Western Regional Assessment

STRATEGIC

INVENTORY MANUAL

1. INTRODUCTION

This manual has been written as a guide for the measurement of MARVL based inventory plots in the native forests of Western Region. It is intended to supplement, NOT replace face to face training. The manual describes the field procedures for primary bound plots.

State Forests is relying on you to provide information which is, as far as possible, accurate, precise and consistent. Do not take short cuts with any aspect of plot measurement, take enough time to do the best job that you can. Attention to detail is crucial because like all sampling systems, a small error at the plot or tree level becomes a large error at the inventory level.

While attempting to give an explanation of correct procedures for most aspects of MARVL plot measurement it cannot be expected to cover all possible situations encountered in the field. If having read the relevant part of this manual, you are still unsure about any aspect of plot measurement you should contact Peter Lezaich, Western Region Resources Forester (02) 6884 5288 or radio call sign 4103.

2. MARVL INVENTORY CHECKLIST

Map of area to be inventoried, with plot information

Hip Chain

Hip chain cotton (Keep a good Supply).

Compass

Clinometer

Vertex Hypsometer

30 or 50 metre tape

Spray paint - white (keep a good supply)

Diameter tape

Angle count gauge

Proformas (keep a good supply)

Booking board

Pencils and erasers

Spare folders for storing finished plot sheets

Set of field notes

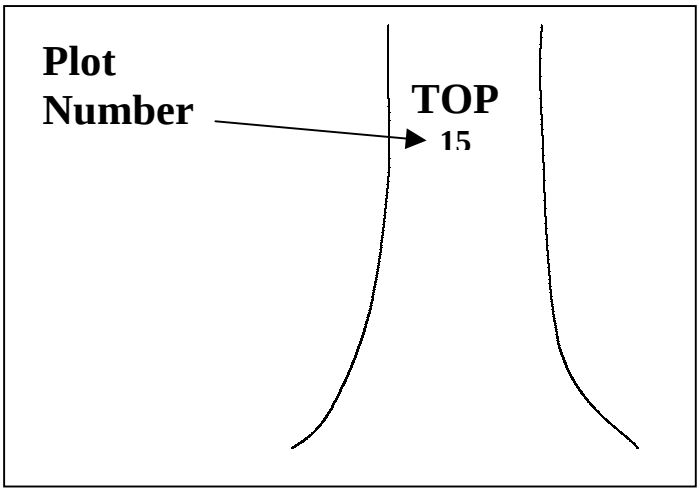
Calculator

3. LOCATING PLOT POINTS

In the office mark Take off Points (ToP's) for each plot point on the 1:50000 maps provided.

Mark the T.o.P. along with the plot number, on a tree or other easily visible spot. See figure 1. Below, which show a T.o.P. marked on a tree.

Figure 1: Marking the T.O.P. for plot 15.



From the plot location notes read off the bearing and distance to the plot you intend to measure. Check that you have all the necessary equipment before leaving the vehicle. Use the hip-chain and compass to locate the plot point.

If you are sure that there is a more efficient traverse which could be used to locate the plot point then that should be used and all details of how the plot was located (i.e. how to locate the T.o.P. and the magnetic bearing and slope distance from the T.o.P. to the plot point) must be recorded in the "comments" section of the proforma.

The plot should be established exactly where the hip-chain and compass bearing take you. If the plot point is in some way "different'" to the general area, feel free to make note of this in the comments section of the proforma.

THE PLOT SHOULD NOT BE MOVED FROM THIS SPOT UNLESS YOU ARE SURE YOU ARE IN THE WRONG PLACE. (Note: you can make an allowance of about 5% of the traverse distance for survey error during the course of locating the plot point.)

3.2. Marking the plot point

In situations where the plot falls on rock, or log, or any other immovable object you should mark the centre of the plot with a cross of paint on the log or rock. The plot number should be painted on the tree nearest the plot point. At the end of the measurement work the plot point should be repainted to allow audit crews to easily find the actual plot point.

4. SETTING OUT PLOTS

4.1. Plot size

The plots in the Cypress pine strategic inventory are circular bound plots. The size of the plot will be shown on the plot location information given to you by the Resources Officer. The plot point mark on the ground is the centre of the plot and the HORIZONTAL radius of the plot is 11.28 metres for a 0.04 hectare plot and 17.84 metres for a 0.1 hectare plot.

4.2. Plot slope

The slope of the plot is measured by standing at the plot point and measuring the slope of the ground in the steepest direction of the plot **and** the slope in the opposite direction. The two readings are **averaged** to get plot slope.

Remember, when taking slope readings with the clino you should "shoot" to something at the same height as your eye level, **not** to ground level.

4.3. Slope correction

In order to ensure that all plots occupy the correct area the slope of the ground needs to be taken into account. This is only critical for trees close to the plot boundary. The procedure for allowing for slope is done on an individual tree basis. In other words, each "close tree" (i.e. within 0.5 metres of the plot radius) must be checked for the slope and the slope distance from the plot point to the middle of the side of the tree at 1.3 metres above mineral earth.

For "close trees" the slope angle to the tree is measured by taking a clino reading from the plot point to the tree (at eye level). The next thing to be done is measure the slope distance from the plot point to the middle of the side of the tree at 1.3 metres. To do this, one person should hold the end of the 30 or 50 metres tape 1.3 metres directly above the plot point marked on the ground while another person holds the other end of the tape at the middle of the side of the tree at 1.3 metres. At all times the tape should be held tight, straight (no bending around trees, branches, etc) and parallel to the ground.

The slope angle and slope distance are looked up on the Slope Correction Table in Appendix 1. If the slope distance to the tree is less than, or equal to, the distance shown in the table then the tree is in, otherwise the tree is out. Trees which have been checked but are out should have a cross painted on the tree facing the plot point.

4.4. Marking the Plot Boundary

Having located (and marked) the plot point, the next thing to do is set out the plot boundary. This is best done using the Vertex to lay out a circle surrounding the plot point.

One person should hold the transponder 1.3 metres directly above the plot point while another person sweeps around the perimeter measuring the distance of all trees which appear close to the plot radius. The hypsometer should be held at the middle of the side of the tree at 1.3 metres when measuring distances. While most trees will be clearly in or out, any which are within 0.5 metres of the plot radius will need to be checked using the slope correction method described in section 4.2.

Please take care when measuring "close" trees because one tree in or out of a plot can make a difference of several hundred cubic metres**!!**

Which trees are in?

Once the boundary of the plot has been determined, **all** trees with a diameter at breast height (1.3 metres) greater than 100 millimetres are recorded. No trees which have a DBHOB less than 100 millimeter's area included.

All "in" trees should have the tree number and DBHOB mark painted on them. The tree number is painted on the side of the tree facing the plot point and the DBHOB mark is painted on the side of the tree where 1.3 metres was measured. For details on measuring and assessing the "in" trees, refer to Section 5 "Measuring Trees", on page 12 and Section 6 "Assessing Trees" on page 14.

4.5. Information to be recorded on the proforma

For each plot there is a list of information which needs to be gathered. This information can be split into two types: Plot based information and Tree based information. The following sections contain a description of what each bit of information (or attribute) means and how it is recorded.

4.5.1. Plot parameters

Plot based information is that which delivers information about the plot such as its location (region, forest centre, management area, state forest and compartment), type of plot (bound or angle count plot), stratum (stratum no., forest type, stand structure, regeneration density and regeneration height, terrain element, slope and aspect).

For example this information helps to determine if the stratification is correct and how it may be improved, if there is adequate regeneration present and what the stand condition is. Combined with the Permanent Growth Plots and Continuous Forest Inventory Plots the information collected will help to determine the future management of the forest and provide information on past management.

4.5.1.1. Date

In the "date" field of the Plot Header record the date you started measuring the plot. Record the date using dd/mm/yy format (eg: 02/09/99)

4.5.1.2. Plot Number

In the "Plot No." field of the Plot Header record the plot number shown on the plot location information page.

4.5.1.3. Crew

Record the initials of each person in the crew. Crew members will be rotated and it is important to know who is in each crew for auditing purposes.

4.5.1.4. Region

This is Western for all plot work during this inventory. This field will be completed automatically with the region code.

4.5.1.5. Forest Centre

In the "Forest Centre" field of the Plot Header insert the code for the Forest Centre from which day to day management occurs. This is provided in the plot location information page.

1 = Baradine
2 = Dubbo
3 = Forbes
4 = Inverell
5 = Narrandera

4.5.1.6. Management Area

In the “Management Area” field of the plot header insert the code for the Management Area which the plot falls within. This will be provided in the plot location information page,

1 = Attunga
2 = Bathurst
3 = Cobar
4 = Condobolin
5 = Dubbo
6 = Forbes
7 = Gilgandra
8 = Griffith
9 = Gunnedah
10 = Inverell
11 = Mudgee
12 = Narrandera
13 = Pilliga
14 = Walgett
15 = Warung

4.5.1.7. State Forest Name

In the “State Forest” field of the plot header record the name of the State Forest which contains the plot you are measuring. The State Forest name is provided in the plot location information page.

4.5.1.8. State Forest Number

In the “State Forest No.” field of the Plot Header record the number of the State Forest which contains the plot you are measuring. The State Forest number is provided in the plot location information page.

4.5.1.9. Compartment No.

In the “Compartment No.” field of the Plot Header record the number of the compartment number which contains the plot you are measuring. The State Forest number is provided in the plot location information page.

