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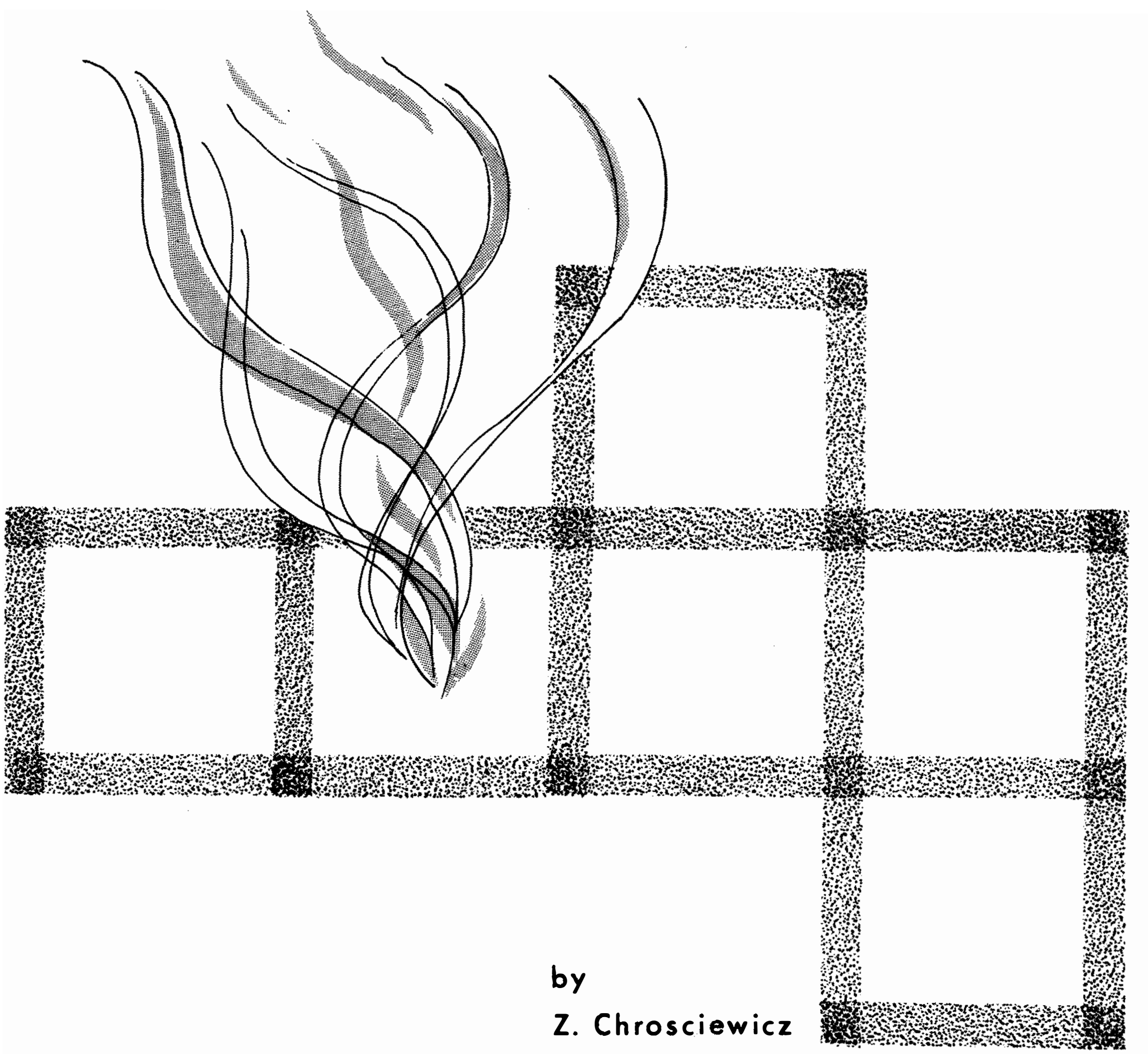
EXPERIMENTAL BURNING FOR HUMUS DISPOSAL ON CLEAR-CUT JACK PINE SITES IN CENTRAL ONTARIO



by

Z. Chrosciewicz

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ABSTRACT

Coniferous raw humus materials were experimentally burned on clear-cut jack pine sites in central Ontario. The drought conditions associated with each in a series of burns were expressed as drought index — fire danger combinations, all based on local weather and determined by standard methods. Both the moisture content of humus materials and the rates of humus disposal by burning varied with the drought index — fire danger combinations. Other factors affecting the rates of humus disposal included the textural humus types, the original humus depths and the major fuels present. The relationships obtained were considered useful as guides in future burning operations.

CONTENTS

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The author wishes to thank the KVP Company Limited in Espanola, Ontario, for active co-operation by providing men and equipment during burning operations. The author also extends his gratitude to the Ontario Department of Lands and Forests for issuing fire permits and supplying jack pine seed as required.

EXPERIMENTAL BURNING FOR HUMUS DISPOSAL ON CLEAR-CUT JACK PINE SITES IN CENTRAL ONTARIO

by

Z. Chrosciewicz[1]

INTRODUCTION

Previous experiments in central Ontario have demonstrated that success in regenerating jack pine (*Pinus banksiana* Lamb.) on well drained sites after cutting, either by burning and subsequent seeding, or by burning in presence of seed trees, depends primarily on the seedbed conditions produced. If a fire burns most of the raw humus, exposes the mineral soil in some places and leaves only a very thin layer of organic residue in other places, then the conditions are generally favourable. But, if the fire destroys only the surface litter and leaves behind a relatively thick layer of otherwise undisturbed humus, the resultant conditions are often as unfavourable as before burning. Nearly complete burning of the raw humus is usually required for an adequate improvement of jack pine seedbeds. A deep burn is possible only when the entire humus layer dries out sufficiently prior to ignition (Chrosciewicz 1959).

