SILVICULTURAL OPERATIONS

RIDING MOUNTAIN FOREST EXPERIMENTAL AREA

1969

Demonstration MS 093

by

R.H.M. Pratt

FOREST RESEARCH LABORATORY
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INTRODUCTION

The following report is a summary of the work carried out at the Riding Mountain Forest Experimental Area during the 1969-1970 fiscal year. This year's program included a regeneration survey, remeasurement of MS-090 rate-of-growth plots, assisting on research projects, general supervision and routine administration of the camp and research area.

REMEASUREMENT OF MS-090 PLOTS

The purpose of project MS-090 is to follow the course of tree mortality, regeneration, rate of growth and succession of tree species on the experimental area.

During the 1966, 1967 and 1968 field seasons, 1,452 MS-090 plots were remeasured at approximately the same time in the growing season as they were established twenty years ago. Because of minor discrepancies at the last remeasurement 32 plots were remeasured again this year in order to complete the 10-year remeasurement cycle.

REGENERATION SURVEY

One of the main objectives of the silvicultural program is to obtain adequate white spruce regeneration on all cut-over and understocked stands in the experimental area. To date the best results have been obtained by scarifying with a bulldozer blade to eliminate the dense hazel understory and expose mineral soil seedbeds to natural white spruce seedfall.

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In August, 1962, scarification treatment was carried out on 256 acres in Compartment 6 (Sec. 31, Twp. 20, Rge. 18, W.P.M.). The treatment area was then shelterwood cut during the 1963 and 1964 winter seasons. All white spruce over 19" d.b.h. as well as dead, dying, defective and high risk spruce trees of merchantable size were taken out.

During the last week in May and the first week in June, 1969 a regeneration survey was carried out; the purpose being to evaluate white spruce regeneration and advance growth.[2]

The survey was made on continuous strips of mil-acre quadrats run across the treated area at five chain intervals (Figure 1). Each quadrat was classified by moisture regime, percent scarification, and seedbed type. All quadrats that were stocked with natural regeneration and advance growth (up to 1" d.b.h.) were recorded and a total count of all white spruce was made on every tenth quadrat. The height of the tallest white spruce seedling was measured on each stocked mil-acre quadrat.

A total of 4,269 mil-acre quadrats were examined along the surveyed lines. Eleven hundred and ninety-nine quadrats or 28 percent of the total number examined showed some evidence of mineral soil exposure. Four hundred and four quadrats along the surveyed lines fell on mounds of dried out duff and humus.

Throughout this survey, the percent of mineral soil on each scarified mil-acre quadrat was recorded. Approximately 19 percent of the treated area examined in 1969 was obviously scarified to mineral soil, a little more than 72 percent was undisturbed and the remainder of the area was humus and bulldozed mounds.

When this area was scarified in 1962 the percentage of exposed mineral soil within the gross area treated per acre was estimated at from 20 to 60 percent, the average being closer to 35 percent. Apparently during the past seven years there has been a loss of receptive seedbeds probably due to logging slash and the reinvasion of woody shrubs and grass.

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[2] Advance growth, trees less than 1" d.b.h. established naturally and not as a result of scarification treatment.
Natural regeneration, trees resulting from the germination of natural seedfall on prepared seedbeds.

