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SUMMARY OF EXPERIMENTS AND STUDIES BEING CARRIED OUT AT NORTH POND FOREST EXPERIMENTAL AREA

by
J. Richardson

FOREST RESEARCH LABORATORY
ST. JOHN'S, NEWFOUNDLAND
INFORMATION REPORT N-X-5



FORESTRY BRANCH
MAY, 1967

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CONTENTS

	<u>Page</u>
<u>Introduction</u>	1
<u>Description of Area</u>	
Topography	2
Soils	2
Forest and its history	
<u>Supporting Work</u>	
Boundary line surveys	4
Regeneration and mapping survey	4
Arboretum	5
Nursery	6
Meteorological observations	7
Phenological observations	9
Relationship of microclimate to development of natural seedlings	11
<u>Broadcast Seeding Experiments</u>	
Determination of quantity of sitka spruce required per unit area for broadcast seeding of recently burned land	11
Broadcast seeding a 1961 burn by cyclone seeder using two intensities of black spruce.....	12
Broadcast seeding a 1961 burn by cyclone seeder following ground scarification	14
Aerial seeding of burned-over land using a mixture of a black spruce and jack pine seed	15

	<u>Page</u>
<u>Seedsplotting Experiments</u>	
Seedsplotting of black spruce at intervals throughout the growing season	17
<u>Capsule Planting Experiments</u>	
Comparison of different dates of planting sitka spruce by the capsule method	18
Field test of capsule planting using high-impact polystyrene tubes	19
<u>Planting Experiments</u>	
White spruce provenance plantation	21
Red spruce provenance plantation	22
Plantation trial of eight pine species	23
<u>Scarification by Swedish SFI Scarifier</u>	24

APPENDIX

- A. File Reference to North Pond Work, Silvicultural
Section, Newfoundland Region.
- B. Reference map of North Pond Forest Experimental
Area.

SUMMARY OF EXPERIMENTS AND STUDIES
BEING CARRIED OUT AT
NORTH POND FOREST EXPERIMENTAL AREA

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INTRODUCTION

The North Pond Forest Experimental Area was established primarily for experimental work in the reforestation of burned lands. It was selected as being representative of much of the burned cut-over land resulting from the 1961 fires. However, the boundaries also enclose sufficient unburned productive and unproductive forestland to enable related research on these sites to take place. To date all experimental reforestation work has been confined to burned sites. The purpose of this report is to provide a ready source of reference to all the work which has been and is being carried out at North Pond. The experimental area is rectangular in shape, measuring six miles in the east-west direction and two miles from north to south. It lies immediately south of North Pond and Mint Pond, and is roughly 18 miles south of Gander. Access is from Gambo by a Price (Nfld.) Limited woods road. The Department of Forestry and Rural Development has a long-term lease on the site and has legal title to a five-acre area in the northeast corner where a four-bedroom cottage is located.

DESCRIPTION OF AREA

Topography

The physiography is generally rolling and is characterized by a gentle northern slope from a bog-covered height of land near the southern boundary (700 feet elevation) to the valley of Mint Brook (300 feet elevation above sea level). Two brooks originate in the bog and meet in the eastern part of the area before flowing into North Pond. One of these lies in a small valley, thus interrupting the regular northward slope.

Soils

No outcrops of bedrock have been found, but bedrock of sedimentary origin occurs immediately to the north. A deep layer of glacial till covers the experimental area under surface soils of predominantly sandy loam texture. However, all combinations from sand to clay-loam occur. Rocks and boulders, at or near the surface, are common. Humus depths vary from nil to two feet or more.

The Forest and Its History

The present forest is directly related to fire history. Company maps based on a 1934 line-plot cruise show all good sites occupied by productive pulpwood forest. The stands varied as to percentage of fir but those containing a high proportion of black spruce predominated. The stands were relatively young and obviously originated following fire. Extensive fires occurred in this part of Newfoundland in 1865 and again in 1886. It is possible that either or both fires affected parts of the experimental area. Although white

birch was not tallied in 1934 there is ample evidence that it was a prominent species in some stands. Residual white pine which must have survived several fires still occurs as a dying species.

In 1941 fire swept the eastern part of the area in a strip between half and one mile in breadth. Salvage cutting was carried out by the Company and later, between 1954 and 1959, the forest to the west of the burn was cut for pulpwood.

In August 1961 fire again occurred and burned the entire new cut-over as well as half of the area burned in 1941. Standing green timber remained only in the eastern compartments. This has since been largely removed.

The section burned in 1941 but not burned in 1961 contains some excellent examples of young black spruce stands of fire origin. These occupy 50 acres in Compartment 6 and an opportunity for stand treatment experimentation involving the use of fertilizers or other methods.

