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FACT SHEET 3

Private Native Forestry

Tree Alliance

Native forest silvicultural systems

Tasmania's extensive private native forests have a long history of active management for timber production. With our changing climate and an expanding bioeconomy, Private Forests Tasmania has identified strong opportunities to boost the health and resilience of these forests, while generating income and other ecosystem benefits through silvicultural treatments such as thinning. This private native forest management series is designed to assist forest owners to successfully plan and carry out active management for beneficial outcomes. It includes fact sheets on relevant topics, a detailed how to guide and case studies demonstrating how active management techniques are being applied to achieve various land management and financial objectives in five private native forests.

Introduction

Silviculture is defined as the art and science of forest management. Silvicultural systems are designed to address the specific requirements of a particular forest and ensure that forest health and productivity are maintained and enhanced. Tasmania's private native forests vary considerably with respect to species composition, structure, age and condition. As a result, actively managing native forests in Tasmania requires consideration and selection of the silvicultural system designed to achieve specific objectives and cater for variation in forest type, conditions and site factors. For example, a mature multi-aged forest will require a different silvicultural approach when compared with a younger, even-aged regrowth forest. It is also important to consider the objectives of the forest owner when selecting or designing a silvicultural approach. Silvicultural systems comprise a harvesting system, a regeneration treatment and ongoing post-harvest monitoring and protection to ensure survival and health of the regenerating forest. This fact sheet introduces the range of silvicultural systems used in Tasmanian native forests and their application.

How do eucalypt forests regenerate?

An understanding of the ecology of eucalypt regeneration is useful when determining the most appropriate silvicultural system for a specific forest. All eucalypts regenerate from seed and some species can regrow vegetatively (e.g., coppicing from cut stumps or growing from underground lignotubers) following disturbance. Seeds fall naturally from mature canopies without disturbance throughout the year and most Tasmanian eucalypt species (except *Eucalyptus delegatensis* and *E. pauciflora*) readily germinate without any additional natural or prescribed disturbance treatment such as fire, mechanical ground disturbance or frost.

Eucalypt seedlings will only develop under favourable conditions. These include a suitable seedbed of exposed soil and adequate supplies of light, water and nutrients, usually requiring some degree of disturbance. The techniques used to create this environment depend on the characteristics of the forest type.

Dry eucalypt forests have relatively shallow litter and low open understorey, requiring minimal disturbance to make a seedbed. The species growing in these forests are slow growing and often shade tolerant. They often develop lignotuberous seedlings, which survive under the canopy in a dormant state until there is enough opening in the overstorey to promote growth. Dry forest tree species have thick bark, enabling individuals to survive fire, with some regenerating by coppice. These factors make partial harvesting systems more appropriate in dry eucalypt forest types.

The rapidly growing eucalypt species of wet forests are shade and fire intolerant, only regenerating from seed. They require full light and high levels of nutrients and water to successfully establish. These forests have dense understorey and thick litter. To successfully regenerate, they require intense disturbance to create a nutrient rich seedbed and remove competition from other plants. These conditions are created by wildfire or silviculture involving intensive harvesting combined with slash burning or ground disturbance.

Private Forests Tasmania

What types of silvicultural systems are effective in Tasmania?

The Forest Practices Code 2020 identifies a range of acceptable native forest silvicultural treatments, which are summarised in the table below. These systems were researched and developed for forests actively managed for sustainable timber production and operate under the premise that the native forest estate is maintained permanently. The silvicultural strategies outlined below are aimed at achieving optimal results in a wide range of conditions, to ensure that forest health and productivity are maintained or enhanced.

Silvicultural system	Situation	Harvesting system1	Regeneration Treatment
Clearfelling	Wet eucalypt forests, dry forests on steep slopes	All stems felled	High intensity burning Seed sown
Aggregated retention	Wet eucalypt forests with >25% oldgrowth or rich in special timbers with ground-based harvest	All stems felled, however the majority of the harvested area is within one tree height of retained forest aggregated in clumps of at least one hectare or coupe edges. Retained forest could be harvested in the next rotation if not required to protect special values.	Moderate intensity burning Seed sown if insufficient along retained forest edges
Group selection	Wet eucalypt forests rich in special timbers	Up to one third of coupe harvested in openings of two tree heights wide at a time. Successive harvests of groups of mature trees within the coupe can occur progressively as harvested areas regrow.	Moderate intensity burning Eucalypt seed sown, rainforest regenerates naturally
Shelterwood	High altitude *E. delegatensis* forests with little advance growth	Retain trees with good crowns at 9-14m^2 basal area per hectare and advance growth where present. Harvest retained mature trees once successful regeneration is achieved.	Low intensity burn or excavator heaping Natural seedfall or sown if light seedcrop
Seedtree retention	Low altitude dry forests with minimal advance growth or potential sawlog	Retain seven to twelve healthy well-spaced trees per hectare with a good seed crop. Remove seedtrees once successful regeneration is achieved.	Low intensity burn or excavator heaping Natural seedfall
Advance growth retention	Uneven-aged forests with healthy advance growth	Mature stems harvested, advance growth retained	Nil
Potential sawlog retention	Two-aged high quality forests comprising potential sawlogs and mature overstorey	All mature stems harvested, potential sawlog evenly retained at 9-12 m^2 basal area per hectare	Minimal
Thinning	Well stocked even-aged regrowth on sites with good growth potential.	Remove approximately 50% of basal area, dominant and codominant trees evenly retained	Nil

