some ecological effects of shelterwood harvesting and site preparation in white pine forests

Growth and survival of planted white pine

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Background

In keeping with the province's *Crown Forest Sustainability Act* (RSO 1995), forest management practices used on public lands in Ontario must be ecologically sustainable. To achieve ecological sustainability, silvicultural practices must regenerate desirable tree species and improve or maintain site quality while maintaining ecological function (e.g., wildlife habitat, nutrient cycling, site productivity). However, white pine stands managed under the shelterwood system on productive sites cannot be successfully regenerated without seedbed preparation and control of competing vegetation. Early intervention, in the form of mechanical and/or chemical site preparation, may provide suitable growing conditions early in the establishment phase (Burgess and Wetzel 2000, Burgess et al. 2000), but can also be very costly. Thus, identifying site preparation techniques that are effective, economically justifiable, and environmentally sound is very important to resource managers. This project compares 4 site preparation treatments and their effects on the survival, growth, and quality of white pine regeneration (planted and natural) as well as the abundance and species of competing vegetation.

Objectives

The objectives of this study are:

- To examine the effects of operational shelterwood harvesting and 4 site preparation methods on the survival and growth of planted white pine
- To determine optimal harvest/site preparation treatment combinations for productive (i.e., competitive) sites in central Ontario
- To provide data for the development of early growth and yield curves for white pine stands managed under different site preparation regimes

Methods

Each treatment plot was planted with 1-year-old Jiffy container stock during May 6 -8, 1998 using operational standards for supplemental planting in shelterwoods (2.7 x 2.7-m spacing). After planting, 40 seedlings were selected from each treatment plot (40 seedlings x 5 treatments x 3 replicate blocks = total of 600 seedlings) and tagged for repeated growth and survival measurements. Total height, basal diameter (just above the root collar), and seedling condition were recorded in late autumn of 1998, 1999, and 2000 after diameter growth had ceased. Condition codes were assigned to each seedling to reflect any damage (browsed, broken leaders, necrosis, disease). Stem volume was used as an indicator of early biomass production. It was calculated for each seedling assuming a cone shape {i.e., 1/3 [p x (basal radius)^2 x height]}.

Data Analysis

Analysis of variance was used to determine the significance (a = 0.05) of treatment and block effects on mortality and seedling growth.

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Results and Discussion

Mortality of planted white pine seedlings was significantly lower in harvested and site prepared plots. Although there was little difference in mortality between treatments in the first season after planting, by the end of the second and third seasons survival was significantly higher in treated plots. Survival was marginally higher in the control plots (cut, no site prep) than the unharvested, unsite-prepared plots; however, survival was highest in site prepared plots. Higher light levels, and increases in soil temperature and moisture resulting from overstory thinning, scarification and vegetation control (Munson et al. 1993; Wetzel and Burgess 2001) may have been the main factors that influenced survival.

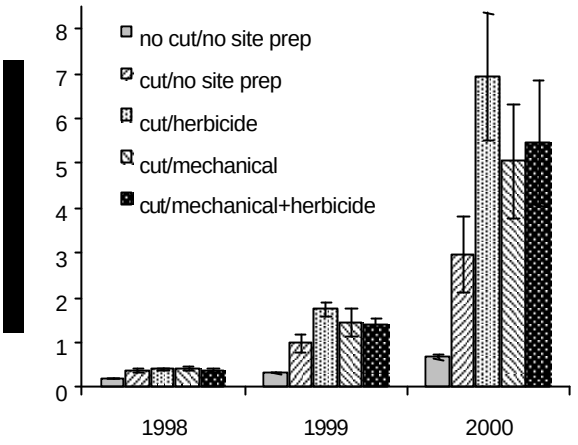

Figure 1. Post-treatment stem volumes of planted white pine seedlings. Error bars indicate the standard error of each mean.

Future Work

Fourth- and fifth-year post-treatment data will be collected and analyzed. Results will be presented in future publications and at workshops.

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