Three Experimental Fires in Jack Pine Slash

by

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ABSTRACT

A series of three 4-acre plots in a jack pine cut over were burned at three degrees of fire hazard. The weather, fire behaviour, and effects are reported, and a general conclusion drawn by others was confirmed: slash hazard is reduced by any running fire, but certain desired silvicultural effects may require the slash and duff to be dry in depth. Morning or late afternoon are suggested burning periods for optimum safety, or, alternatively, a light running fire could be followed later by a smouldering fire in the exposed dry duff.

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by

C.E. Van Wagner[1]

INTRODUCTION

An opportunity arose during the summer of 1963 to carry out a limited burning experiment in jack pine slash adjoining the Petawawa Forest Experiment Station. The main purpose of the project was to obtain some empirical information on the behaviour of fire in jack pine slash, in view of the increasing interest in prescribed burning for slash disposal and for promoting natural regeneration in the jack pine type.

There are several published studies of fire hazard in slash in which test fires were lit at a point, e.g., Wright (1939), Williams (1955), and Fahnestock (1960). For prescribed burning, however, the main interest is in fires lit in a line or around a perimeter to burn inward. Williams (1958) describes two experimental fires in windrowed jack pine slash, the only such published account available.

In this experiment three 4-acre plots were burned at moderate, high and extreme hazard, and several smaller tests were made at low hazard under marginal burning conditions. This report presents the weather and fire data, and some comments on fire behaviour and effect.

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Figure 1. Plots 2 and 3 before burning. Scale 1 in. =208 ft. approx. Arrows show wind direction during fires. Photo in Figure 4 was taken at A looking into Plot 3. Black patches at right of Figures 1 and 2 are result of 10-acre low hazard burn.

AREA DESCRIPTION AND PROCEDURES

Early in 1963, about 30 acres of pure jack pine on rolling sandy land adjoining the Petawawa Forest Experiment Station were clear cut and the slash left in the windrowed pattern typical of 4-foot pulp operations (see Figure 1). The rows of slash were from 30 to 70 feet wide, 2 to 3 feet deep, and spaced 20 to 30 feet apart. The proportion of the plot area covered by slash was estimated by ground survey and from aerial photos to be about 57 per cent. Three 4-acre plots were laid out in the most uniform parts of the cutover; the original stands (estimated from stump cruises after the fires and data from adjacent stands) were as shown in Table 1. The area yielded about 40 cords per acre of 4-foot wood cut to a 3-inch top (diameter inside bark).

TABLE 1. JACK PINE STANDS BEFORE CUTTING ON THE THREE 4-ACRE PLOTS.

Plot number	Area, acres	Basal area, sq.ft./acre	Trees per acre	Average diam., ins.
1	4.2	159	800	5.7
2	3.9	162	714	5.0
3	3.5	152	955	5.0
Average	3.9	158	823	5.2

At the time of the first fire (the end of the first summer) most of the needles were still attached to the twigs. By the time of the third fire early the following summer a few more needles had fallen, but the slash was in essentially the same condition.

In three places throughout the area, the slash from a 2-foot wide swath across a windrow was cut out, dried indoors, and weighed. Small samples were oven-dried and all weights converted to dry basis. The three locations were chosen subjectively as above average, average, and below average in slash concentration. The results appear in Table 2, and the average works out to 25.8 tons per acre on the windrows, or 14.7 tons per acre on the area-at-large. There are as yet no published guides to the weight of slash produced by logging jack pine, but Muraro's (1966) value of 18.7 tons per acre for lodgepole pine slash in a similar stand is in fair agreement considering that it is based on cutting to a 4-inch top, thereby leaving more bole weight on the ground.

TABLE 2. WEIGHT OF SLASH SAMPLED ON 2-FOOT WIDE STRIPS BEFORE BURNING.

Sample number	Length of strip, ft.	Slash weight, lbs./sq.ft., oven-dry basis	
		On windrows	On plot-at-large[1]
1	78	1.43	0.82
2	25	1.25	0.72
3	37	0.87	0.50
Average		1.19 (25.8 Tons/acre)	0.68 (14.7 Tons/acre)

[1] Assuming 57% of area covered with slash (see text).