4.5.1.10. Plot Type

In the “Plot Type.” field of the Plot Header insert the code for the plot type which you are measuring. The plot type code is provided in the plot location information page.

4.5.1.11. BAF/Area

In the “Area” field of the Plot Header record the size of the bound plot. The Area is provided in the plot location information page. When recording plot size record the size of the plot, in hectares, with a leading zero for the decimal place. (eg: 0.04 for a 0.04 hectare plot and 0.1 for a 0.1 hectare plot).

4.5.1.12. Stratum Number

In the “Stratum No.” field of the Plot Header record the stratum number which the plot falls into. The stratum number is provided in the plot location information page.

4.5.1.13. AMG Zone

In the “AMG Zone” field of the Plot Header record the AMG zone which the plot falls into. This information will be obtained through the use of the GPS (Global Positioning System). Refer to the manual provided on use of the GPS.

4.5.1.14. AMG Easting

In the "AMG Easting" field of the Plot Header record the AMG Easting which the plot falls into. This information will be obtained through the use of the GPS (Global Positioning System). Refer to the manual provided on use of the GPS.

4.5.1.15. AMG Northing

In the "AMG Northing" field of the Plot Header record the AMG Northing which the plot falls into. This information will be obtained through the use of the GPS (Global Positioning System). Refer to the manual provided on use of the GPS.

4.5.1.16. Forest Type – Listed

In the "Forest Type-Listed" field of the Plot Header record the Forest type as listed in the plot location information page.

4.5.1.17. Forest Type – Observed

In the "Forest Type-Observed" field of the Plot Header record the Lindsay forest type which the plot falls into **ONLY** if the forest type is substantially different from that which is listed in the plot location information page. Refer to Appendix 2 For Lindsay typing codes and definitions.

4.5.1.18. Stand Structure

In the "Stand Structure" field of the Plot Header record the stand structure code which corresponds to the observed structure of the stand in which the plot falls. Stand structure codes are used to check the accuracy of the stratification and to provide information for future management.

Code		Description
1	=	Predominately thinned 1890's stand
2	=	Predominately thinned 1890's stand and inadequately thinned 1950's regeneration (i.e. < 6m spacing)
3	=	Predominately thinned 1890's stand and adequately thinned 1950's regeneration (i.e. >= 6m spacing)
4	=	Predominately thinned 1890's stand and unthinned 1950's regeneration
5	=	Predominately unthinned 1890's stand
6	=	Predominately unthinned 1890's stand and unthinned 1950's regeneration
7	=	Predominately adequately thinned 1950's stand (i.e. < 6m spacing)
8	=	Predominately adequately thinned 1950's stand (i.e. >= 6m spacing)
9	=	Predominately unthinned 1950's stand.
10	=	No commercial cypress within the stand.

NOTES:

(1) Unthinned 1890's stands are defined as those stands of untouched 1890's cypress pine which are overstocked.

(2) Thinned 1890's stands are defined as those stands of 1890's cypress pine which could be harvested i.e. they have been TSI'd or perhaps harvested once or twice in the past.

(3) The various thinned types of 1950's stand refer to the spacing of the regeneration, not necessarily to actual TSI work being carried out. Hence if an area has sparse 1950's regeneration that does not require TSI work it should be placed in types 2 or 3, or 7 or 8 depending on the presence / absence of 1890's regeneration.

(4) For types 7 and 8 which are essentially thinned regeneration, there may be retained 1890's seed and habitat trees present as a minor component within the stand.

4.5.1.19. Regeneration Density

In the “Regen Density ” field of the Plot Header record the regeneration density code which corresponds to the observed regeneration density of the stand in which the plot falls. Regeneration density codes are used to check the accuracy of the stratification and to provide information for future management.

Regeneration density assessment is made on stems < 10 cm dbhob only.

Code		Description
1	=	Sparse – insufficient regeneration for overstorey removal.
2	=	Medium – adequate regeneration – NCT required but not urgent.
3	=	Dense – regeneration requires NCT as a high priority.

4.5.1.20 Regeneration Height

In the “Regen Height ” field of the Plot Header record the predominant regeneration height code which corresponds to the observed height of the observed predominant regeneration component of the stand, in which the plot falls.

Regeneration height assessment is made on stems < 10 cm dbhob only.

Code		Description
1	=	<= 2 metres in height.
2	=	> 2metres but < 5 metres in height.
3	=	>= 5 metres in height.

4.5.1.21. Terrain element

In the “Terrain Element” field of the plot Header record the terrain element code which corresponds to the terrain element into which the plot falls.

Code		Description
1	=	Creek or river bed
2	=	Alluvial plain
3	=	Sand ridge
4	=	Lower slope
5	=	Mid slope
6	=	Upper slope
7	=	Ridge top
8	=	Plateau
9	=	Cliffs
10	=	Other

4.5.1.22 Slope

In the “Slope” field of the Plot Header record the slope of the plot you are measuring. For details on h0w to measure plot slope refer to section 4.2 on page 6.

4.5.1.23. Aspect

In the "Aspect" field of the Plot Header record the magnetic bearing of the direction of maximum slope as a 1-digit code.

Code		Description
1	=	$0^o – 45^o$
2	=	$45^o – 90^o$
3	=	$90^o – 135^o$
4	=	$135^o – 180^o$
5	=	$180^o – 225^o$
6	=	$225^o – 270^o$
7	=	$270^o – 315^o$
8	=	$315^o – 360^o$
9	=	Flat – no appreciable aspect

4.5.2. Tree Parameters

Tree parameters are those which deliver information about the individual trees in the plot. It is from this information that individual tree volumes, product volumes, and stratum and total volumes are calculated. Other important information such as the number of stems per hectare, availability, habitat potential, and tree quality parameters are also derived from this information.

4.5.2.1. Tree Number

In the "Tree No." column record the tree number (starting from 1) for each tree in the plot you are measuring. Because some trees will take up more than one line of the proforma it is easier to record the tree number as the trees are being measured and assessed, rather then listing all the tree numbers one after the other at the start of tree measuring.

4.5.2.2. Species

In the "Species" column record the standard three letter code for the species of tree you are measuring. A list of standard species codes form Appendix 3.

Note that the MARVL computer system, which is used to process the information, can only recognise the standard codes shown in Appendix 3, so if you can't find a code which could apply to the tree you are measuring (note: there are several "general" codes for such occasions) and you "invent" a new code you must tell your Field Supervisor.

4.5.2.3. DBHOB

In the "DBHOB" column record the diameter of the tree you are measuring in millimetre's. The MARVL computer system requires that all diameter measurements are made in millimetre's. For more information on measuring diameters refer to Section 5 on page 12.

4.5.2.4. Stem quality codes

In the "MARVL Tree Description" column record the description of the tree you are measuring. For more information on MARVL tree descriptions refer to Section 6.1 on pages 14-18.

4.5.2.5. Availability

In the "Availability" column record the availability code for the tree which you are measuring. For more information on recording availability refer to Section 6.2 on page 18.

4.5.2.6.Crown condition

In the column “Crown Condition” record the crown condition for the tree you are measuring. For more information on recording Crown Condition refer to Section 6.3 on page 18.

4.5.2.7. Dominance

In the column “Dominance” record the dominance of the tree you are measuring. For more information on recording Dominance refer to Section 6.4 on page 19.

4.5.2.8. Harvesting Status

This is an assessment by the inventory officer as to whether the particular tree should be retained or removed at the next harvesting operation. For more information on Harvesting Status refer to Section 6.5 on pages 19-21.

4.5.2.8. Hollow Status

All trees are to be assessed for hollows. Hollow status is based upon the model used in the FRAMES inventory. For more information on Hollow Status refer to Section 6.6 on page 21.

5. Measuring Trees

5.1. Diameter (DBHOB)

5.1.1. Measuring Point

Tree diameter obviously changes as you move along the stem of a tree. In general the tree will get thinner as you move towards the tip but there are also changes in diameter caused by limb swellings, damaged points, etc. So for any one tree there are countless diameters you could measure (if you were keen).

What we need is a consistent diameter measurement point so if two different people measure the same tree we should get the same answer. That consistent measuring point is called DBHOB. DBHOB stands for **D**iameter at **B**reast **H**eight **O**ver **B**ark.

There is a set of rules which define DBHOB and how to measure it. These are as follows:

1. Breast height is at 1.3 metres above ground level along the stem.
   Where the tree is on a slope, 1.3 metres is measured on the uphill side of the tree.
   Where the tree is on a lean, 1.3 metres is measured on the underside of the lean.

2. Trees which fork above 1.3 metres are considered to be one tree, but if the two leaders separate at 1.3 metres each leader is treated as a separate tree.

3. Where a swelling occurs at 1.3 metres, two points, unaffected by the swellings or limbs, equal distances above and below 1.3 metres should be selected so two unaffected measurements are then averaged to give an estimate of DBHOB.

4. In situations where a tree forks right at 1.3 metres and the 1.3 metre point is swollen as a result of the fork, the tree should be treated as two separate trees with the diameters measured at the lowest point where the new leaders have assumed a normal shape.

5. The DBHOB point is always located by measurement with the DBH stick.

The measurer should paint the point(s) on the tree where the diameter measurement(s) have been made.

5.1.2. Tape and Placement

The tape should always be placed around the tree perpendicular (that is, at right angles) to the axis of the stem at 1.3 metres. If there is lichen or loose bark at 1.3 metres they should be gently cleared so as not to remove any firm bark from the tree.

