

## Private Native Forestry Code of Practice Guideline No. 1

# Guidelines for Assessing Regeneration and Stocking

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## Introduction

This guideline outlines the method of measuring regeneration and stocking that is required by the Private Native Forestry (PNF) Code of Practice (Code). Stocking is a measure of the occurrence and distribution of trees of any age throughout the forest. The Code sets the minimum stand stocking levels for landowners to achieve following a regeneration event.

A 'regeneration event' is defined as:

- **a harvesting or thinning operation** in North Coast and Northern Tablelands Forests, South Coast and Southern Tablelands Forests, and Western Hardwood Forests
- **the second period of inundation following harvesting or thinning** in River Red Gum Forests
- **the second successive wet summer following harvesting or thinning** in Cypress Forests.

A 'wet summer' occurs when the accumulated rainfall in, or in the vicinity of, the forest, in November, December, January, February and March, is above the average accumulated rainfall for those months.

A landowner must ensure that the minimum stand stocking levels have been reached within:

- a) **36 months** of a regeneration event in Western Hardwood Forests, Cypress Forests and River Red Gum Forests
- b) **24 months** of a regeneration event in all other forests.

## Method for measuring stocking

The simplest way to assess whether a forest is adequately stocked is to sample the level of stocking by installing a number of plots. A plot for this process is a circle of radius 1.67 metres (10 square metres). Plots can be either stocked or unstocked.

A new harvesting operation must not occur in a previously harvested area until stocking levels meet the minimum stand stocking requirements.

Minimum stand stocking requirements are determined by the percentage of stocked plots specified in Table 1. The Environment Protection Authority will work with the landowner or operator to develop strategies to regenerate the forest, if needed.

Table 1: Minimum percentage of stocked plots

Broad forest type	Within canopy openings	Elsewhere in the forest
Cypress	Not applicable	80%
River Red Gum	60%	70%
Western Hardwood	Not applicable	55%
Tablelands Hardwood	50%	60%
Tablelands Ash	55%	65%
South Coast Ash/Stringybark	60%	70%
Spotted Gum	60%	70%
North Coast Dry Mixed Hardwood	50%	60%
North Coast Moist Mixed Hardwood	55%	65%
North Coast Flooded Gum	55%	65%
North Coast Blackbutt	60%	70%

## Types of plot systems

The plot system accommodates all three types of logging permissible under the PNF Code:

- single tree selection (STS)
- thinning
- Australian group selection (AGS).

As it is common for a forest to be subject to a combination of STS and thinning operations, the first system described below can be used for both STS and thinning. Where a thinning operation is proposed there is no need to initiate regeneration, but the forest stand must remain adequately stocked because the aim of the operation is to concentrate site growth on selected retained trees.

## Monitoring

The equipment required for monitoring is a tape measure or a hip chain for measuring up to 200 metres; a compass; and a rod 1.79 metres long. The next step is to set up a system of random plots in the forest regeneration area for STS and thinning operations or AGS, as described below.

### 1 Single tree selection (STS) and thinning operations

- For STS and thinning operations, locate plots along the edges of a square (Figure 1). The sides of the square should be 200 metres long.
- Measure along each 200-metre line with the tape measure or hip chain to locate plots at 20-metre intervals along the square. This method will give a total of 40 plots, which equates to a 1% sample of 4 hectares.
- The starting point should be randomly located within the logging area by selecting it on a map before conducting the assessment. This could be done on a grid or by nominating a

set distance from a known point on the ground, for example, '50 metres west of log dump 4'.

- A compass bearing for the first side of the square should also be nominated before the logging site is assessed.
- The plot radius should be 1.79 metres, which equates to a plot size of 10 square metres. Measuring at this level enables the rod to be used to define the plot boundaries at each plot centre and allows easy calculation of stocking rates.
- Class each plot as stocked if any part of the plot area:
  - is under the canopy of an existing tree
  - contains at least one viable seedling (including new seedlings establishing from seed or lignotubers)
  - contains 'advanced growth' of an upper canopy species that is assessed as having the vigour or capability of reaching a canopy position.

**Note:** 'Advanced growth' comprises any tree regrowth that has become established in advance of regeneration. Advance growth must be in good condition to produce a vigorous stocking of regrowth. Components of advanced growth that might be considered include lignotuberous seedlings at different development stages, non-lignotuberous species, and sapling or pole-stage stems that have responded to past canopy disturbances and are in a vigorous condition. To ensure the adequacy of stocking, seedlings suffering major damage from browsing and coppice from stumps should not be counted.

