

THIS FILE COPY MUST BE RETURNED

TO: INFORMATION SECTION,
NORTHERN FOREST RESEARCH CENTRE,
5320-122 STREET,
EDMONTON, ALBERTA,
T6H 3S5



Forest Research Branch



**RESULTS OF EXPERIMENTAL SEEDING
OF BALSAM FIR ON A RECENT BURN**

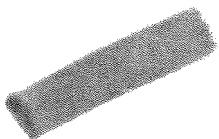
by

R. S. VAN NOSTRAND

Sommaire et conclusions en français

DEPARTMENT OF FORESTRY PUBLICATION NO. 1103

1965



Published under the authority of
The Honourable Maurice Sauvé, P.C., M.P.,
Minister of Forestry
Ottawa, 1965.

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1965

Catalogue No. Fo 47-1103

CONTENTS

	PAGE
INTRODUCTION.....	5
DESCRIPTION OF AREA.....	5
METHOD AND PROCEDURE.....	5
RESULTS AND DISCUSSION.....	6
SUMMARY AND CONCLUSIONS.....	10
SOMMAIRE ET CONCLUSIONS.....	11

1

1

Results of Experimental Seeding of Balsam Fir on a Recent Burn¹

by

R. S. VAN NOSTRAND²

INTRODUCTION

Balsam fir (*Abies balsamea* (L.) Mill.) is noted for its ability to reproduce prolifically following cutting. Some fir stands are known to have originated from fire, but this does not often occur since the time of year and seed crop at the time of burning are important factors in bringing this about.

This study was designed to determine the relative success of two methods of artificial seeding on a recent burn. The study area, located in north-western Newfoundland near Hampden at approximate latitude 49° 34' N, longitude 56° 49' W, was clear cut for pulpwood between 1950 and 1952 and was burned by wildfire early in July of 1952. Seeding was done in June of 1953.

DESCRIPTION OF AREA

The experiment is situated on an exposed upper north-west slope at an elevation between 650 and 700 feet above sea level. The slope varies from nearly flat at the top to twenty per cent gradient on some portions lower down. The soil generally is well-drained with a very stony sandy-loam texture. Some large boulders are exposed. The fire which destroyed all advance growth, caused only a light charring to the surface of the organic layer. This layer varied in thickness from three to five inches. The ground was littered with many trees which had fallen prior to logging (See Figure 1).

At the time of plot establishment some species of minor vegetation were making a reappearance. These included *Cornus canadensis*, *Maianthemum canadense*, *Epilobium angustifolium*, *Clintonia borealis*, *Polytrichum* spp. and certain species of liverworts. Scattered specimens of white birch (*Betula papyrifera* Marsh.) and pin cherry (*Prunus pennsylvanica* L.f.) were also present.

* METHOD AND PROCEDURE

The experiment was laid out in a random block arrangement with eight replications of five treatments. The treatments, which are described below, give the number of balsam fir seed applied to a milacre quadrat.

1. 300 seeds broadcast on turf (high intensity)
2. 150 seeds broadcast on turf (medium intensity)
3. 30 seeds broadcast on turf (low intensity)
4. 20 seeds sown in prepared seedspot.
5. Unseeded control

Eight plots, each consisting of twenty-five square milacre quadrats arranged in five rows of five quadrats each, were located randomly over the slope (Figure 1). The rows within each plot were then assigned to the different treatments at

¹ Department of Forestry, Canada, Forest Research Branch Contribution No. 671.

² Research Officer, Forest Research Branch, Department of Forestry, St. John's, Newfoundland.

random. The seed came from the Green River area of New Brunswick and had an indicated viability of thirty per cent. In seed-spotting, a depression approximately six inches in diameter, was made in the centre of the quadrat by scuffing the burned turf; the seed was deposited and then stepped on. In most instances the scuffing exposed the mineral soil, but where the turf was very thick this was not practical.



FIGURE 1. Area at establishment. Note string and metal stakes.

Annual fall examinations were made from 1953 to 1958, and a final examination was made in the fall of 1963. At each examination a record was made of the heights of coniferous seedlings, plus general information regarding minor vegetation.

RESULTS AND DISCUSSION

Ten years after establishment of the study an almost complete cover of white birch regeneration, five to six feet high, obscures the softwood regeneration, and as well hides the relatively unchanged clutter of stumps and fallen trees (See Figures 2 and 3). Other hardwood species occur scattered throughout. Minor vegetation presents an almost complete carpet with *Cornus canadensis* being by far the most abundant. Other less abundant but important species include *Polytrichum juniperinum*, *Epilobium angustifolium*, *Anaphalis margaritacea*, *Maianthemum canadense*, and *Clintonia borealis*. During the earlier years of this study, *Epilobium angustifolium* was by far the most abundant species, but it has largely been replaced by the birch regeneration.