On larger trees care should be taken to ensure the tape does not "get the droops" around the back of the tree. The tape should always go directly around the stem at the point of measurement.

5.1.3. Taking Readings

All diameter measurements should be measured, called and booked in millimetre's. Where a part millimetre occurs always round down.

5.1.4. Multiple Leaders

Trees which fork above 1.3 metres are considered a single tree. Trees which have physically separated below 1.3 metres are considered to be two (or possibly more) different trees.

In all instances where a tree which forks at, or near, 1.3 metres gets recorded as two or more trees the section of the tree below the fork should be described as waste.

5.2. Height

Defined as the vertical distance from the base of the tree to its uppermost point (tip). The top of the tree must be identified carefully. For Cypress pine and Bull Oak defining the highest point of the crown is relatively simple. When heighting Eucalypts the line of sight should be through the crown of the tree to an estimated tree top. Sighting to the outside of the crown will result in a substantial overestimate of tree height.

Tree height is measured using the Vertex Hypsometer and Transponder units. Vertex Hypsometer user notes are available in Appendix 9.

1. The transponder unit is switched on by turning out the fastening pins. The transponder must be positioned at breast height (1.3m above the ground) at the middle of the side of the tree.

2. The transponder should point to the location of the hypsometer, which should be located at least as far away from the tree as the tree is high and where you can see both the transponder and the top of the tree. i.e. the line of sight must be 45^{o} or less.

3. Turn the Vertex on and check that the TRP height and the Pivot offset are set at 1.3m and 0.3m respectively.

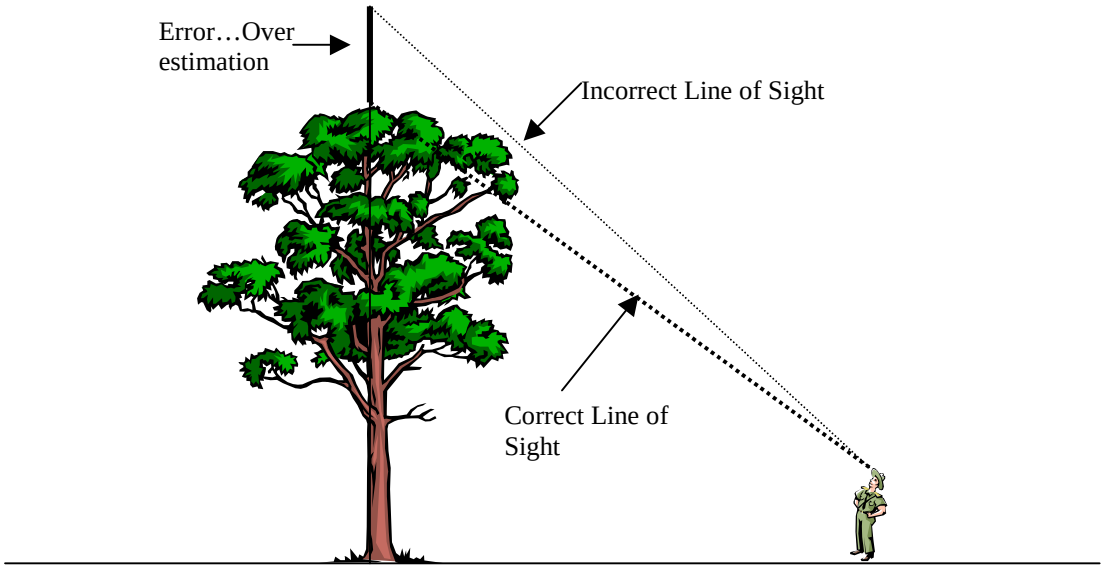
4. Focus through the sight and aim at the transponder. The red point should be visible. Press and hold the red/orange button and keep it pressed until the red point disappears, then release the red/orange button.

On the top line of the display you can now read off the distance and horizontal distance to the tree. Once the Vertex has measured the distance, the operator should check the “dist” and “angle” values to make sure that the values are reasonable.

5. The red light will now be flashing. Aim at the top of the tree and press and hold the red/orange button. Keep it pressed until the red point disappears. You can now read off the height of the tree in the lower left display. If you are unsure of the height given you should turn the Vertex off and back on again, then “re-shoot” to the transponder.

Note:
It is important to move away from the tree a distance at least equal to the height of the tree, as the top of the tree is more readily visible. This facilitates the determination of the point within the crown which is in line with the stem and provides the point of reference when taking the tree height measurement.

The main thing to keep in mind when heighting Eucalypts is the shape of the tree crown. Figure 2 on page illustrates what can go wrong when a height reading is taken to the front of the tree crown instead of to the top of the crown.



6. ASSESSING TREES

This part of the manual has six main sections. Section 6.1 covers the MARVL tree descriptions (Stem Quality Codes and Stem Structural Codes) and sections 6.2 to 6.6 cover Availability, Crown Cover, dominance, Harvesting Status and Hollow Status.

6.1. MARVL Tree Description

6.1.1. Stem quality codes

All trees in these plots are assessed for wood quality characteristics – not products. The assessor should not attempt to break up the tree into “logs” according to current specifications. In general each

tree should be viewed overall and then assessed for wood quality on a "sectional" basis. The series of alphabetic stem quality codes (along with the stem structural codes) are called a Dictionary.

The Marvl Dictionary which is used in this inventory is as follows:

Code		**Description**
A	=	High quality
B	=	Low quality
P	=	Pulp/Fuelwood Quality
W	=	Waste

Flow diagrams for determining wood characteristics for native hardwoods and native softwoods are available in Appendix 4.

An important point to note is that **stem size** makes no difference to **wood quality**. A section of stem which is only 20 centimetre's in diameter but is straight and seemingly defect free should be described as being high quality (coded as "A").

Each tree's description will start with a section of waste (coded as "W") which represents both the stump height of the tree and any additional "butting" of the first log which may be necessary. If the whole tree is entirely unmerchantable then the waste section should continue up to the top height of the tree.

For trees of any species listed in Appendix 5 as being non-commercial, the whole tree is described as waste. Similarly, trees of any species listed in Appendix 6 as being suitable for pulp/fuelwood only, the whole tree is described as pulp/fuelwood (coded as "P"). The lists shown in Appendices 5 and 6 are to be adhered to regardless of current local conditions or the nature of any individual tree being assessed.

For trees of commercial species (i.e. not listed in either Appendix 5 or 6) which contain some potentially merchantable material (including fuelwood) then the merchantable sections should be measured for length with the Vertex and given the appropriate quality code ("A", "B", "P" or "W"). This process continues right the way up the stem from the stump to the top of the tree.

If sections of waste occur between the merchantable sections then they should be included in the tree description in the same way as for merchantable sections.

All of the wood quality codes can be used more than once in any tree, and there is no reason why you cannot revert t a higher quality code once a section of low quality or waste has been described.

All tree descriptions must be booked in a cumulative way. By this we mean that if a tree has a two metre waste ("W") section at the stump, then five metres of high quality ("A") material, then five metres of low quality material ("B") up to the crown base and then eight metres of waste ("W") up to a top height of twenty metres, the tree description should look like this.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
1	WCP	250	W2 A5 B5 W8	1	2	2	1	1

Trees of non-commercial species (NCO) should be given a tree description of waste ("W") for the whole of the tree as in the example below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
2	NCO	148	W	1	3	4	1	1

If a section of a tree borders between two codes always describe the section as being the poorer of the two choices.

Viewing each tree from several angles definitely helps the assessor to pick up all the key features of the tree. Except in the case of very simple trees, all trees should be assessed from more than one perspective.

6.1.2. Stem structural codes

MARVL has a series of "built in " stem structural codes which are available in every type of inventory State Forests undertakes. These codes are used to describe changes in the shape or structure of the stem rather than changes in the quality of the stem (although sometimes both shape/structure and quality are changed by a single feature of a stem, such as a fork).

Each of the stem structural codes has it's own symbol (and associated information) which must be included in the tree description in a very specific way in order for MARVL to correctly interpret the code. An example of each code follows.

6.1.2.1. Dead (or broken) top (*)

This code is used to represent a tree which does not have a normal crown or stem, and is usually applied to trees which have been quite seriously damaged by harvesting or wind.

The code is inserted at the end of the tree description and must follow a feature height. The DEAD TOP code tells MARVL that the top of the tree is not "normal" (so MARVL will not use the diameter and height of this tree to contribute to the formation of a diameter/height curve) and that any material above that point on the stem is dead and therefore not merchantable.

An example of the DEAD TOP structural code is shown below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
3	NIB	458	W 0.4 B15 W21 *	1	3	2	3	3

6.1.2.2. Fork (<)

This code is used to represent a tree which has a fork in the stem, and is applied when each of the leaders contains some merchantable material. The FORK code basically tells MARVL that the original tree has "ended" and that "new" trees now occur above the fork.

The double heart section of the fork is never utilised. Because of this, that section of the tree is always described as waste ("W"). The most common situation is to describe one metre of waste at the top of the main stem of the tree (as in the example). If, however, a tree has a very acute fork, or the tree is very large, then the section of waste may be longer then one metre.

Because the FORK code represents a new leader (which MARVL treats just like a new tree) we need to provide a diameter for the leader. This is done by estimating the diameter of the leader 1.3 metres above the crutch of the fork (to help you with the diameter estimate it is useful to look around for a tree of similar size and measure that tree to put your estimate "in the ball park"). The diameter estimate is then followed by the description of the leader, which is done in the same manner as for a

tree right through to the tip of the leader. The process is repeated for the other leader(s), and this information is inserted directly beneath the first leader.