The earlier experiments were carried out in spring and autumn when the moisture content of humus seldom allowed the fire to burn much below the dry surface litter. This type of

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burning was satisfactory only in those few situations where the raw humus was exceptionally thin. In all other situations, particularly where the original humus layer was more than 1.5 inches thick, the resulting shallow burns were disappointing since most of the organic material remained intact. Mainly because of these past difficulties in proper timing of burning operations, both in spring and in autumn, further experimental work covering the summer drought periods was recommended (Chrosciewicz 1959).

Several burning and seeding treatments were tested between 1960 and 1963 on two different clear-cut sites, both located at latitude 47° 03' N and longitude 82° 15' W, north-northwest of Espanola, Ontario. The main objectives of these tests were (1) to determine the drought conditions for burning raw humus of variable types and depths, (2) to evaluate the individual burns in terms of humus disposal relative to factors involved, and (3) to ascertain the quality of resultant seedbeds in terms of jack pine establishment and growth. This report describes the experiment and deals with the first two of the objectives listed. Regeneration studies are continuing, and further results pertaining to the third objective will be reported later.

SITES

Physiography

This experiment was established on two adjoining terraces each located at a different elevation. The soils were well drained, siliceous, podzolized and acid. In texture, the mineral materials were a slightly pebbly and silty fine sand overlying fine sand on the upper terrace, and a uniformly sorted fine sand on the lower terrace. The depth to ground water varied from approximately 30 feet on the upper terrace to 6 feet on the lower terrace, and the soil moisture regimes (Hills 1955) were 1 (moderately dry) and 2 (fresh) respectively.

Slash and humus

Originally, the area supported an 80-year-old forest, pure jack pine on the upper terrace, and a mixture of jack pine and black spruce (*Picea mariana* (Mill.) BSP.) on the lower terrace. The per-acre basal areas and pulpwood volumes were 128 to 132 sq. feet and 33 to 35 cords respectively. The stands were clearcut in 1957 and all that remained by 1960 were stumps and bare logging slash. On the average, this slash was piled 3 feet high in 30-foot-wide windrows spaced at 66 feet between centres. Some mineral soil was exposed during logging operations, but 78 to 98 per cent of the raw humus remained in its matted, undisturbed state. The humus was a coarse-textured jack pine mor on the upper terrace, and a fine-textured jack pine-black spruce mor on the lower terrace. For these two types, the humus layer ranged in depth from less than 1 inch to more than 6 inches.

Vegetation

Jack pine regeneration was restricted to a few seedlings on some of the patches with exposed mineral soil. Sweet-fern (*Comptonia peregrina* (L.) Coult.), bracken fern (*Pteridium aquilinum* (L.) Kuhn) and sour-top blueberry (*Vaccinium myrtilloides* Michx.) on the upper terrace, and low-bush blueberry (*Vaccinium angustifolium* Ait.), trailing-arbutus (*Epigaea repens* L.) and Schreber's moss (*Pleurozium schreberi* (BSG.) Mitt.) on the lower terrace, were the main species present. The maximum height of this vegetation varied from 22 inches on the upper terrace to 8 inches on the lower terrace, and the total vegetative ground cover was estimated at 80 per cent on both these sites.

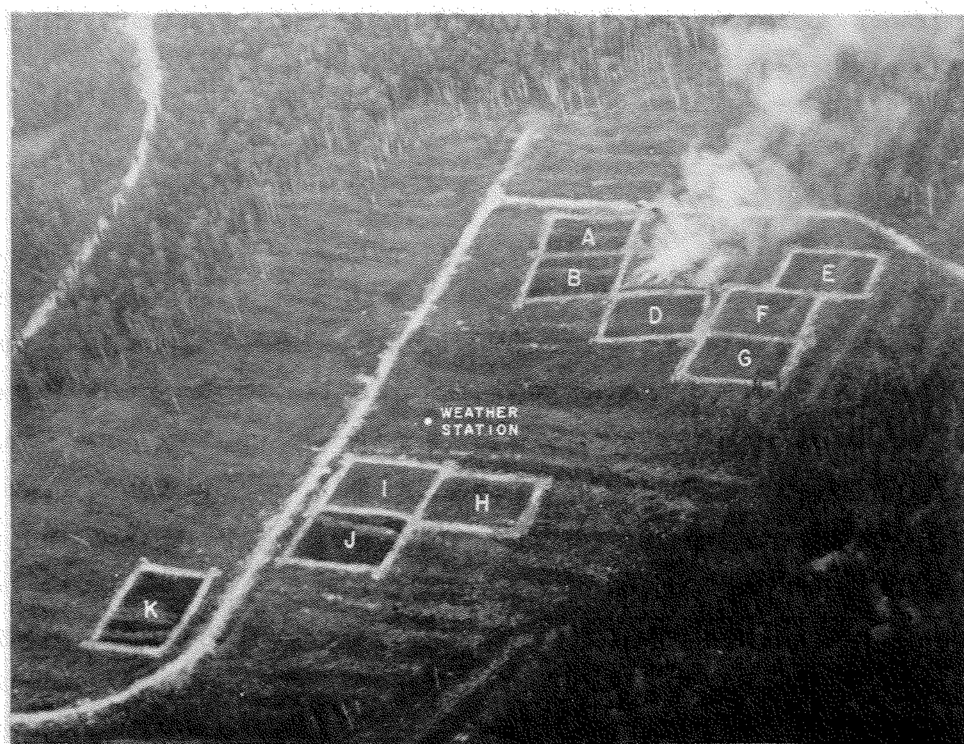

Figure 1. Location of Plots A to G on upper sand terrace and H to K on lower sand terrace (burning on Plot C).

