FITEC also has responsibilities that include:

- setting national standards and qualifications and developing learning resources;
- developing training programmes for employers and employees;
- developing arrangements for training delivery;
- maintaining a database of trainees and their learning records;
- arranging quality assurance of training producers, industry trainers and assessors; and
- providing leadership in industry on skills and learning issues.

FITEC has a training advisor covering Canterbury and the West Coast. (www.fitec.org.nz)

# INFRASTRUCTURE 7

## PORTS

### LYTTELTON PORT OF CHRISTCHURCH

Lyttelton Port is 12 kilometres from Christchurch and provides a natural deep harbour with the main navigation channel maintained to a depth of 11.9 metres below chart datum. This enables access by vessels at high tide with a draught of up to 12.4 metres. There are four heavy-duty berths for handling containerised cargo, multi-purpose vessels, roll-on/roll-off and conventional vessels, another eight berths for general cargo, and an oil berth. Facilities for loading and unloading bulk products, including logs, and conventional break-bulk, are provided.

For the year ended June 2007 some 242 000 tonnes of containerised timber, MDF and paper products, plus 148 000 tonnes of logs, were exported from Lyttelton Port. The main forestry export markets serviced from Lyttelton are Australia, Asia, North America and Europe. (www.lpc.co.nz)

### PRIMEPORT TIMARU

PrimePort Timaru has nine berths, two of which are suitable for container handling and two that are used for log exports. The port is regularly served by vessels up to 225 metres in length and up to 11.4 metres draft. PrimePort Timaru handles containers, breakbulk and project cargoes, bulk grains and seeds, bulk liquids and fish cargoes. It also has an inland container port (PrimePort Canterbury) located at Toll Tranz Link's Middleton depot in Christchurch, providing a twice daily service to and from Timaru.

Log export shipments are accumulated at a six-hectare, multi-user harbourside log yard at Evans Bay on the southern side of the port. Significant volumes of processed wood products, both containerised and in pack form, are exported from Timaru utilising regular container/break-bulk shipping services to all global ports. (www.primeport.co.nz)

## ROAD TRANSPORT

Canterbury is well served with highway standard and secondary roading systems. The extensive alluvial plains provide easy transport routes and low-cost road maintenance. Canterbury's roading infrastructure is generally capable of handling the forecast wood volumes.

## RAIL TRANSPORT

Christchurch and Timaru are located near the centre of Toll Rail's east coast main trunk line, which runs the length of the South Island connecting the ports of Picton and Bluff. The ports at Lyttelton and Timaru are also serviced by rail. The West Coast/Canterbury railway line connects with the East Coast line at Rolleston, about 20 kilometres south of Christchurch.

The West Coast line has long been used for transporting timber into Canterbury. The rail link to Canterbury is strategically important because there are no major export ports on the West Coast, and a small population means there is minimal local demand for forest products.

## ENERGY

Combustion of woody biomass provides the source for 50 to 55 percent of the New Zealand forest industries' energy consumption, while electricity accounts for about 25 percent and the balance comes from gas, coal and oil.

Any new wood processing development in Canterbury, or any significant expansion of existing processing plants, will need to consider the availability of electricity and other energy sources. A large wood processing complex could use about 20 megawatts per year.

The Canterbury region consumes about 57.87 petajoules (PJ) of energy per year, of which biomass accounts for 7.15 PJ, electricity 14.57 PJ, and fossil fuels 36.14 PJ (Energy Efficiency and Conservation Authority, 2007).

The average annual increase in total energy consumption for the period from 1982 to 2004 has been 2.9 percent, which is similar to the increase reported for the industrial/commercial sector at 3 percent per annum (Environment Canterbury, 2006).

In addition to the trend of increasing total demand for energy, Canterbury faces some specific challenges associated with summer peak demand for electricity due to energy-intensive irrigation, and the upgrade of transmission and distribution networks (O'Connell and Hooper, 2006). Transpower has identified the need for a new line from the Waitaki Valley to Christchurch by 2012 (O'Connell, 2005).

The Regional Energy Strategy being prepared by Environment Canterbury is intended to provide a framework within which energy issues can be addressed.

