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NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE
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# SEEDING BLACK SPRUCE ON BRUSHY LOWLAND SUCCESSFUL IF VEGETATION DENSITY KEPT LOW

**ABSTRACT.—A study of direct seeding black spruce on brushy lowland in north-central Minnesota indicates reduction of vegetation regrowth, rather than seedbed preparation, is the major requirement for success.**

**OXFORD:** 232.33:232.21:174.7(776) *Picea mariana.*
**KEY WORDS:** *Picea mariana,* **reforestation, seedbed preparation, vegetation regrowth, leaf litter.**

Reforesting the Lake States' 2 to 3 million acres of brushy lowland is desired and should be possible because much of it was occupied by black spruce (*Picea mariana* (Mill.) B. S. P.) before logging. Many nonstocked areas contain scattered seed trees or are adjacent to mature stands, and so have been exposed to natural seeding. However, black spruce reproduction remains sparse, apparently because seedbed conditions are unfavorable. Planting has also generally failed on brushy lowland in the past, so direct seeding was studied as an alternative.[1]

The objective was to find out what seedbed conditions are required for successful seeding of black spruce. A typical brushy lowland was selected in north-central Minnesota, and several seedbed treatments were applied to small plots where seedling and environmental variables were measured during one growing season.

## PROCEDURE

The study was made in a brushy lowland near Big Falls, Minnesota, where a well stocked stand of black spruce had been clearcut 10 years earlier.[2] The vegetation was mainly dense clumps of speckled alder (*Alnus rugosa* (Du Roi) Spreng.) interspersed with patches of grass and sedge (fig. 1). The ground surface was a typical mosaic of sphagnum moss and leaf litter underlain by organic soil about 1 m. deep.

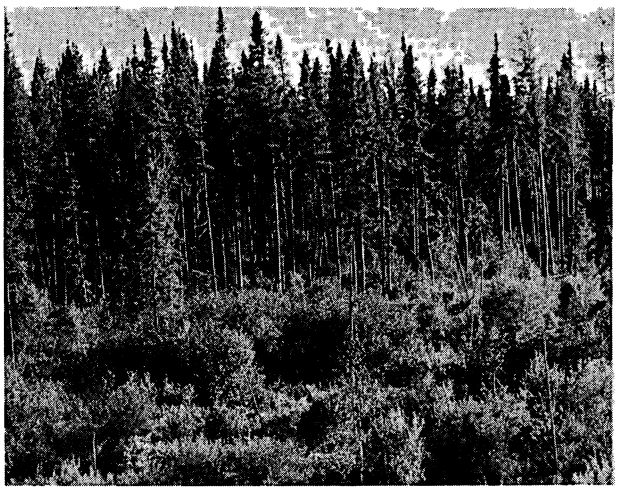

*Figure 1.—Edge of brushy lowland near study area and part of black spruce stand that occupied area 10 years earlier.*

[1] *Planting was also studied but the results were published previously (Johnston 1970).*

[2] *The cooperation of Minnesota's Division of Lands and Forestry is gratefully acknowledged.*

*Figure 2.—Typical plots in mid-August shaded by vegetation regrowth (left) and kept unshaded by frequently clipping regrowth (right). Top of small mammal exclosure in background is about 60 cm. high.*

caused by moss smothering. In contrast, such mortality was high on shaded seedbeds of untreated and compacted sphagnum. Second, scalping exposed a soil surface that was more favorable for seedling survival than the ash layer produced by burning. This surface had fewer occurrences of lethal temperatures (more than 125° F.) and seemed to stay wetter.

## DISCUSSION

The results of this study indicate that reduction of vegetation regrowth, rather than seedbed preparation, is the major requirement for successful direct seeding of black spruce on brushy lowland. For example, seedling percent may be good on scalped sphagnum at the end of one growing season, but failure is inevitable because rapid regrowth (1) reduces light intensity well below that required for good seedling growth (Logan 1969) and (2) produces a heavy leaf fall that will smother many seedlings during winter. An efficient method is therefore needed to reduce vegetation regrowth and to keep it low until seedlings become established.

Scalping deeper than 10 to 15 cm. would remove more roots and so should help reduce vegetation regrowth. Such scalping should also expose favorable seedbeds whether the ground surface is sphagnum

*Figure 2.—Typical plots in mid-August shaded by vegetation regrowth (left) and kept unshaded by frequently clipping regrowth (right). Top of small mammal exclosure in background is about 60 cm. high.*

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moss or leaf litter. But care must be used to prevent flooded seedbeds, because the water table is usually near the surface in brushy lowlands. After seeding, herbicide spraying is probably the most practical way to kill back vegetation regrowth and thus keep its density low. Specific recommendations on deeper scalping and herbicide spraying will require additional research, however.

Finally, cost data are needed to determine whether direct seeding or planting is cheaper for reforesting black spruce on brushy lowland. This would require pilot-scale trials for comparing the total cost of scalping, seeding, and herbicide spraying with the total cost of transplants, careful planting in sphagnum moss, and herbicide spraying (Johnston 1970).

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