Native Forest Stand Management Guide – No 3

White Cypress Forests

Australian Government
Department of Agriculture, Fisheries and Forestry

PFSQ
PRIVATE FORESTRY SERVICE QUEENSLAND

Queensland Government
Department of Primary Industries and Fisheries

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Contents **Page**

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1.0 Basic Principals of Productive Native Forest Management

The fundamental rule of productive White Cypress forest management is to always leave a forest stand in a condition to improve its productivity and ensure regeneration.

The first stage of sustainable forest management is achieved by optimising individual tree growing space – giving trees enough space to grow. Tree stocking levels i.e. trees per hectare, are dependent upon tree species, their diameter and the quality of the site (soil type and depth, rainfall, etc). As a general rule, as trees become larger they require more space to maintain individual tree health and growth rates.

Competition between trees is a major influence on tree health, other major influences are damage inflicted by fire, insect attack or pathogen induced decay but the number one message to gain from reading this guide is that "trees need space to grow". As trees grow and mature the crowns and roots compete for available sunlight, nutrients and moisture. 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.

By selectively removing the poorer quality trees on a cyclical basis, the 'superior' retained trees are able to rapidly grow into a marketable product, while over time regenerating the forest with this advanced standard of tree. Ideally, as trees reach their optimal value and size for their product type, they are removed through a harvest. By only removing trees that have reached an optimal product size, are in poor health or are suppressed, and by maintaining optimum stocking rates, the productivity of a forest will continue to improve.

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Photo 1. Recently harvested Queensland Cypress Forest (note the quality of the residual stand)

The management of a native forest after harvest i.e. promoting regeneration, timely thinning, etc. needs to be regarded as a legitimate cost of maintaining a forest's productivity. The result of not undertaking this level of management is a forest with lower productivity. In other words the length of time until the next harvest will be extended and result in a reduced harvest per Hectare – lower dollar return for landowners and reduced product available for the timber industry.

1.1 Pests and Diseases

(Edited extract from *The Influence of Forest Management on Sawn Timber Recovery and Value in Cypress Pine. Tayor D. et al 2005)*

Relatively few pests and fungi pathogens affect native cypress. However two pests that need to be considered are the Small Cypress Jewel Beetle and the Durabilla White Grub.

Cypress Jewel Beetles are nearly always present in natural stands of cypress, as adults from spring to autumn and as larvae and pupae all year. They breed in stressed, injured and dying trees, freshly fallen branches, and in stumps and trash after logging. Damage to trees is caused by larvae feeding in the inner bark and outer sapwood. A few larvae cause minimal damage. When there are many larvae they cause extensive damage to the sapwood and the tree can ultimately be ring-barked. External signs of infestation can include: cracking and lifting bark; frass (powder) on the trunk or ground and in badly infested trees, crown dieback due to the beetle damage ringbarking the tree.

Durabilla White Grub (Coleoptera: Cerambycidae) is a native longicorn beetle. The larvae of the beetle are typical of the longicorn larvae, with a tiny black head followed by a creamy white almost cylindrical body, which is much broader behind the head than at the hind end.

Durabilla White Grub appears to be most active on 'hard sites' where the cypress is associated with narrow leaf red iron bark, i.e., ridges with shallow soils and stone or clay. The adult beetle preferentially lay eggs in suppressed or unhealthy trees, rather than dominant or co-dominant trees. The damage is seen as tunnels of frass (digested wood) where the wood has been eaten and frass is left behind. The structural properties of the wood are severely impaired.

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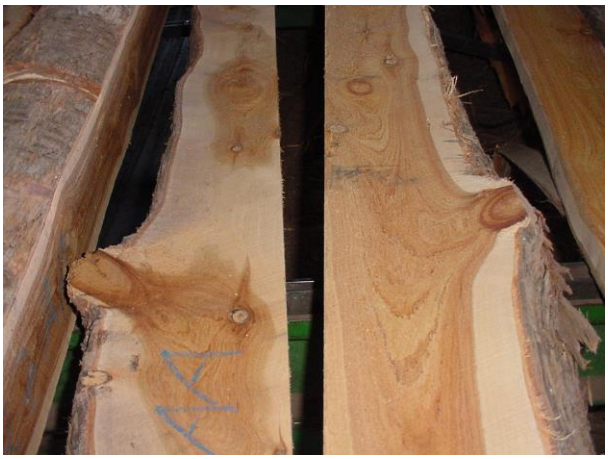

Photo 3. White Cypress slabs with large exposed knot from a branch stub

Photo 2. Severe Grub damage in cypress heartwood (white patches).