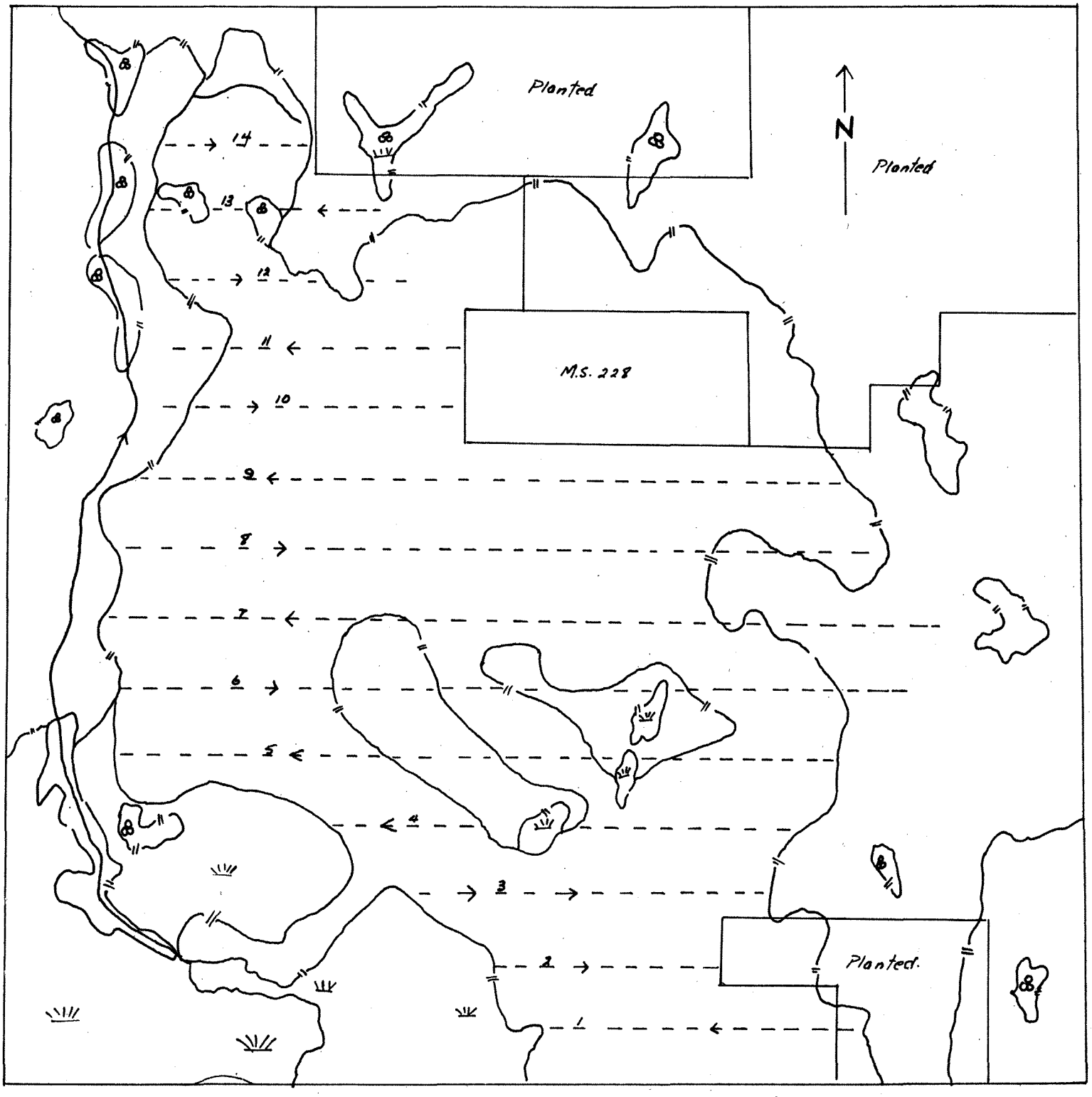
Fig 1

Riding Mountain Forest Experimental Area

White Spruce Regeneration Survey

Compartment 6, (Sec. 31, Twp. 20, Rge 18W)

May 1969



scale 1 inch = 10 chains

Table 1 shows the percent stocking of natural regeneration on white spruce by moisture regime and seedbed type. From the table it can be noted that 1,087 quadrats or 90 percent of the total number of scarified quadrats with mineral soil seedbeds were stocked with one- to five-year-old white spruce natural regeneration. However only 15 percent of the quadrats on mounds of dried out duff and humus were stocked. Seedbed scarification was not attempted on soils with a seven or eight moisture regime (wet to very wet), consequently regeneration of white spruce was absent in these areas.

A total of 1,086 seedlings were counted on 426 total count plots, resulting in an overall average of 2,549 regeneration white spruce seedlings per acre in the treated area. Table 2 shows the number of regeneration white spruce per acre by moisture regime and seedbed type.

Table 3 shows the average height of regeneration white spruce by seedbed and moisture regime.

Table 4 summarizes the percent advance growth stocking by seedbed and moisture regime. Table 5 shows the average height of the advance growth by moisture regime. Table 6 shows the number of advance growth white spruce by seedbed and moisture regime.

Table 7 summarizes the percent stocking, number of trees per acre, and average height in inches of regeneration and advance growth white spruce in the treated area.

