

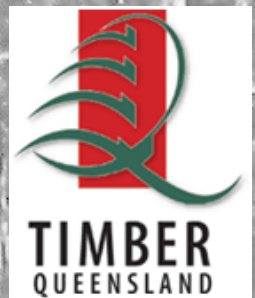
AgForests Queensland

Management Guide

March 2006

Dry Eucalypt Native Forests & Woodlands

(Includes Spotted gum, Ironbark, Forest red gum, Gum topped box,
White mahogany, Bloodwood, etc.)



This publication has been produced by the AgForests Queensland (AgForests) initiative as part of a series of guides available. Funding for this project is provided by the Australian Government Department of Agriculture, Fisheries and Forestry.

Management Guide – Dry Eucalypt Native Forests & Woodlands

Spotted gum, Ironbark, Forest red gum, Gum topped box, White mahogany, Bloodwood, etc.

Introduction:

This publication has been produced by AgForests. Other Guides available from AgForests are:

- *Wet Eucalypt Native Forests Management Guide*
- *White Cypress Native Forests & Woodlands Management Guide*
- *Products & Marketing Guide for Eucalypt (Hardwood) Forests & Woodlands*
- *Lump Sum Timber Sale ‘Model Contract’ Guide*
- *Non Lump Sum Timber Sale ‘Model Contract’ Guide*
- *Using Fire in Spotted gum/Ironbark Forests and Woodlands for Production and Biodiversity Outcomes Guide*

AgForests is a joint industry initiative bringing together mainstream broad acre agriculture (via AgForce) and the timber industry (via Timber Queensland) assisting sustainable management of Queensland’s private forests and woodlands.

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1.0 Basic Principals of Productive Native Forest Management

The fundamental rule of productive native forest management is to always leave forest areas in a condition that allows them to regenerate and maintain, or in some cases, improve their productivity after harvesting, ‘silvicultural’ thinning or burning.

The first stage of sustainable native forest management is achieved by optimising individual tree growing space – providing trees with enough space to grow. Tree stocking levels i.e. trees/stems per hectare, is dependent upon tree species (type), their diameter (size) and the quality of the site (soil type and depth, rainfall, etc). As a general rule, as trees get larger more space is required for them to increase in diameter and maintain their health and growth vigour.

Competition between trees is the major influence on tree health, quality and product value. The number one message to gain from reading this guide is that “**trees need space to grow**”. This is not to say that competition, at certain stages of a tree’s life, is not vitally important. Initial close spacing for a young tree provides mutual protection, encourages the formation of a single leading stem, and restricts the size of branch development. As trees grow up and mature their crowns and roots begin to interact and there is increased competition for the available sunlight, nutrients and moisture. For a tree to continue growing vigorously and maintaining health, it must be provided with sufficient space to do so.



Photo 1. Thinning is an essential element of sustainable forestry

By selectively removing the poorer trees on a cyclic basis, the ‘superior’ healthier retained trees are able to grow into product-sized trees and over time regenerate the forest with this superior standard of tree. Ideally, as trees reach their optimal value and size for their product type they are removed through a harvest. By removing trees that have reached their optimal product size/value, or are in poor health or suppressed, and by keeping an optimum stocking/ha (thinning regeneration), the productivity of a forest will improve.

When productive native forest management principals are applied along with the watercourse protection measures, habitat tree retention (in compliance with the Native Forest Practice Code) and appropriate infrastructure maintenance, the productivity of a forest and its environmental values are maintained, or enhanced. These are the fundamentals principals of sustainable native forest management.

The management of a native forest after harvest i.e. promoting regeneration, timely ‘silvicultural’ thinning, etc. needs to be regarded as a cost of harvesting, and productive forest management. The result of not undertaking timely thinning and ensuring forest regeneration after harvesting is a forest with lower productivity. In other words the next harvest period will be further in the future and result in a reduced product harvest per Hectare, delivering a lower \$ return for landowners and less product volume available to the timber industry.

2.0 Understanding your forest type and its condition

To best manage your native 'Dry' forest areas it is first necessary to have an understanding that there is not a single system of management that is broad enough to cover all forest types and their condition. Below are just three examples that describe the conditions you may find your forest in and how management needs to be adaptive to these conditions before and after a harvest operation. There are many variations to these conditions, but for simplicity three are listed.

2.1 Forest Condition - Regenerating Forest with few Overstorey Trees Present

2.1.1 Description

A regeneration forest is one that has regenerated from being cleared or heavily harvested. The regeneration (suckers, saplings, etc) will have a fairly uniform diameter, commonly with a 10-20cm DBH (Diameter at Breast Height – 1.3m from the ground), and are generally a uniform age. In this situation the forest usually has one layer of tree crowns in the canopy.

There is generally little understorey (or other species or younger regeneration), and only a few dominant trees that have emerged. Overall the forest can be regarded as being “locked up” or “choked”. In other words the growth of the trees has stalled as they have come under increasing competition for light, nutrients, moisture and growing space. Generally the forest growth or productivity has severely declined, and the forest is waiting for natural selection and environmental events to free up some growing space, which may take many decades. The number of trees per hectare in this type of forest condition can be as high as 1000, and even more.