METHODS

Layout and preparation of plots

Eleven 0.26-acre plots, A to K, were laid out, seven on the upper terrace, and four on the lower terrace (Figure 1). The plots were 1.3 by 2.0 chains, with their longer sides oriented either parallel or at right angles to slash windrows[2]. Each plot was divided into two 1.3 by 1.0-chain sections, and the slash was uniformly scattered 2 feet deep on one of these sections. Thus, comparable slash accumulations were secured on all plots, both in the form of original windrows and in the scattered state. Following this, 20-foot-wide fire guards were bull-

[2]Both the varied orientation and the uneven distribution of plots resulted from lack of sufficient area with homogeneous soil and/or fuel conditions.

dozed around each plot. The guards were cleared of all fuels down to mineral soil.

Mapping of fuel-seedbed combinations

Several sample strips were established on each of the plots to facilitate seedbed and regeneration studies. The strips were systematically located across slash windrows. They consisted of single rows of 0.001-acre quadrats with a total length per plot of either 7.8 or 8.0 chains. This resulted in a 30.0 or 30.8 per cent sampling of the plot area. Before burning, all pertinent fuel-seedbed combinations, such as windrowed slash plus undisturbed humus, scattered slash plus undisturbed humus, undisturbed humus only, and mineral soil exposed by logging, were permanently marked on the strips with aluminum stakes and their outlines shown on plot plans. The mapping procedure was repeated a few months after burning, when the surface ashes had leached out. This time, only the outlines of mineral soil exposed by burning were entered on the plot plans. The total humus cover before and after burning was determined from the plot plans by a grid method.

Measurement of humus depths

The depth of burn into the raw humus was one of the criteria used in evaluating the results of this experiment. Shortly before burning, 100 observation points were established on each plot with the aid of iron pins placed at random in undisturbed humus along centre lines of the sample strips. The pins were made of a rigid wire, each with a flattened loop at one end. They were pushed vertically into the ground until their loops touched the surface litter. A few hours after burning, the depth of burn, the depth of residual humus and the depth of original humus were measured at the various points to the nearest 0.1 inch. The exact positions of all these points, and the corresponding humus depth values, were entered on the plot plans. Those few points at which the pins were disturbed during burning operations were not included.

Determination of humus moisture

The effect of humus moisture on depth of burn was investigated. For this purpose, humus samples were taken on each plot immediately before burning, using a tubular auger. The samples were circular, 2 inches in diameter and, with a constant depth of 2.5 inches, closely represented the average depth of raw humus for all plots. To minimize variations due to composition and position of such humus, only samples free of wood fractions and situated just outside slash accumulations were taken. For each plot, the samples were combined, placed in a metal container, sealed against moisture losses and transported to a field laboratory. There, the combined samples were weighed, dried at 212°F for 12 hours, and weighed again for moisture content determinations. This content was expressed in per cent based on net oven-dry weights.

Local weather and fire indices

The plots were to be burned over at different combinations of fire indices based on local summer weather. Each year, the weather measurements commenced after a heavy rain early in July and continued daily to the end of August. This was done on the experimental area (Figure 1) using standard methods of instrumentation. The factors measured included temperature, relative humidity, wind speed, rainfall and cloud cover. The data were recorded at sun noon, or as required for daily determinations of drought index, fire danger index and slash fire hazard index. The various index values were obtained directly from "Forest Fire Danger Tables, Ontario" (Anon. 1957). Additional weather data were recorded at the start and end of each burn (Table 1).

Table 1. FIRE INDICES AND WEATHER CONDITIONS ON DAYS OF BURN

Fire Indices*			Temperature p.m.-EST**			Rel. Humidity p.m.-EST**			Wind Speed p.m.-EST**			Amount of Rain†	Prevalent Sky Condition	Date of Burn
Drought	Danger	Slash Hazard	12:30	3:30	5:30	12:30	3:30	5:30	12:30	3:30	5:30			
			Degrees F.			Per Cent			Miles Per Hour			Inches		
3	9	14	83	80	77	45	49	59	8-12	4-7	4-7	-	P.Cloudy	13 Jul.'61
6	9	15	74	76	75	50	45	49	0-1	0-1	0-1	-	P.Cloudy	20 Aug.'60
7	12	16	75	79	78	39	38	41	4-7	4-7	4-7	-	P.Cloudy	19 Jul.'62
9	10	15	62	75	74	58	52	52	13-18	8-12	8-12	-	Clear	23 Aug.'60
10	12	16	82	80	73	46	45	54	13-18	8-12	8-12	-	Clear	3 Aug.'62
12	12	16	82	83	80	48	44	45	13-18	13-18	13-18	-	Clear	6 Aug.'62
14	8	15	56	61	60	65	49	55	4-7	4-7	4-7	0.01	Overcast	8 Aug.'62

*Values determined from local weather and "Forest Fire Danger Tables, Ontario" (Anon. 1957).

**Eastern Standard Time (EST):
- 12:30 p.m. - Determination of fire indices.
- 3:30 p.m. - Start of burning.
- 5:30 p.m. - End of burning.

†Rainfall measured immediately preceding determination of fire indices.

