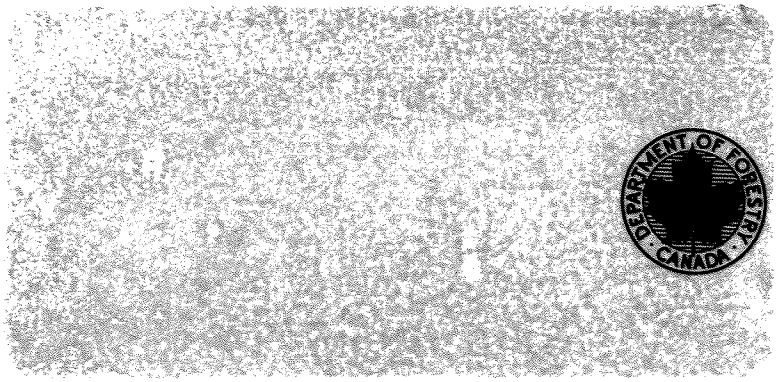

Not for publication

CONVERTING ASPEN STANDS TO WHITE SPRUCE BY PLANTING AND SEEDING ON SCALPED STRIPS, MANITOBA

Project MS-226

by

R. M. Waldron

FOREST RESEARCH LABORATORY
WINNIPEG, MANITOBA
INTERNAL REPORT MS-1

DEPARTMENT OF FORESTRY

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CONTENTS

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CONVERTING ASPEN STANDS TO WHITE SPRUCE BY PLANTING AND SEEDING ON SCALPED STRIPS, MANITOBA

Project MS-226

Progress Report

by

R. M. Waldron[1]

INTRODUCTION

In 1962 a project was begun to test the hypothesis that aspen stands can be converted to mixed coniferous-deciduous stands by planting or seeding white spruce (Picea glauca (Moench) Voss) on scalped strips spaced at approximately regular intervals.

To date twenty areas have been established in aspen stands located throughout Manitoba (Figure 1). These stands vary in size from 3 to 160 acres, in age from 15 to 100 years, and are located on very dry to very moist (moisture regimes 0 to 6) fine gravel, sandy-loam, clay loam and clay textured soils. Scalped strips were prepared in each stand using a bulldozer and straight blade. Planting and seeding of white spruce on the strips was carried out either in the autumn or in the spring.

The success or failure of the two treatments on all areas will be assessed using temporary plots five years following their establishment. Early survival and growth of seeded and planted seed-