1.1.1 Implications for Management

For forest managers with DWG in Cypress stands, knowledge of the level of damage will be critical for any proposed sale. Logs from effected areas which do not conform to the current industry standard will be rejected and thus investment in forest management such as thinning may be lost. Therefore, consideration should be given to avoiding management inputs into areas with severe DWG damage as it is likely to be uneconomic. Growers must first establish whether DWG is present, then determine the level of damage within the stand. At present this can only be done by destructively sampling within your stand (felling a few trees) and checking the stump or butt of the log. If harvesting has occurred on a site DWG damage can also be detected by checking old stumps from previous harvests for the characteristic tunnels. *(Taylor D et al. 2005)*

2.0 Cypress Timber Qualities

White cypress timber has light coloured sapwood with a darker, yellow to brown heartwood. It is not susceptible to lyctus borer attack and has an air dried density of approximately 680 kg/m3. It has a distinctive odor and the heartwood is durable in both external and in-ground situations being highly resistant to both termites and decay. Typically, the sawn timber is knotty and somewhat brittle with contrasting colours and grain. It has been commonly used for both structural and framing timber in the past and is widely used for flooring and lining boards, poles and posts and this remains a large market. Increasingly feature grade markets are being sought out both domestically and overseas.

3.0 Managed Verses Unmanaged Forests

White Cypress grows slowly and in an unmanaged, high density stand ($25m^2$+ basal area), diameter growth will virtually stop, however the tree can persist in that condition for many decades. This is known as 'Cypress Lock-up. Growth rates are generally low in comparison to other commercial forest types. Diameter growth of between 0.2 – 0.5 cm / annum and tree height increments of between 0.2 - 0.5 m / year can be achieved in well managed stands.

White Cypress stand management on Crown lands has developed along two lines in eastern Australia. In New South Wales, a 'shelterwood' system has been developed where harvesting is carried out in two stages to promote regeneration. Under this regime much of the volume is removed in a single harvest leaving a grid of 'seed trees' and resulting in a relatively long growth interval between harvests. Stands tend towards a more 'even-aged' or 'two tier' structure.

In Queensland State Forests, a 'single tree selection' or 'selective harvesting' approach has been taken, favouring an 'uneven-aged' structure where harvesting intervals are relatively short and a range of diameter classes are always present in the stand.

These two management regimes have developed in response to regeneration patterns in each state. In both cases, management of cypress pine forest results in relatively high productivity, up to or in some cases exceeding $0.5m^3$ / ha / yr in high quality forest stands, in comparison with unmanaged stands where negligible growth is often recorded (Taylor 2005). The obvious need to thin dense regrowth stands in order to achieve reasonable levels of productivity was recognized by early forest managers and was subsequently confirmed by research investigations. (Johnson, 1975).

Photo 4. Over stocked Cypress Forest

Photo 5. Thinned Cypress Forest (note the stump height)

4.0 Understanding your forest type and its condition

4.1 What condition is my forest in? - Forest Condition Types

The majority of privately owned Cypress forests in Queensland have had little or no silvicultural management other than periodic harvesting. Depending on the time elapsed and the intensity of the last harvest, landholders keen to commence managing their Cypress forests will find their forest in a variety of conditions but these can basically be broken into three distinct management classes:

1. A stand overstocked with large number of small to medium trees and few merchantable stems
2. A stand with a scattering of larger trees generally unmerchantable but with little regeneration
3. A well stocked stand that will support a harvest but also requires the removal of unmerchantable stems to provide space for quality young stems to grow to product size

Below are three examples that describe these forest types and an outline of the management procedures required in each case to bring that stand into full production.

4.2 Forest Condition 1. - A Dense Forest with a Large Number of Small to Medium Trees and few Harvestable (Merchantable) Stems

4.2.1 Description

In this forest stand there are few trees of merchantable quality over 19cm dbh (diameter at breast height). There may be some large eucalypt trees present that have little or no commercial value; however they may be useful as habitat trees – required under the Native Forest Practice Code.

This forest type is generally heavily overstocked (an average stocking of up to 1500 trees per hectare), mostly of regeneration under 3 metres tall. In this condition it is not capable of achieving financially productive growth rates.

Cypress is very tolerant of competition and will persist for long periods in an almost stagnant state, with any productive growth being very slowly apportioned across a large number of small trees/stems.

