RESEARCH NOTES

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SEED PRODUCTION IN A SECOND-GROWTH BALSAM FIR STAND IN THE LOWER ST. LAWRENCE MODEL FOREST

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INTRODUCTION

Natural regeneration with the shelterwood method is strongly recommended because it is flexible for configuring and adjusting canopy density to the requirements of most species. However, successful regeneration depends on the abundance and quality of the seed bank, and these variables are affected by physiological and climatic factors.

Although softwood reproductive cycles are fairly well known, there is very little specific information about species' phenological variations, seed production dynamics and factors governing seed yield in natural stands. This knowledge is important when we are considering the renewal and composition of forest stands in the context of sustainable management.

The purpose of this study was to assess seed production dynamics for regenerating the balsam fir-yellow birch stand with the shelterwood method.

MATERIALS AND METHODS

The stand, located in the Lower St. Lawrence Model Forest, is a 55-year-old high forest consisting mainly of balsam fir, along with white spruce, white birch, red maple, yellow birch and eastern white cedar, species that have reached the stage of regular seed production.

Balsam fir stand where the study took place

Seeds scattered on the ground were harvested in traps protected from pests, while soil samples were taken to count and analyze buried seeds. Seeds were harvested in traps on six different occasions between September 8 and November 8, 1994, by which time the vast majority of the fir seeds had reached the ground. Soil samples containing buried seeds were taken on November 8, 1994 and September 8, 1995, that is, outside the period of the seed rain.

In the laboratory, the seeds in the traps were identified, separated according to quality and counted. Before the buried seeds were subjected to the same operations, the soil samples were first separated into two layers, the first measuring an average of 2 cm thick, the second almost 4 cm on average. Temporal variations of the seed rain, the number of seeds per square meter, the average weight of the seeds and their germinative capacity were also assessed.

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RESULTS AND DISCUSSION

The seed rain started at the beginning of September, except cedar seeds, which began a month later; the heaviest seed rain was in mid-October for all species.

Almost all of the seeds harvested in the traps were intact. Most of them came from balsam fir, white spruce, white birch and eastern white cedar trees, which reflects the current composition of the forest stand. Using the material harvested from the traps, the number of seeds per square meter was estimated, but the accuracy of the assessment was acceptable only in the case of the balsam fir, as can be seen in Table 1. For the birch and cedar trees, the very high coefficients of variation show that crop estimates were not very reliable for the operation as a whole.

Table 1.

Number of harvested seeds in the traps and an estimate in m²

	Number of seeds in the traps			Estimated number in m²		
Species	Total	Intact	Deteriorated	Average	Standard deviation	Coefficient of variation
Fir	16,180	15,588	592	2,706	469.2	17.3%
Spruce	2,289	2,260	29	392	212.9	54.3%
Birch	683	683	0	119	130.4	109.6%
Cedar	460	460	0	80	241.7	302.1%

From this data, we can conclude that 1994 was a very good seed year for the balsam fir, while spruce and birch yields were fairly average, compared with the years of abundant production.

The average weight of fir and cedar seeds was comparable to the provincial average, but below average for spruce and birch. The germinative capacity, expressed by the ratio between the number of germinated seeds and the total number of seeds tested, showed that it was fairly close to the provincial averages in the germinator for fir, birch and cedar. However, it was significantly below average for spruce.

A count of the number of buried seeds showed that they were found mainly in the litter layer of soil and 70% of them were intact. There were very few seeds in the humus layer and almost 50% of them had deteriorated.

CONCLUSION

Balsam fir experienced a very good seed year in 1994. The species' seeds were distributed regularly throughout the stand, reflecting a uniform distribution of seed trees. Seed germination is greatest for fir and spruce in October, when seed rain begins fast in the stand. For these two species, the buried seeds are concentrated in the first 2 cm of the organic layer of the soil with a very poor rate of germination for intact seeds, which suggests there is not a satisfactory stock of viable seeds in the soil.

Deterioration of seeds, combined with a rapid decrease in their germinative capacity, explains the inability of fir and spruce trees to regenerate naturally in years during which seed production is low. A shelterwood cutting system should be the preferred method to ensure the best possible natural regeneration.

Harvesting seeds in a trap

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