SCARIFYING TO INCREASE ASPEN AND BALSAM POPLAR SUCKERING

In November, 1968 approximately 16 acres in Sec. 26, Twp. 20, Rge. 19, W.P.M. (Compartment 9) were treated with scarifying equipment. This was done to increase aspen and poplar suckering in a mature open hardwood stand with an adverse hazel understory which had limited natural regeneration to an average of 27 aspen and four balsam poplar suckers per acre. The number of trees per acre in the treatment area over one inch d.b.h. are listed in Table 8 by species and basal area.

Table 8

Stand Description

Species	No. of trees (1" d.b.h. + per acre)	Basal area (sq. ft. per acre)
White spruce	47	10.104
Trembling aspen	82	50.875
Balsam poplar	21	10.184
White birch	25	17.541
Total	175	88.704

Table 1

Percent Stocking of Natural White Spruce Regeneration by Seed bed and Moisture Regime

Compartment 6, May 1969

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Moisture Regime 7			Moisture Regime 8			Total		
	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked	Stocked	Not Stocked	% Stocked
Mineral Soil	767	81	90.4	305	29	91.3	15	2	88.2										1087	112	91.4
Humus	38	70	35.2	11	28	28.2	2	4	33.3	1	0	100.0							52	102	33.8
Mounds	4	165	2.3	4	68	5.5	1	8	11.1										9	241	3.6
Undisturbed	0	1220	0	0	1059	0	0	214	0	0	37	0	0	95	0	0	41	0	0	2666	0
All Seedbeds Combined.	809	1536	34.5	320	1184	21.3	18	228	7.3	1	37	2.6	0	95	0	0	41	0	1148	3121	26.9

Table 2

Number of Natural White Spruce Regeneration by Seedbed and Moisture Regime
Compartment 6, May 1969

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Moisture Regime 7,8,9			All		
	No. of Seedlings	No. of Plots	No. of Seedlings Per Acre	No. of Seedlings	No. of Plots	No. of Seedlings per acre	No. of Seedlings	No. of Plots	No. of Seedlings per acre	No. of Seedlings	No. of Plots	No. of Seedlings per acre	No. of Seedlings	No. of Plots	No. of Seedlings per acre	No. of Seedlings	No. of Plots	No. of Seedlings per acre
Mineral Soil	784	89	8809	290	32	9062										1074	121	8876
Humus	10	17	588	1	5	200	0	1	0							11	23	478
Mounds	1	25	40	0	7	0	0	1	0							1	33	30
Undisturbed		111			97			21			7			13			249	
All Seedbeds	795	242	3285	291	141	2064	0	23	0		7			13		1086	426	2549

Table 3

Average Height of Natural White Spruce Regeneration by Seedbed and Moisture Regime.

Compartment 6, May 1969

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Totals		
	Total ht. of tallest Seedling in inches	No. of Seedlings	Av. ht. of Seedlings in inches	Total ht. of tallest Seedling in inches	No. of Seedlings	Av. ht. of Seedlings in inches.	Total ht. of tallest Seedling in inches	No. of Seedlings	Av. ht. of Seedlings in inches	Total ht. of tallest Seedling in inches	No. of Seedlings	Av. ht. of Seedlings in inches	Total ht. of tallest Seedlings in inches	No. of Seedlings	Av. ht. of Seedlings in inches
Mineral Soil	4137	767	5.4	1963	305	6.4	101	15	6.7				6201	1087	5.7
Humus	147	38	3.8	74	11	6.7	7	2	3.5	3	1	3.0	231	52	4.4
Mounds	25	4	6.2	21	4	5.2	4	1	4.0				50	9	5.6
Undisturbed	0	0	0	0	0	0	0	0	0				0	0	0
All Seedbeds Combined.	4309	809	5.3	2058	320	6.4	112	18	6.2	3	1	3.0	6487	1148	5.1

Table 4

Percent Stocking of Advance Growth by Seedbed and Moisture Regime

Compartment 6, May 1969

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Moisture Regime 7			Moisture Regime 8			Total		
	No. Examined	Stocked	% Stocked	No. Examined	Stocked	% Stocked	No. Examined	Stocked	% Stocked	No Examined	Stocked.	% Stocked	No Examined	Stocked	% Stocked	No Examined	Stocked	% Stocked.	No. Examined	Stocked	% Stocked.
undisturbed	1220	60	4.9	1059	79	7.4	214	13	6.0	37	2	5.4	95	0	0	41	0	0	2666	154	5.8
All Seedbeds	2345	62	2.6	1504	79	5.2	246	13	5.3	38	2	5.3	95	0	0	41	0	0	4269	156	3.6

Table 5

Average Height of Advance Growth by Moisture Regime and Seedbed.

