CASE STUDY

Silvicultural interventions to improve sawlog production from Tasmanian forests

Prepared for the Tasmanian Forestry Hub
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GREENWOOD
STRATEGY

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EXECUTIVE SUMMARY

This Tasmanian case study has been prepared as a supplementary report for the project ***Building the case for intervention to support increased sawlog production from Australia's forests*** which was prepared for the Tasmanian Forestry Hub in January 2023. The primary report provides a broad consideration of opportunities to increase short to medium term sawlog production from the existing forest estate in Australia. It identified a number of forest management regimes and species in various Australian regions where silvicultural interventions, supported by Government policy and funding, could meaningfully improve production of high quality logs for a range of applications, including structural application in construction, feature grade timbers and manufactured solid wood products. If implemented, these interventions will assist in bridging some of the supply-demand imbalance being experienced by Australia's forest and wood products, and housing construction sectors. Tasmania has been identified as the region where there is most opportunity to explore these options to improve short term solid wood production. A recent demand study undertaken by Indufor (2022) provides the market and economic rationale for considering a supported program.

The Tasmanian economy stands to realise significant benefit if the proposed measures are supported through policy and funding. In the face of increasing supply scarcity in other jurisdictions, Tasmania is well placed to become the leading producer of raw logs. Investment in domestic manufacturing could significantly increase the value-added contribution to the Tasmanian economy. However, investment confidence requires certainty of supply for the right log products. For Tasmania to capitalise on the emerging opportunities, it is preferable to respond earlier rather than later, so the risk of substitutes (either imports or alternative products) can be mitigated. That requires actively supporting (with policy and funding) actions to improve short term log production. The authors have developed a series of recommendations which could be considered by Governments as part of future incentive programs to support the broader aim of increasing sawlog supply. The recommendations are based on the consultant's analysis and do not necessarily represent the position of the Hub.

Proposed recommendations to support the silvicultural intervention programs outlined in this report include:

1. **Emissions Reduction Fund rules**:
   a) Ensure that *E. nitens* and *E.globulus* are recognised as eligible long rotation species in Tasmania.
   b) Ensure that the additionality exclusion for government program funded projects is relaxed for long rotation conversion projects.
   c) Ensure that actively managed regrowth native forests are eligible for ERF participation where additional and tangible forest and ecosystem health benefits can be demonstrated.
2. **Long rotation plantation forestry fund**:
   Establish a dedicated long rotation conversion fund of up to $2.5 million annually for ten years, for eligible plantations with agreed criteria addressing species, productivity, scale and proximity to processing facilities and infrastructure.
3. **Forest health restoration fund**:
   Establish a forest health restoration fund of up to $4 million annually for ten years to support active silvicultural management of regrowth native forests on public and private land where additional and tangible forest and ecosystem health benefits can be demonstrated and the activity would not be viable without financial support. Criteria for participation to be determined through the application of an appropriate natural capital accounting method and monitoring.
4. **Specialty timbers silviculture fund**:
   Establish a specialty timbers silviculture fund of up to $600,000 over ten years, to support fast-tracking requisite silvicultural interventions for blackwood forests and to trial commercial thinning.

INTRODUCTION

Overview

There is considerable scope to explore the application of alternative silvicultural regimes, along with emerging markets and technology, to generate a short to medium term increase in the production of high quality logs from Australia's existing forest estate. In particular, hardwood plantations and native forests present genuine opportunity. If they can be implemented, these interventions could provide a much-needed improvement in the supply-demand imbalance in wood products currently being experienced by the Australian economy. The broad benefits to the Australian economy are potentially significant. They include reduced dependence on imported timber, reduced reliance on volatile wood product supply chains, increased domestic value-added manufacturing and improved construction efficiency based on more reliable availability of construction materials. There are also considerable environmental gains to be realised. Most obvious is the increase in wood products that can store accumulated carbon in service, compared to other less sustainable construction materials such as concrete and steel. There is also the advantage of increased carbon accumulation in growing trees. Importantly, there are also real and significant opportunities to generate broader biodiversity and environmental health outcomes in actively managed native forests, on both public and private land.

This case study has been prepared to supplement a broader report which provides analysis at the national level. A key finding from the overarching report is that the opportunities for supported silvicultural interventions in Tasmania are significant and have the potential to substantially increase high quality log production from the current forest estate over the next 15 to 30 years. This is in addition to the effect of any material increases in plantation area, which would not influence overall production levels for several decades.

Tasmania's forest estate

Production and economic contribution

The forest and wood products industry is a significant contributor to Tasmania's State economy. In 2020/21, approximately 5.3 million m^3 of native hardwood, plantation hardwood and plantation softwood logs were harvested from public and private forests in Tasmania, with an estimated log value of $395 million (ABARES, 2022). The economic contribution of the sector to Tasmania's economy for the same year is estimated to be $1.028 billion (Forest Practices Authority, 2023). The Tasmanian industry is also a significant contributor to the sector in the Australian economy more broadly, representing 20% of total national log production and 18% of total national log value. Table 1 provides a comparison of key production and economic statistics for the Tasmanian industry.

Table 1: Comparison of key production and economic statistics for the Tasmanian forest and wood products sector (Sources: ABARES, 2022; Forest Practices Authority, 2023)

Forest type	Logs harvested ('000 m^3)	Percent of national harvest	Value of logs harvested ($ million)	Percent of national value	Total economic contribution ($ million)
Native hardwood	1,308	39%	73	24%	224
Plantation hardwood	2,622	37%	226	35%	691
Plantation softwood	1,368	8%	96	8%	293
Total	**5,299**	**20%**	**395**	**18**	**1,028**

Forest estate overview

Tasmania's commercially productive forest estate comprises hardwood plantations (193,000 ha net), softwood plantations (77,000 ha net) and native forests (3 million ha gross), located on both public and private (refer to Figure 1) land across the north, east and south of the State, as shown in Table 2.

Table 2: Distribution of Tasmania's commercial forest estate (Sources: Forest Practices Authority, 2023; Wilson & Tys, 2022)

Forest type	Public land (ha)	Private land (ha)	Total
Native (gross)	2,230,000	842,000	3,072,000
Hardwood plantation	16,000	177,000	193,000
Softwood plantation	4,000	74,000	78,000
Total	**2,249,000**	**1,093,000**	**3,342,000**

In relation to native forests, the net available area on public land is estimated at 471,000 ha. The private land area availability is less certain. Wilson & Tys (2022) modelled approximately 329,000 ha as harvestable, although 149,000 ha is low quality and 23,000 is non-eucalypt. In addition, much of the private native forest estate is either difficult to access or is logistically challenging with respect to distance to market. Of this area,

[1] Estimated by calculating distribution of total value (Forest Practices Authority, 2023) pro-rated to value of logs produced (ABARES, 2022).

approximately 144,000 ha is classified as regrowth, of which an estimated 50,000-70,000 ha is medium to high quality regrowth forest which is likely to be viably accessible.