Photo 2. An example of an overstocked/locked up forest – too many small trees

2.1.2 Stage One of improving the productivity of this type of forest

A forest stand in this condition is in dire need of thinning to enable better trees to be released from competition, to regain their growth and vigour and increase in diameter. The important point to remember is that the optimal number of trees/Ha to retain is determined by the species, site quality and the diameter of the trees. A dry forest such as a spotted gum and/or ironbark forest should have a maximum of approximately 200 trees per Ha, which equates to an average spacing of approximately 7 metres between trees (Note: this ‘200 trees per Ha maximum’ doesn’t include trees with a DBH under 10cm - regeneration). Remember, most of the trees in this forest condition will be between 10 to 20cm DBH. When thinning (spacing out the best trees) you’ll notice that trees will not always be where you want them to be so there will be times when you will need to leave trees anywhere between 5 to 8 metres apart. The point isn’t to try and achieve an exact spacing, just an overall average. Also to note: in ‘remnant’ mapped areas all thinning operations must be compliant with the Native Forest Practice Code (ie, leave required habitat, feed, shelter trees, etc – refer to the Native Forest Practice Code).

How do we determine which trees to keep? The first criteria for selection is a combination of suitable species, straight stems, with little defect and a reasonable diameter. The next consideration is what characteristics does a tree need to grow healthy and large. The answer to this question lies in the tree crown. Tree crowns are the single most important factor in determining the future of the tree. Generally, regardless of how straight the trunk is or how much volume there is, if the crown is defective or in poor health, tree growth will be declining and the formation of defect such as pipe or doze may be increasing.

So what is a defective crown? There are a number of indicators of a defective tree crown, such as: the number of dead branches, sparse foliage, mistletoe infestations, small vertical branch development along existing branches (epicormic shoots) as well as the crown shape. If the tree crown is distorted to only one side due to past competition it is considered suppressed and will have inferior growth rates.

Table 1. 'Optimum' Tree Crown Health Key Factors

Crown Position – Dominant or co-dominant with clear growing space

Crown Shape – Conical with 360° crown cover

Crown Foliage Density – This is the measure of the trees photosynthetic area and is seen in the density and distribution of the foliar clumps as in Photo 1 (on page 4).

Degree of Dead Branches – Few dead branches greater than 25mm in size inside the leaf zone

Crown Epicormic Growth – Few vertical branches along major branches, ie foliage growth towards the outside of the crown



Photo 3. Healthy, fully developed crown with dense foliage in a dominant position

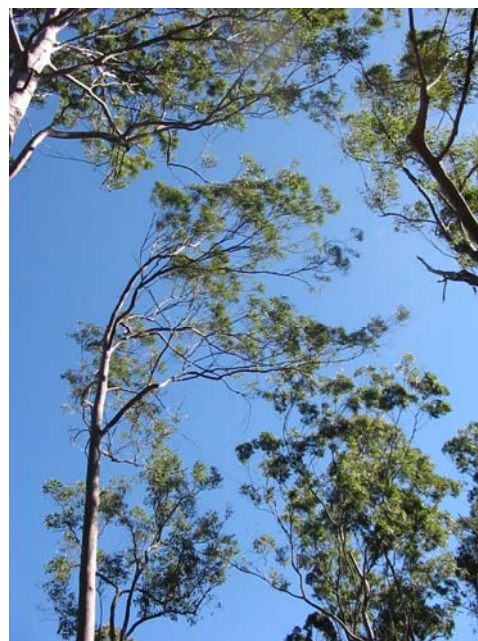


Photo 4. Suppressed crown with poor shape development on only 1/3 of the crown area



Photo 5. Crown in sever decline with predominance of dead branches, epicormic shoots and sparse foliage



Photo 6. Tree crown No 1. is offset in a suppressed position, No 2. is in a dominant position and No 3. has sparse foliage and dead branches

The next issue is how to determine which trees to keep when two or more trees appear equal, but are too close. Crown Placement is the final criteria. Crown placement is the relationship of the tree crown to the trees that are directly next to it. If a tree has its crown above all adjacent trees it is regarded as “dominant”. If it is equal in position to all adjacent trees it is regarded as co-dominant. If the tree has a crown that is below all adjacent trees, it is regarded as “suppressed”.

