

Identifying processing opportunities for key specialty tree species – resource analysis

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EXECUTIVE SUMMARY

This report covers the current and projected supply of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), Cypresses and *Eucalyptus nitens* (Deane & Maiden) Maiden across all the major wood supply regions of New Zealand. Gathering this data is an important preparatory step prior to running the WoodScape model, as the economics of different processing options are very dependent on the location, and long term stability, of the wood supply. This will help to highlight areas where a lack of suitable wood supply is the major barrier to profitability.

The supply projects in this report are based off the Ministry of Primary Industries National Exotic forest description and associated yield tables.

For most species and regions there are highly variable volumes of supply over time, which makes developing processing of, and markets for, the wood products from these species challenging.

Estimates of area and timing of new plantings to stabilise these supplies have been made. In some cases this is very difficult to achieve and would take many decades for the new plantings to mature.

Further, for some species and regions there are issues which limit the likelihood of expanded plantings. For example;

- Douglas-fir - North Island – major growers have concerns over the impact of Swiss Needle Cast on crop productivity and are likely to convert Douglas-fir stands to *Pinus radiata* as they are more confident in the returns from that approach
- Douglas-fir - South Island – there are major barriers to expanded Douglas for, or even restocking of Douglas for stands due to concerns over the spread of wildings onto neighbouring land.
- Cypress species – some regions with large areas of Cypress plantings have issues with crop and log quality, these are sufficient to suggest that it is a barrier to replanting or expansion of the area in cypresses.

For *Eucalyptus nitens* there are opportunities to expand the estate in Otago Southland and also in the CNI (with careful management). These regions have a history of these plantings, and established processing and markets.

Across the country niche opportunities exist for small-scale processing of the three species addressed.

The logs and product prices and the financial viability of these opportunities will be addressed in a separate report.

INTRODUCTION

The Speciality Wood Products (SWP) Research Partnership wishes to know what opportunities there are for processing of their species of interest in New Zealand, in comparison to *P. radiata* processing in terms of financial returns. The focus of this work is on Douglas-fir, Cypress and Eucalyptus species (both durable and non-durable).

Around 89% (1.535M ha) of New Zealand's plantation forest area (1.75M ha) is in *Pinus radiata* (MPI, 2016) and over 90% of the harvest volume is *Pinus radiata*. A further 6% of the plantation area (104,000 ha) is Douglas-fir, 0.6% (9,855 ha) in *Cupressus macrocarpa* and 1.6% in other softwoods. Eucalyptus species together are 23,182 ha (1.35% of the area) and other hardwoods are 0.7% by area. Of the total area in plantation forest in NZ, 70% is in the North Island and 30% in the South Island.

For tree health reasons many specialty species are grown predominantly in the South Island. 79% of the D fir plantings are in the South Island and 54% of the national total is in Otago and Southland. For the Eucalyptus plantings, 59% of the national total is in the South Island, with most of this (54% of national area) in Otago and Southland. As there are known to be large planting (over 10,000 ha) so of *Eucalyptus nitens* in Southland and Otago it can be interpreted that most of the Eucalyptus plantings in this region are *E. nitens*.

The Ministry of Primary Industries (MPI, 2016) National Exotic Forest Description (NEFD) figures are further broken down into territorial authorities to identify where the wood resource is located.

These data can be used to determine both the approximate locations of the forest estate of interest (Douglas-fir, Cypress and Eucalyptus species) and the scale and timing of wood production. The scale and type of the wood processing opportunity will be dictated by the size of the resource in the long run. National level data for Douglas-fir (Appendix 1) and aggregated Eucalyptus species (Appendix 2) are available from the Ministry of Primary Industries (MPI) website.

For Douglas-fir in Otago and Southland there are long term projections of clearfell wood supply in the most recent wood availability forecasts (WAFs), (MPI, 2014). There is no data presented for other regions for Douglas-fir and for the Eucalyptus species there is no regional forecast. For other regions and specialty species the latest MPI National Exotic Forest Description (NEFD) and MPI yield tables can be used to estimate the volume of wood available over time at a regional or district level. This volume analysis is essential as it will dictate not only the size of any processing plant but the type. Some wood processing plants (e.g. pulp mills) are only viable at very large scale (~1.0M m³ per annum).

There is no data on production thinnings volumes in the MPI WAFs so estimates will have to be made based on the NEFD data, yield tables, assumptions about thinning age and slope information based on GIS analysis. These estimates will have to be sense checked by local forestry companies and SWP partners. Further, the dimensions (length, sed, knot sizes) of the thinnings will have an impact on potential end uses, to some extent these can be derived from modelling, but sense checking with the local growers will be essential.

In 2012 Scion conducted the WoodScape study, which developed a model (WoodScape). The WoodScape study was prompted by the Woodco strategic goal of increasing on-shore wood processing, reducing log export volumes and adding \$6 billion to NZ's export earnings. The model developed for the WoodScape project enables comparison of financial returns from a wide range of wood processing options off a common basis. The model currently has 116 wood processing options, including 59 different processing types along with some scale variants. Further, new processing types and scale can be added to the model, as long as there is sufficient data available (capital and operating costs, log and product prices etc.).

Logs from specialty species are sometimes exported as there is no, or limited, onshore market and prices are often lower than radiata prices simply because the species is unfamiliar to the dominant

Chinese log market. A driver here is to get the maximum value from the specialty species estate by determining financially viable wood products, with a focus on Douglas-fir and Eucalyptus species.

The intent of this work is to identify the size and location of the specialty species resource, now and into the future (2050) and then determine which wood processing types, products and scales fit with these resources and have attractive financial metrics (ROCE, NPV, IRR).

At a national level there are substantial fluctuations in wood supply, based on historical planting rates. In order to stabilise wood supply there may be a need to consider new plantings. The area suitable for new plantings can be estimated using the Forest Investment Finder (FIF) model (Barry 2013)

This work will include the following species:

- Douglas-fir (rotation age to be confirmed by industry partners)
 - Douglas-fir production thinnings – subject to sufficient information being available
- *E. nitens* – focussed on Otago and Southland resource
- Cypresses (*macrocarpa* and *lusitanica*) – subject to sufficient information being available on the crop characteristics

Objectives

The objectives of this work are to;

1. Identify the long run supply volume of Douglas-fir, Cypress and Eucalyptus logs by MPI Wood supply regions and district (where a district has a significant area).
2. Where there are regions and districts with significant variation in volume over time, identify the amount of land that is available where forestry is potentially profitable and new forests could be established that would alleviate the fluctuations in log supply.
3. Establish current and historical prices for Douglas-fir, Cypress and Eucalyptus logs
4. Identify wood products that Douglas-fir, Cypress and Eucalyptus can be manufactured into, and prices for these products.

Subsequent work will include using the log volume and price data along with the WoodScape model identify the most attractive wood processing options for the different species.

Then using with the regional supply volumes, identify regions where these technologies could be applied.

The following technologies and products to be added to the WoodScape model:

Technologies

- Sawing appearance grade products with a portable mill (Woodmizer)
- Solar kiln drying
- Small (<50k m³ p.a.) appearance grade sawmill
 - With small conventional temperature (<90°C) kiln

Products

- Decking timber (cypress heartwood)
- Cladding (cypress heartwood).
- Outdoor furniture (cypress heartwood)
- Raised garden beds (cypress heartwood)

METHODS

The study was carried out using the following approach;

1. Extraction of data from the MPI NEFD and wood availability forecasts and production of long term (to 2050) wood supply data for Douglas-fir (including D fir thinnings), Cypresses and *Eucalyptus nitens* at an MPI wood supply region and regional level for those districts with significant resources. Data was summarised by species, region and presented as tables and graphs.
2. Yield data for Cypresses and Eucalypts were derived from New Zealand Farm Forestry Association Handbooks Nos 1 and 2, Best Practice with Farm Forestry Timber Species.
3. Regions with high wood supply variability were identified. For these regions acquire data from past and new FIF modelling on land area suitable (profitable) for forestry. Describe forest establishment area required to smooth wood supply in terms of species, area and timing.

DRAFT

RESULTS

In the following sections on wood supply by species there are estimates of the amount of planting required to stabilise the supply at a given level. This was done as there is a need for a stable supply at a regional level in order to encourage investment in processing.

The levels at which the supply is to be stabilised at are somewhat arbitrary, based on the judgement of the author on what is a reasonable level to target based on what has been achieved in the past (based on the data).

Wood availability

Douglas-fir

There is very little Douglas-fir in Northland, with just a few hundred cubic metres per annum projected to be available intermittently (Table 1 & Appendix 2). The main Douglas-fir resource in the North Island is in the Waikato and Bay of Plenty (CNI). This resource is forecast to be over 200,000 m³ per annum out to around 2050. The volume then declines.

Table 1 – Douglas-fir volumes, cubic metres per annum

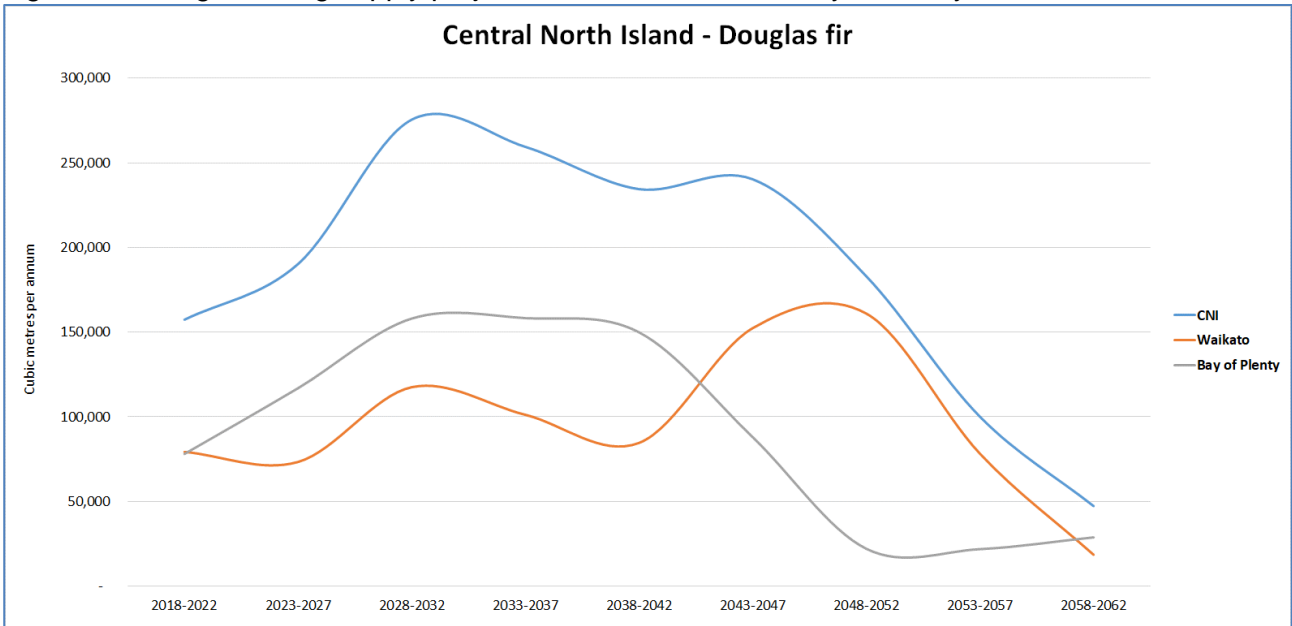
	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062
Northland	120	-	-	478	478	-	-	-	-
Waikato	79,273	73,337	117,501	101,153	84,554	152,308	160,960	78,227	18,531
Bay of Plenty	78,066	116,897	157,992	158,244	149,894	87,975	22,031	21,830	28,772
Gisborne	28,373	221	55	16,394	47,196	49,338	33,114	25,613	22,069
Hawkes Bay	7,463	1,669	1,915	7,169	8,249	4,124	1,964	2,308	4,615
SNI west	4,069	1,803	1,597	3,760	8,601	6,180	9,018	9,296	2,204
SNI East	5,356	103	155	309	1,906	2,060	433	165	185
Tasman Nelson	66,625	119,191	123,622	151,683	138,118	50,598	17,012	5,853	-
Marlborough	22,263	46,823	32,656	11,246	29,768	24,396	7,242	3,446	1,203
West Coast	17,491	5,356	569	1,327	19,055	29,293	29,009	25,596	16,116
Canterbury	9,070	96,237	91,012	242,679	455,695	480,763	263,319	100,919	114,097
Otago	99,035	225,676	195,952	237,989	1,139,170	1,224,104	482,466	400,245	387,270
Southland	50,842	96,453	61,566	326,962	1,042,187	1,078,994	420,635	152,988	174,238

Waikato and Bay of Plenty have sufficient volumes, consistently over time (Figure 1), to consider what processing options would be appropriate. However, these regions already have saw mills that take Douglas-fir and there may not be a large processing expansion opportunity. For instance the volume of logs available in the Bay of Plenty is around 20% of the intake of the Red Stag sawmill near Rotorua.

The CNI Douglas-fir volume, whilst initially around 150,000 m³ per annum, varies over time and declines to around 50,000 m³ per annum by ~2060. In order to stabilise the volume at 150,000 m³ per annum, plantings of around 200 ha per annum for 10 years (total of 2,000 ha), starting in 2020 would be required.