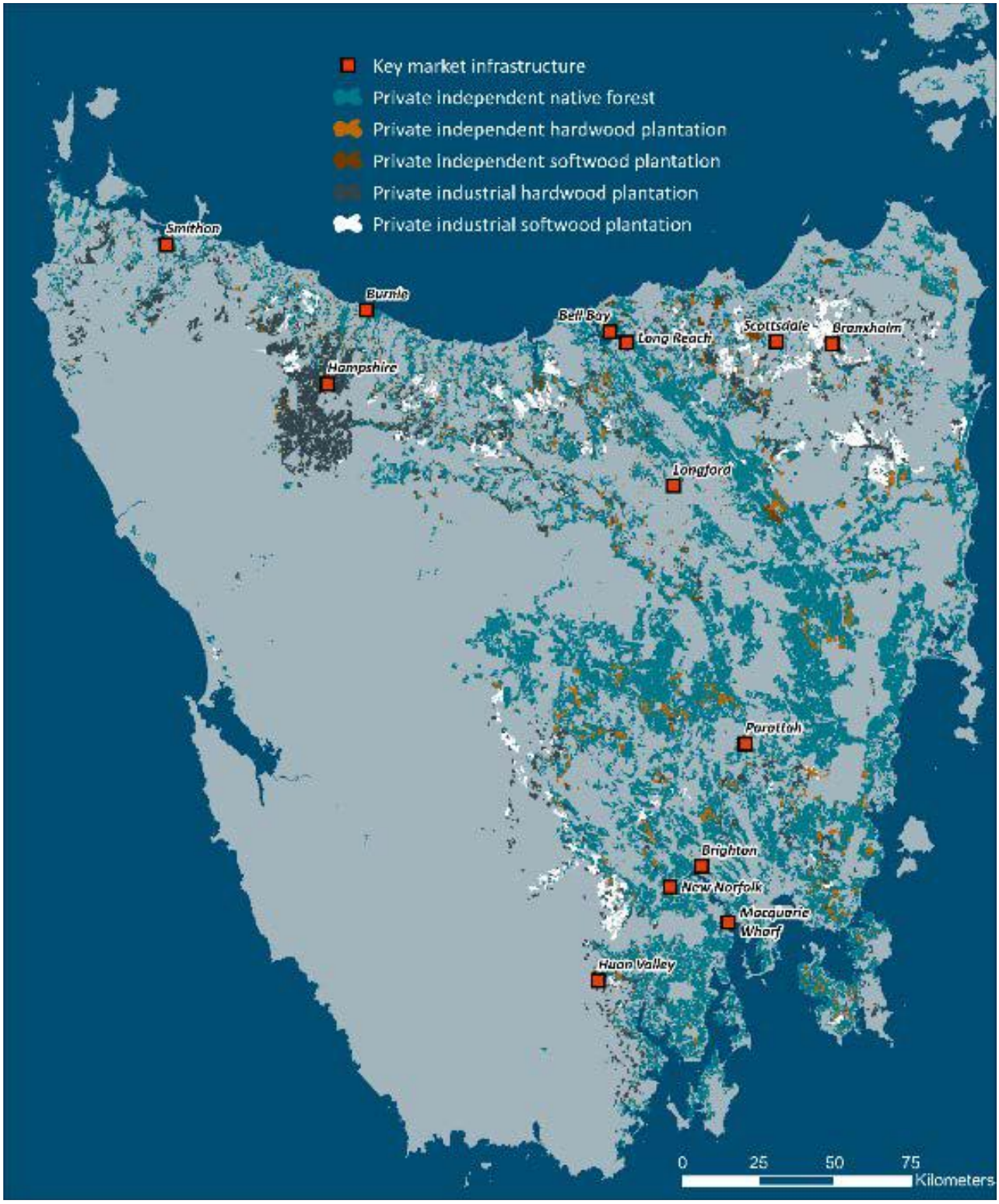

Figure 1: Distribution of Tasmania's privately managed forests (Wilson & Tys, 2022)

Forest and wood products sector demand outlook

Indufor (2022) completed a comprehensive demand outlook for Tasmania's wood products sector. The report identified a number of emerging themes which provide important context for this case study. These are briefly summarised in the section below.

Changes in supply profile

The log supply profile from Tasmania's forest estate has changed considerably in the decade from 2009/10 to 2019/20. In particular, the contribution of native forest logs reduced from 56% to 22% of total log supply, even though total annual log production increased by 17% from 4.77 to 5.73 million m^3. Over the same time period, the contribution of hardwood plantation pulp log increased from 21% to 43% and total hardwood plantation log production has grown to 48% of log output (refer to Figure 2).

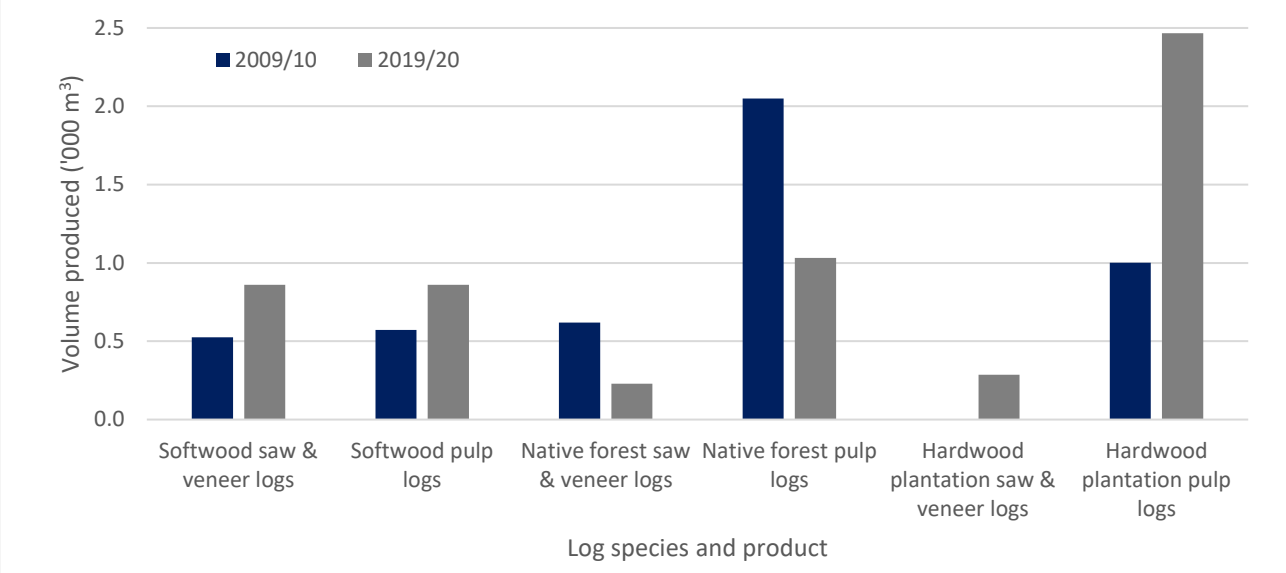

Figure 2: Change in Tasmania's log supply profile (2009/10-2019/20) (Sources: Indufor, 2022; ABARES, 2022)

Demand outlook

The Indufor report notes that Tasmania's opportunity to meet increased domestic demand for sawn wood and wood panels arises from supply scarcity in other states and the ability of Tasmania's wood products manufacturing sector to compete with imported products. In that context, opportunities to improve the short to medium term availability of high quality logs will contribute further to Tasmania's ability to address scarcity in other states, while also providing improved supply scale and confidence for manufacturing investment.

The report identifies seven wood products for which the demand outlook is high or is increasing and that present opportunities for the Tasmanian sector, as summarised in Table 3.

