



**CLEAR CUTTING AND CLEAR CUTTING
IN STRIPS, SEEDBED PREPARATION, AND
SCATTERING SLASH IN JACK PINE STAND
TO SECURE JACK PINE REGENERATION,
MANITOBA AND SASKATCHEWAN**

by
N. R. Walker

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CONTENTS

	Page
INTRODUCTION	1
HISTORY OF EXPERIMENT	1
WORK COMPLETED IN 1965	2
Areas 27, 33 - 41	2
Logging	2
Establishment of Regeneration Plots	2
Condition of Regeneration Quadrats at Establishment.	4
Broadcast Seeding Experiment	7
Slash Scattering Experiment	8
Planting Experiment	9
AREAS 2 - 9	9
Re-examination of 1961 Transects	9
Jack Pine Regeneration - 1961 Transects	11
Effects of Site	13
WORK PROPOSED FOR 1966	14
Establishments of Regeneration Plots	14
Site Classification	14
Examination of 1962 Regeneration Transects	14
REFERENCES	15

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CLEAR CUTTING AND CLEAR CUTTING IN STRIPS
SEEDBED PREPARATION, AND SCATTERING SLASH IN JACK PINE
STANDS TO SECURE JACK PINE REGENERATION

Manitoba and Saskatchewan

Internal Report MS-212

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INTRODUCTION

In 1960 a project was begun to determine whether clear cutting, clear cutting in strips, mechanical seedbed preparation, and scattering of cone bearing slash in jack pine stands would result in adequate regeneration. Additional studies of planting, seeding and supplementary slash scattering have been carried out on several cut-over areas. These operations have provided for five different conditions for regeneration comparison: no scarification, scarification only, scarification and seeding, scarification and slash distribution, scarification and planting.

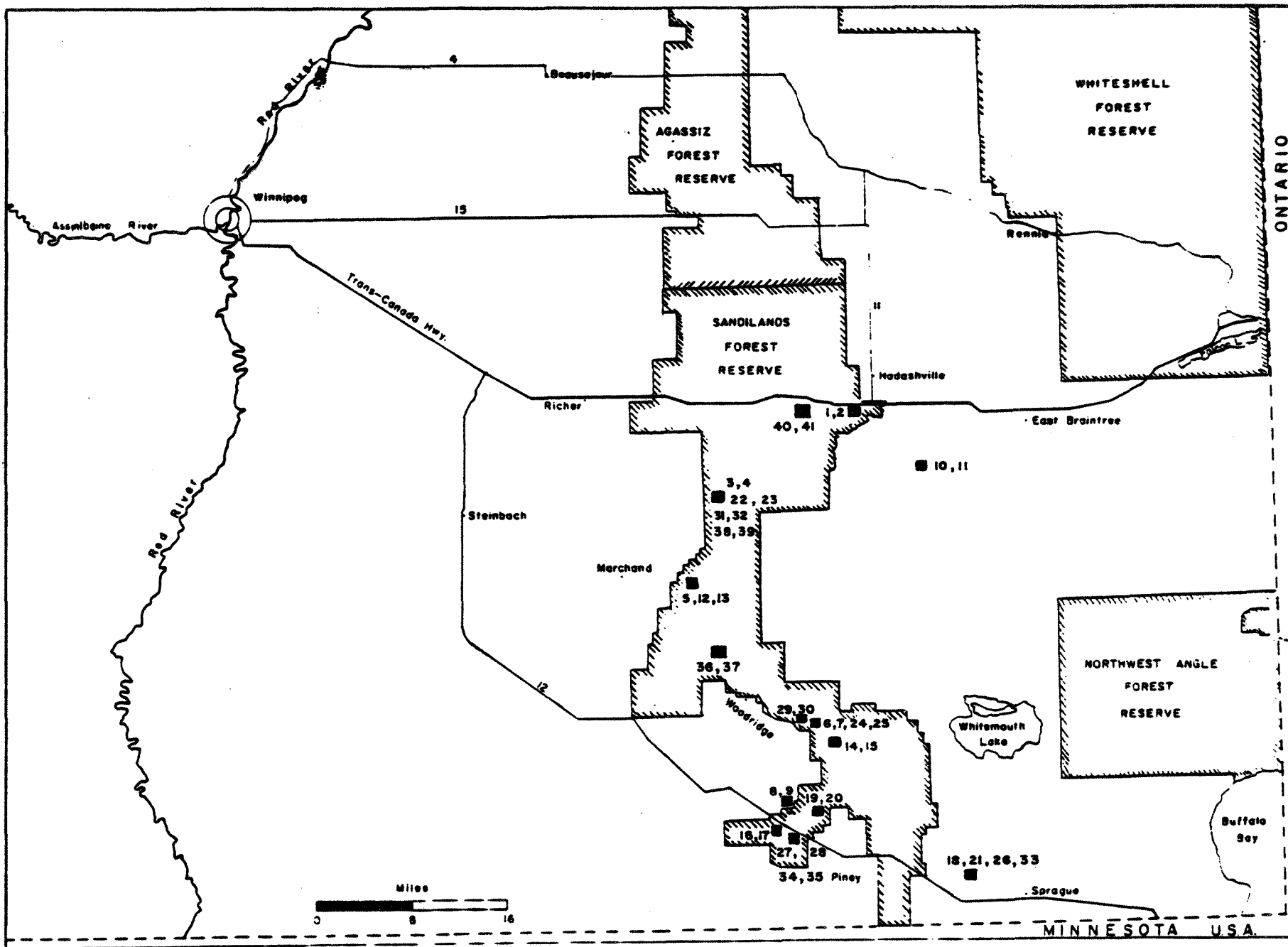
Experimental areas were established between the winter of 1960-61 and the fall of 1964. The project provides for complete regeneration examinations five years after logging. The first five-year assessment was carried out in the fall of 1965.