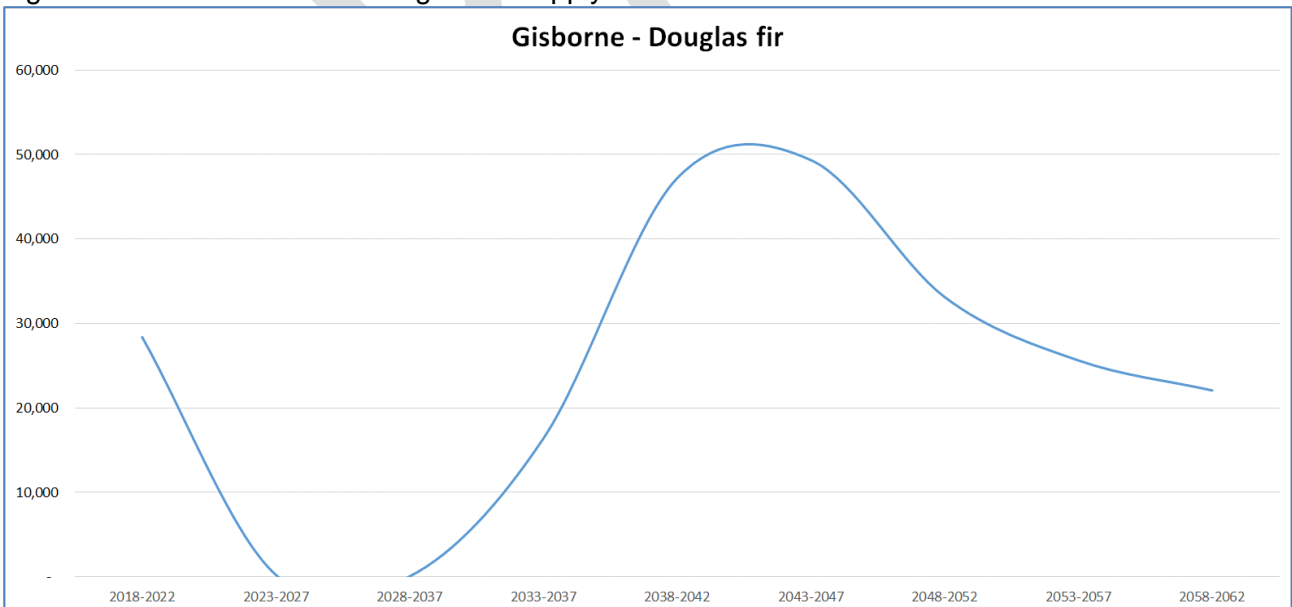
However, industry feedback suggests that rather than expanding the resource is likely to shrink as major growers reduce their area of Douglas-fir to concentrate on Pinus radiata. A key concern is the effect of Swiss Needle cast (SNC) on productivity and limited markets for the logs with most domestic mills being focussed on processing radiata.

Figure 1 – Douglas-fir log supply projections for Waikato and Bay of Plenty



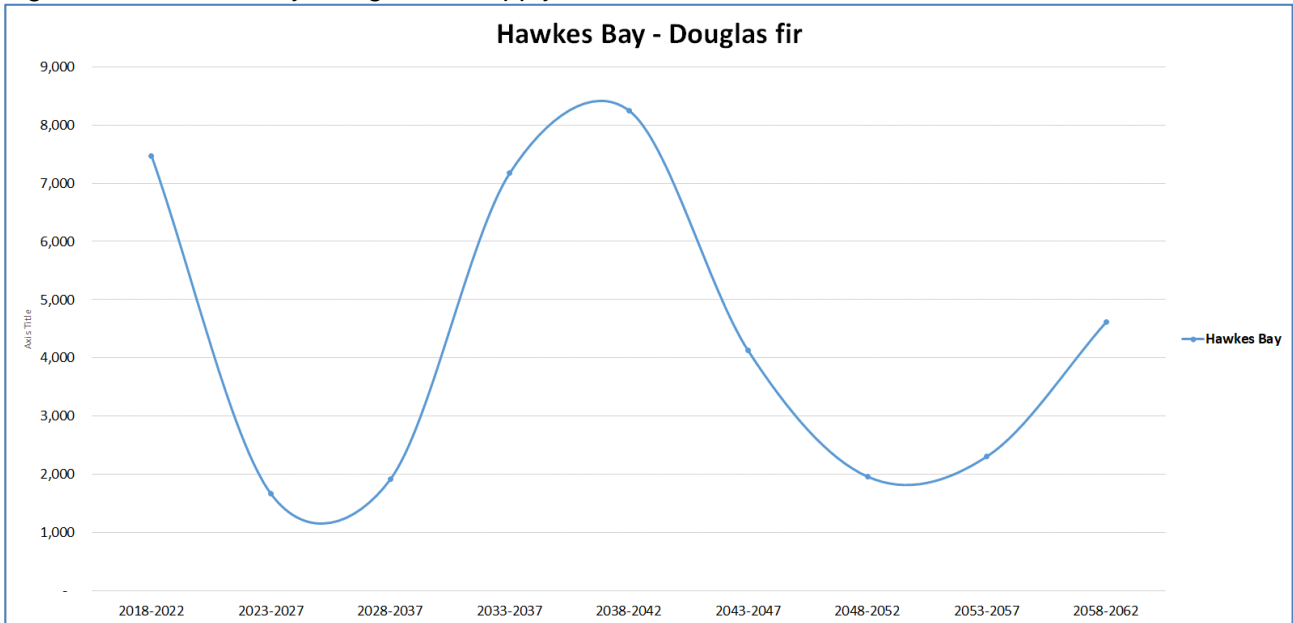
Douglas-fir log supply on the East Coast (Gisborne District) fluctuates over time (Figure 2). Current volumes are estimated to be around 30,000 m³ per annum, but this drops abruptly after 2023 and is negligible until 2038. After 2038 the volume of supply rises to a level where around 25,000 m³ per annum is likely to be a sustainable volume. However, further plantings would be required to keep this level of supply beyond 2062. These expanded plantings would need to be at least 55 ha per annum for a period of 10 years (total area 550 ha), starting no later than 2023. Again the potential for new plantings to stabilise supply would appear to be limited due the same issues as in the Central North Island (SNC and markets).

Figure 2 – Gisborne district Douglas for supply



The supply of Douglas-fir in Hawkes Bay is modest, ranging from 1500 to 8000 m³ per annum, with considerable fluctuation over time (Figure 3). The drop off in supply at 2023 cannot be fixed by new plantings in the near term. This also applies to the second dip at 2048. However, as the volume is small, only a modest area of planting (15 ha per annum) would be required to stabilise the supply at around 7 or 8,000 m³ per annum. These plantings could be done in two 10 year sections, starting in 5 and 25 years' time.

Figure 3 – Hawkes Bay Douglas for supply



In the Southern North Island (SNI) both the east and west have variable volumes available over time. The western side has a larger resource, peaking at 8,000 to 10,000 m³ per annum around 2050 (Appendix 4).

The eastern SNI has around 10,000 m³ per annum available now, but this drops away to a few hundred m³ per annum from 2023 and the volume stays low.

The volume in the SNI west could be stabilised at around 8,000 m³ per annum with plantings of 15 ha per annum for 25 years, starting in 2019.

The Douglas-fir supply in Tasman – Nelson – Marlborough is somewhat problematic. There are volumes in excess of 80,000 m³ per annum available from 2018 out to around 2042 (Figure 4). The volumes over this period fluctuate and could be as high as 150,000 m³ per annum. After 2043 (in 25 years' time) the volume drops rapidly and by 2050 may be as low as 25,000 m³.

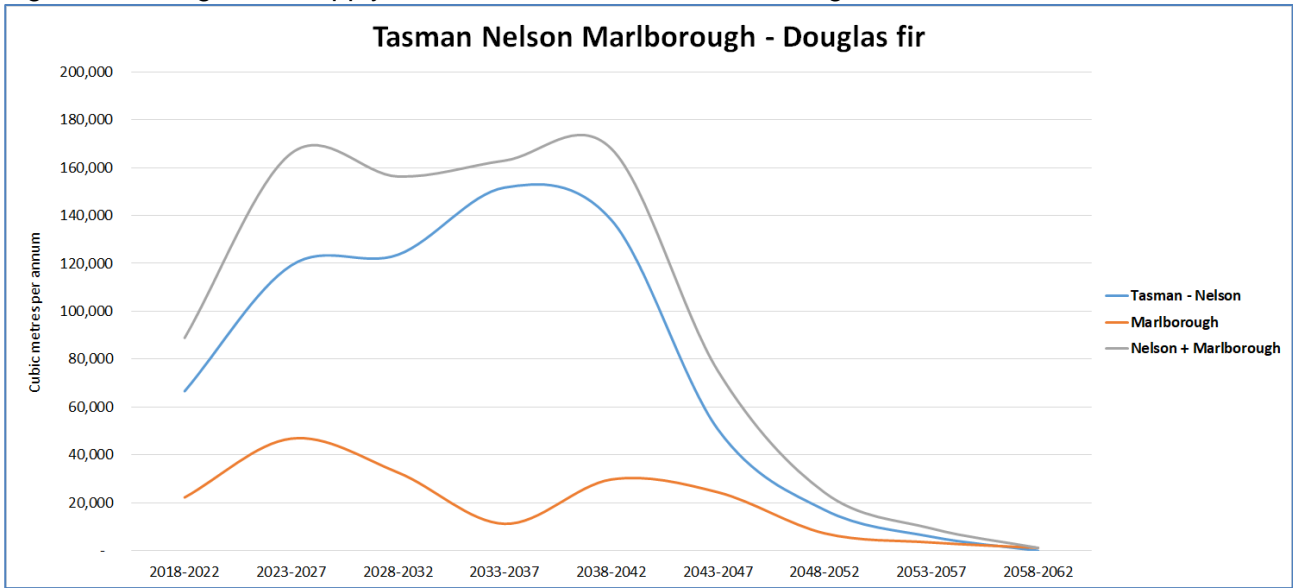
It is not possible to counter-act this decline with new plantings alone, given the rotation length of Douglas-fir is 40 years, and the decline happens in 25 years' time. Trees planted now would be available for harvest in the last period (2058 to 2062).

Stabilising supply would require a combination of delayed harvest of material available in 2038 to 2042 and new plantings. To stabilise supply at 70,000 m³ per annum new plantings would need to be in the order of 150 ha per annum for 20 years (3,000 ha total) with the plantings starting immediately.

Given the very small volumes of Douglas-fir available in Hawkes Bay and the Southern North Island, expanded plantings do not appear to be likely.

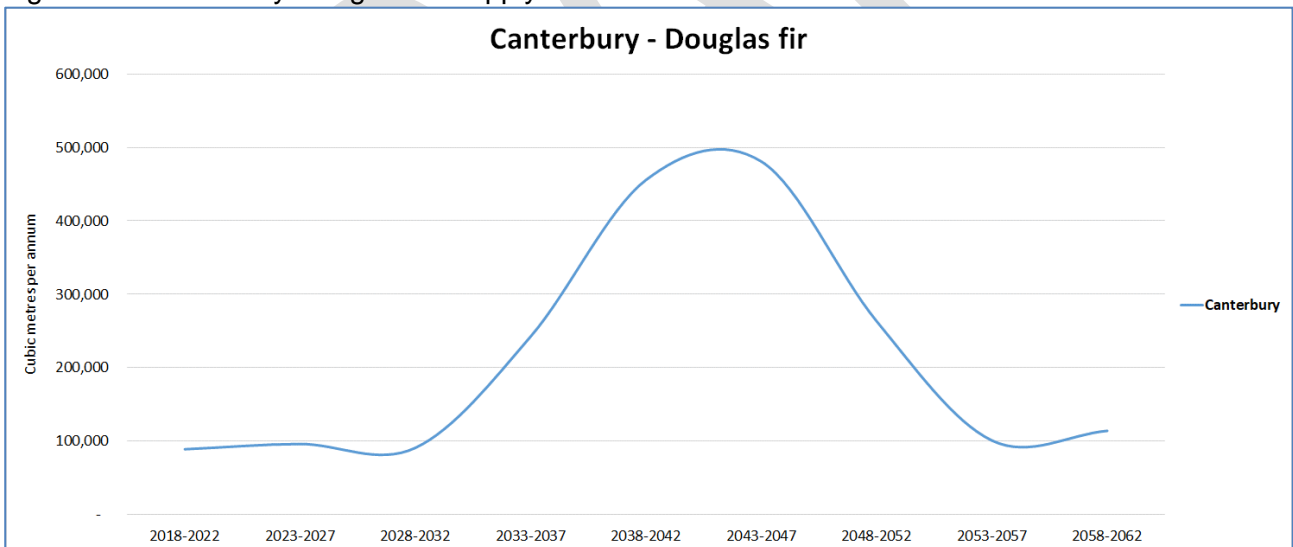
The supply in Marlborough is only a small part of the region total. However some stabilising of supply would be desirable from a processors perspective. This would need to follow the same process as Tasman; some delay of harvest and some new plantings starting immediately. The supply could be around 15,000 m³ per annum in the long run with new plantings of 15 ha per annum, for 20 years (300 ha) with planting starting now.