Photo 6. Cypress Forest with a High Stocking rate in the 0 - 10cm diameter class and relatively few in the larger diameter classes

4.2.2 Stage 1. Improving the productivity of this type of forest

A forest stand in this condition is in dire need of thinning to enable better high quality dominant and co-dominant (referring to canopy height) trees to be released from competition, to regain their growth and vigour and increase in diameter (restore the forest's productivity). Reducing the amount of trees in this type of forest stand to a more optimal stocking level for the site through Timber Stand Improvement (TSI) processes, will restore the site's productive potential. In a cypress forest this is usually a one off operation that will carry the stand through to the next harvest as regeneration is unlikely to occur under a fully stocked stand of trees. Any additional regeneration is usually controlled with periodic burning, however burning should only be undertaken in very mild conditions and excluded for at least 7 years after a harvest.

Photo 7. High quality crown, in a dominant position, few dead branches and dense foliage

The important point to remember is that the optimal number of Cypress trees/ha is determined by the site quality and the diameter of the trees. A Cypress forest on a good quality site should have a maximum of approx. 330 trees per ha in the 10cm+ class size. This equates to an average spacing between 10+cm dbh trees of approximately 5.5 metres. Regeneration trees (5-10 dbh) can be left in any gaps in the canopy sufficiently large enough for a young tree to grow into unhindered.

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 4 to 7 metres apart. The point isn't to try and achieve an exact spacing, just an overall average. Remember 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? Basically the best quality growing stock should be retained. In other words, a tree of larger diameter with large branches should not be retained if a tree of smaller diameter has a significantly better form and a more vigorous and healthy crown.

The first criteria for selection is a combination of straight stems, little defect and reasonable diameter. The next consideration is what characteristics will 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 doze may be increasing.

So what is a defective crown? There are a number of indicators of a defective tree crown, namely: the percentage of dead branches within the crown, sparse and intermittent foliage and crown shape. If the tree crown is distorted to only one side due to past competition it has limited capacity to produce food for wood production and is considered sub dominant and will have inferior growth rates.

The next issue is how to determine which trees to keep when two or more trees appear equal, but are too close. Crown Placement determines which of these to retain. 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 "sub-dominant". Ideally, retain only dominant or co-dominant trees for your future forest.

In 'remnant' (coloured) areas you can either paint mark the 10+cm dbh trees to stay (in this case, at an average spacing of 5.5m apart), 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.

When thinning the forest remove all other stems that do not meet the retention standards you set for the stand. If there are viable quantities of saleable product trees that need to be removed, then harvest these prior to commencing a thinning operation. Unwanted trees can be then treated out as set out in the following:

- Cypress Stems - cut below the lowest green whorl with a small chainsaw or a 65-cc heavy-duty stem brushcutter fitted with tungsten tipped blade. (see Photo 5) Cypress will not survive if cut below this whorl). If the removed tree is a eucalypt, the stump should be sprayed/painted with a Glyphosate (Round-up 450®) mix - Refer to the 'DOW Woody Weed Control Guide', plus the herbicide product label for recommended herbicide mixes information.
- Eucalypts not required are injected with 1:3, 450 Glyphosate to water or 1:4 double strength Tordon to water. Chemical injection involves making a series of cuts around the tree with a small axe and applying the chemical with a stem injection gun into the pocket made by the cut. The chemical should be applied to the cut immediately to ensure adequate uptake with cuts at 13cm centres applying 1mls of the mixture into the pocket if the tree is under 25cm diameter at the base and 2ml /cut if the diameter is greater than 25cm. Cypress pine can be treated the same way or simply cut off below the lowest green whorl and it will die.

As shown in Photo 8 the axe should pass through the bark and then into the sapwood creating a pocket to hold the chemical without run-off. One millilitre of chemical mix is then injected into the pocket if the tree is smaller than 25cm diameter at ground level and 2ml if greater than 25cm.

Photo 8. Axe cuts into cambium layer of a young eucalypt ready for chemical

Table 1. Management Selection Criteria for - 'Retained Trees' in a 'A Dense Forest with a Large Number of Small to Medium Trees and few Harvestable (Merchantable) Stems

Thin or space trees to an average of 5.5 m apart using the following criteria:

1. Based on the 'Tree retention - selection criteria' below, paint mark or select as you go retained trees of high future product potential or required seed trees.
2. If commercial amounts of 'product' trees are present and not suitable for retention, organise a harvest prior to chemical thinning/treatment of the forest.
3. Chemically thin or cut trees not required (unmarked if painting trees).
4. Retained trees (not including trees with a DBH of under 10cm) should equal a maximum of 330 trees/Ha.
5. Fire should be excluded from a harvest/thinned area for at least 7 years

Tree retention – selection criteria:

1. A full healthy crown in a dominant or codominant position in the canopy
2. Free from severe spiral grain (can be seen on the bark).
3. Nil scarring or 'dry sides' from past fires or mechanical damage.
4. Straight enough to yield at least one reasonably straight log 4 m in length
5. Solid stem, free of obvious decay
6. Free of heavy limbs to yield at least one 2.4 m length section with not less than half the round of the log free of knots larger than 12 cm diameter that are less than 1 metre apart
7. 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'

4.2.3 Stage 2 Management

Generally cypress occurs with a mix of eucalypts scattered through the stand and as eucalypts grow at a faster rate than Cypress, the poor quality eucalypts will begin to adversely affect the developing thinned cypress. It is highly likely that this stand will need a follow-up thin (at around 20 years on) to remove this layer of the stand as it begins to impact on the growth rates of the cypress. This will also give an opportunity to remove any poorly performing or defective cypress and will be performed on the same criteria as the early thin.

As the forest grows to the point that the retained trees (spaced at 5 - 6m apart) have reached an average diameter greater than 25cm dbh a harvest operation will be required to maintain the forest health and productivity.
The harvest is based on the same principles of selecting trees to be retained rather then what volume can be removed. This ensures 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. The harvest should aim to remove around one third of the standing volume mainly in the upper diameter range. The product removed should meet the standards outlined in Appendix 1. White Cypress Cutting Guide.

The harvest will again trigger a regeneration response that will need to be managed and thinned according to the above regimes.

4.3 Forest Condition 2. - A Forest Stand with a Scattering of Generally Unmerchantable Larger Trees but with Little Regeneration

4.3.1 *Description*

The condition of this type of stand is most likely to have been the result of past harvests and/or clearing followed by a regime of continual burning and grazing. Periodic fires and constant grazing have prevented the establishment of regeneration. Trees with no merchantable product in them were ignored in the harvest and have remained in the stand. Some small to medium trees have progressed into a merchantable size class but have developed heavy branching due to lack of competition, generally the forest is understocked and the standard of larger trees is poor.

Photo 9. Scattered Cypress with some regeneration

4.3.2 *Stage 1 of improving the productivity of this type of forest*

To bring this stand back into a productive state requires the selection of adequately spaced seed trees, the removal of the non productive stems by stem injection if eucalypts or by cutting if cypress (as described in 4.2.2), and management of good quality regeneration.
The key to rehabilitating this stand is active management of the stand for regeneration. To achieve this, the thinning treatment has to be undertaken while there is mature seed in the canopy of the cypress trees and moisture in the soil. Similar selection criteria are maintained for the retention of the retained trees except in this case in areas of low stocking, trees with scars or heavy branching can be retained. This is not a genetic defect but

has occurred due to lack of competition making these trees of a suitable standard for seed trees. Seed trees are maintained on a grid of approximately 60 metres.

Table 2. Management Selection Criteria for - 'Retained Trees' in a Forest Stand with a Scattering of Generally Unmerchantable Larger Trees but with Little Regeneration

Thin or space trees to an average of 5.5 m apart using the following criteria:

1. Based on the 'Tree retention - selection criteria' below, retain trees for seed trees and higher value products.
2. Cut or Chemically thin trees not required (unmarked if painting trees).
3. Retained trees should equal approximately **330** trees/Ha.

Tree retention – selection criteria:

1. Young trees that have achieved reasonable growth, straight stem, single leader and no spiral grain
2. Ideally A full healthy crown in a dominant or codominant position in the canopy
3. Free from severe spiral grain (can be seen on the bark).
4. No scarring from past fires or mechanical damage.
5. Straight enough to yield at least one reasonably straight log 4 m in length
6. Solid stem, free of obvious decay
7. Free of heavy limbs to yield at least one 2.4 m length section with not less than half the round of the log free of knots larger than 12 cm diameter that are less than 1 metre apart
8. Seed trees with good form but may have non genetic defect (stem damage or large branches) at 60 metre grid
9. 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'

4.3.3 Regeneration establishment in a Cypress Forest

Seed production in Cypress Pine is suppressed and virtually closes down in a highly stocked stand. Regeneration can however be prolific in a stand such as this with low stocking and is usually aligned with a good seed crop which can occur every three -five years. Seed fall occurs in late spring / early summer (October – January). Much of the seed falls within 1 to 2 tree heights, however, seed has been recorded up to 400m from the seed source. Seed dispersal is generally dependant on tree height, wind speed and topography.

