Field exercise for plot establishment & tree measurement

Master Tree Grower's Course
Wellstead 26th July, 1999

by Bob Hingston

Objective: On completion of the session, participants should be able to:

1. Establish a plot and determine tree density (trees/ha)
2. Select crop trees at a nominated density and understand some basic silvicultural practises eg pruning
3. Measure trees to determine tree growth parameters

Location: Leighton's property, Tassie bluegum site.

Note: these notes are used in conjunction with Rowan's Australian Master TreeGrower Exercise notes. There are some differences and these will be explained.

Establishing a plot

Background: "Establishing a plot" means marking out a known area within a stand of trees, counting the number of trees, and calculating the number of trees per hectare.
The purpose is to obtain information about the stand for use in deciding how it should be **managed.** More accurate methods are used for research plots.

Normally at least 3 plots are established within 2-3 ha of forest to obtain a reasonable estimate. For 5-10 ha, 5-7 plots are needed.

The size of the plot depends on the density of the forest. The usual practice is to make the plot large enough to contain about 30 trees. In most situations, a plot size of 20 x 20 metres, or 0.04 ha, is recommended, to account for losses etc.

Method

1. **Mark out a plot.** Select an area that looks representative of the stand and mark out a plot approximately 20 x 20 metres, making the corners as square as possible. Put the corners of the plot midway between the rows of trees to alleviate bias. Measure the length of sides and calculate plot area. (See attached Field Booking Sheet 1).

   For a typical plantation with a density of 1200 trees per ha, a plot of 16 x 16 m (0.026 ha) should contain 32 trees. Plots need to larger in less dense stands.

2. **Calculate number of trees/ha.** Count the number of trees in the plot. Using the area of your plot, determined in Step 1, calculate tree density (trees/ha). Fill-in Field Sheet 1.

3. **Decide what proportion needs to be removed.** Typically 300-400 trees are selected as crop trees; ie trees that have potential to grow into sawlog trees (of course this depends on the type of silvicultural regime you are following).
   Asuming you decide to keep 300 trees/ha and the current density is 1200/ha, then you will need to keep the best tree out of 4.

Collecting additional information about the stand. Tree parameters, such as diameter and height, are commonly measured to describe the stand more completely. However, this depends on why you are measuring your trees in the first place. For example. Are you measuring your trees to determine long term growth trends, or perhaps you want to know how much volume there is for calculating returns from a harvest?
A typical **Field Sheet 1** is attached for recording diameter at breast height over bark (DBHOB) and height (Ht) for each tree in the plot.These data are used to calculate:
- mean diameter (cm)
- mean height (m)
- basal area (m^2/ha)

MTG notes attached, describe how to take these measurements.

Fill in your field sheet with measurements of diameter (and height if possible) for each tree. Diameter measurements can be used to calculate the basal area (m^2/ha)for the stand.

Selecting crop trees

Background. "Selecting crop trees' means selecting a proportion of the trees in the stand as sawlog trees (the crop). The poorer trees need to be identified and either culled (cut down and left to rot) or thinned (cut down and used; eg, for firewood, pulpwood or posts).

Method. Three criteria are used for selecting crop trees. In order of importance they are:

1. **Form** (ie choose trees that are straight and free from malformations, or forks)
2. **Vigour and health.** (ie choose the biggest and healthiest trees)
3. **Spacing.** (ie choose trees to give fairly even spacing of crop trees, but this criteria is less important than the other two).

With your selection ratio in mind (from part 1 of this exercise), select your crop trees in your plot. For example, if your tree density was 1200/ha and you have decided that you want a crop tree density of 300/ha, then you'll need to choose the best tree out of 4. Mark your selected (crop) trees with plastic tape. An alternative method is to select your trees as you prune them, but this may take a bit of practice.

Given that you know the area of your plot, you should also be able to calculate how many crop trees you need to select in your plot to the required density. This is a good check to do at the end.

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Field Booking Sheet 1

(For Field Exercise on Tree Management)

Tree No.	DBHOB (cm)		Basal Area (m^2/tree)	Ht (m)		Calculations
1						
2						**Plot area** = length x width = ...x.....
3						
4						= .....m^2/10,000
5						= .....ha
6						**Stand density** = No. of trees in plot x1000
7						plot area
8						= ..... =.....trees/ha
9						.....
10						
11						
12						**Basal area/tree** = $\left(\frac{\text{Diameter (cm)}}{200}\right)^2$ x 3.142
13						
14						= π x .....
15						= .....m^2/tree
16						
17						
18						**Basal area/plot** = sum of B.A for each tree
19						= .....m^2/plot
20						
21						
22						**Basal area/ha** = basal area/plot
23						plot area
24						= .....
25						.....
26						
27						= .....m^2/ha
28						
29						
30						**Basal area for trees with forks**
31						
32						diam. = $\sqrt{d^2 + d^2 + d^2}$
33						
34						
Σ dbhoh						
Sum B.A.						
Σ Ht						