A rain gauge was maintained at the site and continuous records of temperature, relative humidity and wind are kept at Station headquarters one mile to the south. The weather leading up to each fire was thus well documented. The Drought, Fire Danger, and Slash Hazard Indices (Anon. 1956) were tabulated daily.

Weather measurements at the fires were of temperature and relative humidity with a fan-aspirated psychrometer, and wind at the 4-foot level with two to four Sheppard integrating anemometers read every two minutes. Just before each ignition 12 to 16 samples of slash were collected for moisture content determination, some of fine twigs with attached needles and some of wood of various sizes from both upper and lower slash levels.

Rate of spread was measured by timing the fire's ignition and arrival at marked points around the perimeter and locating the meeting places of headfires and backfires.

The 4-acre fires were surrounded by a bulldozed fire guard and patrolled by a crew of six to eight men, with two tank-trucks standing by. Ignition was with kerosene pressure torches.

THE LARGE TEST FIRES

Plot 1

The first plot, a level area of 4.2 acres, was burned on the morning of September 10, 1963, with a Drought Index of 5 and an estimated Slash Hazard Index of 10. The whole slash bed was fairly dry and most of the needles still attached. Even though the hazard in the uncut forest was low at this time of day, the slash hazard could be classed as high. Two men began lighting at the centre of the downwind side and worked in opposite directions, meeting on the upwind side 10 minutes later. The headfire ran down one side of the plot before the other because one upwind corner was sparsely covered with slash, and open ground would not carry fire more than a few feet away from a windrow. The slash rows burned briskly, but the fire was forced to jump one irregular strip of weedy open ground 5 to 25 feet wide extending across the plot (see Figure 2). The fire was essentially over 30 minutes after the first ignition.

Rate of spread values were obtained for fire running along windrows both with (see Figure 3) and against the wind, but smoke obscured the fire in part of the plot where the rows ran across the wind. The backfire had moved in between 30 and 60 feet when joined by the headfire. One spot fire occurred along the 400-foot downwind side and burned a few square feet in the adjacent pine stand. Crowns of jack pines 30 feet from the downwind edge of the plot were not scorched. The slash bed was levelled but the duff layer was hardly touched and smouldering was slight.

Plot 2

The second plot was burned at moderate hazard on the morning of May 26, 1964. The Drought Index was 1 and the Slash Hazard Index estimated at 7. Only the headfire was set, which ran along the windrows partly up a 10 per cent slope. No backfire was necessary since most of the windrows ended short of