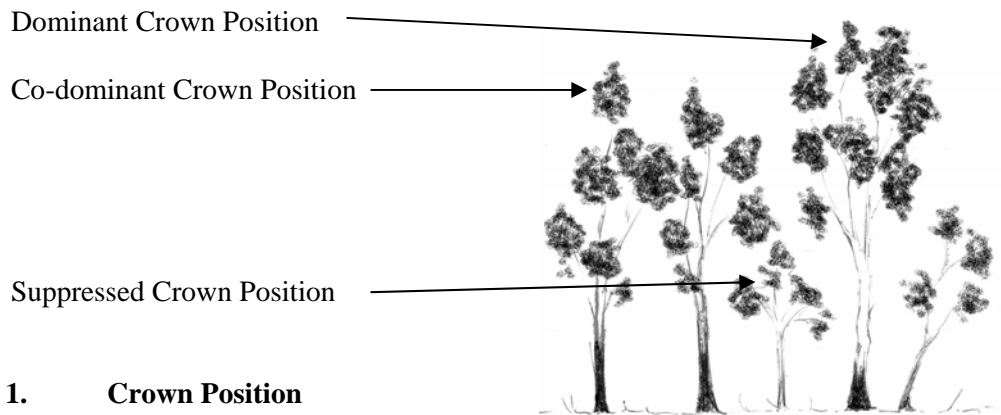


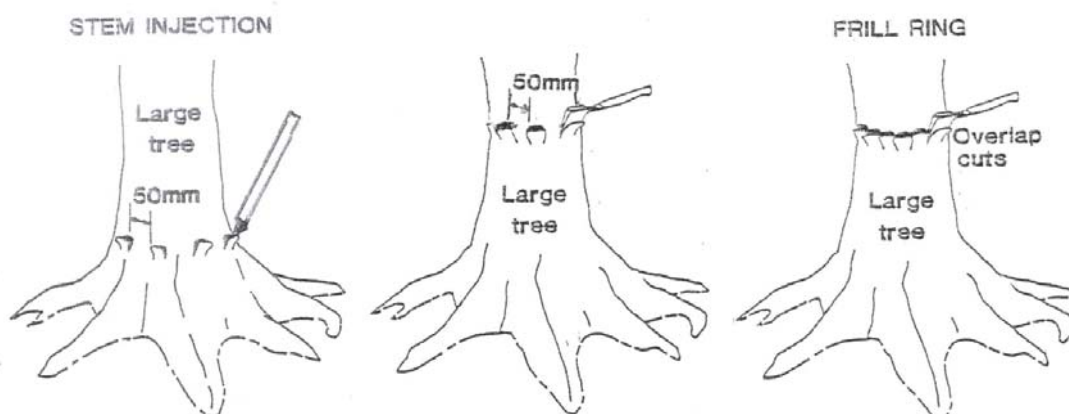
Figure 1. Crown Position

You can then either mark the trees to stay (in this case, at an average spacing of 7m apart) with paint, or train the treatment (thinning) contractor/s to thin according to your desired outcome. Marking trees will usually produce a better result, but can be quite expensive and/or time consuming. When training a treatment gang mark out an area (2-5Ha) with paint so they learn what you require. You’ll need to monitor them to make sure they are doing the job you want, and maybe mark out further training areas to ensure a good quality job is done. To note: under the Native Forest Practice Code mechanical thinning in ‘remnant’ (coloured) areas is not permitted, however in the ‘non remnant’ (white) areas it is allowed.

When thinning the forest ‘take out’ all other stems that are not required to stay. Again, to note: in ‘remnant’ mapped areas all thinning operations must be compliant with the Native Forest Practice Code (ie, leave required habitat, feed, shelter trees, etc – refer to the Native Forest Practice Code. If there are viable quantities of saleable product trees, then remove these prior to commencing a thinning operation. Most landowners or treatment contractors use either Glyphosate or Tordon via an axe or stem injection hammer/gun. As shown in Figure 1 (below) the axe should pass through the bark and then into the sapwood creating a pocket to hold the chemical without run-off. Two millilitres of chemical is then injected into the pocket.

Figure 2. Tree Injection Methodology and Herbicide Mixes

- Glyphosate (Round-up 450®) and Tordon DSH® (double strength) are registered herbicides for this type of activity. Refer to the ‘DOW Woody Weed Control Guide’, plus the herbicide product label for recommended herbicide mixes information.
- Tools used for this activity are tordon axes, tomahawks, stem injectors, brushcutters, etc. See the herbicide product label for application recommendations.



The above diagram of stem injection methods is only an 'example' of how it can be done, and may in fact may be wrong depending on the tree species being treated. Contact your local Dow AgroSciences Representative or local treatment contractor for further advice.

Table 2. Stage 1 Management Selection Criteria for - 'Retained Trees' in a 'Regenerating Forest with few Overstorey Trees Present

Thin or space trees to an average of 7 m apart using the following criteria:

1. Based on the 'Tree retention - selection criteria' below, mark (with paint) or keep retained trees for breeding and higher value products.
2. If commercial amounts of 'product' trees are present, organise a harvest prior to chemical thinning/treatment of the forest.
3. Chemically thin/treat trees not required (unmarked if painting trees).
4. Retained trees (not including trees with a DBH of under 10cm) should equal approximately 200 trees/Ha.

Tree retention – selection criteria:

1. In 'remnant' mapped areas retain the required numbers of habitat, feed and shelter trees prescribed in the 'Native Forests Practice Code – refer to the Native Forest Practice Code'
2. Preferred species
3. Good quality trees - straight log length (>3m), limited fire or other scars, defect bumps or insect damage
4. Healthy, uniform dense tree crown and limited dead branches, mistletoe and/or epicormic shoots.
5. Dominant or at least a co-dominant tree crown placement in the canopy.

2.1.3 Stage Two Management

As the forest grows to the point that the retained trees (at an average spacing at 7m apart) have reached an average diameter greater than 30cm DBH another thinning operation will probably be required to maintain the forest health and productivity. At this stage there should be a range of product types that can be harvested as part of the thinning process. Durability class 1 species such as Ironbark, White mahogany, Red bloodwood, Grey gum, etc may be suitable for fencing timbers (strainers, split posts, rails and stays). If the trees have sufficient log length there may be the option of harvesting small poles. Major pole species include iron bark, grey gum, spotted gum and grey box which are all durability class one or two species. Also, for trees with limited log length that will not make poles, but sufficient diameter i.e.30cm small end diameter under bark, sawlogs may be harvested. Further discussion on products can be found in the 'Forest Products and Marketing Guide' available from AgForests.