Burning and fire controls

Burning operations were carried out during three consecutive summers, 1960 to 1962, at seven different combinations of fire indices. The indices ranged from 3 to 14 for drought, from 8 to 12 for fire danger, and from 14 to 16 for slash fire hazard (Table 1). Each plot was burned over between 3:30 and 5:30 p.m. (EST), starting with a U-shaped back-fire, and ending with a straight-front head-fire. When wind speed was 7 mph or less, the head-fire was started after the back-fire had advanced for approximately one-third of the distance across the plot. But when wind speed exceeded 7 mph, the back-fire was allowed to cover about two-thirds of the distance before the fuels were ignited for the head-fire. The protection crew had no difficulty confining the fires within the plots.

RESULTS

Weather, fire indices and humus moisture

Burning at drought indices 3 to 12 was carried out on partially cloudy to clear days during warm and dry afternoon weather. The fire danger and the slash fire hazard associated with these burns were "high" and "extreme" respectively. In contrast, the last burn at drought index 14 was carried out on an overcast day during cool afternoon weather following a slight rainfall. Although in comparison with other burns the drought index on that day was higher, the fire danger became "moderate", but the slash fire hazard continued to be "extreme". The rather drastic reduction of fire danger from "high" at drought index 12 to "moderate" at drought index 14 was brought about by 0.01 inch of rain, increased relative humidity and decreased wind speed. Such changes in weather had no effect on drought index, and the response of slash fire hazard index was slight (Tables 1 and 2).

Table 2. RATED FIRE INDICES AND HUMUS MOISTURE ON DAYS OF BURN

Rated Fire Indices*						Av. Moisture of 2.5-Inch Humus**		Date of Burn
Drought		Danger		Slash Hazard		Coarse-Textured Mor	Fine-Textured Mor	
Index	Rating	Index	Rating	Index	Rating			
						Per Cent		
3	-	9	High	14	Extreme	75	-	13 Jul. '61
6	-	9	High	15	Extreme	70	57	20 Aug. '60
7	-	12	High	16	Extreme	65	55	19 Jul. '62
9	-	10	High	15	Extreme	53	46	23 Aug. '60
10	-	12	High	16	Extreme	57	-	3 Aug. '62
12	-	12	High	16	Extreme	42	45	6 Aug. '62
14	-	8	Moderate	15	Extreme	60	-	8 Aug. '62

*Values rated according to "Forest Fire Danger Tables, Ontario" (Anon. 1957).

**Values based on oven-dry weight of 5 humus samples per plot taken immediately before burning.

Humus moisture was strongly affected by the variations in weather as represented by the variations in fire indices, especially those indicating "drought" and "fire danger". Whenever the fire danger was "high", the moisture content of 2.5-inch-deep humus appreciably decreased with increasing drought index, from 75 per cent at index 3 to 42 per cent at index 12 for the coarse-textured mor, and from 57 per cent at index 6 to 45 per cent at index 12 for the fine-textured mor. Apart from one abnormality at drought index 9, these decreases in humus moisture were gradual. But when the fire danger decreased from "high" to "moderate", the moisture content of 2.5-inch-deep coarse-textured mor substantially increased with increasing drought index, from 42 per cent at index 12 to 60 per cent at index 14. Thus, a reasonably good representation of drought conditions relating to humus moisture was obtained by the combined use of drought indices and rated fire danger (Table 2).

With the exception of one value, the moisture content of 2.5-inch-deep fine-textured mor was consistently lower than the moisture content of 2.5-inch-deep coarse-textured mor. Moreover, the variation in the former was much less pronounced than the variation in the latter at the same fire indices (Table 2). This suggested that, under comparable weather conditions, the absorption, retention and loss of moisture by the raw humus materials depended on the composition and texture of the materials themselves.

Comparative evaluation of burns

General observations

Slash, aerial parts of vegetation, all surface litter and varying quantities of raw humus were destroyed by the fires. The organic materials remaining on the plots included surface-charred stumps and other large pieces of wood, partially burned humus, and unburned plant roots in and below such humus. All eleven plots had "clean" burns that left them nearly free of

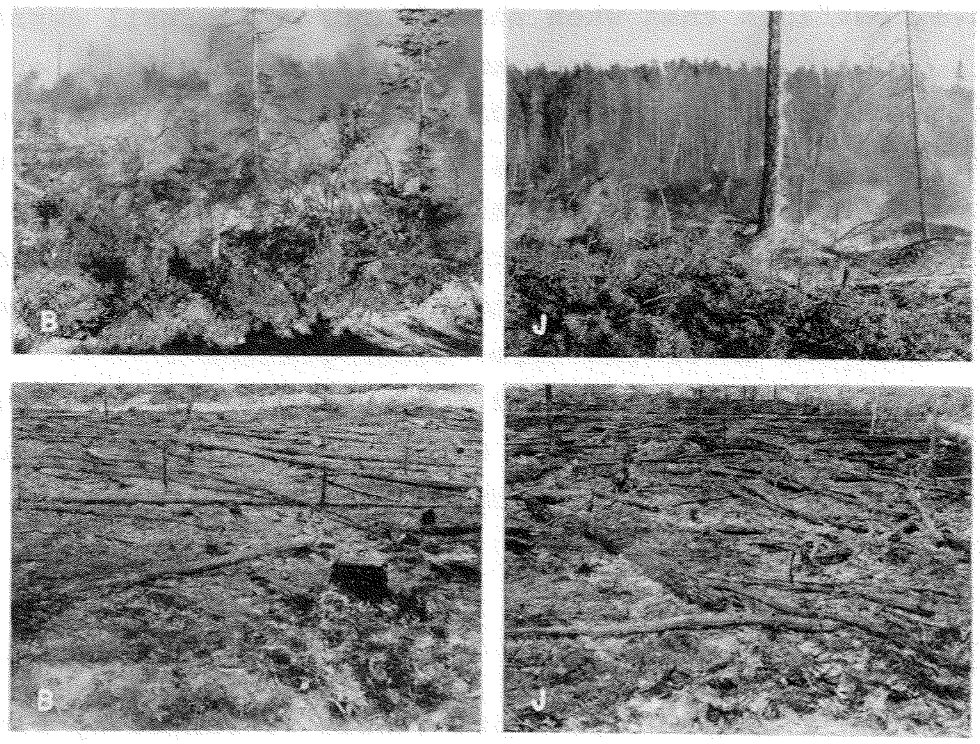

Figure 2. Typical examples of burns on upper sand terrace (Plot B) and on lower sand terrace (Plot J).

