THE ECOLOGICAL EFFECTS OF PRESCRIBED BURNING ON JACK PINE SITES IN SOUTHEASTERN MANITOBA

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by

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INTRODUCTION

In 1964 a research program was begun to investigate the use of prescribed burning in cut-over jack pine stands in southeastern Manitoba. The program deals with three aspects of fire: site preparation, fire behaviour, and post-fire succession. This report is concerned with the third aspect, post-fire succession.

WORK COMPLETED IN 1967

Vegetation Study

Post-burn vegetation was sampled on the 1965 burn (#4553D) and on the 1964 burn. Braun-Blanquets cover abundance scale as presented by Phillips (1959) was used to describe vegetation on the areas.

Soils

Five samples were collected from the Bt horizon and from the 0 to 4-inch depth on each plot in the 1965 burn (#4553D). Samples were transported to the laboratory for analysis.

Rodent Population Studies

The survey of post-burn rodent populations was continued on burns 4553D and 4554W. Trapping in the fall of 1967 completed studies on burn 4553D. Studies on burn 4554W will continue until the fall of 1968.

A third study was initiated on burn number PB-67-M2. Three five-acre blocks were set up as shown in Figure 1. Block II was set approximately two chains from the stand edge and block III was established at the maximum distance possible from the stand edge. The purpose was to study the effect of distance from the uncut stand on rodent reinvasion. Trapping procedures have been described in earlier reports.

RESULTS

Vegetation Study

1964 burn: Table I gives the per cent coverage by species and total coverage of vegetation present on areas I, II and III three years after burning. Vegetative cover on the area as a whole was reduced 13.59 per cent from the preceding year and 21.66 per cent from pre-burn conditions. Arctostaphylos uva-ursi and Carex sp. however, show a considerable increase in coverage from that of the preceding year. Carex sp., not present before the burn, remains the most numerous species followed by Grasses and Arctostaphylos uva-ursi.

1965 burn 4553D: Post burn vegetation coverage for the 1965 burn is shown in Table 2. Total coverage two years after burning was 51.2 per cent, an increase of 13.0 per cent over the previous year, and only slightly below the pre-burn coverage of 56.2 per cent. Species showing comparatively large increases in coverage were as follows: Arctostaphylos uva-ursi, Vaccinium augustifolium, Ceanothus americanus, Compositae sp., Rosa acicularis and Grass sp.

Callurgon schreberi, Graminae sp. and Cladonia rangiferina numerous prior to the burn have not been re-established on the area.

Rodent Population Studies

The number of mammals trapped during the spring and fall periods are shown in Tables 3 and 4 for burn areas 4553D and 4554W respectively and in Table 5 for burn area PB-67-M2. Spring trapping on area PB-67-M2 was carried out prior to burning. Since no information on the home radius of Eutamias minimus borealis could be found, the number per acre was calculated on a five acre basis.

Two new species Microtus pennsylvanicus drummondii and Clethrionomys gapperi larengi were found on burn number 4553D. Clethrionomys however was present before the fire but not present one year after.

On burn 4554W the population of Peromyscus maniculatus has more than doubled in the fall trapping on the burn area. Two new species Zapus hudsonius hudsonius and Microtus pennsylvanicus drummondii have appeared in the control.

On burn area PB-67-M2 a population increase on all sample areas was evident after burning. The increase was not as great on area III as compared to the control and area II, and was due primarily to a large increase in numbers of Peromyscus manuiculatus on areas II and III. All other species on these areas were either reduced in numbers or eliminated. The control area however, experienced an increase in species as well as population.

