

THE USE OF PRESCRIBED BURNING IN JACK PINE MANAGEMENT IN

THE BOREAL FOREST REGION OF SASKATCHEWAN

Project MS-250

by

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WINNIPEG, MANITOBA

INTERNAL REPORT MS-43

March 1967

ACKNOWLEDGEMENTS

This study on prescribed burning in Saskatchewan is being carried out in cooperation with the Forestry Branch, Saskatchewan Department of Natural Resources. The author acknowledges with gratitude the support and cooperation provided by Mr. F.H. Hewett, Director of Forestry, Mr. A.W.B. Benson, Supervisor of Fire Control, and Mr. L.D. Beach, Regional Forester, Central Region.

Particular appreciation is extended to Mr. J.G. Gilmour, Research Forester for the Saskatchewan Department of Natural Resources, who has been directly involved in the conception and conduct of the research reported herein. Mr. Gilmour has had co-responsibility with the author for the collection of pre-burn and post-burn data; in addition, he has been solely responsible for obtaining seedfall and germination data.

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The Use of Prescribed Burning in Jack Pine
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(Establishment Report)

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INTRODUCTION

Prescribed burning was first used as a silvicultural tool in jack pine (Pinus banksiana Lamb.) management in 1949 in Ontario (Chrosiewicz, 1959). Numerous burning trials followed in Ontario and in the Lake States. In 1964, a research program (projects MS-243, MS-245, and MS-603) was begun in the Great Lakes-St. Lawrence Forest Region, L12, (Rowe, 1959) in southeastern Manitoba to investigate the use of prescribed burning in cut-over jack pine stands (Cayford, 1965; Walker, 1966; Sims, 1965; Sims and Bruce, 1966; Adams, 1966). The objectives of the program in Manitoba are to determine under what conditions fire can be used for seedbed preparation for seeding or site preparation for planting, to study factors of fire behavior, and to study the ecological effects of fire.

In 1966, the burning program was extended to Saskatchewan to investigate the uses of prescribed fire in the B18a section of the Boreal Forest Region (Rowe, 1959) and to compare the results with those obtained in the L12.

A 12-acre jack pine cutover was burned by the Forestry Branch, Saskatchewan Department of Natural Resources in cooperation with the Canada Department of Forestry and Rural Development. This first prescribed burn in Saskatchewan was designated the Narrow Hills No. 1 burn and was conducted in Nipawin Provincial Park on the Smeaton Conservation District (latitude approx. 54°00'; longitude, approx. 104°30').

This report describes work completed in 1966. Literature relevant to this study has been reviewed by Cayford (1965) in the Establishment Report for project MS-245.

PRE-BURN EXAMINATION

Methods of assessment

The portion of the cutover which was to be prescribe-burned was an approximate rectangle of 10 chains (north-south) by 12 chains (east-west). An interior fireguard (running east and west) divided the area into two halves. Transects running east and west were established down the middle of each half (Fig. 1). Angle aluminum stakes were placed at 1 chain intervals and designated as stations. Points at every 10 links along the transects were the southeast corners of 5 link by 5 link, 1/4-acre quadrats (209 total) from which the following information was recorded:

1. Depth of organic layer (this included the moss or lichen layer as well as the f-layer).
2. Slash depth (average for quadrat).
3. Cone abundance on slash (unopened cones only).
Classes used:
 - 0 - no cones present.
 - 1 - 1-5 cones present.
 - 2 - 6-10 cones present.
 - 3 - >10 cones present.
4. Cover class by vegetation type (slash, moss, lichen, shrubs, and herbs).
Classes used:
 - 1 - <10% of ground surface.
 - 2 - 10-25% of ground surface.
 - 3 - 26-50% of ground surface.
 - 4 - 51-75% of ground surface.
 - 5 - 76-100% of ground surface.
5. Percent of slash classed as fine fuel (<1-inch diameter).
(The classes shown in item 4 were used here as well).

In addition, a tree was selected and tagged between each station for post-burn assessment of cone condition. Four of the tagged trees were selected for temperature pellet installation. Sets of 3 temp-pellets (m.p. 125°F, m.p. 138°F, and m.p. 163°F) were installed at 10-foot intervals (10, 20, 30 and 40 feet) on poles which were secured to each of the four trees.

Description of area

The prescribe-burned block was located in a jack pine stand that had been cutover for fence posts (Fig. 2). Table 1 shows the number of trees and basal area per acre by D.B.H. class in the uncut stand

