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

by
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INTRODUCTION

In 1964 a program of fire research was initiated in southeastern Manitoba. It deals with three aspects: site preparation, fire behaviour, and fire ecology. A total of five acres was burned in 1964, but this increased to 116 acres in 1965.

WORK COMPLETED IN 1965

Location and Description of 1965 Burn Areas

During the summer of 1965, four areas were prescribed burned in the Sandilands Forest Reserve in southeastern Manitoba. Ecological studies were carried out on burns numbered 4528M and 4553D, located in LSD 3, Sec. 15, Twp. 5, Rge. 9E and LSD 3, Sec. 5, Twp. 7, Rge. 11E respectively.

Both areas were cut-over during the winter of 1964-65. On a 10-acre block of 4553D, ten seed trees per acre were left to establish natural regeneration.

A description of conditions prior to, during, and after burning is given in Table 1.

TABLE 1

SUMMARY OF 1965 BURNING CONDITIONS [1]

Factor	Burn number	
	4528	4553
Date of burn	Aug. 11	Aug. 17
Area of burn (acres)	17.9	50.8
Stand before disturbance:	jP-M	jP
No. of trees 1" d.b.h.+	jP-224; tA-442; wB-100	322
Avg. diam. 1" d.b.h.+	jP-4.9; tA-1.7; wB-2.3	5.6
Site	mf	mf-
Depth organic layer (in.)	1.2	1.3
Slash conditions:		
Depth (feet)	1.1	0.8
Disposal method	lopped and piled	lopped
Fire weather:		
Time start	1120	1155
Time end	1645	1745
Danger index	6	10
Drought index	11	11
Cloud cover	clear	partly cloudy
Max. air temperature	92°F	71°F
Max. rel. humidity	64%	60%
Min. rel. humidity	36%	38%
Avg. wind speed	2.55 mph	6.7 mph
Max. wind speed	5.15 mph	10 mph
Wind direction	W	N to NW
Moisture content (1500 hrs) per cent:		
Full duff layer in open	15.6	8.5
Full duff layer under slash	32.2	35.2
Dry slash (cut winter)	14.6	18.4
Fire behaviour:		
Type of fire	headfire	headfire
Fire effects:		
Depth of organic layer after burn	0.8	0.6
Reduction in per cent	33.3	53.8
Per cent distribution of seedbeds:		
Mineral soil	1.0	13.0
Ash humus	4.0	6.5
Burned litter	62.0	63.0
Wood	1.5	0.5
Unburned	31.5	17.0

1 See reports:

Adams, J. L. 1966. Prescribed burning for site preparation in jack pine management in southeastern Manitoba. (Manuscript proposed for publication.) Dept. Forestry, Canada, For. Res. Lab.

Walker, N. R. 1965. The use of prescribed burning in jack pine management in southeastern Manitoba. Dept. Forestry, Canada, For. Res. Lab., Internal Report MS-20.

Plot Location

A 5-acre area, representing an mf- site, was selected for study on burn 4553D. Within the 5-acre block, ten 1/10-acre plots were systematically located, and the corners marked with 36-inch aluminum stakes. Twenty 1/4-milacre sub-plots were systematically located within each plot for vegetation studies. A map of the burn area and study plots and sub-plots is shown in Figure 1.

On burn number 4528M, 40 one-milacre vegetation plots were located as in Figure 2. Twenty plots were located in white birch (Betula papyrifera Marsh.) stands and twenty in trembling aspen (Populus tremuloides Michx.) stands.

On the 1964 burn areas several plot locations were found to be erroneously recorded (Sims, 1965; Figure 2). A revised map of the three 1964 areas is shown in Figure 3 with plot locations properly marked.

Vegetation Study

On the 1965 burn area 4553D, each one-milacre plot was sampled before burning; presence of vegetation by species was tallied according to Braun-Blanquets' (1932) scale as presented by Phillips (1959:34) and slightly modified for this study. The cover abundance scale is as follows:

+ = sparsely or very sparsely present, cover very small; <1% of plot

1 = plentiful but of small cover value; 1-5% of plot.

2 = very numerous; covers 5-25% of plot.

3 = any number of individuals covering 25-50% of plot.

4 = any number of individuals covering 50-75% of plot.

5 = covering 75-100% of plot.

Vegetation one year after burning was checked on the 1964 burn. All permanent and temporary plots were sampled using the cover abundance scale noted above.

