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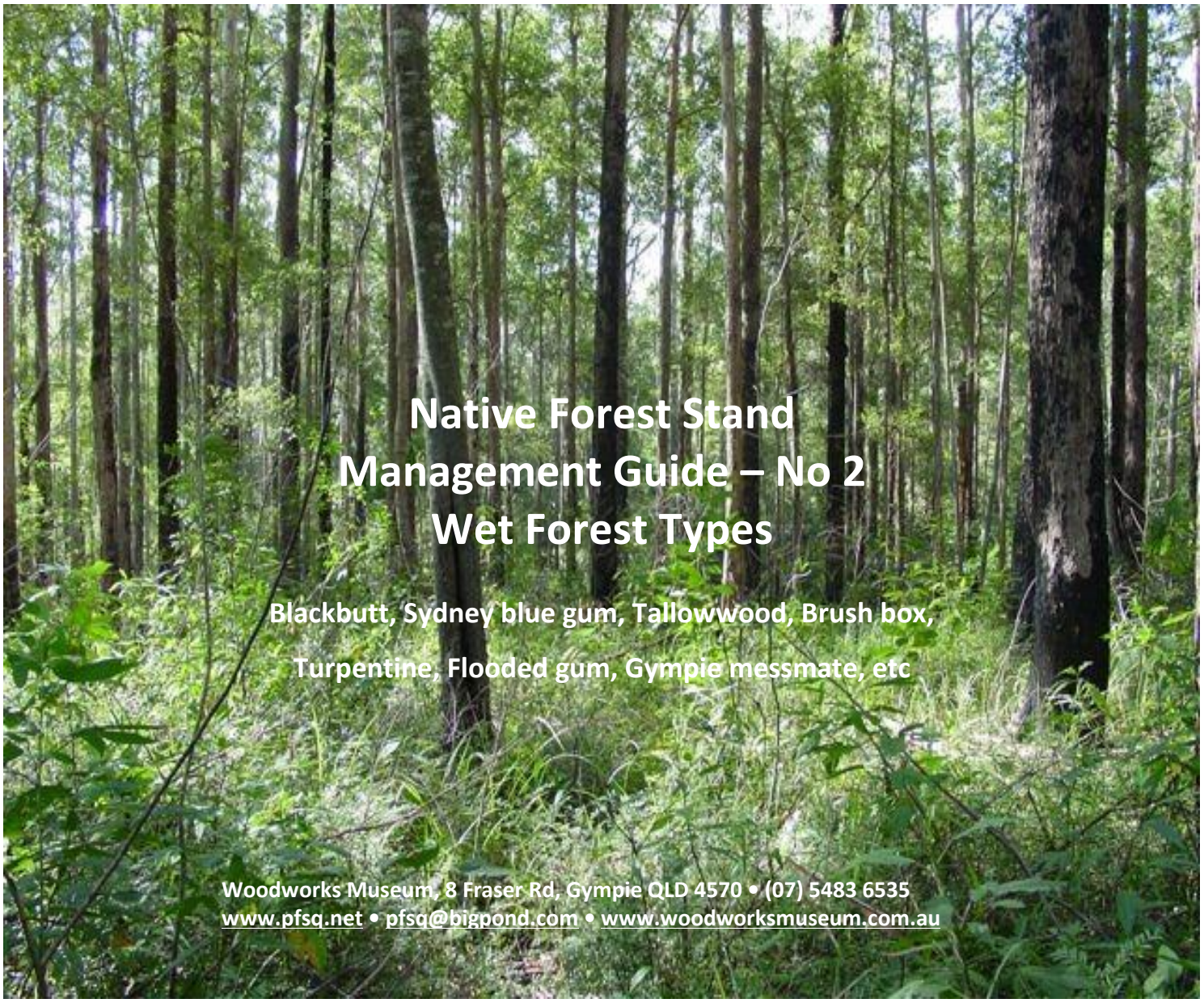

Native Forest Stand Management Guide – No 2 Wet Forest Types

Blackbutt, Sydney blue gum, Tallowwood, Brush box, Turpentine, Flooded gum, Gympie messmate, etc

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TERMINOLOGY

BA / ha	Basal area is a measurement of tree density/ha expressed as the cross section area (m^2) of all trees at 1.3 m from ground level
DBHOB	Diameter at breast height over bark
Doze	A breakdown in the wood fibre due to fungus attack
Drought Index	Measurement of moisture into and out of soil and fuel, a good tool for predicting when to burn in conjunction with the Fire Danger Index calculator
Fencing material	Logs of durability 1 classification that meet minimum fencing requirements (this preference is often area specific eg: yellow stringy bark (Gympie region), Narrow leaved red ironbark (everywhere), Tallowwood (NSW/Qld border region)
Fire Danger Index	Calculates fire intensity, flame height, rate of spread and expected spotting distance
Fuel Loading	This generally refers only to grass fuels and light forest residues <6mmØ
Habitat trees (Original sph)	Habitat trees/ha before management intervention (the definition of a habitat tree is a tree with a 100mm+ hollow)
Forest Inventory	In field and desk top analysis of forest attributes
Logged m3/ha	Estimated volume of commercial trees available/ready for harvest
Logged sph	Estimated number of commercial trees removed in a harvest/ha
MAI – Mean Annual Increment	A measurement of tree growth by either 1. Diameter at breast height (cm); 2. Volume (M^3/ha/year); 3. Basal Area (m^2/ha/yr)
Original m3/ha	Total volume of all trees/ha many of which may be non-commercial
Original sph	Number of trees /ha before management intervention
Pipe	Euphemism for pipelike rotted out centre of the log
Pole	Log that meets the Australian Standard (AS 2209 -1994) for timber electrical transmission line pole specifications
Residual m3/ha	Total commercial volume of trees retained after harvest and treatment
Residual sph	Number of trees /ha retained after management intervention (harvest or treatment)
Sawlog	Log with a minimum 2.4 m section with a ≥ 30cm small end diameter under bark that meets sawlog specifications for species, straightness and defect
Salvage log	Log that fails sawlog specification but of good enough quality to extract a commercially viable product considering extraction costs
Stand Assessment	In field measurement of a representative sample of the forest by management unit (volume, sph, products etc)
Stems/ha (SPH)	The number of trees per hectare
Treated sph	The number of trees (non-commercial) chemically treated or otherwise removed due to being useless or in excess of optimal tree stocking levels