Figure 4 – Douglas for supply in Tasman Nelson and Marlborough



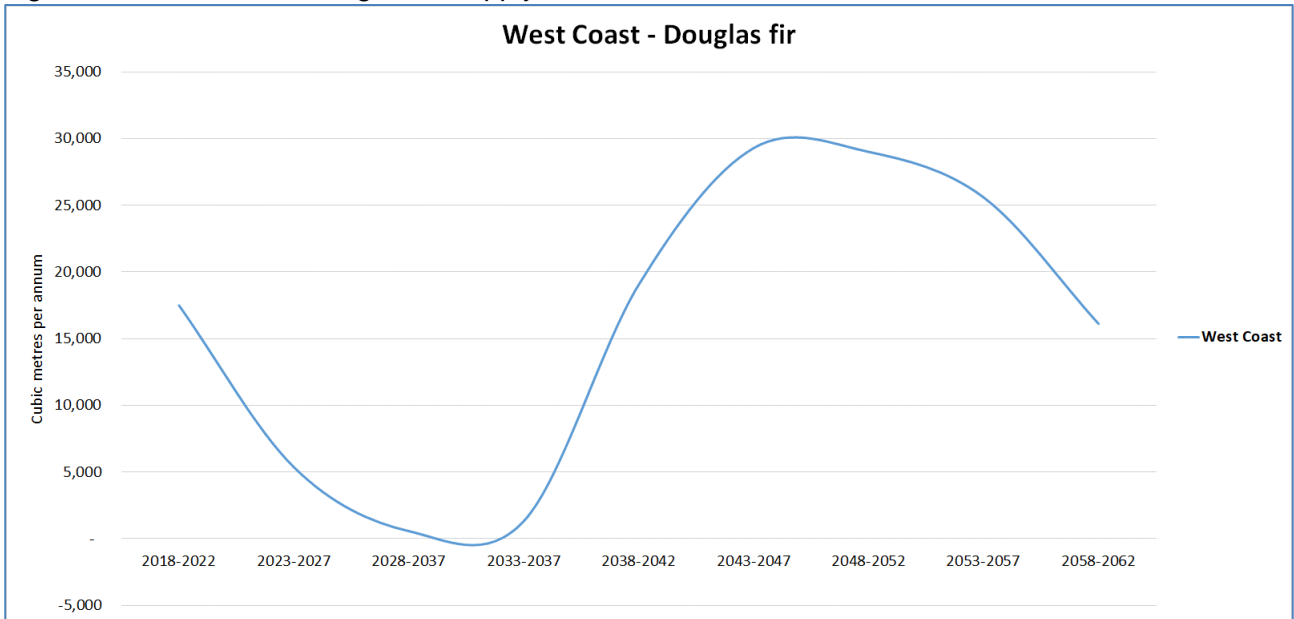
The supply of Douglas-fir in Canterbury has a long run volume of around 100,000 m³ per annum (Figure 5). There is a large peak in supply between 2035 and 2050. The supply in Canterbury could be stabilised at around 300,000 m³ per annum with plantings of around 350 ha per annum. If these plantings started in 2019, they would become available from around 2060. The plantings would have to continue for around 25 years for a total of around 9,000 ha.

Figure 5 – Canterbury Douglas for supply



The supply of Douglas-fir on the West Coast (Figure 6) is currently in the order of 17,000 m³ per annum. This drops away substantially over the next few years to just a few hundred m³ per annum by 2030. In order to stabilise the supply at around 25,000 m³ (the volume available in the longer term) there needs to be plantings in the order of 55 ha per annum for a period of 15 years, starting immediately.

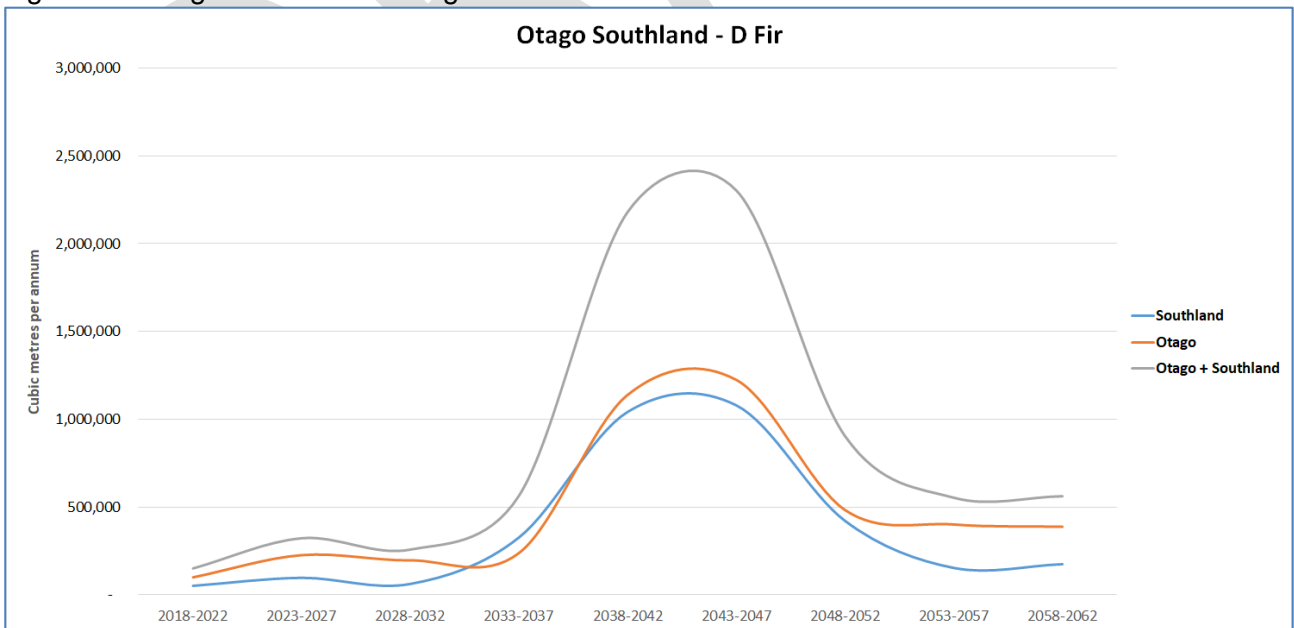
Figure 6 – West Coast Douglas-fir supply



The Otago and Southland wood supply region has the largest volume of Douglas-fir. It also has a highly variable supply in the long term (Figure 7). Current available volume is around 150,000 m³ per annum. This volume climbs rapidly from around 2035 and peaks around 2045 at over 2 million m³ per annum before dropping back to around 500,000 m³ per annum. Given the extent of the fluctuation in volume stabilising this will not be simple as the area of new planting required could be substantial.

To stabilise log supply at 500,000 m³ per annum, would require new plantings of 550 ha per annum for 25 years (13,750 ha total) with planting starting in 2019. To stabilise at 1,000,000 m³ per annum would require 1,300 ha per annum of new plantings for 25 years (total of 32,500 ha) starting in 2019.

Figure 7 – Otago - Southland Douglas-fir



A critical issue in the South Island is propensity of Douglas-fir to self-seed and spread beyond its planted area (wildings). This issue is leading to changes in species choices of major growers, and some of the Douglas-fir planted over the last 10 to 15 years may be the only rotation of this species on those sites. The Resource Management Act and the potential liability for control of wildings on

land outside the planted area is discouraging planting of Douglas-fir in most regions in the South Island.

Douglas-fir thinnings

With Douglas-fir there is the possibility of not only the volume from clearfell, but also from production thinnings. Not all regions have a resource large enough to support the setup of a production thinning operation (e.g. Northland, Hawkes Bay). Others the terrain the forests are established on preclude the use of ground based harvesting to any significant extent and production thinnings with cable harvesting are assumed to be to challenging from a cost and crop management perspective. However, there are two regions where the potential volume of the resource and the nature of the terrain mean that there is potentially a substantial resource to consider. These are the Central North Island (Waikato – Bay of Plenty) and Otago-Southland.

The supply of Douglas-fir from thinnings is estimated to be in the order of 2.3 to 2.3 M m³ per annum for the next 10 years. After that the volume drops away substantially. The data for sawlogs and pulp logs are shown separately in Figures 8 and 9. The supply of logs from thinnings could not be completely stabilised by new plantings even if they started immediately, but there would be additional supply available initially around 2035 and then further volume at 2042. To stabilise thinnings volumes, plantings would need to be in the order of 10,000 ha per annum for around 20 years; a total of 200,000 ha. This is probably an unattainable area. However, some new plantings spread over time, starting now would help with stabilising supply.

Figure 8 – Douglas for pulp logs from thinnings in Otago and Southland

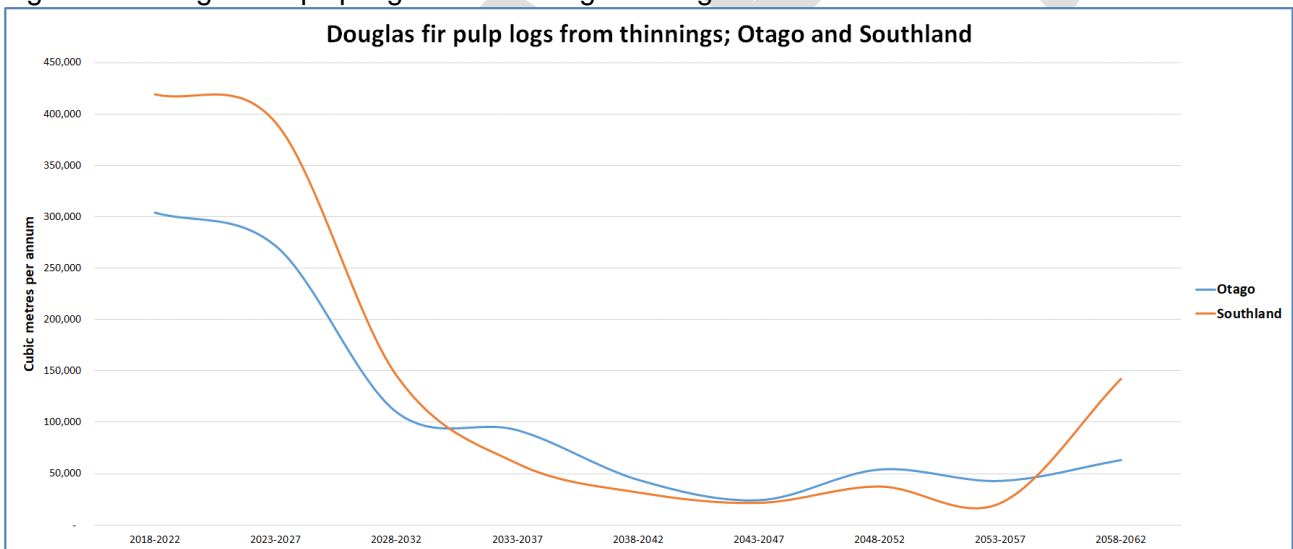
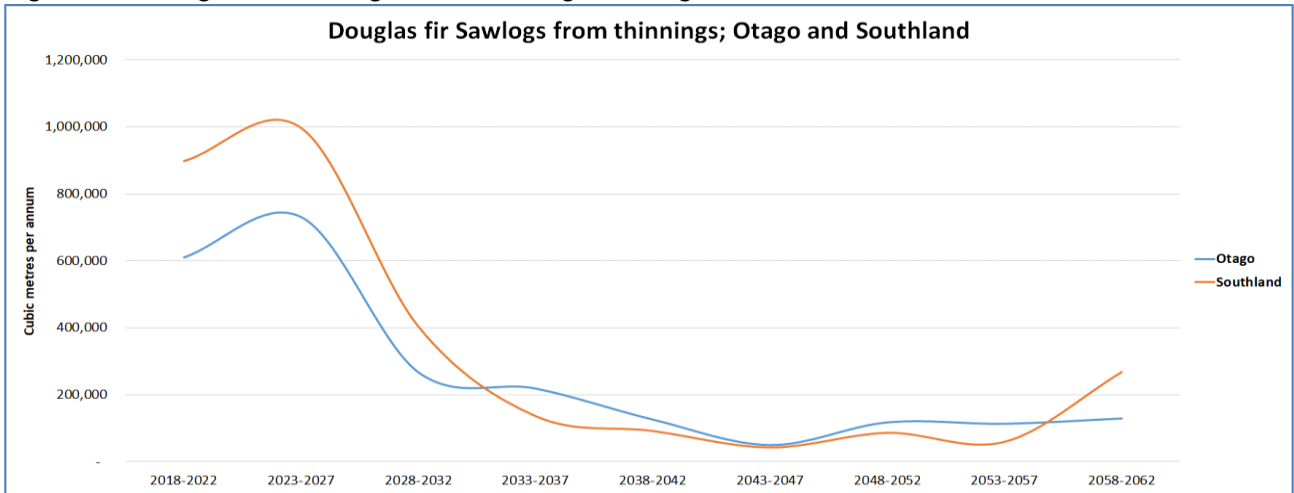