# 8 OPPORTUNITIES AND CONSTRAINTS

## OPPORTUNITIES

### WOOD AVAILABILITY

The wood availability forecasts indicate that the harvested volumes of radiata pine are likely to remain static for the next ten years at around 800 000 cubic metres per year, with the potential for additional wood from the small-scale forest owners compensating for reductions in harvested wood from the large-scale forest owners. However, both the timing of harvesting and the volumes realised from the small-scale owners' resource involve more uncertainty than from the large-scale owners' resource. Consequently variability in harvesting levels over this ten-year period can be expected.

Beyond 2017 there is potential for a significant increase in the harvested volume of radiata pine to a level approaching 1.3 million cubic metres per year for nearly 20 years and perhaps beyond, depending on trends in new planting and deforestation. However, this increase is driven by the maturing of the resource planted by a multitude of small-scale forest owners during the 1990s. This resource was not necessarily planted purely for commercial purposes. Again, the timing of the harvesting is therefore more uncertain.

The quantity and quality of that resource are also less well understood and may provide some challenges for wood processors. In addition, to utilise this resource wood processors will have a more complicated task sourcing logs from a large number of small-scale forest owners, each providing irregular or one-off harvests. To date, co-operative forest management models have not found favour among small-scale forest owners in New Zealand.

Utilising the potential provided by increasing levels of wood availability in ten years' time will not be without its obstacles.

The wood availability forecasts indicate that the harvested volumes of Douglas-fir are also likely to remain static at about 60 000 cubic metres per year through to about 2015. There is potential for a significant increase in harvested Douglas-fir volumes beyond 2025, again driven by the resource of the small-scale forest owners.

### NEW PROCESSING OPPORTUNITIES

From about 2017, an additional 400 000 to 500 000 cubic metres per year of radiata pine provides potential opportunities for existing wood processing plants to increase production, and for the development of new wood processing facilities within the region. The volume is sufficient to support one or two large-scale (by New Zealand standards) wood processing ventures, or a number of small to medium-scale initiatives. The latter may be a more likely scenario as the small-scale forest owner resource is scattered throughout Canterbury.

The increase in available wood will not automatically lead to the establishment of new processing plants. Recent attempts in some parts of New Zealand to gain resource consents for "greenfield" facilities have met with opposition from community groups. This has encouraged timber companies to expand existing plants rather than build new facilities. However, Canterbury has a ten-year lead-in time and the potential for new wood processing facilities should be addressed in the reviews of district plans that will occur during that period.

New processing facilities will only be established if their products can compete in the international market. Economies of scale, increased wood processing efficiency, the use of innovative technology, improved productivity and reduced costs – these are all important factors, as are the types of products.

### › PLANTATION FOREST EXPANSION ON THE HILL AND HIGH COUNTRY

The last few years have seen significant areas of plantation forest cleared from the Canterbury Plains. The degree to which this may continue after 2007 is difficult to predict, not just because the first Kyoto commitment period will have commenced, but also because the economics of primary industries move through cycles. However, development of the Canterbury forest growing sector is likely to continue to focus on the hill and high country which generally contains the best land in the region for forest growing. Controls under the Resource Management Act 1991 (see below under constraints) may significantly influence the degree to which new forest development can occur.

Most Canterbury hill country soils are hill and steepland yellow-brown earths with low to moderate fertility that is usually adequate for good tree growth. Widespread boron deficiencies occur and should be corrected. Rainfall varies considerably and has a major influence on potential tree growth. Sites exposed to north-west storms may be unsuitable for forestry, and the potential for snow may influence species choice.

### › SPECIES DIVERSIFICATION

Canterbury has a relatively high 28 percent of the plantation forest resource held by owners with less than 40 hectares (only 15 percent of the New Zealand resource is held by these small-scale owners). Small-scale forest owners are more likely to plant species other than radiata pine or Douglas-fir (or often in addition to these species), the traditional domains of the large-scale forest owners. In addition to the small-scale forest owners, the New Zealand Redwood Company is establishing a significant redwood resource within the region.

There is potential for Canterbury to develop a modest alternative species-based forest industry.