Table 3: Demand outlook for selected forest wood products (adapted from Indufor, 2022)

Product	Category	Demand assessment	Drivers/considerations
Sawn timber	Hardwood	High	Supply scarcity
	Softwood	High	Housing demand
Panels	Plywood	High	Competitive markets
	MDF	Moderate	Competitive markets
	Particleboard	Stable	Competitive markets
Engineered wood products (EWP)	OSB	Moderate	Competitive markets, low demand
	LVL & I-joists	Increasing	Competitive markets
	CLT & GLT	High	Uncertainty about market scale
Paper	Packaging	High	Changing markets and industry
	Newsprint	Declining	Digital revolution
Exports	Plantation logs	High	Competitive markets
	Plantation fibre	High	Competitive markets and fibre yields
Bioenergy and bio-composites		Increasing	Policy signals, technology developing, emerging markets

Opportunities

The Indufor report notes a strong industry focus on encouraging increased domestic processing and investment in Tasmania, while improving carbon sequestration and storage and reducing emissions, supported by clear policy signals. It further identifies eight specific processing investment opportunities, some of which (e.g. CLT) are already being pursued. At appropriate scale, these investment opportunities represent demand for up to 1 million m^3/yr of log input which can be enabled by actions to improve the short, medium and long term availability of high quality logs through appropriate changes in silvicultural practice. These opportunities are explored in more detail through this case study.

Focus areas for support

Preliminary opportunity assessment

The overarching report analysed the potential opportunities for active intervention to improve short to medium term high quality log production from four forest type categories in each of the National Plantation Inventory (NPI) regions. This analysis demonstrated that Tasmania presents significantly more opportunity for intervention than any other region in Australia. Table 4 presents a heat map for Tasmanian opportunities.

Only three other regions present material opportunities currently, although that could increase through time and investment. In each of those other regions (southeast Queensland and north coast New South Wales (private native forestry) and the Green Triangle (hardwood plantations)) only one forestry type is identified for potential action. As noted below, in Tasmania, there are three forestry types identified for potential action.

Table 4: Opportunities heat map for the Tasmanian NPI region

NPI region	Softwood plantation	Hardwood plantation	Public native forest	Private native forest
Tasmania				

The role of silviculture

Silvicultural regimes are typically designed to meet the objectives of the forest grower keeping in mind the suitability and capability of the forest type to meet those objectives. In Australia, softwood plantations have been established and grown over a very long period of time with primary purpose of producing sawlogs for the domestic construction industry. Softwood plantation silvicultural regimes (along with tree-breeding programs) have been designed and refined with this specific purpose in mind. By contrast, the majority of Australia's hardwood plantations have been established since 1990 with the specific aim of producing logs for woodchip production, and silvicultural regimes developed accordingly. There are, however, important exceptions to this, including large areas of shining gum plantations in Tasmania. It has been clearly demonstrated that shining gum can be managed on long rotations for solid wood production, as long as careful attention is paid to appropriate thinning and pruning regimes. Native forestry is somewhat more complex and silvicultural regimes vary considerably, depending on the history of the forest, location, wood properties and growth characteristics of the species present and the availability of markets. However, in Tasmania there is mounting evidence for the potential to manage large areas of regrowth from previous clearfell operations, which can bring forward sawlog production in successive tranches to deliver more high quality logs to the market, earlier.

Potential interventions analysed

The analysis included in this report focuses on three areas for potential intervention:

1. Conversion of hardwood eucalypt plantations from short to long rotation, with a shift from pulpwood to sawlog as the primary production objective and to generate increased carbon accumulation and storage benefits, including participation in the Emissions Reduction Fund
2. Thinning of native forest regrowth on public and private land to generate a moderate short term increase in sawlog production followed by a substantial medium term increase by bringing forward and enhancing future forest productivity. This will also generate broader forest health and environmental outcomes of benefit to the whole community, as well as improved carbon accumulation and storage (although this can not currently be recognised in the Emissions Reduction Fund)
3. Active management of blackwood (*Acacia melanoxylon*) regrowth to generate increased volume output of specialist timber for feature grade applications.

DETAILED OPPORTUNITIES ANALYSIS

Hardwood plantations

Overview

Tasmania has approximately 193,000 ha of hardwood plantations. These are dominated by two species – shining gum (*Eucalyptus nitens*) and Tasmanian blue gum (*Eucalyptus globulus*). Shining gum comprises about 168,000 ha of the State's hardwood plantation estate, or about 87% of the total area (refer to Figure 3).

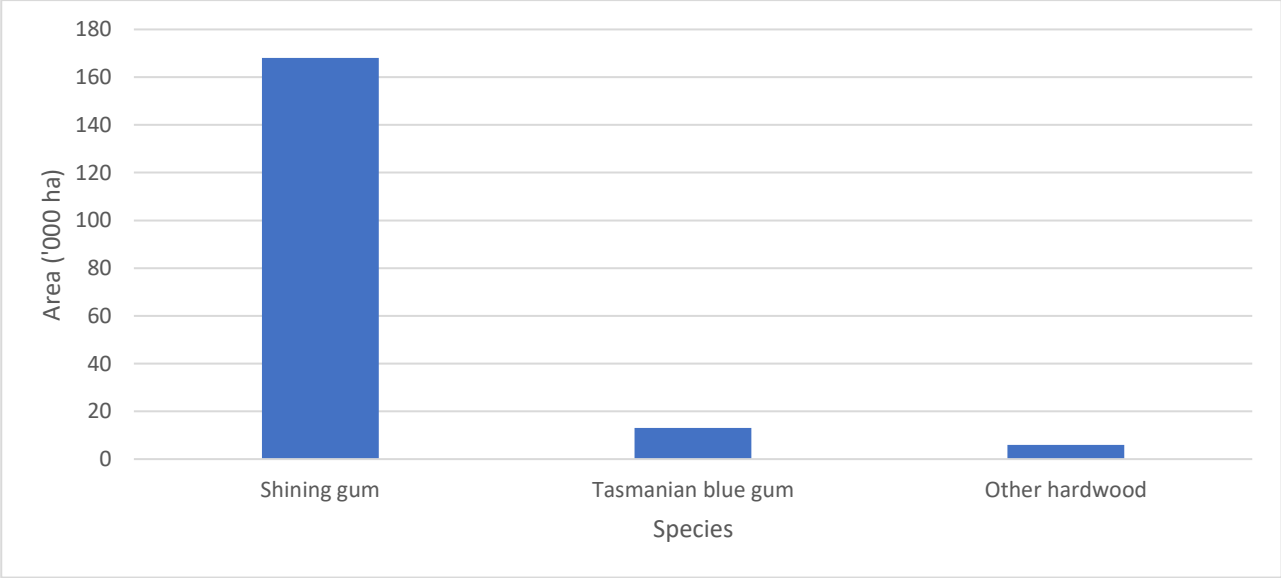

Figure 3: Tasmanian hardwood plantation area by species (Source: Legg et al, 2021

The majority of Tasmania's hardwood plantations are currently managed on a short rotation length for the production of pulp log for export woodchip markets. However, there is a significant and increasing proportion that is being established to longer rotations for saw and veneer log production, on both public and private land. Sustainable Timbers Tasmania began developing long rotation shining gum plantations in the 1990s with the intent of supplementing production of higher quality logs from public native forests. There is now considerable evidence about the suitability of plantation grown shining gum for application to high quality solid wood product manufacturing. There are an estimated 25,000 ha of shining gum (*Eucalyptus nitens*) plantations which are subject to sawlog silvicultural regimes across both public and private land (Vega *et al*, 2021). While new shining gum plantations are likely to take more than 25 years to grow high quality logs for solid wood application, there exists an opportunity to support conversion of existing short rotation plantations to long rotation, which would bring forward high quality log production in a proportion of the estate by 10 to 15 years. There are also opportunities to explore solid wood silvicultural regimes for Tasmanian blue gum (*Eucalyptus globulus*), although it is generally recognised as a more challenging species for this purpose.

