

Management of natural regeneration in eucalypt plantations

Summary

Eucalypt plantations in Tasmania are a relatively new addition to the landscape and our understanding of their management is growing rapidly.

The vast majority of eucalypt plantations have been successfully managed via a clear-fell harvest followed by replanting. However, dense natural regeneration of predominantly *Eucalyptus nitens* (Shining gum) is an increasingly common feature of both recently clearfelled sites and stands that have received heavy silvicultural interventions i.e. intensive thinnings.

Where the natural regeneration is successful, and it meets with the management objectives, it can potentially provide an effective and viable method of re-establishing a eucalypt plantation.

The natural regeneration can be managed in the early stages of stand establishment by:

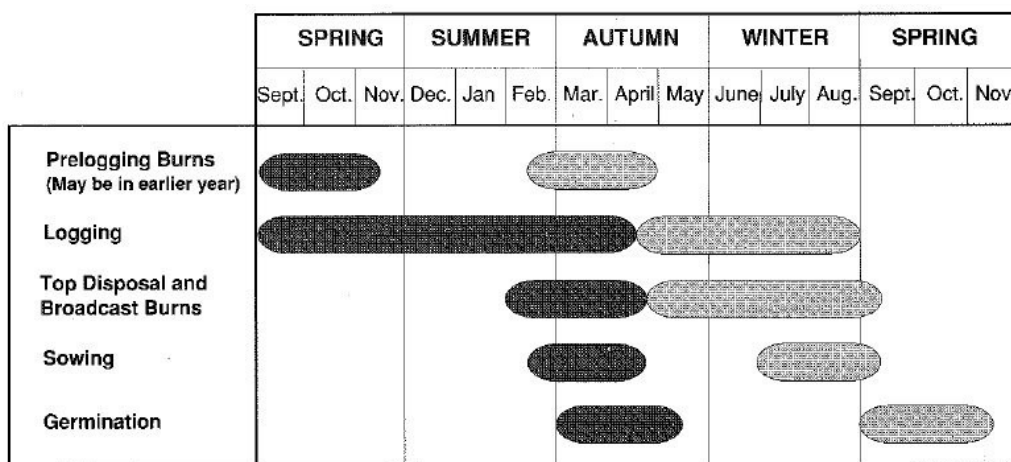
- self-thinning;
- cutting access racks (out-rows); and
- selective respacing to favour the best quality trees.

The target spacing should be about 1,000–1,250 stems per hectare on windfirm sites and where thinning will take place. On sites that are unlikely to be thinned e.g. high wind risk, lower productivity etc., a single respacing to a target spacing of 500–900 stems per hectare should improve mean tree diameter without compromising timber quality.

Natural regeneration can also be managed in non-clearfall plantations or mixed stands but the growth of the regenerated trees will be more variable.

Forestry Operations

Forestry operations are planned around either autumn or spring germination as indicated in this timetable, which is based on usual seasonal weather conditions:



Planning timetable for  Autumn germination (preferred, particularly on dry or grassy sites)
 Spring germination

Planning for natural regeneration in eucalypt plantations

Natural regeneration is dependent on:

- adequate and appropriate seed;
- timing of seed fall;
- adequate receptive seedbed;
- prevention of excessive browsing; and
- absence of severe drought and frosts during the early stages of regeneration.

Adequate, appropriate seed and timing of seed fall

Seed can be provided by retained trees (edge and/or specific seed-trees), fallen heads or can be collected and sown on a site. No reliance should be placed on seed which has been in the soil for longer than six months.

Good eucalypt seed crops tend to occur once every 2-4 years. Seed crops in a particular area can be roughly predicted by examining the outer crowns of trees of each species for capsules. Binoculars can be used to assist this assessment. You cannot assume, however that these capsules still contain seed or that the seed is mature - it is important to examine individual capsules as well. Mature seed is dark brown or black in colour. Seed may be retained on a tree for a further year after reaching maturity, with **seedfall generally peaking in summer**. This seed will be released within weeks once a tree is cut down.