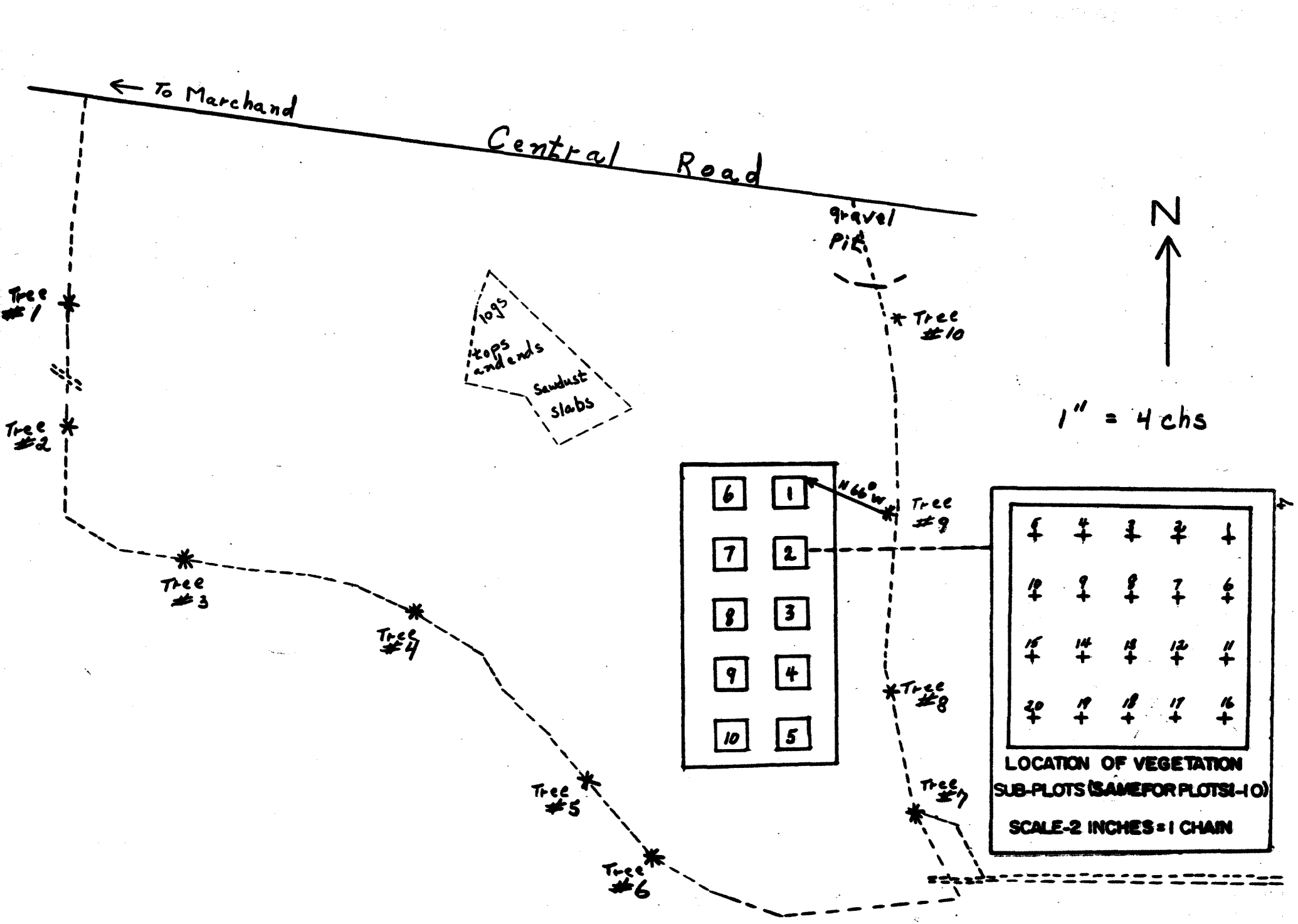


FIGURE 1. MAP OF 1965 BURN NUMBER 4553 D
SHOWING LOCATION OF VEGETATION PLOTS

40ch W of SE cor
Sec. 5
Twp. 7 Rge 11E

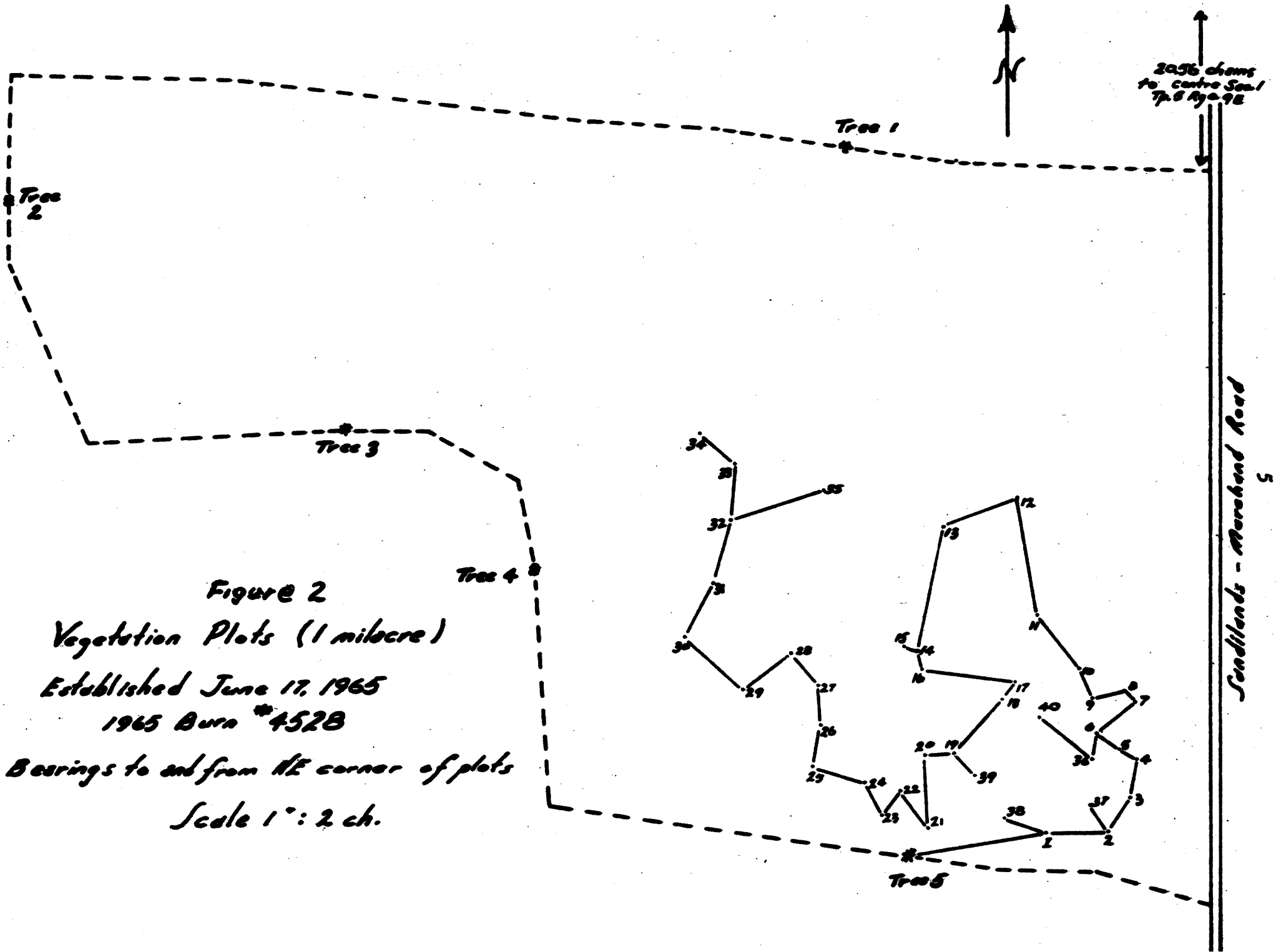


Figure 2

Vegetation Plots (1 milacre)

Established June 17, 1965

1965 Burn #4528

Bearings to and from NE corner of plots

Scale 1": 2 ch.

