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Summer planting performance of white spruce 1 + 0 container seedlings affected by nursery short-day treatment

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Abstract Impacts of nursery short-day treatments on the survival, growth and needle damage of about 5,000 1 + 0 container white spruce (*Picea glauca* [Moench] Voss) seedlings from a single seedlot were studied for two growing seasons following planting on July 22, 1999 at four boreal reforestation sites in Northern Alberta, Canada of varying soil texture, drainage, aspect, slope, and slope position. Each site was separated into two areas that were site-prepared by either ripping or mounding. When seedlings reached a height of about 20 cm under normal greenhouse growth conditions, the seedlings from different germination dates over a 7-week period were exposed to one of five different conditioning treatments (T), mainly through varying the duration of 12-h short-day exposure to 0 (T0), 3 (T3), 7 (T7), 10 (T10), or 15 (T15) days followed by different periods of reduced N supply. N-reduction produced few differences in needle nutrient concentrations and so was not considered a likely cause of differences in field performance. The treatments progressively (from T0 to T15) increased tolerance to drought and frost, and resulted in a similar seedling size for T3, T7 and T10 (planting height of 21 cm and ground diameter of 2.9 mm) although T0 seedlings were smaller (20 cm) and T15 taller (24 cm). The weather in 1999 was dry, particularly in the weeks immediately before and after planting, but relatively moist and favorable in 2000 and 2001 apart from one major frost event (-7°C) in May 2000. Survival, growth and needle damage varied substantially among sites and short-day treatments, and the treatment differences were largely consistent across the four sites. In general the growth was better on the ripped than on the mounded areas. Seedlings in T7 (intermediate tolerance) survived and grew best in the first year but T0 (actively growing) did best during the second year. After 2 years, no differences were observed among T0, T3 and T7 in mortality (18%) and total height growth (15 cm). However, T10 and T15 had higher mortality (24 and 43%), and lower height growth (12 and 10 cm, respectively). The percentage of seedlings showing very severe needle damage after 2 years increased from

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