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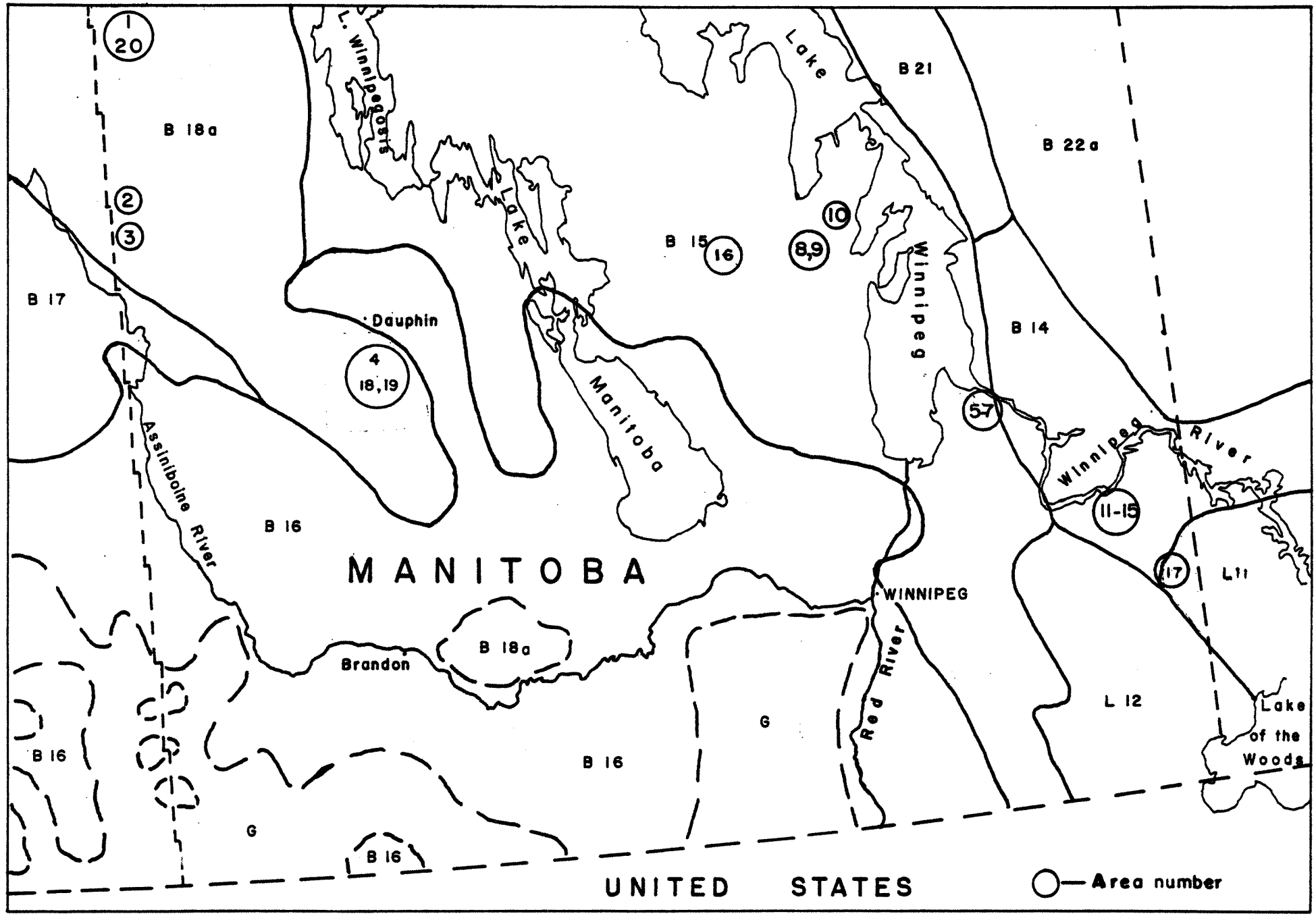

Location of Experimental Areas, Project MS 226, Manitoba

lings is being determined on selected sites under specific stand conditions by means of a small number of observation plots[2]. Results from these plots, along with general descriptions of the areas treated up to 1963 are contained in the establishment report prepared by Waldron (1964). Description of treatments carried out in the summer of 1964 are presented in this report.

It will be noted that on area number 16, species other than white spruce have been planted and seeded. Mr. J. H. Cayford who works with pine in Manitoba will assist in examination of the observation plots and in the assessments of the treatments carried out. This work will be complementary to existing project MS-190, "Planting spruce and pine, Interlake Region, Manitoba."

A detailed ecological study, Project MS-227, "Early survival and growth of planted and seeded white spruce as affected by seedbed type occurring on scalped strips prepared in aspen stands, Manitoba", is being carried out on two of the experimental areas (Waldron 1964a). Other detailed studies will be carried out to solve specific problems as they arise.

DESCRIPTION OF TREATMENTS - 1964

Area No. 7 - Pine Falls

During mid-October, 1963 scalped strips were prepared in a moderately dense stand of young and mature trembling aspen and balsam poplar on a fresh (moisture regime 3), clay textured soil in Section 10, Township 19, Range 10, E.P.M. (Figure 2). The scalped strips were ten feet wide and approximately sixteen feet apart. Visual observations made at the time of seedbed preparation indicated one hundred per

[2] For more details on methods the reader is referred to the project plan (Waldron 1962).

cent exposure of mineral soil.

