

Re-measurement of Growth Monitoring Installations for the Forest Fertilization Program

The Growth Monitoring Installations (GMI) of the fertilization program were established between 2006 and 2011, and they are due for re-measurement after five growing seasons. This document provides the updated operational procedures for the re-measurement of the GMIs. Preliminary analyses were conducted using the establishment data of each installation in order to ensure comparable: 1- stand density, 2- tree size and 3- species composition between control and treatment plots. Those installations showing high variability between control and treated plots might not be re-measured after five growing seasons. Tree and plot level data are collected to describe crop tree response and shrub response (competition) to fertilization. The re-measurement data will be analyzed and compared to the establishment data in order to minimize measurement errors.

If you have any questions please contact **Monty Locke** at Resource Practices Branch (Email: Monty.Locke@gov.bc.ca; Phone: 250-356-6987).

1-Data collection

The initial establishment data provides the location of the plots. All living trees within the plot were numbered with tree marking paint. Ideally, metal number tags were looped on wire around the base of each plot tree. Numbering commenced at the plot centre (i.e., tree 1), then moved north to the nearest tree, and proceeded in a clockwise direction back to the origin. An alternative approach to painting numbers in older stands is to identify trees with an aluminum number tag nailed to the base of the tree below stump height. Tags should all face towards the plot centre tree. The plot centre tree was double flagged or double ringed with tree marking paint, and was GPS'd – to facilitate relocation. The number of plots per installation was influenced by the total number of trees sampled (i.e., trees per plot). The plot size was recorded in the “Plot Data” tab of the establishment Excel data file.

Following is a description of the measurements that were taken at establishment and that will be recorded again after five growing seasons at re-measurement, including: 1- DBH, 2- Crown Class, 3- Tree Health and Vigor, 4- Site Trees Heights, and 5- Total Shrub Cover.

DBH was recorded for all trees in the plot with DBH > 7.5 cm and the measurement location was marked with paint. On sloped ground, DBH was taken on the uphill side of the tree. If after five years additional trees (i.e., ingress trees) present DBH greater than 7.5 cm do not measure them.

Measurements of crown class (i.e., Dominant, Co-Dominant, Intermediate and Suppressed) and tree health and vigor were also taken for each tree.

Tree crown classes¹

D	Dominant	Crown extending above the general level of the layer; somewhat taller than the co-dominant trees, and have well developed crowns, which may be somewhat crowded on the sides.
C	Co-dominant	Crowns forming the general level of the crown canopy; crown is generally smaller than those of the dominant trees and usually more crowded on the sides.
I	Intermediate	Crowns below, but extending into the general level of the crown canopy; crowns usually small and quite crowded on the sides.
S	Suppressed	Crowns entirely below the general level of the crown canopy.

¹ Species Inventory Fundamentals Standards for Components of British Columbia's Biodiversity No.1. November, 1998 Version 2.0

Tree health should be rated according to the Forest Health Surveys Guidebook available at the following link: "<http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/health/Httpoc.htm>" and abbreviated according to appendix 5. Conditions not included in the Damage and Disease Codes shall be included in Remarks. Tree vigor codes are on the sample field data sheet (Figure 2 and separate Excel file).

The heights of the site trees in each plot were recorded. Trees taller than 6 meters shall be measured using an electronic measuring device. When using an electronic measuring device, the painted DBH line shall NOT be assumed to be at 1.3 m.

An ocular estimation of total shrub cover was made for each plot as well as cover of the four leading shrub species. Shrubs can be recorded using common names or the first four letters of the genus and the first three letters of the species. Species identification aids in establishing site series.

Quality control of data collection and data entry is critical to the success of the monitoring program. In order to reduce errors a copy of the measurements at establishment should be carried in the field. Ideally, in the Excel form the latest measurement should be added in a blank cell beside the initial measurement. About one field plot in ten should be re-visited by a second team and the measurements verified. After the data is entered each participant is responsible to verify the quality of the data prior to sending it for storage.

Any measurements smaller than those collected at establishment should be noted in the comments column. Following are some examples of where comments are required:

1- Negative DBH Increment: A negative DBH increment should be impossible, unless some catastrophic damage to the stem has taken place. Double-check your current measurement and add a comment indicating that the DBH was double checked.

2- Negative Height Increment: Not impossible, but should be due to some kind of top damage. If no top damage is evident, double-check your height and provide an estimate of the previous height measurement.

3- Excessive Increments: A subjective assessment, but if detected and double-checked, it would be helpful to have some kind of comment, either to confirm (e.g. "Height OK") or if necessary an estimated correction of the previous measurement. If the current site is a good growing site

and what is first judged to be an excessive increment becomes the norm, then further comments – e.g. beyond the first 10 or so – are no longer required.

2. Re-measurement data storage

The installation monitoring table is to be submitted to RESULTS as well as attached to the current FIRS project file. RESULTS data should be in Excel format with both the current FIRS project number (for re-measurements) as well as the original FIRs project number when the monitoring installation was established. The data table is to be attached to the original opening where the monitoring plots were established as a new activity using coding of (SX; FE; TSP). Do not modify any of the historic data for the opening. If the original opening cannot be found, but the plot location is within the current year's shell opening area of treatment then the monitoring plot can be attached to the current year's treatment as long it is referenced to the previous treatment, clearly marked as a re-measurement in the comments field, and there is clear direction of plot locations (e.g. map).