Growth & yield research at UNBC

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The FRBC / West Fraser Endowed Chair in Forest Growth and Yield at the University of Northern British Columbia started operations in April 2000. A brief description of some of the completed and in-progress research follows. For more details see `http://forestgrowth.unbc.ca`.

Completed

- TADAM. This is a whole-stand growth model fitted to the TASS simulations that are used in TIPSY. It reproduces closely the dynamics of TASS, in a simple and flexible differential equation model that can be easily incorporated into decision support systems. The model is age-independent, and can simulate any combination of initial spacing and thinnings, starting from bare-ground or from existing stands. There are versions for planted coastal Douglas-fir, lodgepole pine, and interior spruce. It has been implemented as an interactive simulator for Palm PDAs (which can also be run on a PC with a Palm emulator), and as an add-on for MS Excel. It has been shown how to use the Excel macros to optimize initial density, thinnings, and rotation.

- Site index and height growth modelling. A software package, EasySDE, implementing a stochastic differential equation approach has been made available. The method is flexible, statistically sound, and efficient. Apart from straightforward site index modelling applications, it has been used to combine stem-analysis with PSP data, to evaluate regional stratifications, and to produce models with asymptotic constraints.

- Top height estimation. The conventional use of proportions corresponding to the 100 largest trees per hectare in plots of different sizes results in biases. The bias was evaluated for lodgepole pine sample plots, and improved estimators were developed.

- Mixedwood dynamics. Succession in aspen-spruce mixtures in the Peace region was investigated, in collaboration with Richard Kabzems from MoF.

- Growth curves. A generalized growth equation was obtained, and its properties analyzed. It includes as special cases most of the univariate sigmoid models used in forestry.

- Tree size distributions and competition indices. The changes in distribution parameters with plot size have been ignored in the literature. In addition, microsite spatial correlations, ignored in current individual-tree growth models, affect stand development and the explanatory power of competition indices. It was shown that these effects can be substantial. Neighbour dbh correlations are often positive, instead of negative as predicted by distance-dependent growth models. The statistical theory of the relationships between plot size, spatial structure and size distributions was elucidated.

In progress

- Lodgepole pine site index model. In an M.Sc. thesis, Adrian Batho developed a site index and top height growth model for lodgepole pine in the SBS Zone. All the suitable available data was used, utilizing both stem-analysis and PSP observations. Complementing the potential advantages and limitations of the two data sources should produce more reliable results. The development work is finished, and Adrian is in the process of documenting it and writing the thesis.

- Growth model for interior spruce. Zhengjun Hu has developed a site-index and whole-stand growth model for spruce in the SBS, as his M.Sc. thesis. The model is data-driven, using information from spruce-dominated PSP and spacing/thinning experiments. The model is parameterized for both planted and naturally regenerated stands. The thesis is at the draft stage.

- Dynamics of beetle-killed lodgepole pine and mixed-species stands. Min Jun Lee is initiating his Ph.D. project investigating stand dynamics following pine beetle attacks.

- Modelling aspen and aspen-spruce stands. Work is underway on a dynamic whole-stand growth model for aspen. The data that was used for STIM has been collected, and will be used together with some more recent measurements. In a second stage, a spruce layer will be added.