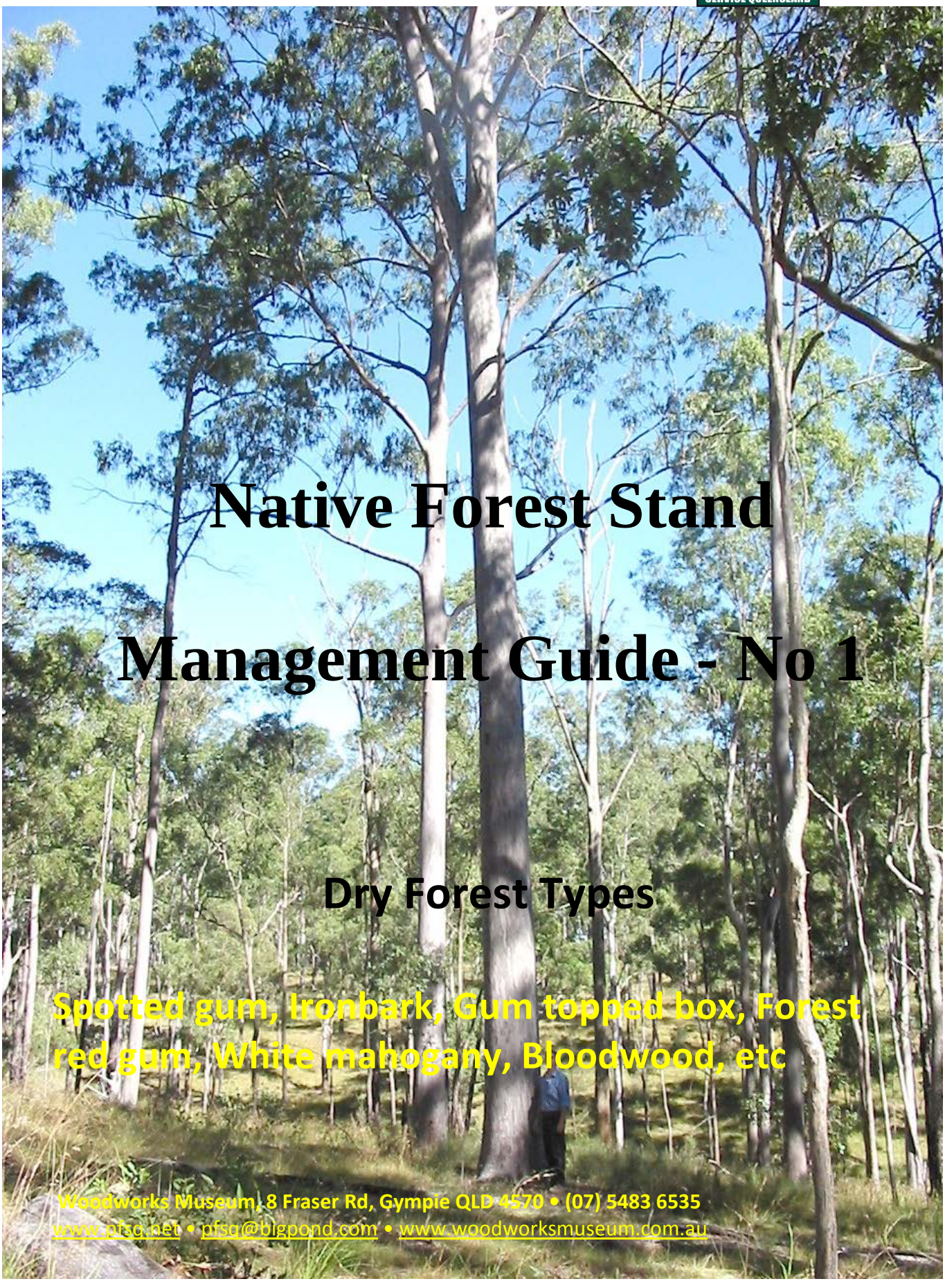

Native Forest Stand

Management Guide - No 1

Dry Forest Types

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

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Native Forest Management Guidelines – No 1