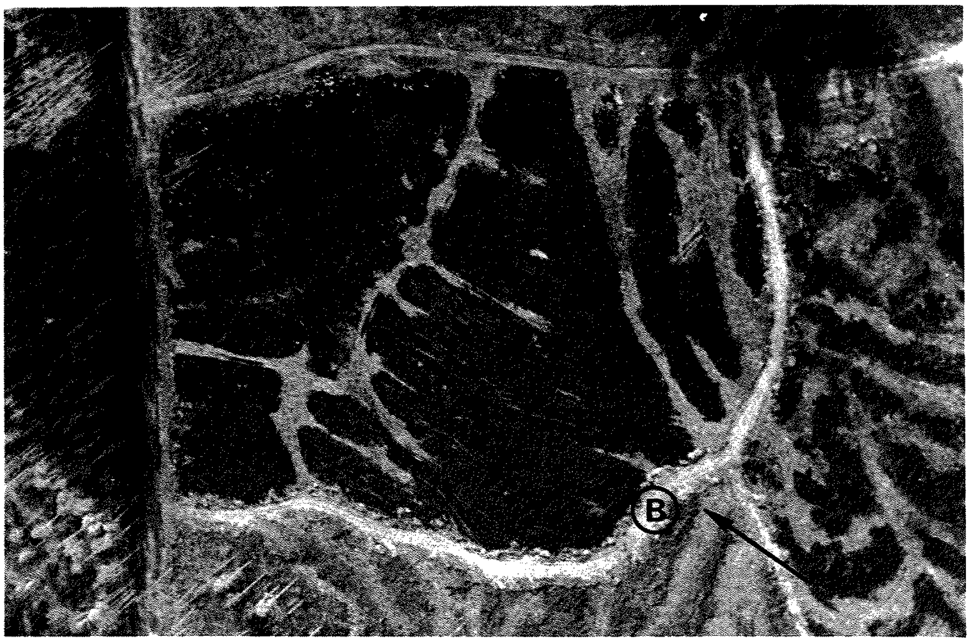

Figure 2. Plot 1 after burning. Scale 1 in.=160 ft. approx. Arrow shows direction of wind during fire. Photo in Figure 3 was taken at B. Patch of jack pine at left of photo is part of original stand on Plots 1, 2, and 3.

Figure 3. Plot 1 headfire just after ignition. The flames are about 10 feet high.

the bulldozed fire break. Although the whole slash bed was less flammable than in the first fire, the fine fuels on top of the slash and on the open ground were drying rapidly and the fire spread easily in the space between the windrows. About twice as much unburned wood remained after this fire as after the first, and again almost no duff was removed and smoking ceased almost immediately. The fire was timed from beginning to end of five windrows about 300 feet long and was over about 40 minutes after the first ignition.

Plot 3

The third fire was on the afternoon of June 12, 1964, under hazard conditions that were certainly extreme. The Drought Index stood at 3 and the Slash Hazard Index at 14. The plot was rectangular except for a long point at one end and the wind was blowing so that about half the headfire burned into the recently-burned Plot 2. First, the part of the downwind side bounding on unburned slash was set alight (350 feet) and this backfire allowed to burn for 16 minutes. A fire was then lit along the 700-foot long upwind edge and the whole plot was burned out by the 23-minute mark, producing a smoke column 1,100-feet high. The fire was so intense and smoky that timing its arrival at marked points was only partly successful; however, two fairly sure observations were made of the headfire's average rate of advance. The backfire and headfire met from 60 to 100 feet inside the plot (see Figure 4), and only one spot fire occurred along this stretch. Spotting was plentiful, however, within the previously burned Plot 2 as the headfire ran right up to its edge. The slash was consumed except for pieces 2 inches in diameter or more. About half the duff was removed and considerable soil bared by smouldering that continued for several hours. Next morning there was almost no smoke to be seen, but it was another story on the previously burned Plot 2. There the exposed duff layer 1 to 2 inches thick was almost bone-dry and, well ignited by spots, it burned and smoked intensely for 36 hours.

Figure 4. Headfire and backfire about to meet during Plot 3 fire. Headfire came from right and is strongly influencing the backfire. Headfire flames are about 120 feet away and 15 feet high.

THE LOW HAZARD TRIALS

On September 19, 1963, about 10 acres of the cut-over area along the highway was burned as a hazard reduction measure. During the nine days since the Plot 1 fire, two heavy rains had fallen, the second only the night before. Occasional drizzle continued for part of morning. The slash could be ignited with kerosene pressure torch, but fire would not spread laterally (see Figures 1 and 2). After fair drying conditions throughout the day, the fires began to spread very slowly by mid-afternoon. The burning was mainly accomplished, however, by igniting the slash in a large number of places.

One year later, a series of three ignition trials was made on October 14, 15 and 16. By then most of the needles had fallen to the ground, and the slash was much more difficult to ignite. The second and third of these trials were made in the morning, the better to catch the border-line moisture content at which leafless slash would carry fire. Fire would certainly have run easily on either of these afternoons, but spread only on the last morning. The data from these trials appear in Table 3.

FIRE BEHAVIOUR

Three fires are too few to permit correlations between any of the important independent variables (weather and fuel moisture) with the resultant fire behaviour and effects. However the three fires provide interesting contrasts on many aspects of fire behaviour.

The weather data for the 4-acre fires appear in Table 4, the fuel moisture and fire behaviour in Table 5. The head-fire rates of spread are averages over distances of 200 to 300 feet along uniform windrows roughly parallel to the wind.

On parts of Plots 1 and 2 the slash pattern was irregular and the total burning times were greater than the given spread rates would suggest, but not enough data were collected to permit a statement of rates of spread in irregular slash patterns or with wind blowing across the windrows.

