

SPECIFICATION 14 - MARVL DATA COLLECTION

CONTRACT JOB SPECIFICATIONS

MARVL data collection

Dated 8 May 2003

1. INTRODUCTION

This Contract Job Specification covers work associated with the collection of MARVL data.

2. OBJECTIVE

To provide a description of the work Pan Pac would like to be carried out by the contractor.

3. ALLOCATION OF WORK

- The Company shall from time to time during the continuance of this agreement allocate the Contractor MARVL Inventory work.
- The company will supply the contractor with a list of stands that require the collection of MARVL data. Maps will be provided that identify where plots need to be established. The maps will also show stand boundaries, known hazards and restrictions.
- The Contractor will thereafter proceed with the establishment and measurement of plots as documented in the MARVL V3.5 user manual or in the Field Procedures documented below.

4. COMPANY'S RESPONSIBILITIES

General: The Company will supply to the Contractor, prior to the commencement of work, the following information:

- a) Stand maps showing the positions where MARVL plots need to be established. The maps will also show stand boundaries, known hazards and restrictions.
- b) The company will supply the contractor with the Forest Research MARVLDE data capture program if required.
- c) The company will supply the contractor with an MDI file containing the dictionary function sets and species codes to be used in the data collection. Electronic data will be supplied by disc or Email.
- d) Any amendments to standard MARVL data collection practice e.g. requirement to gather supplementary data such as density cores, soil samples.
- e) A priority list for the plots to be measured
- f) Target completion date

FIELD PROCEDURES AND CONTRACTOR REQUIREMENTS

Locating the Plot

Plot locations will be provided on a 1:10,000 scale map. Distances and bearing will be on the maps provided or in accompanying documentation.

Measure the distance on the map from a known start point.

Bearing is to be determined with a compass. Distance is to be measured with either a cotton hip chain, or a 50 metre nylon tape.

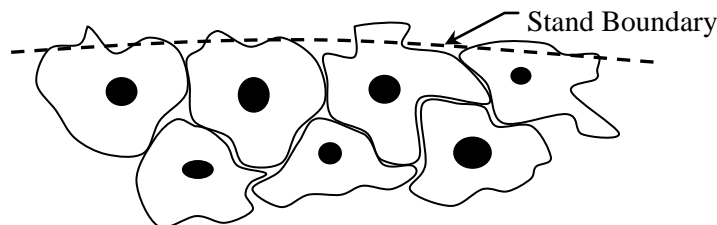
Plot Type

Bounded circular plots are to be used. Plot size shall be calculated based on the estimate of stand stocking provided, or by a preliminary walk through of the stand, to give an average of 18 trees per plot (15 minimum – unless otherwise directed) or a maximum plot size of 0.10 Ha. The same plot size must be used in a single stratum.

Plots on Stand Edges

The stand edge is defined as the drip line of the trees in the stand as indicated in figure 1.