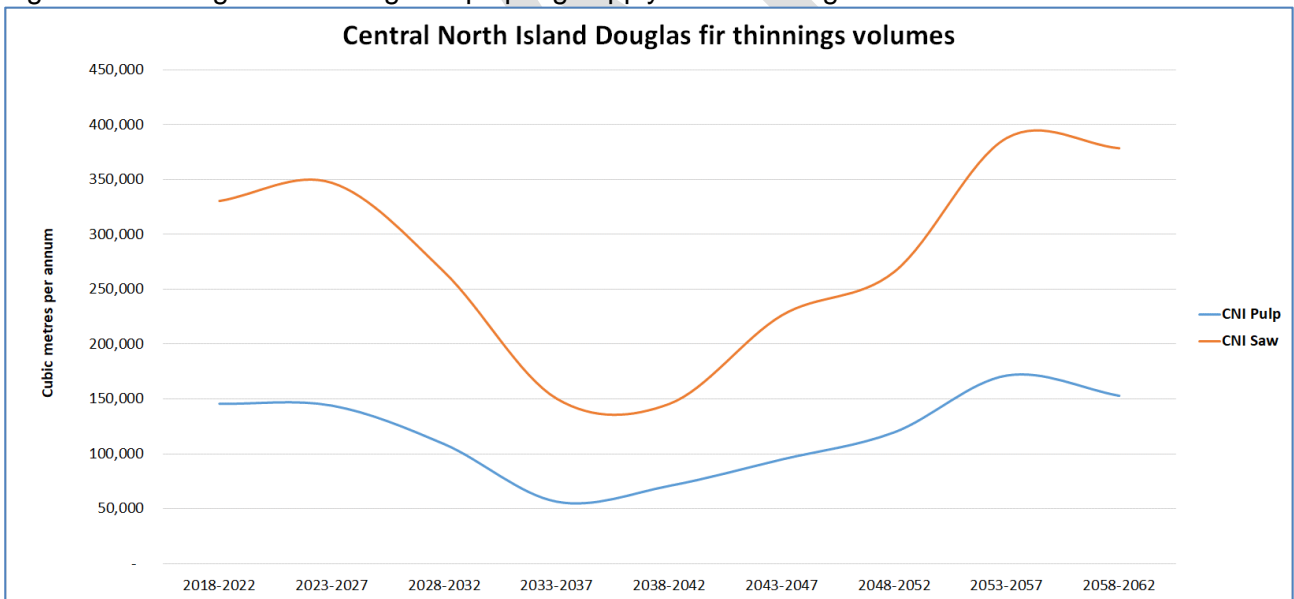
Figure 9 – Douglas-fir sawlogs from thinnings in Otago and Southland



The supply of Douglas-fir sawlogs and thinnings in the Central north Island is shown in Figure 10. Current sawlog supply is estimated at around 300,000 m³ per annum, dropping to 140,000 around 2037. Pulp log supply follows a similar supply pattern but at a lower volume.

In order to stabilise the thinnings supply in the CNI at around 300,000 m³ per annum of sawlog, new plantings of 940 ha per annum for 10 years (9,400ha total), starting immediately would be required.

Figure 10 – Douglas-fir sawlog and pulp log supply from thinnings – Central North Island



One of the issues facing some of the species being addressed in this report is the intention of some growers to liquidate their specialty wood species as it matures and to replace them with Radiata pine. This is an economic decision made by many. The financial performance from a grower's perspective, often based on experience is that it is easier to make more money sooner from P. radiata. An example being the CNI, a driver for the ultimate decline that shows up for sawlog supply from clear-felling (Figure 1, around 2057) is driven by a decision by major growers to not re-establish with Douglas-fir, but to transition those sites (for the most part) to Radiata.

The implication of this is that in some cases stabilising supply by new plantings will not be easy, as there is a lack of enthusiasm for this in some regions.

In order to increase plantings to stabilise wood supply there will need to be proof that there is more value to be created in the long term from the specialty species than from Radiata pine. Given the issues identified with Douglas-fir around wildings and RMA consenting there appears to be pressure for less area of Douglas-fir, not more.

Cypresses

The volumes of cypress forecast to be available over time are presented in Table 2 and Appendix 3. The regions with the largest volumes of cypresses are West Coast and Otago. Southland also has some resource which could be considered in combination with the Otago resource. Many of the regions have a highly variable volume of supply over time; for example Northland has less than 1,000 m³ per annum available for the next 10 years, and by 2042 has over 11,000 m³ per annum, this drops away again by 2058 to around 1,000 m³ per annum. Canterbury has a similar profile, with a higher peak and lower volumes at either end.

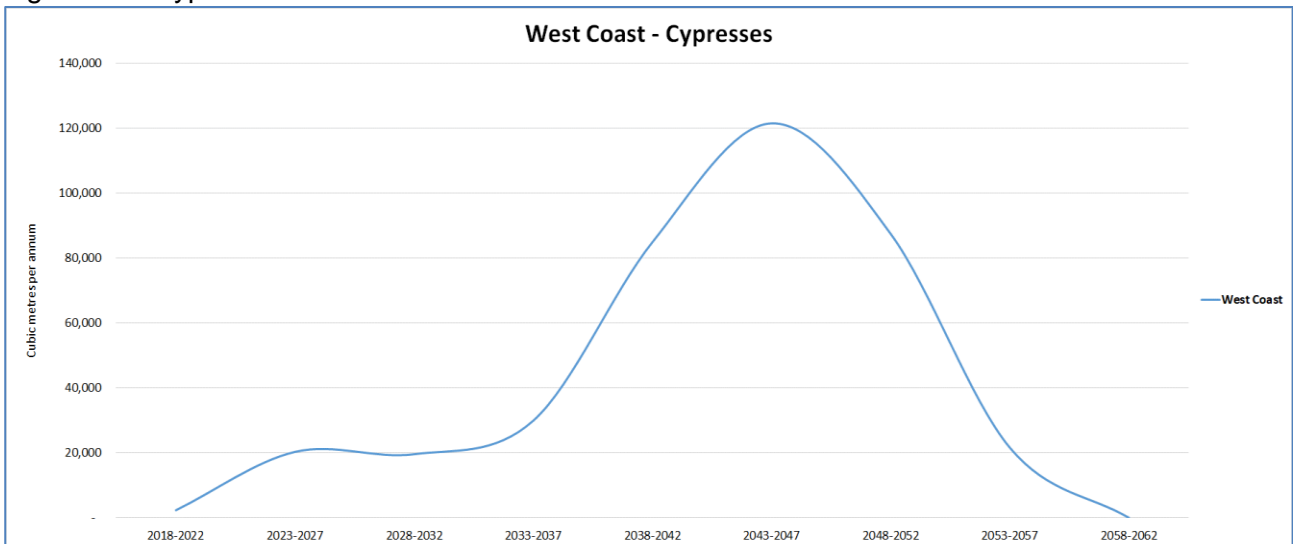
These variations in supply make it somewhat challenging in terms of sustainable supplies of logs and a long term view needs to be taken.

Table 2 - Cypress volumes cubic metres per annum

	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062
Northland	802	944	2,785	10,242	11,517	8,496	5,853	1,558	1,038
Waikato	68	738	1,136	2,597	3,312	5,855	13,449	9,318	1,151
Bay of Plenty	543	3,330	3,620	1,701	3,982	12,380	10,679	2,027	2,172
Gisborne	3,382	2,285	1,554	3,153	6,307	4,296	1,828	2,696	3,016
Hawkes Bay	455	245	315	315	4,655	7,910	6,790	3,815	1,050
SNI west	4,874	3,971	3,430	1,083	1,552	4,982	4,809	3,682	6,267
SNI East	144	217	144	588	1,527	1,339	643	278	-
Tasman Nelson	228	-	228	2,584	3,800	2,204	760	190	380
Marlborough	399	540	988	1,900	3,382	4,446	2,850	863	813
West Coast	2,338	20,315	19,593	29,920	84,873	121,423	87,380	21,590	-
Canterbury	603	371	1,740	11,020	14,709	7,378	4,918	2,784	93
Otago	563	4,470	9,152	12,355	16,438	19,923	17,142	8,906	5,421
Southland	624	2,576	2,285	641	3,345	3,952	2,485	2,251	1,364

The supply of cypresses on the West Coast could peak at 120,000 m³ per annum around 2045 (Figure 11). Either side of this, the volumes are comparatively limited. If planting started immediately supply would not increase until around 2055, well after the peak in supply around 2045. However, if some increase in supply volume was desired (say to 40,000 m³ per annum) then plantings of 95 ha per annum for the next 30 to 35 years would be required (up to 3,325 ha total increase)

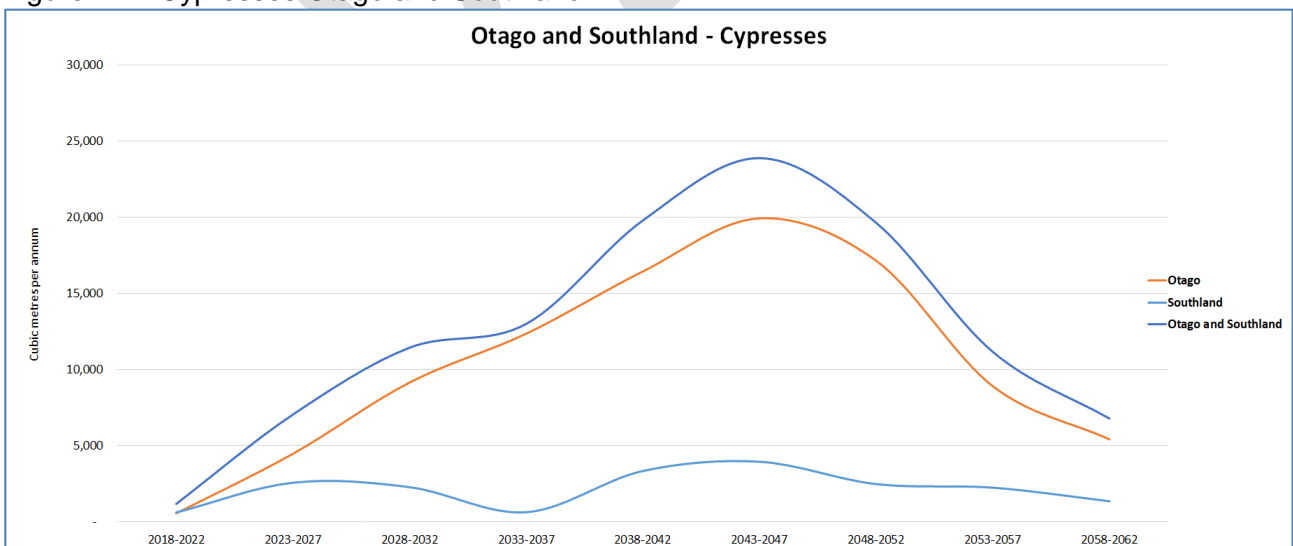
Figure 11 - Cypresses - West Coast



Anecdotally many of the cypress stands on the West Coast are poor quality and have low yields of sawlog grade logs, and some of the logs have defects reducing the yield of high value lumber. Unless the issues with tree crop quality can be addressed further plantings seem unlikely.

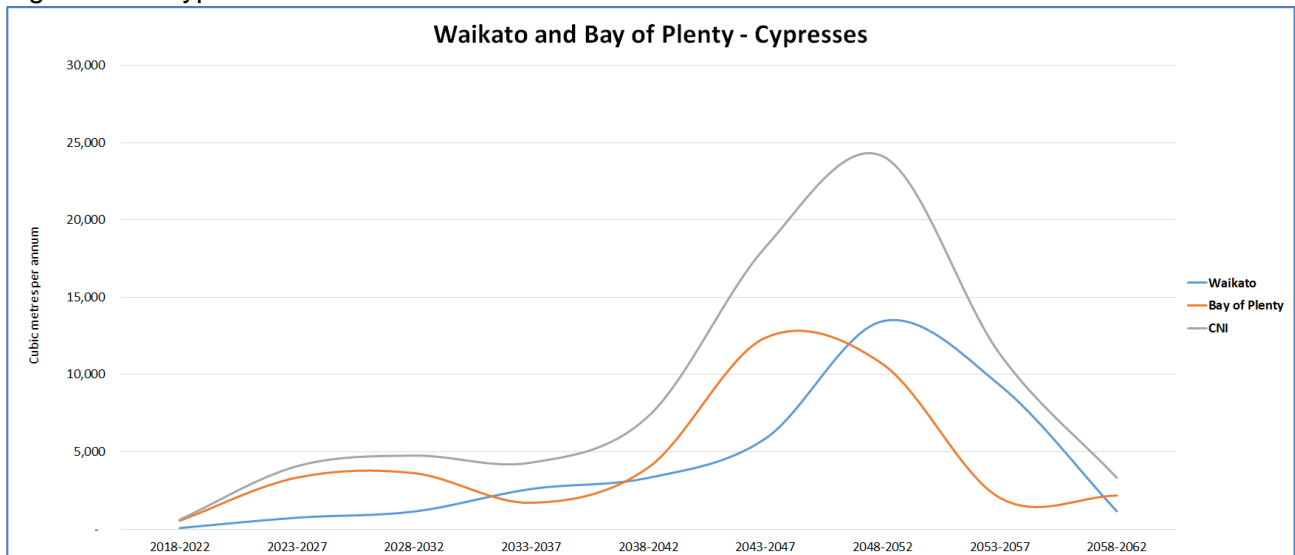
The supply of cypresses in Otago and Southland is shown in Figure 12. The supply from Southland is small in comparison to the From Otago in the long term. The Southland volume is typically between 2 and 3,000 m³ per annum. The Otago volume is low to start with and climbs to a peak of around 20,000 m³ per annum by 2045, after which it declines to around 5,000 m³ per annum. If new planting started now, logs would not become available until around 2057. To stabilise supply at around 10,000 m³ per annum would require plantings of around 15 ha per annum for 15 years (225 ha in total).