- For each square, convert the numbers of stocked plots to a simple percentage. Where multiple squares are assessed, the outcomes should be averaged to give an overall assessment of the logging area.
- A minimum number of squares needs to be sampled to obtain a reliable measure of the stocking level and regeneration. The sampling intensity will be different for each logging area, depending on the circumstances particular to the site. Table 2 sets out the minimum sampling requirement.

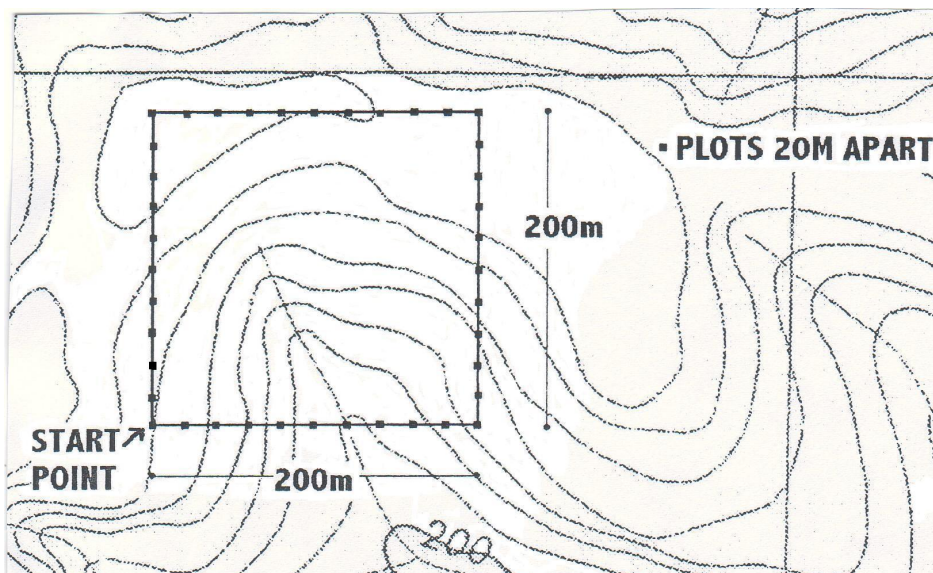


Figure 1: The 'square' method of monitoring tree stocking

Table 2: Minimum sampling points

Logging area in hectares	Number of sample points
Up to 10	80 plots (2 'squares')
11–50	120 plots (3 'squares')
51–100	200 plots (5 'squares')
101–200	280 plots (7 'squares')

**Note:** In some forest situations, it will be impractical to sample in a rigid square format. In these situations, sampling should be done along different compass bearings. Each new line taken should ideally be 200 metres long, but should at least be long enough to obtain a representative sample of the forest. In these cases, sampling should still include at least 40 plots to provide an approximate 1% sample of a 4-hectare area. Figure 2 shows an example of where monitoring on the square is not possible because of the presence of dense impenetrable undergrowth on a drainage line. A line has been run on another compass bearing and plots monitored along this new line.

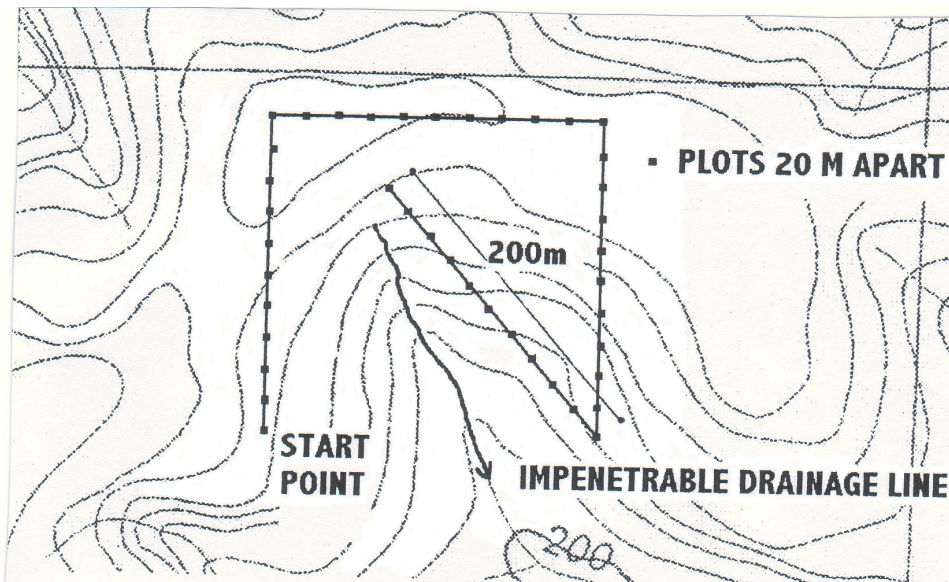


Figure 2: Monitoring on the square has been modified owing to access difficulties.