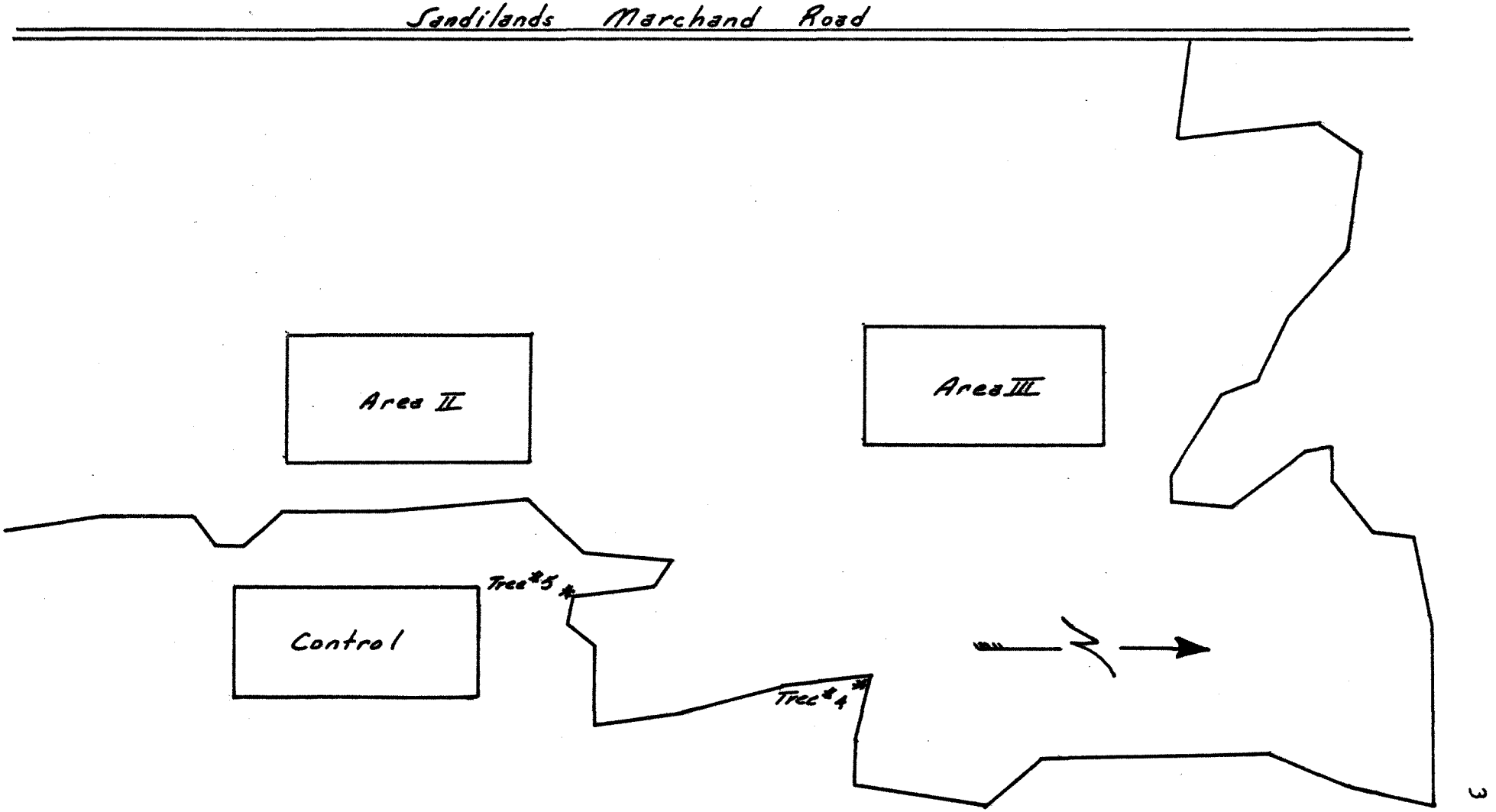

Figure 1

Small mammal survey Burn No. PB-67-M2 Scale 1" = 6 chains

TABLE I
SUMMARY OF POST-BURN VEGETATION - 1964 BURN

Species	Per cent coverage							
	Area I		Area II		Area III		All areas	
	P.S.P.	All plots	P.S.P.	All plots	P.S.P.	All plots	P.S.P.	All plots
Arctostaphylos uva-ursi	3.98	5.42	7.60	10.06	7.80	6.90	6.46	7.46
Apocynum androsaemifolium	0.30	0.40	0.18	0.16	0.95	0.92	0.48	0.49
Amelanchier alnifolia	0.15	0.08	0.32	0.34	1.95	1.12	0.81	0.51
Anemone quinquefolia	0.05	0.06	0.18	0.14	0.22	0.12	0.15	0.11
Antennaria canadensis	1.20	0.61	1.20	0.82	2.28	1.60	1.56	1.01
Anemone patens	1.25	1.48	0.20	0.38	2.60	2.06	1.35	1.51
Compositae sp.	0.92	0.62	1.07	1.07	2.00	2.24	1.33	1.31
Carex sp.	11.58	12.54	6.78	6.65	4.58	4.83	7.65	8.01
Campanula rotundifolia	0.22	0.25	0.18	0.23	0.38	0.28	0.26	0.25
Ceanothus americanus	—	0.02	0.15	0.08	0.02	0.01	0.06	0.04
Epilobium angustifolium	—	—	—	—	—	0.01	—	0.003
Equisetum hyemale	—	0.01	—	—	—	—	—	0.003
Fragaria virginiana	0.02	0.01	—	0.08	0.48	0.29	0.17	0.13
Gaultheria procumbens	0.02	0.01	0.40	0.61	0.35	0.26	0.26	0.29
Galium boreale	0.35	0.26	0.65	0.62	1.22	0.99	0.74	0.62
Heuchera richardsonii	—	0.01	—	—	0.05	0.04	0.02	0.02
Lithospermum canescens	0.12	0.30	0.07	0.14	0.62	0.72	0.28	0.39
Grasses	3.52	3.00	7.62	8.45	7.42	9.52	6.19	6.99
Maianthemum canadense	0.10	0.11	0.30	0.22	0.05	0.06	0.15	0.12
Potentilla tridentata	1.38	1.19	2.02	2.65	1.80	2.14	1.74	1.99
Prunus pumila	0.32	0.31	0.32	0.34	0.02	0.02	0.23	0.23
Prunus virginiana	0.30	0.90	0.30	0.40	1.08	0.70	0.50	0.67
Prunus pensylvanica	—	—	—	—	0.02	0.01	0.01	0.003
Rosa acicularis	1.42	1.55	1.92	1.42	0.75	2.16	1.42	1.71
Symphoricarpos albus	—	—	0.02	0.01	0.02	0.16	0.02	0.06
Salix sp.	0.15	0.22	—	—	0.15	0.45	0.10	0.22
Vaccinium angustifolium	2.70	2.92	3.80	4.00	3.72	3.55	3.41	3.49
Viola sp	0.05	0.16	0.05	0.04	0.12	0.10	0.08	0.10
Spiraea alba	0.45	0.45	0.02	0.04	0.05	0.02	0.18	0.17
Lathyrus ochroleucus	—	—	0.02	0.08	—	—	0.01	0.03
Total coverage all species	30.55	32.89	35.37	39.03	40.70	41.28	35.62	37.94

Nomenclature according to Budd. A.C. and Keith F. Best (1964)

TABLE 2

SUMMARY OF POST-BURN VEGETATION BURN 4553D

Species	Per cent cover by plot											