Three of the four seeding treatments show identical numbers of stocked quadrats after ten years (Table 1). However, there was considerable variation in numbers of seedlings produced and in average seedling heights. The medium intensity broadcast treatment, and the seedspots yielded very similar numbers of seedlings. The high intensity treatment produced approximately forty per cent more seedlings than either of the other two. The low intensity treatment,



FIGURE 2. General view of experimental area in 1963.



FIGURE 3.
Dense white birch with 3.5 foot
fir in foreground.

which had a stocking success of less than eight per cent, was considered unsuccessful. The seedspot treatment appeared superior during the earlier years, and this earlier start gave the seedlings a decided advantage in keeping abreast of competing vegetation (Figure 4). The average height of 43.8 inches for the seedspot seedlings (Table 2) is significantly greater (at the ninety-five per cent level of probability) than the average heights of seedlings resulting from the broadcast treatments. This could be a vital factor when considering artificial seeding of an area where natural vegetative competition is expected to be great.

TABLE 1. PER CENT OF QUADRATS STOCKED TO BALSAM FIR
BY TREATMENT AND YEAR
(40 Quadrats per treatment)

Year	Treatment				
	Broadcast High Intensity	Broadcast Medium Intensity	Broadcast Low Intensity	Seedspot	Control
Sept. 1953	17.5	7.5	2.5	45.0	0.0
Sept. 1954	27.5	17.5	2.5	42.5	0.0
Sept. 1955	27.5	12.5	5.0	37.5	0.0
Sept. 1956	27.5	17.5	5.0	32.5	0.0
Sept. 1957	35.0	17.5	5.0	37.5	0.0
Sept. 1958	35.0	25.0	5.0	37.5	0.0
Sept. 1963	45.0	45.0	7.5	45.0	5.0

A further advantage of seedspotting over broadcast seeding is that far less seed is required to produce the same number of seedlings. Table 2 shows the number of viable seed required to produce one seedling. Although the numbers for the broadcast treatments vary somewhat, the average is approximately nine times that required for seedspotting.

The increase of twenty balsam fir seedlings on the high and medium intensity treatments during the 1958-63 period is surprising, when considered in relation to the fact that only six fir seedlings originated on the other three treatments during the same period. The appearance of two fir seedlings on the control indicates that some seed from an outside source has reached the study area. However, the fact that the increase in new seedlings was far greater where large quantities of seed had been sown than it was where smaller quantities had been sown, strongly suggests that these late seedlings resulted from delayed germination of the sown seed. Any differences in germination due to seedbed receptivity seem most unlikely, since the low intensity treatment, the seedspot treatment, and the control each produced more than their share, percentage-wise, of natural stocking to softwoods other than balsam fir.

Also noteworthy is the abundance of natural softwood reproduction of other species. Forty-three specimens of black spruce (*Picea mariana* (Mill.) BSP.), five of larch (*Larix laricina* (Du Roi) K. Koch), and one of white spruce (*Picea glauca* (Moench) Voss), with average heights of twenty-three inches, twenty-four inches, and forty-nine inches respectively, were found on the 200 quadrats. These three species represented a combined natural stocking of 21.5 per cent of the quadrats.

White birch is present in nearly eighty-eight per cent of the quadrats, and is by far the most abundant tree species. Some quadrats may contain as many

TABLE 2. NUMBERS AND HEIGHTS OF BALSAM FIR SEEDLINGS BY TREATMENT FOR 1957, 1958, AND 1963.

Year	Treatment													
	Broadcast High Intensity (3600 Seeds)**			Broadcast Medium Intensity (1800 Seeds)**			Broadcast Low Intensity (180 Seeds)**			Seedspots (240 Seeds)**			Control	
	No. of Seed- lings	Ave.* Height in Inches	No. Seeds** Per Seed- ling	No. of Seed- lings	Ave.* Height in Inches	No. Seeds** Per Seed- ling	No. of Seed- lings	Ave.* Height in Inches	No. Seeds** Per Seed- ling	No. of Seed- lings	Ave.* Height in Inches	No. Seeds** Per Seed- ling	No. of Seed- lings	Ave.* Height in Inches
1957	22	5.7	—	11	5.9	—	2	4.5	—	23	8.8	—	—	—
1958	23	8.8	—	15	7.0	—	2	5.5	—	22	12.0	—	—	—
1963	34	21.1	106	24	26.3	75	3	15.0	60	25	43.8	10	2	1.5

*Average height using only the tallest seedling from each stocked quadrat.