An example of the FORK structural code is shown below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
4	WCP	320	W1 A8 W9 <210 B18 W21	1	2	2	1	1
			<180 B14 W19					

Note that only one "availability", "crown condition" and "dominance class" etc is given for the tree. These codes should take all leaders into consideration when classifying forked trees.

6.1.2.3. Diameter reduction (>)

This code is used to represent a tree which has a clearly identifiable point where the diameter of the stem reduces at a rate much faster then normal tree taper. The DIAMETER REDUCTION code is similar to the FORK code in that MARVL requires a new diameter estimate to be attached to the code.

Use of the DIAMETER REDUCTION code is relatively rare and is applied in situations such as a sucker growing off an old stump, or where the bottom section of a tree is swollen as a result of insect damage. This code should **not** be applied to the buttressing which occurs normally in trees, especially species such as brush Box or Turpentine.

An example of the DIAMETER REDUCTION code is shown below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
5	NIB	462	W2 > 185 B6 W16	1	2	2	1	1

6.1.2.4. Forced cut (%)

This code is used in circumstances where the stem has a defect which could be removed from the tree in log servicing by a single saw cut but no waste section needs to be removed.

Virtually the only instances where this occurs is when a stem has a sharp change of direction over a distance of no more than 20 cm. In this case it is possible to have high quality wood right up to the change of direction, and more high quality wood immediately above the change of direction but because of the change of direction it would not be possible to have a single high quality log running through that point.

Note that a FORCED CUT should **not** be inserted simply because of a change of stem *quality*.

An example of the FORCED CUT code is shown below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
6	NIB	389	W0.3 A5 % A12 W18	1	2	2	1	2

6.1.2.5. Merchantable branch (+)

This code is used when a tree has one (or more) limbs of sufficient size and quality to contain merchantable material. The main difference between a MERCHANTABLE BRANCH and a FORK is that with a MERCHANTABLE BRANCH the main stem of the tree can be serviced as single log by

using a chamfer cut on the branch and not cross-cutting the stem, whereas a FORK requires cross-cutting to remove the double-heart section of stem.

Like FORKS, MERCHANTABLE BRANCHES require a new diameter (1.3 metres from the base of the branch) and then a description as though they were a normal tree. The (+) symbol is used to star the second line of tree description where the diameter and quality information is placed.

An example of the MERCHANTABLE BRANCH code is shown below.

1	2	3	4	5	6	7	8	9
Tree No.	Species	DBHOB	MARVL Tree Description	Availability	Crown	Dominance	Harvest Status	Hollow Status
6	FIB	467	W0.5 B14 W22	3	2	2	2	3
			+ 220 P5 W9					

6.2. Availability

Not every tree which is found within a plot will be available for harvesting. Tree availability codes are used to develop a broad picture of the reasons which may exclude a tree from a harvesting operation eg: NPWS prescriptions which exclude ironbarks with a dbhob greater then 55 cm from harvesting. Physical impediments may be rocky patches or something which presents a barrier which would prevent you from being able to get to a tree.

Code **Description**

1 = Available
The tree is available for harvesting.

2 = Physical / Safety
The tree is unavailable due to safety reasons.
Trees in this category may be dangerous to fall and may be unavailable due to the safety concerns of the operator or they may be positioned in an inaccessible location and so be physically unavailable.

3 = NPWS
The tree is unavailable due to NPWS prescriptions.
Refer to Appendix 7 for a summary of NPWS prescriptions.

4 = EPA
The tree is unavailable due to EPA requirements. In this instance this refers to either the SEMGL (Soil erosion mitigation guidelines) or the Inland SEMG (Inland soil and water guidelines).
Refer to Appendix 8. For a summary of EPA prescriptions.

6.3. Crown condition

Crown form is a score, not a measurement, of the shape of the crown of the tree. The crown is scored in whole classes. There is no measurement precision.

Each tree in the plot is assessed for its Crown Condition. The definitions of the Crown Condition classes are the same as for State Forest's PGP system.

Code **Description**

1 = Good - leafy vigorous crown, may have slight faults, lopsidedness

etc.

2 = Fair - average for shape and vigour, some dead branches and mistletoe. Silviculturally satisfactory.

3 = Poor - Deformed or unbalanced crown without vigour, contains dead branches and mistletoe may be common eg: senescent, diseased or damaged.

6.4. Dominance

Each tree in the plot shall be assessed. The definitions of the Dominance Classes are the same as for State Forests' PGP (Permanent Growth Plot) system.

Crown Dominance is a scoring or ranking of the size and height of the crown of the tree in relation to the trees around it. Crown dominance is a score, not a measurement. The crown is scored in whole classes. There is no measurement precision.

Code		Description
1	=	Dominant trees with crowns extending above the general level of the crown cover, full light from above and much from the sides.
2	=	Co-dominant Crown forms part of the general level of crown cover, full light from above, some from the sides.
3	=	Sub-dominant Tree shorter then dominant and co-dominant trees, but with the crown extending into their crown cover, little direct light from above, little or no light from the side.
4	=	Suppressed Crown entirely below the general level of crown cover with no direct light from above or the side.
5	=	No crown closure For trees in regrowth stands where crown closure is yet to occur. Trees are neither dominant nor suppressed.

6.5. Harvesting Status

The "Golden Rule" of logging simply states that no stand should be left in a less vigorous condition after harvesting to that which existed prior to harvesting.

For the purpose of this inventory only commercial harvesting operations shall be taken into account.

6.5.1. Thinning

Optimally commercially thinning the developing overstorey to redistribute growth effectively from the most inefficient growers to the efficient growers and so increase stand value. This redistribution will take place across all size classes on trees which are capable of providing product and are in excess of the desired retained basal area, so as to effect a vertical thinning operation.

1. Predominantly Native hardwood (Ironbark >= 67% BA)	6 m^2/ha
Residual Cypress component	2 m^2/ha

2. Predominantly Native softwood (Cypress Pine >= 67% BA) 6 m^2/ha
Residual Ironbark component 2 m^2/ha

3. Mixed species stands

- Cypress - Ironbark 8 m^2/ha
(White cypress pine 4 m^2/ha; Ironbark 4 m^2/ha)

- Ironbark - Other spp 6 m^2/ha

- Cypress - Other spp 6 m^2/ha

In mixed stands a residual stocking or 4m^2/ha for each major species group must be retained.

After a sequence of thinnings, the forest may reach a stage where stand end point is reached and restart/release is required.

6.5.2. Release harvest.

1. Native softwood - When regeneration is adequately established and the stand has reached end point size the end point overstorey trees are removed to allow the next crop to be efficiently established and treated.

- Release occurs when overstorey trees attain a dbhob of 25 - 35cm.

- Where a release harvest occurs 6 healthy trees, which are representative of the pre harvest overstorey, are to be retained per hectare.

2. Mixed species forests - in mixed species forests the native softwood component will be treated in the same manner as in predominantly native softwood forests.

6.5.3. Regeneration/Restart Harvest.

1. Native hardwood - Regeneration/Restart harvests will be appropriate in stands where:

- the end point has been reached after a sequence of thinnings and the stand contains no **suitable** regrowth.

- They are past optimal commercial value, or cannot be improved with further thinning.

- The regrowth or regeneration is in poor condition.

- The Australian Group Selection is utilised for regeneration harvests with canopy openings not exceeding an average of 40m diameter between tree crowns; individual canopy openings are not to exceed 50m diameter.

- The overall objective of the silvicultural technique is to establish canopy openings up to the rate of about 5 - 6 per 5 hectares (up to 22.5% of the net harvest area)

2. Mixed Species Forests - in mixed species forests the native hardwood component will be treated in the same manner as predominantly native hardwood forests.

Table 1: Summary of silvicultural intent for White Cypress Pine, Ironbark a and Mixed Species Stands

	NCT Spacing (m)		**Thin m^2/ha ba**	**End Point**
IBK >= 67% BA	n/a	Vertical cut to prevent high	IBK-6 CYP-2	Restart <=50m opening <=22.5% nha
WCP >= 67% BA	6 x 6		WCP-6 IBK-2	Release Adequate advance growth Overstorey 25-35cm dbhob
Mixed Species WCP - IBK IBK - Other WCP - Other	 6 x 6 n/a 6 x 6		 WCP-4; IBK-4 IBK-6 WCP-6	 IBK - Restart WCP - Release

This classification is heavily dependent upon the level of forest marketing skills which exist within the inventory crew and that the silvicultural intent is known.

6.6. Hollow Status

Each tree in the plot must be assessed for its hollow status. The codes are as follows:

Code		**Description**
1	=	Unlikely to have hollows - Trees which are unlikely to have hollows will in general fall into dominance classes 1 to 3 and crown quality class 1. As such they will display vigour, have obviously expanding crowns and have few if any dead branches.
2	=	Likely to have hollow - Trees in this category are likely to fall into dominance classes 1-3, and crown quality classes 2-3. Tree crown may display some vigour and may not be well formed or balanced. Trees will have a mainly primary crown though some dead branches or branchlets may be present.
3	=	Hollows visible - Trees in this category are likely to fall into dominance classes 1-3 and crown quality class 3. Trees crowns are likely to be deformed, unbalanced, of low density and without vigour. The crown will be primarily of secondary growth with dead branches common. Trees may be senescent, diseased or heavily damaged.