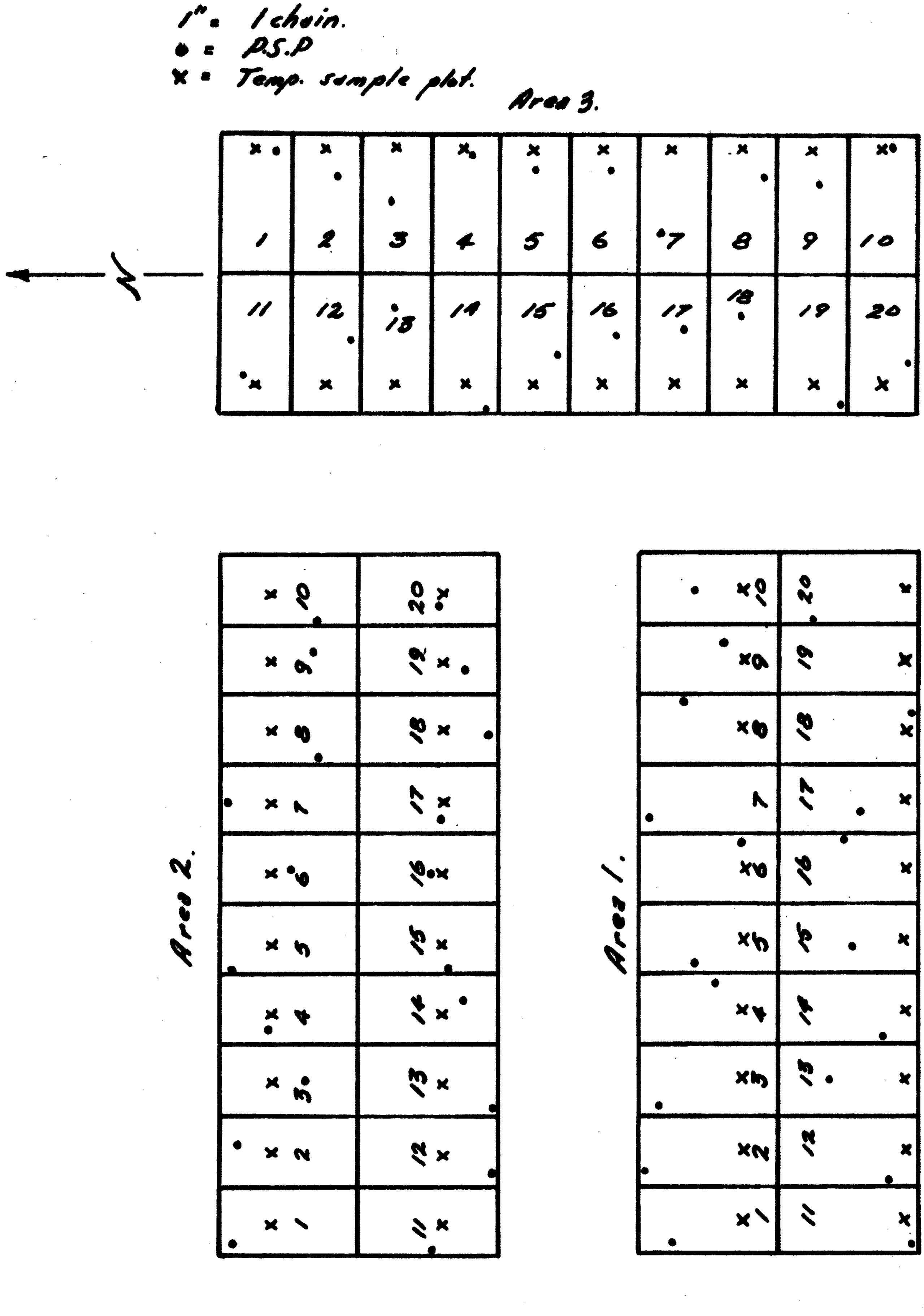


Figure 3.
Location of MS 243 sample plots - Revised from map of 65-MS-17 after field remeasurement.

Before burning area number 4528M, vegetation was sampled to determine number of stems per acre of shrubs and trees. All living stems on each sample plot were counted. Diameters of all stems greater than 1-inch d.b.h. were recorded. Lesser vegetation (herbs and grasses) was recorded as sparse, medium, or heavy cover and the litter layer was described.

Soils

On the 1964 burn, soil samples from the Ahe, AB and B_{f1} horizons were collected one year after burning. Samples were collected close to, but not on, vegetation plots.

On 1965 area 4553D, five samples were collected from the Bt horizon and from 0-4-inch depth on each plot before burning, and one month after burning.

All samples were transported to the laboratory for chemical analysis, pH determination, and field capacity and wilting coefficient determination.

Percolation Tests

Fifty tests of water infiltration rate were carried out on area 4553D before and after burning, according to the method of Burns (1952). Twenty-five of the pre-burn tests were done on litter and 25 on mineral soil. Twenty-five of the post-burn tests were done on mineral soil, and 25 on burned humus or ash.

Temperature Study

On area III of the 1964 burn, 30 maximum thermometers were set out to determine surface temperatures. Seedbeds tested were mineral soil, burned litter, and burned ash-humus. Thermometer bulbs were set flush with the soil surface and covered with a thin layer of surface material. Stems were protected by a burlap covering. Maximum temperatures were recorded once each week.

On the 1965 area 4528M, temperature pellets enclosed in small Fourdrinier wire envelopes were set out on each vegetation plot before burning. Pellets used ranged from 150 to 800°F, and were located at the junction of the duff layer and mineral soil.

Five sets of pellets, ranging from 150 to 800°F, were located on each of the 1/10-acre plots of area 4553D in the same manner.

On the seed-tree portion of area 4553D, ten trees were selected and sets of temperature pellets were attached to branches at 10-, 20-, 30- and 40-foot heights. Pellets with melting points ranging from 200 to 2000°F were used, and were encased in Fourdrinier wire envelopes. Temperatures were measured at two points at each height.