Natural regeneration on the burned areas has been more successful than originally anticipated considering history prior to fire but the overall situation with respect to black spruce regeneration is far from satisfactory. It was found by an extensive regeneration survey that while some 40 percent of all milacre quadrats sampled contain black spruce, it is the most numerous tree species on only 20 percent of all quadrats. White birch commands an equal percentage of all quadrats and trembling aspen, most numerous

on 32 percent, is the most abundant. Complete absence of regeneration to tree species occurs on 26 percent of all quadrats. Wide variations exist between compartments and between blocks within compartments. Plot analysis (by groups of five quadrats) indicates that less than 40 percent of the entire burned area is likely to produce commercial stands of black spruce from existing regeneration.

SUPPORTING WORK

Boundary Line Surveys

The Experimental Area is divided on the map into 12 square compartments each containing one square mile. These are numbered from 1 to 12. Each compartment is in turn divided into 16 square blocks which are numbered from 1 to 16. Therefore a designation such as Compartment 4, Block 3 defines a particular 40 acre square in the experimental area.

Lines defining the outer boundary and the subdivision of the experimental area into compartments one mile square have been completed. The policy is to complete the subdivision into 40 acre blocks as required for research purposes.

Regeneration and Mapping Survey

The entire burned area, 5200 acres, has been covered by a line-plot survey. Plots consisting of 5, milacre quadrats were laid out and examined at intervals of 4 chains. The average interval between strips in 1964 and 1965 was ten chains.

Data recorded for each quadrat consisted of a count of the number of stems of each tree species. Notes on depth of humus, soil conditions, vegetation and nearness of a seed

source were taken at each plot.

Arboretum

A program of preliminary trials of exotic tree species has been started to find species to replace balsam fir which suffers severely from attack by the balsam woolly aphid, and to supplement black spruce the only other major commercial tree species in Newfoundland. The North Pond arboretum is designed to test suitability of certain exotic forest trees to Central Newfoundland conditions. Other arboreta will be located in Western Newfoundland and on the Avalon Peninsula.

During the 1964 field season a site was selected in Compartment 4, and five arboretum blocks each 360 feet square were laid out on one side of a road which was bulldozed through the length of the arboretum area. A 30 foot space separates adjoining blocks. Each of the five blocks has been subdivided into 16 plots 90 feet square. A small quantity of exotic fir, spruce, and pine species, obtained from the Acadia Forest Experimental Station in the spring of 1964 were planted in temporary locations on the area.

In 1966 another five blocks, similarly subdivided, were laid out on the other side of the road.

The site, which is on a low ridge (elevation 400 feet) sloping gently eastward, supported a mixed stand of balsam fir and white birch, with some white pine, prior to cutting and the subsequent 1961 fire. The soil is relatively stone-free and varies in texture from clay loam to sandy loam. It is proposed to plant with only a minimum of clearing to

facilitate access and inspection. Suitable stock from the adjacent nursery should be available beginning in 1967.

Nursery

The North Pond nursery is located on a fertile, relatively stone-free site in Compartment 4 at the east end of the bulldozed road constructed through the arboretum area. It is designed primarily to produce planting stock for use in experimental work. At present 54 tree species are represented, several by more than one provenance.

In its final form the nursery will measure 197 x 82 feet and contain an area of 0.37 acres. Approximately half of the area will be devoted to seedbeds and half to transplant beds. It is primarily a seedbed operation with the product to be 2-0 or 3-0 seedlings.

In the spring of 1965 an area measuring 97 feet by 41 feet was laid out as seven seedbeds. The soil is a sandy loam and the seedbeds were prepared in accordance with a prescription used by the British Forestry Commission calling for the use of waste hops as the organic additive to the soil and coarse grit to cover the seeds. These were sown at the end of May and at the end of the first year it was estimated that 158,000 seedlings had been produced. A further area of similar size was prepared in the fall.

Seedbeds were covered with boughs in the late fall and except for the loss of one section containing unduly dense lodgepole pine seedlings (a grey mold) winter mortality has not been excessive.

One seedbed measuring 81 by 3½ feet was planted in October

1965 with sitka spruce of Terrace, B.C., origin. This particular origin is proving frost hardy in parts of Newfoundland and transplant material is badly needed for experimental work.

In the spring of 1966 the area prepared the previous fall was laid out as five seedbeds which were prepared and sown as in 1965. Another area measuring 100 feet by 50 feet was made ready for transplants. A total of 36,000 one-year seedlings, mostly pines, were lined-out during the first part of the summer.

Seedling growth in 1966 has been satisfactory, though the fall-sown sitka spruce grew slower than expected, and plots sown with seed of Acer species which had not been stratified, failed to germinate. Growth of transplants was very good but unfortunately overcrowding in the seedbeds and lateness in transplanting resulted in the later transplants being now rather poor specimens.

Meteorological Observations

A seasonal meteorological station was set up on the experimental area in 1964 to obtain accurate information on the local climate and to help account for successes and failures in artificial regeneration. Data are recorded only during the field season which is normally from May to October. In addition to weather measurements at the main station, observations have also been made at five satellite stations to sample variations in temperature at ground level and in precipitation at widely separated locations in the experimental area.