Dry Forest Types: Spotted Gum, Ironbark, Gum Topped Box, etc

Contents **Page**

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**

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)
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

1 Productive Native Forest Management

1.1 General Forest Condition

Queensland's dry native forests usually support a mix of one or more of the following species, Spotted gum, Ironbark, Gum topped box, Forest red gum, White mahogany, Bloodwood etc. These forests generally react to disturbance (clearing, heavy harvesting, severe wild fires) by producing large numbers of regeneration, consequently the majority of Queensland's productive native forests are overstocked, often supporting more than 600 + stems/ha. Long term stocking trials has shown 120-150 stems /ha (8.5 x 8.5m spacing) provides sufficient spacing to maximise individual tree growth, ensure native grass cover to minimise soil loss and optimise ground and arboreal habitat values.

The first element of sustainable native forest management is achieved by optimising individual tree growing space. Tree stocking levels i.e. trees/stems per hectare, is dependent upon the average tree 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 maintain health and vigour. As trees grow 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.

Photo 1-3 . Thinning, an essential element of sustainable forestry to ensure optimal crown and root development

Another measurement of tree density is basal area. 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 dry forest this will be in the vicinity of 25m². Table 1 is a basal area reckoner and it shows 25m², the point at which trees start to die in dry forest as 700 x 20cm trees (average); 350 x 30cm; or 150 x 45cm dbh trees. It also means that from about 18m² individual tree growth drops off markedly.

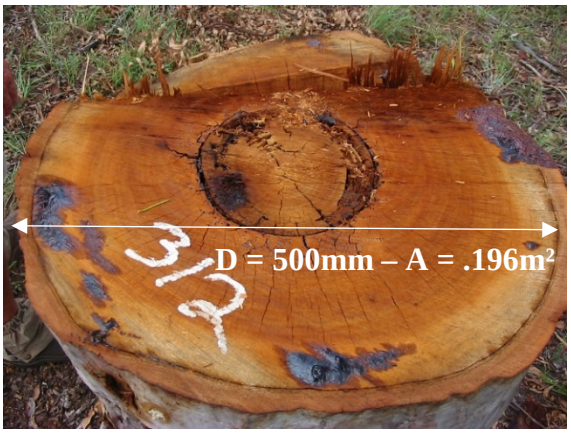

Photo 4. Example of a cross section of tree calculation for basal area

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 100 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 trees un-merchantable are paint marked to be 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.

1.2 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.

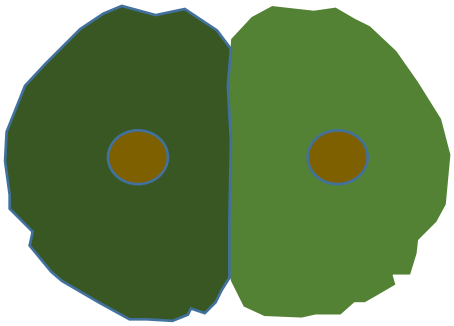

Figure 1. Typical plan view co-dominant crown development

2. **Crown Shape - Conical** with 360º crown cover,
    a. If a tree is codominant it may have only 200° +, if the rest of the crown is healthy, then that is 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 5. Healthy, fully developed crown with dense foliage in a dominant position

Photo 6. Suppressed offset crown with poor shape development on only 1/3 of the crown area