Figure 12 – Cypresses Otago and Southland



Similar to other regions the supply of Cypresses in the Central North Island is inconsistent over time. There are low volumes available at the moment, increasing over the next 5 years to around 5,000 m³ per annum, a supply level that lasts for around 15 years (Figure 13). Around 2040 supply increases and peaks at over 20,000 m³ per annum at around 2050. After 2055 supply levels drop rapidly back down to less than 5,000 m³ per annum. In order to stabilise supply at a level of 10,000 m³ per annum plantings would need to start now and be around 15 hectares per annum for 30 years (a total of 450 ha).

Figure 13 – Cypresses in Central North Island



The supply in Northland is challenging in terms of stabilising supply with new plantings as the projected peak (11,000 m³ per annum) is 2035 to 2045 (Figure 14), and new plantings even if they started now would not be available until around 2053, by which time the supply has dropped to around 2000 m³ per annum. A stable supply of around 5,000 m³ per annum could be achieved by a combination of new plantings and holding some of the current plantation a few years longer before harvest. Plantings of around 10 ha per annum for 40 years (total area of 400 ha) would help with stabilising supply.

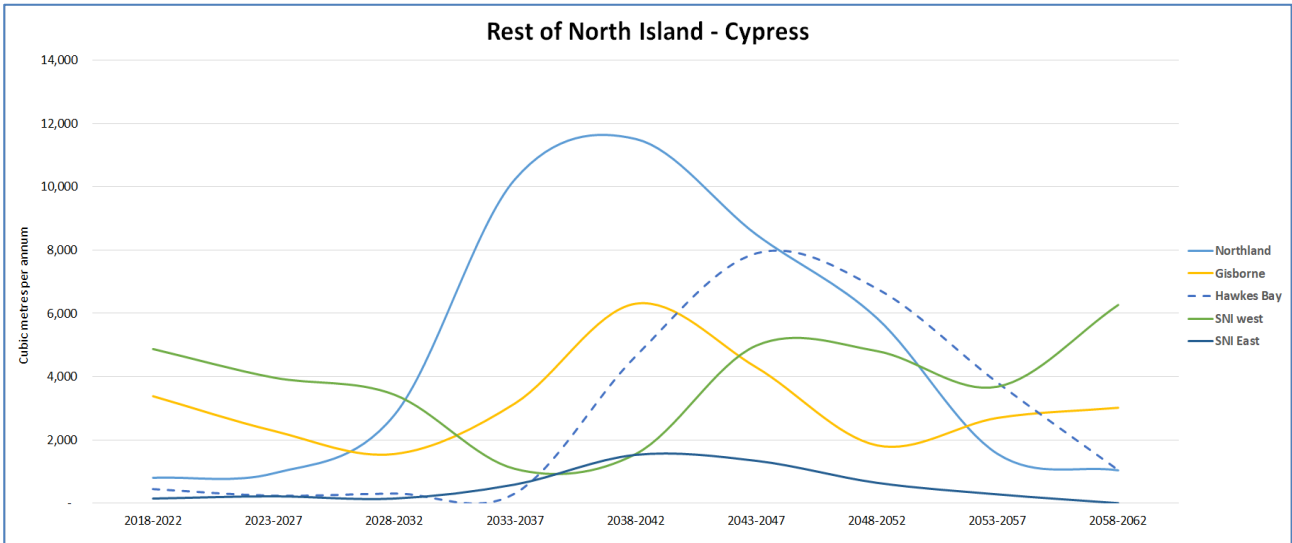
Gisborne's supply of cypresses varies between 2 and 6,000 m³ per annum. Some intermittent plantings could be used to increase supply (say to 4,000 m³ per annum) in the long term.

Hawkes Bay's supply of cypresses is also problematic due to the very low volumes currently available, and low levels for the next 20 years. The increase in volume occurs around 2035 and lasts for about 15 years before dropping down to around 1,000 m³ per annum. New plantings of around 10 ha per annum for 30 years would help stabilise the potential harvest volume at around 4,000 m³ per annum.

The Eastern side of the Southern North Island (SNI) has minimal amounts of Cypress logs available.

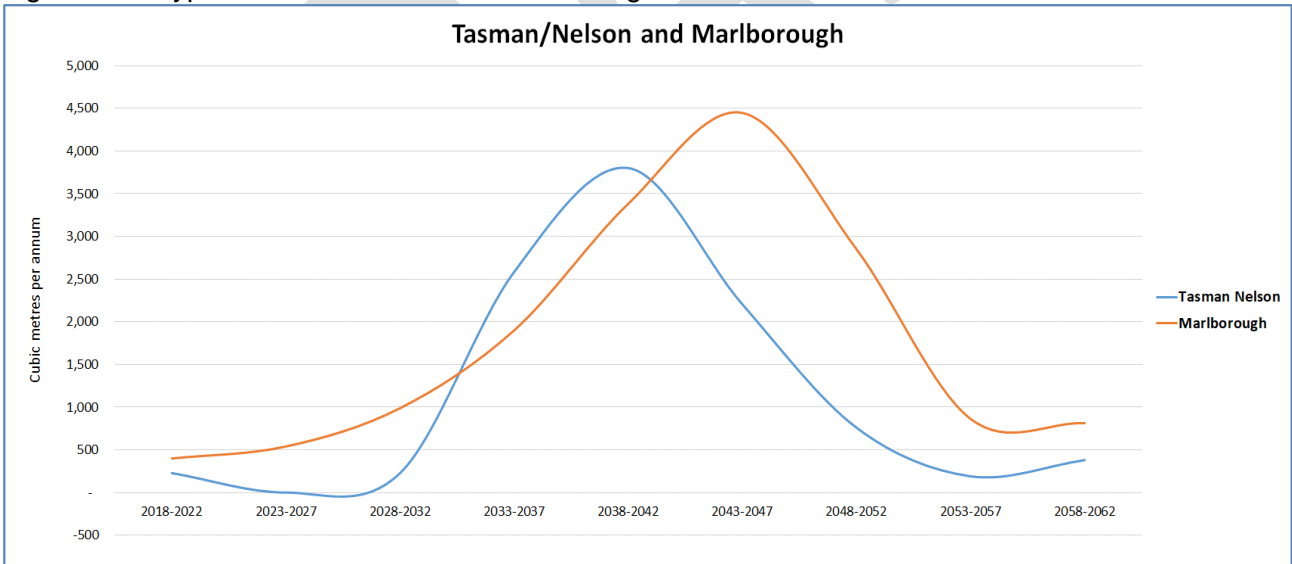
The Western SNI has around 4,000 m³ per annum available currently, but this volume declines over the next 15 years to a low point around 2037 of 1,000 m³ per annum. Supply then picks up to around 5,000 m³ per annum. New plantings now will not be able to address the low volume period. Bringing some harvest forward and pushing some out either side of the low point might help smooth the supply volumes to a level of around 3,000 m³ per annum.

Figure 14 – Cypresses – Other North Island regions; Northland, Gisborne, Hawkes Bay and Southern North Island East and West.



The supply of cypresses in Tasman and Marlborough is shown in Figure 15. The two regions have a similar pattern, with slightly different timing on the peak supply. Both currently have small volumes available. The supply climbs rapidly after 2028 and peaks around 2040 in Tasman and 2045 in Marlborough. Then the available volume declines rapidly in both regions. Planting now would be more effective in Marlborough. Across the two regions new plantings, starting immediately would need to be in the order of 10 ha per annum for 40 years (400 ha total) to stabilise supply at around 4,000 m³ per annum.

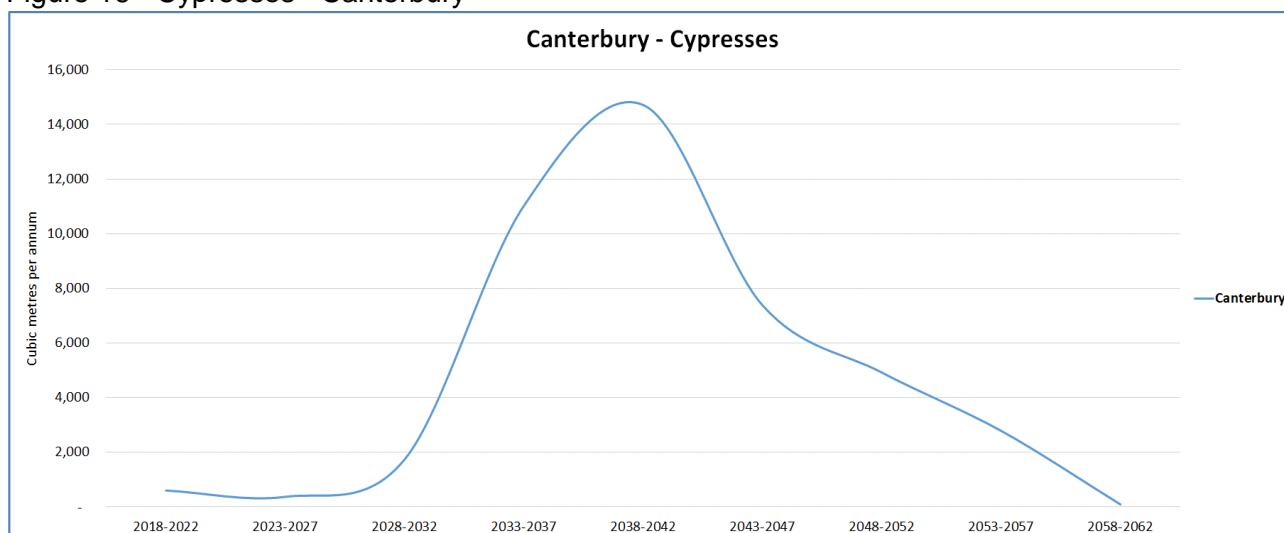
Figure 15 - Cypresses – Tasman and Marlborough



The variability in the Cypress log supply in Canterbury is high. Current supply is negligible, with only a few hundred cubic metres per annum available (Figure 16).

Over the period 2035 to 2040 this volume increases to around 14,000 m³ per annum and then drops away to the point where by 2060 the supply is back to very low levels, similar to that of 2018. Planting now would only affect supply beyond 2055. To stabilise supply at around 4,000 m³ per annum new plantings of around 10 ha per annum for a period of 40 years, or 400 ha in total.

Figure 16 - Cypresses - Canterbury



Eucalypts

The volumes of eucalypts forecast to be available over time are presented in Table 3 and Appendix 4. The regions with the most resource over time are; Southland, Otago, Waikato, and Hawkes Bay. The Bay of Plenty resource is variable and will be considered along with the Waikato resources as the CNI. The Southland and Otago resources will also be considered together. There is very little eucalypt resource in Canterbury, West Coast, the Southern North Island and the Gisborne resource is variable over time.

