

We are unable to supply this entire article because the publisher requires payment of a copyright fee. You may be able to obtain a copy from your local library, or from various commercial document delivery services.

From Forest Nursery Notes, Winter 2009

136. © Spring versus summer spruce stocktypes of western Canada: nursery development and field performance. Grossnickle, S. C. and Folk, R. S. Western Journal of Applied Forestry 18(4):267-275. 2003.

Spring Versus Summer Spruce Stocktypes of Western Canada: Nursery Development and Field Performance

Steven C. Grossnickle and Raymund S. Folk, CellFor Inc., P.O. Box 133, Brentwood Bay, B.C., Canada, V8M 1R3.

ABSTRACT: *This article summarizes information on the performance of spring versus summer spruce (*Picea glauca*, *Picea engelmannii*) stocktypes grown in western Canada. The spring planted stocktype is grown over one growing season in the nursery, hardened in late summer, goes through acclimation in the fall, lifted within a fairly broad window in late fall and early winter when it is considered winter-hardened, and then frozen-stored until planting in the spring. This stocktype is planted across a fairly broad spring planting window. In contrast, the summer planted stocktype is grown over one or two growing seasons in the nursery, lifted during late spring to early summer for planting in a narrow planting window in mid summer. These stocktypes are quite different in their phenology during final stages of nursery development, through stock quality assessment and initial performance in the field. For this reason, the discussion centers on comparing important morphological and physiological attributes between these two stocktypes. The stocktype used for spring planting programs has a high level of stress resistance just after planting (i.e., freezing tolerance: index of injury at -6°C of 11%; drought tolerance: osmotic potential at turgor loss point of -2.2 MPa). This stocktype starts to lose this high level of stress resistance as seedlings break bud and undergo shoot development within weeks of being planted on reforestation sites. The stocktype used for summer planting programs has a low level of stress resistance just after budset (i.e., freezing tolerance: index of injury at -6°C of 43%; drought tolerance: osmotic potential at turgor loss point of -1.6 MPa). This stocktype has a rapidly changing phenology resulting in an increasing level of stress resistance and decreasing growth potential (primarily in the root system), whether budset is induced naturally or by a short-day cultural treatment. Thus, timing of lifting plays a critical role in the success of summer stocktypes. The spring-plant stocktype has both shoot and root growth, while the summer-plant stocktype only root growth during the first season on a reforestation site. During the second growing season, both stocktypes have a similar pattern of shoot and root growth across the growing season. *West. J. Appl. For.* 18(4):00–00.*

Key Words:

Northern spruce species are primarily produced as container-grown stocktypes throughout Canada. Container-grown seedlings comprised over 90% of the conifer seedling production in British Columbia and over 75% of all conifer seedlings in Canada by the early 1990s (Arnott 1992). The container seedling format allows nurseries to manipulate the growing environment, thereby applying cultural practices that produce stocktypes with a range of sizes and various performance attributes that can be planted throughout both spring and summer. Nonhardened spruce seedlings lack the physiological capability to tolerate environmental stresses related to drought and freezing temperatures that occur after

planting on reforestation sites (Christersson 1972). As a result, nurseries producing containerized seedlings manipulate nursery cultural practices such as daylength, water, and fertilization regimes to “harden” conifer species (Tinus and MacDonald 1979, Landis et al. 1999). These practices are intended to induce budset and improve the capability of seedlings to overcome planting stress while becoming established on reforestation sites.

The spring and summer planted stocktypes have been developed to fit two separate planting windows within the forest regeneration silvicultural program. The spring stocktype is grown over one growing season, hardened, and then overwintered or frozen-stored in the nursery (Figure 1). Spring stocktypes are then planted on reforestation sites before budbreak in the spring. In contrast, summer stocktypes are grown over one or two growing seasons in the nursery,

NOTE: Steven Grossnickle can be reached at 250-544-0492; E-mail: sgrossnickle@cellfor.com. Copyright © 2003 by the Society of American Foresters.