



**UNIFORM SHELTERWOOD CUTTING AND MECHANICAL  
SEEDBED TREATMENT IN WHITE SPRUCE-TREMBLING  
ASPEN STANDS TO INDUCE WHITE SPRUCE REGENERATION,  
MANITOBA AND SASKATCHEWAN**

Project MS-228

by  
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TREATMENT IN WHITE SPRUCE-TREMBLING ASPEN

STANDS TO INDUCE WHITE SPRUCE REGENERATION

MANITOBA AND SASKATCHEWAN

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by

V. S. Kolabinski<sup>1</sup>

INTRODUCTION

In 1962 the Department of Forestry began a study to determine whether two-stage uniform shelterwood cutting and mechanical seedbed preparation in mixed white spruce-trembling aspen stands will induce adequate white spruce regeneration. The project is being carried out co-operatively with the governments of Manitoba and Saskatchewan. To-date seven study areas have been established.

This report summarizes the work completed on the project during the summer of 1966 and the work proposed for 1967.

For further details concerning the scope of this project, methods of assessing results, scarification, preliminary results, etc., the reader is referred to the project plan for MS-228 and progress reports 65-MS-22, 65-MS-19, 64-MS-8, 63-MS-3.

DESCRIPTION OF AREAS ESTABLISHED IN 1965

Location and Establishment

Area 6: This area was established during the summer of 1965 by the Manitoba Department of Mines and Natural Resources. It is about 106 acres in size and is located in the Porcupine Forest Reserve in portions of Sec. 18, Twp. 38, Rge. 28, W.P.M. and Sec. 13, Twp. 38, Rge. 29, W.P.M.

Logging for white spruce saw logs had taken place a number of years ago. The present stand is made up of scattered mature white spruce left behind by the loggers and hardwoods. The hardwood component is made up of aspen, balsam poplar and white birch. The aspen varies in age from over-mature to about 30 years. Moisture conditions on the area vary from fresh to moderately moist.

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During the summer of 1965 the area was scarified with a D-6 crawler type tractor equipped with an hydraulically controlled straight blade. The seedbeds were prepared by bulldozing scalps between trees where conveniently possible and in forest openings whenever seed trees were close by.

Area 7: This area was also established in 1965 by the Manitoba Department of Mines and Natural Resources. It is about 96 acres in size and is located in the Porcupine Forest Reserve in Sec. 4, Twp. 38, Rge. 29, W.P.M.

Stand history and composition is similar to that of Area 6, with the exception that in some places, the residual white spruce stand is quite dense. Sites on this area vary from fresh to very moist but the proportion of moister sites is greater than on Area 6.

Scarification on Area 7 was carried out in the same way as on Area 6 so the resulting seedbeds were similar in all respects.

#### WORK COMPLETED IN 1966

##### Seedbed Treatment

Area 2: This area was selected for study during the summer of 1963. It is about 70 acres in size and is located in the Hudson Bay region of Saskatchewan in Secs. 1 and 2, Twp. 51, Rge. 7, W.2 Mer.

Logging operations were begun during the winter of 1963-64, but were not completed until the winter of 1965-66.

Seedbed treatment was carried out on the area by the Saskatchewan Department of Natural Resources in September 1966. A D-7 bulldozer equipped with a cable controlled straight blade was used. Because of fall rains and difficulties experienced due to wetness, scarification had to be confined to the drier sites.

##### Stand Data

Area 6: During the summer of 1966 the Department of Forestry established a permanently marked cruise line (1/2 chain wide x 20 chains long) on Area 6 to obtain stand data and to follow stand development. All living trees were recorded by species and 1-inch diameter classes. Dead trees were blazed.

Number of trees and average basal area in 1966 is shown in Table 1. The average basal area (Table 1) shows white spruce to represent 24 per cent of the stand component, balsam fir less than one per cent and the hardwoods 76 per cent. The 76 per cent of hardwoods was made up of 39 per cent aspen, 21 per cent balsam poplar and 15 per cent white birch.

TABLE 1

## STAND TABLE, AREA 6, AFTER SCARIFICATION IN 1966

(basis - 1/2 x 20 chains cruise tally)

D.b.h. (inches)	White spruce		Balsam fir		Hardwoods	
	Number of trees Per acre	Basal area Per acre (sq. ft.)	Number of trees Per acre	Basal area Per acre (sq. ft.)	Number of trees Per acre	Basal area Per acre (sq. ft.)
1			1	.005	35	.175
2			1	.002	53	1.166
3					39	1.911
4	1	.087			9	.783
5	1	.136			2	.272
6					12	2.352
7	1	.267			7	1.869
8					10	3.490
9	3	1.326			8	3.536
10	3	1.635			17	9.265
11					6	3.960
12					10	7.850
13	1	.922			3	2.766
14	1	1.069			6	6.414
15	2	2.454			2	2.454
16	3	4.188			2	2.792
17	2	3.152			3	4.728
18					2	3.534
19					1	1.969
20					1	2.182
21	1	2.405				
22	1	2.640				
All	20	20.281	2	.027	228	63.468

Hardwoods = 76%

Softwoods = 24%

Area 7: Permanently marked cruise lines for the collecting of stand data were also established on Area 7 in 1966. They consisted of three 1/2-chain-wide x 10-chains-long lines. Stand information was collected in the same way as on Area 6.