The fire intensities represent the heat energy produced per second on each foot of fire front. They were calculated (after Byram, 1959, p.79) with the following formula:

$$\underset{(\text{Btu/sec.-ft.})}{\text{Fire intensity}} = \underset{(\text{Btu/lb.})}{\text{Heat of combustion}} \times \underset{(\text{lbs./ft}^2)}{\text{Fuel consumed}} \times \underset{(\text{ft./sec.})}{\text{Rate of spread}}$$

The heat of combustion of dry jack pine slash was taken as 8550 Btu per pound, based on references and some actual determinations with a bomb calorimeter. This is the so-called "low heat of combustion", assuming that the water produced by the combustion reaction is not recondensed; it is a gross value, so that the fire intensity includes energy dissipated by convection, radiation, and conduction. The value 8550 was reduced for each plot in accordance with its fuel moisture content (after Byram, 1959,

TABLE 3. SLASH-BURNING TRIALS AT LOW HAZARD

Date	Time Standard	Rel. hum. %	Wind mph.	Drought Index	Fire Danger Index[1]	Moisture content %		Rate of spread ft./min.
						Fines[2]	½" Wood	
Sept. 19/63	10 a.m.[3]	70	-	1	0	53	51	0
Oct. 14/64	2 p.m.[4]	53	-	3	2	34-62	73	0
Oct. 15/64	10 a.m.[4]	58	3.4	4	2	22-43	43	0
Oct. 16/64	10 a.m.[4]	55	3.6	5	4	18	23	9[5]

[1] Corrected to time of fire according to Beall (1950, p.55).

[2] Upper and lower averages given separately in two cases.

[3] Needles still attached.

[4] Most needles fallen.

[5] Over a distance of 30 feet.

TABLE 4. WEATHER AT THE THREE 4-ACRE FIRES, IN ORDER OF INCREASING HAZARD.

Plot No.	Date of fire	Time Standard	Weather at fire[1]			Sky	Last rain ins.	Drought Index		Indexes at time of fire	
			Temp. °F	Rel. Hum. %	Wind mph			Before last rain	On day of fire	Fire Danger[3]	Slash Hazard[2]
2	May 26/64	9 a.m.	60	40	4.8	Clear	1.0	1	1	3	7
1	Sept. 10/63	10 a.m.	60	50	6.0	Cloudy	1.2	2	5	3	10
3	June 12/64	2 p.m.	80	30	8.3	Clear	0.5	12	3	9	14

[1] Measured 4 feet above ground.

[2] Estimated for the two morning fires; from tables for the afternoon fire.

[3] Corrected for time of day according to Beall (1950, p.55).

TABLE 5. FUEL MOISTURE, UNBURNED FUEL, AND FIRE BEHAVIOUR AT THE THREE 4-ACRE FIRES, IN ORDER OF INCREASING FIRE INTENSITY.

Plot No.	Moisture content, %			Unburned fuel[2] lbs./sq.ft.		Rate of spread[1] ft./min.		Headfire	
	Fine fuel	Wood ½"-1"	Duff[3]	Wood	Duff	Head-fire	Back-fire	Flame height[1] ft.	Intensity[2] Btu/sec.-ft.
2	18(upper) 47(lower)	24(upper) 90(lower)	> 100	0.35	—[4]	16	—	6	700
1	19	21	60-80	0.15	0.66	25	2	10	1800
3	9	22	< 40	0.16	0.32	55	4	20	4000

[1] Average along windrows

[2] Average for plot-at-large

[3] Estimated, no samples taken

[4] Measured after reburn only (then 0.16 lbs./sq.ft.)

p. 68). The fuel consumed was obtained by subtracting the remaining wood (Table 5) from 0.68 lb. per sq. ft., the initial average slash weight over the whole area. The rates of spread used in the calculation are the headfire values in Table 5. The resultant fire intensities are in terms of the rate of energy produced per foot of fire front on the plot-at-large in the region of uniform windrows; the intensity within the windrows was thus considerably higher. This energy was produced in deep fronts perhaps two to three times the flame heights; such low, deep flames would probably be easier to control than equally intense fires in uncut forest where part of the fuel is elevated.

