

## Moose, forestry and climate change

Sauli Härkönen

Finnish Forest Research Institute, Joensuu Research Unit, P.O. Box 68, FI-80101 Joensuu,  
Finland

### Abstract

Moose browsing causes economically significant damage in young Scots pine and birch stands in Finland. Although pine can be considered a medium-preferred browse species in the winter diet of moose (Bergström & Hjeljord 1987), the major proportion of consumed browse consists of pine from late autumn to early spring owing to its high availability (Cederlund et al. 1980). Birches and other deciduous trees are damaged by moose throughout the year. Climate change may affect the tree species composition and food availability, and also the distribution and abundance patterns of moose resulting in more damage to forestry unless controlled.

In recent decades in particular, the moose density has increased in Finland continuously (Torvelainen 2007). Simultaneously, increasing moose damage (i.e., twig-browsing, stem breakage, and bark stripping) has raised increasing concern amongst forest-owners and the associated industries. This concern is based on the fact that, as a long-term consequence, moose damage reduces the quality of butt logs (i.e., merchantable timber that is intended as high-quality plywoods or sawn timber), especially as a result of broken main stems (Heikkilä & Löyttyäniemi 1992, Heikkilä et al. 1993, Glöde et al. 2004, Ingemarson et al. 2007). In addition to the flaws in the stem form, pith discolorations and colour changes outside the pith reduce the quality, and hence also the value of the logs, irrespective of their end use. In Finland, compensation for damage caused by moose to private forest-owners is paid from State funds (e.g., EUR 5 million in 2006).

Various chemical repellents, visual and acoustic devices, and tree sheltering methods and devices have all been used in attempts to prevent moose damage in young seedling and sapling stands. The effects of the different methods have been variable, and in many cases the methods used have generally shown little promise for the reduction of moose damage on a large-scale or long-term basis.

Different moose-related interest groups have conflicting targets with respect to the ideal moose density, and thus moose management. This has led to intense public debate on the need to search for balance not only between moose and forest management but also with nature conservation. To avoid conflicts of interest, Ministry of Agriculture and Forestry (MAF) has made preparations for drafting the new strategy for moose management in Finland. The strategy will be finalised and approved by MAF in 2012.

There is a strong need to control over-abundant moose population densities. Development of cost-effective mechanical and/or chemical preventive methods is also needed to reduce the risk of moose damage in young stands. Finally, it is also important to evaluate the effects of climate change on moose herbivory (cf., Niemelä et al. 2001), spatial and temporal changes in habitat quality (i.e., food availability and cover) and moose population dynamics. This will help in adapting to the implications of climate change may have for forestry and moose management.

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