Native Forest Stand Management Guidelines – No 2

Wet Forest Types: Blackbutt, Sydney blue gum, Tallowwood, Brush box, etc

Contents

Revision History and Version Control				
Version #	**Author**	**Changes**	**Approved By**	**Approval Date**
3	**Matthews/Ryan**	**Final version**	**S Ryan**	**2006**
4	**Ryan**	**Rewrite**	**S Ryan/DAF**	**2017**

1. What is a Wet Schlerophyll Forest

1.1 Status and Condition

The wet schlerophyll forests of southern Queensland are dominated by a varying mix of Blackbutt, Tallowwood, Grey Gum, Grey Ironbark, Pink Bloodwood, Turpentine, Brush Box, White and Red Stringybark, Flooded gum and Sydney Blue Gum. These forests mostly occur on the eastern side of the range often elevated and within the high rainfall zones on moderate to fertile soil types. They are predominantly seedling based regenerators. There are two forms of these forests; the Blackbutt/Tallowwood dominated forests with a grassy understory usually on the drier elevated areas and the Flooded Gum dominated forests generally on the wet gully lines or alluvial flats. Of particular interest to timber production are the Blackbutt forests.

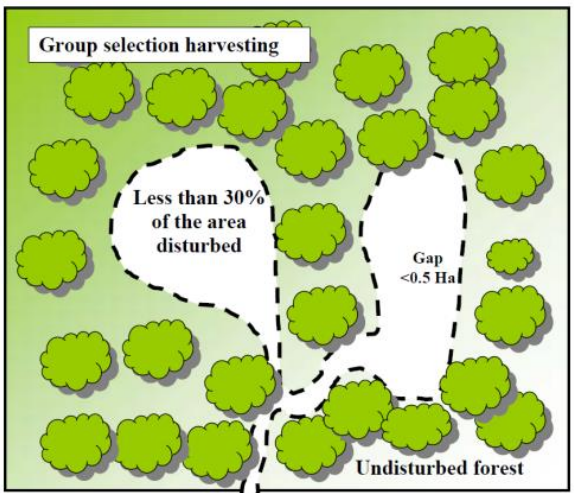
The greatest risk to these forests is the lack of fire, allowing for the invasion woody weed (Lantana) and scrubby understory. This effectively suppresses the eucalypt regeneration and changes the species mix and thus the regional ecosystem. Fire is a critical tool to reinstate the Kangaroo grass groundcover. Conversely lack of burning inevitably leads to a catastrophic fire burning in the worst conditions, resulting in severe negative impacts on wildlife, environment and forest productivity. Excellent burning guide (*Planned Burn Guidelines - Southeast Queensland Bioregion*)

Photo 1. Heavy Lantana infestation due to lack of fire in young Blackbutt

Photo 2. Severe damage due wildfire during extreme conditions

1.2 Productive Native Forest Management

Wet schlerophyll forest are very productive, growing at up 5 m^3/ha/yr in a well-managed forest. It is generally at harvest and post-harvest management that mistakes are made. It is often observed that a heavy harvest takes place with no follow-up burning or weed control, this greatly favours the lantana which rapidly dominates the site eliminating the chance of adequate regeneration. These forest require significant disturbance in the form of bare earth or fire resulting in bare earth to regenerate. That is why the Code for Managing a Native Forest Practice allows for group selection harvesting where (.5ha) trees are felled into a central point and the heads are then burnt to provide a bare mineral earth to aid regeneration. Weed control following the harvest is critical to maintaining the productive condition of the forest.



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, maintain tree health and crown vigour.

Figure 1: Aerial view of a group selection harvesting operation

Competition between trees is the major influence on tree health, quality and value. As trees grow up and mature their crowns and roots begin to interact and there is increased competition for available sunlight, nutrients and moisture. In simple terms too many trees and they all go hungry. Reduced crown or root development directly impacts on growth rates.

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 continue to improve.
These are the fundamentals of sustainable native forest management.

Photo 3. A Wet Forest (Blackbutt) in Need of Thinning

The management of a native forest after harvest i.e. promoting regeneration, timely thinning, etc. needs to be regarded as one of the costs of harvesting. The result of not undertaking this level of management after a harvest is a forest with lower productivity. Slower growth rates results a longer harvest cycle, higher fault levels, lower volumes per hectare and a lower return for landowners.

The Four Basics of a Highly Productive Forest

Photo 4. Full healthy crown not interlocking with other crowns

Photo 5. Unimpeded root development

Photo 6. The larger the tree the more space required

Photo 7. Long straight bole with no signs of fault

1.3 Basal Area

Another measurement of tree density is Basal Area (BA). It is usually measured using a basal area wedge. This is a sum of the area of a cross section of all trees per hectare measured at 1.3m from the ground. All forests have a threshold basal area, that is, when the basal area reaches a maximum density that cannot be exceeded, trees start to die. In a wet forest this will be in the vicinity of 50m² or higher. **Table 1** is a basal area reckoner and it shows 50m², the point at which trees start to die in a wet forest as 1000 x 20cm trees (average); 500 x 30cm; or 250 x 50cm dbh trees. It also means that from about 40m² individual tree growth drops off markedly.