Rodent Population Studies

During the spring of 1965 a 1-by 1-chain grid was laid out on a 5-acre portion of burn area 4553D. The area measured 5 by 10 chains and was marked at each one-chain co-ordinate by 36-inch aluminum stakes. Three snap traps were tied to each stake and baited with a mixture of oatmeal and peanut butter. The traps at each co-ordinate were placed approximately two feet apart. Trapping began on May 27 for pre-burn conditions, and on September 14 for post-burn conditions. Trapping in each case lasted for three days. Daily examinations of all traps were made. Trapped mice were collected and sprung traps rebaited and set. The study was replicated in a portion of an adjacent uncut stand.

RESULTS

Vegetation Study

1964 burn:- In 1964 areas II and III had substantially more vegetative cover than area I. After burning, vegetative cover was only slightly higher on areas II and III. Per cent coverage of vegetation on the 1964

burn areas one year after burning is given in Table 2. As a result of burning, vegetation was reduced an average of 32.5 per cent. Vegetation on areas I, II and III was reduced 21.5, 41.2 and 27.9 per cent respectively.

Overall, Arctostaphylos suffered the greatest reduction (25 per cent) accounting for most of the difference between total pre-burn and post burn vegetation. Grasses were slightly reduced.

As a result of burning, vegetative evidence of the following species was completely eliminated from the area: Calliergon schreberi, Cladonia rangiferina, Oryzopsis spp., Lathyrus ochroleucus, Melampyrum lineare, Anemone quinquefolia, Chimaphila umbellata, and Equisetum arvense.

New species appearing on the burn area were: Carex spp., Apocynum androsaemifolium, Campanula rotundifolia, Lithospermum canescens, Solonum nigrum, Spiraea alba, Vicea sp., Lillium philidelphicum, Salix sp., Heuchera richardsonii, Geranium bicknellii and one unidentified species. The most interesting of the new species was Carex, which was well distributed over the burn area, but does not exist as a mature plant in the surrounding stand.

1965 burn 4553D:- Per cent coverage of vegetation before burning is given in Table 3. A total of 38 species was recorded for the area, the most common being Arctostaphylos uva-ursi, grasses, and Calliergon schreberi. These accounted for over 50 per cent of all vegetative cover.

Coverage by plot varied from 44.8 to 73.6 per cent and averaged 56.2 per cent. All but two plots were within $\pm$ 10.0 per cent of the average.

Due to low wind and high humidity, plus a lack of fuel, the fire on the study area did not carry well and subsequently some of the plots were incompletely burned. However, burning success averaged 78 per cent and was over 80 per cent on all but two plots. A map of burning success is shown in Figure 4.

TABLE 2

SUMMARY OF POST-BURN VEGETATION - 1964 FIRES

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
Vaccinium angustifolium	2.8	3.2	4.2	3.6	4.0	3.4	3.7	3.4
Carex spp.	4.4	4.1	4.2	4.2	1.9	4.4	3.5	4.2
Grasses:								
- Andropogon gerardi	3.7	3.1	3.5	4.6	4.4	3.0	3.9	3.6
- Koeleria cristata	-	-	-	-	1.0	1.0	0.3	0.3
Arctostaphylos uva-ursi	1.6	1.3	2.7	3.8	2.7	1.9	2.3	2.3
Rosa acicularis	1.4	1.4	1.4	1.4	0.9	2.5	1.2	1.8
Potentilla tridentata	1.2	1.0	1.4	1.6	1.6	1.4	1.4	1.3
Anemone patens	1.2	1.0	0.2	0.4	1.1	1.2	0.8	0.9
Apocynum androsaemifolium	0.9	1.0	0.4	0.4	0.8	0.8	0.7	0.7
Campanula rotundifolia	0.7	0.6	0.2	0.6	0.3	0.2	0.4	0.5
Compositae spp.	1.0	0.6	0.8	0.9	2.6	2.1	1.5	1.2
Maianthemum canadense	0.4	0.6	0.4	0.6	0.2	0.2	0.3	0.5
Gaultheria procumbens	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Lithospermum conescens	0.4	0.4	0.1	0.2	0.3	0.4	0.3	0.3
Viola spp.	0.4	0.4	0.1	0.2	0.2	0.4	0.2	0.3
Prunus virginiana	0.2	0.4	0.4	0.4	1.1	0.8	0.6	0.5
Solanum nigrum	0.9	0.4	0.9	0.5	-	0.1	0.6	0.3
Prunus pumila	0.2	0.3	0.2	0.6	0.2	0.2	0.2	0.4
Spiraea alba	0.2	0.2	-	0.2	-	-	0.1	0.1
Galium boreale	0.5	0.4	0.6	1.2	1.2	1.4	0.8	1.0
Antennaria canadensis	0.5	0.2	1.4	1.0	2.2	1.4	1.4	0.9
Amelanchier alnifolia	0.1	0.1	0.4	0.4	3.2	1.8	1.2	0.8
Vicea sp.	0.1	0.1	0.02	0.11	-	-	0.04	0.1
Pyrola sp.	0.02	0.01	-	-	0.2	0.1	0.1	0.04
Fragaria virginiana	0.02	0.1	-	0.1	0.6	0.4	0.2	0.2
Lillium philidelphicum	-	-	0.02	0.01	-	-	0.01	.03
Symphoricarpos albus	-	0.1	-	-	0.1	0.2	0.03	0.1
Salix sp.	-	0.1	-	-	0.1	0.1	0.03	0.1
Heuchera richardsonii	-	0.1	-	-	0.02	0.02	0.01	0.04
Geranium bicknellii	-	-	-	0.4	-	0.1	-	0.2
Unidentified species (2)	0.3	0.5	0.8	1.0	0.5	0.4	0.5	0.6
Total coverage - all species	23.5	22.0	24.6	28.7	31.7	30.2	26.6	27.0

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

1965 Burn 4528M:- The number of stems per acre by species and timber-type is given in Table 4. Figure 5 shows height-diameter curves for the main hardwood species.