Whilst this thinning operation involves harvesting, the same principles of selection for trees to be retained should be applied to ensure ongoing forest health and productivity advances. The principles of retaining trees based on their form, vigour and spacing is something that should be maintained throughout the management cycle. Again depending upon site quality, the number of 20cm+ DBH trees per hectare to be retained should be 100-150 trees per hectare. The average spacing between trees at 100-150 trees per hectare translates into an average distance of 8-10m between trees. This stocking level does not discount that there will also be smaller, less than 10cm DBH regeneration trees resulting from seed, lignotubers or stumps from the last thinning event. This smaller regeneration is extremely important to protect and manage as it is your future crop. As the forest is managed this regeneration will also need to be thinned. The timing and intensity of that thinning will change as the forest matures (changes in structure) however thinning every 10 to 15 years is recommended. The forest condition described in 2.3 - An 'optimal managed' forest is what to aim for.

2.2 Forest Condition – A ‘Locked Up’ Forest with mainly Non Commercial Overstory Trees.

2.2.1 Description

This type of forest has generally had most or all trees with a sawlog grade or pole product previously removed. There are usually two layers to the forest canopy i.e. a tall layer of bent, defective or damaged trees overtopping a second layer of overstocked regrowth that is being suppressed by the trees that were harvested. There is generally ample evidence of tree stumps. In this situation there can also be a high proportion of non-commercial regrowth such as Acacia, Supple jack, (*sub species of Lophostemon confertus*) etc. The non-productive trees have a dramatic impact upon the forest, competing heavily with the young regenerating commercial species.



In this type of forest the DBH size class distribution shows high numbers in the small diameter classes and few stems within the harvestable range.

2.2.2 Stage One of improving the productivity of this type of forest

This forest is critically in need of thinning. Undertaking this process enables the selected trees to be released from competition, to regain their growth and vigour and to put on diameter. The difference with this forest condition compared to the previous one (2.1) is that the first thinning operation may have the opportunity to generate some \$ income to support the costs of the thinning. The number of trees per hectare in a stand such as this can be highly variable depending upon past management. Typically the trees per hectare over 10 cm DBH can be as high as 400 – 600+ but distributed over a number of diameter classes such as 10–20cm, 20–40cm, 40–60cm and perhaps 60cm+, but predominantly in the small diameter classes. Generally the larger trees are defective and will not make poles, sawlogs or even salvage grade products, or they would have been removed in previous harvests. Unless required as habitat, feed or shelter trees (as prescribed in the Native Forest Practice Code – refer to the Native Forest Practice Code) these trees should be removed. The table below gives the spacings guide recommended for each tree diameter size class.

Table 3. Stage 1 Management Recommendations for a ‘Locked Up’ Forest with large amounts of Non Commercial Overstory Trees

Trees in the 10–20cm diameter size class	Trees in the 20–30 cm diameter class	Trees in the 30cm+ diameter class.	The combined retained stand should be between 100 to 150 trees per Ha, on the condition that every tree has space to freely grow into. (Note: this 100 to 150 trees per Ha <u>doesn't</u> include trees with a DBH under 10cm - regeneration)
Spaced at an average of 6 – 7m from any other tree.	Spaced at an average of 7 – 8m from other trees in this size class or larger.	Spaced at an average of 10m from other trees in this size class.	
Thin or space trees to the above spacings based on trees diameter size using the following criteria: <ol style="list-style-type: none"> 1. Based on the ‘Tree retention - selection criteria’ below, mark (with paint) or keep retained trees for breeding and higher value products. 2. If commercial amounts of ‘product’ trees are present, organise a harvest prior to chemical thinning/treatment of the forest. 3. Chemically thin/treat trees not required (unmarked if painting trees). 4. Retained trees should be between 100 to 150 trees/Ha (not including trees with a DBH of under 10cm). 			

Tree retention – selection criteria:

1. In ‘remnant’ mapped areas retain the required numbers of habitat, feed and shelter trees prescribed in the ‘Native Forests Practice Code – refer to the Native Forest Practice Code’
2. Preferred species
3. Good quality trees - straight log length (>3m), limited fire or other scars, defect bumps or insect damage
4. Healthy, uniform dense tree crown and limited dead branches, mistletoe and/or epicormic shoots.
5. Dominant or at least a co-dominant tree crown placement in the canopy

2.2.3 Stage Two Management

As the forest stand matures and trees increase in diameter taking up available nutrients and moisture the forest becomes overstocked. At this time a commercial thinning (harvest), for poles or fencing timbers may be possible. If this is the case, carry out a harvest but leave the better trees to grow on as per table 1. There may be a need to follow the commercial thinning (harvest) with a chemical treatment to reduce competition regeneration that has now moved on to advanced growth.

There are a range of product types that may be harvested as a ‘commercial thinning harvest’. Smaller diameter durability class 1 species such as, Iron bark, White mahogany, Red bloodwood and Grey gum may be suitable for strainer posts, rails and stays. If the trees have sufficient log length there may be the option of harvesting poles. Major pole species include Grey gum, Forest Red Gum, Grey Box, Spotted Gum and Ironbark, which are all durability class one or two species. Alternatively for trees which have limited log length but sufficient diameter ie. 30cm small end diameter, sawlogs may be harvested. Further discussion on products can be found in the ‘Forest Products and Marketing Guide’ available from AgForests.

In some cases no commercial thinning harvest options may be possible. If this is so, proceed straight to having a chemical thinning operation to remove non-commercial trees and competition allowing the better trees to grow on and reach to maximum product potential as fast as possible. The forest condition described in 2.3 - An ‘optimal managed’ forest is what to aim for.

2.3 Forest Condition – An Optimally Managed Forest

2.3.1 Description

A forest that has been selectively harvested with follow up management to promote sustainable growth. This is the type of forest condition landowners should be aiming for – maximum sustainable production.