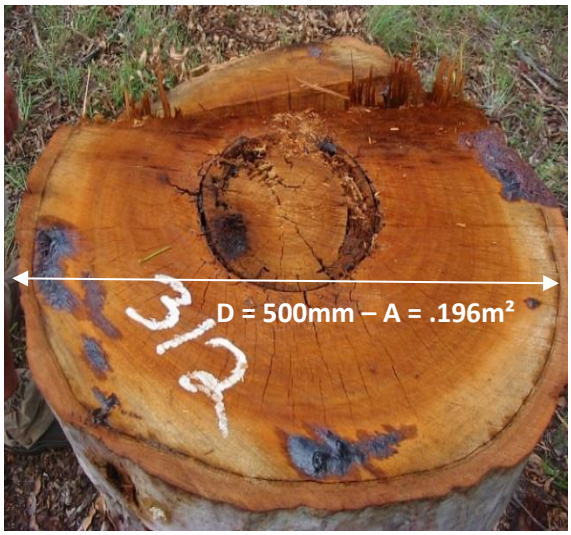


Photo 8. Example of a cross section of tree calculation for basal area

DBH	(Diameter @ Breast Height)								TBA (Total Basal Area)									
50	1.0	2.0	3.9	5.9	7.9	9.8	11.8	13.7	15.7	17.7	19.6	29.5	39.3	49.1	58.9	68.7	78.5	88.4
45	0.8	1.6	3.2	4.8	6.4	8.0	9.5	11.1	12.7	14.3	15.9	**23.9**	31.8	39.8	47.7	55.7	63.6	71.6
40	0.6	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.1	11.3	12.6	18.8	25.1	31.4	37.7	44.0	50.3	56.5
35	0.5	1.0	1.9	2.9	3.8	4.8	5.8	6.7	7.7	8.7	9.6	14.4	19.2	24.1	28.9	33.7	38.5	43.3
30	0.4	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.7	6.4	7.1	10.6	14.1	17.7	21.2	**24.7**	28.3	31.8
25	0.2	0.5	1.0	1.5	2.0	2.5	2.9	3.4	3.9	4.4	4.9	7.4	9.8	12.3	14.7	17.2	19.6	22.1
20	0.2	0.3	0.6	0.9	1.3	1.6	1.9	2.2	2.5	2.8	3.1	4.7	6.3	7.9	9.4	11.0	12.6	14.1
15	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.2	1.4	1.6	1.8	2.7	3.5	4.4	5.3	6.2	7.1	8.0
10	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	1.2	1.6	2.0	2.4	2.7	3.1	3.5
5	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	5	10	20	30	40	50	60	70	80	90	100	150	200	250	300	350	400	450
	SPH (Stems per Hectare)																	

Table 1. Basal Area reckoner using average diameter at breast height x the number of trees/ha

The best opportunity to bring an overstocked forest back into a healthy condition is at harvest; this is known as reset silviculture. One methodology to achieve this is to paint mark the best trees to be retained (minimum of 150 stems/ha, down to 10cm dbh), based on good crown health, good form and little stem defect as well as retaining 6 habitat trees/ha in remnant mapped forest. All other trees with a merchantable product in them are then harvested, all remaining un-merchantable trees are either:

- Chemically injected,
- Chopper rolled, or
- Harvested for bio-fuels (under development)

Best practice forest management aims to retain the best quality trees each time a harvest occurs. Removing the bent, twisted or forking trees results in the stand's genetics being improved, as opposed to past practices of removing the best trees and leaving the worst trees to parent the next generation.

2.0 Tree Selection for Retention

Traditionally selecting which tree was to be harvested was undertaken by the cutter, as was the tree to be chemically injected for thinning (Tordon® gang). This does not necessarily achieve the best result for the long term productivity of the forest. Paint marking for retention is focused on choosing the best possible trees for the future of the forest, not which trees are going to earn the cutter the most money.

How do we determine what trees to keep? The obvious attributes are preferred species, straight stem, little defect and a reasonable diameter. However a tree's crown is the single most important factor in determining the future of the tree. Generally, regardless of how straight the trunk is, if the crown is defective or in poor health, tree growth will be slow or declining and defects such as pipe or doze are likely to be increasing.

The crown of a tree is the power house for tree growth. A small defective crown invariably results in poor tree growth (see Photos 5-8). A healthy crown is demonstrated by:

1. **Crown Position –** Dominant or co-dominant with clear growing space
   a. Crown position 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 and is being adversely effected by them, it is regarded as "suppressed". Ideally, retain only dominant or a maximum of 2 co-dominant trees in a cluster as your future forest.

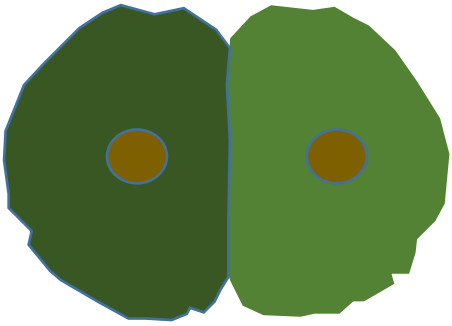


Figure 1. Typical plan view co-dominant crown development

2. **Crown Shape - Conical** with 360º crown cover,
   a. If a tree is codominant it may have only 200° +, if the rest of t adequate
3. **Crown Foliage Density** - This is the measure of the trees photosynthetic area and is seen in the crown depth, density and distribution of the foliar clumps as in Photo 5.
4. **Degree of Dead Branches -** Few dead branches greater than 25mm in diameter inside the leaf zone
   a. There are often dead branches at the bottom of the crown, that is crown lift and not associated with crown health
5. **Crown Epicormic Growth –** Few small vertical branches along major branches,
   a. Epicormic growth is a sign the tree is under or has come under stress (competition, drought, fire or severe insect attack)

Photo 9. Healthy, fully developed crown with dense foliage in a

Photo 10. Suppressed offset crown with poor shape development on only 1/3 of the crown area

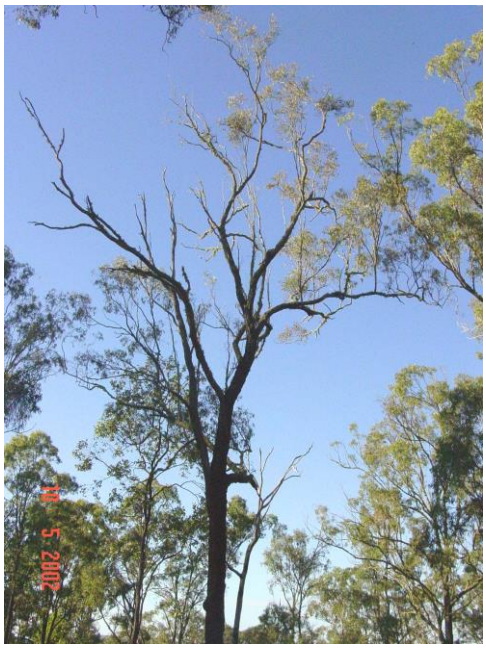


Photo 11. Crown in severe decline with predominance of dead branches, epicormic shoots and sparse foliage