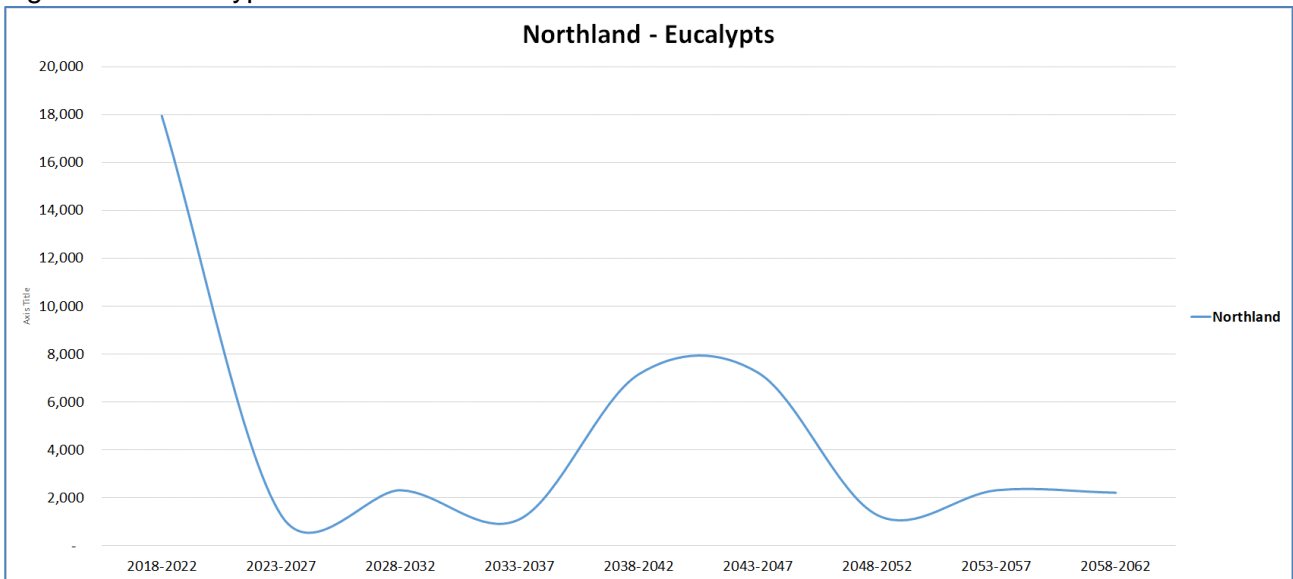
Table 3 – Eucalypt volumes – cubic metres per annum

	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062
Northland	17,961	1,280	2,318	1,107	7,162	7,231	1,280	2,318	2,214
Waikato	42,107	26,149	52,762	108,556	80,704	26,982	26,149	52,762	81,446
Bay of Plenty	15,840	13,306	5,702	2,390	4,982	10,483	13,306	5,702	288
Gisborne	5,004	445	6,794	6,898	760	891	445	6,794	13,378
Hawkes Bay	2,392	4,092	24,188	26,038	5,463	899	4,092	24,188	41,569
SNI west	1,140	296	209	524	480	392	296	209	348
SNI East	2,826	117	183	348	258	129	117	183	285
Tasman Nelson	4,406	14	-	-	95	109	14	-	-
Marlborough	1,588	329	1,020	1,306	892	364	329	1,020	1,469
West Coast	2,420	5	-	-	25	30	5	-	-
Canterbury	1,092	377	247	78	637	689	377	247	-
Otago	38,243	22,378	3,407	5,945	3,440	22,946	22,378	3,407	6,480
Southland	234,034	170,674	63,460	106,446	112,892	199,832	170,674	63,460	86,172

The Northland volume is currently high, but drops away in the next few years (Figure 17). To stabilise the Northland volume at around 6,000 m³ per annum plantings of around 20 ha per annum for a period of 15 to years is required.

The very low areas planted and volumes available suggest that Eucalypts have not proved successful in Northland. Further plantings are likely to be very limited.

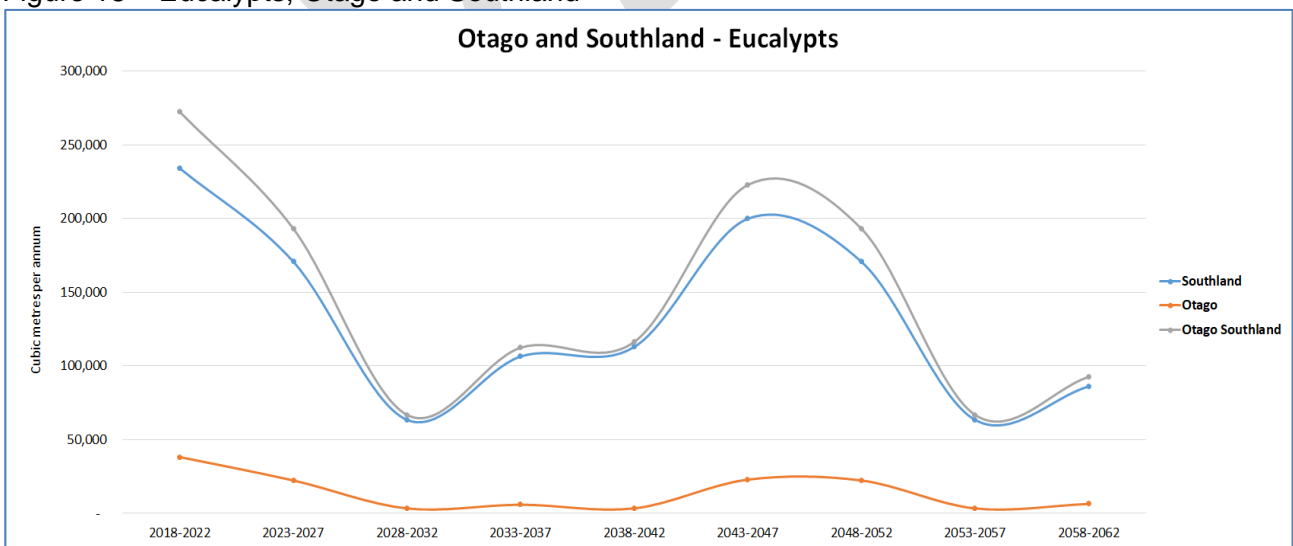
Figure 17 – Eucalypts - Northland



The available eucalypt volume in the South is dominated by the *E nitens* plantations in Southland, with variable contribution from Otago (Figure 18). The long run supply is at least 60,000 m³ per annum. The dip in supply at 2030 will occur too soon for any plantings now to have any effect. Further plantings would stabilise the longer term supply in Southland. These plantings would need to start in 2035, and would only alleviate the dip in supply around 2055. The area required would be in the order of 270 ha per annum for 20 years (total 5,400 ha). This would stabilise the supply at around 150,000 m³ per annum.

Given the long term viability of the *E. nitens* estate in Southland and Otago to date, there seems to be no major impediment to expansion of this estate.

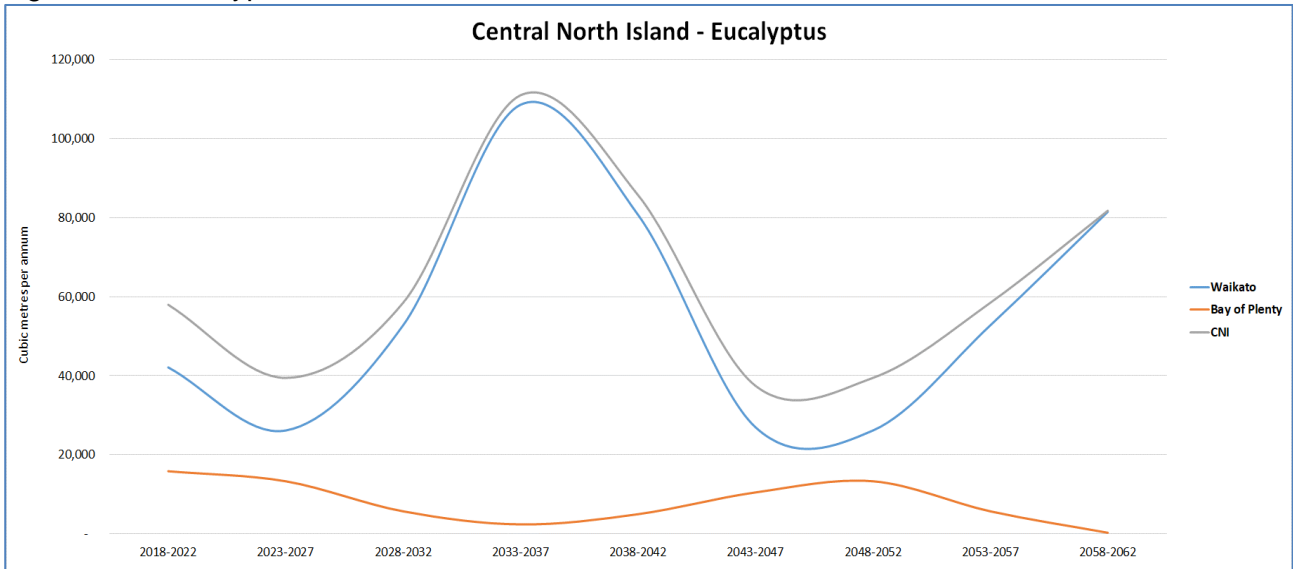
Figure 18 – Eucalypts, Otago and Southland



The major source of Eucalyptus in the Central North Island is Waikato (Figure 19). The volume in the Bay of Plenty region is comparatively modest at between 2,000 and 15,000 m³ per annum. The volume in Waikato fluctuates between 20,000 and 100,000 m³ per annum. The long run supply could be stabilised at around 100,000 m³ per annum with new plantings of 210 ha per annum for 20 years (4,200 ha) from 2028 would alleviate the supply gap around 2040 to 2055 with a second lot of new plantings required to fill the longer term drop in supply.

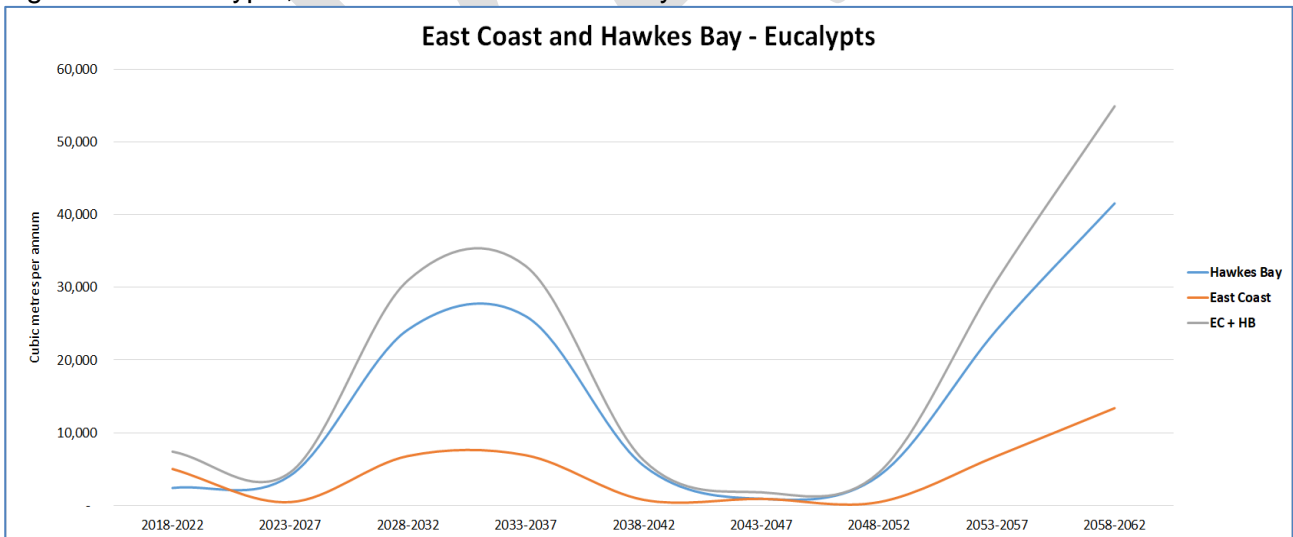
Growth of *E. nitens* in the CNI has a chequered history, but with careful site selection (cooler sites) and good pest management it can be a viable choice, so expansion of the estate is possible if the is a driver such as a demand for short fibre feedstock for the local pulp mills.

Figure 19 – Eucalypts, Central North Island



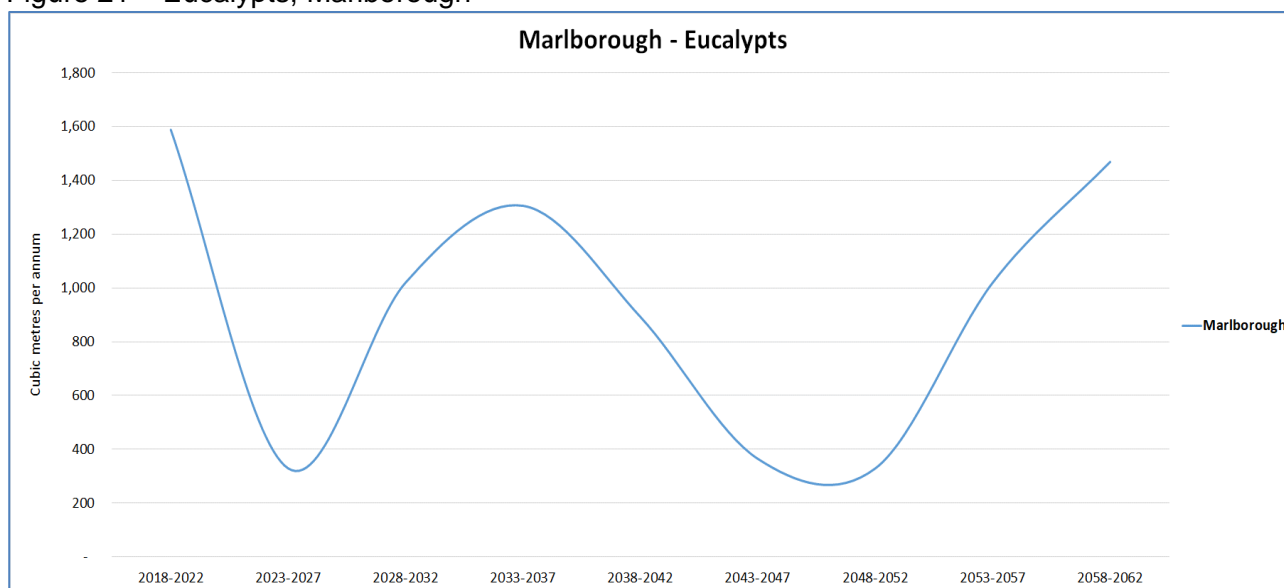
The volume of eucalyptus logs available in the Hawkes Bay and East Coast regions is shown in Figure 20. The East Coast supply is modest and the Hawkes Bay supply is highly variable. To stabilise the Hawkes Bay supply at 25,000 m³ per annum would require plantings of 95 ha per annum for a period of 15 years (1,425 ha total). To stabilise the East Coast supply at around 5,000 m³ per annum would require plantings of 20 ha per annum for 15 years (total of 300 ha).