The three fires described here all burned in 1-year old jack pine slash with most of the needles attached. Williams (1958) describes two fires in 2-year old slash with most of its needles down. The burning conditions were roughly similar to those on Plots 1 and 3, and the rates of spread reported are 4.4 and 22 ft. per min. respectively. The small test of October 16, 1964, also in leafless slash, spread at 9 ft. per min. (Table 3) in conditions like those of the Plot 1 fire. These limited comparisons suggest that the linear rate of spread in jack pine slash drops by at least one-half after the needles fall.

CONTROL PROBLEMS

The three fires covered a wide range of intensity. The Plot 2 fire was completely contained by the 8-foot fire guard; it did not spot outside the plot and no control action was required. The Plot 1 fire was somewhat more intense, but was controlled with little effort; the one spot fire was expanding very slowly when discovered. Without doubt on either of these occasions the same crew could have safely burned a much larger area with no danger of abnormal fire behaviour. The Plot 3 fire was a more ticklish affair; spotting was plentiful up to 100 feet into the previously burned Plot 2. Along the backfired section of the downwind side only one spot ignition in unburned slash took place, but it required prompt attention. If the burned out strip had been less than 60 to 100 feet wide, a difficult situation might have developed. It is also possible that this fire did not reach equilibrium on a plot this size; on a larger area fire behaviour might have become uncontrollable. And yet the Plot 3 fire was by no means the most intense possible in this fuel--samples taken at other times gave as low as 6 per cent moisture content for the exposed fine fuel and 12 per cent for wood near the bottom of the slash bed (c.f. Table 5).

A difficulty at the fires on Plots 1 and 3 was heavy smoke on the downwind side, coming at first from within the backfired area. Later, after headfire and backfire met, convection ceased and dense smoke from the whole plot rolled along at ground level making patrolling difficult. A mask might make breathing easier in such smoke, but the visibility problem would remain. Of these two fires the margin of safety was much greater on Plot 1, where the moisture content of the surface fuel was high enough to render spot fires unlikely or, if started, very feeble.

FIRE EFFECTS

A prescribed fire in jack pine slash will likely have one or more of the following objectives:

a) to reduce the fire hazard,
b) to clear the ground for planting,
c) to prepare a seedbed, or
d) to open cones in jack pine seed trees.

Taking these in turn, the first is the simplest. Judging from the visual results on Plots 1, 2, and 3, any running fire will consume all or most of the fine slash components and drastically reduce the fire hazard. Williams (1955) presents experimental evidence to confirm this. As illustrated by the reburning of Plot 2 after the Plot 3 fire, however, a lightly-burned slash area is not by any means a perfect fire-break. If the exposed duff catches fire, it may burn slowly and completely, accompanied by much smoke but little flame.

The less wood remaining after a slash fire, the easier would be the planting job; for this objective it follows that the lower layers of slash should be fairly dry. The Plot 2 fire was the least efficient of the three for clean-up purposes (see Table 5).

Chrosciewicz (1959) and Beaufait (1962) both emphasize that to create a good seed bed for jack pine the fire must remove much of the duff and bare the mineral soil on a substantial proportion of the area. The Plot 3 fire was the only one to do this. The moisture content of the duff was the controlling factor, fire behaviour in the slash being less important. The Plot 1 fire was quite intense at times, but consumed very little duff.

The fourth possible objective, cone-opening in jack pine seed trees,could not be tested because no cone-bearing trees were left on the area. The height above ground to which cones open depends mainly on the fire's intensity. The required heat can be supplied either by the torching foliage, as in a crown fire, or by a hot surface fire. As Beaufait (1962) pointed out, seed in standing jack pines readily survives a crown fire; the seed supply on a cut over, however, is forfeited in a slash fire. The cones in the slash were consumed on all three plots in this experiment. Judging from the observed effects of several wild fires in jack pine stands, it is certain the cones in mature jack pines would have been opened on Plots 1 and 3 at least, and probably in places on Plot 2. Pieces of slash can of course be shifted to increase intensity under seed trees. A summary of the safety and effects of the three 4-acre fires, rated subjectively, appears in Table 6.