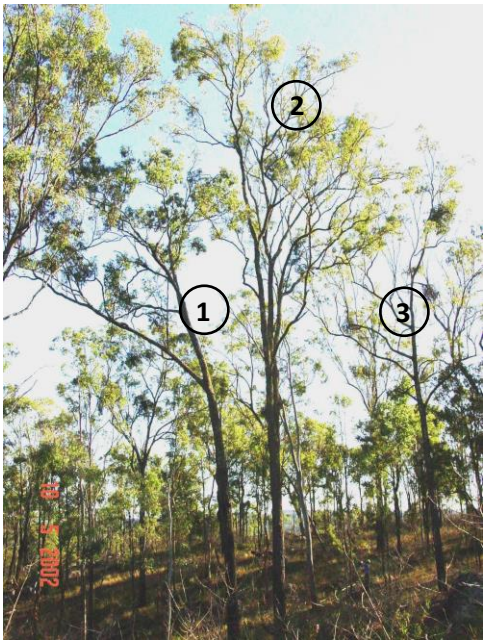


Photo 12.Tree crown No 1. is offset in a suppressed position, No 2. is in a dominant position and No 3. has sparse foliage and dead branches

Summary of selection Criteria

Thin or space trees to average 8-8.5 m apart based on:

1. Preferred Species
2. Good quality - straight log length (>6m), limited fire or other scars, defect bumps or insect damage
3. Healthy, uniform dense tree crown and limited dead branches, mistletoe and/or epicormic shoots.
4. Dominant or at least a co-dominant tree crown placement in the canopy.
5. In 'remnant' vegetation retain the required numbers of 'habitat' trees prescribed in the 'Forests Practices Code'

Thinning/spacing method

- Based on the selection criteria above, mark trees to keep with paint
- If commercial amounts of 'product' trees are present, organise a harvest prior to chemical thinning/treatment of the forest.
- Chemically thin/treat any unmarked, un-merchantable stems.

Summary of Stem Fault to look for:

Vertical Dead Branches – sizable dead branch will persist on the tree and allow decay to develop

Fire Scar – usually at butt level, may allow decay to develop or restrict nutrient transfer and hinder growth

Stem Damage – broken off large branch or damage resulting from an impact from machine or treefall

Lumps or Bumps – generally an indication of an internal fault or termite attack,

Bracket Fungi - indication of internal decay

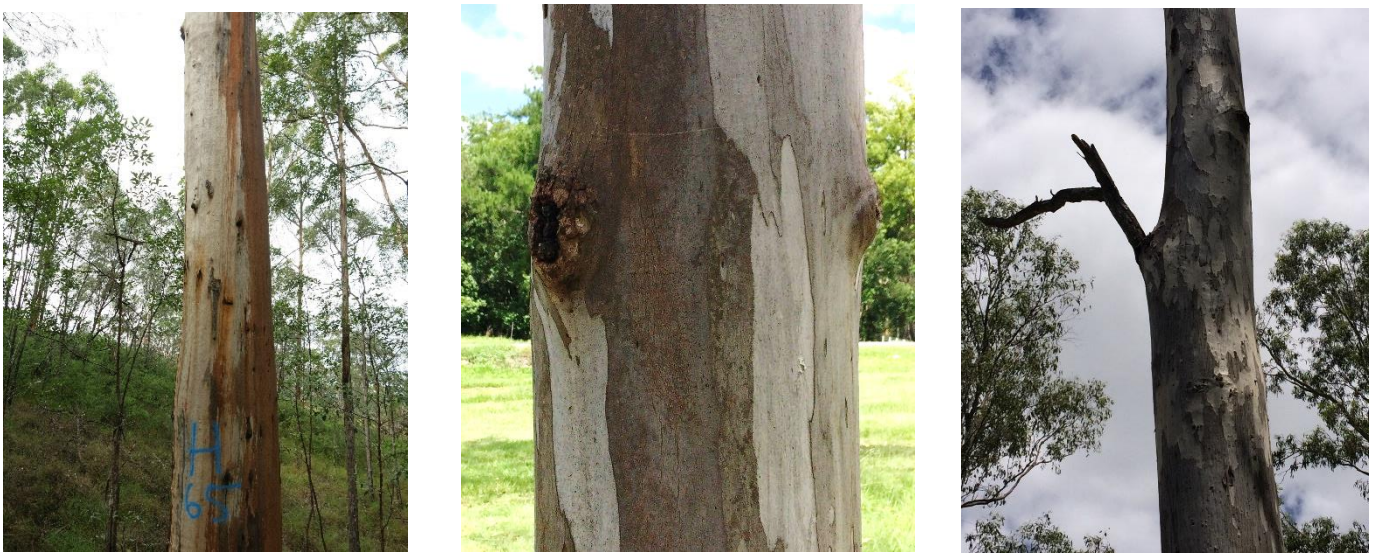


Photo 13-15 - Tree stem fault showing up in Lumps, Bumps and dead branch stubs

3.0 What Condition is my Forest in? - Forest Condition Types

There is not a single system of management that is broad enough to cover all forest types and their condition. The basics are the same based around optimal stocking and good quality trees, however forest condition can vary widely as do the management intervention processes to be employed.

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 considered.