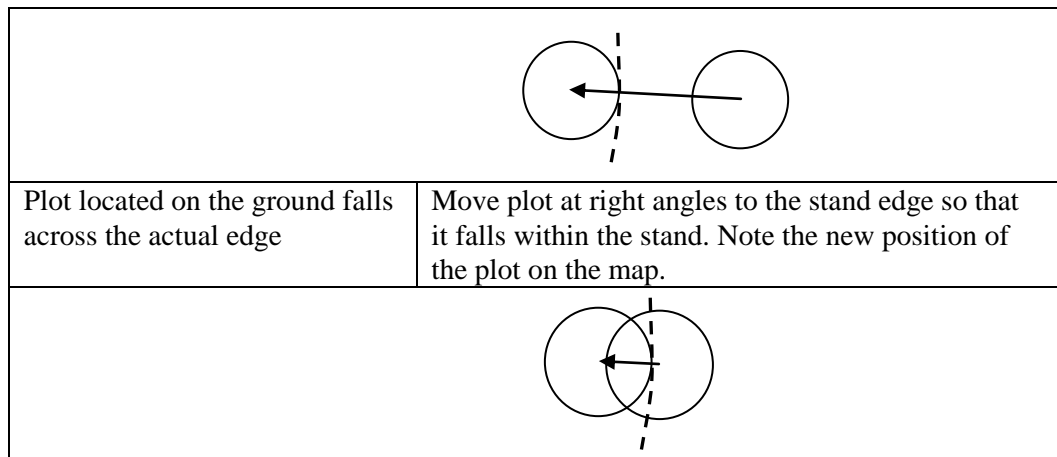
Figure 1: Stand Boundary



When a plot located on the ground falls outside the actual boundary of the stand it may be due to a number of causes. The cause and the appropriate remedy for plots outside the stand boundary are presented in table 1.

Table 1: Adjustment of plot position to fit into a stand.

Cause	Remedy
The plot falls in an unstocked less than 0.1 Ha	Record plot as having no trees on map
Plot falls in an unstocked area greater than 0.1 Ha	Mark unstocked area on the map – no plot required
Stocked area has been modified by tree lining or skid construction	Record area of felling on map – no plot required
Actual stand edge differs from that shown on the map	Move the plot at right angles to the stand edge so that it falls within the stand. Note the new position of the plot on the map.



Marking the Plot

Once the centre of the plot has been located, it is to be marked with a painted stick or rock in order to see the centre of the plot from a distance and to relocate the plot at a later date. The plot number should be painted on the tree nearest the plot centre.

Plot Slope

The slope for the plot is to be recorded. The plot slope is determined by averaging the maximum up-slope and the maximum down-slope from the centre of the plot.

Tree Selection

A tree is included in the plot if the axis of the tree falls within the slope-adjusted radius of the plot at breast height. Marginal trees are to be checked with a tape for inclusion and marked “ X” if out. Inclusion rules are presented in table 2 and figure 2.

Table 2: Tree inclusion rules

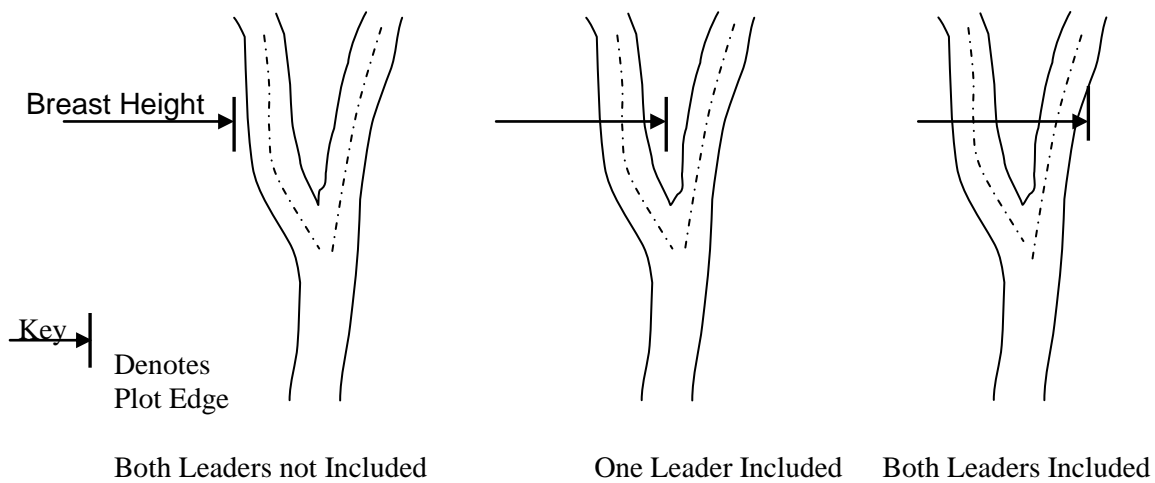
Item	Rule
Double leader below 1.4m	Include leaders whose axis is within the slope-adjusted radius at breast height (refer diagram) – Each leader is to be treated as a separate tree.
Leaning tree	Include if the axis of the tree is within the slope-adjusted radius at breast height (refer diagram)
Bent Tree	Include if the axis of the tree is within the slope-adjusted radius at breast height (refer diagram)

Dead “sound” trees (no visible rot) are to be assessed for inclusion – these are to be measured for diameter at breast height, and assessed as dead.