major physical obstructions (Figure 2).

The fires produced a multitude of micro-seedbeds varying in frequency of occurrence, distribution, size, shape and depth of residual humus. Patches of mineral soil exposed by burning were randomly interspersed in residual humus, and the proportion of such patches varied by plots with the type of humus and the drought conditions under which the materials were burned. The mineral soil was exposed usually where the original humus was thinner than the average, but there were several instances in which a thick humus was completely destroyed and a relatively thin one burned only on its surface. This variation in the depth of burn was probably caused by variation in humus moisture. The latter was affected by the depth of original humus and by the exposure of such humus to direct insolation and ventilation. For example, the raw humus materials of a given type and depth burned more readily when unshaded and/or on convex surfaces than when shaded and/or in small depressions.

Slash had a predominantly beneficial effect on the reduction of humus depth by increasing the over-all combustibility of fuels. Apart from this, the differences in effects of windrowed slash and scattered slash were both negligible and inconsistent. Therefore, distinction between these two classes of slash distribution was not maintained, and the data were jointly analysed under the term "slash present".

Slash, vegetation and humus burned equally well under back- and head-fires. Drought conditions suitable for burning these fuels were apparently much more important than the kind of fire used.

Factorial considerations

The average humus depth (Table 3) ranged by plots from 2.0 to 2.7 inches before burning, and from 0.3 to 1.4 inches after burning. Similarly, the total humus cover (Table 3) ranged by plots from 78 to 98 per cent before burning, and from 40 to 87 per cent after burning. The values after burning were adjusted to a constant 2.5-inch humus depth, and to a constant 100-per cent humus cover, before burning. Subsequent plotting of these adjusted values by drought index — fire danger combinations and humus types for all fuels facilitated comparisons between the individual burns in terms of humus disposal (Figures 3 and 4).

These comparisons showed the following relationships. Whenever the fire danger was "high", the reduction of humus depth, and the removal of humus cover, increased in most cases with increasing drought index. But when the fire danger decreased from "high" to "moderate" regardless of increasing drought index, both the reduction of humus depth and the removal of humus cover substantially diminished (Figures 3 and 4). The reduction of humus depth was consistently greater in fine-textured mor than in coarse-textured mor at drought indices 6

Table 3. HUMUS CONDITIONS BEFORE AND AFTER BURNING BY DROUGHT INDEX-FIRE DANGER COMBINATIONS

Drought Index	Fire Danger	Coarse-Textured Mor Upper Sand Terrace					Fine-Textured Mor Lower Sand Terrace				
		Plot	Av.Humus Depth*		Tot.Humus Cover**		Plot	Av.Humus Depth*		Tot.Humus Cover**	
			Before Burn	After Burn	Before Burn	After Burn		Before Burn	After Burn	Before Burn	After Burn
			Inches		Per Cent			Inches		Per Cent	
3	High	C	2.0	1.4	93	87	-	-	-	-	-
6	High	A	2.6	1.4	83	76	K	2.4	1.1	78	71
7	High	D	2.7	1.2	97	86	I	2.0	0.7	98	87
9	High	B	2.7	1.2	88	78	J	2.5	0.8	86	76
10	High	E	2.6	1.0	83	54	-	-	-	-	-
12	High	F	2.3	0.3	78	40	H	2.2	0.5	80	63
14	Moderate	G	2.3	1.3	89	74	-	-	-	-	-

*Values based on 75 to 98 direct humus depth measurements per plot (scarified portions excluded).

**Values based on direct humus cover determinations from appropriate plot plans.

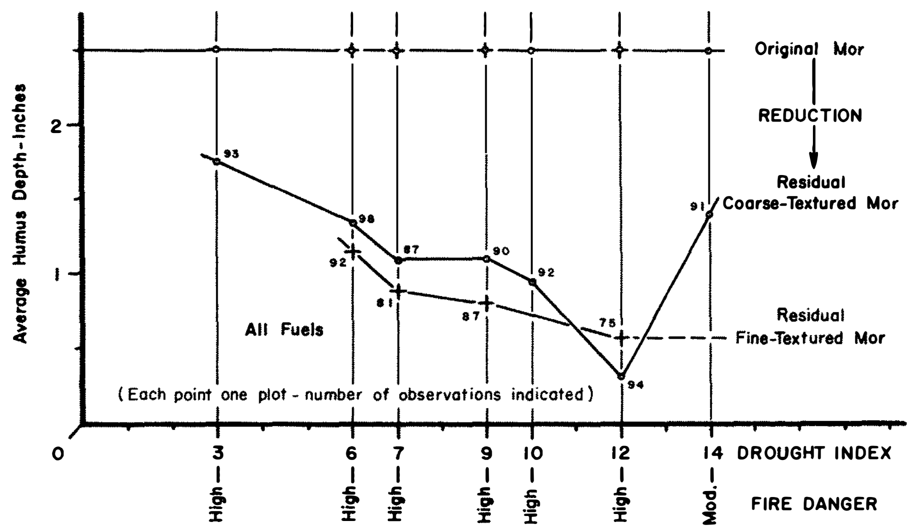

Figure 3. Reduction of humus depth by burning related to drought index — fire danger combinations and humus types on upper and lower sand terraces.

