From Forest Nursery Notes, Summer 2007

73. © Growth in supplementarily planted *Picea abies* regenerations. Nilsson, U. and Gemmel, P. Scandinavian Journal of Forest Research 22:160-167. 2007.

Scandinavian Journal of Forest Research, 2007; 22: 160–167

ORIGINAL ARTICLE

Growth in supplementarily planted *Picea abies* regenerations

URBAN NILSSON & PELLE GEMMEL

SLU, Southern Swedish Forest Research Centre, Alnarp, Sweden

Abstract

An experiment was established in 1978 in two Norway spruce [*Picea abies* (L.) Karst.] plantations in southern Sweden to study yield after mortality in patches with and without supplementarily planted (SP) seedlings. Gaps of different sizes were created by removing the originally planted seedlings. The gaps were either left unplanted or a supplementary planting was performed with one of four species [Norway spruce, Scots pine (*Pinus sylvestris* L.), lodgepole pine (*Pinus contorta* Dougl.) or hybrid larch (*Larix deciduas* Mill × *L. Leptolepis* Gord.)] 2 (at Knäred) or 6 years (at Ullasjö) after the original plantation. In 2002, most of the SP Scots pine, lodgepole pine and hybrid larch seedlings were dead or severely damaged by roe deer and moose. Survival was high among SP Norway spruces, but they had slower growth than the originally planted spruces. Growth was lower at Ullasjö than at Knäred. In Ullasjö, growth was lower in small gaps than in large gaps. Trees in original regeneration in areas surrounding unplanted gaps were larger than trees surrounding gaps with SP seedlings, which in turn were larger than originally planted trees in plots without gaps. In conclusion, because the original plantation surrounding unplanted gaps used a large part of the open space and growth of SP seedlings was slow, supplementary planting resulted in an insignificant growth increase. However, supplementary planting may increase the timber quality of trees surrounding the gaps, although this effect remains to be quantified.

Keywords: *Competition, Norway spruce, replacement planting, volume production.*

Introduction

Supplementary planting, i.e. planting in forest regenerations with insufficient stocking, is a silvicultural practice that is commonly used to improve future yield and timber quality in intensive commercial forestry. However, several studies have shown that the supplementarily planted (SP) seedlings only contribute to a minor extent to the total yield (Wakely, 1968; Jones, 1974; Schmaltz, 1986; Gemmel, 1988; Gemmel & Nilsson, 1990). This is due partly to competition between the supplementary and originally planted seedlings, and partly to poor conditions for growth and survival of the SP seedlings (Gemmel, 1987).

Results from spacing experiments and growth models show small addition to total growth due to increasing seedling density in stands with more than about 1000 seedlings ha^{-1} (e.g. Hamilton & Christie, 1974; Eriksson, 1976; Ekö, 1985). For Norway spruce plantations in southern Sweden, the stem volume produced during a rotation will be 5–10% higher for a stand with an initial density of 2500 stems ha^{-1} compared with a stand with an initial density of 1000 stems ha^{-1} (Ekö, 1985). This result could represent a rough estimate of the additional yield of supplementary planting, provided that the stands are regularly spaced and that the SP seedlings survive and develop in a similar way to the originally planted seedlings. However, since the SP seedlings are usually suppressed by the originally planted seedlings, total stem volume will probably be lower than the volumes forecast using available growth models (Nyström & Gemmel, 1988).

The growth of individual trees is related to the trees' position in the social hierarchy and stand density (Nilsson, 1993; Nyström, 2001). Gemmel (1987) concluded that supplementary planting in regularly spaced Norway spruce plantations in southern Sweden did not improve stand volume growth if the supplementary planting was done more than 2 years after the original planting. However, the result of supplementary planting may be improved by using vital seedlings capable of rapid

Correspondence: U. Nilsson, SLU, Southern Swedish Forest Research Centre, Box 49, SE-230 53 Alnarp, Sweden. E-mail: Urban.Nilsson@ess.slu.se

(Received 9 June 2006; accepted 21 January 2007)

ISSN 0282-7581 print/ISSN 1651-1891 online © 2007 Taylor & Francis
DOI: 10.1080/02827580701231530