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Foothills Growth and Yield Association Quicknote #13

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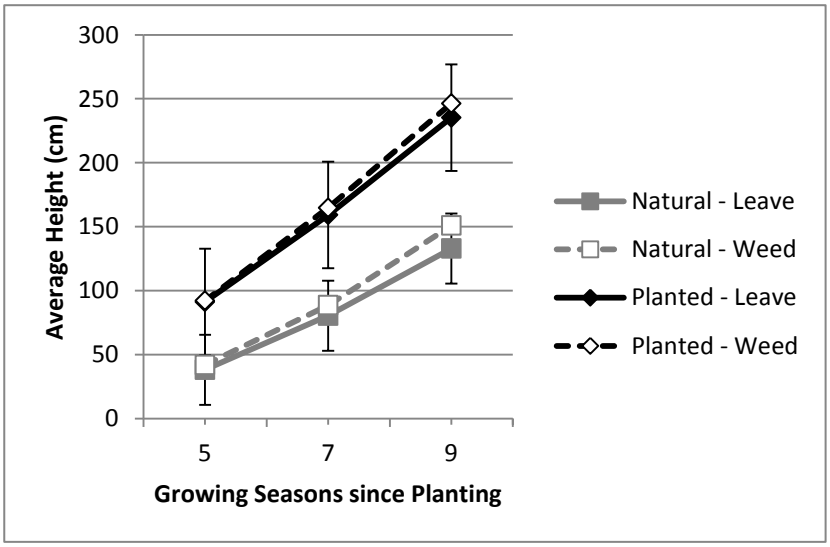
Regenerated Lodgepole Pine Trial 10-year Results: Growth and Natural Regeneration

Introduction

The Regenerated Lodgepole Pine Trial consists of 102 one-hectare permanent sample plot clusters ("installations") installed about 10 years ago throughout the Alberta foothills to monitor stand development of lodgepole pine, planted and naturally regenerated after harvesting, in relation to site and treatment factors. This note is one of 3 summarizing results after10 years. A more detailed report is also available.[1]

Tree Growth

Growth has been monitored on all installations for at least 9 full growing seasons since planting. The image at left shows pine established at the highest experimental planting density (4444 trees per ha) on a west-central Upper Foothills "e" ecosite. Tree height growth throughout the trial is strongly influenced by site (soil nutrient and moisture regime) but, on most sites, only slightly by weeding. Weeding (usually ground application of herbicide) has a more significant and positive effect on diameter growth.

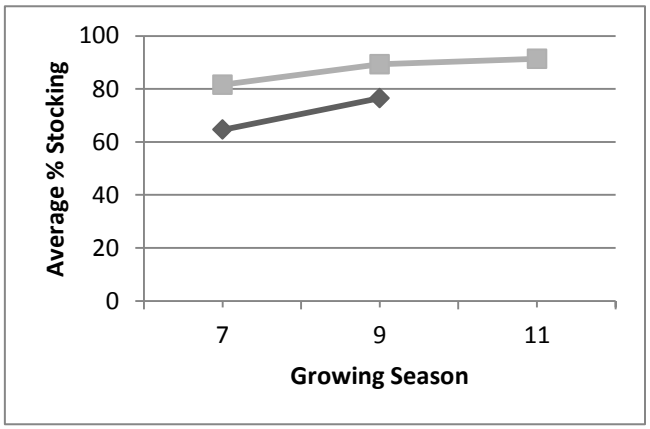


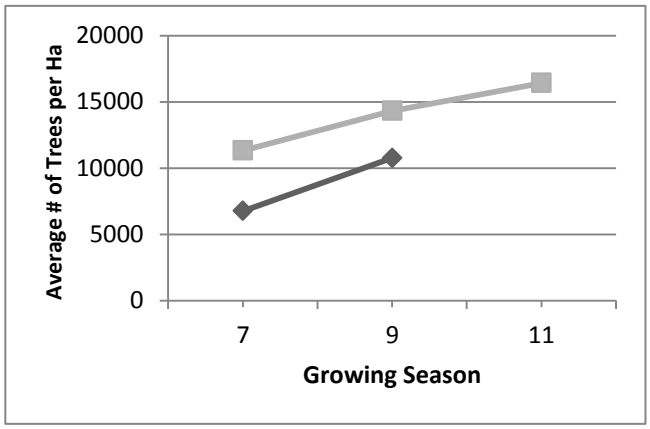
The graph at left shows recent trends in height of lodgepole pine averaged across all site types, but differentiated by stock type and weeding treatment. (Vertical bars indicate standard errors of the mean values.) Planted stock is currently ahead of natural regeneration. The apparent higher rates of growth indicated by the steeper slope of the graphs for planted stock may be explained by the continued ingress of naturally regenerated seedlings (see overleaf) rather than by actual growth differences. Comparisons between the tallest planted and naturally regenerated trees per plot suggest that leading natural regeneration is lagging about 2 years behind planted stock in height but growing at a similar rate.

[1] *Regenerated lodgepole pine trial 10-year crop performance report*. Foothills Growth and Yield Association, February 2012. http://foothillsresearchinstitute.ca/pages/Publications/

Rate and Amount of Natural Regeneration

Ingress of natural regeneration is being monitored on all installations (planted and non-planted) at the same times that planted stock are measured. Since the 7th growing season after planting, trees over and under 30cm tall have been differentiated in ingress counts. The 2 figures below show trends in percent stocking (left) and stand density (right) of coniferous ingress 30cm+ in height. The average trajectories of 26 installations that were 11 growing seasons since planting when last measured are shown in grey; those for the remaining installations, measured to their 9th growing season, are shown separately in black. (The latter are lower because they include a wider range of site types, some of which demonstrated poor natural regeneration potential.)





Trends over time suggest that average percent coniferous stocking is approaching culmination, although ingress of coniferous trees per ha above 30cm in height is still increasing by about 1000 stems per ha per year. Results illustrate the difficulty of judging regeneration success during the first 10 years of stand establishment.

Stocking and density of coniferous regeneration are strongly influenced by ecological site class and time since disturbance (harvesting or site preparation). Nutrient-rich sub-hygric and nutrient-poor hygric sites generally have poor potential for natural regeneration, with stocking typically less than 70% at 10-12 years after harvest. The potential of the other site classes in the trial (medium-poor nutrient regimes and mesic-subxeric moisture regimes) is usually much better, with stocking averaging over 85%. Except on the richest sites, weeding seems to have had little consistent effect. However, a number of competition-related variables are negatively correlated with ingress of natural regeneration, the most statistically significant ones being the number and size of deciduous trees present on the site, height of tall shrubs, and percent cover and height of forbs. A significant proportion of the variation in the stocking of natural regeneration 9 growing seasons after trial establishment can be explained by the number of cones per unit area, dropped from slash, measured following site preparation. (The image at right shows cones, mostly opened, remaining on the ground after 10 years.)