The following instrumentation is maintained at the main station:

<u>Instrument</u>	<u>Type</u>
Anemometer, connected to	M.S.C. 45B4
Anemograph	M.S.C. B
Recording rain gauge	Belfort 5-780
Standard rain gauge	M.S.C. 26-81
Maximum thermometer	M.S.C. 26-329
Minimum thermometer	M.S.C. 26-330
Standard thermometer	M.S.C. 26-573
Recording hygrothermograph	Bendix-Freiz Model 594

The last four instruments are housed in a Standard M.S.C. type B Stevenson Screen. The wind equipment was added in 1966.

The following instrumentation was maintained at each satellite station:

<u>Instrument</u>	<u>Type</u>
Standard rain gauge	M.S.C. 26-81
Maximum and Minimum registering thermometer	Taylor, Six-pattern No. 5458-5459

The thermometers were exposed flat on the forest floor. Each satellite station was visited in the morning of each working day. Satellite stations were operated in 1964 and 1965, but were discontinued in 1966.

Meteorological records for 1964 have been summarized in Mimeo 65-N-6, North Pond Meteorological Station Report 1964,

by J. Richardson. A file report containing 1965 results has been prepared. This also contains comparisons with 1964 and with records from the Gander Meteorological Station. A brief summary of 1964, 1965 and 1966 weather conditions at North Pond is given below:

	<u>June</u>			<u>July</u>			<u>August</u>			<u>September</u>		
	<u>1964</u>	<u>'65</u>	<u>'66</u>	<u>'64</u>	<u>'65</u>	<u>'66</u>	<u>'64</u>	<u>'65</u>	<u>'66</u>	<u>'64</u>	<u>'65</u>	<u>'66</u>
Extreme Max.												
Temp. (°F)	76	80	82	87	84	82	79	82	83	74	76	79
Extreme Min.												
Temp. (°F)	23	30	26	32	40	41	33	35	36	27	26	27
Mean Temp. (°F)	51	54	56	60	62	64	57	61	60	52	52	51
No. of days												
32°F or less	6	2	3	2	0	0	0	0	0	2	6	5
No. of days												
rain fell	10	14	17	8	10	21	14	12	18	14	13	15
Rain (inches)	3.8	8.23	2.85	1.27	3.98	2.12	5.14	1.80	4.38	1.20	0.93	2.55

Phenological Observations

This study is designed to provide basic phenological information for forest tree species at North Pond and to investigate correlations between growth characteristics and meteorological data. The information on dates of phenological phenomena should prove useful in reforestation work in the area by defining the dates when growth of local species starts and ceases, and the whole study will add to the information about growth phenomena on the Island of Newfoundland.

Observations are made on 30 trees in the northeast corner

of Compartment 6. No tree is more than 100 feet from the main approach road from Gambo. Six trees of each of the following species are included: black spruce, balsam fir, larch, white birch, and trembling aspen. Three of the trees of each species are saplings and three are mature.

The following growth phenomena are recorded for each tree as applicable.

- | | |
|-------------------------|-----------------------------|
| a) Leaf buds bursting | f) Winter buds formed |
| b) Leaves fully flushed | g) Leaves starting to fall |
| c) Flowering begins | h) Leader growth - |
| d) Fruits fully formed | measured twice weekly |
| e) Cones ripe | i) Radial growth - measured |
| | twice weekly by dial-gauge |
| | dendrometer |

Results for 1964 may be found in Mimeo 65-N-3, Progress Report, Phenological Observations at North Pond Experimental Area, by J. Richardson. A file report covering 1965 observations has been prepared.

In the spring of 1966 larch buds were the first to open, May 16, and those of black spruce were the last, June 16. White birch and aspen buds opened on May 25 and balsam fir on June 2. This is a week earlier than in 1965 and 3 to 10 days earlier than in 1964. Radial growth of all species except black spruce had started by May 16. Black spruce started on May 31. Radial growth ended for black spruce and larch at the end of August with a final period of shrinkage thereafter.

Relationship of Microclimate to Development of Natural Seedlings

The purpose of this study is to determine the timing of phenological phenomena on regeneration of black spruce, white birch and aspen on a series of sites, and to compare these phenomena with the recorded microclimate.

Three specimens of each of the three species were selected at each of five sites in May 1966. These sites lie on the boundary line between Compartments 3 and 4, and 9 and 10 which crosses a small valley at right angles, so that each has a different topographic situation. There is a difference in elevation of about 80 feet between the highest and the lowest stations. A standard rain gauge and a small radiation screen containing a maximum and a minimum thermometer were located at each station.

Meteorological observations were made once every working day; leader growth measurements were made twice a week during the period of growth.

This study is scheduled to continue for three years. 1966 results show that growth was generally slower at the stations in the valley bottom and on the south-facing slope. Minimum temperatures varied between stations more than maxima. The highest station and the one in the valley bottom experienced the lowest minima.