Appendix 1 Slope Correction Table

Average Slope	Plot Size 0.04 ha	0.1 ha
0	12.62	17.84
1	12.62	17.84
2	12.63	17.85
3	12.64	17.86
4	12.65	17.88
5	12.67	17.91
6	12.69	17.94
7	12.71	17.97
8	12.74	18.02
9	12.78	18.06
10	12.81	18.12
11	12.86	18.17
12	12.9	18.24
13	12.95	18.31
14	13.01	18.39
15	13.07	18.47
16	13.13	18.56
17	13.2	18.66
18	13.27	18.76
19	13.35	18.87
20	13.43	18.98
21	13.52	19.11
22	13.61	19.24
23	13.71	19.38
24	13.81	19.53
25	13.92	19.68
26	14.04	19.85
27	14.16	20.02
28	14.29	20.21
29	14.43	20.4
30	14.57	20.6
31	14.72	20.81
32	14.88	21.04
33	15.05	21.27
34	15.22	21.52
35	15.41	21.78
36	15.6	22.05
37	15.8	22.34
38	16.02	22.64
39	16.24	22.96
40	16.47	22.39
41	16.72	22.64
42	16.98	24.01
43	17.26	24.39
44	17.54	24.8
45	17.85	25.23

Appendix 2: Lindsay Forest Types

Type Code	Lindsay Type Description	Area (ha)
AB	Roughbarked Apple-Red Gum	17
B	Red Gum	1606
BA	Red Gum-Roughbarked Apple	8255
BABp	Red Gum-Roughbarked Apple-Black Pine	227
BAC	Red Gum-Roughbarked Apple-Narrow leaved Ironbark	173
BADp	Red Gum-Roughbarked Apple-Desert Pine	36
BAL	Red Gum-Roughbarked Apple-Smoothbarked Apple	136
BAP	Red Gum-Roughbarked Apple-Pine	12132
BBp	Red Gum-Black Pine	389
BC	Red Gum-Narrow leaved Ironbark	1345
BCA	Red Gum-Narrow leaved Ironbark-Roughbarked Apple	202
BCBp	Red Gum-Narrow leaved Ironbark-Black Pine	267
BCP	Red Gum-Narrow leaved Ironbark-Pine	6835
BCT	Red Gum Narrow leaved Ironbark-Bloodwood	206
Be	Belah	620
BN	Red gum-Broad leaved Ironbark	3520
BNBp	Red Gum-Broad leaved Ironbark-Black Pine	1991
BNP	Red Gum-Broad leaved Ironbark-Pine	2751
BNT	Red Gum-Broad leaved Ironbark-Bloodwood	873
BNTBp	Red Gum-Broad leaved Ironbark-Bloodwood-Black Pine	55
BOP	Red Gum-Forest Oak-Pine	534
BOTBp	Red Gum-Forest Oak-Bloodwood-Black Pine	37
BP	Red Gum-Pine	1525
BpB	Black Pine-Red Gum	36
BpBA	Black Pine-Red Gum-Roughbarked Apple	120
BPg	Red Gum-Pilliga Box	36
BpN	Black Pine-Broad leaved Ironbark	108
BpNT	Black Pine-Broad leaved Ironbark-Bloodwood	29
BprS	Black Pine-Mugga Ironbark	20
BpTN	Black Pine-Bloodwood-Broadleaved Ironbark	40
Br	Broom	14884
Brig	Brigalow	29
Br-KUR	Broom	510
BrNT	Broom-Broadleaved Ironbark-Bloodwood	294
BROOM+T	Broom Bush	66
BROOM-HE	Broom Bush	97
BROOM-JU	Broom Bush	925
BSA	Red Gum-Mugga Ironbark-Roughbarked Apple	36
BT	Red Gum-Bloodwood	64
BTBp	Red Gum-Bloodwood-Black Pine	567
BTCP	Red Gum-Bloodwood-Narrow leaved Ironbark-Pine	10
BTP	Red Gum-Bloodwood-Pine	110
C	Narrow leaved Ironbark	3137
C&C	Narrow leaved Ironbark	41
CB	Narrow leaved Ironbark-Red Gum	481
CBA	Narrow Leaved Ironbark-Red Gum-Roughbarked Apple	58

CBP	Narrow leaved Ironbark-Red Gum-Pine	93
CLEARED	Cleared Land	202
CO	Narrow leaved Ironbark-Forest Oak	727
COP	Narrow leaved Ironbark-Forest Oak-Pine	76157
COP(Sd)	Narrow leaved Ironbark-Forest Oak-Pine	144
CP	Narrow leaved Ironbark-Pine	2291
CPB	Narrow leaved Ironbark-Pine-Red Gum	21
CPT	Narrow leaved Ironbark-Pine-Bloodwood	1337
CPTB	Narrow leaved Ironbark-Pine-Bloodwood-Red Gum	59
CT	Narrow leaved Ironbark-Bloodwood	6150
CTB	Narrow leaved Ironbark-Bloodwood-Red Gum	184
CTBP	Narrow leaved Ironbark-Bloodwood-Red Gum-Pine	1107
CTP	Narrow leaved Ironbark-Bloodwood-Pine	2541
CTPB	Narrow leaved Ironbark-Bloodwood-Pine-Red Gum	23
DpBA	Desert Pine-Red Gum-Roughbarked Apple	143
H	White Box	50
HBP	White Box-Red Gum-Pine	42
HEATH-Br	Heath-Broom	174
HP	White Box-Pine	431
JUNGLE	Jungle	1297
KURRICAB	Mallee	34
Mall	Mallee	105
MALLEE-W	Mallee	19
Me	Silver leaved Ironbark	141
N	Broad leaved Ironbark	1773
NB	Broad leaved Ironbark-Red Gum	58
NBp	Broad leaved Ironbark-Black Pine	152
NOP	Broad leaved Ironbark-Forest Oak-Pine	19
NP	Broad leaved Ironbark-Pine	2280
NT	Broad leaved Ironbark-Bloodwood	31037
NTB	Broad leaved Ironbark-Bloodwood-Red Gum	40
NTBp	Broad leaved Ironbark-Bloodwood-Black Pine	8007
NTBr	Broad leaved Ironbark-Bloodwood-Broom	3952
NTP	Broad leaved Ironbark-Bloodwood-Pine	1202
Open	Cleared Land	134
OPEN BOX	Cleared Land	52
OUTSIDE	Not State Forest	904
PA	Pine-Roughbarked Apple	54
PAB	Pine-Roughbarked Apple-Red Gum	1820
PB	Pine-Red Gum	5286
PBA	Pine-Red Gum-Roughbarked Apple	7558
PBC	Pine-Red Gum-Narrow leaved Ironbark	486
PBO	Pine-Red Gum-Forest Oak	14
PC	Pine-Narrow leaved Ironbark	738
PCA	Pine-Narrow leaved Ironbark-Roughbarked Apple	7
PCB	Pine-Narrow leaved Ironbark-Red Gum	10494
PCH	Pine-Narrow leaved Ironbark-White Box	17
PCn	Pine-Fuzzy Box	189
	Pine-Narrow leaved Ironbark-Broad leaved Ironbark	32

PCO	Pine-Narrow leaved Ironbark-Forest Oak	76669
PCO(Sd)	Pine-Narrow leaved Ironbark-Forest Oak	20
PCPg	Pine-Narrow leaved Ironbark-Pilliga Box	77
PCT	Pine-Narrow leaved Ironbark-Bloodwood	2658
PCTB	Pine-Narrow leaved Ironbark-Bloodwood-Red Gum	469
Pf	Bimble Box	62
PfP	Bimble Box-Pine	5430
Pg	Pilliga Box	201
PgBP	Pilliga Box-Red Gum-Pine	51
PgP	Pilliga Box-Pine	17142
PgPf	Pilliga Box-Bimble Box	279
PH	Pine-White Box	652
PMe	Pine-Silver leaved Ironbark	2391
PN	Pine-Broad leaved Ironbark	34
POC	Pine-Forest Oak-Narrow leaved Ironbark	8
Pp	Pine	292
PPf	Pine-Bimble Box	13829
PPg	Pine-Pilliga Box	13763
PPgC	Pine-Pilliga Box-Narrow leaved Ironbark	37
PSB	Pine-Mugga Ironbark-Red Gum	143
PSdO	Pine-Mugga Ironbark-Forest Oak	146
PSdO(Pg)	Pine-Mugga Ironbark-Forest Oak	183
PSO	Pine-Mugga Ironbark-Forest Oak	713
PTB	Pine-Bloodwood-Red Gum	817
PTBC	Pine-Bloodwood-Red Gum-Narrow leaved Ironbark	52
PTC	Pine-Bloodwood-Narrow leaved Ironbark	35
PTCB	Pine Bloodwood-Narrow leaved Ironbark-Red Gum	387
SCRUB	Scrub	705
SdOP	Mugga Ironbark-Forest Oak-Pine	388
SdP	Mugga Ironbark-Pine	206
SOP+COP	Narrow leaved Ironbark-Forest Oak-Pine	394
SWAMP	Swamp	16
T	Bloodwood	74
TB	Bloodwood-Red Gum	1478
TBA	Bloodwood-Red Gum-Roughbarked Apple	22
TBBp	Bloodwood-Red Gum-Black Pine	539
TBC	Bloodwood-Red Gum-Narrow leaved Ironbark	848
TBCBp	Bloodwood-Red Gum-Narrow leaved Ironbark-Black Pine	22
TBCP	Bloodwood-Red Gum-Narrow leaved Ironbark-Pine	7078
TBP	Bloodwood-Black Pine	499
	Bloodwood-Red Gum-Pine	1125
TBr	Bloodwood-Broom	654
TBSP	Bloodwood-Red Gum-Mugga Ironbark-Pine	8
TCA	Bloodwood-Narrow leaved Ironbark-Roughbarked Apple	125
TCB	Bloodwood-Narrow leaved Ironbark-Red Gum	85
TCP	Bloodwood-Narrow leaved Ironbark-Pine	104
TN	Bloodwood-Broad leaved Ironbark	759
TNBp	Bloodwood-Broad leaved Ironbark-Black Pine	3688
TPB	Bloodwood-Pine-Red Gum	16