Successful seed germination is greatly enhanced by bare soil, but germination will also occur in leaf litter where the moisture retention is enhanced. Seedling survival is dependant on protection from fire and grazing. Sheep will heavily graze regeneration whereas cattle will generally leave it but will damage young seedlings. Grazing protection will be required until the trees are around 1.5 m high. Protection from fire is needed until the tree is at least 3 meters tall and then after only mild fires should be considered.

In relatively pure White cypress forest, the minimal leaf fall habit and the compact nature of the litter reduces fire hazard substantially however in mixed forests and more open country such as in this scenario, grass litter accumulation, particularly as aerial fuel, increases fire hazard substantially. As the regeneration develops, and the canopy closes over, the percentage of aerial fuel diminishes as does the fire risk.

4.3.4 Regeneration Management

The growth rate of heavily stocked regeneration will rapidly decline if left unmanaged. Once the average height of the regeneration has reached 1.5m it is time to thin the stand to provide an average spacing of 3-5 m between stems. This can be achieved in a number of ways. One of the advantages of Cypress at this stage of its

development is that the majority of regeneration will be identical in quality with little difference between one stem and the next and requires little selection consideration other than spacing.

In areas with a range of diameter sizes cutting to waste with a 65-cc heavy-duty Stem Brushcutter fitted with a tungsten tipped blade is the most efficient method for thinning. The stems do not need an application of herbicide as the cut stump of a cypress pine will not re-shoot.

In areas of thick regeneration with few large trees a grid pattern of stems can be removed using a heavy duty slasher or chopper roller behind a tractor with the remainder of the stems individually selected and reduced to 3 m spacing with the brush cutter.

Photo 10. Heavy duty slasher strip thinning cypress regeneration

4.3.5 Stage 2 Management

Generally cypress occurs with a mix of eucalypts scattered through the stand and as eucalypts grow at a faster rate than Cypress, the poor quality eucalypts will begin to adversely affect the developing thinned cypress. It is highly likely that this stand will need a follow-up thin (at around 20 years on) to remove this layer of the stand as it begins to impact on the growth rates of the cypress. This will also give an opportunity to remove any poorly performing or defective cypress and will be performed on the same criteria as the early thin.

As the forest grows to the point that the retained trees (spaced at 5 - 6m apart) have reached an average diameter greater than 25cm dbh a harvest operation will be required to maintain the forest health and productivity.
The harvest is based on the same principles of selecting trees to be retained rather then what volume can be removed. This ensures 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. The harvest should aim to remove around one third of the standing volume mainly in the upper diameter range. The product removed should meet the standards outlined in Appendix 1. White Cypress Cutting Guide.

The harvest will again trigger a regeneration response that will need to be managed and thinned according to the management regime outlined in 4.4.

4.4 Forest Condition 3 – An Optimally Managed Forest that will support a harvest but also requires the removal of unmerchantable stems to provide space for quality young stems to grow to product size.

4.4.1 Description

This stand has had some management in the past, removing faulty stems and retaining good quality trees at around 330 stems/ha in the 10cm+ class size. There are some larger trees present, eucalypts and cypress that are in decline or have no commercial value due to the level of fault. Approximately 40% of the stand has a diameter of 25cm or greater dbh. The stand is managed on a 25-30 year rotation where approximately one-third of the standing merchantable volume is removed. This is based on the average cypress taking up to 80 years to reach 30cm+ dbh.

Photo 10. Optimally Managed Cypress Forest Stand

4.4.2 Maintaining or improving the productivity of this type of forest

A forest stand with this level of 25cm+ dbh trees/ha is ready for harvesting. These trees have now reached optimum size for the number of trees per hectare and from this point on individual tree growth will decline if not thinned. The stand needs to be harvested ASAP with a subsequent post harvest treatment (thinning) to follow.

Table 3. Trees per ha by diameter class <u>before</u> harvest and treatment

Diameter Class (cm)	5-10cm	10-20cm	20-30cm	30cm+
Stems /ha	150	140	120	70

There are a number of management benefits to a harvest at this stage for a stand in this condition. Namely:

- To remove the trees that have reached their optimum size, considering declining rate of growth and risk of fault development such as doze from pest and fungi infestation (see appendix 1.)
- Reduce the tree stocking back to a level that will ensure maximum growth/productivity on the optimum number of trees (approximate levels shown in table 6. below)
- Provide an ideal opportunity for a stand treatment to remove any useless or non commercial stems and promote a regeneration response.