(i) Planting

In May of 1964 approximately 600 white spruce and 400 black spruce (Picea mariana (Mill.) BSP.) were set out using both the slit and hole method of planting at eight foot spacing. Three rows of transplants were set out per scalped strip. Planting stock data were as follows:

Species	Average root length (in.)	Average height (in.)	Average[1] root weight (gm.)	Average[1] top weight (gm.)	Root/shoot ratio (By weight)
W. spruce (Area No. 16)	11.0	5.1	1.56	3.29	0.47
B. spruce	5.8	8.7	.36	1.84	0.20

[1] Oven dried at 105°C for 48 hours.

Weather conditions at the time of planting were good. However, there was a surplus of soil moisture which made planting very difficult. Surface water occurred in small depressions made by the bulldozer blade.

Observation plots were established on May 25 and 26, 1964. Details are as follows:

Species	Method of planting	Number of observation plots	Spring 1964	
			Number of transplants	Average height (in.)
W. spruce	Slit	17	149	4.5
	Hole	11	109	5.0
	Both	28	258	4.7
B. spruce	Slit	12	115	7.0
	Hole	14	120	7.9
	Both	26	235	7.5

Ninty-three per cent of the white spruce and ninty-five per cent of the black spruce living on May 26, 1964 were classified as healthy.

(ii) Seeding

See Waldron (1964).

Areas No. 8 and 9 - Fish Road

Observations made in mid-summer of 1963 revealed that the scalped strips on Area No. 8 supported a moderate to heavy cover of lesser vegetation and aspen suckers. Experience indicated that this competition was of sufficient magnitude to suppress height growth and perhaps even bring about seedling and transplant mortality. With these points in mind, a herbicide spraying program was undertaken.

On August 14, 1963 an aqueous solution of 2,4,5-T[3] at approximately 3,000 ppm. was applied to the dripping point on the lesser vegetation and aspen suckers using ordinary garden pressure sprayers of two- to three-gallon capacity. The solution was applied at the rate of 30 gallons or one pound acid equivalent per acre of scalped strip. The day on which the spraying took place was windy and cloudy; air temperature was estimated at 70°F.

Visual observations made on Sept. 24, 1963 indicated that a good top kill was obtained. None of the transplants were damaged.

Between July 27 and 29, 1964 identical treatments were carried out on additonal strips in Area No. 8 and on all strips in Area No. 9 (Figure 3). Weather conditions at the time of spraying were ideal, however, a brief thunderstorm necessitated the respraying of a

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3 Standard Chemical 2,4,5-T, 76.8 acid equivalent.

number of strips. Visual observations made in September, 1964 indicated that the spraying was successful in killing the aerial portions of the competing vegetation.

Details on volume of solution applied on the two areas in 1963 and 1964 are as follows:

Area No.	Year of spraying	Scalped strip number	Treatment	Volume of solution required (gal.)	Volume of solution applied (gal.)
8	1963	3	Seeded red pine	8.6	7.7
		6	Planted black spruce	8.0	9.0
		7	Planted white spruce (2 rows/strip)	7.8	7.8
		12	Seeded jack pine	7.3	7.0
		14	Planted red pine	7.5	7.7
		16	Seeded white spruce	7.0	7.0
		20	Planted white spruce	7.1	8.2
		22	Planted jack pine	5.8	8.2
	1964	1	Seeded red pine	8.4	9.0
		2	Seeded red pine	(8.6)[1]	9.5
		4	Planted black spruce	7.8	7.0
		5	Planted black spruce	(8.0)[1]	6.0
		8	Planted white spruce (2 rows/strip)	7.8	8.0
		9	Planted white spruce (2 rows/strip)	(8.4)[1]	6.5
		11	Seeded jack pine	7.2	7.5
		12	Seeded jack pine	(7.5)[1]	7.0
		13	Planted red pine	7.5	7.0
		18	Seeded white spruce	6.9	8.0
		19	Planted white spruce	7.2	7.0
		24	Planted jack pine	5.7	6.0
9	1964	30	Planted red pine	10.2	9.5
		31	Planted white spruce	10.2	14.0
		32	Seeded jack pine	9.6	14.0
		33	Seeded red pine	9.6	12.0
		34	Seeded white spruce	9.3	11.0