The jack pine--trembling aspen stands contained more stems per acre of less than one-inch d.b.h., but less stems per acre of greater than one-inch d.b.h. than the jack pine--white birch stands. Major shrub species were Alnus crispa, Rubus pubescens, and Rosa acicularis. The latter two species were more widespread than Alnus, which tended to grow in many-stemmed clumps.

Because of the amount of hardwood on the area, there was very little dry fuel. In addition, weather conditions at the time of burning were not optimum for burning in this type of vegetation.

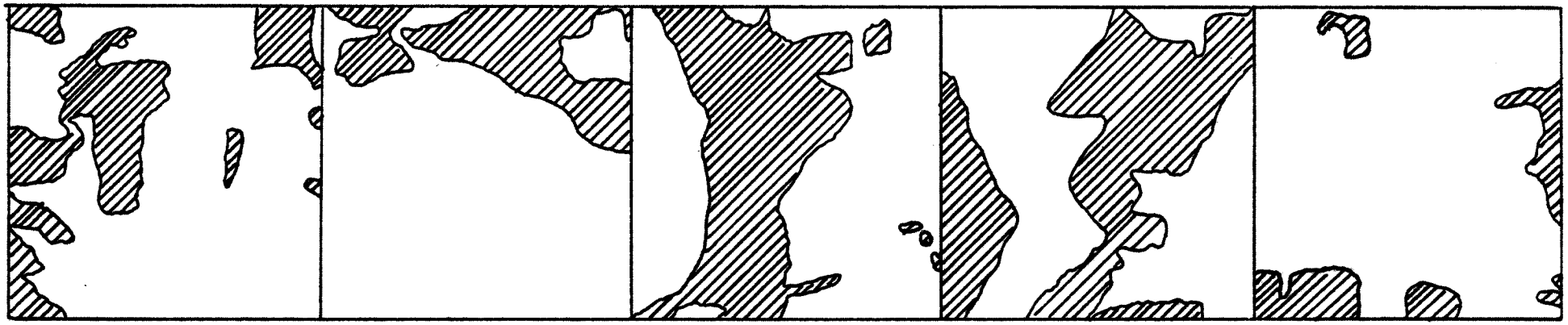
Figures 6 - 9 give an indication of the varying intensity of burn in the trembling aspen and white birch stands. Photos taken less than one month after burning indicate the speed of recovery of vegetation. Fireweed (Epilobium angustifolium, Figure 10) and bracken (Pteridium aquilinum, Figure 11), have already appeared on the burned area.

Soils

No chemical analysis has been completed, due to lack of facilities.

Soil pH was measured in samples taken from the 1964 burn one year after fire (Table 5). The depth-pH relationship has been completely reversed by the fire. The higher pH in the A horizon is somewhat surprising due to the high potential for leaching in the sandy soil. The lower pH in the B horizon, however, is puzzling, as some increase was expected as a result of leaching. It may be that fire has had a significant effect on percolation, although there was no difference in percolation rates before and immediately after burning in 1964.

On the 1965 burn, pH values increased from 5.8 before burning to 5.9 one month after burning in the 0-4-inch depth and from 7.5 to 7.7 in the Bf horizon (16-18-inch depth).



