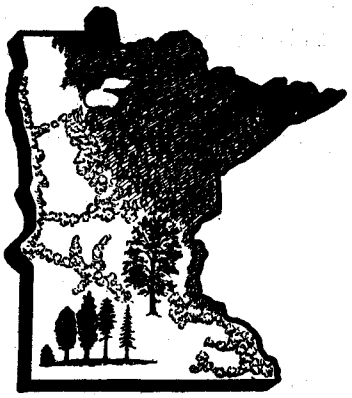

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REGENERATION FOLLOWING CUTTING IN BLACK SPRUCE SWAMPS 1)

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The study from which the following data were derived was concerned with the status of restocking following cutting in black spruce swamps. The following tables and conclusions are based upon examinations of 2900 mil-acre quadrats in Koochiching County. Data are grouped into three site classes and four categories of residual stand basal area.

Table 1. Abundance of regeneration on medium sites following clearcutting in relation to number of years since cutting.

Years since cutting	Basis (Number of quadrats)	Average number of stems per acre (black spruce, balsam, tamarack)	Percent of quadrats stocked
8	80	2362	56
10	230	1978	61
12	90	1977	68
14	140	1878	71

The abundance of regeneration thus remained fairly constant after the initial period (8 years) of establishment. Distribution improved appreciably, however, between 8 and 13 years after cutting. It is probable that excessive crowding, competition, and other factors eliminated some early regeneration, but that additional seedlings became established in other locations favorable for survival and growth, thus improving the distribution percentage.

Table 2. Distribution of regeneration as affected by site and degree of cutting.

Site	Residual basal area (sq.ft. per acre)			
	0-9.9 (Clearcut)	10-49.9	50-89.9	90 plus
	Percent of quadrats stocked			
Good (Swamp margin)	28 (180 Quads.)	16 (180 Quads.)	34 (110 Quads.)	-- (---Quads.)
Good (True peat)	65 (260 Quads.)	65 (120 Quads.)	60 (110 Quads.)	44 (140 Quads.)
Medium	66 (700 Quads.)	85 (20 Quads.)	63 (30 Quads.)	34 (50Quads.)

Table 2 data indicate a generally poor stocking of swamp margin good site areas regardless of the degree of cutting. A medium degree of restocking occurred uniformly on true peat good site and medium site areas except where more than 90 square feet of basal areas per acre were left in partial cuts. Under the latter condition, the degree of stocking was considerably poorer on both sites.

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Table 3. Layering as a source of regeneration in relation to site and degree of cutting.

Site	Residual basal area (sq. ft. per acre) 0-9.9 (Clearcut)	10-49.9	50-89.9	90 plus
	Percentage of stocked quadrats where a layer was the best specimen of regeneration			
Good (Swamp margin)	8 (180 Quads.)	7 (180 Quads)	14 (110 Quads.)	-- (--- Quads.)
Good (True peat)	11 (260 Quads.)	29 (120 Quads)	33 (110 Quads.)	44 (140 Quads.)
Medium	4 (700 Quads.)	18 (20 Quads)	84 (30 Quads.)	18 (150 Quads.)

The above data indicate that, for the quadrats investigated, layering was of considerable importance in the regeneration of cut-over black spruce sites. Its importance was generally greatest on true peat good sites, next on medium sites, and least on swamp-margin good sites. With the exceptions evident, a trend toward more layering with increasing residual basal area may be noted.

Table 4. Percentage of quadrats stocked before cutting in relation to site and degree of cutting.

Site	Residual basal area (sq. ft. per acre) 0-9.9 (Clearcut)	10-49.9	50-89.9	90 plus
	Percentage of stocked quadrats where the best specimen of regeneration was established before cutting.			
Good (Swamp margin)	10 (180 Quads.)	18 (180 Quads.)	25 (110 Quads.)	-- (--- Quads.)
Good (True peat)	12 (260 Quads.)	38 (120 Quads.)	49 (110 Quads.)	49 (140 Quads.)
Medium	13 (700 Quads.)	18 (20 Quads.)	84 (30 Quads.)	53 (150 Quads.)

Both site and degree of cutting appeared to bear significantly on the percentage of quadrats stocked before cutting (on the basis of the regeneration specimen with the best chance for survival). Very likely, similar stands on a given site in all of the areas studied may have had an average comparable amount of regeneration present prior to cutting, and the various degrees of cutting simply influenced survival and growth as indicated.

Conclusions:

1. Even on the study areas classified as clearcut, reproduction distribution improved appreciably with the passage of time following cutting.

2. Except where residual basal area amounts to 90 or more square feet per acre, degree of cutting appeared to have little bearing on the percent of quadrats stocked. Hence, the need for a variety of purely regeneration cuttings in black spruce swamps may well be questioned for Northern Minnesota.

3. Swamp margin good sites have not reproduced satisfactorily in the areas investigated. Additional experimental work is required to find practicable means of improving stocking on such sites.

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