Stand data in 1966 for Area 7 is shown in Table 2. This table shows that white spruce comprises 32 per cent of the basal area and hardwoods 68 per cent. The 68 per cent of hardwoods is made up of 34 per cent aspen, 28 per cent balsam poplar and 6 per cent white birch.

#### Establishment of Regeneration Transects

Area 6: During the summer of 1966 the Department of Forestry established a total of 20 randomly located permanent transect plots (each composed of ten 1-milacre quadrats) to assess regeneration. Ten plots were established on scarified ground and 10 on undisturbed ground.

The following data were collected from these plots:

- (1) A tally of the presence or absence of regeneration and advance growth on each quadrat by species (the height of the tallest seedling of each species in a quadrat was measured to the nearest half inch).
- (2) Notation of seedbed type on which regeneration occurred.
- (3) A count of the number seedlings by species on the 5th and 10th quadrat of each transect.
- (4) Notation of area of seedbed types on each quadrat by 10 per cent classes.
- (5) Classification of each quadrat by moisture regime.

Per cent stocking and number of stems per acre on the scarified areas and on the controls in 1966 is given in Table 3 and 4 respectively. White spruce regeneration occurred only on the scarified seedbeds but using Candy's (1951) criterion of assessing reproduction, they are still understocked.

Some factors considered responsible for the low stocking on these seedbeds were a poor seed year (observations in 1965 indicated cone crop on the area to be poor to light); and that seed trees were too sparse in some places. However, it is expected that stocking on the scarified seedbeds will increase, as these seedbeds should remain receptive for three or more years.

TABLE 2

## STAND TABLE, AREA 7, AFTER SCARIFICATION IN 1966

(basis - 1/2 x 30 chains cruise tally)

D.b.h. (inches)	White spruce		Hardwoods	
	Number of trees Per acre	Basal area Per acre (sq. ft.)	Number of trees Per acre	Basal area Per acre (sq. ft.)
1	1.3	.006	22.7	.114
2	2.7	.059	50.0	1.100
3	0.7	.034	46.7	2.288
4	0.7	.061	35.9	3.123
5			45.3	6.161
6			35.9	7.036
7	2.7	.721	18.7	4.993
8	2.7	.942	14.6	5.095
9	2.0	.884	8.0	3.536
10	2.7	1.472	6.6	3.597
11	2.0	1.320	3.9	2.574
12	0.7	.550	3.3	2.590
13	1.3	1.199	0.7	.645
14	4.0	4.276	1.3	1.390
15	4.0	4.908	4.0	4.908
16	3.3	4.607	2.7	3.769
17	0.7	1.103	0.7	1.103
18	0.7	1.237		
19				
20				
21	0.7	1.684		
22	0.7	1.848		
23			0.7	2.020
All	33.6	26.911	301.7	56.042

Softwoods = 32%

Hardwoods = 68%

TABLE 4

NUMBER WHITE SPRUCE, BALSAM FIR, AND HARDWOOD STEMS  
PER ACRE, AREA 6, 1966

Condition	Number of List Quadrats	White Spruce		Balsam Fir		Hardwoods	
		Regener- <sup>1</sup> ation	Advance Growth	Regener- ation	Advance Growth	Regener- <sup>2</sup> ation	Advance Growth
		Number per Acre		Number per Acre		Number per Acre	
Scarified	20	1,300	0	0	0	0	2,900
Control (Not scari- fied)	20	0	100	0	150	0	5,850
All	40	650	50	0	75	0	4,375

<sup>1</sup> Soft wood regeneration - established since scarification.

<sup>2</sup> All hardwood regeneration - classed as advance growth.



Area 7: A total of 20 randomly located permanent transect plots (each composed of 10-milacre quadrats) were also established on this area to assess regeneration. Ten plots were established on scarified ground and 10 on non-scarified. Methods and procedures for collecting of data were the same as those used on Area 6.

Regeneration data for Area 7 in 1966 have been summarized and are shown in Tables 5 and 6. These data show the scarified seedbeds to be well stocked (Candy 1951) with white spruce regeneration.

Although the 1965 seed crop was also reported to be light for this area, stocking is higher than on Area 6. The reasons may be attributed partly to a greater abundance of wetter sites and partly to a larger seed source as suggested by the stand tables (Tables 1 and 2).