TABLE 6. RELATIVE SAFETY AND EFFECTIVENESS OF THE 4-ACRE FIRES.

Plot	Slash Hazard Index	Safety	Hazard reduction	Clean-up	Seedbed preparation	Cone opening
2 (single burn)	Moderate	Excellent	Good	Fair	Poor	Probable
2 (double burn)	--	Adequate	Excellent	Excellent	Excellent	[1]
1	High	Adequate	Good	Good	Poor	Certain
3	Extreme	Doubtful	Excellent	Excellent	Good	Certain

[1] Regeneration from seed trees would not be feasible here; the second fire would consume the seed released by the first.

WHEN TO BURN

The question when to burn must be answered at three levels: season, date, and time of day. Fires solely for hazard reduction have the simplest prescription: the slash must merely be dry enough for fire to run freely with adequate safety. Any season will do, and the actual day can be chosen with little advance notice.

If clean-up or seedbed preparation are desired, the slash and duff must be dry in depth, a situation most likely to occur in summer (Williams, 1960). But when the fuel is dry in depth, an afternoon fire (as on Plot 3) may result in uncomfortably high intensity and plentiful spotting. Williams (1958) found late afternoon and evening a desirable time of day for burning, when winds are light and humidity is rising. Judging from Plots 1 and 2, there is also much to be said for morning fires, especially because the higher moisture content of the fine surface fuel at that time of day minimizes the danger from spotting. True, fire intensity rises throughout the morning, but, if the downwind side and flanks are backfired at the start, the rising intensity may actually be convenient. Plots 1 and 3 (Table 5) offer a fair comparison between morning and afternoon fire behaviour in a 1-year old slash bed equally dry to the duff level. Burning on a cloudy, muggy day may limit the fire intensity to a safe level, but the occurrence of such weather when it is desired cannot be counted on; the best chance of completing a silvicultural burn in summer is with a morning or late afternoon fire on a sunny, moderately windy day. Good weather forecasts would make morning fires more attractive. Still another way of achieving deep burning with safety is suggested by the partly accidental reburning of Plot 2 after the Plot 3 fire. If a seedbed were desired for artificial seeding, a running fire in early spring, when the duff is too moist to burn, could be followed a few weeks later by a creeping, smouldering fire in the exposed duff on a day when it was bone-dry in the sun and fanned by a brisk wind. Double burning, however, would not be feasible where regeneration from seed trees was planned; the second fire would consume the seed released by the first.

Very desirable indeed would be indices based on daily fire weather observation for judging (a) when the duff is dry enough to burn and (b) what rate of spread and fire intensity to expect. When the proper season arrives, tentative plans must be made after each heavy rain until a drought of sufficient length occurs. Williams (1960) presents some information on how duff moisture content in open jack pine stands varies with Drought Index throughout the fire season. As he points out, however, the Drought Index is not always a good indicator of duff dryness; it performs best with periodic heavy rains, but not so well when light rains fall between major storms. Plot 3, for example, was much drier than the Drought Index would suggest. The Slash Hazard Index (Anon. 1956) and Williams' (1955) hazard experiments give some relative indication of the fire behaviour to be expected. The Slash Hazard Index (Anon. 1956), however, applies to the afternoon peak hazard period only, and no tables are available to show how it varies throughout the day.

Until research produces some quantitative indices, the best short-term approach is to observe the burning conditions, behaviour, and results of semi-operational trial fires in jack pine slash, and to use the experience directly in combination with the available information. The fires described here are offered as small-scale examples for three common burning conditions.

SUMMARY

Three 4-acre controlled fires were conducted in 1-year-old windrowed jack pine slash that retained most of its needles on the twigs. Observations were made of weather conditions leading up to and during the fires, fuel moisture content, fire behaviour,

and immediate effects. The fires were lit under three degrees of hazard: moderate (Plot 2), high (Plot 1), and extreme (Plot 3); the first two were in the morning and the third in the afternoon.