1 Applies only to the operational area of the coupe, excludes areas with special management prescriptions to protect significant values and areas managed specifically for wildlife habitat

What is thinning?

Thinning is a silvicultural practice which involves the controlled removal of trees from a densely stocked, often even-aged stand to release selected trees from competition. This enables the retained trees to grow larger in a shorter timeframe. In native forest regrowth thinning, the aim is to harvest sub-canopy trees so that taller, better formed stems can grow to produce a higher proportion of sawlogs in the future.

Thinning can be pre-commercial or commercial. **Pre-commercial** (or non-commercial) thinning applies in stands that have not yet grown large enough to produce logs which can be harvested and sold to available markets. Thinned trees are not recovered for commercial gain and are usually treated by injection of glyphosate into the stem. It is a cost to the forest grower. **Commercial** thinning is used in more mature regrowth stands (generally over 25 years in age). The thinned trees can be recovered for products (including sawlogs, veneer logs and pulplogs) through a commercially viable harvesting operation. It provides revenue for the forest grower. This fact sheet focusses on commercial thinning.

Why thin?

- Shortens time to final harvest OR produces larger trees in the same time.
- Promotes growth on trees with higher future potential value.
- Generates earlier returns for the forest owner.

Following regeneration events (eg fire, storm events, clearfall), productive native eucalypt forests in Tasmania can have very high stocking rates. The young eucalypts compete fiercely for light, water and soil nutrients. They gain rapidly in height, self-pruning their lower branches and slower growing trees are suppressed or die (self-thinning). After age 40, intense self-thinning and height growth slow as trees mature. Silvicultural thinning allows the forest manager to open-up the stand and concentrate diameter growth on trees which have been deliberately selected for a specific purpose. Thinning also promotes canopy health and is beneficial for regeneration and understorey development.

Thinned *E. obliqua* in State forest at Cluan Tiers

Maximum growth gain occurs in the first two years after thinning. It then tapers off over the next six years, although the growth advantage when compared to unthinned stands can extend over a much longer period at lower levels.

In Tasmania, thinning of regrowth native forests is usually expected to bring forward sawlog production. A thinned stand will grow the same sawlog volume in 65 years that an unthinned stand will in 80 years. Commercial thinning also enables the forest owner to generate earlier revenue from trees that would naturally die or degrade before final harvest.

What forests suit commercial thinning?

Commercial thinning is usually undertaken in dense even-aged regrowth native forest of commercial species with good growth potential. In Tasmania, forests meeting the following characteristics are ideal for thinning:

- **Species:** predominantly commercial (e.g. *Eucalyptus regnans*, *E. delegatensis* and *E. obliqua*).
- **Forest age:** best between 25 and 45 years (after this age, growth response declines and thinned stands become less windfirm).
- **Forest size:** 10 hectares or more for economy of scale.
- **Basal area[2]:** 32m^2/hectare or more.
- **Stem density:** at least 500 stems per hectare of 17cm dbh[3] or more.
- **Tree form:** at least 50 percent of trees have at least one 2.5m section of potential sawlog.
- **Altitude:** up to 600m (higher altitudes have slower growth response).
- **Slope:** 20 degrees or less to minimise damage potential and maintain economic viability.
- **Terrain:** minimal rock, ground debris such as large logs and thick scrub that impede machinery access.

Site factors such as terrain and location affect the cost of harvesting and log transport which affects the financial viability of the operation. In some circumstances sites that fall outside the listed parameters will be feasible due to ease of harvest, proximity to processing facilities or landowner tolerance of slower growth response.

Thinning prescription and rationale

Typical Tasmanian commercial thinning prescriptions presented in Forest Practices Plans (FPP) specify the target basal area, and provide direction on retained tree selection and spacing, management of non-eucalypt species and minimising damage.