Table 4. Trees per ha by diameter class after harvesting and treatment

Diameter Class (cm)	5-10	10-20	20-30	30+
Stems /ha	100	140	20	5

The harvest process should be focused on what trees are to be retained in the stand rather than what quantity of product could be removed. This shifts the focus of the harvest onto maintaining or improving the forest's productivity. The selection criteria for the retained trees should have a strong emphasis on vigour, form and spacing with the primary goal to improve the quantity and quality of stems in the stand to ultimately achieve the highest number of stems into the highest product class in the next harvest.

Table 5. Selection Criteria for 'Retained Trees' in 'An Optimally Managed Forest' that will support a harvest but also requires the removal of un-merchantable stems to provide space for quality young stems to grow to product size

Trees suitable for retention should meet the following minimum criteria:

1. **A full healthy crown in a dominant or codominant position in the canopy**
2. **Average spacing between trees of 5-6m (stocking rate 265/ha)**
3. **Free from sever spiral grain (can be seen on the bark).**
4. **No scarring from past fires or mechanical damage.**
5. **Straight enough to yield at least one reasonably straight log 4 m in length**
6. **Solid stem free of obvious decay**
7. **Free of heavy limbs to yield a 4 m length section with not less than half the round of the log free of knots larger than 12 cm diameter and less than one metre apart**

All trees not marked for retention are then either harvested, or treated - injected with Glyphosate or Tordon® or cut to waste (as described in 4.2.2).

Table 6. Criteria for Tree Removal (Harvest or thinning) Includes:

- **Optimum product size**
- **Declining tree health, usually assessed by crown condition**
- **Developing defect such as dead limbs, fire scarring or suspected decay or grub attack from old wounds etc**

4.4.3 Post Harvest Management

On completion of the harvest major snig tracks and log dumps need to be protected from soil erosion with the installation of cross drainage at appropriate intervals on tracks and log dumps to distribute water flow from these areas onto undisturbed ground. (As per Table 7 in the Code of Practice stipulating the distance between cross drains according to the degree of slope)

High stocking rates or a stand at the maximum stocking capacity, suppresses seed production in Cypress and harvesting/thinning will trigger a seed production response in the residual stand. The thinned stand is now in a condition to allow this seed to germinate with a likely significant regeneration response. This regeneration must be protected from grazing and fires until large enough to survive a fuel reduction burn (minimum of 7 years), and managed as specified in 4.3.4 - Regeneration Management.

4.4.4 A Recommended Management Timeline for an 'Optimally Managed' Forest' Regime:

Stage I - Year 1 harvest approximately one third of the standing merchantable volume. The higher the proportion of the stand removed at a harvest increases the length of time between harvests significantly.

The aim is to retain the best 160 trees/Ha (10+ cm dbh trees), with a size class ratio as close as possible to that described in Table 3 above, as well as 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 - 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 I Post harvest treatment - 3 to 5 years after harvest, once subsequent regeneration (trees with dbh under 10cm) has grown enough to indicate form and growth habit, cut to waste unwanted regeneration and other non commercial trees to leave a total of up to 330 trees/Ha, ensuring each retained tree is growing into an adequate space in the canopy.

Stage II - 25 to 30 years after the last harvest, the forest should be ready for another harvest, again removing approximately one-third of the standing merchantable volume. The higher the proportion of the stand removed at a harvest significantly increases the length of time between harvests.

The aim is again to retain the best 160 trees/Ha (10+ cm dbh trees), with a size class ratio as close as possible to that described in Table 3 above, as well as 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 - 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 Post harvest treatment - 3 to 5 years after harvest, once subsequent regeneration (trees with dbh under 10cm) has grown enough to indicate form and growth habit, cut to waste unwanted regeneration and other non commercial trees to retain up to 330 trees/Ha, ensuring each retained tree is growing into an adequate space in the canopy.

Stage III Stage II - 50 to 60 years after the first harvest, the forest should be ready for another harvest, again removing approximately one third of the standing merchantable volume.

The aim is again to retain the best 160 trees/Ha (10+ cm dbh trees), with a size class ratio as close as possible to that described in Table 3 above, as well as 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 - 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 III Post harvest treatment - 3 to 5 years after harvest, once subsequent regeneration (trees with dbh under 10cm) has grown enough to indicate form and growth habit, cut to waste unwanted regeneration and other non commercial trees to retain up to 330 trees/Ha, ensuring each retained tree is growing into an adequate space in the canopy.

This effectively completes the growth cycle of the stand from seedling to harvest

5.0 Fire Management

White cypress is very sensitive to fire, particularly in the early regeneration stage, and great care and considerable experience is required to successfully use fire as a forest management tool. Uncontrolled or indiscriminate burning will result in loss of regeneration and damage or even death to quite large trees.