Assessment of potential

Northern Tasmania is the primary region of focus, due to the concentration of both plantations and processing capability, and relatively short haulage distances. There is an estimated 156,000 ha of eucalyptus plantations in the region (Greenwood Strategy, 2020).

ABARES (2021) has published data which indicates the potential productivity of eucalypt sawlog regimes in Tasmania. It is assumed that eucalypt plantations with an average mean annual increment (MAI) of 20m^3/ha/yr will produce 150m^3/ha of sawlog and 170m^3/ha of pulp log at a clearfall age of 25.

Assuming that 10% (15,600 ha) of the estate could readily be converted from short to long rotation over a ten year period, that represents an annualised increase in sawlog production of 234,000 m^3 at maturity, with Tasmanian production increases commencing within 16 years (2038). An alternative approach could be to convert the area over a shorter period of time and bring forward the sawlog production.

An important question, which requires further investigation and trialling, is whether it would be possible to bring forward sawlog production by converting slightly older plantations (older than 10 years). The critical considerations are:

- The extent to which older plantations are capable of responding to silvicultural intervention (thinning) to generate a sufficient growth response for future sawlog production.
- Whether or not unpruned shining gum stands older than ten years can be effectively pruned without a significant increase in stem defect.

Silvicultural and market requirements

Rotation length

Hardwood pulpwood plantations are usually grown on rotation lengths between 10 and 15 years, generally with no silvicultural interventions following initial establishment. Eucalypt plantations grown for solid wood production need to be grown over longer rotations, for two key reasons:

(i) to ensure log size is sufficient for solid wood processing; and
(ii) to maximise the development of desirable wood properties for solid wood processing.

The optimal rotation length varies considerably with species, climate, site quality and other silvicultural interventions (e.g., thinning and pruning). Wood *et al* (2009) calculated that rotation length should be extended to between 17 and 28 years for shining gum and Tasmanian blue gum plantations in Tasmania, with variability driven by site quality, and thinning and pruning status, in order to optimise net present value for harvestable sawlogs.

The decision to increase the rotation length of a hardwood plantation and shift the silvicultural and production focus from pulpwood to solid wood comes at a price. That price includes the cost of increased silvicultural interventions, such as non-commercial thinning and pruning, and the negative effect of longer rotations on net present value.

Thinning and pruning

A typical shining gum solid wood silvicultural regime involves establishment at 1,100 stems per hectare (sph), with a non-commercial thinning event at around age 3 to reduce stocking to 1,000 sph. A first lift pruning event is also advised at age 3, followed by a second lift pruning event by age 6, with preferred pruned height of 6.4 m. A commercial thinning event at about age 9 to further reduce stand density and generate revenue is recommended and a second commercial thinning at about age 15.

The intensity of commercial thinning is important to consider. For example, Gendvisal *et al* (2021) note that thinning shining gum to 300 sph at three sites resulted in a reduction in wood stiffness (an important characteristic for structural timber), while thinning to 500 sph had no effect on wood properties.

The importance of these silvicultural interventions and their timely application cannot be overestimated, particularly where the intent is to change from pulp wood to solid wood silviculture. In relation to stand density, unthinned shining gum plantations can be prone to high levels of stand mortality and potentially

stand lock-up. There is a high risk that stands which are not thinned in a timely manner will not be biologically capable of exhibiting a growth response. In relation to pruning, shining gum is not an effective self-pruning species in a plantation environment. Therefore, larger branches can develop which compromise the solid wood properties of logs produced. Delayed pruning can also result in an increased risk of decay-forming infections. It is generally recommended that pruning is undertaken at a young age, when the branches are still green, to avoid potential infection leading to wood decay or other defects such as kino voids (Wardlaw and Neilsen, 1999).

Pruning is not undertaken in current pulpwood plantations and is not advised for plantations older than 10 years. It is unlikely that pruning would be a practical solution for most of the existing pulpwood estate. However, it is an important consideration for new solid wood rotations where market demand for clearwood exists. Thinning is a viable intervention for existing pulpwood plantations under 10 years old. However, for older plantations there is an increased likelihood that thinning may not result in a sufficient growth response and may increase the risk of adverse outcomes such as increased windthrow.

Processing, markets and price

The ability to convert eucalypt plantations from short rotation pulp log to long rotation solid wood production requires the presence of appropriate processing capacity, markets for a full range of log products and a market price for saw and/or veneer logs which justifies the impact on net present value of increasing the length of the rotation. In Tasmania, the first two criteria are demonstrably fulfilled, especially for *E. nitens*. It is less clear that prices for sawlogs are sufficient to justify the shift. However, private property eucalypt plantation logs are currently being transported from Tasmania to Gippsland for solid wood processing which suggests a willingness to pay on the part of at least some processors.

Proposed options for intervention

The primary policy option available for achieving increased high quality log production from Tasmania's hardwood plantation estate is the application of Schedule 2 of the Plantation Methodology, which allows conversion from short to long rotation under the Emissions Reduction Fund (ERF). While this falls under the Commonwealth Government's policy remit, there is a funding gap between potential revenue under the ERF and the costs of converting to long rotation. There is a strong argument for the Tasmanian Government to play a role in providing policy support and funding to complement ERF revenue, and support a program aimed at increasing the production of high quality logs from the State.

ERF process and requirements

Projects to convert short rotation to long rotation plantations are recognised in Schedule 2 of the Carbon Credits (Carbon Farming Initiative-Plantation Forestry) Methodology (the plantation forestry method) under Australia's ERF. Australian Carbon Credit Units (ACCUs) can be earned for the difference in carbon accumulation between the baseline (short rotation) scenario and the additional carbon stored by switching to a long rotation. There are specific eligibility requirements, including:

1. The plantation must be in or within 100km of a National Plantation Inventory (NPI) region (refer to Figure 4).
2. The plantation must fall within a specified zone in relation to rainfall (refer to Figure 5).
3. The current species must be recognised as a short rotation species (including *E. nitens* and *E. globulus*).
4. The new species must be recognised as a long rotation species (currently does not include *E. nitens* and *E. globulus*) or have an undefined rotation which means that the project proponent must be able to demonstrate that the species has been grown and harvested as a long rotation species

within 100km of the project area (demonstrable for *E. nitens* in Tasmania, possible for *E. globulus* in Tasmania).

5. An independent financial assessment must be undertaken to demonstrate that a long rotation would not have been viable in the absence of ERF.

Another potential barrier currently is the fact that the additionality rules in the plantation forestry method do not allow for ERF participation where the project can be funded by another government program. However, other vegetation methods under the ERF (e.g. environmental plantings) can be supplemented by alternative government funding as occurs with Queensland's Land Restoration Fund ($500 million)[2] and potentially the Biodiversity Credits Scheme recently announced for NSW ($100 million)[3].

Preliminary analysis and quantification

Preliminary industry analysis indicates the cost of converting from a short rotation pulpwood plantation to a long rotation solid wood regime is at least $2,000/ha. Schedule 2 projects which have been successful in ERF auctions have delivered about $1,250/ha for ACCUs (based on $16.94/ACCU during Auction 13). The most recent ERF auctions (Auction 14 and 15) paid $17.35 and $17.12 per ACCU respectively, which would improve ERF returns to approximately $1,300/ha. That leaves a gap of about $700/ha.