In this forest condition, retained trees are well spaced, have a healthy crown and a straight stem free of fault. Trees are only removed when they have reached their full economic potential, are declining in health or the forest is over stocked. There has been adequate regeneration over the years and timely management that has maintained forest growth and health. The management has maintained an optimal number of quality trees per hectare by applying timely ‘thinning harvesting’ and ‘chemical treatment’. This type of forest stand generally has between 100 to 125 trees/Ha, and an average spacing between trees of about of 10m (Note: this 100-125 trees per Ha doesn't include trees with a DBH under 10cm - regeneration).

Fire management has been undertaken by the landowner to reduce competition and fuel load, while protecting the retained trees.



Photo 4. Example of an Optimally Managed Dry Forest

2.3.2 Maintaining or improving the productivity of this type of forest

Management of an optimally managed forest is a less complicated processes than restoring a forest, in one of the previously described conditions. Maintaining high productivity involves timely harvesting and the follow-up management processes of tree head disposal, tree regeneration establishment, thinning and fire management. This management regime is based on an approximate 45-75 year cycle with a harvest occurring every 15-25 years. An ‘ideal’ forest stand structure is one carrying 40% of the stand in the 10-20cm DBH trees/stems, 35% in 20-40 cm DBH trees/stems and 25% in 40+cm DBH trees/stems size classes, and has total combined retained tree amount of between 100 to 200 trees per Ha (Note: this 100 to 130 trees per Ha doesn’t include trees with a DBH under 10cm - regeneration).

Table 4. Recommended retained average tree amounts per Ha for all diameter (DBH) size classes (including under 10cm DBH trees – regeneration) in an ‘optimal’ managed ‘dry’ forest

Trees in the 0-10cm DBH size class (regeneration)	Trees in the 10–20cm DBH size class	Trees in the 20-40cm DBH size class	Trees in the 40+cm DBH size class
Between 0 – 50	Between 40 – 50	Between 35 – 45	Between 25 – 30

This structure allows a number of selection opportunities (via treatment) along the growth cycle, particularly in the less than 20cm DBH range, to select the superior trees to grow into the harvestable range at the high end of the product value spectrum. This selection (via treatment) would take place a couple of years after each harvest cycle. (See 2.3.4).

2.3.3 Harvesting

A typical harvest for this management regime would aim at the removal of between one third to a half of the standing now available commercial volume, however the harvest volume amount should be determined for each individual site ensuring the forest’s future productivity is not compromised. Harvesting a higher volume is likely to include a significant proportion of immature smaller diameter trees that are well below their potential \$ value thus compromising the stand’s future productivity and returns. Harvesting trees before they have reached their full \$ value potential could be considered in today’s terms as ‘asset stripping’ the forest. Also, harvesting a higher volume that includes trees that are well below their potential \$ value will extend the next harvest events resulting in less regular cash flow for a landowner.

Criteria for tree removal is directed towards harvesting trees that have reached their maximum economic value, are showing signs of defect or poor health, will decline prior to the next harvest, or are suppressed and are unlikely to develop to their potential. In this way harvesting is used to make \$, plus as a tool for forest stand productivity improvement.

2.3.4 A Recommended Management Timeline for an ‘Optimally Managed’ Forest’ Regime:

Stage I - Year 1 harvest approximately one third to a half of the standing now available commercial volume (depending on what’s best to maintain the forest’s future optimal productivity) and merchandise trees into the highest value product considering the quality of the log (girder, poles, sawlog, fencing timbers, etc). Aim to retain the best approx. 100 trees/Ha (20+ cm DBH trees), with a size class ratio as close as possible to what’s described in Table 2 above, including the required habitat, feed and shelter trees, etc in compliance with the Native Forest Practice Code, if the forest area is mapped as ‘remnant’ vegetation.

Post-harvest - top disposal and hazard reduction burning and the maintenance of snig tracks, haul roads and log dumps by the installation of suitable drainage and if appropriate the removal of temporary gully crossings.

Stage II - 3 to 5 years after harvest, once subsequent regeneration (trees with DBH under 10cm) has grown enough to indicate form and growth habit, chemically treat the forest to remove unwanted regeneration and other non commercial trees to leave a total of up to 180 trees/Ha (including regeneration – see above Table 3), ensuring each retained tree is growing into an adequate space in the canopy.

Stage III - 15 to 25 years after the last harvest, the forest should be ready for another harvest, again removing approximately one third to a half of the standing now available commercial volume (depending on what's best to maintain the forest's future optimal productivity) following the same principles as the harvest in Year 1, including leaving the required habitat, feed and shelter trees, etc in compliance with the Native Forest Practice Code, if the forest area is mapped as 'remnant' vegetation.

Post-harvest - top disposal and hazard reduction burning and the maintenance of snig tracks, haul roads and log dumps by the installation of suitable drainage and if appropriate the removal of temporary gully crossings.

Stage IV - 3 to 5 years after harvest, once subsequent regeneration (trees with DBH under 10cm) has grown enough to indicate form and growth habit, chemically treat the forest to remove unwanted regeneration, plus other damaged or non-commercial larger DBH trees to leave a total of up to 180 trees/Ha (including regeneration – see above Table 3), ensuring each retained tree is growing into an adequate space in the canopy. The twenty year old regeneration from Stage I harvest now makes up a large part of trees in the 20 to 40cm DBH size class and is managed as part of the forest.