## »» CONSTRAINTS

### › GENERAL CONSTRAINTS

A number of factors are constraining the development of the forest industry across New Zealand. The most prominent include: requirements under the Resource Management Act 1991; uncertainty associated with climate change policy development; compliance costs; skill shortages; distance from markets; shipping costs; the strength of the New Zealand dollar; the fragmentation of the industries; increased competition from low-cost overseas producers; non-tariff barriers; and the increased competition from wood substitutes.

Particular constraints for Canterbury are described below.

### › RESOURCE MANAGEMENT ACT 1991

While the hill and high country provide the best land in Canterbury for forest growing, they are also subject to regional and district plan objectives, policies and rules that are likely to constrain forest establishment.

Environment Canterbury's Proposed Natural Resources Regional Plan contains provisions to protect in-stream values and the reliability of supply to existing abstractors from the effects of change from short to tall vegetation in flow-sensitive catchments. These catchments cover a large part of the Canterbury foothills and parts of Banks Peninsula, and can restrict new planting as a permitted activity to between 5 and 20 percent of a property. Further catchments may be added to the lists subject to the provisions.

At the district level, landscape-based provisions affect forest establishment across most of the hill and high country, requiring land use consents as controlled or discretionary activities.

The costs and uncertainties that arise from seeking land use consents under these provisions may act as significant disincentives to forest establishment.

### › PHYSICAL CONSTRAINTS

Forestry in Canterbury has had to evolve with topographically enhanced north-west wind storms that have periodically caused major damage to the plantation forest resource. The expectation is that climate change will result in more frequent westerly winds with a greater risk of severe winds and storms (Ministry for the Environment, 2006).

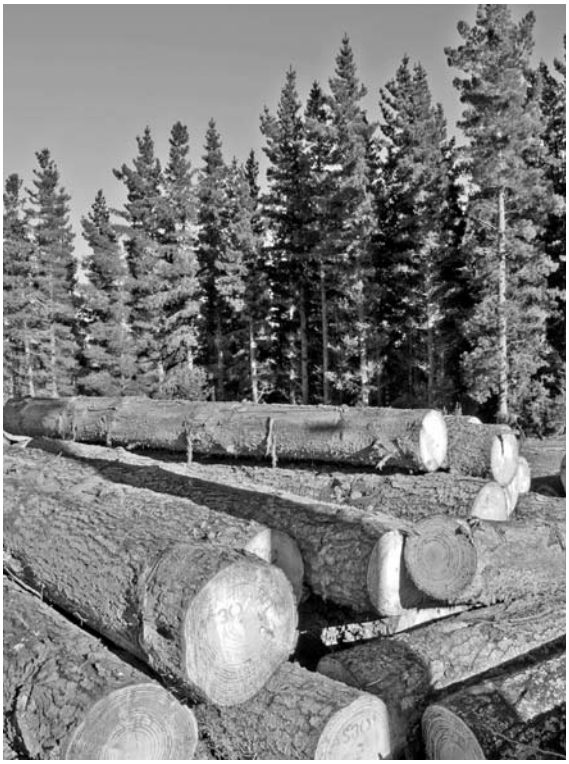
Climate change is also expected to result in higher fire risks along the east of New Zealand, including Canterbury (NIWA, 2005).

The forest owners in Canterbury will need strategies to manage the risks that arise from these physical factors.

## »» CONCLUDING COMMENTS

The forest industry in Canterbury is being significantly influenced by a period of deforestation and land use change on the Canterbury Plains, driven by cyclical trends in primary industries. The full impacts of these have yet to play out, but the dynamics of wood availability will change. Provisions in regional and district plans mean the development of new plantation forests on the hill and high country is uncertain.

The wood availablity forecasts indicate that the harvested volumes from Canterbury's plantation forests are likely to remain relatively static for the next 10 years, followed by significant increases in available wood. As all district plans in the region will be subject to review during this period, there is a window of opportunity to ensure they provide appropriately for future investment in wood processing.



