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The effects of herbaceous and woody competition on planted white pine in a clearcut site

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ABSTRACT

We investigated the effects of herbaceous and woody vegetation control on the survival and growth of planted eastern white pine (*Pinus strobus* L.) seedlings through six growing seasons. Herbaceous vegetation control involved the suppression of grasses, forbs, ferns, and low-shrubs, and was maintained for 0, 2, or 4 years after white pine seedlings were planted. Woody control involved the removal of all tall-shrub and deciduous trees, and was conducted at the time of planting, at the end of the second or fifth growing seasons, or not at all. Seedling height and basal diameter responded positively and proportionally to duration of herbaceous vegetation control. Gains associated with woody control were generally not significant unless some degree of herbaceous vegetation control was also conducted. Only herbaceous control increased pine crown closure and rate of crown closure. Herbaceous control and the presence of 5000–15,000 stems per ha of young overtopping aspen were associated with reduced weevil (*Pissodes strobi* Peck.) injury and increased pine height growth. The study suggests that white pine restoration strategies on clearcut sites should focus on the proactive, early management of understory vegetation and the gradual reduction of overtopping cover from woody vegetation to create a seedling light environment that supports acceptable growth with minimal weevil damage.

1. Introduction

Eastern white pine (*Pinus strobus* L.) has made significant contributions to the economy of northeastern North America since colonial times and, despite being absent or greatly reduced over its former range (Aird, 1985; Frelich, 2002; Pinto et al., 2008), continues to be among our most valued species. Consistent demand for quality lumber (Wray, 1985), coupled with growing appreciation for its ecological, wildlife, and social benefits, has prompted ongoing interest in white pine regeneration and restoration in a variety of forest ecosystems.

Where mature white pine exists, the preferred regeneration method involves some form of partial harvesting, in combination with microsite/understory treatment to enhance natural and/or artificial regeneration (OMNR, 1998; Burgess and Wetzel, 2000). However, on the many sites where quality white pine has largely been extirpated, foresters have been forced to rely on artificial regeneration methods for the restoration of this species, with notably variable results. Damage to regeneration caused by white pine blister rust (*Cronartium ribicola* J.C. Fisch.) and white pine weevil (*Pissodes strobi* Peck.) has often been devastating, prompting foresters in some jurisdictions to abandon such restoration efforts altogether (Wray, 1985; Gross, 1985). Competition from vigorous herbaceous and woody species can exacerbate the effects of these pests and has the direct effect of reducing seedling survival and growth through critical reductions in available light, moisture, and nutrients (Stiell, 1985). The declining presence of frequent, low-intensity fires that may alleviate pressure from these factors and create favourable environments for white pine regeneration has also been problematic, contributing to wide variation in regeneration success (Weyenberg et al., 2004; Thompson et al., 2006). As a result, foresters are recognizing that successful white pine regeneration and restoration requires an integrated, holistic suite of intensive silviculture measures that include avoidance of high-hazard environments, timely and adequate vegetation management, stem density regulation, and, possibly, pruning, and direct pest-control tactics (Pitt et al., 2006).

Consistent operational application of timely and adequate vegetation management has been particularly difficult to achieve due to debate among foresters concerning the most appropriate

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