

Summary of:

Responses of Spruce, Aspen and Understory Vegetation to Wildfire and Five Site Preparation Treatments.

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Several silviculture methods have been developed to re-establish conifer forests after harvesting. These methods can influence the productivity and plant species diversity of regenerating sites by affecting the dispersal, establishment, growth and mortality of plants. This report describes the effects of several site preparation methods on forest regeneration and plant species diversity.

The site preparation treatments examined, in order of increasing disturbance to soil and vegetation, were:

- 1) undisturbed forest (control sample; no treatment)
- 2) natural regeneration after fire
- 3) natural regeneration after harvest
- 4) Bracke-cultivation
- 5) drum-chopping
- 6) disk-trenching
- 7) straight-blading

Results:

Spruce Establishment and Survivorship: The type of treatment had no significant effect on the establishment and survival of new spruce trees; however, the highest establishment rates were recorded in burned areas.

Tree Growth Rate: There were significant differences in spruce growth rate between treatment types. Spruce grew fastest in burned areas. The type of treatment had no significant effect on the growth rate of aspens; however, the highest aspen growth rates were recorded in areas with the most intensive site preparation.

Tree and Understory Mass: The type of treatment had no effect on total spruce and understory mass, but had a significant effect on total aspen mass. Aspen mass was highest in areas of natural regeneration, and lowest in areas of intensive site preparation. For both spruce and understory mass, there was a significant difference between the treated sites and the control sites. Spruce mass was significantly higher, and understory mass was significantly lower, in the control sites compared to the treated sites.

Stem Density: The type of treatment had no effect on spruce stem density, but had a significant effect on aspen stem density. Aspen density was highest in burned and naturally regenerating areas, and lowest in areas of intensive site preparation. **Species Composition and Diversity:** Species diversity was significantly lower in control sites than in treated sites, but there was no difference in species diversity between treated sites. Treatment type affected species composition. Differences in species composition were due mainly to the reduction of aspen growth on sites with mechanical site preparation. Further, some species found in the control, fire and natural regenerating sites were less common in sites with mechanical site preparation. Conversely, some species that were uncommon in less disturbed sites were found to be more common on sites with mechanical site preparation.

Site preparation was effective at suppressing aspen mass and stem density; however, this was offset by the relatively high growth rate of aspen in areas that received site preparation. The highest natural spruce establishment and growth rate of seedlings were observed in burned areas. This suggests that fire and site preparation differ in their ability to promote natural establishment and growth. Understory vegetation was affected by any form of disturbance, whether fire or site preparation, but the forms of disturbance differed little in their effects on understory mass or diversity.

Root mass values in naturally regenerating and Bracke-cultivated sites were closest to the values observed in control sites. Since nutrient leaching results from the removal of early successional vegetation, natural regeneration and Bracke-cultivating are probably the treatments most effective at conserving nutrients and enhancing sustainable forest productivity.