Figure 20 – Eucalypts, East Coast and Hawkes Bay



Marlborough has a small volume of Eucalypts available currently (~1,500 m³ per annum) with significant fluctuation over time (Figure 21). To even out the supply over time, at around 2,000 m³ per annum new plantings of around 15 hectares per annum are required; starting in 2030 and continuing for at least 20 years.

Figure 21 – Eucalypts, Marlborough



Summary of long run log supply volumes

In order to be able to determine the type and scale of processing that is appropriate for a region / species, there needs to be an understanding on the volume of wood that is available on a consistent basis over the long term (30 to 40 years). These supply volumes without and with new plantings are presented in Table 4 and 5.

Log supply by region and species (without new plantings)

Table 4 – long run supply volume (no new planting)

Region	Douglas-fir	Cypresses	Eucalypts
Northland	-	1,500	1,200
Waikato	75,000	9,000	26,000
Bay of Plenty	25,000 ¹	2,000	3,000
Gisborne	2,000	2,000	400
Hawkes Bay	4,000	3,000 ⁴	1,00
SNI west	400	3,000	200
SNI East	20,000	200	100
Tasman Nelson	7,000	200	-
Marlborough	20,000	3,000	300
West Coast	100,000 ²	20,000	-
Canterbury	100,000	3,000 ⁵	300
Otago	200,000 ³	4,000	3,000
Southland	90,000 ³	2,000	63,000

1 = after 2033, 2 = after 2028, 3 = after 2035 volumes increase to 400,000 in Otago and 150,000 in Southland, 4 = after 2038, 5 = after 2033

Log supply by region and species (with new plantings)

Table 5 – long run supply volume with new planting

Region	Douglas-fir	Cypresses	Eucalypts
Northland	-	5,000	6,000 ³
Waikato	150,000	10,000	100,000
Bay of Plenty			3,000
Gisborne	25,000	4,000	5,000
Hawkes Bay	8,000	4,000	25,000
SNI west	8,000	3,000	200
SNI East	400	-	100
Tasman Nelson	70,000	4,000	-
Marlborough	15,000		2,000
West Coast	20,000 ¹	40,000	-
Canterbury	300,000 ²	4,000	300 ³
Otago	500,000	10,000	3,000
Southland		3,000	150,000

1 = post 2038, 2 = Post 2060, 3 = post 2047, 4 = No new planting

Land suitable for afforestation by region

A Scion model, Forest Investment Framework (FIF) has been run several times, with the aim of identifying land area suitable for afforestation across New Zealand. This model is focussed on the afforestation using radiata pine, but the data gives an indication of the likely area of land where forestry is viable as it includes not only forests growing costs and log prices, but also the costs of harvesting and building of roads and landings (which are generic across species).

The areas of land identified in the FOIF run as suitable (profitable) for afforestation by region are shown in Table 6.

Table 6 – area of land estimate as suitable for forestry, and required for volume stabilisation by region

Region	Hectares suitable for afforestation	Hectares required (all species)
Northland	26,335	700
Waikato	43,393	6,650
Bay of Plenty	12,696	
Gisborne	31,152	1,150
Hawkes Bay	45,987	2,025
SNI west	76,571	375
SNI East	21,163	-
Tasman Nelson	4,532	4,000
Marlborough	15,376	
West Coast	5,295	4,125
Canterbury	112,884	9,400
Otago	73,143	19,000 to 32,000 ¹
Southland	32,323	

1 = depends on level long term volume of Douglas-fir supply required (500,000 m³ or 1.0M m³)

The data in Table 6 indicates that there are no regions where there would be a major problem with forestry suitable land being present. Availability is another question – which we are not addressing here. The West Coast is the only regions where the estimated need for land for new plantings is close to the area deemed to be suitable.

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CONCLUSIONS

For all species, available volumes vary significantly over time. This provides a challenge for encouraging investment in domestic processing capacity, when there is no guarantee of a stable wood supply.

There is a substantial resource of Douglas-fir available in the Central North Island (Waikato and Bay of Plenty) through to around 2055. After 2055 the volume of D. fir resource declines due to the age class distribution of this species. New plantings to alleviate this decline are unlikely to come from major growers.

There are significant resources of Douglas-fir in Tasman, Canterbury, Otago and Southland. Canterbury has a large peak in supply at around 480,000 m³, but also has a long term supply of approximately 100,000 m³ per annum. For the other regions, the long term outlook is for volumes to decline. However, this does not occur until around 2050. New Douglas-fir plantings in the South Island are likely to be limited.

Long run supply volumes for the three target species, without new plantings indicate significant opportunities for;

- Douglas-fir, >20,000 m³ per annum, Waikato, Bay of Plenty, Southern North Island East, Marlborough, West Coast, Canterbury, Otago and Southland
- Cypress, >20,000 m³ per annum, West Coast
- Cypress, > 5,000 m³ per annum, Waikato
- Cypress, 2,000 to 4,000 m³ per annum, Bay of Plenty, Gisborne, Hawkes bay, Southern North Island West, Marlborough, Canterbury, Otago and Southland.
- *Eucalyptus nitens*, >20,000 m³ per annum, Southland and Waikato. Other regions have negligible volumes except Otago (3,000) which can be aligned with the southland resource.

Data gathered for this report will be used as an input into subsequent WoodScape modelling of the economics of processing specialty species.

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APPENDICES

Appendix 1: Douglas-fir projected volumes by district

Douglas Fir	45 year rotation assumed								
	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062
Far North	239	-	-	-	239	-	-	-	-
Whangarei	-	-	-	-	-	-	-	-	-
Kaipara	-	-	-	-	-	-	-	-	-
Auckland	-	-	-	-	718	-	-	-	-
Northland	239	-	-	-	957	-	-	-	-
Thames-Coromandel	-	-	-	-	1,006	-	-	-	-
Hauraki	-	-	-	-	-	-	-	805	-
Waikato	-	-	101	-	101	-	-	-	-
Matamata-Piako	-	-	-	-	-	402	-	-	-
Hamilton	-	-	-	-	-	-	-	-	-
Otorohanga	101	-	-	101	2,515	5,231	3,622	-	-
Waitomo	26,860	201	-	-	23,540	14,386	34,305	119,110	-
South Waikato	1,408	-	-	-	905	704	36,618	7,444	-
Taupo	64,686	65,289	81,084	153,717	20,422	99,896	109,453	10,563	18,531
Waikato	93,055	65,491	81,184	153,817	48,489	120,619	183,997	137,923	18,531
Tauranga	-	-	-	-	-	-	-	-	-
Western Bay of Plenty	2,012	201	101	-	805	503	302	-	-
Rotorua	48,690	29,979	11,770	42,654	31,085	44,163	1,408	-	-
Kawerau	-	-	-	-	-	-	-	-	-
Whakatane	20,019	49,797	140,438	120,821	114,986	83,397	18,309	1,006	-
Opotiki	-	-	-	-	-	-	-	1,911	-
Waipa	-	-	-	-	101	201	-	-	-
Ruapehu	4,125	1,308	201	-	6,036	18,510	9,155	11,971	28,772
Bay of Plenty	74,846	81,285	152,510	163,475	153,013	146,775	29,174	14,889	28,772
Gisborne	56,414	331	110	-	32,789	61,603	37,072	29,157	22,069
Gisborne	56,414	331	110	-	32,789	61,603	37,072	29,157	22,069
Wairoa	7,954	786	-	-	98	1,178	1,964	-	4,419
Hastings	4,026	786	1,669	-	11,882	2,553	1,375	-	196
Napier	-	-	-	-	-	-	-	-	-
Central Hawkes Bay	1,277	98	-	2,160	196	589	589	-	-
Hawkes Bay	13,257	1,669	1,669	2,160	12,177	4,321	3,928	-	4,615
New Plymouth	-	-	-	-	-	-	-	-	-
Stratford	103	-	-	-	-	103	103	-	-
South Taranaki	-	103	-	-	-	-	-	-	-
Wanganui	3,605	309	1,236	412	1,030	1,339	206	824	-
Rangitikei	1,339	824	103	-	5,356	5,665	412	15,450	-
Manawatu	103	206	721	309	-	515	206	-	-
Kapiti Coast	-	-	-	-	-	309	-	-	-
Upper Hutt	515	-	-	309	103	927	206	-	-
Porirua	-	-	-	-	-	-	-	-	-
Wellington	-	-	-	-	-	-	-	-	-
Lower Hutt	-	-	-	-	-	-	-	-	-
Palmerston North	-	-	-	-	-	-	-	113	2,204
Tararua	1,030	-	103	-	-	1,854	515	-	-
SNI West	6,695	1,442	2,163	1,030	6,489	10,712	1,648	16,387	2,204
Masterton	10,609	103	-	-	412	1,030	618	144	185
Horowhenua	-	-	-	103	-	-	-	-	-
Carterton	-	-	-	103	-	2,369	103	-	-
South Wairarapa	-	-	103	-	-	-	-	-	-
SNI East	10,609	103	103	206	412	3,399	721	144	185
Tasman	5,908	14,878	8,971	-	3,173	3,282	438	438	-
Nelson	30,194	82,269	132,265	106,009	194,185	75,595	21,880	11,268	-
Tasman Nelson	36,102	97,147	141,235	106,009	197,358	78,877	22,318	11,706	-
Marlborough	7,439	31,288	62,249	2,954	18,445	38,903	8,796	5,142	438
Kaikoura	5,798	-	109	-	1,094	1,094	-	547	766
Marlborough	13,237	31,288	62,358	2,954	19,539	39,997	8,796	5,689	1,203
Buller	379	3,982	-	190	1,896	11,660	12,324	23,131	7,868
Grey	23,795	4,550	948	-	190	23,321	10,618	11,945	8,248
Westland	1,043	1,232	-	-	379	664	-	-	-
West Coast	25,217	9,764	948	190	2,465	35,645	22,942	35,076	16,116
Hurunui	3,584	42,425	43,003	23,120	111,670	93,983	127,588	43,350	58,956
Waimakariri	8,670	3,352	809	694	3,006	4,508	3,699	2,428	9,364
Selwyn	347	1,387	1,965	2,659	5,780	9,710	-	-	-
Christchurch	14,681	2,428	20,808	39,188	47,743	13,641	1,965	-	-
Ashburton	7,167	1,734	4,624	4,046	9,826	10,173	4,508	2,428	-
Mackenzie	30,634	41,616	1,272	10,288	8,901	158,025	244,032	21,617	37,108
Timaru	1,965	10,173	4,277	12,947	31,559	66,008	35,142	16,762	3,699
Waimate	4,046	3,930	8,670	3,653	170,279	166,580	21,964	1,156	4,971
Canterbury	71,094	107,046	85,428	96,595	388,763	522,628	438,899	87,740	114,097
Waitaki	530	9,533	10,592	2,516	51,239	434,140	17,742	13,372	2,913
Queenstown-Lakes	12,313	33,630	76,395	9,798	16,550	30,717	3,178	7,150	1,456
Central Otago	1,059	3,045	17,609	14,829	15,888	6,752	530	-	-
Dunedin	7,414	5,296	11,916	6,223	21,978	296,708	35,086	47,796	20,522
Clutha	23,170	102,080	181,256	60,772	276,186	1,128,180	495,176	344,902	362,379
Otago	44,486	153,584	297,768	94,136	381,842	1,896,498	551,711	413,220	387,270
Gore	2,118	397	-	662	9,136	151,466	3,310	-	-
Southland	11,784	87,384	105,126	17,344	626,782	1,296,990	706,222	131,738	174,238
Invercargill	-	-	-	-	-	-	-	-	-
Southland	13,902	87,781	105,126	18,006	635,917	1,448,456	709,532	131,738	174,238