Compartment 6. May 1969.

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Moisture Regime 7			Moisture Regime 8			Total		
	No. of trees	Total ht. in inches	Av. Ht. in inches	No. of trees	Total ht. in inches	Av. ht in inches	No. of trees	Total ht. in inches	Av. ht in inches	No. of trees	Total Ht in inches	Av ht in inches	No. of trees	Total Ht. in inches	Av. ht in inches	No. of trees	Total Ht. in inches	Av. ht. in inches	No of trees	Total Ht. in inches	Av. ht. in inches.
undisturbed	60	1589	26.5	79	1798	22.8	13	445	34.2	2	93	46.5							154	3925	25.5
All Seedbeds	62	1615	26.0	79	1798	22.8	13	445	34.2	2	93	46.5							156	3951	25.3

Table 6

Number of Advance Growth White Spruce per Acre by Moisture Regime and Seed bed, Compartment 6, May 1969

Seedbed	Moisture Regime 3			Moisture Regime 4			Moisture Regime 5			Moisture Regime 6			Moisture Regime 7			Moisture Regime 8			Total		
	No. Plots	No Trees	No trees Per Acre	No. Plots	No Trees	No Trees Per Acre	No Plots	No Trees	No Trees Per Acre	No Plots	No Trees	No trees Per Acre	No Plots	No Trees	No Tree Per Acre	No Plots	No Trees	No. Tree Per Acre	No Plots	No Trees	No Trees Per Acre
Undisturbed	111	3	27	97	6	62	21	2	95	7	1	143	9	0	0	4	0	0	249	12	48
All Seedbeds	242	3	12	141	6	42	23	2	87	7	1	143	9	0	0	4	0	0	426	12	28

Table 7

Percent Stocking, Number of Trees Per Acre and Average Height in Inches of Regeneration and Advance Growth White Spruce by Seedbed and Moisture Regime

Compartment 6, May 1969

	Moisture Regime																				
	3			4			5			6			7			8			ALL		
Seed bed.	% Stocking	No. trees Per Acre	Av. Ht in inches	% Stocking	No. trees Per Acre	Av. Ht in inches	% Stocking	No. trees Per Acre	Av. Ht in inches	% Stocking	No trees Per Acre	Av. Ht in inches	% Stocking	No trees Per Acre	Av. Ht in inches	% Stocking	No. Trees Per Acre	Av. Ht in inches	% Stocking	No. Trees Per Acre	Av. Ht in inches.
Mineral Soil	90.4	8809	5.4	91.3	9062	6.4	88.2	0	6.7										91.4	8876	5.7
Humus	35.2	588	3.8	28.2	200	6.7	33.3	0	3.5	100	0	3.0							33.8	478	4.4
Mounds	2.3	40	6.2	5.5	0	5.2	11.1	0	4.0										3.4	30	5.6
Undisturbed	4.9	27	26.5	7.4	62	22.8	6.0	95	34.2	5.4	143	46.5							5.8	48	25.5
ALL Seedbeds	37.1	3298	6.8	26.5	2106	9.7	12.6	87	17.9	7.9	143	32.0	0.0	0.0		0.0	0.0		30.5	2577	8.0

Thirty-five twelve foot wide strips were scarified in the test area (Figure 2) in the following manner:

Strips	Treatment
1-E to 10-E	Scalped and chained in one operation
6-W to 10-W	Scalped and then chained
10-W to 24-W	Scalped and shark-finned barrelled in one operation
11-E to 24-E	Scalped first then shark finned barrelled
25 to 36	Scalped only

In August, 1969 regeneration on the various treatments was tallied on strips selected at random throughout the test area. The results of the scarification treatments are summarized in Table 9 and provide evidence that scarifying understocked deteriorating hardwood stands with heavy equipment to remove the unwanted shrubs and expose the ground to sunlight will encourage aspen and poplar regeneration.