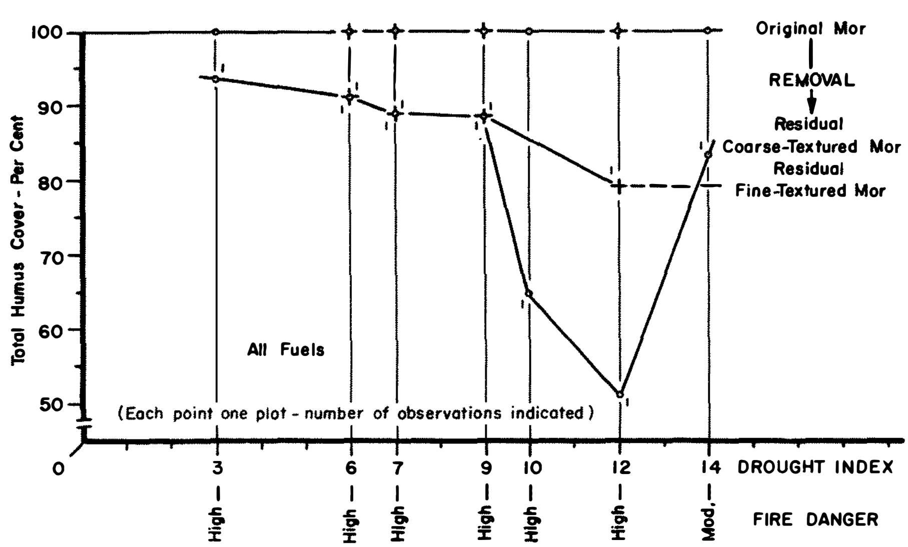

Figure 4. Removal of humus cover by burning related to drought index — fire danger combinations and humus types on upper and lower sand terraces.

to 9; for drought index 12, the reverse held true (Figure 3). These deeper burns were not always associated with proportionally greater exposure of mineral soil. The removal of humus cover was equal for both humus types at drought indices 6 to 9, but became considerably less in fine-textured mor than in coarse-textured mor at drought index 12 (Figure 4). Variable content and distribution of moisture within the lower portions of different humus materials were probably responsible for this apparent lack of co-ordination between the reduction of humus depth and the removal of humus cover.

In addition to comparing plot averages, curvilinear relationships were obtained between the actual humus depth values before and after burning. These values were grouped, averaged and plotted in 1-inch classes of original humus depth by drought index — fire danger combinations, humus types and major fuels. The effects of individual factors under consideration were determined in relation to the variable depths of original humus (Figures 5 to 8).

Among the most important effects were those pertaining to drought index — fire danger combinations in presence of slash[3]. By gradually reducing the original depth of humus over most of its range, burning at drought indices 3, 6, 7, 10 and 12 for coarse-textured mor, and burning at drought indices 6, 7 and 12 for fine-textured mor, improved as the drought index values within the "high" fire danger increased. These relationships were very consistent wherever the original humus depth was greater than 1 inch, but some of them were either equivalent or interchangeable at depths less than 1 inch (Figures 5 and 6). Burning coarse-textured mor at drought index 9 produced results which failed to fit into the pattern of variation established by other drought indices within the "high" fire danger (Figure 5),

[3]Similar effects in absence of slash were not delineated because of insufficient data.

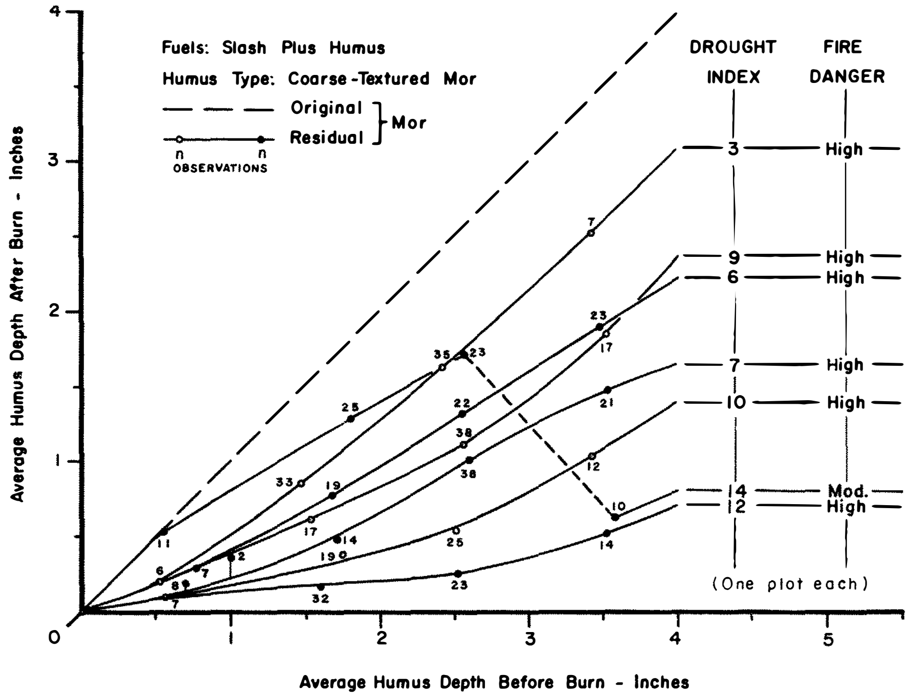

Figure 5. Humus depths before and after burning related to drought index — fire danger combinations on upper sand terrace.