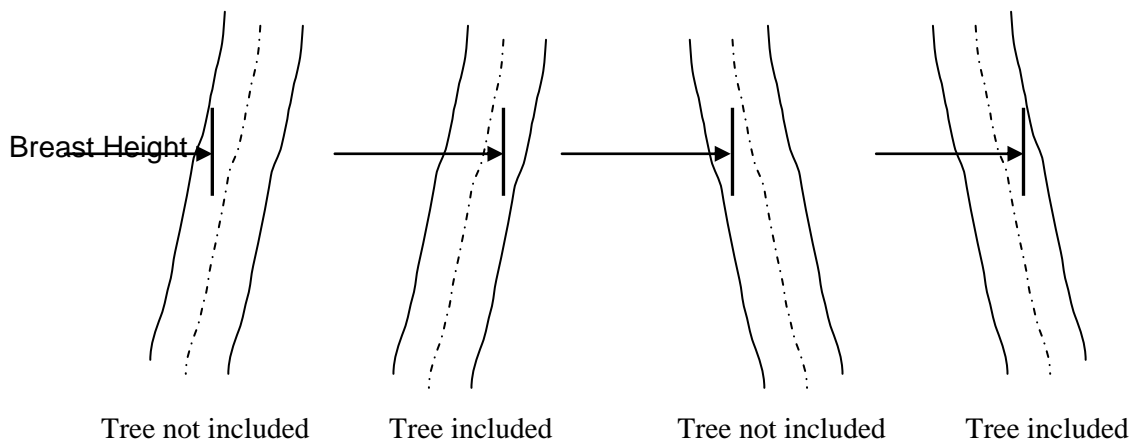
Non-crop trees (regeneration trees with diameter at breast height below 100mm) are not to be included in the plot.

Figure 2: Tree Inclusion Rules

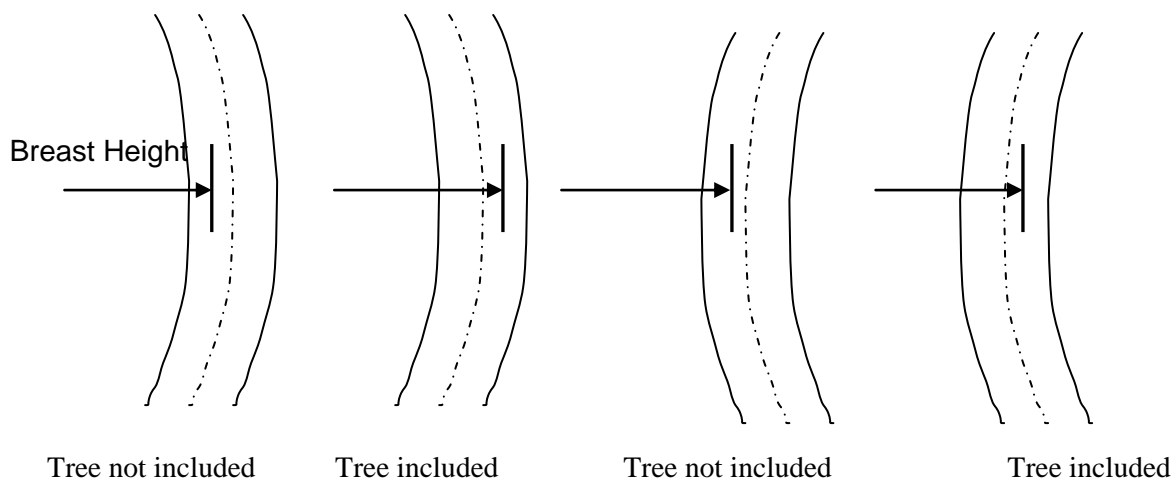
Double Leaders



Leaning Trees



Bent Trees



Tree Measurements

Diameter at Breast Height (DBH)

