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ORIGINAL ARTICLE

Regeneration and tree growth dynamics of *Picea abies*, *Betula pendula and Betula pubescens* in regeneration areas treated with spot mounding in southern Finland

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Abstract
This study addresses the dynamics of young stands established in areas of southern Finland which have been site prepared with spot mounding and planted with Norway spruce. The principal attributes investigated were the density of natural birch on the major soil surface types associated with the method (mounds, patches and undisturbed soil) and the growth rate of the planted spruces compared with natural birches. The study material included 18 regeneration areas treated with spot mounding and planted with Norway spruce container seedlings, around three, six or nine growing seasons before measurement. Rather than permanent plots that would have constituted a genuine time series, the data collected for the study originated from a sample of stands of different ages. The results indicated that there were comparatively few birches on the mounds after 3 years, but greater average densities were evident at 6 and 9 years than on the patches and undisturbed soil. Compared with methods such as patch scarification and disc trenching, the observed delay in the emergence of birch probably gives spruce a competitive advantage during the most susceptible, earliest stages of development in spot mounding.

Keywords: Betula pendula, Betula pubescens, *mounding, regeneration,* Picea abies, *site preparation, stand dynamics, tree growth.*

Introduction

The conventional regeneration regime for Norway spruce [*Picea abies* (L.) Karst.] stands in Finland consists of planting container seedlings on prepared sites following clear-cut. On mesic spruce sites, site preparation methods that establish slightly elevated planting spots, topped by bare mineral soil, enhance seedling survival and growth owing to improved soil moisture, temperatures and nutrient regimes, reduced competition by brush and weed in the immediate vicinity, and a reduced risk of damage by weevils (e.g. *Hylobius abietis* L.) (Örlander et al., 1990; Schildt, 2000; Heiskanen & Viiri, 2001, 2005; Tuomola, 2002; Saksa et al., 2005; Luoranen et al., 2007). Increased early survival and accelerated early height growth have been observed compared with older site preparation methods (scarification, disc trenching) (Heiskanen & Viiri, 2001, 2005; Nordborg, 2001; Hallsby & Örlander, 2004; Johansson, 2005; Saksa et al., 2005).

In recent years, an improved variety of mounding, known as "spot mounding" (Örlander et al., 1990), has become more common. Based on this method, a slab of soil (about 100 × 50 cm) with a humus layer and 5–10 cm of mineral soil is detached (creating a patch), turned over and slightly compressed, to form a mound (about 75 × 75 cm). An optimal mound is 5–10 cm high on fine-textured soils and 15–20 cm high on medium-textured soils. The mound thus constitutes the following layers (top to bottom): 5–10 cm mineral soil; overturned humus layer, undisturbed humus layer, undisturbed mineral soil. One container seedling is planted on each mound, placed deeply enough to locate the container (with the roots) mainly in the two-fold humus layer, while maintaining contact with the underlying mineral soil. Some 1600–2000 ha^{-1} of mound–patch complexes

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