AERIAL SPRAYING SURVEY

In 1964, 280 acres of spruce-aspen forest were sprayed with herbicide to release advance growth white spruce from competing hardwoods and shrubs and to improve the habitat for the regeneration of white spruce from natural seedfall (Figure 3).

Aerial spraying was carried out on August 12 with a Super Piper Cub aircraft with a spray-carrying capacity of 80 gallons. Five gallons of aqueous solution containing 48 oz. acid equivalent 2,4-D were applied per acre.

In June, 1965 the crown condition of individual trees was recorded on all hardwoods in 30, tenth-acre plots spaced at 10 chain intervals throughout the sprayed area. In addition the effects of the herbicide spray on shrubs was assessed on two mil-acre quadrats systematically located within each 1/10 acre sample plot.

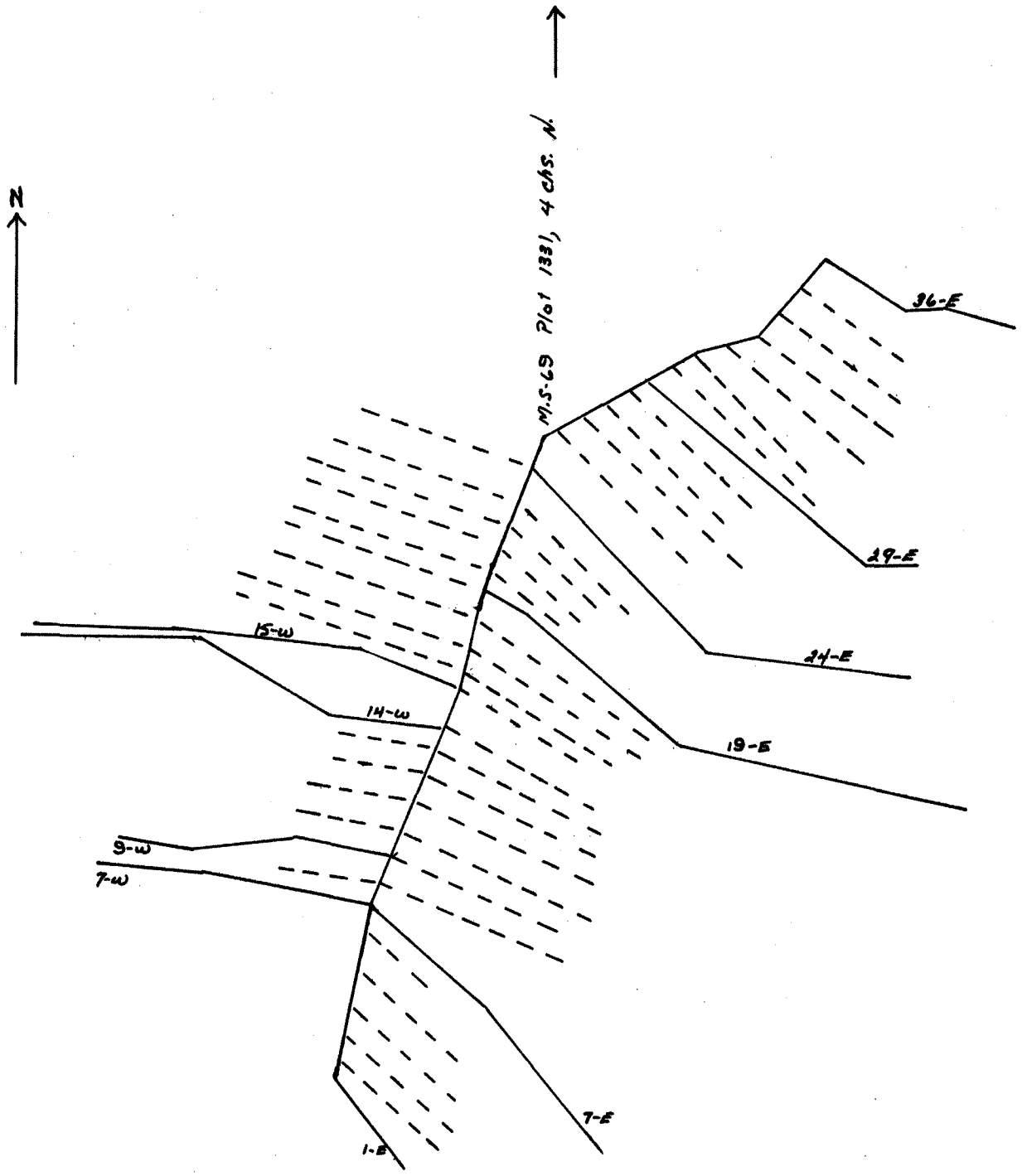
In general, the aerial application of 2,4-D appeared to be an effective and efficient way to release spruce from overtopping hardwoods and minimize leaf smothering to white spruce seedlings by top killing unwanted shrub growth. White spruce in the sprayed area was not adversely affected by the herbicide.