HISTORY OF EXPERIMENT¹

Between 1960 and 1964 forty-one areas were located and established in southeastern Manitoba (Figure 1). Areas varied from 6.4 to 32.5 acres in size. Areas were usually located in pairs with one area clear cut and the other clear cut in two-chain-wide strips alternating with two-chain-wide uncut strips. Prior to cutting a 10 per cent cruise was made of the original stand on each area and sufficient measurements were taken to prepare a height-diameter curve and to determine site index. Before logging seedbeds were prepared mechanically with a tractor-drawn middlebuster plough on approximately one-half of each area. Furrows approximately 3 to 4 feet wide and 2 to 5 inches deep were ploughed; the sod layer was overturned on each side of the furrow creating ridges 1 to 2 feet wide.

Following logging, regeneration transects were established on each area. Where possible, 400 milliacre quadrats were located per area, 200 where mechanical seedbeds had been prepared and 200 on undisturbed seedbeds. Quadrats were established on randomly located transects each 200 by 10 links. On several cut-over areas seeding and supplementary slash scattering was done.

Figure 1



MAP OF SOUTHEASTERN MANITOBA
SHOWING LOCATIONS OF EXPERIMENTAL AREAS, MS-212

¹ For further details, the reader is referred to the establishment and progress reports prepared for this project (Cayford 1961, 1963, 1964, Cayford and Sims 1962, Walker 1965).

WORK COMPLETED IN 1965

Areas 27, 33 - 41

Logging

Logging on areas 33 - 41; established in 1964, was scheduled for completion by the spring of 1965. Slash was to be lopped and scattered in conjunction with the logging operation.

Logging on areas 34 to 37 was not started and these areas will be cut during the winter of 1965-66. Cutting and hauling was completed on areas 27, 33, 40 and 41. Logging was also completed on areas 38 and 39, however, these areas were flooded for several months during the summer and both were abandoned.

Establishment of Regeneration Plots

A total of 80 transects, each containing 20 milli-acre quadrats, were established on four of the areas cut during the winter of 1964-65. Transects were established randomly on unscarified and scarified areas, on seeded and on slash scattered areas (Table 1). Transects were marked at the northeast corner by a numbered wooden post, 2 by 2 inches by 2.5 feet in length. The other three corners and the mid points of the long boundaries were marked with numbered wooden posts, 1 by 1 inch by 2 feet in length. Quadrat 1 in each transect was located adjacent to the large corner post.

Advance growth and residual trees were tallied on each quadrat. Advance growth, which was considered as stems less than 0.5 inches d.b.h., was tallied in one-foot height classes. Residual trees were tallied in one-inch diameter classes.

In addition, the following information was recorded on each quadrat.

- (a) Coverage of seedbed types by 10-per cent classes. Seedbeds recognized were mineral soil, humus, undisturbed, slash, and logs.
- (b) Number of cones, using the following classes:

class 0 = 0 cones
class 1 = 1 - 10 cones
class 2 = more than 10 cones

- (c) Presence or absence of mineral soil; any amount of mineral soil whether covered with slash or not.