However fire can be a very useful and cost effective management tool if used carefully and with adequate infrastructure in place to ensure maximum control throughout the burn. Tracks and firebreaks that break up the forest into manageable areas are essential to protect the forest from wildfires and for the management of fuel

reduction burning. Burning should only be undertaken in May, June and July when conditions are very mild with temperatures in the low 20's, light winds (<10km/hr) and low relative humidity.

Firebreaks of 10 metres or more in width (up to 10m is 'exempt' clearing and allowed under the VMA) (wider than 10m needs clearing permit if in 'remnant' coloured areas), including a graded track can be made around the out side perimeter of an area together with sufficient internal firebreaks and access tracks to break up the area into management blocks of approximately 50 - 100 hectares. These firebreaks and roads should be strategically placed to provide the best protection possible considering block geography and predominant weather patterns. Firebreaks should be grassed with most trees removed and preferably incorporating a graded track to allow quick access for fire suppression and to allow a clean line for fire lighting or back burning.

The limited fuel reduction burning trials carried out by DPI Forestry suggest that, under appropriate weather conditions, cypress stands carrying even quite high levels of ground fuel can be successfully burnt, with little resultant mortality in the commercial component of the crop. This has been particularly successful with the use of aerial incendiary ignition, providing a tight pattern of ignition and reducing the development of long fronts on the fire. It is strongly recommended when considering a fuel reduction burn to use a similar spot ignition technique under controlled 'mild' conditions. Recommended grid spot ignition spacings are approximately 100 x 100m.

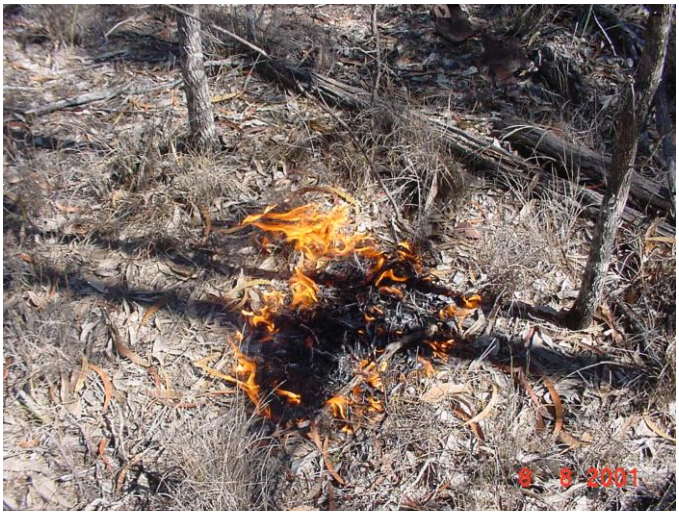

Photo 6. Spot ignition 1 minute after ignition

Photo 7. Spot ignition point 10 minutes after ignition

6.0 Complying with Legislation and Planning Laws

6.1 Queensland Vegetation Management Act (VMA) 1999 and Native Forest Practice Code. *(as at Oct 2013 these laws are under review by the Qld Govt)*

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.

6.1.1 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.

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

1. Q - Do I have to notify DERM 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 been obtained from DERM Offices and their web site:*

   http://www.nrm.qld.gov.au/vegetation/clearing/pdf/forest_field_guide.pdf

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.*

6.2 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'.

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Photos – Scott Swift and Damian Cotter

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 of this guide cannot be held responsible or accept any liability for the use of this information.

By: PFSQ 2006

Chemical treatment	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.
Centre diameter	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.
Codes of Practice	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.
Competition	The struggle between trees to obtain sunlight, nutrients, water and growing space.
Coppice	**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.
Cut, snig and haul	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.
Decline	Tree decline in health and vigour due to pathogen or climatic effects, old age, salt, soil compaction, etc.
Defect	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
Diameter at breast height over bark	(DbhOB) Measured at 1.3 m above ground on uphill side using a diameter tape, which converts circumference to diameter.
Diameter Tape	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.
Durability	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.
Epicormic Growth	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.
Even-aged stand	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.
Lignotuber	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.
Spacing	The distance trees are planted along rows and distance between rows or are growing naturally. Spacing directly relates to stocking rate.
S.P.H	Stems per hectare or stocking. The number of trees per hectare
Stand	A group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.
Stocking	The number of trees per hectare.
Suppression	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.

Thinning	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.
Thinning-harvesting	The use of thinning principals during a harvest operation i.e. Trees are selected for retention based upon form (straightness), vigour (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
Top disposal burning	After harvest burn that encourages regeneration, improves forest access and reduces fuel loads.