Stage V - 15 to 25 years after the last harvest, the forest should be ready for another harvest, again removing approximately one third to a half of the standing now available commercial volume (depending on what's best to maintain the forest's future optimal productivity) following the same principles as the harvest in Stage I. Some of the harvested stems are likely to be from the selected regeneration from Stage II that may have developed some fault (insect or pathogen attack, physical damage from storms etc), thus won't grow into a higher \$ value product.

Post-harvest - top disposal and hazard reduction burning and the maintenance of snig tracks, haul roads and log dumps by the installation of suitable drainage and if appropriate the removal of temporary gully crossings.

Stage VI - 3 to 5 years after harvest, once subsequent regeneration (trees with DBH under 10cm) has grown enough to indicate form and growth habit, chemically treat the forest to remove unwanted regeneration, plus other damaged or non-commercial larger DBH trees to leave a total of up to 180 trees/Ha (including regeneration – see above Table 3), ensuring each retained tree is growing into an adequate space in the canopy. The twenty year old regeneration from Stage IV harvest now makes up a large part of trees in the 20 to 40cm DBH size class and is managed as part of the forest

Stage VII - 15 to 25 years after the last harvest, the forest should be ready for another harvest, again removing approximately one third of the standing volume following the same principles as the harvest in Stage 1. This harvest represents the completion of a full growing cycle with the removal of selected stems from the regeneration that occurred after the Stage I harvest.

Post-harvest - top disposal and hazard reduction burning and the maintenance of snig tracks, haul roads and log dumps by the installation of suitable drainage and if appropriate the removal of temporary gully crossings.

Table 5. Criteria for Tree Removal (Harvest or thinning) Includes:

- | |
|---|
| <ul style="list-style-type: none">▪ Optimum product size▪ Declining tree health, usually assessed by crown condition▪ Defect such as vertical dead limbs or suspected decay from old wounds▪ Bad mistletoe infestation▪ Suppressed trees as indicated by crown shape and condition |
|---|

3.0 Forest Regeneration

Dry Eucalypt forests in Queensland generally rely on a combination of seed fall, lignotuber pool (older seedlings that have been knocked back and persist on the forest floor until an opportunity to grow on occurs) or coppice (re-shoot from stump) for regeneration.

Seed based regeneration is usually dependent upon three factors - available seed dispersal, favourable climatic conditions and soil disturbance.

Due to the seed of Eucalypts being very small, successful germination requires areas of bare earth. Some degree of bare earth is achieved by machinery during the logging and snigging operation. Bare earth will also occur as a result of tree head disposal or hazard burning after harvesting is completed.

The resulting regeneration needs to be protected from fire for at least three to five years. Care should be taken with the first fire or burn after regeneration establishment to ensure the fire does not destroy it. In areas where there is a poor regeneration history, it is recommended that timing of harvest operations coincides with the

retained trees having a mature seed crop. In most eucalypts mature seed is present in the canopy approximately six months after flowering. Eucalypts tend to have a major seeding event every 5 to 7 years. It is worth while for landholders to monitor tree flowering in order to be able to plan the best time for harvest operations. (Refer to flowering calendar that is contained within the 'Forest Products and Marketing Guide' available from AgForests.



Photo 6. The presence of mature seed in the forest canopy at the time of a harvest greatly enhances successful regeneration prospects

Dry forest species follow similar habits of other seedling-regenerating eucalypts in retaining seed in the canopy for up to 18 months or until some event (e.g. fire) triggers shedding. This has been dramatically demonstrated in research sites where, after a fire, the majority of the seed within the burnt area is shed within three days of the fire and the adjoining unburnt areas have no seed capsules that have opened. This illustrates the importance of burning - a delayed seed fall risks weed and other pioneer species becoming established before the eucalypt seed fall even occurs which can severely restrict the regeneration process. Regeneration management is essential to sustainable dry forest productivity management.

The advantage of many eucalypts is their ability to coppice (re-shoot from stump). Generally stumps from a harvest will coppice immediately. This can be a good alternative to seedling regeneration but requires stump heights of <30cm to ensure the future stem is not lost to 'wind-throw' or rot associated with the old stump. Coppice regeneration can be thinned to one shoot, preferably originating from ground level, when a height of 2 meters is reached.

4.0 Fire Management

Burning is generally practiced by landowners on grazing/timber properties. Damage to trees from fire can sometimes be severe, particularly if a fire occurs in the hotter, drier parts of the year accompanied by strong winds. Thus, the value of a forest's products can be reduced dramatically by fire damage. Tree losses, downgrading due to fire scarring, loss of growth due to defoliation, combined with increased germination of non-commercial species such as wattle can all impact on the productivity of a forest after fire.

To best protect trees from damage regular periodic hazard reduction burning (2-5 years) needs to be undertaken. To minimise tree damage it's best to burn when conditions are milder (eg. in the winter/spring, following rain, early in the morning, in the evening, etc). Burning also reduces the build up of forest fuel and refreshes fire reliant understorey species. Targeted burning can also have a number of important benefits such as the control of

excessive regeneration, invasive species, particularly Supple Jack (*sub species of Lophostemon confertus*) and weeds such as lantana.

When planning a harvest it may be useful to undertake a burn in the 12-24 months prior to the harvesting operation. This improves visibility and access for tree marking, cutting and snigging. Damage to products such as poles, during the cut and snig operation from hidden tree stumps or rocks can result in severe downgrading at the ramp. The down side of burning 12-24 months before harvest is that there may not be enough fuel to carry a decent 'regeneration' burn that is usually required after a harvest and thinning to replace trees. However, heavy harvesting operations can produce large quantities of fuel which may enable a successful regeneration burn after harvest and thinning. Landowners should work out what suits their country best to maintain or improve their forest productivity.