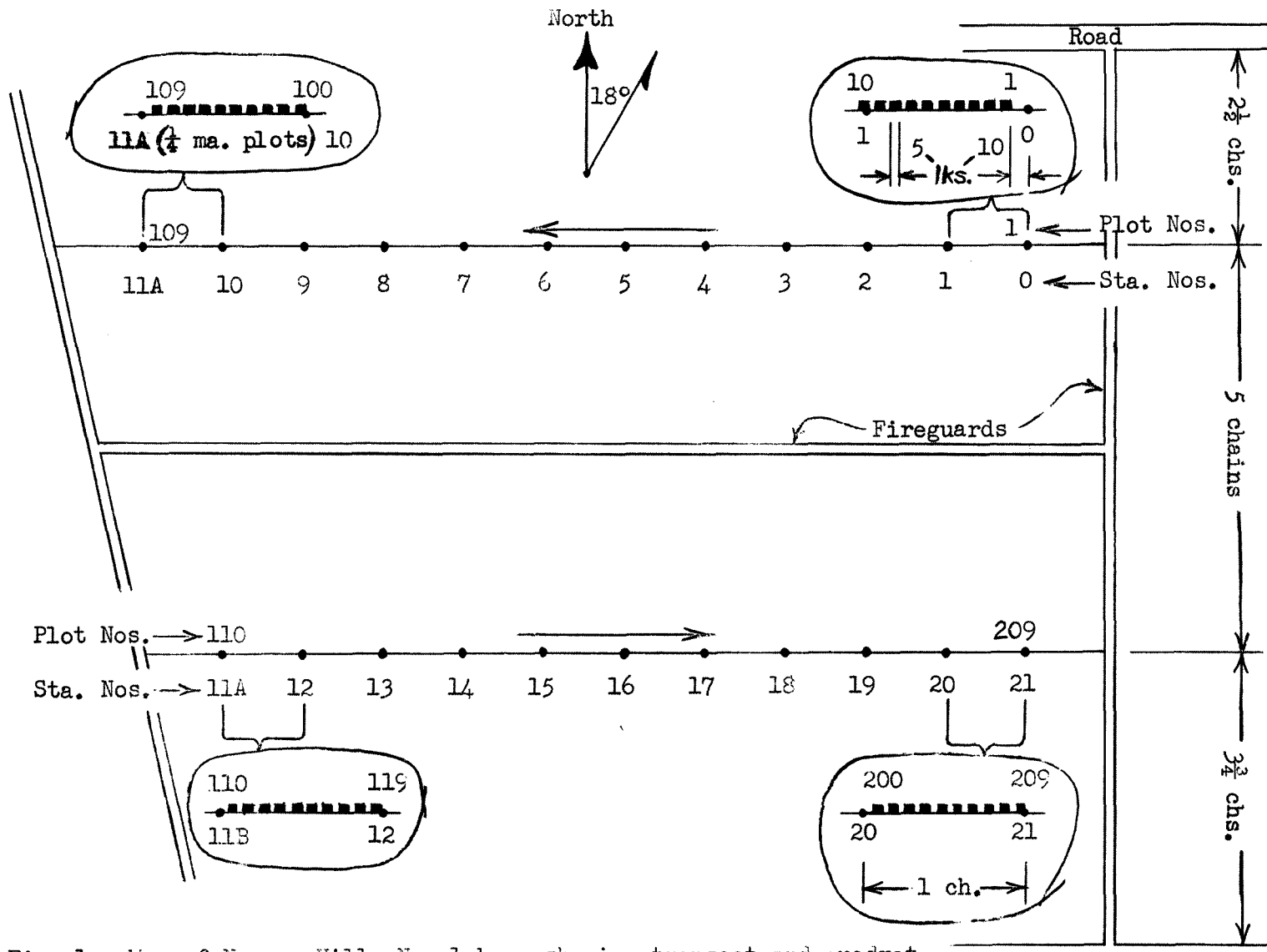


Fig. 1 - Map of Narrow Hills No. 1 burn showing transect and quadrat layout.

and in the cutover as well as number and basal area of standing dead trees in the cutover. Prior to cutting the stand contained about 421 trees per acre making up a basal area of 55.6 square feet per acre. Diameters at breast height ranged from 3 to 10 inches with the modal diameter from 4 to 5 inches. Average height was 49 feet and average age was 66 years giving a site index of 40 (Kabzems and Kirby, 1956).

Since the area was being harvested for fence posts only, unsuitable trees were left resulting in a residual stand containing 106 trees per acre and 16.3 square feet of basal area per acre. There also remained in the cutover 260 standing dead trees per acre making up a basal area of 20.4 square feet per acre (Fig. 2).

There was a moderate amount of slash in windrows running north and south. Tables 2 and 3 show, respectively, the distribution and depth of slash. The average coverage for the entire area was about 40.5 per cent. The greatest measured depth was 30 inches but the majority of plots had slash depths from one to 18 inches.

Tables 4 and 5 show, respectively, ground coverage by vegetation type and depth of the organic layer prior to the burn. Moss and lichen occurred in dense, extensive mats; average coverages were 54 and 18 per cent, respectively. Average shrub coverage was 24 per cent; principle species were Arctostaphylos Uva-ursi, Vaccinium spp., and sprout clumps of Populus tremuloides and Alnus rugosa var. americana. Herb coverage was 7 per cent.

On the majority of quadrats the organic layer depth (measured from the surface of the moss or lichen mat to mineral soil) was from 1 to 4 inches. Average depth of the organic layer was 2.7 inches.

