



PhD Research Opportunity

Physiological ecology of understorey trees in alternative management systems



Maurizio Mencuccini¹, John Grace¹, Mike Perks², Nigel Straw² & Bill Mason²

Forest Research

¹ University of Edinburgh & ² Forest Research

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Background

Alternative management systems to clearfelling are being adopted in Great Britain as a means of increasing the species and structural diversity of plantation forests (Mason & Kerr, 2001; Mason et al., 2004). These regimes are often termed Continuous Cover Forestry (CCF). CCF is a priority topic for action in both the Welsh (2001) and the Scottish (2000) forestry strategies and the UK Woodland Assurance Scheme (2000). CCF is characterised by favouring natural regeneration and it aims to create structurally varied stands.

One area of limited knowledge is the critical levels of below-canopy light for survival and growth of young trees (e.g. Malcolm et al., 2001; Hale et al., 2004). The most important species employed in British forestry cover a wide range of shade tolerance, and some are not expected to survive for long periods under the low light conditions of a closed canopy plantation. Tolerance of shade can also be influenced by other factors. Understorey trees have been reported to be more susceptible to insect attack than overstorey trees and, as a result, to suffer higher rates of mortality than trees planted in the open. The combined effects of light availability and insect attack on sapling growth and survival are not well understood, but they are crucial to understanding and managing for regeneration success within CCF systems.

Project description

The student will combine observational and experimental approaches. Specifically, the project will aim to answer the following questions: 1) How variable is the light regime beneath different overstorey species and what is the impact of these differences on sapling physiology? 2) What influence do insect herbivores have on sapling responses to variation in the light environment? 3) How do saplings of various species respond to sudden changes in light availability, as occur during thinning and harvesting.

Methods and Research Plan

Researchers at Edinburgh University and Forest Research are already studying a number of well-established CCF trials. Fieldwork components of the proposed project will be carried out in forests in South and Central Scotland and North Wales. This will include experimental manipulations of the incident light environment in established plantations and in a common garden experiment. More detailed experiments on the physiological response of saplings to light availability and insect attack will be conducted using pot-grown or out-planted trees in a nursery.

Research Training

The project provides an opportunity for a student to learn a range of techniques used in the study of plant physiological ecology and plant-insect interactions. The student will join active groups working in forest ecosystem research and management at Edinburgh University and Forest Research, and will interact with scientists from diverse backgrounds. Participation in specific modules within the MSc courses at Edinburgh University will be encouraged.

References:

- Hale, S.E., Levy, P.E. and Gardiner, B. (2004) Trade-offs between seedling growth and stand stability in alternative silvicultural systems : a modelling analysis. *For. Ecol. Manage.* 187:105-115.
- Malcolm, D.C., Mason, W.L., and Clarke, G.C. (2001) The transformation of conifer forests in Great Britain – regeneration, gap size, and silvicultural systems. *Forest Ecology and Management*, 151, 7-23.
- Mason, W.L., Edwards, C. and Hale, S.E. (2004). Survival and early seedling growth of conifers with different shade tolerance in a Sitka spruce spacing trial and relationship to understorey light climate. *Silva Fennica*, 38:357-370.
- Mason, W.L. and Kerr, G. (2001) Transforming even-aged conifer stands to Continuous Cover Management. Forestry Commission Information Note 40, Forestry Commission, Edinburgh. 8pp. (revised version in 2004).

Contacts:

Further information on the research project can be obtained from: m.mencuccini@ed.ac.uk {<http://www.geos.ed.ac.uk/homes/maurizio/>} & mike.perks@forestry.gsi.gov.uk {<http://www.forestresearch.gov.uk/>}

Applications are invited from any UK or EU nationals. Details of the application procedure are available at <http://www.edinburgh.ac.uk/studying/postgraduate/applications/forms.html>

Applications should be sent to Helena Sim (Grant Institute, The King's Buildings, West Mains Road, Edinburgh EH9 3JW) by **29th July 2005**. The interviews will take place in August with a view to start the project in September or October.