A year later in August, 1966, approximately 122 acres at the south half of the sprayed area were scarified, creating mineral soil seedbeds for the regeneration of white spruce from natural seedfall.

Figure 2

Area Scarified in November 1968, to encourage t.A. and b.Po. Suckering.

(Sec. 26, twp. 20, Rge. 19. W. A.M.F.E. A.)



Regeneration Survey Carried out on Numbered Lines

Scale 1 inch = 2 chains

Table 9

Regeneration Following Scarification in an Open Mature Aspen Stand

Treatment	Sample Strips	Tree Species	Percent Stocked	Number of Suckers Per Acre	Basis Number of Quadrats Examined
Scalped only	36, 29, 27	tA	98	27,400	
		bPo	52	3,300	
		All	99	30,761	110
Scalped and barrelled in one operation	14, 15	tA	96	22,300	
		bPo	5	0	
		All	96	22,300	74
Scalped first then barrelled	24, 19	tA	95	16,400	
		bPo	54	3,700	
		All	95	20,125	127
Scalped and anchor chained in one operation	1, 7-E	tA	89	10,800	
		bPo	0	0	
		All	89	10,800	56
Scalped first then anchor chained	9-W, 7-W	tA	87	13,100	
		bPo	0	0	
		All	87	13,100	158

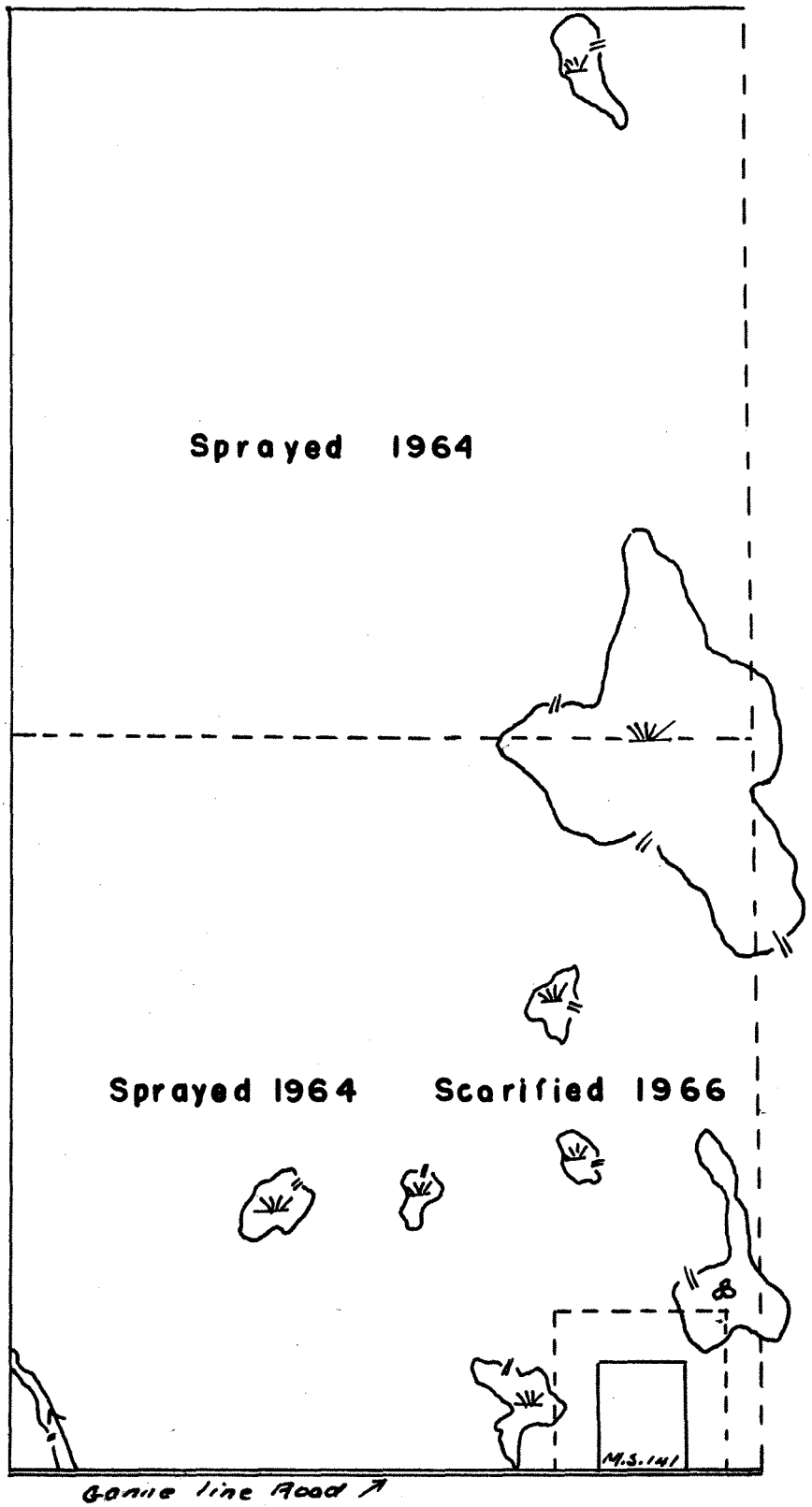
During the third week of August, 1969 the sprayed area was reexamined to check the condition of the remaining hardwoods; to evaluate the aspen and poplar suckering, and the white spruce regeneration which had occurred since the herbicide and seedbed treatments.