[1] Sprayed unintentionally

Area No.	Year of spraying	Scalped strip number	Treatment	Volume of solution required (gal.)	Volume of solution applied (gal.)
9 (cont.)	1964	35	Planted black spruce	9.3	10.5
		36	Planted jack pine	8.4	9.5
		37	Planted white spruce	8.1	8.0+10.0[2]
		38	Planted black spruce	7.5	8.0+ 9.0[2]
		39	Seeded jack pine	7.2	9.0+ 8.0[2]
		40	Seeded red pine	6.6	7.0+ 3.0[3]
		41	Planted red pine	6.3	8.0+ 3.0[3]
		42	Seeded white spruce	6.0	8.0+ 3.0[3]
		43	Planted jack pine	5.4	6.0
		44	MS 227	3.3	3.5
		45	MS 227	2.4	4.0

[2] Strips resprayed because of a heavy rainfall immediately following the first application.

[3] Strips partial resprayed because of a heavy rainfall immediately following the first application.

Area No. 16 - Mantago Lake

In March, 1964 scalped strips were prepared in a dense young aspen stand on very dry to very moist (moisture regimes 0 to 6), fine gravel, sandy loam and clay loam textured soils in Section 20, Township 26, Range 3, W.P.M. (Figures 4, 5 and 6). The scalped strips were 10 to 11 feet wide and approximately 14 feet apart. A survey carried out on April 24, 1964 showed the following distribution of seedbed types:

Moisture regime	Soil texture	Seedbed types % exposed			Basis: number of point observations
		Mineral soil	Humus	Undisturbed	
0-1	Fine gravel, sand	47	30	23	131
2-3	Sandy loams	47	40	13	60
4	Loam-clay loam	36	44	20	73
5-6	Loam - clay loam	5	46	49	117
All		32	39	29	381

(i) Planting

Between the 5th and 11th of May, 1964 approximately nine hundred transplants of each of the following species: white spruce, black spruce, jack pine (Pinus banksiana Lamb.), and red pine (Pinus resinosa Ait.), were set out on scalped strips using the slit method of planting. A single row of transplants at six foot spacing was set out in the center of each planted strip. Planting stock data were as follows:

Species	Average root length (in.)	Average height (in.)	Average[1] root weight (gm.)	Average[1] top weight (gm.)	Root/shoot ratio (by weight)
White spruce	11.0	5.1	1.56	3.29	0.47
Black spruce	7.5	10.7	.87	3.90	0.22
Jack pine	7.9	4.6	.53	2.03	0.26
Red pine	8.8	3.6	.75	2.15	0.35

[1] Oven dried at 105°C for 48 hours.

Weather conditions at the time of planting were ideal. The days were cool although somewhat windy, Rain fell on the 7th and 8th of May. Soil moisture was excellent on most sites, however there were a number of low spots which held up to three feet of water. Transplants were set out in these low spots on the 14th of May.

Observation plots were established on May 12th to 14th, 1964. Details are as follows:

Species	Number of observation plots	Spring 1964	
		Number of transplants	Average height (in.)
White spruce	41	403	4.3
Black spruce	42	403	8.3
Jack pine	40	395	4.6
Red pine	41	396	3.3

(ii) Seeding

White spruce, jack pine and red pine seed treated with Arasan, Endrin and aluminum flakes were sown on scalped strips on April 23, 1964. White spruce seed[4] testing 57.6 per cent viability was sown at the rate of three pounds per acre; jack pine[5] testing 96.5 per cent viability was sown at the rate of one pound per acre, and red pine[6] testing 89.6 per cent viability was sown at the rate of 1.5 pounds per acre.

Moisture conditions at the time of seeding were excellent although some depressions held up to three feet of water. Rainfall during late May and June was light and only on the wetter sites was there sufficient moisture to result in seed germination.

