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THE EXTENT AND CHARACTER OF REGENERATION IN UNCUT BLACK SPRUCE SWAMP STANDS OF NORTH-CENTRAL MINNESOTA

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The extent and character of regeneration in uncut black spruce (*Picea mariana*) swamp stands are matters of considerable importance to those concerned with the silviculture of this extensive, high value northern Minnesota forest type. For that reason the subject was specifically investigated in Koochiching county by the senior author under the 1951-52 Minnesota and Ontario Paper Company Graduate Research Fellowship in Forestry. The study was confined to pure, uncut black spruce stands where mature trees averaged at least 25 feet in height, basal area generally exceeded 50 square feet per acre and age was greater than 55 years. The data which follow are based on 1,950 milacre quadrats selected and studied within a 200 square mile area in the vicinity of Big Falls, Minnesota.

Frequency of Regeneration in Koochiching County Uncut Swamp Black Spruce Stands as Affected by Site and Overstory Density.

	Low overstory density (50-90 sq. ft. basal area per acre)	Medium overstory density (95-130 sq. ft. basal area per acre)	Heavy overstory density (135-190 sq. ft. basal area per acre)
Good site			
Total no. quadrats*	80	340	230
No. quadrats stocked	45	180	94
% quadrats stocked	56	53	41
Medium site			
Total no. quadrats	110	290	290
No. quadrats stocked	70	161	128
% quadrats stocked	64	56	44
Poor site			
Total no. quadrats	150	270	190
No. quadrats stocked	114	198	115
% quadrats stocked	76	73	61

* Quadrat size 6.6 x 6.6 ft.

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The above stocking data permit the following conclusions: 1) For all sites and overstory density classes studied, the advance reproduction stocking frequency was high enough to be considered of great importance in swamp black spruce management. 2) For all sites stocking frequency was highest in low overstory density stands and declined progressively (but not always substantially) in the higher overstory density categories. 3) For each overstory density category, stocking frequency was highest on poor sites and declined progressively (but here, also, not always substantially) as the site improved.

Other information resulting from this study:

1. Stocking frequency appeared not to be affected by overstory age.
2. The average number of reproduction for all quadrats examined was 1,830 per acre. Except for stands of high density (135-190 sq. ft. of basal area per acre) all areas examined had more reproduction than overstory stems, averaging 29 per cent more. The reproduction stocking frequency was found to be consistently lower, however, than the stocking frequency of the overstory, averaging 78 per cent of the latter.
3. Ninety-three per cent of all reproduction found was black spruce, the remainder mostly balsam fir (*Abies balsamea*). The latter was found to be most important numerically on good sites and in young stands.
4. Areas with a medium degree of brush density were found to be better stocked than areas having no brush or only light brush density. Plots heavily shaded by the overstory had less reproduction than medium- or lightly-shaded plots. Stands where coarse litter covered the forest floor had less reproduction than where such debris was absent. Low herbaceous cover density had little apparent effect on reproduction.
5. Layers accounted for 53 per cent of all best specimens of reproduction ("best" denoting that individual seedling or layer which in the observer's opinion would be most likely to survive) and were most important on poor sites and in stands of low density, but especially in old stands.
6. Most of the best specimens of reproduction had only medium vigor. Seedlings showed more vigor than layers, and good sites contained a greater proportion of high vigor specimens than poor sites. About 71 per cent of all best reproduction specimens showed a good chance for survival. Seedlings were estimated to have a much greater survival potential than layers.

The above conclusions and the data upon which they are based, plus the information and results made available in Minnesota Forestry Note No. 3 (2) provide at least a partial basis for establishing swamp black spruce silvicultural management guides in northern Minnesota.

(2) Buckman, Robert E. and Arthur E. Schneider. 1952. Regeneration following cutting in black spruce swamps. Minnesota Forestry Notes No. 3.