Prescribed Burning after Barrel-Scarifying on a White-Spuce — Trembling-Aspen Cutover

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Burning and scarification techniques can be developed which will create environments suitable for conifer reproduction on upland white-spruce—trembling-aspen stands, conclude the authors after their experiments.

In 1966, three experimental burns were carried out at the Riding Mountain Forest Experimental Area in Manitoba. The objectives were to determine if prescribed fire might be a feasible tool for use on upland white-spruce (*Picea glauca* (Moench) Voss) — trembling-aspen (*Populus tremuloides* Michx.) cutovers to eliminate slash fire hazards, stimulate trembling aspen suckering and create favourable habitats for conifer reproduction, Surveys in 1967 have shown that the first two objectives were attained. However, habitats suitable for conifer reproduction were not created because in most places very little of the organic mantle had been consumed.

All Organic Mantle

During burning operations, it was observed that the fire consumed practically all of the organic mantle wherever it had been accidentally disarranged and churned-up. On the basis of these observations, two other small experimental areas were established to determine if prescribed burning following scarification with finned barrels might appreciably reduce the organic mantle and improve the habitat for conifer reproduction.

Two Study Areas

Two study areas, each 1.5 acres in size, were located on an upland white-spruce — trembling-aspen cutover, adjacent to those burned in 1966. Prior to harvesting, the stand contained a volume of about 2,800 cu. ft. per acre (half softwood and half hardwood). Commercial logging during the winter of 1965-66 and subsequent fellings to reduce fire hazard removed all the spruce and white birch (*Betula papyrifera* Marsh.) and some of the trembling aspen; the residual stand was entirely hardwood with an open canopy (Fig. 1). Slash piles and decayed wood, in the form of old logs and stumps, covered about 30% of each area; the remainder supported large patches of dense hazel (*Corylus cornuta* Marsh.) interspersed with large open areas containing a variety of shrubs, herbs and grasses (Fig. 1).

Soils were clay loam tills and the

TABLE I. Burning statistics.

Factor	First burn Areas 1 & 2	Second burn Area 1
Date of burn	Aug. 8/67	Aug. 28/67
Area of burn, acres	1.5	1.5
Start of ignition	1:00 p.m.	1:30 p.m.
End of ignition	2:00 p.m.	2:30 p.m.
Danger index	6	12
Drought index	6	19
Maximum air temperature, °F	85	70
Relative humidity, %	38	50
Average wind speed (m.p.h.)	4	10
Maximum gusts (m.p.h.)	10	20
Wind direction	south	south
Average moisture content, %		
L[1] (unburned)	26	18
F and H (unburned)	143	61
L (partly burned)	—	4
F and H (partly burned)	—	52
Fine slash	9	—
Coarse slash	10	—
Debris[2]		
surface	52	12
interior	140	124
Decayed wood[3]		
surface	14	12
interior	274	240

[1]L, F, H, horizons within the organic mantle — L = litter; F = fermentation; H = humus.
[2]Piles and ridges of debris made up of organic mantle material, rotten wood, soil, slash, etc.
[3]Rotten logs smashed up by tractor and left often in loose piles.

topography was gently undulating with a general slope to the west. Sites, according to the classification of Hills (1952), varied from fresh on knolls and slopes to very moist in depressions; the latter occupied only a minor portion of each area. Average depth of the organic mantle was 2.5 in.

A total of 120 ¼-milacre permanent sample plots were systematically established on each of the two areas. These were used to record presence of slash and other surface conditions before scarifying, after scarifying and after burning. Scarification was accomplished by pulling finned barrels, filled with water, back and forth across each area with a crawler-type tractor.

Areas Burned

Both areas were burned on August 8 and one was reburned on August 28. Conditions prevailing at times of burning are summarized in Table 1. Burning methods and precautions taken to prevent the escape of the fires were similar to those described by Tucker and Jarvis (1967). Each area was ignited by the progressive-strip method described by Adams (1966) so as many strips as possible would burn at one time to create drafts and aid fire spread. At no time was there any difficulty in controlling the fires.