As identified earlier, the hardwood plantation estate in northern Tasmania is about 156,000 ha. Conversion of 10% of that estate to long rotation plantations over a ten year period would deliver an estimated annualised increase in sawlog production of 234,000 m^3 by the late 2030s (approximately 4.5% increase on current sawlog production). Applying the current differential between ERF auction value and silvicultural costs of $700/ha, if Commonwealth and/or State government support was available for this transition, the annual cost would be between $1.5 and $2 million, which would reduce if the ERF auction returns for ACCUs continues to rise.

What is required to make it happen?

There are three interventions which could facilitate a significant shift from short to long term hardwood plantations:

1. Species eligibility: It is imperative that industry be provided confidence that *E. nitens* and *E. globulus* in Tasmania, as a minimum, are eligible species for long rotation plantations under Schedule 2 of the plantation forestry method.
2. Additionality: It is important to ensure that any additional incentive is excluded from the current additionality exclusions related to Government program funding, so that plantation conversion projects can be supported in the same fashion as environmental plantings.
3. Program funding: Commonwealth or State funding incentive, in the form of a subsidy to bridge the gap between ACCU price and the costs to convert to long rotation is required at up to $2 million annually.

[2] https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund

[3] https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/about-the-biodiversity-offsets-scheme/about-the-biodiversity-credits-supply-fund

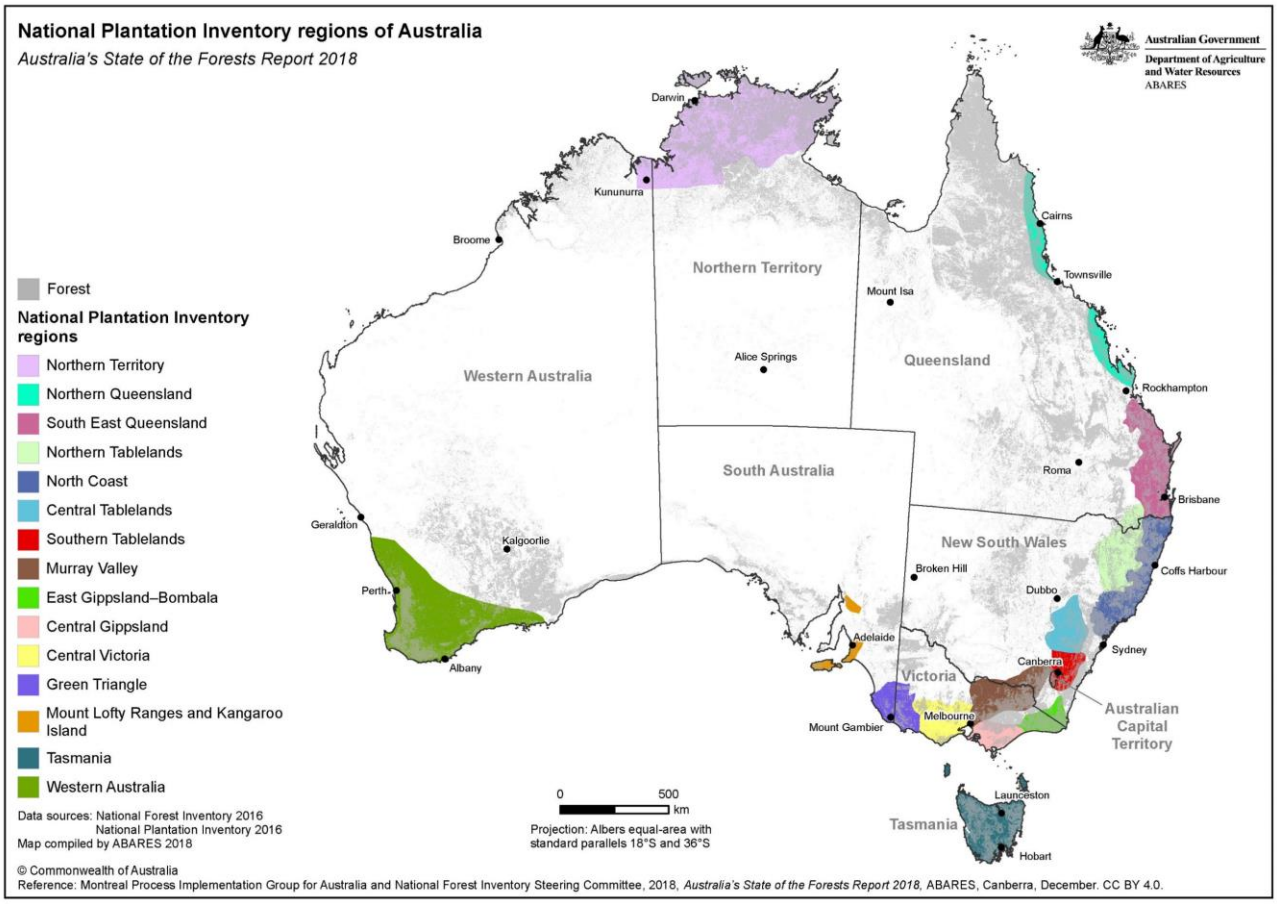

Figure 4: National Plantation Inventory regions

Recommended structure

It is proposed that a dedicated fund be established with agreed criteria against which forest owners can make a determination about the suitability of plantations for rotation conversion and apply for the incentive. These criteria could include species, productivity, scale and proximity to processing facilities and infrastructure. It is reasonable to expect that forest owners would need to demonstrate the viability of the proposed project and justify the exact level of financial support.

Economic rationale

The proposed program would be capable of supporting the construction of up to 15,000 new dwellings annually at maturity, or up to 150,000 over a ten year period. It would create an additional 10 direct jobs in forest management, harvest and haulage and a further 20 indirect employment opportunities through the supply chain. It would also provide significant opportunity for expansion of domestic processing capacity in Tasmania.