3.1 Forest Condition 1. A Regeneration forest with very few overstorey trees present

3.1.1 Description

A regeneration forest is one that has regenerated from being previously cleared, subject to a severe wild fire or heavily harvested. The dense regeneration (Suckers, saplings, etc) have a fairly uniform diameter and age. In this situation the forest only has one layer of tree crowns in the canopy. There is little understorey (other species or younger regeneration), there are a few dominant trees that have emerged from the majority of the tree crowns, but 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 individual tree growth has severely declined and 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 forests condtion can be as high as 4000+.

Photo 16. Good quality advanced growth in need of thinning

3.1.2 How to best manage it for wood production

A stand in this condition is overdue for thinning, this is evidenced by very tall skinny trees with 'pompom crowns'. Pompom crown is a description given to trees packed in so tight they only develop a small crown with no substantive structure. The trees need to be spaced out so a full healthy crown can develop.
The optimal number of trees/ha is determined by the species, site quality and the diameter of the trees. A wet forest such as a Blackbutt forest is often found on quality soil types and when the trees are averaging **15 – 20 cm dbh** (Diameter at breast height) the stocking (stems per hectare) needs to be a maximum of 300 sph (Basal Area 9.4m²; average spacing of 6 metres between trees). Remember, this is an average, not a definite. Trees will not always be where we want them to be and so there will be times when trees are 4 metres apart or 6 metres. The point isn't to try to achieve an exact, just an average. The trees will have a commercial thin again at average 30cmdbh, from 300 to 200 sph, (BA 21.2 m² down to 14.1 m²)

All stems that have not been marked for retention and remain in the stand following harvesting should be chemically treated. Most landowners or contractors use either Tordon or Glyphosate (+ metsulfuron) via an axe and stem injection. The axe should pass through the bark and then into the sapwood creating a pocket to hold the chemical without run-off. The required quantity of chemical is then injected into the pocket.

Tree Injection Methodology

Using either a Tordon® axe or long handled tomahawk, make cuts through the bark and into the wood at 13 cm centres around the stem. The herbicide mix is then immediately applied into each pocket using a calibrated sheep drench gun and backpack (1 ml of mixture for trees with a base diameter under 25cm and 2 mls for any larger trees).

Herbicide Mixes

- Glyphosate (Round-up 450), Using a 1: 3 Glyphosate : water mix
- Tordon® DSH (double strength), Using a 1: 4 Tordon water mix (DOW Woody Weed Control Guide)

Table 2. Axe cuts by tree diameter (Ø)

Tree Ø cm	No cuts	Tree Ø cm	No cuts
10 cm	3 cuts	40 cm	10 cuts
20 cm	5 cuts	50 cm	12 cuts
30 cm	7 cuts	60 cm	14 cuts

RATE: Mix one part Tordon® with four parts water. Application rate - 1 ml/cut <25cm Ø **;** 2ml/cut>25cm Ø at base of tree.

Photo 17. Axe cuts at 13 cm centres suitable for herbicide application

3.1.3 Second Stage Management

As the stand matures to the point where the retained trees have reached an average diameter greater than 30cm dbh, another thinning operation is required to maintain the forest health and productivity. At this stage there is likely to be a range of small poles that are able to be harvested as part of the thinning process.

Even though this thinning operation has a product component able to be realised, the same principles of selection for trees to be retained must be applied to ensure ongoing forest health and productivity advances.

Again depending upon site quality, the number of trees per hectare to be retained in the 30cm+ category should be approximately 200 trees per hectare. The average spacing between trees at 200 trees per hectare translates into an average distance of 7 m between trees in any direction. This stocking level does not discount that there will also be smaller diameter regeneration from seed, lignotubers and stumps from the last thinning event. This regeneration is extremely important to protect and manage as it constitutes the third generation harvest in the future. As the forest is managed into the future, all regeneration will 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 - A 'optimal managed' forest** is what to aim for.

4.0 Forest Condition 2. Regenerating Forest Resulting From an Extreme Harvest Operation

4.1.1 Description

This type of forest has generally had most or all trees with a sawlog grade product or pole removed in the past. There are usually two layers to the forest canopy i.e. a tall layer of bent, defective or damaged trees with some quality young stems overtopping a second layer of overstocked regrowth that has been suppressed by the trees that were harvested. In this situation there can also be a high proportion of non-commercial regrowth such as Acacia, Red Ash, Mutton Wood and Lantana, etc. This non-productive growth can have a dramatic impact upon the forest, competing heavily with the young regenerating commercial species.

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

In the past all trees with a sawlog grade product or poles were removed as part of the minimum diameter harvest. A minimum diameter harvest is a harvest where every tree over 30cm dbh with certain products (predominantly sawlog and pole) is removed. The problem with this type of harvest without the critical follow-up management is that the defective and damaged trees remain in the stand and suppress the quality regeneration, destroying the future productivity of the stand. In the end the stand is made up of a predominance of non commercial species, duds, salvage grade logs and unmanaged regeneration.

Photo 18. Over Harvested Wet Forest in need of Management

4.1.2 How do I return this forest to productivity and health?

This stand of trees is critically in need of thinning to remove the defective or suppressed trees. This process will enable the selected best trees to be released from competition, to regain their growth and vigour and to put on diameter. The difference with this forest compared to the first example is that the first thin may have the opportunity to generate some income to support the operation. The number of trees per hectare in a stand such as this can be highly variable depending upon the frequency and intensity of past harvest practices. Typically the trees per hectare over 10 cm diameter can be as high as 400 - 600 but distributed over a number of diameter classes. Generally the larger trees are defective and will not a make pole, sawlog or even salvage grade product or they would have been removed in previous harvests. Again the optimal number of trees/ha is determined by the site quality and the diameter of the trees but should be in the 150-200 range, if there are that number of quality trees present.

Table 3 gives the spacing guide recommended for each tree diameter size class.

Table 3. Management Recommendations

Trees 30cm + diameter class. (few of these will be retained due to fault)	**Trees within the 20 – 30 cm diameter class**	**Smaller trees in the 10 – 20cm diameter class (advanced growth)**	**The combined retained stand should not exceed 250 trees/ha, on the condition that every tree has space to freely grow into**.
Spaced at an average of 10m from other trees in this size class.	Spaced at an average of 7 m from other trees in this size class or larger.	Spaced at an average of 6 m from any other tree.	