Make sure cutters and sniggers don't leave tree heads and other harvesting residue too close to retained trees, or fire damage may occur which ultimately reduces the \$ returns and forest productivity.

5.0 Complying with Legislation and Planning Laws

5.1 Queensland Vegetation Management Act (VMA) 1999 and Native Forest Practice Code.

Under the *Queensland Vegetation Management Act 1999* (VMA) trees or vegetation on freehold land are now either 'remnant' (coloured green, orange or pink on a Regional Ecosystem map) or 'non-remnant' (white on the map). If you have trees or vegetation that are in 'non-remnant' (white areas), you **do not** need to comply with VMA or Native Forest Practice Code. It is only in areas mapped as 'remnant' (coloured areas - green, orange or pink) that you must comply with the VMA 1999, and the Native Forest Practice Code.

The following section sets out your rights and responsibilities for 'remnant' vegetation' (coloured areas - green, orange or pink) on freehold land. However, again, this **does not** relate to 'non-remnant' vegetation (white areas) on freehold land.

5.1.1 Landowners Rights for 'remnant' mapped (coloured areas - green, orange or pink) vegetation

1. Q - Can I still harvest my freehold native forest or have it harvested?

A - Yes, you can harvest as an 'ongoing' forest practice which is an existing lawful use, if you have conducted a forest practice previously. If a forest area is to be harvested or thinned, etc for the first time it may be a 'new use', and require a development approval from local government (check with your local government).

Landowners conducting a forest practice must be able to demonstrate that it is "ongoing". In other words it needs to be a planned reoccurring income over time and part of a properties' business. Landowners are advised to maintain records of timber removals and other forest management activities that they perform such as thinning, fire, etc. to justify this.

2. Q - Is there a restriction on the regional ecosystem (RE) types or vegetation categories (different colours) that can be managed (harvested, thinned, etc) for forestry (timber production)?

A - No, the forest practice exemption applies to all regional ecosystem types and vegetation categories - green, orange or pink coloured areas on your RE map.

5.1.2 Landowners Responsibilities for 'remnant' mapped (coloured areas - green, orange or pink) vegetation

1. Q - Do I have to notify NRM&W if I am harvesting or thinning my freehold 'remnant' native forest or having it harvested or thinned by contractors (all these activities are considered forest practices)?

A - Yes, notification is required and can be done by filling out the form available and lodging it with NRM&W. It is advised that you include ALL your property or properties on the notification form so they

are covered if you ever decide to harvest, thin, etc. Notification to NRM&W needs only to be made once over an area.

2. Q - Is there a Native Forest Practice Code I have to comply with for 'remnant' (coloured areas) on freehold land?

A - Yes, a copy can be obtained from NRM&W Offices and their web site:

<http://www.nrm.qld.gov.au/vegetation/forestpractice>

3. Q - Does the Native Forest Practice Code relate to 'non-remnant' vegetation (white areas)?

A - No, in 'non-remnant' (white areas) you don't need to comply with VMA or Native Forest Practice Code.

4. Q - Do I need to have a forest management plan?

A - No, but it is advisable to develop one to assist you in protecting your harvest rights and to aid in successful enterprise management.

5.2 Local government planning schemes and local laws

Most private freehold native forestry land uses have been going on over many years (landowners selling, using timber, etc). As such they are deemed an 'existing use' under Queensland's Integrated Planning Act 1997 and there will be no requirement to lodge a development application with the relevant local government under their Planning Scheme to continue operations (harvesting, silvicultural thinning, etc).

A new native forest practice use is one where no evidence of an existing forest practice use exists or the use has been abandoned, changed in scale or intensity. A new native forest practice use 'may be' regarded as a "material change of use" by some Local Government planning schemes and 'may require' the submission of a development application. Check with your local government.

In the situation where the native forest practice use is in question, tree stumps, snig tracks, logging debris, local knowledge of timber removals, fire management, past thinning, regeneration from stumps, tree diameter distribution, etc are all indications of past native forest practice use management, and help build a case in proving an existing native forest practice use exists. Where there is no evidence of prior native forest management practice use landholders should check with their local government and determine whether a 'development application' is required before commencing a 'Forest Practice'.

6.0 References

- IPA (*Integrated Planning Act*) 1997, Reprinted as in force on 17 September 2004, Reprint No 5D, Queensland Parliamentary Counsel.
- Matthews, K. 2004. *Landholder Guide: Sustainable Forest Management on Freehold Land, Rights and Responsibilities, In respect to the Vegetation Management Act 1999 and the Integrated Planning Act 1997*, Edition 1 May 2005, PFSQ, Gympie, QLD
- Native Forest Practice Code, Nov. 2005. From - www.nrm.qld.gov.au/vegetation/forestpractice
- Ryan, S. and Taylor, D. undated. *Private Native Forest Productivity, is it the Key to the Future of Queensland's Timber Industry?*
- Ryan, S. 2000. *Sustainable Management Private Native Forests*
- Taylor, D. 2005. Pers. Comm. (Native Forest Research Scientist, D.P.I & F)
- VMA (*Vegetation Management Act*) 1999, Reprinted as in force on 21 May 2004, Reprint No 1D, Queensland Parliamentary Counsel.

