

# **Growth and Yield Monitoring Task Force**

**Report to the Growth and Yield Monitoring Task Force**

**by the Inventory Working Group**

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## Background

The Inventory Working Group (IWG) was constituted on October 29 by the Growth and Yield Monitoring Task Force (GYMTF) at the request of Dave Gilbert, Director of the Resource Inventory Branch. It is the first of several such working groups to be established, each dealing with a distinct component of growth and yield monitoring.

## Objective

The general objective of the IWG is to develop an Inventory Monitoring Design.

In doing so,

- we need to know not only the quantity and location of our resources but also how they are changing and how we can check our estimates;
- a monitoring system is necessary to provide this check;
- we should be cognizant of other potential uses of such a system, e.g. for a provincial level inventory that could also be part of a national inventory, and for Criteria and Indicators data;
- we should be cognizant of existing initiatives such as the proposed new National Forest Inventory (NFI) design and the proposed provincial monitoring system for sustainable development of forest resources;
- in particular, however, we should consider the newly developed Vegetation Resource Inventory (VRI) and the Phase 2 sample unit design and ask ourselves: can they be used for monitoring purposes as is and, if not, how can they be modified for that purpose?

## Decisions

Having reviewed relevant information, IWG members agreed that

- a. the VRI will form the basis for the Inventory Monitoring Design;
- b. both sampling method and sample unit design of the VRI are included in the IWG mandate;
- c. at the highest (provincial) level of inventory, the Inventory Monitoring Design will be compatible with the design for a proposed National Forest Inventory and the design of the proposed provincial monitoring system for sustainable development of forest resources;

- d. the monitoring data can be used for other purposes, e.g. the estimation of growth (for which the VRI is not designed).

The first three decisions form the basis for the Inventory Monitoring Design, which is outlined below

## **The Inventory Monitoring Design**

Two levels of summary are recognized: the management unit level for which the VRI is available, and the whole province for which the VRI is not suitable.

At the highest (provincial) level, a set of approximately 200 sample units will be selected across B.C. using a grid type of sampling frame.

At lower levels (inventories of TSAs, TFLs, Analysis Units), the Inventory Monitoring Design will utilize the sorted list type of sampling frame of the VRI.

The 200 sampling units selected for the provincial level monitoring design will, if possible, be incorporated into the lower levels.

The sampling units of the lower level monitoring designs will be a sub-set of the VRI sampling units. On this sub-set, for monitoring purposes, polygon boundaries will be ignored but, as always, population boundaries will be respected.

Sample units will be essentially the same as in the VRI.

The Inventory Monitoring Design will be implemented approximately as follows:

- a population (e.g. a TSA) will be selected for monitoring, as well as the attributes to be monitored (e.g. total merchantable volume);
- a sub-set of the VRI sampling units in the TSA will be selected and measured. For cost-effectiveness,
  1. sample selection and measurement will, on the first occasion, be part of the VRI;
  2. sampling intensity and number of attributes measured will, on re-measurement, be based on stated needs for precision and detail;
  3. managers are free to establish additional, non-VRI plots for other monitoring purposes.
  - statistics will be compiled from the measurements of the attributes. These will include an approximate confidence interval (of a given probability level) around each attribute;

- validation of the original (VRI) estimate of merchantable volume (in this example) will consist of determining if it fits within the confidence interval or not; if it does, we can say that the VRI estimate is acceptable; if not, a search for reasons why will begin - but that is not part of monitoring.

## Recommendations

The IWG recommends that the Inventory Monitoring Design as described above be used to develop and implement an Inventory Monitoring Program. More specific and detailed recommendations follow.

### 1. Relationship to proposed National Forest Inventory

Although the high level monitoring design will be compatible with the proposed National Forest Inventory, it will differ in two respects:

- the VRI sample unit design will be used; and
- no stratification by ecozone be used (summation by ecozone at the national level is still possible).

Also, some lesser issues (treatment of plots on boundaries and inaccessible plots) will have to be resolved.

### 2. Sample Unit Design

- considering that the variable radius plot (VRP) is already in place and that it can be used to provide estimates of growth, no additional fixed radius plot is warranted. However, for each tree selected in a VRP, the distance and bearing from plot center to the tree will be measured. The distance is required to improve growth estimation, while distance and bearing are required to relocate the tree on remeasurement, which will assist in estimating mortality. Also, where no VRP is planned in the VRI, it will be included in monitoring plots even if the count is zero.
- destructive sampling for net volume adjustment will take place outside the plots, in a location associated with the cluster. Due to the high cost, a small number of such samples will be taken. Monitoring procedures currently being developed will be reviewed to determine how they can be incorporated into the inventory monitoring program.
- no attributes need to be added to nor deleted from the current VRI for monitoring purposes. However, in any given implementation not

all attributes need to be measured. This will reduce the cost of field sampling.

- although the estimates of mortality obtained with the current VRI plot design are not very precise (and may lead to less precise growth estimates), an additional mortality plot is not warranted for growth and yield monitoring.

## **Growth Issues**

- If we take a subset of VRI sample units and re-measure them in 10 years' time, we can monitor yield projections and estimate growth, but we cannot monitor growth estimates;
- Growth monitoring is different from yield projection monitoring: growth monitoring is checking the precision of growth estimates obtained from measurements made on the same sampling units at different times, while yield projection monitoring is checking the precision of yield estimates obtained from measurements made on sampling units at one occasion only and projected forward.