Area No. 17 - West Hawk Lake

In the autumn of 1963 scalped strips were prepared in a dense mature aspen stand on fresh to very moist (moisture regimes 3 to 6), clay loam textured soils in Sections 14 and 15, Township 10 Range 16, E.P.M. (Figure 7). The scalped strips were 12 feet wide and approximately 16 feet apart. Visual observations in the spring of 1964 revealed that there was a 100 per cent exposure of mineral soil seedbeds.

(i) Planting

Planting was carried out in September of 1963. Approximately 33,000 white spruce transplants were set out on the scalped strips using the slit method of planting and six-foot spacing. Three rows of transplants were set out; one in the centre and two along the edges.

4 From the 1962 cone crop at the Riding Mountain Forest Experimental Area.
5 From the 1962 cone crop in southeastern Manitoba.
6 From the 1957 cone crop in Michigan, U.S.A.

Observation plots were established on May 20th, 1964. Details are as follows:

Soil moisture regime	Number of observation plots	Autumn 1963		Spring 1964	Autumn 1964
		Number of transplants	Average height (in.)	Transplant survival (%)	Transplant survival (%)
3	10	100	5.4	90.0	86.0
4	10	100	5.9	98.0	93.0
6	10	101	6.2	97.0	52.5

Overwinter mortality was very low on all three sites. However, during the summer flooding on the very moist (MR 6) site resulted in the death of nearly one-half of the transplants set out. Mortality on the fresh and moderately moist site was relatively small.

Area No. 18. - Riding Mountain

In the autumn of 1963 scalped strips were prepared in an open over mature trembling aspen stand with a dense understorey of Corylus cornuta Marsh. located on a fresh to moderately moist (MR 3-4) clay loam textured soil in Section 35, Township 20, Range 19, W.P.M. (Figures 8 and 9). The scalped strips were prepared using a 11½ foot blade and a D-7 bulldozer. Observations made in the spring of 1964 revealed a 100 per cent exposure of mineral soil seedbeds.

(i) Planting was carried out on May 6, 1964 using the slit method of planting. Two staggered rows of transplants at six foot spacing was set out along the edge of each planted strip.

Observation plots were established on June 12, 1964. Details are as follows:

Number of observation plots	Spring - 1964	
	Number of transplants	Average height (in.)
20	195	5.6

Area No. 19 - Riding Mountain

In the autumn of 1964 scalped strips were prepared in an open, overmature trembling aspen stand containing a dense understorey of Corylus cornuta Marsh. on a fresh (MR-3) clay loam textured soil in Section 35, Township 20, Range 19, W.P.M. (Figure 8). The scalped strips were prepared using a 11½ foot wide blade and a TD-19 bulldozer.

(i) Planting

These strips will be planted in the spring of 1965.

Area No. 20 - Porcupine Mt.

This area was established as Area No. 1 in 1961 and details as to the ground treatments, planting and seeding trials may be found in Progress Report 64-MS-16 (Waldron 1964). Briefly the white spruce seed sown on the scalped strips in the autumn of 1961 failed to germinate. In the autumn of 1963 when this failure became apparent to the field staff it was decided to plant the strips. Area location and treatments may be found in Figure 10.

Observation plots were established in June 1964. Details

are as follows:

Number of observation plots	Spring 1964		
	Number of transplants	Average height (in.)	Transplant survival (%)
29	277	5.3	99.3

FUTURE WORK

Examinations of the observation plots and the five-year assessments will be carried out for both planted and seeded areas as outlined in the project plan (Waldron 1962). Tables 1 and 2 show the years in which this work will be undertaken.

It is proposed to add two or three areas to the project in 1965. General field measurements will be carried out on these areas following the outline given in the project plan. Observation plots will be established if conditions suitable for detailed study are available.

A detailed progress report will be prepared in the winter of 1965-66.