**Viable Seed.



FIGURE 4. Elite seedspotted fir
89 inches in height.

as twenty stems ranging in height up to eight feet, thus providing severe competition for other species. Scattered trembling aspen (*Populus tremuloides* Michx.) and pin cherry occur throughout.

During the early remeasurements moose browsing, particularly of the birch, was prevalent and it was thought that this animal might influence the development of both the fir and birch. However, during the 1963 examination no moose damage whatsoever was noted.

SUMMARY AND CONCLUSIONS

A study to determine the relative success of two methods of artificial seeding of balsam fir on a recent burn, was set up near Hampden in north-western Newfoundland. The study area was clear cut for pulpwood between 1950 and 1952, and burned in July of 1952. The experimental layout consisted of a random block arrangement with eight replications of five treatments. Treatments, which were assigned randomly, consisted of three intensities of broadcast seeding (300, 150, and 30 seeds per milacre quadrat), a prepared seedspot treatment (20 seeds per spot), and an unseeded control. Seeding was done in June of 1953, using seed which was thirty per cent viable. Measurements were carried out annually up to 1958, with a final examination in 1963.

Ten years after seeding, the two broadcast treatments using 300 and 150 seeds, and the seedspot treatment, each attained a stocked quadrat tally of forty-five per cent. The fourth treatment, using 30 seeds per milacre broadcast, which

shows a stocking of less than eight per cent, was considered unsuccessful. The average height of seedlings on the seedspot (43.8 inches) was significantly greater than that on the other treatments.

Natural white birch regeneration, attaining heights up to eight feet, dominates the whole study area, and natural softwood regeneration, mainly black spruce with a sprinkling of balsam fir, white spruce, and larch, is present in 21.5 per cent of the quadrats.

This study has led to the following conclusions:

1. Balsam fir seeded on seedspots from which at least some of the turf has been removed, will result in more prompt germination than broadcast seeding on burned turf.
2. The amount of seed required to produce a given number of seedlings, on recent burns, is approximately nine times as great for broadcast seeding as for seedspots.

SOMMAIRE ET CONCLUSIONS

L'auteur a entrepris une étude, près de Hampden, dans le nord-ouest de Terre-Neuve, en vue de déterminer l'efficacité comparée de deux méthodes d'ensemencement artificiel de sapin baumier en terrain récemment ravagé par un incendie. L'aire à l'étude avait fait l'objet d'une coupe à blanc de bois à pâte entre 1950 et 1952, et avait été incendiée en juillet 1952. Le terrain d'expérimentation avait été partagé en blocs délimités au hasard; chacune des cinq façons d'ensemencement avait fait l'objet de huit expériences. Les traitements, qui étaient distribués au hasard, consistaient en troisensemencements à la volée et à intensités différentes de 300, 150 et 30 semences par quadrat d'une milliacre de superficie, en un ensemencement par places préparées à l'avance (20 semences par place) et en un emplacement non ensemencé. L'ensemencement eut lieu en juin 1953, et les semences accusaient un coefficient de viabilité de 30 p. 100. On a fait un relevé annuel jusqu'en 1958, puis on a procédé au dénombrement final en 1963.

Dix ans après l'ensemencement, les deux ensemencements à la volée, à raison l'un de 300 semences et l'autre de 150 semences par milliacre, ainsi que l'ensemencement par places, accusaient une venue de quarante-cinq pour cent des semences. Le quatrième, soit l'ensemencement à la volée à raison de 30 semences par milliacre et qui accusait une venue de moins de huit pour cent des semences, a été considéré comme un insuccès. La hauteur moyenne des sujets semés par places (43.8 pouces) était nettement supérieure à celle des sujets semés selon les autres méthodes.

La régénération du bouleau à papier, dont certains sujets atteignent une hauteur de huit pieds, domine toutes les essences de l'aire à l'étude, et les résineux de régénération naturelle, pour la plupart des épinettes noires et quelques sapins baumiers, épinettes blanches et mélèzes laricins, se rencontrent dans 21.5 p. 100 des quadrats.

L'étude entreprise a conduit aux conclusions suivantes:

1. Les semences de sapin baumier semées par places en terrain où on a enlevé au moins une partie de la couche végétale, germent plus rapidement que celles qu'on sème à la volée en terrain brûlé.
2. Lorsqu'on sème à la volée, il faut à peu près neuf fois plus de semences pour obtenir un nombre donné de sujets en terrain brûlé que lorsqu'on sème par places.