UNTYPED	Untyped	26897
WATTLE/T	Brigalow-Bloodwood	1031
Grand Total		418510

Appendix 3: Species codes

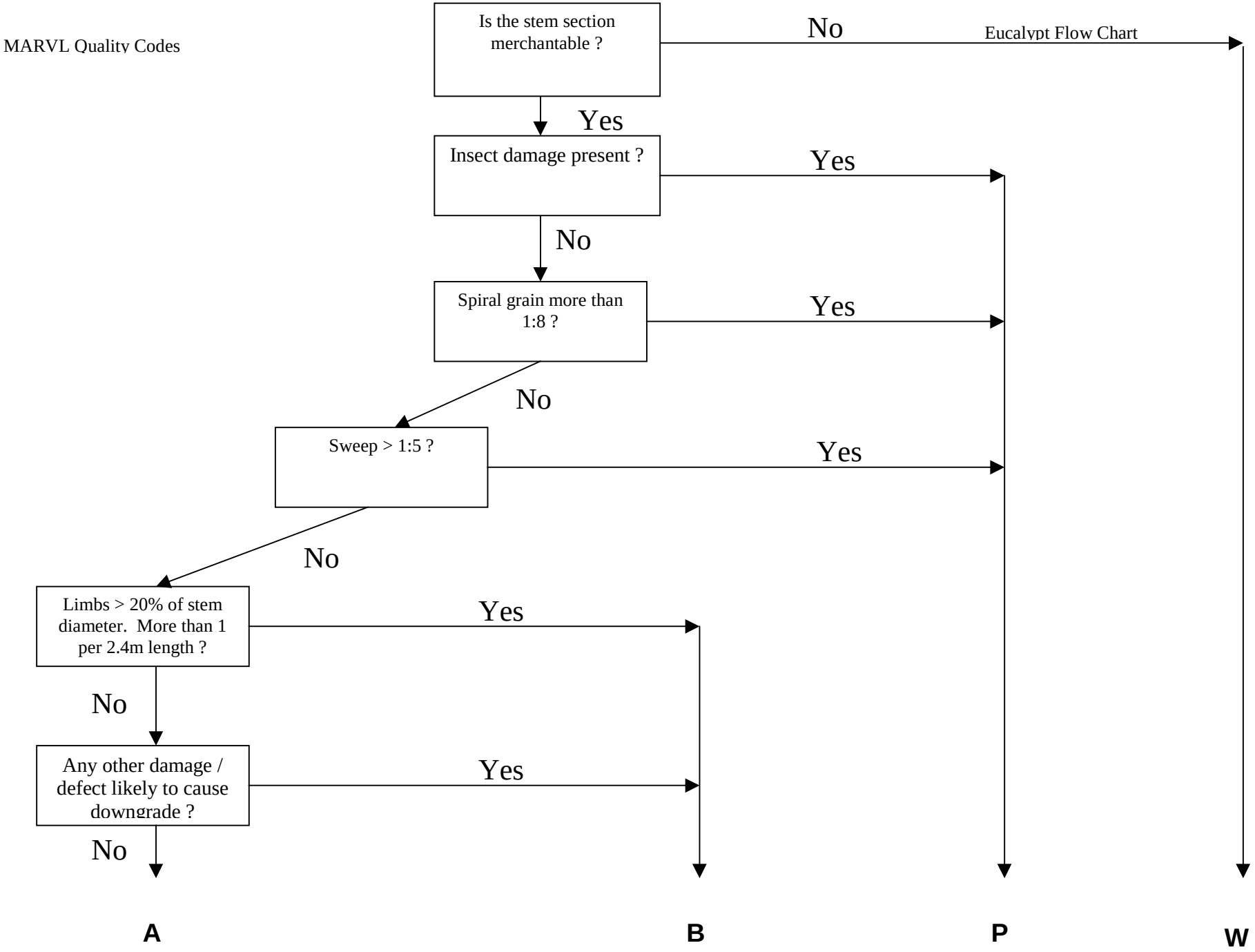
Common Name	Botanical Name	Species Code
Alpine Ash	Eucalyptus delegatensis	ALA
Apple Box	Eucalyptus bridgesiana	ABX
Appletopped Box	Eucalyptus angophoroides	TBX
Baileys Stringybark	Eucalyptus baileyana	LSB
Bangalay	Eucalyptus botryoides	BAN
Belah	Casuarina cristata	BLH
Berrigen	Eremophila longifolia	EMU
Big Badja Gum	Eucalyptus badjensis	BBG
Bimble Box	Eucalyptus populnea ssp. populnea	PBX
Black Ash	Eucalyptus sieberi	STA
Black Box	Eucalyptus largiflorens	BLX
Black Cypress pine	Callitris endlicheri	BCP
Black Gum	Eycalyptus aggregata	BKG
Black Sallee	Eucalyptus stellulata	BSA
Blackbutt	Eucalyptus pilularis	BBT
Blakelys red Gum	Eucalyptus blakelyi	BRG
Bloodwood group	Eucalyptus spp.	BLW
Bloodwood Stringybark	Eucalyptus baileyana	LSB
Blue Gum	Eucalyptus saligna	SBG
Blue mountain Ash	Eucalyptus oreades	BMA
Blueleaved Ironbark	Eucalyptus fibrosa ssp. nubila	BIB
Blueleaved Stringybark	Eucalyptus agglomerata	ASB
Brigalow	Acacia harpophylla	BRI
Brittle Gum	Eucalyptus mannifera ssp. maculosa	MMG
Broadleaved Ironbark	Eucalyptus fibrosa ssp. fibrosa	FIB
Broadleaved Peppermint	Eucalyptus dives	BPM
Broadleaved white Mahogany	Eucalyptus umbra ssp. carnea	BMY
Broombush	Melaleuca uncinata	BRO
Brown barrel	Eucalyptus fastigata	FAS
Brown Bloodwood	Eucalyptus trachyphloia	BBW
Brown Stringybark	Eucalyptus capitellata	BSB
Brush Box	Lophostemon confertus	BBX
Brushwood group	(Various)	BWD
Budda	Eremophila mitchellii	BUD
Bull Oak	Allocasuarina leuhmanii	BOK
Butterbush	Pittosporum phylliraeoides	BUT
Cabbage Gum	Eucalyptus amplifolia	CGG
Cabbage tree Palm	Livistona australis	CTP
Candlebark	Eucalyptus rubida	CBK
Carbeen	Eucalyptus tessellaris	CAR
Coast Ash	Eucalyptus sieberi	STA
Coast grey Box	Eucalyptus bosistoana	CBX
Coolibah	Eucalyptus microtheca	COO
Cuttail	Eucalyptus fastigata	FAS
Desert Cypress pine	Callitris preissii	DCP
Diehard Stringybark	Eucalyptus cameronii	DSB
Dwyers red Gum	Eucalyptus dwyeri	DRG
Emu bush	Eremophila longifolia	EMU