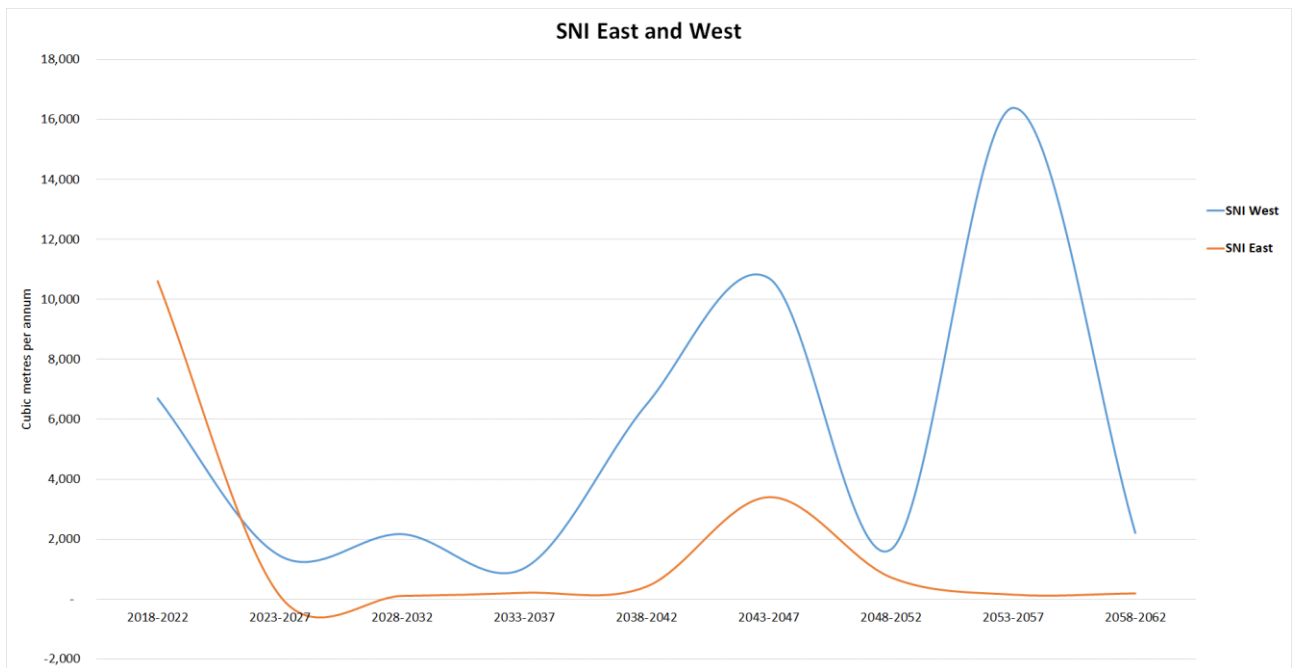
Appendix 2: Cypress projected volumes by district

Cypress	45 Year rotation assumed									
	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062	
Far North	-	944	378	2,266	3,965	2,926	1,888	566	472	
Whangarei	-	189	-	283	1,133	850	-	-	94	
Kaipara	-	-	-	-	566	-	3,870	-	189	
Auckland	472	-	378	2,266	10,006	3,587	3,870	1,510	283	
Northland	472	1,133	755	4,814	15,670	7,363	9,629	2,077	1,038	
Thames-Coromandel	-	-	190	-	127	63	-	-	-	
Hauraki	-	-	190	-	-	-	-	1,268	-	
Waikato	63	-	444	-	-	63	-	-	-	
Matamata-Piako	-	-	-	-	-	-	-	-	-	
Hamilton	-	-	-	-	-	-	-	-	-	
Otorohanga	-	-	290	-	-	-	-	-	-	
Waitomo	-	72	72	-	72	-	-	-	-	
South Waikato	-	-	-	652	724	-	-	145	507	
Taupo	-	-	217	217	3,403	2,172	9,412	16,073	644	
Waikato	63	72	1,403	869	4,326	2,299	9,412	17,486	1,151	
Tauranga	-	-	-	-	-	-	-	-	-	
Western Bay of Plenty	-	145	434	-	869	217	2,244	1,520	-	
Rotorua	72	-	3,113	652	579	724	9,774	290	1,738	
Kawerau	-	-	-	-	-	-	-	-	-	
Whakatane	-	-	2,896	-	1,014	4,127	7,385	72	-	
Opotiki	-	-	-	72	-	-	-	-	145	
Waipa	-	-	-	-	217	-	-	-	-	
Ruapehu	869	-	72	-	-	217	72	-	290	
Bay of Plenty	941	145	6,516	724	2,679	5,285	19,476	1,882	2,172	
Gisborne	4,296	2,468	2,102	1,005	5,301	7,312	1,280	2,376	3,016	
Gisborne	4,296	2,468	2,102	1,005	5,301	7,312	1,280	2,376	3,016	
Wairoa	910	-	-	-	-	6,790	5,180	-	-	
Hastings	-	-	70	140	490	1,540	1,400	6,580	1,050	
Napier	-	-	-	-	-	-	-	-	-	
Central Hawkes Bay	-	-	420	-	-	490	420	-	-	
Hawkes Bay	910	-	490	140	490	8,820	7,000	6,580	1,050	
New Plymouth	72	-	217	-	-	-	-	-	-	
Stratford	72	-	361	-	289	-	-	72	3,393	
South Taranaki	-	-	-	-	-	289	72	-	-	
Wanganui	939	217	505	-	-	-	6,859	217	1,444	
Rangitikei	6,859	650	1,372	289	866	289	1,588	289	72	
Manawatu	217	-	1,011	72	505	722	-	-	-	
Kapiti Coast	-	-	-	-	-	72	-	-	-	
Upper Hutt	-	722	2,888	144	-	72	-	-	-	
Porirua	-	-	-	-	-	-	-	-	-	
Wellington	-	-	-	-	-	-	-	-	-	
Lower Hutt	-	-	-	-	-	-	-	-	-	
Palmerston North	-	-	-	-	-	-	-	520	1,357	
Tararua	-	-	-	-	-	-	-	-	-	
SNI West	8,159	1,588	6,354	505	1,661	1,444	8,520	1,097	6,267	
Masterton	-	-	217	-	939	1,083	267	267	-	
Horowhenua	72	72	-	-	166	289	173	289	-	
Carterton	-	-	-	-	-	-	144	-	-	
South Wairarapa	-	144	-	72	-	578	144	-	-	
SNI East	72	217	217	72	1,105	1,949	729	556	-	
Tasman	456	-	-	-	380	684	304	-	76	
Nelson	-	-	-	456	4,332	2,204	1,216	-	304	
Tasman Nelson	456	-	-	456	4,712	2,888	1,520	-	380	
Marlborough	532	152	836	1,140	2,660	4,104	4,180	912	813	
Kaikoura	23	91	-	-	-	-	608	-	-	
Marlborough	555	243	836	1,140	2,660	4,104	4,788	912	813	
Buller	850	-	1,615	-	425	-	-	-	-	
Grey	1,020	850	8,670	850	1,445	7,650	2,890	3,400	-	
Westland	-	1,955	27,540	510	56,610	103,615	128,690	39,780	-	
West Coast	1,870	2,805	37,825	1,360	58,480	111,265	131,580	43,180	-	
Hurunui	835	-	-	93	464	2,134	1,299	5,475	93	
Waimakariri	-	-	-	445	1,114	742	-	-	-	
Selwyn	93	278	-	269	12,899	5,661	-	-	-	
Christchurch	-	-	-	93	557	464	-	-	-	
Ashburton	-	-	-	371	186	-	186	-	-	
Mackenzie	-	-	464	-	1,114	835	1,206	-	-	
Timaru	-	-	-	-	2,042	-	371	-	-	
Waimate	-	-	-	1,745	650	557	1,299	-	-	
Canterbury	928	278	464	3,016	19,024	10,394	4,362	5,475	93	
Waitaki	282	70	-	915	915	1,056	422	422	1,056	
Queenstown-Lakes	-	-	1,408	2,816	4,365	774	1,619	-	-	
Central Otago	-	-	-	-	-	-	-	-	-	
Dunedin	-	-	-	282	-	-	-	-	-	
Clutha	422	352	7,110	5,773	9,645	16,122	19,853	11,968	4,365	
Otago	704	422	8,518	9,786	14,925	17,952	21,894	12,390	5,421	
Gore	-	-	-	-	-	675	-	-	-	
Southland	-	1,248	3,904	665	617	5,398	1,832	3,138	1,364	
Invercargill	-	-	-	-	-	-	-	-	-	
Southland	-	1,248	3,904	665	617	6,073	1,832	3,138	1,364	

Appendix 3: Eucalypts project volumes by district

Eucalypts	20 year rotation assumed									
	2018-2022	2023-2027	2028-2037	2033-2037	2038-2042	2043-2047	2048-2052	2053-2057	2058-2062	
Far North	12,947	138	1,176	346	-	761	138	1,176	346	
Whangarei	8,166	-	-	-	-	2,491	-	-	-	
Kaipara	11,764	-	-	-	-	10,449	-	-	-	
Auckland	2,906	-	1,246	1,868	-	623	-	1,246	1,868	
Northland	35,783	138	2,422	2,214	-	14,324	138	2,422	2,214	
Thames-Coromandel	5,778	-	-	-	-	-	-	-	-	
Hauraki	-	54	-	-	-	-	54	-	-	
Waikato	162	-	-	-	-	54	-	-	-	
Matamata-Piako	-	-	-	-	-	-	-	-	-	
Hamilton	-	-	-	-	-	-	-	-	-	
Otorohanga	230	-	-	-	-	-	-	-	-	
Waitomo	230	-	-	3,571	-	115	-	-	3,571	
South Waikato	10,483	22,579	16,128	31,277	106,099	806	22,579	16,128	31,277	
Taupo	39,110	5,587	7,949	46,598	29,566	24,768	5,587	7,949	46,598	
Waikato	55,994	28,220	24,077	81,446	135,665	25,744	28,220	24,077	81,446	
Tauranga	-	-	-	-	-	-	-	-	-	
Western Bay of Plenty	6,682	9,274	2,074	288	-	288	9,274	2,074	288	
Rotorua	3,859	576	1,786	-	4,493	1,786	576	1,786	-	
Kawerau	634	1,152	-	-	-	634	1,152	-	-	
Whakatane	4,378	4,262	7,258	-	-	2,765	4,262	7,258	-	
Opotiki	518	-	-	-	-	-	-	-	-	
Waipa	-	-	-	-	-	-	-	-	-	
Ruapehu	115	230	-	-	-	-	230	-	-	
Bay of Plenty	16,186	15,494	11,117	288	4,493	5,472	15,494	11,117	288	
Gisborne	9,327	681	210	13,378	419	1,100	681	210	13,378	
Gisborne	9,327	681	210	13,378	419	1,100	681	210	13,378	
Wairoa	52	1,378	6,073	3,474	9,196	-	1,378	6,073	3,474	
Hastings	2,253	-	629	31,440	1,310	105	-	629	31,440	
Napier	314	-	-	-	-	314	-	-	-	
Central Hawkes Bay	786	-	105	6,655	-	-	-	105	6,655	
Hawkes Bay	3,406	1,378	6,807	41,569	10,506	419	1,378	6,807	41,569	
New Plymouth	35	-	-	-	-	-	-	-	-	
Stratford	35	-	-	-	-	-	-	-	-	
South Taranaki	35	-	-	70	35	-	-	-	70	
Wanganui	661	-	-	-	-	-	-	-	-	
Rangitikei	400	174	70	209	226	226	174	70	209	
Manawatu	35	348	-	-	104	35	348	-	-	
Kapiti Coast	-	-	-	-	-	-	-	-	-	
Upper Hutt	557	-	-	70	-	-	-	-	70	
Porirua	-	-	-	-	-	-	-	-	-	
Wellington	-	-	-	-	-	-	-	-	-	
Lower Hutt	-	-	-	-	-	-	-	-	-	
Palmerston North	-	-	-	-	334	-	-	-	-	
Tararua	-	-	-	-	-	-	-	-	-	
SNI West	1,757	522	70	348	699	261	522	70	348	
Masterton	139	153	80	285	271	70	153	80	285	
Horowhenua	766	-	-	-	139	35	-	-	-	
Carterton	-	-	-	-	-	-	-	-	-	
South Wairarapa	4,594	-	-	-	-	-	-	-	-	
SNI East	5,498	153	80	285	411	104	153	80	285	
Tasman	490	-	-	-	-	-	-	-	-	
Nelson	8,296	27	-	-	-	190	27	-	-	
Tasman Nelson	8,786	27	-	-	-	190	27	-	-	
Marlborough	3,090	87	571	1,469	1,142	642	87	571	1,469	
Kaikoura	-	-	-	-	-	-	-	-	-	
Marlborough	3,090	87	571	1,469	1,142	642	87	571	1,469	
Buller	3,550	-	-	-	-	-	-	-	-	
Grey	860	-	-	-	-	30	-	-	-	
Westland	420	10	-	-	-	20	10	-	-	
West Coast	4,830	10	-	-	-	50	10	-	-	
Hurunui	26	-	364	-	-	-	-	364	-	
Waimakariri	-	-	-	-	156	-	-	-	-	
Selwyn	1,014	260	-	-	-	624	260	-	-	
Christchurch	182	-	52	-	-	-	-	52	-	
Ashburton	390	-	-	-	-	312	-	-	-	
Mackenzie	260	-	78	-	-	182	-	78	-	
Timaru	-	-	-	-	-	-	-	-	-	
Waimate	52	-	-	-	-	-	-	-	-	
Canterbury	1,924	260	494	-	156	1,118	260	494	-	
Waitaki	5,544	334	-	2,472	534	-	334	-	2,472	
Queenstown-Lakes	4,542	-	-	-	-	200	-	-	-	
Central Otago	-	-	-	-	-	-	-	-	-	
Dunedin	2,004	-	-	-	-	67	-	-	-	
Clutha	19,973	44,088	334	4,008	4,876	1,202	44,088	334	4,008	
Otago	32,064	44,422	334	6,480	5,411	1,470	44,422	334	6,480	
Gore	2,338	33,467	-	6,480	-	-	33,467	-	6,480	
Southland	165,130	267,133	40,748	79,692	126,720	99,064	267,133	40,748	79,692	
Invercargill	-	-	-	-	-	-	-	-	-	
Southland	167,468	300,600	40,748	86,172	126,720	99,064	300,600	40,748	86,172	

Appendix 4 – Douglas-fir, Southern North Island



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