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Table 1

SCHEDULE OF EXAMINATIONS AND ASSESSMENT FOR PLANTED AREAS

Area No.	Area	Year of planting, observation plot examination and five-year assessemnt[1]											
		1960	1962		1963		1964	1965	1966	1967	1968	1969	1970
		Autumn	Spring	Autumn	Spring	Autumn	Spring	Spring	Spring	Spring	Spring	Spring	Spring
1	Porcupine Mt.	-	P	-	E	-	E	-	-	E-A	-	-	-
2	Madge Lake	-	P	-	E	-	E	-	-	E-A	-	-	-
3	Gill Meadow	-	P	-	E	-	E	-	-	E-A	-	-	-
4	Riding Mt.	-	-	-	P	-	E	E	-	-	E-A	-	-
5	Pine Falls	-	P	-	E	-	E	-	-	E-A	-	-	-
6	Pine Falls	-	-	-	P	-	E	E	-	-	E-A	-	-
7	Pine Falls	-	-	-	-	-	P	E	E	-	-	E-A	-
8	Fish Road	-	P	-	E	-	-	E	-	E-A	-	-	-
9	Fish Road	-	-	-	P	-	E	-	E	-	E-A	-	-
10	Beaver Creek	-	-	P	E	-	E	E	-	-	E-A	-	-
11	Nutimik	-	P	E	-	-	E	-	-	E-A	-	-	-
12	Nutimik	P	E	-	-	-	E	-	E-A	-	-	-	-
15	Falcon Lake	-	-	-	-	-	-	-	-	-	-	-	-
16	Mantago Lake	-	-	-	-	-	P	E	-	E	-	E-A	-
17.	West Hawk	-	-	-	-	-	P	E	E	-	-	E-A	-
18	Riding Mt.	-	-	-	-	-	P	E	E	-	-	E-A	-
19	Riding Mt.	-	-	-	-	-	-	P	E	E	-	-	E-A
20	Porcupine Mt.	-	-	-	-	P	E	E	-	-	-	E-A	-

[1] P- planting, E- examination, A- assessment.

Table 2

SCHEDULE OF EXAMINATIONS AND ASSESSMENT

FOR SEEDED AREAS

Area No.	Area	Year of seeding, observation plot examination and five-year assessment[1]																	
		1960	1961	1962		1963		1964		1965		1966		1967		1968		1969	
		Autumn	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
1	Porcupine Mt.	-	S	-	E	E	-	-	-	-	-	-	-	-	-	-	-	-	-
1	Porcupine Mt.	-	-	-	-	S	-	E	-	-	-	-	-	-	-	-	-	-	-
2	Madge Lake	-	S	-	E	E	-	E	-	-	-	E-A	-	-	-	-	-	-	-
3	Gill Meadow	-	S	-	E	E	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Riding Mt.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Pine Falls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Pine Falls	-	-	-	S	E	-	E[2]	E	-	E	-	-	-	E-A	-	-	-	-
7	Pine Falls	-	-	-	-	-	S	-	-	E	-	-	E	-	-	-	E-A	-	-
8	Fish Road	-	-	S	E	E	E	-	E	-	-	-	E-A	-	-	-	-	-	-
9	Fish Road	-	-	-	-	S	E	-	E	-	E	-	-	-	E-A	-	-	-	-
10	Beaver Creek	-	-	-	S	E	E	E	-	-	-	-	-	-	E-A	-	-	-	-
10	Beaver Creek	-	-	-	-	S	E	E	-	-	E	-	-	-	-	E-A	-	-	-
11	Nutimik	S	-	E	-	-	-	-	-	-	E-A	-	-	-	-	-	-	-	-
12	Nutimik	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Nutimik	-	S	-	E	E	E	-	-	-	-	-	E-A	-	-	-	-	-	-
14	Nutimik	-	-	S	E	E	E	-	-	-	-	-	-	E-A	-	-	-	-	-
16	Mantago Lake	-	-	-	-	-	-	S	-	E	E	-	E	-	-	-	E-A	-	-

1 S- seeded, E- examination, A- assessment.

2 Reseeded May 27, 1964.