# WEBSITE ADDRESSES

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## FOR MORE INFORMATION[3]

### FOREST NURSERIES

Rangiora Nursery
www.rangioranursery.co.nz

Southern Cypresses Ltd
www.cypress.co.nz

Southern Woods Tree Nursery
www.southernwoods.co.nz

### FOREST OWNERS/MANAGERS

Ashburton District Council
www.ashburtondc.govt.nz/services/forestry/

Blakely Pacific Ltd
www.blakely-pacific.co.nz

Environment Canterbury
www.ecan.govt.nz

Matariki Forests
www.rayonier.com

NZ Redwood Company
www.nzredwood.co.nz

Selwyn Plantation Board Ltd
www.spbl.co.nz

Warren Forestry
www.warrenforestry.com

### WOOD PROCESSORS

Carter Holt Harvey
www.chh.co.nz

Gunns Veneer
www.gunnsveneers.co.nz

Hunter Hills Lumber
www.hunterhills.co.nz

McAlpines Sawmilling Ltd
www.mcalpines.co.nz

McVicar Timber Group Ltd
www.mcvicar.co.nz

SRS New Zealand
www.srs.co.nz

### PORT COMPANIES

Lyttelton Port of Christchurch
www.lpc.co.nz

PrimePort Timaru
www.primeport.co.nz/

### FORESTRY RESEARCH, EDUCATION AND TRAINING

Scion and Ensis
www.scionresearch.com

Landcare Research
www.landcaresearch.co.nz

New Zealand School of Forestry
www.fore.canterbury.ac.nz

FITEC
www.fitec.org.nz

### GOVERNMENT DEPARTMENTS

Department of Conservation
www.doc.govt.nz

Ministry of Agriculture and Forestry – Home Page
www.maf.govt.nz/mafnet/index.htm

Ministry of Agriculture and Forestry – Forestry Statistics
www.maf.govt.nz/statistics/primaryindustries/forestry/index.htm

Statistics New Zealand
www.stats.govt.nz/default.htm

[3] All accessed 5 December 2007.

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# REFERENCES

Burdon, R D; Miller, J T (ed) (1992) *Introduced forest trees in New Zealand: Recognition, role and seed source – 12 Radiata pine, Pinus radiata* D. Don, FRI Bulletin No. 124, New Zealand Forest Research Institute Limited, Rotorua.

Energy Efficiency and Conservation Authority (2007). The EECA Energy End Use Database, at http://www.eeca.govt.nz/enduse/endusesearchresults.aspx?type=A. Accessed 5 December 2007.

Environment Canterbury (2006) *Regional energy survey 2004, Report No. R06/28*, ISBN 1-86937-612-9, May 2006, Environment Canterbury.

Ministry of Agriculture and Forestry (2000) *National Exotic Forest Description, National and Regional Wood Supply Forecasts 2000.* Ministry of Agriculture and Forestry, August 2000.

Ministry of Agriculture and Forestry (2006) *A National Exotic Forest Description as at 1 April 2005*. Ministry of Agriculture and Forestry, March.

Ministry of Agriculture and Forestry (2007) *A National Exotic Forest Description as at 1 April 2006*. Ministry of Agriculture and Forestry, May.

Ministry for the Environment (2006) *Preparing for and adapting to climate change. Look ahead to the future.* Ministry for the Environment, December.

NIWA (2005). *Climate change increases fire risk*, NIWA Natural Hazards Update No. 4, July. National Institute of Water and Atmospheric Research.

O'Connell, M (2005) *Energy into the future for the Canterbury region*, Canterbury Region Energy Seminars Briefing Paper, Report No. U05/90, Environment Canterbury.

O'Connell, M; Hooper, G (2006). *Energy into the future: Creating a long-term balance between energy planning and desired community outcomes.* A paper presented to the EEA Annual Conference.

Selwyn Plantation Board Limited (2007). *History,* at http://www.spbl.co.nz/SPBL.php?page=History. Accessed 5 December 2007.

Simpson, T E (1973). *Kauri to radiata.* Hodder and Stoughton Ltd, Auckland.

