



CWFC Facts 014

## Canadian Wood Fibre Centre

### Fibre Facts

#### National stem taper models

Forest managers need taper data to assess the value of standing trees and determine their potential commercial use, i.e. veneer wood, sawtimber or wood chips. Work has been done to collect stem taper data for most forest tree species across Canada. The data were used to produce taper models that can be applied to the National Forest Inventory or to regional forest inventories when regional taper models are not available. The models are based on limited input, namely the tree species and diameter at breast height (DBH), with or without tree height. These national models are the culmination of prolonged, meticulous work to collate taper data collected through the ENFOR program and by Canadian provinces.

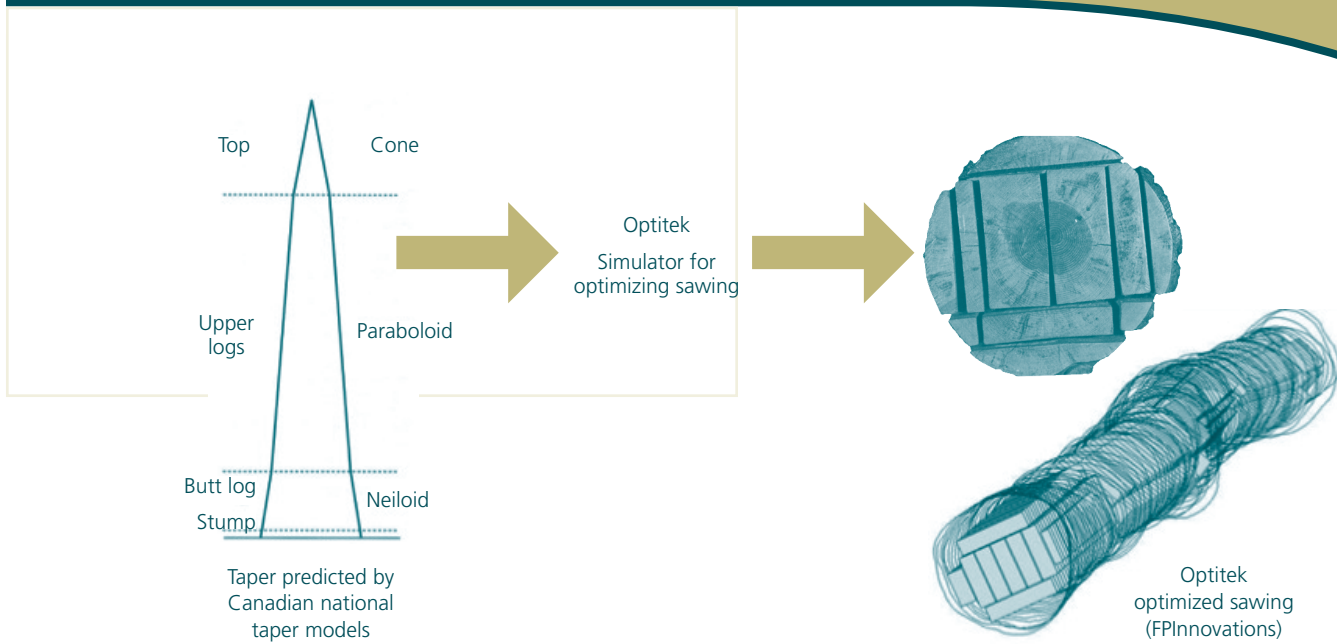
Information on forest tree resources and their economic value are required for forest management decision-making and to understand and better manage the wood supply chain. The economic value of a stand is easily quantified both during and after tree harvesting. However, pre-harvest information must be taken from regional or national inventories and from stem taper models. In eastern Canada, these models are only available for a few species. In western Canada, different studies provide models for several tree species. Essentially, stem taper models are not available for all Canadian provinces and when they are, only a few species are modeled. In addition, the diameter at the thin end of the stem, which represents the limit of merchantable wood volume, varies in stem taper models from one province to the next. This variability prevents the comparison or combining of inventory results from Canadian provinces.

In 2008, a research project was undertaken to compile stem taper data from all across Canada, and to produce taper models for thirty-three (33) Canadian commercial forest tree species. Taper data is mainly derived from two sources. Data for Ontario, Quebec and the Yukon comes from the ENFOR program (Lambert et al. 2005). The geographic coverage of the ENFOR data was supplemented with data from Alberta, British Columbia, Manitoba and Saskatchewan, and additional taper data was received from Ontario.

The primary purpose of applying taper models is to support the National Forest Inventory of the Canadian Forest Service (CFS), which contains DBH data for different species. Following the extensive work required to harmonize data from the different provinces and territories, two models using a dimensional analysis approach were proposed. The first version of the model is constructed from observed tree height. The second version was modified to include scenarios where tree height is not available. In this case, tree height was replaced in the model with a nonlinear function commonly used for modelling height–diameter relationships. Both stem taper models are limited to the merchantable portion of the tree.

Although the models tend to slightly underestimate results, they are very useful in national applications, or when local or regional forest stand data is not available. Consequently, the models appear to be suitable for pre-harvest estimation of sawlog volumes at both the national and the regional level. This work was made possible thanks to the collaboration





**Figure 1.** One of the applications of Canadian national taper models is sawing optimization with Optitek software by FPIinnovations, using basic forest inventory data such as the species and DBH, with tree height being optional.

of the CFS National Forest Inventory team, who facilitated contacts with the provincial and territorial governments, and with financial support from the Canadian Wood Fibre Centre of Natural Resources Canada.

An on-line tool is now available at the following address: <https://apps-scf-cfs.nrcan.gc.ca/calc/en/volume-calculateur-calculator>. By entering the DBH of a selected species, this tool will calculate the volume of the stem ( $m^3$ ) for its full height or for any other height specified.

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