Example of a FPP silvicultural prescription for commercial thinning

Silvicultural treatment

- The harvesting system is Potential Sawlog Retention, the following prescriptions will apply:

Initial Eucalypt BA*	Silver Wattle (Acacia dealbata)	Eucalypts
>12 m2/ha	Remove all (stems with sawlog potential should be retained)	Retain eucalypts at BA10-12 m2/ha, target trees with sawlog potential

Where practical retain two equally competing dominant or co-dominant trees growing close to one another rather than retaining a tree of poorer form at the prescribed spacing.

It may be necessary to retain dominant or co-dominant trees of poorer form, or subdominant trees with vigorous crowns, in order not to enlarge any natural gaps in the canopy.

Directional falling should be used to assist processing / extraction and to minimise tree damage.

Target basal area is the measure used to communicate to harvesting operators what the retained stand should look like. A moderate basal area reduction of 50 percent is standard for commercial thinning across many forest types. Research has shown that this prescription promotes a good growth response while minimising epicormic shoot development and maintaining a windfirm stand.

Retained tree selection prescriptions generally preference retention of larger, well-formed, healthy trees rather than tree spacing. Dominant trees which are growing vigorously and have well-developed crowns will respond better to thinning than smaller and more suppressed trees. If the objective of thinning is to create a high value future sawlog crop, retained trees should also have a potential sawlog (i.e. at least 2.5m of straight

2 Basal area is the unit used to express forest density. It is measured in square metres per hectare (m^2/ha) and represents the cross-sectional area of trees at 1.3 metres above ground.
3 dbh (diameter at breast height), the diameter of the trunk of a standing tree measured at 1.3m above ground.

stem with minimal branching and no signs of decay). While spacing is not critical, thinning operations should avoid creating large gaps and should aim to maintain the original species composition.

Damage to retained trees during thinning operations exposes the trees to decay and degrades log quality. Falling and extraction operations almost always cause some damage to retained trees. Terrain, harvesting equipment and operator skill are major factors in minimising the level of damage. Thinning should be monitored carefully to ensure damage is kept to under 10 percent of retained stems.

Tasmanian native forests usually have some proportion of non-eucalypt tree species. *Acacia melanoxylon* (blackwood) and *A. dealbata* (silver wattle) are common understory species with commercial uses. Where present, slow growing, shade tolerant *A. melanoxylon* trees will be retained for harvest with the main sawlog crop. Prescriptions usually specify *A. dealbata* removal as it is a short lived colonising species that will die before the main harvest, and it is in demand as a pulpwood species.

Other considerations

Stand variability: Native forests are inherently variable with respect to species, density, size and structure. Silvicultural treatments may need to vary across the forest block to achieve the desired outcome.

Habitat: Native forests provide habitat for many native animals. Thinning operations that remove trees unsuitable for future sawlog have the potential to remove future habitat trees. For this reason, most thinning prescriptions include instructions on the retention of wildlife habitat clumps. These are usually situated where there are clusters of hollow bearing and overmature trees, ideally adjacent other exclusion areas.

Fire: Thinning reduces the quantity and continuity of elevated fuels for many years. However, for several years following the operation, fire risk can increase due to higher volumes of fine surface fuels and exposure of these fuels to drying sun and wind. Careful fuel reduction burning, typically conducted in autumn, can reduce this risk, providing enhanced fire protection in areas where this is important. If not burnt, surface fuels will decompose and remain more consistently moist after several years as shade returns. Fuel reduction burning is usually confined to dry eucalyptus forests. Some forest types are unsuitable for burning. These include alpine, sub-alpine, mixed and rainforest which are severely damaged by fire, and wet forest types which can be difficult to ignite. Understanding potential sources of ignition, fuel distribution, forest type and important assets around the thinned forest will assist in determining your fire protection approach. Detailed instructions on planning and conducting fuel reduction burning are provided in the Planned Burning Manual referenced below.

References

Forestry Tasmania (2001), Technical Bulletin 13 Thinning regrowth eucalypts

Forestry Tasmania (2010), Technical Bulletin 2 *Eucalyptus delegatensis* Forests

Forestry Tasmania (2009), Technical Bulletin 3 Lowland dry eucalypt forests

Forestry Tasmania (2010), Technical Bulletin 5 Silvicultural systems for native eucalypt forests

Marsden-Smedley J.B. & Sherriff L.J. (2014), Planned burning manual - guidelines to enable safe and effective planned burning on private land. NRM North, Launceston TAS.

Thinned private native forest regrowth, Ben Nevis

More information

Prepared April 2023 by Greenwood Strategy Solutions

Tasmania is one of the best places in the world to manage forests for sustainable and profitable outcomes. To learn more about your options for renewable native forest management, contact the team at Private Forests Tasmania on their Tree Alliance hotline or through their general enquiries.

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