PLOT 1

325/400 OR 81% BURNED

PLOT 2

325/400 OR 81% BURNED

PLOT 3

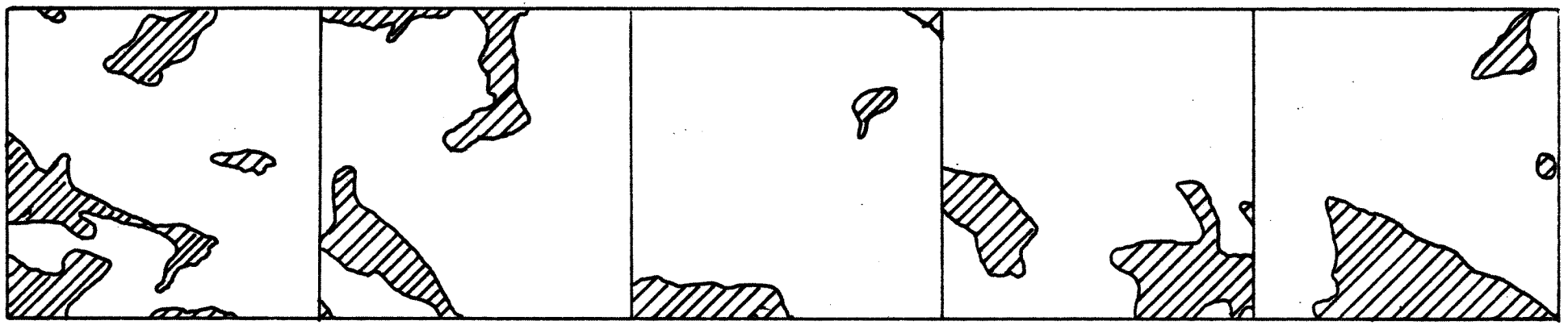
252/400 OR 63% BURNED

PLOT 4

168/400 OR 42% BURNED

PLOT 5

355/400 OR 89% BURNED



PLOT 6

328/400 OR 82% BURNED

PLOT 7

343/400 OR 86% BURNED

PLOT 8

372/400 OR 93% BURNED

PLOT 9

335/400 OR 84% BURNED

PLOT 10

326/400 OR 82% BURNED

SCALE

2" = 1 CHAIN

Burning Success

1965 Burn 4553D

UNBURNED VEGETATION

AVG BURNED 31290/4000 OR 78%

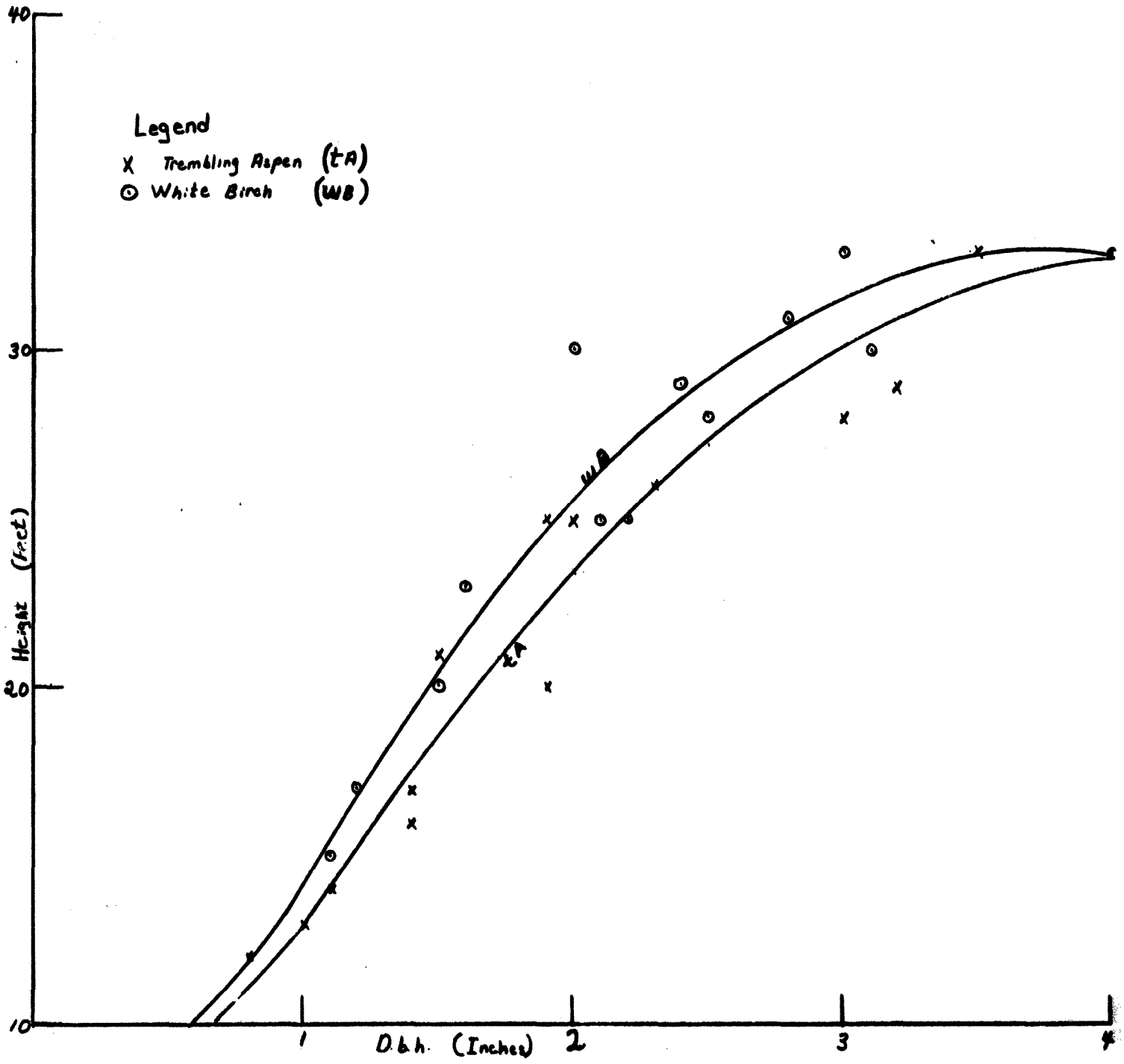


Figure 5 Height – Diameter Curve for Trembling Aspen and White Birch

TABLE 3

SUMMARY OF PRE-BURN VEGETATION - AREA 4553 D

	Per cent cover - by plot											
	1	2	3	4	5	6	7	8	9	10	Total	Avg.
Gaultheria procumbens*	0.02	1.9	0.8	0.1	1.6	0.2	0.1	0.2	6.3	1.1	12.3	1.2
Antennaria canadensis	3.3	1.0	0.05	1.0	1.0	1.8	3.3	9.4	0.3	1.1	22.3	2.2
Dicranum sp.*	0.1	0.9	0.05	0.1	1.8	0.2	1.2	0.5	0.4	0.3	5.6	0.6
Salix sp.	0.08	0.08	-	-	-	-	-	-	-	-	0.2	0.02
Apocynum androsaemifolium	0.6	0.4	2.9	2.6	1.6	0.6	2.3	2.4	1.6	0.6	15.6	1.6
Symphoricarpos albus	5.3	0.6	1.2	4.4	0.6	9.3	8.1	0.7	0.1	0.2	30.5	3.0
Viola sp.	0.1	0.2	0.08	0.1	0.2	0.1	0.4	0.2	0.05	0.2	1.6	0.2
Calliergon schreberi*	2.6	15.4	12.0	7.8	10.8	8.2	2.2	4.5	4.0	13.9	81.4	8.1
Maianthemum canadense	0.02	0.5	0.4	0.8	0.5	0.2	0.2	0.3	0.8	0.6	4.3	0.4
Arctostaphylos uva-ursi	10.9	13.4	19.7	6.7	8.4	9.8	7.2	6.7	22.9	14.3	120.0	12.0
Amelanchier alnifolia	2.9	0.4	0.1	0.8	0.5	2.7	1.5	1.7	2.2	0.2	13.0	1.3
Galium boreale	1.6	0.9	0.9	1.1	1.1	0.9	1.3	0.8	0.6	0.6	9.8	1.0
Fragaria virginiana	1.3	0.8	0.8	0.5	0.9	0.6	1.9	0.6	0.3	0.4	8.1	0.8
Vaccinium angustifolium	1.6	7.4	3.6	5.1	8.2	3.5	0.6	2.1	5.7	3.0	40.8	4.1
Compositae spp.	0.3	0.2	0.4	0.5	0.4	0.4	0.4	0.7	0.3	0.2	3.8	0.4
Rosa acicularis	2.6	0.5	0.7	1.2	1.3	3.6	0.7	2.0	0.7	0.3	13.6	1.4
Graminae spp.	23.3	3.4	7.7	9.7	5.9	18.3	8.8	10.3	7.6	3.9	98.9	9.9
Ceanothus americanus	2.4	0.1	2.4	4.9	2.3	3.6	2.6	-	1.6	0.1	20.0	2.0
Lithospermum canescens	0.2	0.2	0.02	0.3	0.4	0.4	0.4	0.5	0.3	0.2	2.9	0.3
Potentilla tridentata	0.4	1.0	0.4	0.4	0.8	0.2	0.2	0.2	0.8	0.1	4.5	0.4
Prunus pumila	-	0.05	0.2	0.1	0.8	0.5	0.2	0.2	0.02	0.1	2.2	0.2
Anemone quinquefolia	0.08	0.2	0.02	0.2	0.2	0.2	0.3	0.1	0.3	0.02	1.6	0.2
Rubus pubescens	1.9	-	-	-	-	-	-	-	-	-	1.9	0.2
Prunus virginiana	0.2	0.4	1.1	-	0.9	1.8	1.0	0.3	1.0	0.3	7.0	0.7
Pyrola spp.	-	0.05	-	-	-	0.02	-	-	-	0.08	0.2	0.02
Anemone patens	-	0.02	0.02	1.0	0.3	-	-	-	0.4	0.1	1.8	0.2
Linnaea boreale	-	0.05	-	-	-	-	0.2	0.8	-	-	1.1	0.1
Juniperus commune	-	0.1	0.8	-	1.9	4.6	0.9	0.1	0.1	-	8.5	0.8
Cladonia rangiferina	-	1.9	-	3.1	0.8	0.2	0.02	1.1	6.8	2.0	15.9	1.6
Chimaphila umbellata	-	0.2	-	-	-	-	-	-	-	-	0.2	0.02
Spiraea alba	-	-	-	0.02	0.05	-	-	0.4	-	0.05	0.5	0.05
Aquilegea candensis	-	-	-	0.7	-	0.1	-	-	0.1	0.3	1.2	0.1
Campanula rotundifolia	-	-	-	0.05	-	-	-	-	0.02	0.02	0.1	0.01
Rhus radicans	-	-	-	-	-	1.0	0.3	-	-	-	1.3	0.1
Lillium philedelphicum	-	-	-	-	-	-	-	-	0.2	-	0.2	0.02
Equisetum arvense	-	-	-	-	-	-	-	-	-	0.08	0.1	0.01
Unidentified species (2)	0.4	0.8	1.6	1.7	0.4	0.6	0.8	1.4	0.8	0.4	8.9	0.9
Total	62.2	53.1	57.9	55.0	53.7	73.6	47.1	48.2	66.3	44.8	561.9	56.2