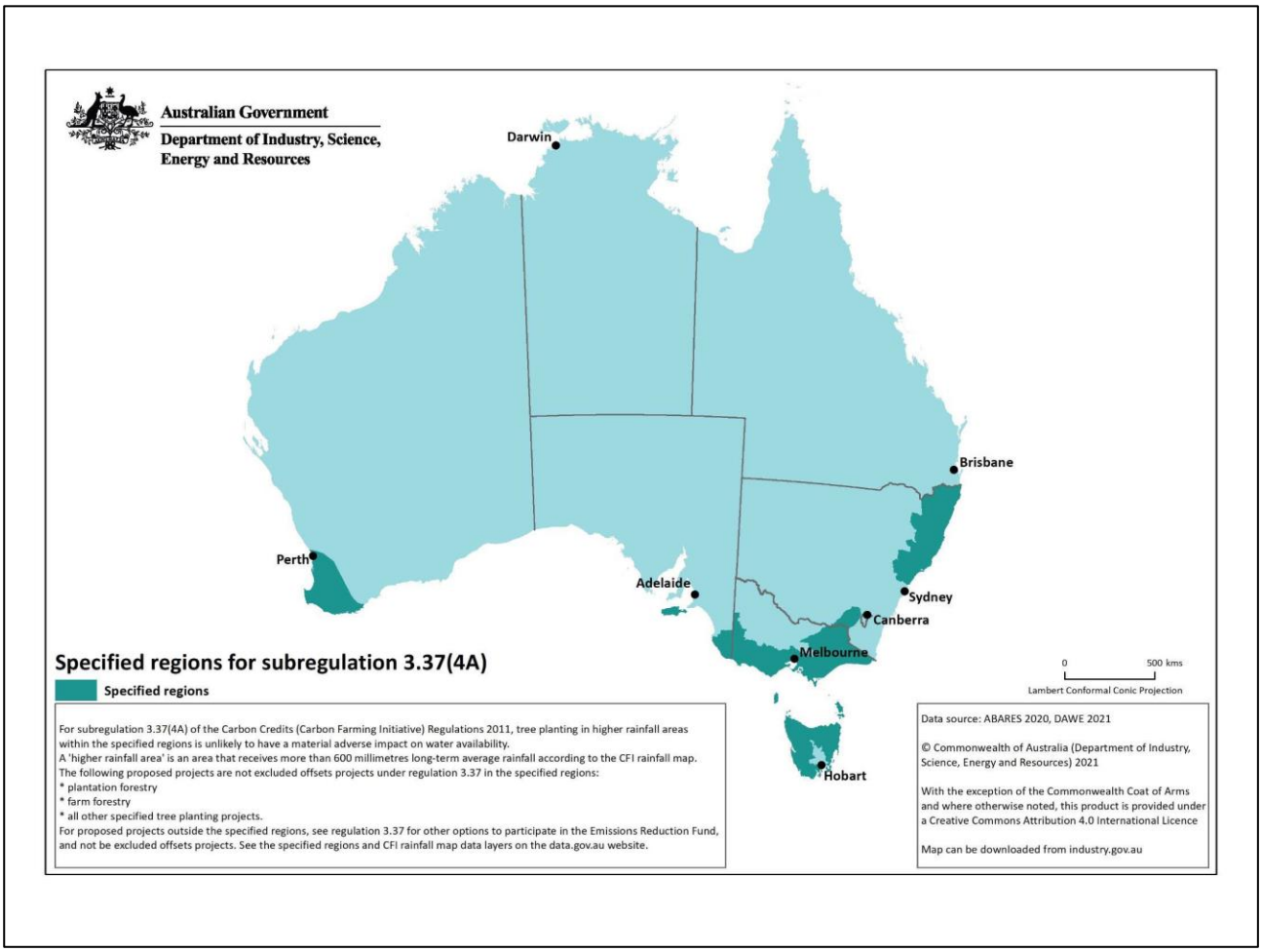

Figure 5: Specified rainfall zones

Native eucalypt forests

Overview

Commercial management of Tasmania's native forests is significant in the overall Australian context. Nearly 40% of all native forest log production (by volume) is from Tasmania, representing about 24% of Australian native forest harvest value. The differential between production volume and production value is due to a combination of the available markets (particularly lower value pulp log markets in Tasmania) and the relatively high value of highly durable sawlog species in other jurisdictions.

Throughout Tasmania, but particularly in the north and east, there is a significant even-aged regrowth forest resource on both public and private land that has resulted from clearfall harvesting between the 1970s and 1990s. It is dominated by ash (*E. delegatensis* and *E. regnans*) and other light, temperate species (such as *E. obliqua* and *E. viminalis*). These forests respond well to thinning from below, a silvicultural intervention that can bring forward future sawlog production.

There is some difference between the public and private native forest resource. In particular, the private native forest resource tends towards drier, less productive forest types. However, the potential opportunity is significant on both tenures.

The primary focus for this assessment is these regrowth forests, where there exists a significant opportunity to bring forward high value log production using alternative silvicultural techniques.

Assessment of potential

In Tasmania there is an estimated 144,000 hectares of commercially viable and harvestable regrowth forest on private land, with an estimated 21.9 million m^3 standing volume (Wilson & Tys, 2020). A proportion of this estate is likely to be low productivity, inaccessible or distant from market, and the practical available area of medium to high quality regrowth is probably between 50,000 and 70,000 hectares. However, this is still a significant area of forest representing a potentially world class forest resource. It is likely to represent in excess of 10 million m^3 of standing volume. On public land, the estimated area is about 63,000 (clearfell regeneration between 1960 and 2010) with an estimated standing volume between 15 and 18 million m^3.

There is currently an active regrowth thinning program on both public and private land which is generating pulp log and sawlog, as well as bringing forward future sawlog production. The program involves thinning from below, removing about half the basal area and between 30 to 40% of the standing volume. Harvested logs typically comprise small sawlog (10%) and pulp log (90%). It is estimated that between 4,000 and 5,000 ha have been treated across private and public land over the past five years and, although it is still relatively early in its development, this approach holds considerable promise.

It is conservatively assumed that public forest standing volume averages 250m^3/ha and private forest standing volume averages 200m^3/ha for medium and high quality stands. Assuming that 10% of the viable private forest is made available for harvest over the next ten years (6,000 ha in total at 600 ha/yr), that represents an additional 48,000m^3/yr (4,800m^3 sawlog and 43,200m^3 pulp log). Similarly, assuming the public land program is undertaken over ten years (63,000 ha in total, or 6,300 ha/yr) an additional 630,000m^3/yr of log could become available (63,000m^3 of sawlog and 567,000m^3 of pulp log). However, this would mean harvest area would almost double on the public forest estate[4]. It is therefore more reasonable to assume that the program would occur over 20 years, at about half the annual rate by area and volume (31,500 m^3 sawlog and 283,500 m^3 pulp log). The combined impact of a public and private land program is therefore likely to deliver a short term increase in production of up to 36,000m^3/yr of small sawlog and 325,000 m^3/yr of pulp log.

In addition to the immediate increase in log (including sawlog) production, the regrowth thinning program will result in bringing forward future sawlog production. Extrapolating these assumptions, the average retained stand will have a standing volume of 150m^3/ha for public forest and 120m^3/ha for private forests. The current expectation is that these stands will be grown on for a further 10 to 15 years, at an average MAI of 1m^3/ha/yr. It is expected that at harvest they will produce a higher ratio of 50% sawlog to 50% pulp log. It is therefore possible that by the mid-2030s, between 170,000m^3 and 340,000m^3 of sawlog could be produced annually from these thinned stands, depending whether the subsequent operation is a subsequent thinning of the mature overstory or 100% harvest.

Work currently being undertaken for Private Forests Tasmania (Greenwood Strategy, 2023, *in prep*). Provides a useful point for comparing the potential for regrowth thinning against deferral to a later clearfell event. Three regrowth treatment options are assessed:

[4] Sustainable Tasmania's 2022 annual report identifies about 6,300 hectares harvested and regrown

1. Ongoing thinning, commencing at age 50, with second thinning at age 65 and third thinning at age 100.
2. Thinning at age 50 and clearfell at age 100.
3. No thinning, with clearfell at age 85.

Figure 6 shows the standing volume profile for a sample hectare of good quality regrowth under the three treatment options. Figure 7 shows the sawlog harvest profile for the same three treatment options. Under scenario 1, sawlog volumes are lower (75 m^3/ha total over 50 years) but commence earlier and occur regularly. In option 2, early thinning volume is supplemented by a significant clearfell volume at age 75 (total of 112m^3/ha over 25 years), rather than age 85 for option 3, generating a total sawlog volume of 125m^3/ha.