Tree Selection Criteria

1. Preferred Species
2. Good quality - straight log length (>3m), limited fire or other scares, defect, bumps or insect damage
3. Healthy, uniform dense tree crown and limited dead branches, mistletoe and/or epicormic shoots.
4. Dominant or at least a co-dominant tree crown placement in the canopy.
5. In 'remnant' vegetation retain the required numbers of 'habitat' trees prescribed in the 'Forests Practices Code'

Thinning method

- Based on the selection criteria above, (mark trees for retention with paint; recommended practice)
- If commercial quantities of 'product' are present, organise a harvest prior to chemical thinning.
- Chemically thin any unmarked, unmerchantable stems – refer to Chemical Treatment Information in 3.1.2

4.1.3 The Second Stage Management

As the stand matures and the trees grow into the next diameter class, they are now using the available nutrients and moisture on the site and there will need to be further management of regeneration and thinning of the retained stand. Again, the retained trees greater than 30 cm should be spaced at an average of 10 m. Most of the 10 – 20 cm size class (dbh) have now progressed into the 20 – 30 cm diameter range and should be retained at an average of 7 m to a maximum total stocking of 150 – 200 stems/ha. There will also be the need to manage the next round of regeneration (less than 10 cm) at an average of 4m but keeping less than 60/ha. Regeneration will only progress in growth and health, if there is a canopy space to grow into.

At this stage there should be a range of product types that are able to be removed as part of the thinning process. Smaller diameter durability class 1 species such as, Tallowwood, Messmate, 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 Blackbutt, Tallowwood, Messmate, Grey gum and Grey ironbark, which are all durability class one or two species. Alternatively for trees which have limited log length but sufficient diameter to make sawlog grade material (30 cm small end diameter, SED) or salvage grade sawlog (26cm SED) may be harvested. Further discussion on products can be found in Guide No 4 – Forest Products and Marketing.

Even though this thinning operation has a product component able to be realised, the same principles of selection for trees to be retained must 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 is maintained throughout the management cycle.

For further information on native forest management go to: www.pfsq.net

5.0 Forest Condition 3. A Well Managed Forest

5.1.1 A Forest That Has Been Selectively Harvested On a Sustainable Yield Basis with Follow-Up Regrowth Management.

Sustainable Yield is simply the rate of available growth that can be removed indefinitely without impacting on the health and productivity of the forest.

A well-managed forest scenario for this forest type would show that the last harvest was performed appropriately retaining well-spaced trees, with a healthy crown and straight stem. There has been good regeneration over the years and the landholder has maintained the forest growth and health by undertaking regular thinning and selective harvesting. A tree is only removed when it has reached its full economic potential or is declining in health.

Photo 19. Well Managed Wet Forest

5.1.2 How to best manage it for wood production

Managing a forest that is in good condition is a much simpler process than bringing a forest in poor condition back into a productive state. The management revolves around the harvest cycle i.e. when that portion of the stand has reached its optimum product size, how that harvest will take place and then the follow-up processes of head disposal and regeneration establishment and management. A typical harvest for this forest would aim at the removal of 30% of the standing volume with an 'ideal' stand structure carrying 40% of the stand as <20cmdbh, 35% 20-40 cm dbh and 25% >40cm and managed over a 60 year cycle with a harvest each 10-15 years. This structure allows a number of selection opportunities along the growth cycle (particularly in the <20cm dbh range) to pick the best possible trees to grow into the harvestable range. This selection process would take place a couple of years after each harvest cycle.

5.1.3 Harvesting

A typical harvest for this management regime would aim at the removal of one third of the standing volume. A harvest at a higher volume is likely to include a significant proportion of immature smaller diameter trees that are under their potential value and would compromise the stands future productivity and returns.

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

5.1.4 A Recommended Management Timeline for This Regime:

Year 1 - harvest approximately one third of the standing volume and merchandise into the highest value product considering the quality of the log (veneer billet, girder, poles, sawlog, fencing timbers, etc). Ensuring the retention of the best 100 sph over 20 cm dbh and the required habitat trees if in 'remnant' vegetation under the Forests Practices Code.

Post-harvest - top disposal burning and reinstating cross drains on snig tracks, haul roads and log dumps.

Year 3 to 5 - once subsequent regeneration has grown enough to indicate form and growth habit, chemically treat any unwanted regeneration to approximately 50 sph, ensuring each retained tree is growing into an adequate space in the canopy.

Year 10-15 - 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 year 1.

Post-harvest - top disposal 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 should be performed.

Year 3 to 5 years after harvest, once subsequent regeneration has grown enough to indicate form and growth habit, chemically treat any unwanted regeneration to approximately 100 sph, ensuring each retained tree is growing into an adequate space in the canopy. The twenty year old regeneration from year 1 harvest (now advanced growth 20cm+) is again selected to remove any faulty or damaged stems to ensure all retained stems are of the highest quality

Year 20 - 25 –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 year 1. Some of the harvested stems are likely to be from the selected regeneration from that year that may have developed some fault and need to be removed (insect or pathogen attack, physical damage from storms etc).

Post-harvest - top disposal burning and the maintenance of snig tracks, haul roads and log dumps.

Year - 3 to 5 years after harvest, once subsequent regeneration has grown enough to indicate form and growth habit, chemically treat any unwanted regeneration to approximately 100 sph, ensuring each retained tree is growing into an adequate space in the canopy. Maximum overall stocking is maintained at no higher than 250 stems/ah. The twenty year old regeneration from year 15 harvest (now advanced growth 20cm+) is again reviewed to remove any faulty or damaged stems to ensure all retained stems are of the highest quality

Year 30-35 – 10- 15 to 15 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 year 1.

Year 50-55. This harvest represents the completion of a full growing cycle with the removal of selected stems from the regeneration that occurred after the year 1 harvest and the cycle continues.