BROADCAST SEEDING EXPERIMENTS

Determination of Quantity of Sitka Spruce Seed Required per Unit Area for Broadcast Seeding of Recently Burned Land, 1962

The purpose of this experiment is to determine the smallest amounts of sitka spruce seed which must be sown per unit area

to produce seedlings on typical burned seedbeds. Seeding was replicated in 1962, 1963, and 1964. All seeding was carried out in November, using seed of known provenance, from the Terrace area of British Columbia.

The experiment is described in Mimeo 64-N-3, Establishment Report Project NF-70 by E.W. Howard. The unit experiment is replicated on four separate sites on Compartment 1. Each replication consists of five blocks, each containing three plots, each of which in turn contains four milacre quadrats.

One plot in each block was seeded in each of three successive years. Each milacre quadrat in a plot received one of the following treatments.

- 1) 10 viable seed sown broadcast
- 2) 100 viable seed sown broadcast
- 3) 500 viable seed sown broadcast
- 4) No seeding - control

Five years after seeding, beginning in 1967, counts will be made of the number of seedlings present in each quadrat. A final report will be prepared in 1970.

Preliminary observations in the fall of 1966 show the best stocking is in the plots seeded in 1962. Ninety-five per cent of the quadrats sown in 1962 with 500 seed, 90 percent of those sown with 100 seed, and 50 percent of those sown with 10 seed are stocked with sitka spruce seedlings.

Broadcast Seeding a 1961 Burn by Cyclone Seeder using Two Intensities of Black Spruce, 1963

Direct seeding by means of the hand-operated Cyclone seeder is a relatively inexpensive method except for the cost of seed

and is quicker than seedspotting. The first trial of this method at North Pond was undertaken in November of 1963.

The purpose of the experiment was to measure seedling establishment and on this basis to compare two rates of seeding; to determine the uniformity of seed distribution; and to evaluate the method in terms of cost-success.

One forty-acre block, Block 3 of Compartment 7, was sown on land burned in 1961. The establishment of this experiment is fully described in Mimeo 64-N-7, Broadcast Seeding a 1961 Burn by Cyclone Seeder using Two Intensities of Black Spruce, by W.C. Wilton.

Counts were made of black spruce seedlings on permanent handseeded milacre quadrats on: 15 June 1964, 30 September 1964, 5 October 1965, 10 June 1966 and 14 October 1966. These quadrats constitute a very limited sample, 14 quadrats to each intensity (100,000 seeds per acre and 200,000 seeds per acre) but the results are extremely interesting because they suggest that delayed germination may be an important factor in broadcast seeding of burned land to black spruce and that there may be little or no advantage in using 200,000 seeds per acre instead of 100,000. As of October 1966 100 percent of the quadrats seeded at the rate of 100,000 seeds per acre contained one or more seedlings as opposed to only 86 percent of those seeded at 200,000. This early experiment indicates that it is not necessary to use quantities of seed as great as 100,000 per acre.

No further examinations are scheduled until the fall of 1968 when a regeneration survey of the entire experiment will be carried out by the stocked quadrat method.

Broadcast Seeding a 1961 Burn by Cyclone Seeder following
Ground Scarification, 1964

The purpose of this experiment is to test the success of regeneration from broadcast seeding Newfoundland black spruce by Cyclone seeder following ground scarification by an agricultural discer towed by a D-6 Caterpillar tractor.

The operations of scarification and seeding were completed in the fall of 1964 and are described in the establishment report, Mimeo 65-N-2, by W.C. Wilton and J. Richardson.

The experiment consists of four 20-acre blocks (20 chains by 10 chains) in separate locations. The blocks were designed to sample four major site conditions on the 1961 burn. These are: rich hardwood, poor hardwood, rich kalmia, and poor kalmia. One half of each block was scarified. The blocks were then each divided into 40 treatment plots measuring $2\frac{1}{2}$ chains by 2 chains. Twenty plots in each block, ten scarified and ten unscarified, were then broadcast seeded by Cyclone seeder at the rate of 100,000 seeds per acre.

Two permanent milacre quadrats were established in the centre of each treatment plot, making a total of 240. These were screened while Cyclone seeding was taking place and seeded evenly by hand at the same rate later.

In 1965 a detailed survey of each block was carried out to map local site variations. The permanent quadrats were examined in July and again in October in 1965 and 1966.

Indications to date are that so far as the sites and method of scarification involved in this experiment are concerned

there is no significant difference in success between broadcast seeding on scarified and unscarified seedbeds. The final success of the experiment will be judged from an intensive stocked quadrat survey over the entire area of all blocks to be carried out in the fall of 1967.

Aerial Seeding of Burned-over Land using a Mixture of Black Spruce and Jack Pine Seed, 1965

An aerial seeding operation was carried out on April 24, 1965 on the experimental area to test techniques and to evaluate the effectiveness of seeding by helicopter using a mixture of species. Approximately 160 acres of 1961 burn in Compartment 5 were sown.