# APPENDIX 11

| TABLE | DESCRIPTION | CORRESPONDS TO: |
|---|---|---|
| Table 1 | Canterbury harvest intentions survey results, large-scale owners | N/A |
| Table 2 | Canterbury radiata pine availability under Scenario 1, (unconstrained cut), for all owners | Figure 4.3 |
| Table 3 | Canterbury radiata pine availability under Scenario 2 | Figure 4.7 |
| Table 4 | Canterbury radiata pine availability under Scenario 3 | Figure 4.8 |
| Table 5 | Canterbury radiata pine availability under Scenario 4, by log grade, for all owners | Figure 4.12 |
| Table 6 | Canterbury radiata pine recoverable volume and average clearfell age for each target rotation age under Scenario 5, for all owners | Figure 4.14 |
| Table 7 | Wood availability and average clearfell age for other species (Douglas-fir) in Canterbury | Figure 4.16 |

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 1: CANTERBURY HARVEST INTENTIONS SURVEY RESULTS, LARGE-SCALE OWNERS

| | EXPECTED HARVEST 2005 | HARVEST INTENTIONS FOR SUBSEQUENT 10 YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| **RADIATA PINE** | | | | | | | | | | | |
| Pruned ($m^3$) | 43 891 | 27 812 | 35 896 | 35 976 | 36 456 | 36 856 | 10 087 | 10 087 | 10 087 | 13 257 | 15 247 |
| Unpruned ($m^3$) | 435 511 | 468 588 | 440 003 | 388 977 | 388 102 | 392 892 | 357 309 | 358 039 | 361 639 | 361 647 | 368 369 |
| Pulp ($m^3$) | 258 805 | 295 104 | 266 140 | 177 753 | 176 153 | 174 013 | 135 846 | 136 106 | 136 896 | 140 190 | 141 456 |
| **Total ($m^3$)** | **738 207** | **791 504** | **742 039** | **602 706** | **600 711** | **603 761** | **503 242** | **504 232** | **508 622** | **515 094** | **525 072** |
| **Area radiata (ha)** | **2 029** | **2 131** | **1 877** | **1 643** | **1 657** | **1 641** | **1 313** | **1 319** | **1 333** | **1 331** | **1 347** |
| **DOUGLAS-FIR** | | | | | | | | | | | |
| Unpruned ($m^3$) | 4 398 | 37 751 | 35 051 | 32 976 | 32 976 | 32 976 | 33 127 | 31 652 | 31 652 | 31 652 | 31 652 |
| Pulp ($m^3$) | 1 424 | 11 245 | 9 925 | 9 450 | 9 450 | 9 450 | 13 159 | 12 974 | 12 974 | 12 974 | 12 974 |
| **Total ($m^3$)** | **5 822** | **48 996** | **44 976** | **42 426** | **42 426** | **42 426** | **46 286** | **44 626** | **44 626** | **44 626** | **44 626** |
| **OTHER SPECIES** | | | | | | | | | | | |
| Unpruned ($m^3$) | 77 | 10 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pulp ($m^3$) | 49 | 3 761 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total ($m^3$)** | **126** | **13 891** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **TOTAL ALL SPECIES ($M^3$)** | 744 155 | 854 391 | 787 015 | 645 132 | 643 137 | 646 187 | 549 528 | 548 858 | 553 248 | 559 720 | 569 698 |

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 2: CANTERBURY RADIATA PINE AVAILABILITY UNDER SCENARIO 1 (UNCONSTRAINED CUT), FOR ALL OWNERS

| YEAR ENDING DECEMBER | RECOVERABLE VOLUME (000 $M^3$ IB) |
|---|---|
| 2005 | 828 |
| 2006 | 882 |
| 2007 | 834 |
| 2008 | 1 039 |
| 2009 | 351 |
| 2010 | 257 |
| 2011 | 642 |
| 2012 | 650 |
| 2013 | 677 |
| 2014 | 813 |
| 2015 | 1 150 |
| 2016 | 1 068 |
| 2017 | 934 |
| 2018 | 680 |
| 2019 | 830 |
| 2020 | 825 |
| 2021 | 811 |
| 2022 | 1 536 |
| 2023 | 1 709 |
| 2024 | 2 542 |
| 2025 | 1 973 |
| 2026 | 2 802 |
| 2027 | 1 967 |
| 2028 | 1 310 |
| 2029 | 1 245 |
| 2030 | 1 559 |
| 2031 | 1 213 |
| 2032 | 977 |
| 2033 | 1 091 |
| 2034 | 664 |
| 2035 | 488 |
| 2036 | 666 |
| 2037 | 689 |
| 2038 | 621 |
| 2039 | 1 030 |
| 2040 | 311 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 3: CANTERBURY 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.

