

# Size-class model based on simulated growth data

## *Estimation and technical analysis*

Jani Laturi, Jussi Lintunen and Sini Niinistö

Stage-class models represent population dynamics in a more general way than age-class models. In a stage-class model, population dynamics can be based on a combination of measurable properties of the population rather than mere age. The model structure allows for convenient way to optimize thinning and harvesting behaviour and, therefore, it has been used for example in modelling uneven-aged forest stands. However, caution is needed when choosing the structure of a stage-class model, since model structure can have effects on modelling results. In our paper, we study the application of stage-class model to describe the development of a forest stand. The model used is Usher's size-class model with nonlinear transition functions. We assess the effects of model specification on simulated growth projections as well as on optimal harvesting patterns.

We chose to examine a mature even-aged stand, for which the availability of reliable data is best. The simulation data of the forest growth is drawn using Motti stand level growth simulator, by running it with several harvest paths and initial states. From simulated growth data of representative trees, we estimate the transition parameters of the diameter-class model using statistical methods. The study is divided into three stages: First, we simulate the growth data with Motti simulator. In the second stage, we estimate the transition proportions of the diameter-class model. The third stage is a comparative study of the effects of choice of diameter-classes on the resulting growth, timber yield and optimization of harvesting regimes.

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*Finnish Forest Research Institute*

*Jokiniemenkuja 1 (P.O. Box 18) FI-01301 VANTAA FINLAND*

[jani.laturi@metla.fi](mailto:jani.laturi@metla.fi)