Table 1

SUMMARY OF REGENERATION PLOTS

Area Number	Location	Number of quadrats				Transect numbers			
		Scarified	Un-Scarified	Scarified and Seeded	Scarified and Slash Scattered	Scarified	Un Scarified	Scarified and Seeded	Scarified and slash scattered
27	Piney	200	200			801-810	811-820		
33	Sprague	100	100	100	100	821-825	826-830	831-835	835-840
40	Hadashville	100	100	100	100	881-885	886-890	891-895	896-900
41	Hadashville	100	100	100	100	901-905	906-910	911-915	916-920
TOTAL		500	500	300	300	-	-	-	-

Condition of Regeneration Quadrats at Establishment

Regeneration transects were established and tallied during the summer of 1965.

Advance growth stocking by quadrat ranged from 0 to 3.5 per cent, density from 0 to 45 trees per acre, (Table 2).

Residual stocking of jack pine ranged from 2 to 30 trees per acre. Volumes ranged from 0 to 1.9 cords per acre (Table 3).

Tables 4 and 5 give the distribution of seedbeds for the cut-over areas. On the prepared areas mineral soil and humus average 28 per cent of the area, slash and undisturbed averaged 72 per cent. On the unprepared areas mineral soil and humus averaged 4 per cent of the area, slash and undisturbed averaged 96 per cent.

On the prepared areas the per cent of quadrats containing mineral soil ranged from 70 to 94. The average for all areas was 85 per cent (Table 6).

The per cent of quadrats stocked with jack pine cones is shown in Table 7. Ninety-five per cent of all quadrats were stocked with one or more cones and 76 per cent had more than 10 cones.

Table 2

SUMMARY OF JACK PINE ADVANCE GROWTH

Area Number	Location	Per cent Stocking	Number Per Acre	Basis=number of milliacre quadrats
27	Piney	None	None	400
33	Sprague	3.5	45.0	400
40	Hadashville	0.8	7.5	400
41	Hadashville	0.2	2.5	400

Table 3

SUMMARY OF JACK PINE RESIDUAL TREE TALLY

Area Number	Location	No. per acre			Basal Area (sqft.)	Cords per Acre	Basis-number of milliacre quadrats
		1-3 inch d.b.h.	4+ inch d.b.h.	Total			
27	Piney	0	20	20	3.8	0.9	400
33	Sprague	0	30	30	7.5	1.9	400
40	Hadashville	0	5	5	0.9	0.3	400
41	Hadashville	2	0	2	0.06	0	400

Table 4

DISTRIBUTION OF SEEDBED TYPES - PREPARED AREAS

Area Number	Location	Per Cent Occurrence of Seedbeds					Basis-number of milliacre quadrats
		Mineral Soil	Humus	Slash	Undis-turbed	Logs	
27	Piney	13	2	53	32	0	200
33	Sprague	25	1	64	10	0	300
40	Hadashville	31	1	44	24	<1	300
41	Hadashville	30	3	46	21	0	300
Average		26	2	51	21	<1	1100

Table 5
DISTRIBUTION OF SEEDBED TYPES - UNPREPARED AREAS

Area Number	Location	Per Cent Occurrence of Seedbeds					Basis-number of milliacre quadrats
		Mineral Soil	Humus	Slash	Undis- turbed	Logs	
27	Piney	4	1	48	47		200
33	Sprague	3	2	58	37	0	100
40	Hadash- ville	0	<1	37	62	<1	100
41	Hadash- ville	3	0	61	36	0	100
Average		3	1	50	46	<1	500

Table 6
PER CENT OF QUADRATS WITH MINERAL SOIL

Number	Location	Quadrats with Mineral Soil (per cent)	Basis - number of milliacre quadrats ¹
27	Piney	70	200
33	Sprague	94	300
40	Hadashville	89	300
41	Hadashville	84	300
Average		85	1100

¹ Quadrats on prepared areas only.

Table 7

PER CENT OF QUADRATS WITH JACK PINE CONES

Area Number	Location	Per cent of quadrats with:			Basis-number of milliacre quadrats ¹
		0 Cones	1-10 Cones	More than 10 Cones	
27	Piney	19	30	51	200
33	Sprague	41	8	92	300
40	Hadashville	4	19	77	300
41	Hadashville	2	21	77	300
Average		5	19	76	1100

¹ Quadrats on prepared areas only.

Broadcast Seeding Experiment

Broadcast seeding was carried out on three of the prepared cut-over areas (Table 8). Seeding was done on May 6 and 7. The locations of all seeded plots were mapped and plot corners were marked with wooden posts, 2 by 2 inches by 2.5 feet.