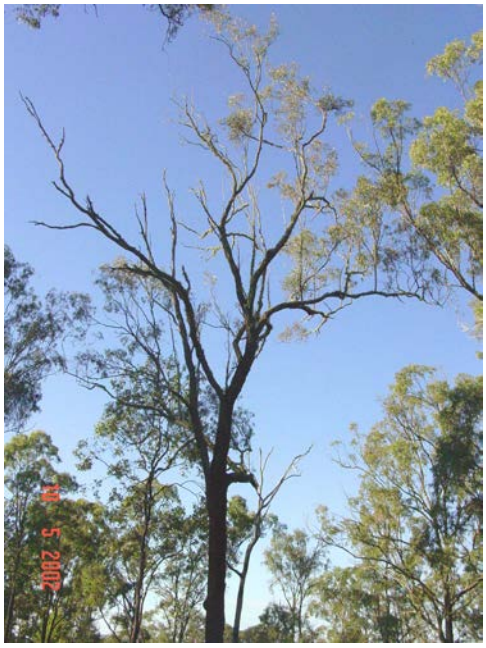

Photo 7. Crown in severe decline with predominance of dead branches, epicormic shoots and sparse foliage

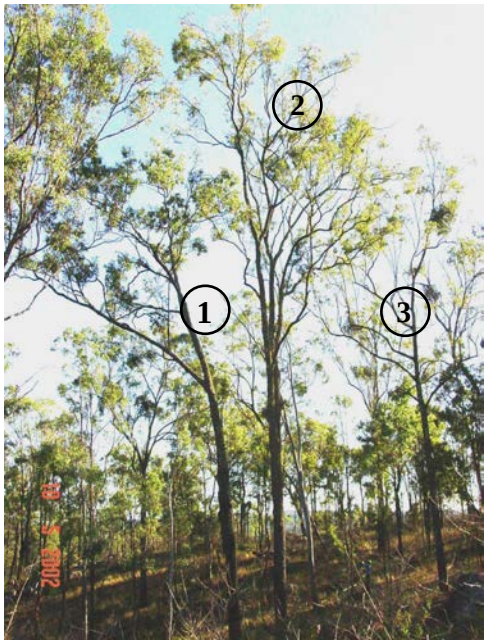

Photo 8.Tree crown No 1. is offset in a suppressed position, No 2. is in a dominant position and No 3. has sparse foliage and dead branches

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

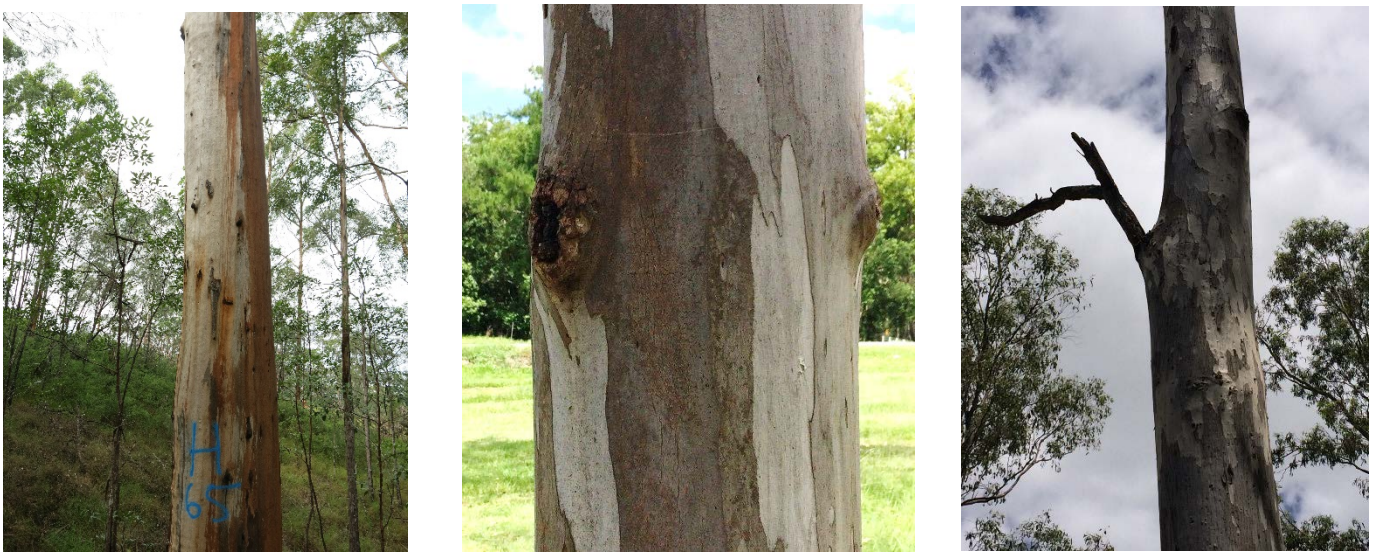

Photo 9-11 Lumps, Bumps and dead branch stubs

1. Understanding Your Forest Type and Its Condition

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.