Criteria for Selecting Trees for Removal (Harvest or thinning) Includes:

- **Optimum product size**
- **Declining tree health, usually assessed by crown condition**
- **Defect such as a large vertical dead limb or suspected decay from old wounds**
- **Bad mistletoe infestation**
- **Suppressed trees as indicated by crown shape and condition**

6.0 Forest Regeneration

Wet Eucalypt forests in Queensland predominantly rely on seed fall or coppice (re-shoot from stump) for regeneration. But these forests also include some lignotuberous species that will also regenerate from the lignotuber pool (older seedlings that have been knocked back and persist on the forest floor until an opportunity to grow on occurs).

Seed based regeneration is usually dependent upon three factors - available mature seed, favourable climatic conditions and soil disturbance. Due to the seed of eucalypts being very small, successful germination requires areas of bare earth. Some bare earth will be evident from the snigging operation but a broader scale bare earth will also occur as a result of tree head disposal burning after harvesting is completed.

Eucalypts generally retain 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 un-burnt 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.

Photo 20. The presence of mature seed in the forest canopy at the time of a harvest will greatly enhance regeneration prospects

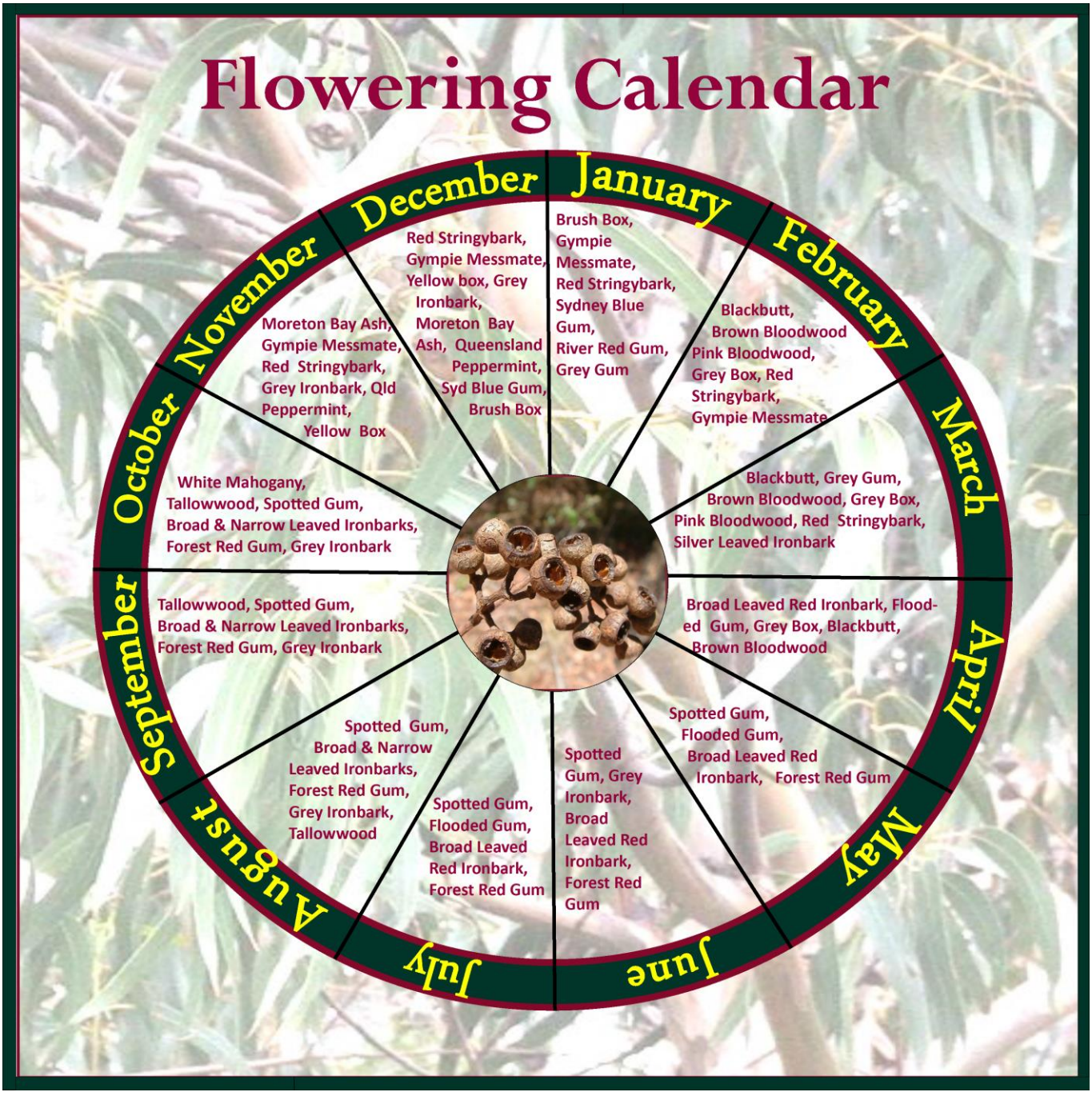
Photo 21. Coppice and regeneration after a post-harvest burn

6.1 Regeneration management is essential to wet forest management.

The resulting regeneration needs to be protected from fire for at least three years. Care should be taken with the first 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 is coincided with the retained trees having a mature seed crop. In most eucalypts mature seed is present in the canopy 6 months after flower.

The advantage of many eucalypts is their ability to coppice (re-shoot from stump). Many stumps from a harvest will coppice immediately. This can be a good alternative to seedling regeneration but requires maximum 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 5 metres is reached.

Figure 1. Flowering Calendar for se Qld Eucalypts



7.0 Fire Management

Damage to a forest from wildfires can be severe, particularly if it occurs in the hotter, drier parts of the year accompanied by strong winds. The value of a forest can be reduced dramatically, depending on the severity of a fire. 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 wildfire.

Periodic fuel reduction burning (2-5 years) should be undertaken during mild conditions (during winter or following rain) to reduce the build-up of forest fuel. Targeted burning can also have a number of important management functions such as the control of excessive regeneration, invasive species, particularly Red Ash, Mutton Wood and Brush Box and weeds such as lantana.