Seed was obtained from the Manitoba Department of Mines and Natural Resources; it had been collected in 1962 from the Sandilands Forest Reserve. It was pretreated by the Department of Forestry in Winnipeg in April 1965 as follows:

- Arason 75 - 11.8 grams per pound of seed.
- Endrin 75 W - 3.0 grams per pound of seed.
- Aluminum flakes - 4.5 grams per pound of seed.

One part of Latex (Dow 512-R) to 9 parts of water was used as a sticker.

A germination test between April and May, 1965, indicated a viability of 92.0 per cent after 21 days.

Seed was sown with a Cyclone hand seeder at a rate of approximately 12 ounces per acre. Care was taken to ensure that most seed was sown on favourable seedbeds.

Table 8

BROADCAST SEEDING - 1965

Area Number	Location	Method of Cutting	Area Seeded (Acres)	Date of Seeding
33	Sprague	strip cut	0.5	May 6
40	Hadashville	strip cut	0.5	May 7
41	Hadashville	clear cut	1.0	May 7

Slash Scattering Experiment

Supplementary slash scattering was carried out on three of the prepared cut over areas (Table 9). Cone bearing branches were distributed over all favourable seedbeds to improve upon slash scattering done during logging. Plot locations were mapped and corners were marked with wooden posts, 2 by 2 inches by 2.5 feet.

Table 9

SUPPLEMENTARY SLASH SCATTERING - 1965

Area Number	Location	Area (Acres)	Date of Scattering	Man Hours Per Acre
33	Sprague	0.5	May 6	3.0
40	Hadashville	0.5	May 12	2.0
41	Hadashville	1.0	May 7	1.5

Planting Experiment

Planting was carried out on one-tenth-acre plots on three of the 1964-65 cut-over areas. Two-hundred seedlings were planted on each area, 100 seedlings per prepared and unprepared seedbeds.

Planting stock, age 2 - 1, was obtained from the Manitoba Department of Mines and Natural Resources nursery at Hadashville. A separate report describing the planting has been prepared.

Areas 2 - 9

Re-examination of 1961 transects -

All advance growth tallied in 1961 was remeasured in one-foot height classes in 1965. Table 10 gives a comparison for the two measurements by per cent stocking and density per acre. Area 7 shows an increase in stocking and density in 1965. However, only 140 quadrats were examined as three transects were destroyed before the final measurement. Stocking declined on areas 2 - 6 and remained the same on areas 8 and 9. Density declined on areas 2 - 6 and 9 and remained the same on area 8.

All residual trees tallied in 1961 were recorded as living or dead in 1965. Table 11 gives a comparison for the two measurements. The total number of living trees per acre declined on all areas.

Mineral soil exposure, not recorded at the time of plot establishments in 1961, was rated on areas 2 - 9 during the 1965 measurements (Table 12). An average of 78 per cent of the quadrats contained mineral soil. Individual areas ranged from 62.9 to 96.7 per cent.

Table 10

SUMMARY OF JACK PINE ADVANCE GROWTH

Area Number	Location	% stocking		No. per acre		Basis-number of milliacre quadrats	
		1961	1965	1961	1965	1961	1965
2	Hadashville	5.5	3.2	68	40	400	400
3	Richer	7.0	5.2	85	62	400	400
4	Richer	12.0	8.0	155	105	400	400
5	Marchand	8.8	7.2	148	117	400	400
6	Woodridge	9.0	7.0	120	90	200	200
7	Woodridge	24.0	26.4	635	700	200	140
8	Piney	1.6	1.6	22	22	320	320
9	Piney	0.5	0.5	55	5	400	400

Table 11

SUMMARY OF JACK PINE RESIDUAL TREE TALLY

Area Number	Location	Total No. per acre		Basis-number of milliacre quadrats	
		1961	1965	1961	1965
2	Hadashville	60	25	400	400
3	Richer	85	75	400	400
4	Richer	170	137	400	400
5	Marchand	68	50	400	400
6	Woodridge	35	25	200	200
7	Woodridge	85	71	200	140
8	Piney	37	34	320	320
9	Piney	22	12	400	400

Table 12

PER CENT OF QUADRATS WITH MINERAL SOIL

Area Number	Location	Quadrats with mineral soil (per cent)	Basis-number of milliacre quadrats ¹
2	Hadashville	70.0	200
3	Richer	80.0	200
4	Richer	94.5	200
5	Marchand	78.5	200
6	Woodridge	66.5	200
7	Woodridge	62.9	140
8	Piney	96.7	120
9	Piney	78.0	200
Average		78.0	

¹Quadrats on prepared areas only.