	1	2	3	4	5	6	7	8	9	10	Total	Avg.
Arctostaphylos uva-ursi	6.0	4.8	13.2	7.5	1.8	1.6	1.5	1.1	7.3	4.3	49.1	4.9
Apocynum androsaemifolium	1.9	6.1	5.1	2.1	1.6	2.3	4.0	4.2	3.5	1.4	32.2	3.2
Amelanchier alnifolia	2.4	0.6	0.05	1.4	0.2	4.1	0.7	1.5	0.6	0.05	11.6	1.2
Anemone quinquefolia	0.4	0.6	0.6	0.6	0.3	0.6	1.0	0.2	0.6	0.2	5.1	0.5
Antennaria canadensis	0.8	0.1	0.2	0.2	0.2	1.4	2.7	1.4	0.02	1.2	8.2	0.8
Anemone patens	0.2	0.2	0.05	1.1	1.1			0.3	1.3	0.5	4.8	0.5
Anemone cylindrica							0.02				0.02	0.002
Compositae sp.	3.2	1.5	1.8	2.4	2.9	2.2	2.0	3.4	1.3	1.0	21.7	2.2
Carex sp.	0.9	1.8	0.6	0.05	6.3	2.0	1.9	2.7	1.4	5.0	22.6	2.3
Campanula rotundifolia	0.2	0.05	0.5	0.4	0.6	0.02	0.6	0.5	0.8	0.3	4.0	0.4
Ceanothus americanus	10.4	1.2	7.2	13.7	2.9	6.9	9.0	1.5	6.2	0.3	59.3	5.9
Epilobium angustifolium						0.02					0.02	0.002
Equisetum hyemale		0.02			0.02			0.05	0.02	0.1	0.2	0.02
Fragaria virginiana	0.6	0.4	3.6	1.1	0.4	0.5	0.8	0.4	0.1	1.0	8.9	0.9
Gaultheria procumbens		0.2	1.2	0.3	0.1	0.02	0.1	0.02	1.1	0.2	3.2	0.3
Galium boreale	1.6	2.7	1.1	3.2	1.8	0.9	2.6	4.0	1.6	0.9	20.4	2.0
Juniperus communis		0.2									0.2	0.02
Lithospermum canescens	2.2	1.2	0.2	0.6	1.2	0.5	1.2	0.2	0.5	1.0	8.8	0.9
Grasses	15.8	5.7	18.8	21.2	12.4	19.0	8.4	11.4	10.9	14.8	138.4	13.8
Cruciferae sp.							0.02				0.02	0.002
Linnaea borealis		0.02					0.02				0.04	0.005
Maianthemum canadense		0.05	0.1	0.9	0.05	0.02	0.05	0.1	0.2	0.1	1.6	0.2
Potentilla tridentata	0.6	1.1	0.5	1.3	0.05	0.3	0.4	0.02	1.6	1.0	6.8	0.7
Prunus pumila	0.5	0.5	0.8	0.1	2.6	1.5	0.3	1.0	0.2	0.8	8.3	0.8
Prunus virginiana	0.2	0.3	1.2	0.3	1.0	2.0	0.8	2.6	0.3	0.3	9.0	0.9
Prunus pensylvanica								0.8	0.2		1.0	0.1
Petasites sagittatus			0.02						0.2		0.2	0.02
Polygala senega			0.02			0.2		0.2			0.4	0.04
Rosa acicularis	2.1	3.4	1.8	2.6	1.8	3.4	0.8	1.5	3.5	0.9	21.8	2.2
Rubus strigosus	1.9	0.02						0.02			2.0	0.2
Rhus radicans						0.3	0.2				0.5	0.05
Symphoricarpos albus	4.8	1.6	1.0	3.6	1.0	7.9	4.2	0.4		0.3	24.8	2.5
Salix sp.						0.2					0.2	0.02
Thalictrum venulosum				0.60		0.02				0.1	0.7	0.01
Vaccinium angustifolium	0.8	8.6	3.9	3.9	4.2	3.8	0.5	3.4	1.6	3.8	34.5	3.4
Viola sp.	0.05	0.1		0.05	0.2	0.05		0.1	0.3	0.8	1.6	0.2
Total coverage	57.6	43.1	62.6	69.2	44.7	63.1	43.8	43.0	45.3	40.4	511.5	51.2