APPENDIX 1.

White Cypress Cutting Guide

The majority of Cypress harvesting on private land is now completed as a 'Weighted Scale Sale', that is the logs are not individually measured other than to a small end diameter and minimum log length. The load of logs is then weighed and the landholder stumpage and the cut and snig are calculated from a formula agreed to in the Harvest agreement. The basic guidelines for the cutter to present a log suitable for sale for a weighed sale and the more traditional fully measured sale are outlined below

A. LOG DIMENSIONS (Weight Scaled Sales)

1. The minimum log length is 2.4 m.

2. Logs are normally sold to a top diameter under bark of 14 cm. In the case of an oval cross section, the smaller diameter is used.

3. Logs are to be butted and topped in accordance with the Guidelines shown in sections D & E. Maximum utilisation is sought in all instances.

4. Useless sections may be butted out of logs on weight scaled sales, with these pieces being left in the bush.

B. LOG DIMENSIONS & MEASUREMENTS (Measured Sales)

1. The minimum log length is 2.4 m.

2. Logs are normally sold to a top end diameter under bark of 14 cm. In the case of an oval cross section, the smaller diameter is used.

3. The cutter records the log number, length and centre diameter on the butt end of the log and in his cutter book.

4. Log lengths are recorded in multiples of 0.3 m starting at 2.4 m, i.e. 2.4 m, 2.7 m, 3.0 m and so on. The recorded log length is 0.3m multiple below the <u>actual</u> length of the log, e.g. a log 7.4m long is recorded as 7.2 m.

5. The centre diameter is measured at half the recorded log length from the butt of the log. This point is usually marked by an axe cut or chalk mark. The centre diameter is best measured with a steel diameter tape.

6. When measuring centre diameter where a branch stub, lump or dog leg section occurs take two measurements the same distance above and below the centre point and record the average of the two measurements.

C. LENGTH OF BUTTS & TOPS

1. Butting and topping of logs is undertaken to reduce or eliminate defects.

2. <u>Normally</u> the first butt is less than 1 meter long.

3. If a defect which needs butting can be seen along the side of the log (eg. a dry side showing rot), the first butt is made at that point **with the aim to reduce the defect to about 50% of the circumference of the log.**

4. The length of further butts is determined by how much the defect was reduced by the last butt.

D. BUTTING & TOPPING DEFECTS

1. Yellow Doze or Heart Rot

(i) Yellow doze or heart rot at either end of the log may be reduced by butting if the area of the defect is greater than 25 sq cm. ie a bit bigger than the face of a match box (20 sq cm)

(ii) Logs with yellow doze or heart rot must be solid at one end. If the defect shows at both ends then the log is a dud. If he wants to, the cutter may continue to butt or top the log to try to produce a useful section.

2. Heart Rot with Fire Scar

Where heart rot occurs with a fire scar and more than half (50%) the butt (excluding butt swell) cannot be used, then the log may be butted.

3. Dry Heart or Dry Side

Where dry heart or dry side occurs and more than half the butt (excluding butt swell) cannot be used, then the log may be butted.

4. Grub Holes

If there is more than one grub hole for every 2 cm of butt diameter over bark then the log may be butted.

5. Windshake

(i) Windshake is defined as a check through the centre of the butt showing defective or discoloured wood at time of cut.

(ii) When the length of the windshake is more than half the butt diameter over bark then the log may be butted.

(iii) There are often discussion and arguments about windshake. It is important to remember that the windshake must have discoloured or defective wood in the crack. Windshake almost always opens up and extends after cutting, usually to show clean wood. Only the discoloured section of the windshake seen at cutting is used to decide if a log can be butted.

(iv) Windshake sometimes shows at both ends of a log. This means that there is rot at both ends of the log and so that log is a dud

6. Large Knots

(i) Large knots (over 12 cm in diameter) are defined as knots on the face of the log

(ii) Where large knots occur closer together than 1 m then that section may be topped.

7. Bends

Topping or butting, of sections with bends occurs if the section of the log with the bend cannot be milled into a piece of timber 2.4 m x 75 cm x 75 cm.

8. Spiral Grain

(i) When spiral grain measured on the wood at the centre of the log is greater than 1 in 6 then that log is a dud.

(ii) Spiral grain often increases with distance up the tree. Where it seems from the bark that this is happening, the cutter is expected to top the log so that a useful section may be obtained.

9. Combination of Defects

When a combination of defects prevents more than half of a section of a log being utilised then that section may be butted or, topped so as to make a useful log