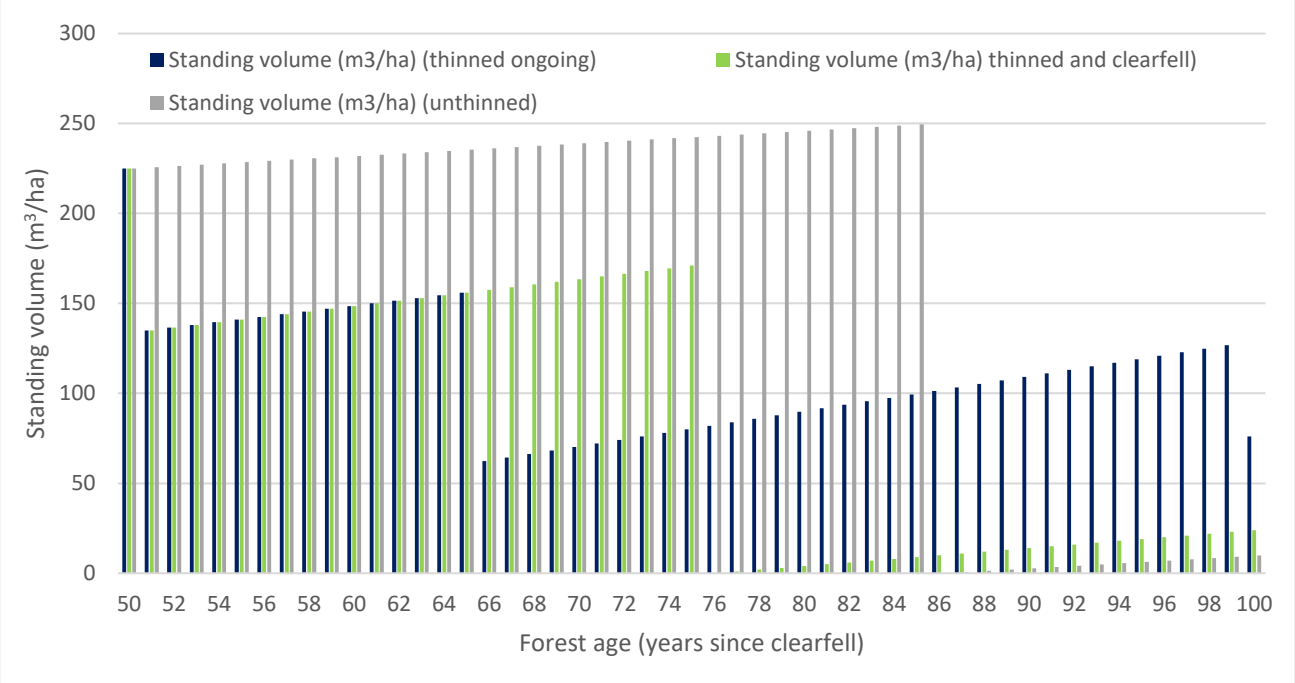

Figure 6: Standing volume profile for three regrowth treatment options

The two thinning options bring sawlog production forward, which also has benefits for the net present value of the operation. It also offers the advantages associated with turning an even0aged stand into a multi-aged stand, providing additional ecosystem benefits and minimising any adverse impacts of broadscale harvesting. While the clearfell only option potentially produces more sawlog, the timing is 35 years in the future to achieve an equivalent volume of sawlog.

Processing, markets and price

In Tasmania there is considerable and competitive market demand for both pulp. saw and veneer logs that means silvicultural activity can be undertaken commercially. Regrowth thinning is currently occurring on both public and private native forest, with pulpwood being purchased by a number of woodchip customers, including Midway Tasmania and high quality logs being purchased by Western Junction, NSFP SmartFibre and Brittons.

External benefits

An important outcome from active management of these forests is the on-farm and external environmental benefits which derive from improving forest structure and health. These include improved ecological function

and diversity, management of soil and water and increased carbon sequestration capacity in healthier, growing forests.

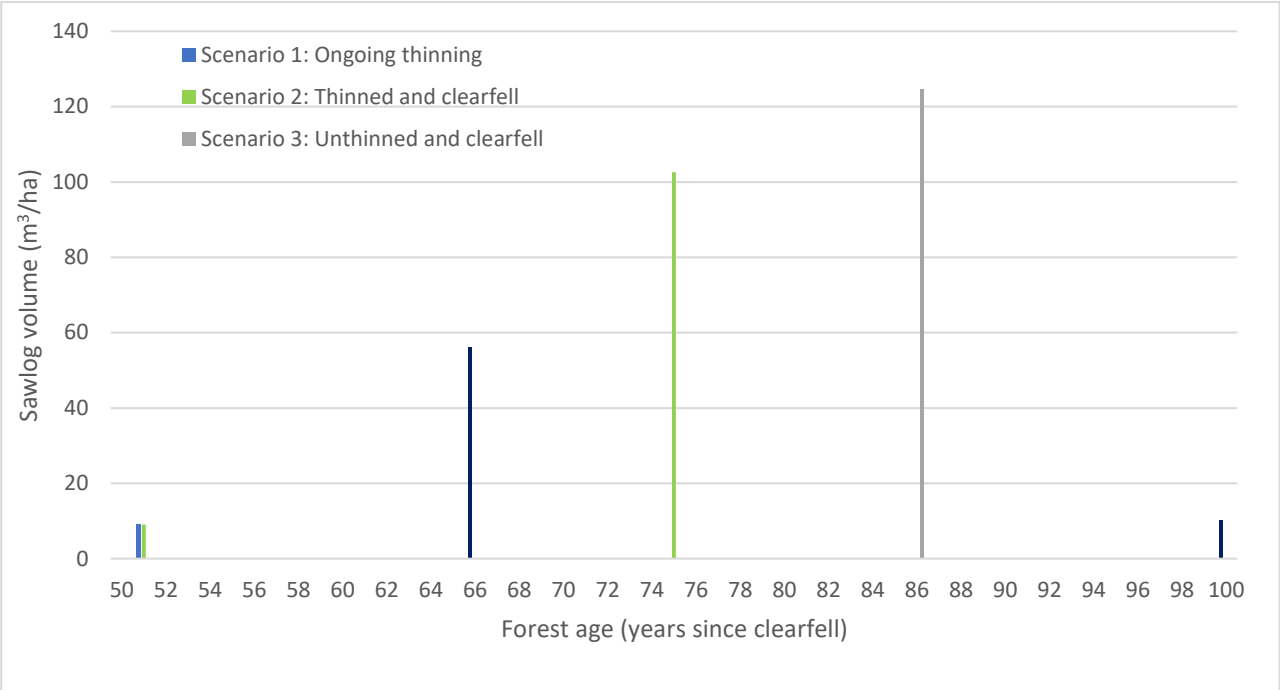

Figure 7: Sawlog production for three regrowth treatment options

Proposed options for intervention

The immediate focus for timber stand improvement relates to native forest stands which were clearfelled between 1970 and 2000. A sizeable area of forest (approximately 120,000 ha) has been identified on public and private land which is suitable and viable for timber production. Through the application of regrowth thinning regimes, this estate is capable of producing an additional 36,000m^3/yr of sawlog over the next ten years, assuming that 10% of the private native forest estate is available and the public forest regrowth is thinned over a ten year period. In addition, the result of regrowth thinning will be to develop a future sawlog rich forest resource which will be available from the mid-late 2030s and can produce an additional 170,000-340,000m^3/yr of sawlog.

While much of the area addressed above can be managed on a commercially viable basis, there are more marginal areas (either further from market or in a more degraded condition), particularly on private property, where regrowth thinning would deliver both increased future sawlog availability as well as short term ecological and environmental improvements which are of benefit to the whole community. The estimated cost of treating these areas is between $750-1,000/ha. Assuming that a further 10% of the private forest estate could be accessed in this category, the estimated annual cost of treatment would be up to $600,000. That investment would deliver improved future productivity, adding up to 40,000-50,000m^3/yr in future sawlog production, as well as delivering immediate benefits with respect to forest and ecosystem health.