Forest Condition 1. - A Regenerating Forest with few Mature 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) have a fairly uniform diameter, commonly 10-20cm DBH (Diameter at breast height – 1.3m from the ground), and are generally a uniform age. In this situation the forest has mostly one layer of tree crowns in the canopy. There is little understorey, there are a few dominant trees that have emerged, 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. The number of trees per hectare in this type of forests condition can be as high as 1000+.

Photo 12-13. Overstocked / locked up forest with too many small trees

2.1.2 Improving the Productivity of this Type of Forest

2.1.3 Stage One Management

A forest stand in this condition is in dire need of thinning to enable the better trees to be released from competition, to regain their growth and vigour and to put on greater diameter. The important point to remember is that the optimal number of trees/ha to retain is determined by the 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 120 - 150 trees per Ha (which equates to an average spacing of 8 – 8.5 metres between trees). Remember, most of the trees in this stand are between 10 and 20cm diameter. Trees will not always be where we want them to be and so there will be times when trees are 8 metres apart or 5 metres. The point isn't to try and achieve an exact spacing, just an overall average.

2.1.4 Tree Marking for Treatment

In preparation for thinning, this stand ideally should be marked for retention. Trees to be retained (8 - 8.5m apart) are marked with spray paint or alternatively spend time with the Tordon® gang and train them to select the trees that should be removed according to your criteria. Marking trees will usually produce a better result, but is more costly and/or time consuming. When training a Tordon® gang, mark out an area of 2-5Ha with spray-paint, point out the desirable characteristics you require for the retained stems (crown health, straightness, position, spacing, species etc) so that they will understand what you require. You'll need to monitor them, and possibly mark out more areas, particularly when a forest type or condition changes to ensure they are doing the job you want.

Photo 14. Retained trees clearly showing paint marking

Photo 15. Chopped pocket adequate to take the 2ml of chemical

Most landowners or contractors use either Glyphosate or Tordon® 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.

An alternative to chemical injection is the use of a chopper roller. A chopper roller is a 9 tonne roller with 200mm vertical blades attached in a chevron pattern. It is towed with a skidder or similar machine and weaves through the trees knocking over and chopping up any unmarked trees. The stand must be paint marked as the driver cannot see which trees are the best trees to retain. There is often a fair degree of coppicing, this is either controlled by fire within 2 years or sprayed out.

Photo 16-17. Chopper roller working between paint marked trees, note the delineation line between thinned and unthinned

2.1.4 Management - Stage Two

As the forest grows to the point that the retained trees (spaced at 8 - 8.5m apart) have reached an average diameter greater than 40cm 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 are able to be harvested as part of the thinning process. If the trees have sufficient log length there should be the opportunity to harvest smaller poles. Major pole species include Iron bark, Grey gum, and Grey box (durability 1 species) and Spotted gum, durability 2 species. Shorter length trees with a 30cm small end diameter (SED) under bark could make A class sawlogs and down to 25cm for salvage class log. 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).. Further discussion on products can be found in the "Forest Products and Marketing Guide – No 4".

Even though this thinning operation has a product component able to be realised, 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 trees per hectare to be retained in the 40cm+ category should be around 100 trees per hectare, that equate to a 9-10m average spacing. On top of this there will be a layer of around 50 stems /ha regeneration. 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 **3.3 - An 'optimal managed' forest** is what to aim for.