The behaviour of the first two fires was judged mild enough for large-scale operations, while the third, at extreme hazard, was uncomfortably intense. Thick smoke made downwind patrolling difficult at high and extreme hazard, but spotting was a problem at extreme only. Rates of spread and fuel consumption were measured, and the fires' rate of energy output calculated.

All three fires levelled the slash bed, leaving only wood of diameter 2 inches or more. Only on Plot 3 (extreme hazard) was the duff dry enough to burn and smoulder, resulting in good seedbed preparation. Plot 2 burned twice, the second fire (several weeks later) consuming most of the duff. The two more intense fires at least would have opened cones in standing jack pines. Cones in the slash were consumed on all three plots.

The results confirm the conclusions of other experimenters with fire in jack pine slash. Fires for hazard reduction alone can be run at any season, but seedbed preparation and good clean-up can only be accomplished in summer when the slash and duff are dry in depth. For control of fire intensity others have suggested fires on humid days or in the evening. The behaviour of two fires in this experiment suggests that morning is a good time as well. Another possibility suggested by the reburning of one plot is a combination of two fires: the first a running fire in spring when the duff is moist, and the second a smouldering fire a few weeks later when the exposed duff is dry.

Indices for quantitatively predicting duff dryness and slash fire behaviour are not yet available; the Drought and Slash Hazard Indices (Anon, 1956) are helpful, but experience is needed as well. Carefully observed test fires in slash are therefore very useful and those reported here are offered as small-scale examples.

SOMMAIRE

L'auteur a dirigé des feux expérimentaux sur trois terrains de 4 acres où des déchets de pin gris étaient empilés depuis un an. Ils étaient encore garnis de presque toutes leurs aiguilles. Il prit note des conditions atmosphériques avant et durant les feux, aussi des quantités de carburant, du comportement du feu et de ses effets immédiats. Le danger d'incendie forestier différait dans chaque cas. Il était soit modéré (parcelle 2), soit élevé (parcelle 1) ou extrême (parcelle 3). Les deux premiers feux furent allumés le matin, le troisième eut lieu un après-midi. Le comportement des deux premiers était anodin mais le troisième fut trop violent. Aux jours de danger élevé ou extrême, on patrouilla avec difficulté en avant du feu. En revanche, la localisation de nouveaux brasiers était ardue seulement lors de danger extrême. On constata ou calcula le degré d'expansion, la consommation d'essence et le taux de rendement en énergie.

A part le bois à diamètre de deux pouces ou plus, le feu consuma tous les déchets d'abattage. Sur la parcelle 3 (danger extrême), l'humus brut, suffisamment sec pour brûler, disparut; l'ensemencement était donc favorisé. Sur la parcelle 2, cependant, l'humus brut ne fut consumé que lors d'un deuxième feu allumé plusieurs semaines plus tard.

Les cônes de pins gris debout auraient facilement ouvert dans la chaleur des deux brasiers les plus violents. Ceux dans les déchets d'abattage flambèrent.

Les résultats qu'il a obtenus de ses expériences confirment ceux d'autres chercheurs: on peut en toute saison brûler en vue de réduire les dangers d'incendie mais un feu pour nettoyer au ras du sol ou pour une bonne préparation aux fins

de semer ne peut s'accomplir qu'en période de sécheresse estivale. L'incendie peut être mieux circonscrit si, comme d'autres l'ont suggéré, on brûle par temps humide ou le soir. A la suite de deux expériences faites par l'auteur, le matin ferait autant l'affaire. Une bonne combinaison semble la suivante: produire d'abord un feu violent au printemps alors que l'humus brut est humide, et brûler une seconde fois à petit feu quelques semaines plus tard quand l'humus, dénudé, aura séché.

L'auteur n'est pas encore en mesure de préparer une table d'indices de sécheresse de l'humus brut ni celle qui a trait au comportement du feu de déchets d'abattage. A ce sujet, on devra savoir interpréter celles qui existent déjà (Anon., 1956). Les feux expérimentaux de déchets d'abattage, si on les étudie minutieusement, sont très utiles. Ceux rapportés ici étaient de faibles proportions.

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