Nomenclature according to Budd, A.C. and Keith F. Best (1964)

TABLE 3

RODENT SURVEY BURN AREA 4553D

Species	Burn				Control			
	Mice caught		mice per acre		Mice caught		Mice per acre	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Peromyscus maniculatus	15	7	1.19	0.55				
Zapus hudsonius hudsonius					1		0.08	
Clethrionomys gapperi lorengi		2		0.21	7	18	0.73	1.87
Eutamias minimus borealis						4		0.80
Microtus pennsylvanicus drummondii	2	3	0.23	0.34	1	58	0.11	6.58
Sorex cinereus cinereus		1		0.08		6		0.46

TABLE 4

RODENT SURVEY BURN AREA 4554W

Species	Burn				Control			
	Mice caught		Mice per acre		Mice caught		Mice per acre	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Peromyscus maniculatus	14	57	1.11	4.51	2	5	0.16	0.40
Zapus hudsonius hudsonius					1		0.08	
Clethrionomys gapperi lorengi					1	30	0.10	3.12
Eutamias minimus borealis					1	3	0.20	0.60
Microtus pennsylvanicus drummondii		2		0.23		3		0.34
Sorex cinereus cinereus						2		0.15

TABLE 5

RODENT SURVEY BURN AREA PB-67-M2

Species	Control				Area II				Area III			
	Mice caught		Mice per acre		Mice caught		Mice per acre		Mice caught		Mice per acre	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Peromyscus maniculatus	1	1	0.08	0.08		24		1.90	5	30	0.40	2.38
Zapus hudsonius hudsonius												
Clethrionomys gapperi loreagi		43		4.47					2		0.21	
Eutamias minimus borealis		3		0.60					1		0.20	
Microtus pennsylvanicus drummondii	1	18	0.11	2.04	5	1	0.57	0.11	12		1.36	
Sorex cinereus cinereus		4		0.30								

WORK PROPOSED FOR 1968

Work on 1964 Burn

Vegetation studies: Plant succession on the burn area will be studied in late June or early July using the permanent and temporary sample plots established in 1964. Sampling technique will be as outlined earlier in this report.

Soil chemistry: Soil samples from the top four inches of soil will be collected from the burn area and chemical analyses to determine calcium, nitrogen, phosphorus, potassium and magnesium content will be carried out.

Samples will be taken one year from the previous sampling date and will be collected as close to the previous sample spot as possible.

Work on 1965 Burn

Vegetation studies: Plant succession on burn 4553D will be studied in late June or early July using the permanent sample plots established in 1965. Sample techniques will be as outlined earlier in this report.

Soil pH: Soil samples from the 0 - 4" level and Bt horizon will be collected from each plot and pH determined in the laboratory. Chemical analysis to determine calcium, nitrogen, phosphorus, potassium and magnesium content will also be carried out.

Work on Burn PB-67-M2

Rodent population studies: Trapping will be carried out for three nights during the spring and fall of 1968. Trapping procedure will be as outlined in earlier reports.

New burns: Several burns are planned for the 1968 field season on d and mf- sites. Studies of vegetation, soils and microclimate will be carried out on these areas.

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