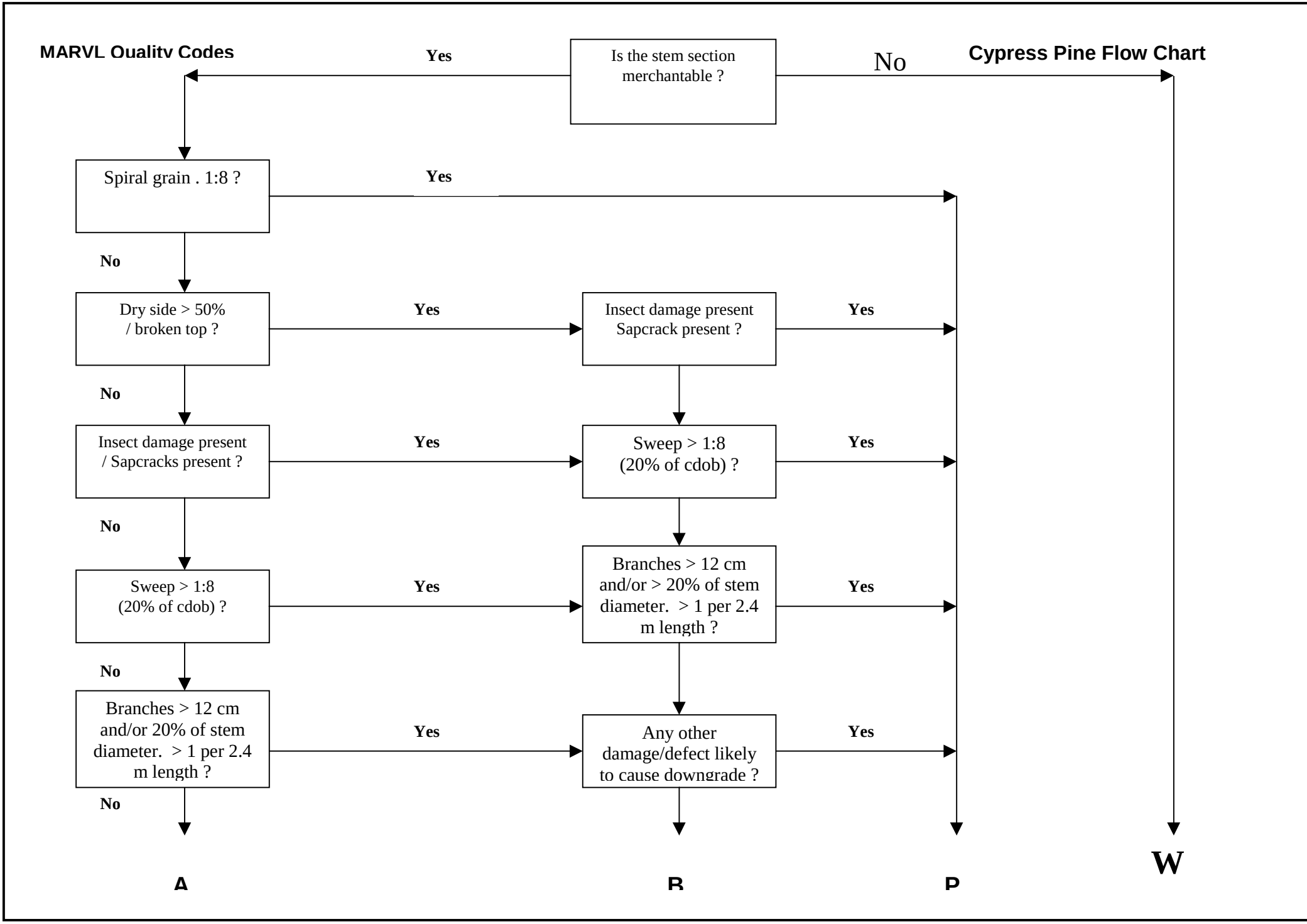
Eucalyptus spp.	Eucalyptus spp.	EUC
Eurabbie	Eucalyptus globulus ssp. bicostata	EUR
Eurah	Eremophila bignoniflora	ERB
Flooded Gum	Eucalyptus grandis	FLG
Forest Oak	Allocasuarina torulosa	FOK
Forest red Gum	Eucalyptus tereticornis	FRG
Fuzzy Box	Eucalyptus conica	FBX
Grey Box	Eucalyptus moluccana	GBX
Grey Box	Eucalyptus dawsonii	GBX
Grey Gum	Eucalyptus propinqua	GYG
Grey Gum	Eucalyptus punctata	GYG
Grey Ironbark	Eucalyptus siderophloia	GIB
Grey Ironbark	Eucalyptus paniculata	GIB
Gully Peppermint	Eucalyptus smithii	GPM
Gympie messmate	Eucalyptus cloeziana	GMM
Hoop Pine	Araucaria cunninghamii	HPP
Ironbark group	Eucalyptus spp.	IBK
Kurrajong	Brachychiton populneus	KUR
Largefruited Blackbutt	Eucalyptus pyrocarpa	PYR
Leopardwood	Flindersia maculosa	LEO
Maidens Gum	Eucalyptus globulus ssp. maidenii	MDG
Mallee Cypress pine	Callitris preissii	MCP
Mallee group	Eucalyptus spp.	MAL
Manna Gum	Eucalyptus viminalis	MAG
Messmate	Eucalyptus obliqua	MMT
Mixed species		MIX
Monkey Gum	Eucalyptus cypellocarpa	MKG
Mountain grey Gum	Eucalyptus cypellocarpa	MKG
Mountain Gum	Eucalyptus dalrympleana	MTG
Mugga Ironbark	Eucalyptus sideroxylon	RIB
Mulga	Acacia aneura	MUL
Myall	Acacia pendula	MYL
Narrowleaved Ironbark	Eucalyptus crebra	NIB
Narrowleaved Peppermint	Eucalyptus radiata	NPM
Narrowleaved Stringybark	Eucalyptus oblonga	OSB
Narrowleaved white Mahogany	Eucalyptus acmenioides	NMY
Native Cherry	Exocarpus cupressiformis	NCH
Needlebark Stringybark	Eucalyptus planchoniana	NSB
Needlewood	Hakea leucoptera	NCO
New England Blackbutt	Eucalyptus andrewsii ssp. campanulata	NEB
New England Peppermint	Eucalyptus nova-anglica	EPM
New England Stringybark	Eucalyptus calignosa	ESB
Nolle	Eucalyptus wilcoxiana	NOL
Non-commercial Eucs	Eucalyptus spp	NCE
Non-commercial others	(Various)	NCO
Oak group	(Various)	OAK
Other commercial Eucalypt	Eucalyptus spp	OCE
Peppermint group	Eucalyptus spp.	PPM
Pilliga Box	Eucalyptus pilligaensis	LBX
Pink Bloodwood	Eucalyptus intermedia	PBW
Quandong	Santalum acuminatum	QUA

Red Bloodwood	Eucalyptus gummifera	RBW
Red Box	Eucalyptus polyanthemos	RBX
Red Ironbark	Eucalyptus sideroxylon	RIB
Red Mahogany	Eucalyptus resinifera	RMY
Red Mahogany	Eucalyptus pellita	RMY
Red Stringybark	Eucalyptus macrorhyncha	RSB
Ribbon Gum	Eucalyptus viminalis	MAG
River Oak	Casuarina cunninghamiana	ROK
River Peppermint	Eucalyptus elata	RPM
River red Gum	Eucalyptus camaldulensis	RRG
Rosewood	Heterodendron oleifolium	ROS
Roughbarked Apple	Angophora floribunda	RAP
Roundleaved Gum	Eucalyptus deanii	RLG
Rudders Box	Eucalyptus rudderi	UBX
Sandalwood	Santalum lanceolatum	SAN
Scribbly Gum	Eucalyptus haemastoma	SCG
Scribbly Gum	Eucalyptus racemosa	SCG
Scribbly Gum	Eucalyptus rossii	SCG
Scribbly Gum	Eucalyptus sclerophylla	SCG
Scribbly Gum	Eucalyptus signata	SCG
Shining Gum	Eucalyptus nitens	SHG
Silverleaved Ironbark	Eucalyptus melanophloia	SIB
Silvertop Ash	Eucalyptus sieberi	STA
Silvertop Stringybark	Eucalyptus laevopinea	SSB
Smoothbarked Apple	Angophora costata	SAP
Snow Gum	Eucalyptus pauciflora	SNG
Spotted Gum	Eucalyptus maculata	SPG
Steel Box	Eucalyptus rummeryi	SBX
Stringybark group	Eucalyptus spp.	SBK
Swamp Box	Lophostemon suaveolens	LSU
Swamp Mahogany	Eucalyptus robusta	SMY
Sydney blue Gum	Eucalyptus saligna	SBG
Sydney Peppermint	Eucalyptus piperita	SPM
Tallowwood	Eucalyptus microcorys	TWD
Tumbledown red Gum	Eucalyptus dealbata	TRG
Turpentine	Syncarpia glomulifera	TRP
Unknown species		UNK
Wattle group	Acacia spp.	WAT
Weeooka	Eremophila oppositifolia	WEE
Western Boobialla	Myoporum montanum	BOO
Western grey Box	Eucalyptus woollsiana ssp. microcarpa	MBX
Western red Box	Eucalyptus intertexta	IBX
White Ash	Eucalyptus fraxinoides	WHA
White Box	Eucalyptus albens	WBX
White Cypress pine	Callitris glaucophylla	WCP
White Gum	Eucalyptus dunnii	DWG
White Mahogany	Eucalyptus acmenioides or E. umbra	WMY
White Sallee	Eucalyptus pauciflora	SNG
White Stringybark	Eucalyptus globoidea	WSB
Whitetopped Box	Eucalyptus quadrangulata	QBX
Wild Lemon	Canthiun oleifolium	LEM
Wild Orange	Capparis mitchelli	ORA

Wilga	Geijera parviflora	WIL
Woollybutt	Eucalyptus longifolia	WBT
Yarran	Acacia homalophylla	YAR
Yellow Bloodwood	Eucalyptus eximia	YBW
Yellow Box	Eucalyptus melliodora	YBX
Yellow Stringybark	Eucalyptus muelleriana	YSB
Yertchuk	Eucalyptus consideniana	YER
Youmans Stringybark	Eucalyptus youmanii	USB
	Eucalyptus olida	OLI

MARVL Quality Codes




MARVL Quality Codes
Yes
Is the stem section merchantable ?
No
Cypress Pine Flow Chart
Spiral grain . 1:8 ?
Yes
No
Dry side > 50% / broken top ?
Yes
Insect damage present Sapcrack present ?
Yes
No
Insect damage present / Sapcracks present ?
Yes
Sweep > 1:8 (20% of cdob) ?
Yes
No
Sweep > 1:8 (20% of cdob) ?
Yes
Branches > 12 cm and/or > 20% of stem diameter. > 1 per 2.4 m length ?
Yes
No
Branches > 12 cm and/or 20% of stem diameter. > 1 per 2.4 m length ?
Yes
Any other damage/defect likely to cause downgrade ?
Yes
No
A
B
P
W