Diameter at breast height, over bark, is to be measured with a standard diameter tape. The diameter is to be measured at 1.4m (breast height) from the ground on the up-slope side of the tree. The tape is to be at right angle (90°) to the axis of the tree as indicated in figure 3. The measuring of diameters above and below nodal swellings and or major defects is acceptable

Figure 3: Tape at Right Angles to Tree Axis



Where there is nodal swelling or other uneven taper malformation at 1.4m, then suitable diameter measurements must be taken equal distance above and below the malformation at a point where there is no longer an effect on diameter, and these averaged to obtain the diameter. The two points must be marked with paint.

When a tree forks below 1.4m and both leaders are within the slope-adjusted radius of the plot, then both leaders are to be measured (and treated as distinct trees).

Tree Marking

All trees measured are to be marked at the point where the DBH measurement was taken, and a unique tree number within the plot painted to be visible from the plot centre. On tree number 1 a “P” and the plot number is also to be painted. Height trees are to be marked with an “H” and trees that are marginally out on the boundary of the plot are to be marked with a “X”.

Tree Height Measurement

A minimum of 20 height trees per stratum or 2 trees per plot, whichever is the greater, shall have total height measured. Where there are less than 10 plots in the inventory, additional heights are to be taken, distributed across the plots. In cases where there is only one plot, 10 height trees are required. Tree heights are to be measured either using a SUUNTO clinometer and tape, a VERTEX hypsometer, or a laser.

Height trees are to be selected across the diameter range with a minimum of two trees at or near each of the extremes of the diameter range (minimum and maximum). Height trees must not have

- o Broken or dead tops
- o Excessive lean - no greater than 5° (refer figure 5)
- o Excessive sweep
- o Excessive malformation

Height trees are to be measured at right angles to the direction of lean in order to remove the effect of the lean

Tree Description

Introduction

Tree description is to be achieved via the quality code dictionary supplied by the Forest Analyst. Sections of stem that contain defects are to be downgraded as specified.

Mortality

Live trees and dead “sound” trees are to be assessed. Dead trees are to be assessed with an *.

Height of features

All pruned heights need to be measured with a graduated pole to the nearest 0.1m from ground level on the uphill side of the stem to the point where the lowest branch is estimated to meet the tree centre.

The height of non-pruned features shall be assessed to the nearest 0.1 metre. The heights at which the change in feature occurs, which may be attributable to branch class, sweep class, or defect incidence, is to be assessed and recorded.

Equipment

The contractor shall at all times ensure their equipment is accurate to the standards as presented in table 4.

Table 4: Tolerance on Equipment Accuracy.

Equipment	Accepted tolerance
Lineal tapes, Diameter tape, & Height Poles	± 0.5% of actual length
Hip chains.	± 4.0% of actual length
Vertical angle measurements	± ½° from actual
Field compasses	± 2° from actual
Indirect height measurement	± 2% of true height
Hypsometer calibration	Minimum twice daily*

* As per manufacturers recommendation

Equipment is to be calibrated weekly to meet the standards above or to ensure the equipment meets as-manufactured specifications (by comparing to standard measures).

Provision of Data

The contractor shall, at regular intervals of no more than two weeks, provide maps and data files to the Forest Analyst for stands that have been completed. The MARVL data should be in electronic form either through email, a floppy disc, or directly transferred by a computer communications tool. Hard copy of maps may be delivered by regular mail.

Quality Assurance

Introduction

The contractor is responsible for the quality of the work that is provided to the company. They may wish to perform their own audits.

The company will from time to time may conduct an audit via an independent contractor, or a Pan Pac staff member.

Audits will be carried out on up to 10% of plots.

The Company will supply the contractor with a description of the auditing standards prior to the commencement of any work that will be subject to audit.

Failure to meet the agreed audit standards will result in a maximum of 10 plots requiring remeasurement. This remeasurement will be done at the contractors time and expense.