

Incorporating a process based Norway spruce model with economics and optimization

Sami Niinimäki, Olli Tahvonen and Jari Perttunen

This study links a process based growth model for even-aged Norway spruce (*Picea abies* [L.] Karst.) with economical optimization. Earlier studies on detailed forest management optimization on Norway spruce have applied less advanced statistical-empirical growth models. One main benefit from using a process based growth model is its large range of validity; the optimization results are not restricted to some limited states determined by the limitations in empirical data. In addition, the detailed structure of the growth model enables the inclusion of timber quality and its dependence of the size and quality of branches. The model describes the growth and optimal management of Norway spruce over all relevant site types and latitudes in Finland. The optimized variables include the initial stand density, the number, type and intensity of thinnings and the optimal rotation period. The results show the optimality of thinnings from above. The initial seedlings structure planting density and timber quality specifications are shown to have major impacts on economic returns and optimal management actions.

Keywords: Norway spruce model, ecological-economical optimization, process based growth

Finnish Forest Research Institute (Metla)

Jokiniementie 1

P.O. Box 18, FI-01301 VANTAA

FINLAND

Email: sami.niinimaki@metla.fi, jari.perttunen@metla.fi, olli.tahvonen@metla.fi