| | RECOVERABLE VOLUME | | |
|---|---|---|---|
| YEAR ENDING DECEMBER | LARGE-SCALE OWNERS (000 $M^3$ IB) | SMALL-SCALE OWNERS (000 $M^3$ IB) | ALL OWNERS (000 $M^3$ IB) |
| 2005 | 738 | 90 | 828 |
| 2006 | 792 | 90 | 882 |
| 2007 | 744 | 90 | 834 |
| 2008 | 603 | 427 | 1 030 |
| 2009 | 601 | 139 | 740 |
| 2010 | 604 | 180 | 784 |
| 2011 | 503 | 115 | 618 |
| 2012 | 504 | 133 | 637 |
| 2013 | 509 | 100 | 609 |
| 2014 | 515 | 318 | 833 |
| 2015 | 525 | 370 | 895 |
| 2016 | 533 | 319 | 853 |
| 2017 | 533 | 235 | 769 |
| 2018 | 533 | 230 | 763 |
| 2019 | 533 | 160 | 693 |
| 2020 | 533 | 343 | 876 |
| 2021 | 533 | 388 | 922 |
| 2022 | 533 | 1 144 | 1 677 |
| 2023 | 533 | 1 369 | 1 902 |
| 2024 | 533 | 2 092 | 2 625 |
| 2025 | 533 | 1 543 | 2 077 |
| 2026 | 533 | 2 080 | 2 613 |
| 2027 | 533 | 1 397 | 1 931 |
| 2028 | 533 | 638 | 1 171 |
| 2029 | 533 | 463 | 997 |
| 2030 | 533 | 649 | 1 182 |
| 2031 | 533 | 432 | 965 |
| 2032 | 533 | 231 | 764 |
| 2033 | 533 | 444 | 978 |
| 2034 | 533 | 164 | 698 |
| 2035 | 533 | 5 | 538 |
| 2036 | 533 | 86 | 620 |
| 2037 | 533 | 92 | 626 |
| 2038 | 533 | 98 | 631 |
| 2039 | 533 | 429 | 962 |
| 2040 | 533 | 149 | 682 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 4: CANTERBURY 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 $M^3$ IB) | SMALL-SCALE OWNERS (000 $M^3$ IB) | ALL OWNERS (000 $M^3$ IB) |
| 2005 | 738 | 90 | 828 |
| 2006 | 792 | 90 | 882 |
| 2007 | 744 | 90 | 834 |
| 2008 | 603 | 238 | 841 |
| 2009 | 601 | 240 | 841 |
| 2010 | 604 | 237 | 841 |
| 2011 | 503 | 338 | 841 |
| 2012 | 504 | 337 | 841 |
| 2013 | 509 | 357 | 866 |
| 2014 | 515 | 351 | 866 |
| 2015 | 525 | 341 | 866 |
| 2016 | 533 | 333 | 866 |
| 2017 | 533 | 420 | 953 |
| 2018 | 533 | 515 | 1 048 |
| 2019 | 533 | 562 | 1 096 |
| 2020 | 533 | 562 | 1 096 |
| 2021 | 533 | 562 | 1 096 |
| 2022 | 533 | 562 | 1 096 |
| 2023 | 533 | 562 | 1 096 |
| 2024 | 533 | 562 | 1 096 |
| 2025 | 533 | 562 | 1 096 |
| 2026 | 533 | 562 | 1 096 |
| 2027 | 533 | 562 | 1 096 |
| 2028 | 533 | 562 | 1 096 |
| 2029 | 533 | 562 | 1 096 |
| 2030 | 533 | 562 | 1 096 |
| 2031 | 533 | 562 | 1 096 |
| 2032 | 533 | 562 | 1 096 |
| 2033 | 533 | 562 | 1 096 |
| 2034 | 533 | 562 | 1 096 |
| 2035 | 533 | 562 | 1 096 |
| 2036 | 533 | 562 | 1 096 |
| 2037 | 533 | 562 | 1 096 |
| 2038 | 533 | 562 | 1 096 |
| 2039 | 533 | 562 | 1 096 |
| 2040 | 533 | 562 | 1 096 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 5: CANTERBURY 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 | TOTAL (000 $M^3$ IB) | RECOVERABLE VOLUME BY LOG TYPE | | |
|---|---|---|---|---|
| | | PRUNED LOGS (000 $M^3$ IB) | UNPRUNED LOGS (000 $M^3$ IB) | CHIP LOGS (000 $M^3$ IB) |
| 2005 | 828 | 51 | 498 | 279 |
| 2006 | 882 | 36 | 537 | 309 |
| 2007 | 834 | 39 | 519 | 278 |
| 2008 | 830 | 56 | 548 | 227 |
| 2009 | 830 | 69 | 536 | 226 |
| 2010 | 830 | 70 | 533 | 227 |
| 2011 | 830 | 74 | 530 | 226 |