The site selected for the experiment was bounded on one side by North Pond and on the other by a road. These two clearly recognizable boundaries were of great assistance to the personnel involved, none of whom had experience with this kind of operation. Over half of the site was free of snow at time of seeding.

The Newfoundland Forest Service provided the services of a Sikorsky S55 helicopter equipped with a seeding device developed by the Ontario Forest Service. This device consisted of an agricultural dust hopper, auger, and seed-slinging equipment. The Newfoundland Forest Service also provided the local black spruce seed used in the experiment.

The black spruce seed was collected at West Branch, near Badger, in 1964. The jack pine seed was collected in 1963 from Ontario Site Region 4E. Seedtrap counts immediately after seeding indicated an average of 31,800 black spruce and 4,200 jack pine seeds per acre.

The wind was light and variable at time of seeding. Flight lines were 80 feet apart and two flagmen clad in bright jackets were posted on each line. These men moved rapidly to predetermined points on the next flight line after the helicopter had passed. The helicopter was flown at a height of approximately 120 feet above the ground.

Casual observations in late June and July 1965 indicated that aerial seeding had resulted in a good crop of seedlings. However, in October of that year when a seedling count was made on 32 permanent milacre quadrats from which natural seedlings had previously been removed, only 9 seedlings were found of which 7 were jack pine and 2 black spruce. There were only 5 stocked quadrats out of 32.

Available evidence indicates that germination was satisfactory but seedling mortality due to dry spells of up to 10 days in mid-summer was severe. The possible loss of the seedling crop due to a dry summer is of course a well-known hazard in direct seeding.

In 1966, however, there was an appreciable amount of delayed germination and in October, 86 jack pine and 41 black spruce were found on the 32 permanent milacre quadrats, 66 percent of which were stocked.

A stocked quadrat survey using plots of 5 milacre quadrats at 4 chain intervals on lines 5 chains apart was conducted over the entire seeded area in July 1966 primarily to estimate the stocking of natural black spruce seedlings prior to the seeding operation. Fifty-two percent of the quadrats were found to contain natural spruce seedlings, while 51 percent contained seedlings

attributed to the seeding operation. Sixty-eight percent of all milacre quadrats contained black spruce seedlings.

SEEDSPOTTING EXPERIMENTS

Seedspotting of Black Spruce at Intervals throughout the Growing Season, 1964

Seedspotting on natural burns in Newfoundland by scuffing the surface with the foot, depositing 10 to 15 viable seeds, and stepping on them is the only method of direct seeding which has provided consistently encouraging results in experiments carried out by the Department of Forestry on burned and cut-over areas in the Newfoundland Region. This experiment is designed to establish the best season for seedspotting with native black spruce and to determine the period over which successful seeding may be expected.

The experiment is located in Block 1 of Compartment 7 at an elevation of approximately 500 feet above sea level. The terrain slopes gently north. The soil is a well-drained stony clay till. The area originally supported a stand of balsam fir with some birch and black spruce. It had been clearcut for softwood pulpwood prior to the fire in 1961.

The experiment consists of three plots in close proximity. Each measures 360 feet by 300 feet. These plots are subdivided into ten subplots and seeding is carried out in six rows in each subplot. Two rows were seeded in each of three successive years. The seeding schedule was arranged so that, for example, one particular subplot contains 2 rows seeded in mid-July 1964, 2 in mid-July 1965, and 2 in mid-July 1966.

Work has proceeded as planned. The final seeding was carried out in 1966.

An unfortunate feature of this experiment is that due to the seasonal nature of the North Pond operation late fall and early spring seeding has not been practical. Nevertheless interesting and useful results should be obtained for the period from June 2 to October 7 through which seedspotting has been carried out.

CAPSULE PLANTING EXPERIMENTS

Comparison of Different Dates of Planting Sitka Spruce by the Capsule Method, 1964

The object of this experiment is to determine whether or not sitka spruce seedlings can be successfully established on a recent burn by capsule planting and how survival varies with different planting dates.

Planting was carried out on Compartment 4 at two-week intervals during the 1964 and 1965 growing seasons. Sitka spruce seed of Terrace origin (viability 84 percent) was used. The capsules, made by Columbia Plastics Limited, were of styrene plastic molded into a bullet shape measuring $2 \frac{1}{3}$ inches by $\frac{7}{8}$ inches. The walls of these capsules are weakened by a narrow slit extending from the rim to a hole near the tip. Capsules used in 1964 were $\frac{1}{16}$ inch thick, those used in 1965 were $\frac{1}{20}$ inch in thickness.

Seedlings were grown in a heated greenhouse at Mount Pearl Experimental Farm for four months before planting. Germination and early development were far from satisfactory as is evidenced

by the fact that instead of the 2,000 seedlings which it was planned to produce for planting each year only 1,436 were available in 1964 and 589 in 1965.