Jack Pine Regeneration - 1961 Transects

All permanent transects established for the 1960 - 61 cutting areas as well as temporary transects on seeded and slash scattered areas were examined in 1965. The number of milliacre quadrats examined for each condition is: unprepared 1,200, prepared 1,460, prepared and seeded 500, prepared and slash scattered 300.

Seedling heights were taken at the time of remeasurement. However as heavy browse damage occurred on most areas the heights are not indicative of a five year growing period and are not included in any of the Tables.

Table 13 gives the per cent stocking and the density per acre of jack pine regeneration for areas 2 - 9.

Seedbed preparation, seeding, and slash scattering have increased stocking over no treatment. However, on average stocking of over 40 per cent was reached only on the seeded areas, and on individual areas from 32 to 52 per cent.

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Table 13

JACK PINE REGENERATION STOCKING AND DENSITY - 1965

Area Number	Year of Logging	Unprepared		Prepared		Prepared and Seeded		Prepared and Slash Scattered	
		Per cent Stocking	Density	Per cent Stocking	Density	Per cent Stocking	Density	Per cent Stocking	Density
2	1960-61	7.5	175	22.0	625	33.0	1,550	30.0	650
3	"	4.5	50	14.5	175	-	-	28.0	600
4	"	6.0	200	30.0	275	45.0	1,400	17.0	200
5	"	36.0	425	36.0	1,225	50.0	650	-	-
6	"	-	-	25.5	325	-	-	-	-
7	"	-	-	25.0	1,286	-	-	-	-
8	"	0.5	25	20.8	500	32.0	650	-	-
9	"	8.5	125	19.0	375	52.0	800	-	-
Average		10.5	166.7	24.2	575.3	42.4	1,010.0	25.0	483.3

On areas 3 and 4 there was also considerable trembling aspen and balsam poplar regeneration. Per cent stocking for trembling aspen was 28.8 and 19.5 with a density of 450 and 550 stems per acre, per cent stocking for balsam poplar was 5.2 and 1.2 with a density of 175 and 50 stems per acre, for areas 3 and 4 respectively.

Effects of Site

The effect of site on jack pine regeneration is shown in Table 14. The per cent stocking for unprepared, prepared and seeded areas was best on the dry habitat. For the slash scattered areas the mesotrophic fresh habitat had a higher stocking percentage than the drier subtype (mf-).

Table 14

EFFECT OF SITE ON JACK PINE REGENERATION

Treatment	Year of Logging	Habitat Type							
		d*	d	d to mf-	mf-	mf	of	om	d to of
		Per cent stocking							
Unprepared	1960-61		35.6	12.9	4.0	6.6			26.8
Prepared	1960-61		37.4	15.7	19.5	20.6	20.9		29.0
Seeded	1960-61		50.0	32.0	43.3				
Slash Scattered	1960-61				24.2	30.0			

WORK PROPOSED FOR 1966

Establishment of Regeneration Plots

Regeneration plots will be established on areas 33 - 37 which will be cut during the winter of 1965-66. Regeneration plots will be one milliacre in size and located in transects of 20. On each plot advance growth, residual trees, seedbed types, mineral soil occurrence, and cone abundance will be recorded.

Site Classification

Areas 33 - 37, 40 and 41 will be mapped in accordance with the habitat types recognized for southeastern Manitoba (Mueller-Dombois 1964).

Examination of 1962 Regeneration Transects

The fifth-year examination of regeneration on Areas 1 and 12 - 18, which were cut during the winter of 1961-62, will be carried out after August 1st, 1966. This will involve the measurement of 3,200 milliacre quadrats that were established in 160 permanently located transects in 1962. Of these quadrats, 1,600 are located on mechanically prepared areas and 1,600 on unprepared areas.

On each quadrat all advance growth stems tallied in 1962 will be recorded as living or dead and will be recorded in one-foot height classes. Residual trees which were recorded in 1961 will be recorded as living or dead. Mineral soil exposure, not recorded in 1961, will be rated on each of the quadrats. (This rating is required in order to be comparable with data collected on areas 20 to 42.)

On each quadrat the presence or absence of regeneration of jack pine and other species will be noted, and the height of the tallest seedling of each species recorded by one-inch height classes. On quadrats 5, 10, 15 and 20 a total tally of regeneration will be made by species and by one-inch height classes.

Regeneration on slash scattered and seeded plots will be examined on all habitat types occurring within a plot on randomly located transects, 200 by 10 links. On each of the plots there will be five transects. Regeneration will be recorded in the same manner as on the permanent transects. Slash scattered plots are located on areas 13, 15, 16, 17 and seeded plots on areas 12, 13, 15 and 17.

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