The cheapest sources of seed are the logging residues and any seed trees in the area being harvested. If however, the seed crops are poor, seed in tree heads is burnt following harvesting, or if the site is difficult to regenerate, it may be necessary to sow additional seed or plant the area(s).

If you want to collect your own seed, this should be done from a number of widely dispersed trees from the site being sown.

Adequate receptive seedbed

Regeneration is much more likely to become established where there is bare soil or an ashbed.

“The greater the area of seedbed there is, the more regeneration there will be.”

At least 70% of the ground in areas where regeneration is required should be mechanically exposed or an ashbed. Where it is grassy, a higher level of disturbance is desirable. This seedbed should be well distributed, with no large areas left undisturbed. Areas with adequate existing regeneration do not require

additional seedbed. Damage to regeneration from seedbed preparation should be avoided.

Seedbeds from mechanical disturbance

Under the Forest Practices Code, soil disturbance should be minimised. It is essential however, to remove vegetation and litter layers and expose a bare mineral seedbed where eucalypt establishment is required. When burning is not appropriate or adequate to do this, careful mechanical disturbance can often be used to displace understorey vegetation and harvest debris from the soil surface while causing minimal displacement to the topsoil.

Adequate mechanical disturbance is often achieved through ordinary logging operations. Additional disturbance of grassy sites is best obtained with a root rake, such as can be fitted to the front of a bulldozer.

“The advice of a forest practices officer must be obtained before increasing mechanical disturbance during harvesting.”

Seedbeds from burning

When vegetation and/or harvest residue are sufficient to restrict an adequate seedbed of bare mineral earth, and mechanical disturbance is not appropriate or adequate to do this, it may be appropriate to carefully use fire to produce an ash seedbed for natural regeneration.

Great care is necessary with regeneration burns to avoid damaging existing regeneration, retained trees or causing bushfires.

REMEMBER - A fire permit must be obtained during much of the burning season and those conducting a burn are responsible for any damage if it escapes. The timing of a burn is important. Particularly on wetter aspects, there may be only a brief period when burning will be both safe and effective.

Burns are often desirable on grassy sites. Grass however, rapidly becomes re-established following mild fires to cover most of the seedbed within a year so the natural regeneration must be established quickly to ensure it beats the competing grasses.

Burns can be used to remove as much as possible of the harvesting residues and surviving vegetation following clearfelling, before natural regeneration or sowing. But, during harvesting residue should be kept away from the bases of retained trees, seedlings and from stumps from which coppice is desired to avoid scorch damage when they are burnt. Heaping together lots of residue should be avoided as this will reduce the area of ashbed and result in thick layers of ash in which seedlings will not grow well. However, small heaps of residue can be very beneficial.

“Absence of severe drought and frosts during the early stages of regeneration Burns are not always appropriate.”

Tree heads felled on to an exposed seedbed and left well dispersed and unburnt can provide a concentrated source of seed, while protecting seedlings from frost damage, dry hot conditions and browsing. These burns should be avoided in lower productivity plantations, as the only regeneration likely to occur may be found in the edges of this residue.

“Professional advice should be obtained regarding where to use burns’. ‘Conducting them safely requires considerable skill and care.”

Prevention of excessive browsing

See *Private Forests Information Series No. 9 - Browsing damage to seedlings* available at PFT’s website: www.trealliance.com.au

Why should we bother to respace natural regeneration in eucalypt plantations?

When we naturally regenerate a plantation the resultant seedling spacings are more varied than a planted plantation; they often vary from 100’s/hectare to 100,000’s/hectare. Therefore a respacing operation will make the plantation have a more consistent spacing and associated management benefits.

In addition, respacing will usually be necessary to:

- reduce tree density to concentrate the growth on the better performing trees;
- to produce larger, higher value timber;
- increase the stability of the stand;
- reduce fireload;
- improve access;
- limit the number of dead, suppressed, dying, diseased trees i.e. improving hygiene; and
- remove unwanted species.

Otherwise, the only reason for not respacing is to manage the natural regeneration for short rotation forestry; the trees are grown for approximately 10 years and clearfall harvested for fuel, biomass or pulpwood.

When should respacing take place?