2.2 Forest Condition 2. – Over Harvested Forest with a Non Productive Overstory.

2.2.1 Description

It is probable that a forest in this condition has had most trees with a sawlog grade product or pole removed. There are usually two layers to the forest canopy, namely:

1. An upper layer of bent, defective or damaged trees

2. A subdominant layer of overstocked regrowth often with good potential that is being suppressed by the overstory.

Photo 18. Forest dominated by poor form trees and residues from previous harvest

A forest in this condition can also have a high proportion of non-commercial species such as Swamp mahogany, 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 size class distribution shows high numbers in the small diameter classes and few stems within the harvestable range.

Photo 19. Forest dominated by poor form trees but with sufficient good trees to warrant thinning

2.2.2 Improving the productivity of this type of forest

2.2.3 Stage One Management

There are two outcomes to be achieved by thinning this forest, namely:

1. Provide good quality trees clear space to grow
2. Trigger a regeneration event to ensure the future stand is brought back to 100% productivity.

Well managed regeneration growing into clear space will achieve a much higher rate of growth than the retained tree as these trees will still be partially affected by their earlier suppression.

The difference with this forest compared to a regrowth forest (as in 2.1) is that the harvesting stage of this operation should generate income to offset the costs of the thinning. 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, but invariably there are a range of products, such as some sawlog, salvage grade logs and fencing material.

Generally the larger trees are defective or they would have been removed in previous harvests. Unless required for habitat, these trees should be removed. The below table gives the spacing guide recommended for each tree diameter size class.

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 150 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 – 8m from other trees in this size class or larger.	Spaced at an average of 5 – 7m from any other tree.	

Selection Criteria for Retained Trees

1. Preferred Species
2. Good quality - straight log length (>6m), limited fire or other scars, defect, bumps or insect damage
3. Healthy, apical dominance crown with limited dead branches, mistletoe and/or epicormic shoots.
4. Dominant or ability/space to become dominant (not too impacted by suppression).
   In 'remnant' vegetation retain the required numbers of 'habitat' trees required in the ***Managing a native forest practice*** *- A self-assessable vegetation clearing code.*

Thinning/spacing method

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

2.2.4 Stage Two Management

As the forest stand matures and trees increase in diameter taking up available nutrients and moisture, competition again starts to impede growth rates. 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 with a chemical treatment to reduce competition from regeneration that has now moved in to the advanced growth stage.

There are a range of product types that may be harvested as a 'thinning harvest'. Smaller diameter Durability class 1 species such as, Ironbark, 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 1 or 2 species. Alternatively, for trees which have limited log length but sufficient diameter i.e. 30 cm small end diameter, compulsory grade sawlogs may be harvested. Further discussion on products can be found in the "Forest Products and Marketing Guide" No 4 of this series.

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.

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

2.3 Forest Condition No 3. A Well Managed Forest

2.3.1 Description

A forest that has been selectively harvested with follow up management to promote growth.

In this forest condition, retained trees are well spaced, have a healthy crown and a straight stem free of fault. A tree is only removed when it has reached its full economic potential, are declining in health or is approaching its threshold basal area. 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 (130-150) of quality trees per hectare by applying timely 'thinning harvesting' and 'chemical treatment'.

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

Photo 20. Spotted gum spaced to suite the large diameter

2.3.2 Maintaining or improving the productivity of this type of forest

Management of a forest that is in good condition is less complicated than the processes required to restore a forest. Maintaining high productivity involves timely harvesting and the follow-up processes of tree head disposal,

regeneration establishment, thinning and fire management. This management regime is based on an approximate 60 year cycle with a harvest occurring at approximately 10-15 year intervals and an 'ideal' stand structure carrying 20% of the stand in the <20cm dbh, 20% 20-40 cm dbh and 60% >40cm stem size classes.

This structure allows a number of selection opportunities (during treatment) along the growth cycle, particularly in the <20cm dbh range, to select the superior trees to grow into the harvestable range at the high end of the product value spectrum. This treatment process would take place around 5 years after each harvest cycle once the regeneration has reached a sufficient height to select on form and vigour.