When planning a harvest it is highly advantageous to undertake a burn in the 12 months prior to the harvesting operation. Burning 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 sever downgrading at the log dump. Harvesting can also produce a large quantity of fuel and reducing any build-up of fuel before the harvest ensures the head disposal burn after the harvest is not too hot causing damage to the retained stems.

8.0 Complying with Legislation and Planning Laws

8.1 Queensland Vegetation Management Act (VMA) 1999

Under the Queensland Vegetation Management Act (VMA) 1999 trees or vegetation on freehold land are either 'remnant' (green, orange or pink on a Vegetation Management Map - DNRM) or 'non-remnant' (white on the map). If you have trees or vegetation that are in 'non-remnant' areas (white), you do not need to comply with Vegetation Management Act 1999, or Forest Practices Code. It is only in areas mapped as 'remnant' (coloured on the regional ecosystem map) that you must comply with the VMA 1999, and the Self-assessable Vegetation Clearing Code.
The following sets out your rights and responsibilities for 'remnant' vegetation (coloured on the regional ecosystem map). However, this does not relate to vegetation on 'white' mapped areas. It is strongly advised to 'lock in' the white areas by submitting a Property Mapping of Assessable Vegetation (PMAV) application. *https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0017/111095/pmav-application-form.pdf*

8.1.1 Landowners Rights for 'remnant' mapped trees or vegetation

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

  Yes, as an ongoing forest practice and existing lawful use and if timber harvesting has happened 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 (see your local government if this is the case).

- Is there a restriction on the regional ecosystem (RE) types that can be managed (harvested, thinned, etc)?

  Yes these are outlined in Tables 1A, 1B and 1C - ***Managing a native forest practice*** *A self-assessable vegetation clearing code.*
  https://publications.qld.gov.au/storage/f/2014-08-04T23%3A17%3A15.199Z/managing-native-forest-practice-code.pdf

  - Do I need to have a forest management plan?

  No, it may be required under the proposed code but it is advisable to develop one to assist you in protecting your harvest right and to aid in successful enterprise management.

8.1.2 Landowners Responsibilities for 'remnant' mapped vegetation

- Do I have to notify DNRM if I am harvesting my freehold native forest or having it harvested?

  Yes, notification is required and can be completed on the DNRM website, or by filling out the form and lodging it with DNRM.

  Landowners conducting a forest practice must be able to demonstrate that it is "ongoing". In other words it needs to be planned to provide recurring 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.

- Is there a forest practice code I have to comply with for 'remnant' mapped areas?
  *Yes - **Managing a native forest practice** - A self-assessable vegetation clearing code.*

Summary of Code Requirement - Dry Native Forest

Landholders must lodge a notification of a Forest Practice with DNRM (can be done online)
A native forest practice must: o only occur for the purpose of producing value added forest products o maintain documentary evidence of the sale of products.
No more than 5% of the area, in which a native forest practice is conducted, may be disturbed by roads, tracks, snig tracks and log landings.
Selective harvesting and thinning: only occur in the regional ecosystems listed in Table 1A, 1B and 1C as per ***Managing a native forest practice -*** *A self-assessable vegetation clearing **Code**).* o retain the number of habitat and recruitment habitat trees listed in Table 5 in the **Code** o in a hardwood forest, must retain the number of timber trees listed in Table 2 in the range of sizes and spacing's outlined in Table 3 in the **Code** o retain representatives of all species in a range of sizes in each hectare o wherever possible retained trees are evenly spaced o not create a park like appearance by removing the majority of understorey species. o not involve felling trees into or against trees required as future crop or habitat trees
Except for roads, tracks, snig tracks and landings, a native forest practice will maintain at least 50% of the ground surface in any 50 by 50 metre area either: o undisturbed; or o with a vegetative ground cover (dead or alive).
A native forest practice must not occur: o on an area with a majority slope greater than 45 percent or 25 degrees o within 20 metres of an unstable area or area vulnerable to mass movement. o within a buffer zone of a wetland or designated stream line except for the establishment of a crossing – Table 4 in the **Code**
A native forest practice must retain • the number of habitat and recruitment habitat trees listed in Table 5 in the **Code** • retain all active feed, nest and shelter trees
Roads and tracks • not be used when soils are saturated • be drained and water diverted onto undisturbed areas before the water is able to traverse the maximum permitted distances listed in Table 6 in the **Code** • that a creek crossing in a creek bed is to be set at bed level
• Snig tracks are not to be located within a filter or buffer zone except at a creek crossing • Log dumps are to be a maximum 50x50m

8.2.0 Local Government Planning Schemes and Local Laws

The majority of forests have been harvested at some time in the past and have ample evidence of an on-going forest practice. 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 forest management. Forestry is a long term business that may be many years between events, as such section 681 and 682 of the Sustainable Planning Act protects the existing legal use from any requirements of council for a development application or material change of use. (See sections below)

681 Lawful uses of premises on commencement
(1) To the extent an existing use of premises was lawful immediately before the commencement of this Act, the use is taken to be a lawful use under this Act on the commencement.

(2) To remove any doubt, it is declared that subsection (1) does not, and has never, affected or otherwise limited a requirement under another Act to obtain an approval for the existing use.
Example of an approval—
an environmental authority under the Environmental Protection Act

682 Lawful uses of premises protected
(1) Subsection (2) applies if—

(a) immediately before the commencement of a planning instrument or an amendment of a planning instrument, the use of premises was a lawful use of the premises; or
(b) immediately before an existing planning instrument starts applying to land, the use of premises was a lawful use of the premises.

Neither the instrument nor the amendment can—
(a) stop the use from continuing; or
(b) further regulate the use; or
(c) require the use to be changed.

A new native forest use is one where no evidence of an on-going forest use exists or the use has been abandoned, changed in scale or intensity. A new forest 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.

Disclaimer:

This publication is provided as a guide to landholders and should not be relied upon as the only basis for any decision to take action on any matter that it covers. Readers should make their own enquiries and obtain professional advice, where appropriate, before making such decisions. The people involved in the development and issue of this guide cannot be held responsible or accept any liability for the use of this information.