Native forest thinning and ERF participation

Thinning overstocked or degraded forests to improve productivity has the effect of significantly improving the capacity of those forests to accumulate and store carbon in growing trees and harvested wood products. Thinning is likely to result in a growth response which delivers as much as a ten-fold increase in MAI (from about 0.1 m^3/ha/yr to between 1 and 2 m^3/ha/yr). Under the current ERF arrangements, actively managed

commercial native forests are not eligible for participation. However, there is a strong argument for the including these activities in the ERF where it can be demonstrated that commercial thinning is also delivering a wider range of desirable environmental outcomes when compared to no management, as well as improving the carbon accumulation and storage capacity of the forest.

What needs to happen?

In order to deliver a combined outcome of improved timber production capacity, increased carbon capture and ecological and environmental gains, there is a role for Government incentives to support forest owners to undertake the required silvicultural interventions. There already exists an interstate model for this in the form of Queensland's Land Restoration Fund (QLRF) which applies a natural capital accounting model to determine the value of active interventions in improving long term environmental outcomes. The QLRF aims to supplement ERF auction returns for vegetation-based carbon projects to ensure financial viability. However, commercial native forest operations are not currently eligible to participate in the ERF. There is a strong argument that commercial native forest silviculture projects which can also demonstrate tangible forest health and ecosystem outcomes should be eligible for ERF participation.

Incentive program structure

It is proposed that a dedicated fund be established that provides incentives to forest owners to undertake active forest management where it can be demonstrated that the project will deliver tangible forest health and ecosystem improvement outcomes, measured against an agreed natural capital accounting methodology, and where forest owners would not undertake the activity in the absence of Government support (because of financial viability barriers). Criteria for participation could include environmental benefits, likely future commercial productivity improvements, scale and proximity to processing facilities and infrastructure. It is reasonable to expect that forest owners would need to demonstrate the viability of the proposed project and justify the exact level of financial support.

Economic rationale

There are both direct and indirect economic benefits that accrue from providing incentives for the active management of regrowth forests where it would otherwise not be viable to do so. The actions outlined in this section would create direct employment in forest management, harvest and haulage of up to 15 additional people, and a further 30 jobs along the supply chain. They would also support and maintain increased processing capacity and contribute to construction of an additional 10,000 to 15,000 dwellings annually. Indirect economic benefits accrue from short term improvement in environmental outcomes and longer term maintenance of forest and ecosystem health. That includes the opportunity benefit that results from removing the need for more expensive environmental improvement actions in the future.

NATIVE BLACKWOOD FORESTS

A unique aspect of Tasmania's forest and wood products sector is the availability of speciality timbers which have a highly valued place in the sector. Of those speciality timbers, blackwood (*Acacia melanoxylon*) is perhaps the most important - not because it is the most valuable, but because it has some availability at scale and is still relatively valuable. Blackwood occurs in a wide range of environments. In some of those environments it is well suited to active silvicultural intervention.

Forestry Tasmania (2005) recognises three main silvicultural systems for the management of blackwood:

1. Fenced intensive blackwood
2. Swamp blackwood teatree forest
3. Swamp blackwood myrtle forest

Fenced intensive blackwood occurs predominantly in northern Tasmania and is well suited to silvicultural intervention in the form of non-commercial thinning to release better quality trees to maximise their growth and productive potential.

Fenced intensive blackwood silviculture

Forestry Tasmania (2005) notes that fenced intensive blackwood silviculture is suited to blackwood rich we eucalypt forests with a satisfactory level of ground-stored seed which has derived from the pre-existing presence of understorey blackwood trees. Germination of ground-stored seed is stimulated by a mix of ground disturbance from harvesting and high intensity burning following harvest. In order to maintain the original mix of species on site, as well as providing an overstorey and additional economic forest crop, a light aerial sowing of eucalyptus seed is typically incorporated as part of the site establishment process. The sites are fenced to prevent the re-introduction of browsing animals which preferentially target the regenerating blackwood seedlings. Approximately 5,650 ha in north-west Tasmania are managed (Jennings, 2002a) to produce a sustainable supply of sawlogs over a 70 year rotation (Mesibov, 2001). Of this area, about 750 ha has is managed under the fenced intensive silviculture system (Jennings, 2002b)

The role of thinning

Non-commercial thinning

Fenced intensive blackwood stands are grown with a mix of eucalyptus overstorey. This mix of species allows some protection for more widely spaced blackwood trees as an understorey species. Thinning of the eucalyptus overstory enhances growth and productivity of the blackwood trees, as well as improving future high quality log production from the eucalyptus overstory. A challenge is to minimise damage to the blackwood crop and, therefore, non-commercial thinning of the overstorey at age 10-15 to remove about 75% of the eucalyptus basal area, or retain a final eucalypt crop of about 150 sph has traditionally been considered the preferred approach. Eucalypt overstorey thinning can potentially increase blackwood diameter increment from 0.8 cm/yr to 1.4 cm/yr (Forestry Tasmania, 2005; Jennings, 2002b). Thinning is typically achieved by poisoning select eucalypt trees with a stem injection of glyphosate.

Commercial thinning option

The focus on non-commercial thinning with stem injection is intended to ensure that the commercial blackwood crop is protected from damage as a consequence of the harvest and extraction of larger trees. That possibly reflects the fact that when the silvicultural regime was developed, harvesting was undertaken either manually with skidder extraction, or with relatively unsophisticated mechanical harvesting technology.

Harvesting systems for thinning in native forest environments are now much more capable of operating with minimal or no damage to the retained stands, and experienced harvesting crews are currently undertaking sophisticated thinning operations in eucalypt regrowth which leave behind a stand of largely undamaged trees, with minimal soil disturbance. In this context, there is value in consider the introduction of commercial thinning, initially through trials to assess the impact on the commercial blackwood crop. If the trials are successful, this presents an additional opportunity to increase both the overall production of eucalypt regrowth and to supplement the future potential increase in high quality log from these areas.

Cost considerations

Non-commercial thinning is always a cost, regardless of the thinning technique applied. Thinning by stem injection is a labour intensive, particularly in densely stocked stands. Lewis *et al* (2002) considered a range of non-commercial thinning techniques for densely stocked private native forests in southern Queensland and northern New South Wales. Their analysis for stem injected herbicide application suggests that the total costs for this treatment would be between $250/ha and $350/ha including travel time, labour and materials (herbicide), assuming treatment levels of up to 1,000 sph. Additional planning, regulatory and other associated costs bring the total to about $500/ha.

There is estimated to be about 1,000 ha subject to this silvicultural regime in north-west Tasmania. It is suggested that thinning treatment could be fast-tracked to be delivered over a ten year program, at about 100 ha/yr. Indicatively, the cost of delivering the program over this shorter period is about $50,000/yr, or $500,000 in total.

The estimated cost of implementing a trial of commercial thinning for the eucalypt overstorey is estimated at $100,000.

Production and market implications

Fast-tracking the silvicultural treatment of the fenced intensive blackwood resource in north west Tasmania will contribute to earlier access to high quality log from both the eucalypt overstorey and the high value blackwood crop, as well as generating increased growth rates from both. That will result in both increased volume available to the market as well as making it available at an earlier stage than would occur without treatment.

Proposed options for intervention

Fast-tracking silvicultural treatment and trialling commercial thinning require financial support. Indicatively, that requires up to $50,000/yr to a maximum of $500,000 over ten years to bring forward non-commercial thinning, and an estimated $100,000 to support an operational trial of commercial thinning.

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