2.3.3 Harvesting

A typical harvest for this management regime would aim at the removal of one quarter to 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 significantly under their potential value and is compromising the stands future productivity and returns.

Criteria for tree removal is directed towards harvesting trees that have reached their maximum economic value, or showing signs of defect or poor health, or 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.

2.3.4 A Recommended Management Timeline for This Regime:

Year 1 – harvest trees that have reached their maximum value or are showing signs of deterioration and merchandise into the highest value product considering the quality of the log (girder, poles, sawlog, fencing timbers, etc). Ensure the retention of the best 100 sph over 20 cm dbh, including the required habitat trees if in 'remnant' vegetation under the Forests Practices Code.

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.

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, following the same principles as the harvest in year 1.

Post-harvest – as per **Year 1**

Year 18-20 - 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 50 sph, ensuring each retained tree is growing into an adequate space in the canopy.

The twenty year old regeneration from the 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. A maximum stocking rate of 150 stems/ha is maintained.

Year 40 – 15 years after the last harvest, the forest should be ready for another harvest, following the same principles as the harvest in year 1. Some of the harvested stems are likely to be from the selected regeneration from year 1 now 40cm+ that may have developed some fault (insect or pathogen attack, physical damage from storms etc) and need to be removed.

Post-harvest – as per **Year 1**

Year 43 or 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 50 sph, ensuring each retained tree is growing into an adequate space in the canopy. The twenty year old regeneration from Year 18-20

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 60 or 15 to 20 years after the last harvest. 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.

Post-harvest – as per **Year 1**

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

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

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 ml for any larger trees).

Photo 21. Axe cuts at 13 cm centres suitable for herbicide application

Herbicide Mixes

- Glyphosate (Round-up 450), Using a 1: 3 Glyphosate : water mix
- Tordon® TM (Regrowth master), Using a 1: 4 Tordon® water mix (DOW Woody Weed Control Guide)

Table 2 – Number of cuts/diameter class

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® RegrowthMaster with four parts water
Application rate - 1 ml/cut <25cm Ø **;** 2ml/cut>25cm Ø at base of tree.

3.0 Forest Regeneration

Dry Eucalypt forests in Queensland generally regenerate via the lignotuber pool (older seedlings that have developed a thickened root that allows the seedling to persist on the forest floor for decades until an opportunity to grow on occurs).

Seed based regeneration however does occur (some into the lignotuber pool and some progressing straight into advanced growth) 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 broader scale bare earth will be achieved as a result of tree head disposal burning after harvesting is completed.

Photo 22. Lignotuberous growth on an advanced seedling

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 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 23. Seedlings regenerating along an ash bed

The resulting regeneration needs to be protected from fire for at least three 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 a mature seed crop in the preferred species. In most eucalypts mature seed is present in the canopy 6 months after flowering.

The advantage of many eucalypts is their ability to coppice (re-shoot from stump). Many stumps from a harvest will coppice immediately. This will only be a minor addition to the regeneration pool but requires stump heights of <30cm to ensure the coppice is well grounded and 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 6 meters is reached.

Photo 24. The presence of mature seed in the forest canopy at the time of a harvest will greatly enhance regeneration prospects

4.0 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 Supple Jack (*sub species of Lophostemon confertus*) 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. 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 downgrading at the ramp. 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.

5.0 Complying with Legislation and Planning Laws

5.1 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*

5.1.1 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.

5.1.2 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: • only occur for the purpose of producing value added forest products • 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****).* • retain the number of habitat and recruitment habitat trees listed in Table 5 in the **Code** • 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** • retain representatives of all species in a range of sizes in each hectare • wherever possible retained trees are evenly spaced • not create a park like appearance by removing the majority of understorey species. • 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: • undisturbed; or • with a vegetative ground cover (dead or alive).
A native forest practice must not occur: • on an area with a majority slope greater than 45 percent or 25 degrees • within 20 metres of an unstable area or area vulnerable to mass movement. • 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

5.2 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.