| 2012 | 830 | 57 | 540 | 234 |
| 2013 | 830 | 66 | 533 | 231 |
| 2014 | 830 | 66 | 535 | 230 |
| 2015 | 830 | 60 | 540 | 231 |
| 2016 | 830 | 66 | 536 | 230 |
| 2017 | 830 | 72 | 531 | 228 |
| 2018 | 913 | 79 | 583 | 250 |
| 2019 | 1 004 | 71 | 652 | 281 |
| 2020 | 1 105 | 66 | 727 | 311 |
| 2021 | 1 215 | 73 | 800 | 343 |
| 2022 | 1 274 | 80 | 836 | 359 |
| 2023 | 1 274 | 88 | 832 | 355 |
| 2024 | 1 274 | 97 | 827 | 350 |
| 2025 | 1 274 | 107 | 821 | 345 |
| 2026 | 1 274 | 117 | 816 | 339 |
| 2027 | 1 274 | 106 | 825 | 342 |
| 2028 | 1 274 | 95 | 834 | 344 |
| 2029 | 1 274 | 105 | 830 | 339 |
| 2030 | 1 274 | 115 | 824 | 335 |
| 2031 | 1 274 | 127 | 817 | 331 |
| 2032 | 1 274 | 130 | 815 | 329 |
| 2033 | 1 274 | 117 | 824 | 332 |
| 2034 | 1 274 | 105 | 832 | 336 |
| 2035 | 1 147 | 95 | 748 | 303 |
| 2036 | 1 032 | 85 | 673 | 273 |
| 2037 | 929 | 77 | 605 | 246 |
| 2038 | 929 | 70 | 610 | 248 |
| 2039 | 929 | 64 | 613 | 251 |
| 2040 | 929 | 68 | 609 | 251 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 6: CANTERBURY 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 $M^3$ IB) | AVERAGE AGE (YEARS) | RECOVERABLE VOLUME (000 $M^3$ IB) | AVERAGE AGE (YEARS) | RECOVERABLE VOLUME (000 $M^3$ IB) | AVERAGE AGE (YEARS) |
| 2005 | 828 | 30 | 828 | 30 | 828 | 30 |
| 2006 | 882 | 29 | 882 | 29 | 882 | 29 |
| 2007 | 834 | 28 | 834 | 28 | 834 | 28 |
| 2008 | 880 | 30 | 830 | 30 | 744 | 30 |
| 2009 | 880 | 30 | 830 | 30 | 744 | 30 |
| 2010 | 880 | 29 | 830 | 29 | 744 | 30 |
| 2011 | 880 | 29 | 830 | 29 | 744 | 30 |
| 2012 | 880 | 28 | 830 | 29 | 744 | 30 |
| 2013 | 880 | 28 | 830 | 29 | 744 | 29 |
| 2014 | 880 | 28 | 830 | 29 | 744 | 30 |
| 2015 | 880 | 28 | 830 | 29 | 744 | 30 |
| 2016 | 968 | 28 | 830 | 29 | 744 | 30 |
| 2017 | 1 064 | 27 | 830 | 29 | 744 | 31 |
| 2018 | 1 171 | 28 | 913 | 29 | 744 | 30 |
| 2019 | 1 250 | 28 | 1 004 | 29 | 744 | 31 |
| 2020 | 1 250 | 28 | 1 105 | 29 | 818 | 31 |
| 2021 | 1 250 | 28 | 1 215 | 29 | 900 | 30 |
| 2022 | 1 250 | 28 | 1 274 | 29 | 990 | 30 |
| 2023 | 1 250 | 29 | 1 274 | 29 | 1 089 | 31 |
| 2024 | 1 250 | 29 | 1 274 | 29 | 1 198 | 31 |
| 2025 | 1 250 | 29 | 1 274 | 30 | 1 318 | 31 |
| 2026 | 1 250 | 30 | 1 274 | 30 | 1 331 | 31 |
| 2027 | 1 250 | 30 | 1 274 | 31 | 1 331 | 32 |
| 2028 | 1 250 | 31 | 1 274 | 31 | 1 331 | 32 |
| 2029 | 1 250 | 31 | 1 274 | 32 | 1 331 | 33 |
| 2030 | 1 250 | 31 | 1 274 | 32 | 1 331 | 33 |
| 2031 | 1 250 | 31 | 1 274 | 33 | 1 331 | 34 |
| 2032 | 1 250 | 31 | 1 274 | 33 | 1 331 | 35 |
| 2033 | 1 125 | 31 | 1 274 | 33 | 1 331 | 35 |
| 2034 | 1 013 | 30 | 1 274 | 33 | 1 331 | 36 |
| 2035 | 912 | 29 | 1 147 | 33 | 1 331 | 36 |
| 2036 | 912 | 28 | 1 032 | 33 | 1 331 | 36 |
| 2037 | 912 | 28 | 929 | 33 | 1 198 | 36 |
| 2038 | 912 | 28 | 929 | 32 | 1 078 | 36 |
| 2039 | 912 | 28 | 929 | 32 | 970 | 35 |
| 2040 | 912 | 28 | 929 | 31 | 970 | 36 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.