## 2. Australian Group Selection (AGS) canopy openings or gaps

- The procedure for measuring plots is the same as for STS. What varies is how the survey is set out.
- Gaps created under the AGS provisions should be assessed separately to any forest that has been subject to STS or thinning. This is necessary because the area subject to AGS will be small (a maximum of 20% of the logging area) and a combined assessment would not result in an accurate representation of the adequacy of regeneration within the gaps.
- For AGS gapping operations, measure the regeneration stocking percentage within the gaps on a 20 metre x 10 metre grid, which will give 50 plots per hectare and a sampling intensity of 5%. For each gap area that is assessed, convert the stocking rate to a

percentage figure and then average these percentages across the number of gaps assessed within the logging area.

- At least 10% of the total number of gaps should be sampled to obtain a reliable measure of stocking level and regeneration. Table 3 outlines the minimum sampling requirement for regeneration gaps.

Table 3: Minimum sampling requirement for regeneration gaps

Number of gaps	Number of gaps sampled
Up to 10	2
11–50	5
51–100	10
101–200	20

## More information

A regeneration survey plot sheet template is attached for monitoring purposes (Table 4). It includes provision for monitoring basal area and stand height at the four corners of the 'square' to check compliance with harvesting limits set by the PNF Code, although such monitoring is optional.

An example of a completed regeneration survey plot sheet is also attached (Table 5).

The standard procedures for stocking and regeneration assessment set out by these guidelines will help landholders comply with the requirements of the PNF Code of Practice.

For more information about forest management, refer to the *Silvicultural guidelines for private native forestry* at <http://www.environment.nsw.gov.au/pnf/index.htm>.

Table 4: Regeneration survey plot sheet template

Property details:									
Survey date:			Survey team:						
Plot no.	Stocked	Viable seedling	Advanced growth	Retained tree	Plot no.	Stocked	Viable seedling	Advanced growth	Retained tree
1					21				
2					22				
3					23				
4					24				
5					25				
6					26				
7					27				
8					28				
9					29				
10					30				
11					31				
12					32				
13					33				
14					34				
15					35				
16					36				
17					37				
18					38				
19					39				
20					40				
Totals									

Stocking %

Adv. gth %

Seedling %

Ret.tree %

Std heights

Av. std height

	Basal area	Forest type
Basal area 1		
Basal area 2		
Basal area 3		
Basal area 4		
<b>Average basal area</b>		

**Comments**

Table 5: Example of regeneration survey plot sheet

Property details: 'Glenugie Peak'. Spotted Gum forest type. Heavily logged 2 years ago.									
Survey date: 22/01/2004					Survey team: Fred Jones and Neville Nobody				
Plot no.	Stocked	Viable seedling	Advanced growth	Retained tree	Plot no.	Stocked	Viable seedling	Advanced growth	Retained tree
1	1	1	0	0	21	1	1	0	1
2	1	1	0	0	22	1	0	0	1
3	0	0	0	0	23	0	0	0	0
4	1	1	0	1	24	1	1	1	0
5	1	1	0	1	25	1	0	0	1
6	0	0	0	0	26	0	0	0	0
7	0	0	0	0	27	1	1	0	0
8	1	0	1	1	28	1	1	0	0
9	1	1	0	0	29	1	1	0	0
10	1	1	0	1	30	1	0	1	1
11	1	0	0	1	31	1	0	0	1
12	1	1	0	1	32	0	0	0	0
13	1	1	0	0	33	1	1	0	0
14	0	0	0	0	34	0	0	1	0
15	0	0	0	0	35	1	0	0	0
16	1	1	0	0	36	1	0	0	1
17	0	0	0	0	37	1	1	0	0
18	1	1	0	1	38	1	0	0	1
19	1	0	0	1	39	1	1	0	1
20	1	1	0	1	40	1	0	1	0
Totals	14	11	1	9		16	8	4	8

Stocking %	75
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Adv. gth %	12.5
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Seedling %	47.5
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Ret.tree %	42.5
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Std heights	31	30.5	31.2	29.5
			Av. std. height	30.55

	Basal area	Forest type
Basal area 1	14	SG
Basal area 2	11	Dry H.
Basal area 3	14	SG
Basal area 4	17	SG
<b>Average basal area</b>	<b>14</b>	

**Comments**

- Plots 14/15/16 dominated by red ash regrowth. Cattle have heavily grazed block.
- Most of the regeneration is spotted gum with very little regrowth.
- Area is well stocked following logging, with more than sufficient regrowth to perpetuate stand.

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**Note:** This information does not constitute formal legal advice. Please seek specific advice from the Environment Protection Authority before undertaking any forestry activity.

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ISBN 978 1 74293 980 3

EPA 2013/0026

February 2013

Printed on environmentally sustainable paper