Nomenclature according to Budd, A.C. and Keith F. Best (1964) except (*) according to Cunningham, G.C. (1958).

TABLE 4

PRE BURN STEMS PER ACRE - AREA 4528M

Species	Stems per acre			
	jP—wB type		jP-tA type	
	< 1-inch d.b.h.	≥1-inch d.b.h.	< 1-inch d.b.h.	≥1-inch d.b.h.
Populus tremuloides *	500	150	1,150	3,800
Betula papyrifera *	2,350	7,150	50	
Pinus banksiana*	-		50	
Rubus pubescens	11,450		7,700	
Alnus crispa	9,450		10,900	
Rosa acicularis	5,950		8,700	
Amelanchier alnifolia	2,950		2,300	200
Corylus cornuta	2,150		-	
Prunus virginiana	950		3,600	
Diervilla lonicera	900		100	
Salix sp.	750	200	4,050	150
Prunus pennsylvanica	600	50	1,100	
Symphoricarpos albus	200		14,500	
Ceanothus americanus	-		2,000	
Total	38,200	7,550	56,200	4,150

Nomenclature according to Budd, A. C. and Keith F. Best (1964) except (*), according to Harlow and Harrar (1950).

Field capacity of the 0-4-inch depth on burn 4553D was virtually unchanged by burning, increasing from 17.9 per cent before burning to 18.4 after burning.

Permanent wilting point was slightly decreased from 2.7 per cent before burning to 2.0 per cent after burning. The difference is attributed to experimental technique and virtually no change in PWP is assumed.

Percolation Tests

Infiltration time increased from 7.2 minutes on pre-burn mineral soil to 8.1 minutes on post-burn mineral soil. On pre-burn litter infiltration time was 4.4 minutes. This increased to 7.5 minutes on post-burn ash and humus.

Figure 6. Severely burned birch on area 4528M (Plot 5). All tops (leaves) were dead on these trees. Diameters (b.h.) ranged from 1.0 to 3.7 in inches.

Figure 7. Less severely burned birch on area 4528M (Plot 4). All tops were green on these trees. Diameters (b.h.) ranged from 1.7 to 3.7 inches.

Figure 8. Severely burned aspen on area 4528M (Plot 29). All tops (leaves) on these trees were dead. Diameters (b.h.) ranged from 1.3 to 5.4 inches.

Figure 9. Less severely burned aspen on area 4528M (Plot 33). All tops on these were dead, but tops on larger trees nearby had green leaves. Diameters (b.h.) ranged from 1.4 to 2.9 inches.

Figure 10. Epilobium angustifolium on burn 4528M, three weeks after burning.

Figure 11. Pteridium aquilinum on burn 4528M, three weeks after burning.

Temperature Study

Average weekly maximum temperatures for the period June 16 to September 29 on seedbeds created by the 1964 burn were 114°F, 112°F, and 111°F for burned litter, burned ash-humus and mineral soil respectively. Seasonal maximum temperatures for these three seedbeds were 150°F, 153°F and 143°F respectively. There were slightly fewer temperatures $\leq$120°F on mineral soil seedbeds than on burned ash-humus or burned litter, but the difference was not significant. Average daily maximum air temperature for the period was 73.2°F.

TABLE 5

PRE- AND POST-BURN pH VALUES

1964 BURN

Soil horizon	Depth of sample (inches)	pH value					
		Area I		Area II		Area III	
		Pre-burn	Post-burn (1 year)	Pre-burn	Post-burn (1 year)	Pre-burn	Post-burn (1 year)
Ahe	0-1	5.7	5.9	5.9	6.1	5.9	6.2
AB	1-6	5.7	5.5	5.8	5.8	5.8	5.9
Bf_1	9-14	5.8	5.7	6.0	5.6	6.2	5.8

Fire temperatures as recorded at the soil surface on burn 4553D are shown in Table 6.