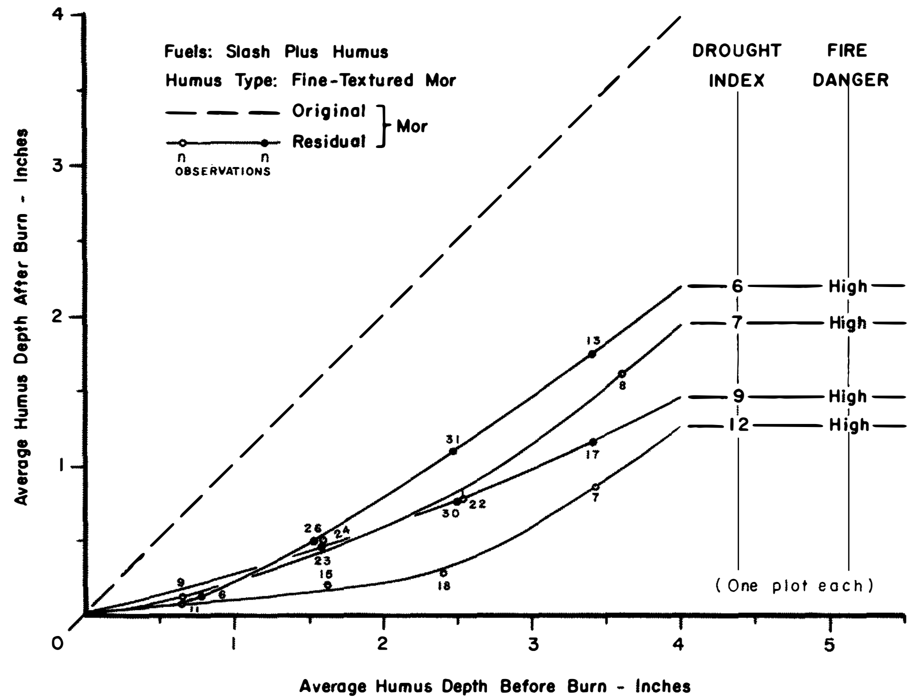

Figure 6. Humus depths before and after burning related to drought index — fire danger combinations on lower sand terrace.

although a somewhat better fit in this respect was obtained from burning fine-textured mor under the same index 9 particularly at original humus depths greater than 2 inches (Figure 6). Moreover, sharply contrasting results were obtained from burning coarse-textured mor at drought index 14, or when the fire danger was "moderate". In terms of original humus depths for this burn, no appreciable reduction of such depths occurred below 1 inch, relatively small reduction followed between 1 and 3 inches, and very substantial reduction took place above 3 inches (Figure 5). Variations in content and distribution of moisture within the humus materials of different depths were probably responsible for most of these variations in burns by drought index — fire danger combinations.

Averaged for common drought indices 6, 7, 9 and 12 within the "high" fire danger, the effects of humus types in presence of slash[4], and the effects of major fuel combinations regardless of humus types, were defined. The burns in fine-textured mor were somewhat deeper than the burns in coarse-textured mor, and this differentiation between humus types was particularly consistent at original humus depths greater than 2 inches (Figure 7). Humus materials situated directly under slash accumulations generally burned deeper than those situated between such accumulations, but the differences gradually decreased at original humus depths greater than 2 inches (Figure 8). These variations in burns attributed to humus types and major fuels were probably due to interactions between humus moisture and different amounts of heat generated by burning various surface materials.

[4]Similar effects in absence of slash were not delineated because of insufficient data.

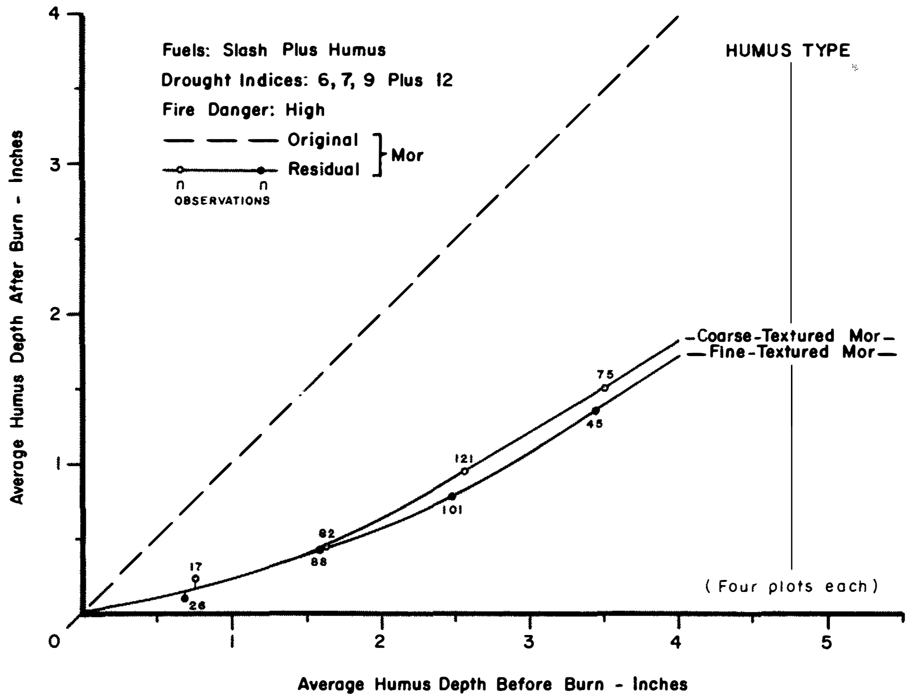

Figure 7. Humus depths before and after burning related to humus types on upper and lower sand terraces.