The soil on the planting site is a sandy loam overlain by an average of 3 inches of scorched raw humus. Ground vegetation is virtually absent except for scattered blueberry and Dicranum moss. The planting site is a rectangular block 480 by 300 feet in size. Plantings at two week intervals were arranged systematically by rows.

Mortality has been heavy due to a variety of causes including frost heaving. Thirty-two percent of all capsules planted in 1964 were partially lifted by frost during the first winter and had to be pushed into the soil by hand in the spring of 1965. This alone discredits use of the bullet-type capsule. It is still not known how successful the seedlings will be in extending roots through and escaping from the capsules. Thirty-five percent of seedlings planted in 1964 and 54 percent of seedlings planted in 1965 were alive in October 1966.

At present it appears that the period from mid-June to the end of July is most favourable for capsule planting. However, until numerous technical difficulties can be overcome the method cannot be considered practical for this site or any other where frost heaving is likely to occur.

Field Test of Capsule Planting using High-Impact Polystyrene Tubes, 1966

A small-scale experiment was started early in 1966 to test the suitability of plastic tubes of a type developed by the

Ontario Forest Service. The tubes are open-ended and split down the side.

Six different soil mixes were used to fill separate batches of capsules.

1) Commercial potting compound, sterilized.

	Loam	Peat Moss	Sand	Vermiculite
2)	1 part	1 part	1 part	
3)	1 part	1 part		1 part
4)		1 part		1 part
5)	1 part		1 part	
6)	1 part	1 part		

Sitka spruce seed of Terrace, B.C., origin was sown and with regular watering and direct supervision by forestry staff, excellent germination success was achieved. Rapid seedling growth was encouraged by weekly applications of liquid fertilizer so that the capsules were ready to be planted after two to three months.

The capsules were planted out on an unprepared site on the boundary between Compartments 3 and 9 where survival so far has not been satisfactory due to the small size of the seedlings, unfavourable competition from surrounding vegetation, and smothering by dead leaves and other debris. By October 1966, 50 percent of the seedlings planted in June had died. Mortality was greatest in the capsules filled with the loam-sand mixture in which not one seedling survived.

Mortality counts will be made in the spring and fall of 1967 and 1968. The final assessment of the plantation will be made in 1970.

PLANTING EXPERIMENTS

White Spruce Provenance Plantation, North Pond, 1963

This experiment, designed to compare thrity-two provenance of white spruce (Picea glauca (Moench) Voss) was established in May 1963 in co-operation with Mark Holst of the Petawawa Forest Experiment Institute.

It is located at the intersection of Compartments 1, 2, 7 and 8 and measures 738 by 402 feet. Details of the layout and planting may be found in Mimeo 64-N-2, Establishment Report NF-88, by W.C. Wilton.

A complete record of dead trees was completed in June 1965. 752 were found dead out of the 7680 planted.

It was noted that one of the highest rates of mortality occurred in white spruce of Newfoundland origin but these were wildlings while the other 31 provenances were nursery stock. No major differences between provenances have yet been observed and no attempt has been made to measure minor differences.

The following provenances are being compared :

Peterborough, Ont.	McNally Lake, P.Q.
Napanee, Ont.	Notre Dames du Laus
Beachburg, Ont.	Searchmont, Ont.
Cushing, P.Q.	Price, P.Q.
Grandes Piles, P.Q.	Edmundston, N.B.
Lake Edward, P.Q.	Upper Green River, N.B.
N. Baskatong Lake, P.Q.	Ashley Mines, Ont.
Algonquin Park, P.Q.	Marten River, Ont.
Aubrey Falls, Ont.	Cheguamegon Nat. For., Wisc.
Kakabeka Falls, Ont.	Grand Rapids, Minn.

Potter, Ont.	Huron Nat. For., Mich.
Pagwachuan Lake, Ont.	Luce Co., Mich.
Mitchinamokus Lake, Ont.	Shipshaw River, P.Q.
Lac Simard, P.Q.	Western Newfoundland
Swastika, Ont.	
Valcartier, P.Q.	

Red Spruce Provenance Plantation, North Pond, 1964

This experiment, designed to compare thirty provenances of red spruce (Picea-rubens Sarg.) was established in May 1964 in co-operation with H.G. MacGillivray of the Maritime Region.

It is located on the south boundary of Compartment 4 and measures 282 by 222 feet. Details may be found in Mimeo 65-N-4, Establishment Report, NF-88, by W.C. Wilton.

Mortality has been very low, only 11 trees out of the 1,200 planted, needed to be replaced after one year. No provenance differences have yet been observed.

The following provenances are being compared:

Napadogan, York County, N.B.

Great Salmon River, St. John County, N.B.

Timber Lake, Lunenburg County, N.S.

Sisters Brook, York County, N.B.

Scotts Bay, Kings County, N.S.

Corberrie, Digby County, N.S.

Waverley, Halifax County, N.S.