Scarification broke up many of the old logs and stumps, spread slash accumulations to some extent, churned up the organic mantle on much of the area, and destroyed most of the above-ground portion of the shrub layer (Fig. 2). After scarification, about 25% of each area was covered by undisturbed organic material with an average depth of 2.5 in. Typical surface conditions on the remainder were: decayed pulverized wood about 6-in. deep, slash accumulations about 6-in. deep, debris piles 12-in. deep and disturbed organic material about 4.5-in. deep.

Burned Fiercely

During the first burn, slash accumulations, deposits of pulverized decayed wood, some debris piles and some areas of churned-up organic material burned fiercely with flames often more than 20-ft. high. Other debris piles and some of the areas of disturbed organic material burned poorly or not at all. However, on the average, 48% of each area was burned (Fig. 3) and on these areas depth of undistrurbed organic material was reduced by 33%, pulverized decayed wood by 20%, slash by 100%, and debris piles by 30%.

The second burn was more gentle

FIG. 1. Upland white-spruce — trembling-aspen cutover area. Note grassy herbaceous ground cover in foreground and hazel in background.

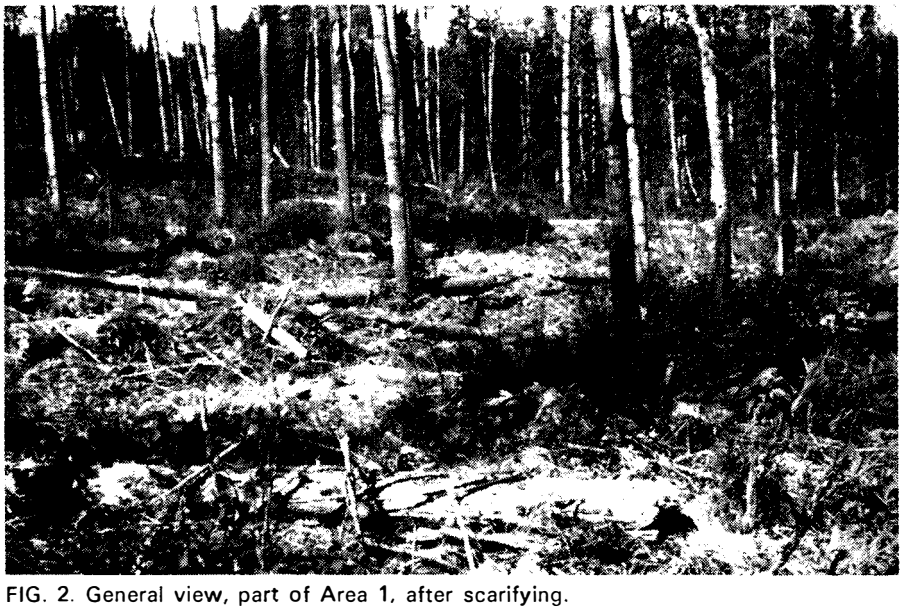

FIG. 2. General view, part of Area 1, after scarifying.

FIG. 3. General view, part of Area 1, after first burn.

In most cases the organic mantle was still an inch or more deep and would provide harsh, droughty environment for newly-germinated conifer seedlings. Many competing roots still lived.

than the first. Flames were low and persisted for only a short period after ignition. Nevertheless, fires continued to smoulder in the organic material for several hours and, as a consequence of burning a second time, the burned-over area was increased to about 84%. The average total reduction in depth of the organic material on the burned area was about 50%, pulverized decayed wood about 35% and debris piles about 45%.

Conclusions

It is doubtful if many suitable habitats for conifer reproduction were created on either area. In most places the organic mantle was still an inch or more deep and would provide harsh and droughty environments for newly-germinated conifer seedlings. In addition, many of the roots of competing vegetation were not destroyed. Sprouts originating from these roots would likely offer severe competition to both natural and planted seedlings.

In spite of the fact that habitats deemed suitable for conifer reproduction have not yet been created, burning and reburning after scarification have reduced the depth of the organic mantle considerably. This suggests that burning and scarification techniques can be developed which will create environments suitable for conifer reproduction on upland white-spruce — trembling-aspen cutovers. **P&P**

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