Appendix 5 Non-commercial tree species

Common Name	Botanical Name	Species Code
Mulga	Acacia aneura	MUL
Brigalow	Acacia harpophylla	BRI
Yarran	Acacia homalophylla	YAR
Myall	Acacia pendula	MYL
Wattle group	Acacia spp.	WAT
Kurrajong	Brachychiton populneus	KUR
Desert Cypress pine	Callitris preissii	DCP
Eurah	Eremophila bignoniflora	ERB
Berrigen	Eremophila longifolia	EMU
Emu bush	Eremophila longifolia	EMU
Budda	Eremophila mitchellii	BUD
Weeooka	Eremophila oppositifolia	WEE
White Box	Eucalyptus albens	WBX
Native Cherry	Exocarpus cupressiformis	NCH
Wilga	Geijera parviflora	WIL
Needlewood	Hakea leucoptera	NCO
Western Boobialla	Myoporum montanum	BOO

Appendix 6 Fuelwood only species

Common Name	Botanical Name	Species Code
Bull Oak	Allocasuarina leuhmanii	BOK
Smoothbarked Apple	Angophora costata	SAP
Roughbarked Apple	Angophora floribunda	RAP
Black Cypress pine	Callitris endlicheri	BCP
Belah	Casuarina cristata	BLH
Blakelys red Gum	Eucalyptus blakelyi	BRG
Fuzzy Box	Eucalyptus conica	FBX
Dwyers red Gum	Eucalyptus dwyeri	DRG
Western red Box	Eucalyptus intertexta	IBX
Pilliga Box	Eucalyptus pilligaensis	LBX
Bimble Box	Eucalyptus populnea ssp. populnea	PBX
Brown Bloodwood	Eucalyptus trachyphloia	BBW
Western grey Box	Eucalyptus woollsiana ssp. microcarpa	MBX

National Park and Wildlife Service Prescriptions

Eucalypts

All Eucalypts greater than 55cm dbhob are to be retained irrespective of the number of such trees per hectare.

White Cypress Pine

All “Old Greys” are to be retained. An old grey is a cypress pine which pre-dates the 1890’s regeneration phase and displays the following characteristics:

- has a late mature to overmature habit i.e. is over 200 years old
- is a large tree

Gazetted streams, water courses, drainage lines, drainage depressions and drainage plains

a) State Protected Land (Gazetted Stream)

Whilst State forest is not subject to the provisions of the Native Vegetation Conservation Act 1997, cognisance should be taken of Section 7 entitled "State Protected Lands", to ensure that State Forests of NSW does not compromise its intent, particularly in relation to management of gazetted streams under Section 7 (1) b) of the Act.

On private property and other Crown timber lands (Western Lands Leases, leasehold lands), harvesting within 20 metres of a gazetted stream is not permitted without approval of the Minister. This strip of State protected land is called a "filter strip". A Regional Vegetation Management Plan may override this provision (see Diagram 6).

In this SEMG area, gazetted streams on State forests are regulated by the prescription of harvesting up to a maximum of 50% of the canopy, to within 5 metres of the stream bank, however it must be specified in the Harvest Plan, and marked in the field (see Diagram 5).

b) Watercourses and Drainage Lines

Watercourses and drainage lines exhibit an incised channel of more than 30 cm depth with clearly defined bed and banks (see Diagram 7, 8 & 10).

Harvesting guidelines include:

- Harvesting is not permitted within 5 metres of the edge of the watercourse or drainage line (low bank-normal flow channel), and this is called a "no harvest zone". Trees are not permitted to be felled from within a "no harvest zone", except at designated crossings;

- Where a high bank occurs within 10 metres of the edge of a stream, watercourse or drainage line, then the 'no harvest zone' will be extended out to include the high bank plus 2 metres;

- Where active erosion is occurring to a high bank then the "no harvest zone" will be extended to include the high bank plus 5 metres (same prescription as for gully erosion);

- At an actively eroding gully site, no operations will occur within 20 metres upstream of the gully head and within 5 metres of the edge of the gully (see Diagram 11);

- Heads of felled trees and logging slash are to be removed from watercourses and drainage lines and "no harvest zones" except where this will cause excessive damage to banks; and
- Heads of felled trees and logging slash should be removed from the 'no harvest zones' except where this will damage watercourse/drainage line banks.

c) Drainage Depressions / Drainage Plains

A drainage depression or drainage plain may or may not have an incised channel.

Without Channelised Flow

Irrespective of catchment size where a drainage depression or drainage plain has no evidence of channelised flow then harvesting of such drainage depressions or drainage plains may occur subject to:

- Section 2.2.2 a) above, if State Protected Land;
- harvesting taking place in dry ground conditions;
- extraction of logs is generally in a direction across (right angles to) the normal direction of water flow;
- operations causing minimal soil disturbance;
- no log dumps being located within 40 metres of the centre of the drainage depression, nor within 40 metres of a drainage plain; and,
- no extraction of logs up or down the drainage depression or drainage plain.

With Channelised Flow

Where a drainage depression or drainage plain has an incised channel less than 30 cm deep then buffer strips should be retained as follows (see Diagram 9):

- Buffer strips should be a <u>minimum</u> of 5 metres either side of the channelized flowline;
- Trees should be felled out of a buffer strip to minimise later machinery entry;
- Trees may be felled into a buffer strip;
- Machinery may enter the buffer strip to extract logs by the most direct route whereby soil disturbance is minimised;
- Where crossing of the buffer strip or drainage depression is necessary, machinery should cross at right angles to the direction of flow;
- Snigging up or down the flowline within a buffer strip is not permitted;
- Snigging shall be done in a manner to achieve the least amount of soil disturbance within a buffer strip; and,
- Buffer strips will not normally be marked in the field by the supervising forest officer, and the onus for identification will be on harvesting machinery operators, and tree fallers.

d) <u>Actively Eroding Watercourses & Drainage Lines</u>

Where active erosion of watercourses and drainage lines is occurring, harvesting is not permitted:

- within 5 metres of the active erosion site (**); and,
- within 5 metres of the side of the flowline for a distance of 20 metres up stream of the active erosion site (**).

How to record Grid References

Zone Identification

NSW is covered by three mapping zones, 54, 55 and 56. The zone identification should be found on the information panel of the map. Record which zone the plot is located within.

Grid references within a zone

At the bottom left hand corner of the map there will be the full reference for the first grid line, eastings along the bottom and the northings up the side. These numbers are the distances in ,metres from the false origin of the zone.

Eastings

Locate at the bottom of the map the grid line immediately to the west of the plot point. This should allow you to determine the first three digits (XXX_00).

Measure the distance in 100m units from the grid line to the point. This should allow you to determine the fourth digit (XXXX00).

Northings

Locate at the side of the map, the grid line immediately to the south of the plot point. This should allow you to identify the first four digits (XXXX_00).

Measure the distance in 100m units from the grid line to the point. This will allow you to determine the fifth digit (XXXXX00).

The full reference should be a 13 digit number, 6 for Eastings and 7 for Northings.

Vertex Hypsometer User Notes

General

The Vertex uses ultrasonic pulses to determine the distance between the hypsometer and the transponder, the speed of those pulses varies with temperature and therefore the Vertex should only be used when it has reached a stable temperature.

To check the stability of the temperature of the Vertex press the ON/OFF button while holding down the STEP button. If the temperature displayed is steadily moving up or down then place the Vertex in the shade and wait until the temperature is stable (normally 5-10 minutes).

Instrument Set-up

The Vertex has two settings which must be checked before use, they are the "Pivot offset" and TRP height". To check these settings press the ON/OFF button and read the display on the side of the instrument. The "Pivot offset" should be set at 0.3 and the "TRP height" should be set at 1.3. If either of these settings are different then follow the routine described in the table below.

The "Pivot offset" is an allowance for the fact that when the operator tips their head back to look up to the top of the tree the angle they generate is created some distance behind the Vertex, usually about 0.3 metres. The "TRP height" is the height above the ground at which the transponder is held, in our case the height will always be 1.3 metres.

Vertex set-up procedures

1. Press ON/OFF while holding UNDO
2. Press the orange button once.
3. Press the STEP button three times.
4. Press the orange button once.
5. Press the STEP button once
6. Press the orange button once.
7. Press the STEP button three times..
8. Press the ON/OFF button once.

Calibration

To check if the Vertex needs calibration measure out exactly 10.00 metres between the centre of the transponder and the front of the hypsometer, turn the transponder on and hold the ON/OFF button don until the display shows an" Auto distance". If this "Auto distance" is between 9.98 and 10.02 then the instrument is ready for use, if not then is needs to be calibrated.

Vertex Calibration Procedure

1. Measure 20.00 metres between the transponder and the front of the hypsometer.
2. Press and hold down the ON/OFF button.
3. Wait until the Vertex displays an "Auto dist"
4. While the ON/OFF button is still being pressed, press UNDO until the display shows 20.00.
5. Turn the hypsometer off by releasing the ON/OFF button and pressing it once more.

The Vertex has now been calibrated for the **current temperature**. If the temperature changes by more than 5^{o} Celsius during the day then you should repeat the calibration process.

Temperature sensitivity

Because the Vertex is very temperature sensitive it should not be carried close to your body as your body heat will warm the hypsometer up. The hypsometer should never be placed in the sun and you should avoid touching the temperature sensor (the small steel circle on the front of the instrument) or aiming the hypsometer at the sun when heighting a tree.