### Maps

Areas 6 and 7: Maps were prepared for each area showing locations of regeneration transects and cruise lines.

### Observation Plots

Area 1: This study area was established in 1962. It is 20 acres in size and is located at the Riding Mountain Experimental Area.

Seedbed treatment was carried out in the fall of 1962 with an HD-11 tractor using a straight blade. Logging (by the shelterwood method) took place during the winter of 1963-64.

In the spring of 1963 a study was begun to obtain information on the development of white spruce seedlings and competing ground vegetation, on seedbeds arising from scarification.

Subsequently 12 pairs of observation plots<sup>1</sup> (each composed of six subplots one foot square) were randomly established on seedbeds bulldozed to mineral soil and bulldozed to humus. Each subplot was then sown by hand with 30 white spruce seeds. Prior to sowing this seed had been treated with Captan and had a viability of 65 per cent.

The initial establishment of the seedlings in 1963 was recorded, and examinations of their survival and growth have been made yearly. A tally of competing ground vegetation on these plots was made during the 1964 remeasurements.

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<sup>1</sup>Two pairs of plots were destroyed by the logging operations.

<sup>2</sup>Subject of an earlier report - the reader is referred to report 65-MS-19 by J.M. Jarvis.

TABLE 5

PER CENT QUADRATS STOCKED TO WHITE SPRUCE AND HARDWOODS,  
AREA 7, 1966

Condition	Number of Quadrats	White Spruce		Hardwoods	
		Regener- <sup>1</sup> ation (Per cent)	Advance Growth (Per cent)	Regener- <sup>2</sup> ation (Per cent)	Advance Growth (Per cent)
Scarified	100	67	0	0	61
Control (Not scarified)	100	0	27	0	49
All	200	34	14	0	55

TABLE 6

NUMBER WHITE SPRUCE AND HARDWOOD STEMS PER ACRE,  
AREA 7, 1966

Condition	Number of List Quadrats	White Spruce		Hardwoods	
		Regener- <sup>1</sup> ation	Advance Growth	Regener- <sup>2</sup> ation	Advance Growth
		Number per Acre		Number per Acre	
Scarified	20	2,150	0	0	4,000
Control (Not scarified)	20	0	550	0	2,500
All	40	1,075	275	0	3,250

<sup>1</sup> White spruce regeneration - established since scarification.

<sup>2</sup> All hardwood regeneration - classed as advance growth.

Data on the establishment and survival of seedlings on the mineral soil and humus seedbeds to the fall of 1966 is summarized in Table 7.

This data was subjected to "t" tests and results indicated: that initial establishment was significantly better on the humus seedbeds than on the mineral soil seedbeds; and that to the fall of 1966 there was no significant differences in seedling survival between seedbeds.

#### WORK PROPOSED FOR 1967

##### Plot Establishment

Area 2: Permanent sample plots will be established on Area 2 to collect regeneration and stand data. This work will involve: (1) the establishment of 200 milacre quadrats (100 on scarified ground and 100 on non-scarified), (2) the establishment of 1/2-chain-wide cruise lines, and (3) a survey to determine amount of ground scarified.

##### Remeasurements

Area 1: The first five-year remeasurement of all sample plots on Area 1 will be carried out during the summer of 1967. This work will include: (1) a regeneration survey on the milacre transect plots, (2) measurement of the 1/2-chain-wide cruise lines for stand information, (3) remeasurements of the observation plots for seedling survival, and development of vegetation on the mineral soil and humus seedbeds.

##### Reports

Data collected during the 1967 survey will be analyzed and results reported.

TABLE 7

NUMBER OF WHITE SPRUCE SEEDLINGS PER OBSERVATION PLOT  
IN 1963 AND THEIR SURVIVAL TO 1966, AREA 1

Plot Number	Bulldozed to Mineral Soil				Bulldozed to Humus Horizon			
	Number established in 1963	Number of Survivors			Number established in 1963	Number of Survivors		
		Fall 1964	Fall 1965	Fall 1966		Fall 1964	Fall 1965	Fall 1966
1	13	10	10	10	24	17	15	15
2	3	2	2	2	15	4	4	3
3	5	2	2	1	4	1	1	0
4 <sup>1</sup>	-	-	-	-	-	-	-	-
5	7	3	3	3	16	1	1	0
6	11	7	6	6	22	10	8	5
7	11	1	1	0	17	0	-	-
8	3	2	1	1	2	1	1	1
9	6	4	4	4	10	2	2	2
10	3	2	1	1	19	9	4	3
11 <sup>1</sup>	-	-	-	-	-	-	-	-
12	4	3	1	1	21	9	6	5
Average	6.6	3.6	3.1	2.9	15.0	5.4	4.1	3.4
Per cent Survival		54	47	44	-	35	27	23

<sup>1</sup> Plots 4 and 11 were destroyed by logging operations on the area.