Where plantations are a very low wind risk it could be possible to not respace the natural regeneration until

the trees have self-thinned.

However, due to access, respacing operations are usually carried-out when trees are 1.5–2 m in height. But better tree selection is made when the trees are 3–4m tall, but the conditions can be very dense making operations difficult & costly.

Respacing operations can be carried out using: chainsaws, brush cutters, tractor-mounted slashers or purpose built flails; this depends on the scale and intensity of the operation.

How many stems per hectare should be retained?

In general, the target spacing should be about 1,000–1,250 stems per hectare on windfirm sites and where thinning will take place. On sites that are unlikely to be thinned e.g. high wind risk, lower productivity etc., a single respacing to a target spacing of 500–900 stems per hectare should improve mean tree diameter without compromising timber quality.

However, the smaller the height at which respacing occurs, the more the target spacing should replicate a standard plantation; therefore:

- if the trees are 1–2 m tall, a target spacing of 1,000–1,250 stems per hectare is recommended; and
- if the trees are 3–4 m, and the site is a stable one where thinning is likely, the target spacing could be reduced to 900–1,000 stems per ha. But sites that are unlikely to be thinned e.g. high wind risk, lower productivity etc., a single respacing to a target spacing of 500–900 stems per hectare is more appropriate.

The respacing process should be based on favouring the best form tree and removing all its competitors within the specified chosen target spacing (e.g. 3 – 4.5 m for the examples above) to create a reasonably consistent spacing throughout the plantation, where possible. The trees should cut as close to the ground as practically possible, and below the lowest live branch to reduce regrowth from the stump.

‘Cut access (out-rows) at regular intervals in areas with extensive regeneration to provide easy access and safer working conditions’.

Respacing natural regeneration within retained seedtrees

In situations where trees have been retained as seedtrees the above general guidelines are also appropriate, but the resultant seedlings will generally be more variable in height due to the level of competition exerted by the retained trees. It is therefore usually beneficial to remove the seedtrees when it is silviculturally appropriate i.e. before the regeneration becomes suppressed. The respacing

operation, particularly the access racks (out-rows), can be combined with the seedtree removal to improve viability and reduce damage to seedlings.

Review of information

Dense natural regeneration of predominantly *Eucalyptus nitens* (Shining gum) is an increasingly common feature of both recently clearfelled sites and stands that have received heavy silvicultural interventions i.e. intensive thinnings.

Natural regeneration is dependent on:

- adequate and appropriate seed;
- timing of seed fall;
- adequate receptive seedbed;
- prevention of excessive browsing; and
- absence of severe drought and frosts during the early stages of regeneration.

Where the natural regeneration is successful, and it meets with the management objectives, it can potentially provide an effective and viable method of re-establishing a eucalypt plantation.

Respacing of naturally regenerated eucalypt plantations will usually be necessary to:

- to make tree spacing more consistent;
- reduce tree density to concentrate the growth on the better performing trees;
- to produce larger, higher value timber;
- increase the stability of the stand;
- reduce fireload;
- improve access;
- limit the number of dead, suppressed, dying, diseased trees i.e. improving hygiene; and
- remove unwanted species.

Although naturally regenerating eucalypt plantations will self-thin over time; the respacing process should aim to:

- Use respacing if it provides benefits for future stand stability, particularly on sites unlikely to be thinned e.g. high wind risk, lower productivity etc.;
- Use selective respacing to favour better quality stems, or the preferred species when other species have regenerated e.g. silver wattle;
- Wait until trees are 3 – 4 m tall before respacing for sawlog regimes, this allows better tree form selection;

- Re-space the densest, most productive and lowest windthrow risk sites;
- Be about 1,000–1,250 stems per hectare on windfirm sites and 500–900 stems per hectare on high wind risk, lower productivity sites;
- Remove dead, dying, diseased etc. trees that could impede later harvest operations; and
- Cut access (out-rows) at regular intervals in areas with extensive regeneration to provide easy access and safer working conditions.

ACKNOWLEDGEMENTS

Orr, Simon (1991) Managing your dry forests, Private Forestry Council (Tas.).

FURTHER INFORMATION

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