Headwaters, East Sheet Harbour River, N.S.

Hart's Lake, Colchester County, N.S.

Economy River, Colchester County, N.S.

Canaan Mountain, West Virginia
Monongahela National Forest, West Virginia
New River Watershed, Charlotte County, N.B.
Upper Blackville, N.B.
Rocky Brook, York County, N.B.
East End, Acadia Forest Experiment Station, N.B.
Boyne Road, Sunbury County, N.B.
Lakelands, Cumberland County, N.S.
Chezzetcook, N.S.
South Paradise, Annapolis County, N.S.
Blanchard, Pictou County, N.S.
Snare Lake, Colchester County, N.S.
West of Five Mile Lake, Hants County, N.S.
Crooked Creek, Albert County, N.B.
West of Great Salmon River, St. John County, N.B.
Penebscot Forest Experiment Station, Maine
Evans Brook, Annapolis County, N.S.
Estcount, Maine
Nictau West, Annapolis County, N.S.
Mushamuch and Spondo Lakes, Lunenburg County, N.S.

Plantation Trial of Eight Pine Species, 1966

This plantation was established in October 1966 in Block 2 of Compartment 9 using planting stock from the North Pond nursery to compare the success of the eight species.

The following species are included:

<u>Species</u>	<u>Age Class</u>	<u>Origin</u>
pinus albicaulis	2-0	Cranbrook, B.C.
Pinus banksiana	1-1	Newcastle, N.B.

<u>Species</u>	<u>Age Class</u>	<u>Origin</u>
Pinus cembra	2-0	park trees grown in St. John's, Nfld.
Pinus contorta	1-1	Long Beach, Wash.
Pinus laricio var. calabrica	2-0	Sherwood, Notts., U.K.
Pinus resinosa	2-0	Petawawa F.E.S., Ont.
Pinus sylvestris	1-1	Kuorevesi, Finland
Pinus sylvestris	1-1	Speymouth, Moray, U.K.

There are eight replications of each species in the plantation. Each individual plot measures 100 feet by 50 feet and contains 128 trees planted at six foot spacings. The whole plantation measures 800 feet by 400 feet.

The site is a south-facing slope with a well drained sandy loam which is in some places so rocky as to make planting difficult. Its fertility is attested by the presence of numerous large white pine stumps. Balsam fir and some black spruce were also present before cutting. Six foot tall pin cherry and birch on the site should act as a nurse crop for the pines.

SCARIFICATION BY SWEDISH SFI SCARIFIER, 1966

A total of 70.9 acres of land were prepared in 1966 by this machine at six different locations representing a variety of sites. The ground thus prepared has scarified scalps at fairly regular six foot intervals exposing the mineral soil in many places. The scarified areas will be used partly for large-scale demonstrations of broadcast seeding, and partly for smaller, more intensive studies and comparisons of reforestation techniques.

Two scarified blocks in Compartment 10, comprising 34.8 acres were sown by Cyclone seeder in November 1966 with black spruce seed at a rate of 50,000 seed per acre. This work is the responsibility of the Forest Management Liaison Section.

In Compartment 5 the establishment of two latin square experiments was started in October 1966. One will compare six planting treatments and the other six seedspotting treatments on SFI scarified scalps using black spruce in both cases. The site of both experiments is a 1941 non-reproducing burn with a relatively deep, 5 to 10 inch partially decomposed humus layer over-lying an apparently well drained leached sandy soil. Reindeer moss and kalmia dominate the ground vegetation.

The treatments concern the position and time of planting or seedspotting and are as follows:

1. Planting or seedspotting on scalp bottom in fall
2. Planting or seedspotting on scalp bottom in spring
3. Planting or seedspotting on intermediate position
on scalp in fall
4. Planting or seedspotting on intermediate position on
scalp in spring
5. Planting or seedspotting on scalp mound in fall
6. Planting or seedspotting on scalp mound in spring

The layout follows standard latin square patterns, each subplot containing ten scalps in two rows of five. The total size of each experiment is approximately 1 chain by $2\frac{1}{2}$ chains.

The fall part of the experiments was completed in 1966. 15 viable seed of Badger, Newfoundland, origin were used in each seedpot and the plants used were 2-0 stock of Northumberland Co., N.B. origin grown in the North Pond nursery.