7.0 Glossary

<i>Chemical treatment</i>	The thinning of trees using chemical injection into the sapwood of trees so the chemical will travel throughout the tree via the cambium layer and cause the tree to die.
<i>Centre diameter</i>	Diameter measured at the centre of a log/pole used to calculate timber volume. The diameter is generally measured by a girth/dbh tape in which the centimetres are multiplied by Pi.
<i>Codes of Practice</i>	A document that describes required practices in order to sustainability and protection of environmental values. Compliance with the DNRM&E Native Forest Management Code is mandatory under the Vegetation Management Act 1999.
<i>Competition</i>	The struggle between trees to obtain sunlight, nutrients, water and growing space.
<i>Coppice</i>	Regrowth from dormant buds under the bark of stumps after the tree has been felled. (Most eucalypts will coppice) Coppicing is used as a commercial method of regeneration in some areas.
<i>Cut, snig and haul</i>	The felling of trees, the moving of logs to a loading site, the loading and transport of logs to the mill yard: significant costs of timber production.
<i>Decline</i>	Tree decline in health and vigour due to pathogen or climatic effects, old age, salt, soil compaction, etc.
<i>Defect</i>	Any irregularity in timber that lowers its strength, durability or utilisation potential. Defect can include: resin ducts, dry rot, cracking, warp, cup, doze, mould, shakes, gum rings , etc
<i>Diameter at breast height over bark</i>	(DbhOB) Measured at 1.3 m above ground on uphill side using a diameter tape, which converts circumference to diameter.
<i>Diameter Tape</i>	Also called a di-tape. A tape that is used to directly measures trunk diameter when placed around the circumference of the tree. It assumes a perfectly round cross-section.
<i>Durability</i>	The natural ability of timber to resist decay by natural organisms and maintain its appearance and structural capabilities. Timber is graded into durability classes depending on the species.
<i>Epicormic Growth</i>	Shoots growing from dormant buds beneath the bark, often after fire, drought, stress or when branches are heavily pruned. Severe epicormic branching increases knottiness and reduces timber quality. The leaf type of epicormic growth often reverts to the juvenile state.
<i>Even-aged stand</i>	A stand in which the age differences between the oldest and youngest trees is minimal. Sizes may vary as a result of competition. Even aged stands are perpetuated by cutting all trees within a relatively short period of time or by total fire destruction.
<i>Lignotuber</i>	A large swelling in some plants at or under the ground level that contains dormant buds which sucker/coppice after a tree has been felled or severely damaged. They allow the rapid regeneration of some species after logging.

Log dumps	Areas where logs can be dragged to be sorted for loading. Log dumps are also known as ‘Ramps’ although this is an old term which is often misused. Log dumps require reasonable access for the loading of trucks.
Merchandise	To prepare or present forest products for marketing/sales by trimming, cross cutting, etc according to product specifications.
Merchantable length	The length of log suitable for processing into wood products for which markets exist.
Natural Regeneration	The growth of new trees in one of the following ways without human assistance: (a) From seeds carried by the wind,(b) From seeds stored on the forest floor,(c) suckering from stumps or lignotubers
Non-commercial thinning	The removal of trees that have a limited or no market value due to poor form, suppression and spacing. Also referred to as pre-commercial thinning or thinning to waste. Non-commercial thinning is predominantly used to allow additional space, nutrients and moisture to be available to the selected retained stems of higher quality. Thinning is designed to improve tree health, stand vigour and to shorten time between harvests. When seen in this light there is no such thing as a non-commercial thin. The operation is actually value adding.
Overstocked	The situation in which trees are so closely spaced that they compete for resources and do not reach their full incremental growth potential.
Post-harvest	Any management action that takes place after a harvest operation, i.e. ‘Post-harvest thinning.
Regeneration	The next generation of trees. Often called “Regen”. The process by which a forest is reseeded and renewed. Advanced regeneration refers to regeneration that is established before the existing forest stand is harvested or thinned.
Residual stand	The trees remaining intact/standing following any cutting/harvest/thinning operation.
Retained trees	Trees retained during harvesting to serve as seed trees or wildlife habitat, or which have been selected as being suitable to grow on after thinning. The retained trees make up the residual stand.
Skidder	A rubber tyred tractor with a winch or grapple used for dragging logs from the stump to the loading area, log dump or ramp.
Snig	The dragging of logs from the stump to the loading site. The butt end should be lifted of the ground to avoid excessive soil disturbance and to reduce power needed to pull.
Snig tracks	Tracks used to access or remove forest products from the forest. Generally machinery such as a dozer, skidder, drott or tractor will remove logs by dragging logs along a snig track to a loading area.
S.P.H	Stems per hectare or stocking. The number of trees per hectare.
Spacing	The distance trees are planted along rows and distance between rows or are growing naturally. Spacing directly relates to stocking rate.
Stand	A group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

<i>Stocking</i>	The number of trees per hectare.
<i>Suppression</i>	The process by which a tree loses its vigour due to competition with more dominant stems that cause a reduction in the availability of light, water and nutrients.
<i>Thinning</i>	The process of removing trees from a stand to concentrate growth onto the best trees, without competition. (Usually taking into account form, vigour and spacing) Thinning can be performed by removing unwanted trees with a chainsaw, ringbarking or application of herbicide.
<i>Thinning-harvesting</i>	The use of thinning principals during a harvest operation i.e. Trees are selected for retention based upon form (straightness), vigor (how healthy they are) and spacing (Number of trees per hectare). Poorer quality trees are removed during the harvest and the forest condition is improved or maintained.
<i>Top disposal burning</i>	harvest burn that encourages regeneration, improves forest access and reduces fuel loads