THE PRESCRIBED BURN

Presuppression procedure

The prescribed-burn block was bordered on the north by a woods road. A bulldozed fireguard, about 10 feet in width and cleared to mineral soil, was constructed around the other three sides and through the middle of the area in a east-west direction (Fig. 1). Trees on a 100-foot-wide interior strip around the perimeter were pushed over by a heavy tractor. These trees were laid parallel to the perimeter.



Figure 2. View of area before burn showing heavy accumulations of slash.



Figure 3. View of area (same view as in figure 2) after prescribed burn.

The north half of the area was ignited at 1300 hours on the west side. (The wind was generally from the southeast). After a strip about one chain wide was burned out by a backfire, the rest of the north half was burned by a progressive series of headfires. The burn was completed on the north half in $1\frac{1}{2}$ hours. The south half of the area was ignited at 1500 hours. On this half of the area a narrow headfire strip was burned out along the western half of the northern edge. When it was apparent that the fire would be easily controlled, the entire perimeter was ignited. The resulting draft pulled the fire inward where it crowned with considerable intensity. The burn on the south half was completed in a half-hour.

Before and during the burn, brush along the outside edge of the fireguard was wetted. Patrolmen, equipped with walkie-talkies and back-pack pumps, quickly suppressed any spotfires which started outside the prescribed-burn unit.

POST-BURN EXAMINATION

Slash disposal

The fire consumed all fine to moderate slash. However, a large amount of heavier debris - stems and chunks - remained. Figure 2 shows a view of the area before burning and figure 3 shows the same view after burning. The comparison gives a good impression of the effectiveness of the burn in disposing of the heavy accumulation of slash.

Forest floor

A post-burn examination of the forest floor and the condition of cones on the tagged trees was made on September 20-21, 1966. The predominant seed-bed type - unburned, wood (stumps, chunks and logs), ash-humus complex, ash over mineral soil, or exposed mineral soil - was listed for a total of 418 $\frac{1}{4}$ -milacre quadrats taken along the permanent transects. These included the 209 quadrats described earlier as well as an additional 209 quadrats which fell between the originals (Fig. 1). On those plots with remaining humus, average depth was recorded.

Table 7 shows the distribution of seedbed types. The large majority, 62.9 per cent, of the quadrats were classified as ash-humus seedbeds; on these quadrats, post-burn humus depths ranged from 0.1 to 2.5 inches with an average depth of 0.65 inch.

Table 7. Post-burn seedbed types (September 20-21, 1966).

Predominant seedbed types on $\frac{1}{4}$ -acre plots	No. of quadrats	% of total
Unburned	2	.5
Wood (stumps, chunks, and logs)	47	11.2
Ash-humus complex	263	62.9
Mineral soil (overlaid by ash)	66	15.8
Mineral soil (exposed)	40	9.6
Total	418	100.0%

Seed trees

On August 29, the four trees on which temp-pellets were installed were felled and the condition of the temp-pellets was examined. On one tree, traces of 160°F. m.p. temp-pellet were found at 30 and 40 foot heights on the "lee" side of the tree. The pellets were consumed in all other cases.

On September 21 the remaining tagged trees were felled and the condition of their cones was noted. In all cases, cones were opened and much seed had apparently been dispersed.

On August 29, three days after the burn, 37 inverted cone seed traps with 2 square foot trap areas were set out in the burned area. Seedfall data are presented in Table 8 and germination data on the collected seed are shown in Table 9.

Table 8. Post-burn seedfall data.

Date	No. of 2 ft. ² seed traps	No. of seed	No. of seed per acre
9/8/66	37	228	134,300
9/21/66	37	92	54,200
10/13/66	36	48	29,100
10/31/66	30	17	12,400
Totals		385	230,000

Table 9. Germination data for seed collected from burned area.

Days to germination	Number germinated	% of total (385)
5	95	25.0
6	105	27.0
7	32	8.0
8	5	
9	3	
10	3	
11	1	4.5
12	1	
13	-	
14	1	
15	3	
-	-	
22	-	
Total No. of germinants	249	64.5
Number of non-germinants	80	21.0
Unsound	56	14.5
Grand Total	385	100.0%

The data in Tables 8 and 9 indicate that 148,000 viable seed per acre fell on the burned area; this figure is in addition to the unknown number which fell between the date of the burn and the date that seedtraps were placed on the area.

FUTURE WORK

The Department of Natural Resources plans to set out jack pine transplants and tubelings on the Narrow Hills No. 1 Burn this spring. Survival and development of this stock as well as secondary succession of vegetation on the present quadrats will be followed with joint studies by the Department of Natural Resources and the Canada Department of Forestry and Rural Development.

The Department of Natural Resources has indicated their intention of extending prescribed burning to other jack pine cutovers. Replications of the present experiment, with possible modifications, will be carried out on these areas as they are burned. Future emphasis will be placed on the establishment and survival of artificial regeneration on these burned areas. As particular regeneration problems present themselves, more intensive studies devoted to their underlying causes and solutions will be set up within the framework of this project.

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