TABLE 6

PER CENT OF PELLETS (LOCATED AT SOIL SURFACE) MELTED - BURN 4553D

Melting Temperature (°F)					
350	400	450	500	600	800
Per Cent Melted					
95.5	81.9	63.7	68.2	68.2	22.8

Temperatures in the crowns of seed trees are shown in Table 7, as recorded by temperature pellets. One of the trees was situated near a very large pile of tops and ends. This resulted in extremely high temperatures (up to 1750°F) in

TABLE 7

PER CENT OF TEMPERATURE PELLETS MELTED AT VARIOUS HEIGHTS IN THE TREE CROWN

BURN 4553D

Height above ground	Melting temperature (°F)												
	200	300	350	400	450	500	600	800	1000	1250	1500	1750	2000
	Per cent melted												
10	30.0*	20.0*	25.0	20.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0
20	10.0*	0.0*	10.0	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0	0.0
30	0.0*	0.0*	10.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0*	0.0*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

* Based on five trees in which melting points of temperature pellets ranged from 200°F to 2000°F.

the crown. Where no concentrations of slash existed, temperatures in the crowns above the 10-foot height were generally less than 200 - 350°F.

On burn 4528M pellets were buried under duff ranging from 0.6 to 2.1 inches in depth. Table 8 gives the range of burn temperatures as recorded by the pellets.

TABLE 8

PER CENT OF TEMPERATURE PELLETS (LOCATED AT SOIL SURFACE) MELTED - BURN 4528M.

Timber type	Melting temperature (°F)					
	350	400	450	500	600	800
	Per cent Melted					
jP-wB jP-tA	25.0 10.0	15.0 15.0	20.0 0.0	10.0 0.0	20.0 10.0	0.0 0.0
Total	35.0	30.0	20.0	10.0	30.0	0.0

Temperatures did not reach 800°F on any plots. Overall, the fire was not hot but more high temperatures occurred on the jP-wB plots than on the jP-tA plots. A check of burning after the fire showed that only 3 of 20 jP-wB plots were less than 50 per cent burned by the fire, while 10 of 20 jP-tA plots were less than 50 per cent burned.

Depth of duff did not appear to affect temperature, since average burial depth of temperature pellets on the jP-wB plots was 1.7 inches, and on the jP-tA plots, 1.3 inches.

Rodent Population Studies

The following species of mice were trapped on the 1965 burn (4553D).

1. Peromyscus maniculatus bairdii (Hay and Kennicott[1]), (Baird's white-footed mouse, or deer mouse).
2. Clethrionomys gapperi lorengi (Bailey), (The plains red-backed vole).
3. Zapus hudsonius hudsonius (Zimmerman), (The Hudson Bay jumping mouse).

Tables No's. 9 and 10 show the number of mice trapped during each period, and mice per acre for the burn and control areas. The area trapped varied according to the home range of each species.

It will be noted that of the three species trapped in the burn area, a population change was evident for Clethrionomys gapperi only. This species decreased by 100 per cent after the fire. In the control area, a population decrease also of 100 per cent was evident for Zapus hudsonius, a species not present in the burn area, but which accounted for 80 per cent of the mice trapped in the spring population assessment of the control. All other species remained in equilibrium in both areas.

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1 Nomenclature according to Anderson (1946).

TABLE 9

MICE TRAPPED - BURN 4553D

Species	Burn		Control	
	Before fire	After fire	Before fire	After fire
Peromyscus maniculatus	6	6	0	0
Clethrionomys gapperi	2	0	1	1
Zapus hudsonius	0	0	4	0

TABLE 10

MICE PER ACRE - BURN 4553D

Species	Burn		Control		Area trapped (acres)
	Before fire	After fire	Before fire	After fire	
Peromyscus maniculatus	0.47	0.47	0	0	12.64
Clethrionomys gapperi	0.21	0	0.10	0.10	9.62
Zapus hudsonius	0	0	0.32	0	12.64

WORK PROPOSED FOR 1966

Work on 1964 Burns

Vegetation studies: - Plant succession on the 1964 burns will be studied in late June or early July using the permanent and temporary sample plots established in 1964. Sampling techniques will be as outlined on page 3.

Soil chemistry:- Soil samples from the top 4 inches of soil will be collected from the 1964 burn areas and a chemical analysis to determine calcium, nitrogen, phosphorus, potassium and magnesium content will be carried out on these soils.

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

Soil pH:- Soil samples from the Ahe, Ab, and Bf_1 horizons will be collected and pH measured in the laboratory.

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

Work on 1965 Burns

Temperature studies:- Soil-surface temperatures on 1965 burn area 4553D will be measured using Lambrecht maximum thermometers reading to 180°F. Thirty themometers will be systematically located on a 1/10-acre block; one-third of the thermometers will be set out on a burned humus seedbed, one third on ash-humus complex seedbed, and the remaining one third on adjacent seedbeds which have been scraped to mineral soil.

Thermometers will be placed flush with the soil surface. The bulbs will be coated with a thin layer of resin and soil mixture and then sprinkled with a thin covering of surface material. The stem will be covered with burlap.

Temperatures will be recorded once per week; if results prove to be of critical importance, more detailed studies will be carried out in the future.

Moisture relations:- Field capacity and wilting coefficient of post-burn soils will be determined and compared to that of pre-burn soils.

Rodent population studies:- A final trapping will be made on the 1965 rodent survey area in late May of 1966.

Vegetation studies:- Plant succession on the 1965 burns will be studied in late June or early July using the permanent sample plots established in 1965. Sample techniques will be as outlined on page 3.

On burn 4528M, mortality of hardwood stems ≥ one-inch d.b.h. will be recorded and sprouting of all deciduous species will be tallied.

Soil chemistry and pH:- Soil samples from the top 4 inches of soil and from the Bt horizon will be collected from 1965 burn area 4553D and pH measurements as well as a chemical analysis to determine calcium, nitrogen, phosphorous, potassium and magnesium content will be carried out on these soils.

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

Work on 1966 Burns

Studies of vegetation, temperature, physical and chemical soil characteristics, and rodent populations, will be carried out on any of the following jack pine sites burned in 1966: vd, of, mf, and om (Mueller-Dombois 1964).

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