**NFI Stand Volume Survey Results**

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One of the attributes required for treed polygons in NFI photo plots is the total volume per hectare in each layer. This volume, is defined in the photo plot data dictionary, is the total volume inside bark of the main stem, including stump and top as well as dead and decayed wood, of all trees taller than 1.3 metres. In addition to standing dead trees, the total volume includes dead windfalls which still have roots attached. The layer volumes are used to estimate the total volume and biomass of trees on forested lands in Canada.

During the establishment phase conducted during 2000-2006, the photo plot data delivered by jurisdictions to the NFI was largely a clip of existing forest cover maps and conversion of attributes to NFI standards. Our experience with processing these data informed us that not all of the volumes met the definition for total volume and therefore procedures were devised to convert known gross merchantable volumes to total volumes during data compilation and estimation. Procedures were also devised to convert presumed total volume per ha values to gross merchantable volumes for computing tree biomass based on NFI models.

The current remeasurement phase presented the first opportunity to resample the same photo plots by interpreting and attributing entirely to NFI standards, including the attribution of layer volumes as total volume per ha. However, we soon realized that not every jurisdiction has models to compute total volume for the NFI and this presents a problem with data handling during data processing. It was therefore suggested that we should conduct a survey to determine the characteristics of the volumes delivered by jurisdictions for remeasured plots so that procedures for generating consistent values for both total and merchantable volume could be devised.

**The volume survey**

A copy of the volume survey sent to each jurisdiction is in Appendix 1. Much of the survey is of the simple yes-no type that asks whether or not the volume of stumps, tops, fallen live trees, standing dead trees, non-commercial species and so on are included in the volume reported for each layer in the NFI photo plot data. The survey also asked for details on merchantability (utilization) limits by species/species groups for both commercial and non-commercial species and the methods used to calculate volumes (models, equations, scale factors or visual estimation).

A summary of the yes-no portion of the survey is shown in Table 1. Responses were received from all jurisdictions except Nova Scotia, Yukon and Northwest Territories. Although Yukon provided photo plot data with volumes in the establishment phase, it has not been involved in the remeasurement phase and therefore we do not expect a response from them.

Table 1. Components included in volumes reported in NFI photo plots.



The survey shows that five of the jurisdictions report volumes that partially meet the NFI definition of total volume in that one or both of the stump and top components are included in the volume. Two jurisdictions report volumes for all trees down to 1.3 metres in height while the other three report volumes to a minimum dbh that is lower than the merchantability limit. Three jurisdictions report what is essentially gross merchantable volume while one jurisdiction reports net merchantable volume, i.e. the volume does not include the volume attributable to decay, waste and breakage. BC is the only jurisdiction that includes standing dead, five other jurisdictions include fallen live while fallen dead are not included by any jurisdiction. Two jurisdictions report outside bark volumes while the rest report inside bark volume. Only three jurisdictions include non-commercial species in the volumes they report to NFI.

A side issue that should be addressed is what to do about standing dead trees. BC is the only jurisdiction that includes standing dead trees in the reported volume. They also appear to be the only jurisdiction that reports standing dead (stems per ha, basal area per ha) in their own forest inventory attribute tables. Should the NFI try to capture these data? When can we expect other jurisdictions to follow suit?

**What does the NFI project office need to do?**

To use what we now know about the volumes delivered to NFI, the project office needs to:

1. Add a table to the photo plot data dictionary. This table will contain a volume code (vol\_code) that is associated with the characteristics of the volume data delivered to the NFI. The survey shows that the characteristics of these volume data are unique to each jurisdiction and therefore each jurisdiction can be assigned a unique vol\_code (Table 2).

Table 2. Volume code and volume type assigned to photo plot volumes delivered by jurisdictions.



The definition for volume code 1 in Table 2 is the definition given for gross total volume (GTV) in the current photo plot data dictionary for layer\_vol in the stand layer header table. Codes 2 and 3 are equivalent definitions for gross merchantable (GMV) and net merchantable volume (NMV) as they would be defined by the NFI (Table 3).

Table 3. Components included in the NFI definitions of GTV, GMV and NMV.



Table 2 will also contain a use\_after column to indicate the year after which the volume defined by the volume code should be used. If a jurisdiction changes the characteristics of volume delivered to the NFI due to model improvements, a new volume code and use\_after date can be added to the table.

1. Since the vol\_code is unique to a jurisdiction, it is not necessary to add the code to any of the tables during data entry. Consequently, no changes to the data entry and QA tools will be needed in the Photo Plot Data Entry Utility.
2. A shortened form of the table above (without codes 1, 2 and 3) must be added to the nfi\_ppprd schema on the production and pgpfc1 servers.
3. The plot download tool must be revised to add and populate a vol\_code field in the stand layer header table when the data are extracted from the database. This will ensure the end user of the data is made aware the stand tree components that are included in the layer volume.
4. Photo plot compilation routines will need to be updated to convert the volumes to the required form for estimation. Table 2 contains a volume type code that best matches the volume the jurisdiction delivers to the NFI to standard definitions of gross total volume (GTV), gross merchantable volume (GMV) and net merchantable volume (NMV) as defined by NFI in the first three rows of Table 2. The volume type code is needed so that the necessary adjustments can be made during photo plot compilation to convert the supplied volume to normalized values for both gross total and gross merchantable volume. Gross merchantable volumes are used to compute stand biomass while gross total volumes are required for reporting purposes.

**What do the jurisdictions need to do?**

1. Check that the definition for the code is correct.
2. Advise us if their code should be applied to all of their remeasurement data.
3. Advise us if the same code can be applied to establishment data.
4. Advise us when their volume models change so that the code can be updated.

**Appendix 1 – Volume Survey Form**