# CANTERBURY WOOD AVAILABILITY FORECAST FOR THE PERIOD 2007–2040

## TABLE 7: WOOD AVAILABILITY AND AVERAGE CLEARFELL AGE FOR OTHER SPECIES (DOUGLAS-FIR) IN CANTERBURY

| YEAR ENDING DECEMBER | RECOVERABLE VOLUME (000 $M^3$ IB) | AVERAGE AGE (YEARS) |
|---|---|---|
| 2005 | 8 | 59 |
| 2006 | 51 | 54 |
| 2007 | 58 | 48 |
| 2008 | 58 | 48 |
| 2009 | 58 | 46 |
| 2010 | 58 | 46 |
| 2011 | 58 | 46 |
| 2012 | 58 | 46 |
| 2013 | 58 | 46 |
| 2014 | 58 | 46 |
| 2015 | 58 | 46 |
| 2016 | 95 | 46 |
| 2017 | 95 | 46 |
| 2018 | 95 | 46 |
| 2019 | 95 | 46 |
| 2020 | 95 | 46 |
| 2021 | 95 | 46 |
| 2022 | 95 | 46 |
| 2023 | 98 | 46 |
| 2024 | 98 | 46 |
| 2025 | 98 | 46 |
| 2026 | 98 | 46 |
| 2027 | 102 | 46 |
| 2028 | 112 | 46 |
| 2029 | 123 | 46 |
| 2030 | 135 | 46 |
| 2031 | 149 | 46 |
| 2032 | 164 | 46 |
| 2033 | 180 | 46 |
| 2034 | 198 | 46 |
| 2035 | 218 | 46 |
| 2036 | 240 | 46 |
| 2037 | 264 | 46 |
| 2038 | 271 | 46 |
| 2039 | 271 | 46 |
| 2040 | 271 | 46 |

**Note**
IB denotes inside bark: the recoverable volume of wood excluding bark.