APPENDIX A

File Reference to North Pond Work, Silviculture Section, Newfoundland Region

<u>Supporting Work</u>	<u>File Reference</u>
Boundary line surveys	NF-71
Regeneration and mapping survey	NF-71
Arboretum	NF-81
Nursery	1 S 65
Meteorological observations	NF-80
Phenological observations	NF-77
Relationship of microclimate to develop- ment of natural seedlings	2 S 66
<u>Broadcast Seeding Experiments</u>	
Determination of quantity of sitka spruce seed required per unit area for broadcast seeding of recently burned land	NF-70
Broadcast seeding a 1961 burn by cyclone seeder using two intensities of black spruce	NF-85
Broadcast seeding a 1961 burn by cyclone seeder following ground scarification	NF-98
Aerial seeding of burned-over land using a mixture of black spruce and jack pine seed	NF-84

File Reference

Seedspotting Experiments

Seedspotting of black spruce at
intervals throughout the growing
season NF-78

Latin square trial of six seedspotting
treatments on SFI scarified scalps using
black spruce 6 S 66

Capsule Planting Experiments

Comparison of different dates of planting
sitka spruce by the capsule method NF-79

Field test of capsule planting using
high-impact polystyrene tubes 3 S 66

Planting Experiments

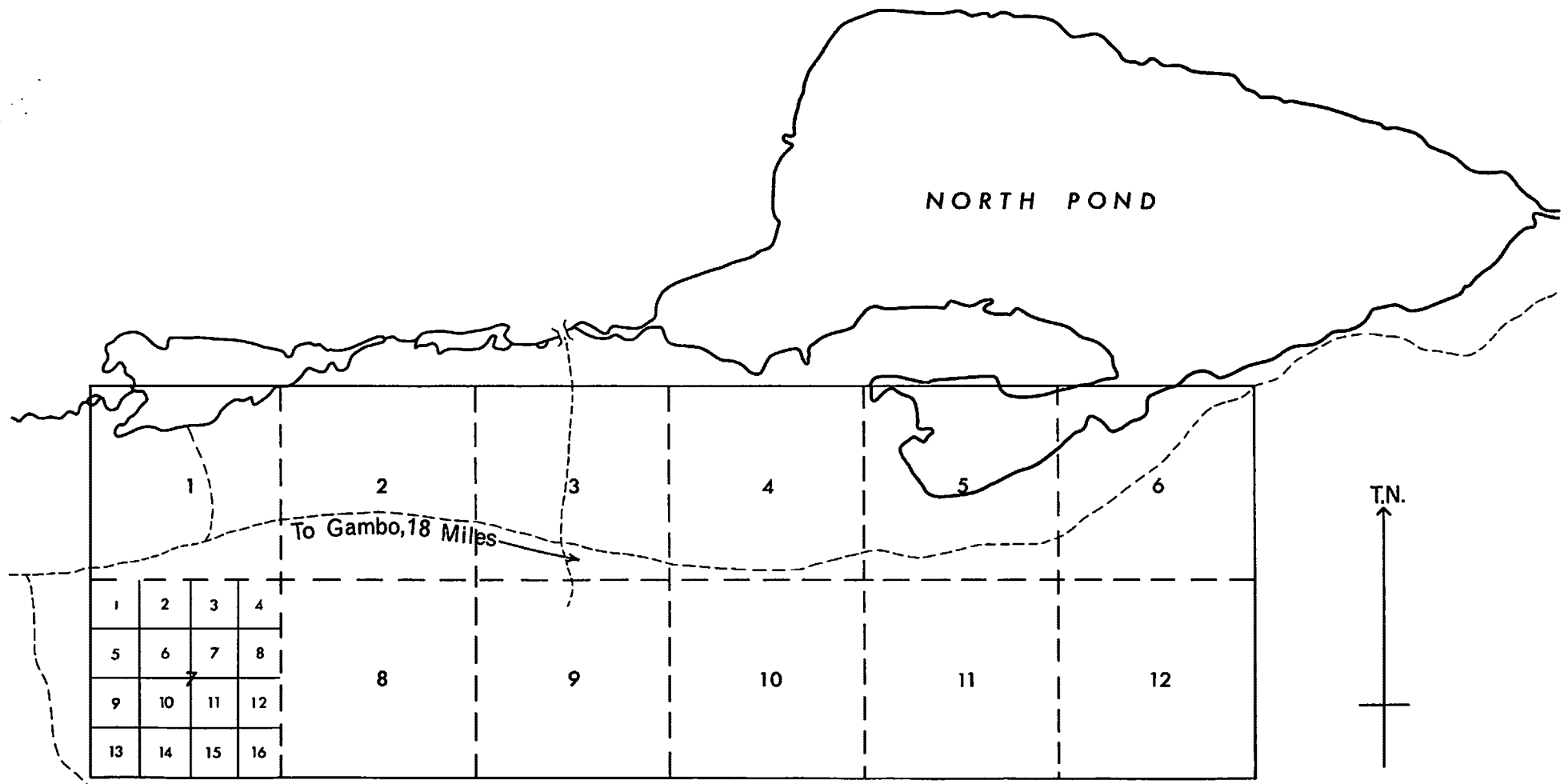
White spruce provenance plantation NF-76

Red spruce provenance plantation NF-88

Plantation trial of eight pine species 4 S 66

Latin square trial of six planting
treatments on SFI scarified scalps using
black spruce 5 S 66

PLAN
NORTH POND FOREST EXPERIMENTAL AREA



SCALE : 1-25 inches to 1 mile approx.