Table 10 shows the crown condition and mortality to hardwoods one year after and five years after the herbicide treatment. Table 11 shows the reproduction of understory shrubs and trees on the unscarified and scarified sprayed areas during the same periods.

Figure 3.

COMPARTMENT 3 (WEST 1/2)

Sec 6 Twp 21 Rge 18 WPM



Scale 1 inch = 10 chains.

Table 10

Effect Of 2,4-D Aerial Spray On The Crowns Of Hardwoods, 1965 And 1969

Injury Class (Percent reduction of living crown)	Trembling aspen		Balsam poplar		White birch		All	
	1965	1969	1965	1969	1965	1969	1965	1969
	No. of Trees Examined							
0 - 20	7	17	6	18	3	6	16	41
21 - 40	12	19	7	3	1	3	20	25
41 - 60	8	11	8	2	3	0	19	13
61 - 80	24	5	4	0	6	1	34	6
81 - 100	79	29	0	0	9	2	88	31
Dead	0	48	0	5	0	6	0	59
Basis: No. trees examined	130	129	25	28	22	18	177	175

Table 11

Effect Of 2,4-D Aerial Spray And Scarification On Understory Shrubs And White Spruce Regeneration

Species	Average number of stems per acre			
	1965		1969	
	Killed by spraying	Living	Scarified	Not scarified
Hazel	22,800	0	1,000	5,352
Trembling aspen suckers	2,640	0	3,055	1,725
Balsam poplar suckers	40	500	277	225
Currant spp.	40	800	1,555	1,625
Raspberry	0	4,460	4,500	4,775
Rose	140	4,110	2,166	2,750
White spruce	0	0	15,500	425

Basis: 60 one mil-acre plots

GENERAL

Table 12 lists jobs and projects on which assistance was provided during the 1969 field season.

Table 12

Project	Type of Work	Man-days
MS-075	Thinned trembling aspen stand	3 days
MS-090	Weather station notes and supervision	Daily
MS-093	Demonstration area tours	3 days
MS-004	Fencing experimental plots	2 days

FUTURE WORK

Silvicultural operations which were carried out in 1966 and 1961 (ie. 5 and 10 remeasurements) will be examined in 1970. Progress reports will be prepared. Consideration will be given as to the desirability of outlining a program of improving roadside amenity values along the experiment area's secondary road system.