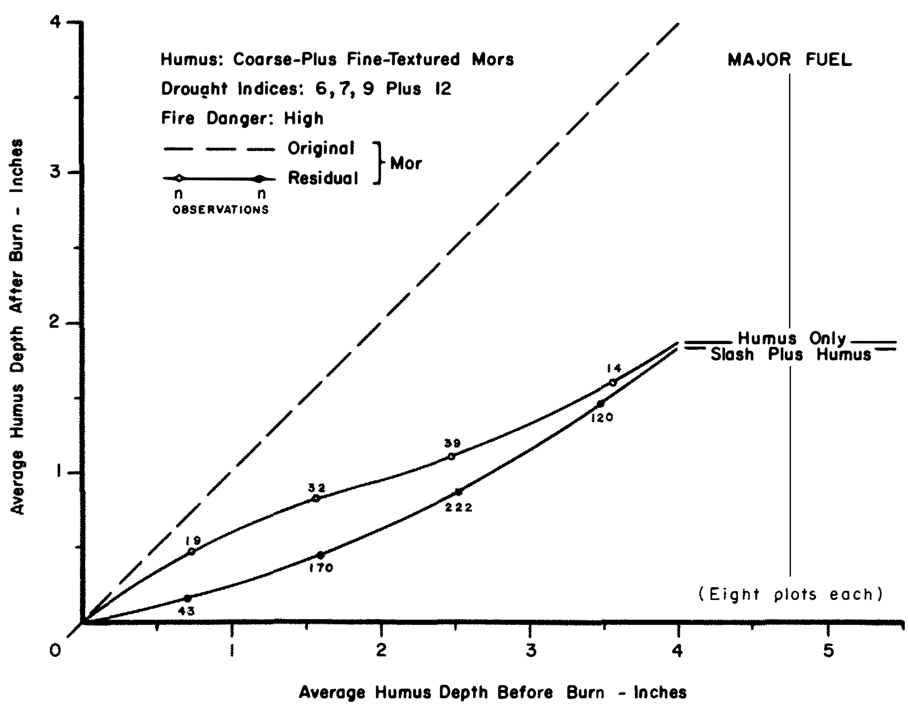

Figure 8. Humus depths before and after burning related to major fuels on upper and lower sand terraces.

DISCUSSION

One of the main contributions of this experiment to the use of burning for silvicultural purposes is the determination of a gradient in drought conditions under which the coniferous raw humus materials can be destroyed by fire at rates related to their original types and depths. Providing the slash and other fuels are similar, the relationships obtained can be used as guides in future burning operations. Adequate measurements of local weather, and daily determinations of drought and fire danger indices by standard methods (Anon. 1957), are the preliminary requirements. Knowing the approximate type and depth of humus on any given jack pine or jack pine-black spruce clear-cut site, the burning operation may then be carried out at a preselected drought index — fire danger combination best fitting the desired reduction in humus depth. This selection can be made through interpretation of results presented in Figures 5 and 6.

The amount of mineral soil exposed by such burning will vary with the drought index — fire danger combination, the humus type, the distribution of individual humus depths, the variation in micro-relief and other factors. If the humus materials designated for burning average about 2.5 inches in depth, both the selection of a suitable drought index — fire danger combination and the prediction of approximate results can be made directly from Figures 3 and 4. No matter which of the relationships is used for this purpose, much of the customary guesswork can be avoided. One thing, however, must be remembered. There is a considerably greater tolerance in selecting the drought index — fire danger combinations for burning thin humus than for burning thick humus (Figures 5 and 6).

Since raw humus burns somewhat deeper directly under slash than elsewhere (Figure 8), it is usually an asset to have the slash materials uniformly distributed prior to ignition.

For all practical purposes, however, slash windrows spaced one chain or less from centre to centre provide satisfactory distribution. Scattering of slash is not recommended because this normally leads to additional costs which seldom can be justified by the relatively slight improvement in the burn. Burning for humus disposal is possible only when the fuels involved are sufficiently dry, and ignition under such conditions carries the fire from one slash windrow to another without difficulty. The over-all results in terms of humus disposal depend considerably more on the drought conditions than on the differences in slash distribution.

The minimum drought requirements for burning humus differ greatly from those for burning slash. The thick raw humus materials, predominant in Ontario, require at least a "high" fire danger, and high drought indices within that danger, before they can be adequately reduced in depth by fire (Figures 3, 5 and 6). In contrast, a "low" to "moderate" fire danger will probably be sufficient for effective slash disposal by burning. Selection of proper drought index — fire danger combinations for this purpose will depend on the age and decomposition of slash.

Burning operations must be carried out both safely and efficiently. Adequate fire lines, a source of water nearby, a good communication system, sufficient number of men, proper distribution of pre-tested equipment, skillful timing of back- and head-fires, and the complete mopping-up of fire early next day are essential. Subject to adequate control at all times, the rate of burning must be reasonably rapid to utilize the right drought conditions. If burning progresses too slowly in relation to the size of a given area, adverse changes in such conditions may occur and, consequently, some of the objectives may not be fully realized. The aspects of burning on cut-over jack pine sites described by Chrosciewicz 1959, Williams 1960, Beaufait 1962, and Van Wagner 1966, warrant consideration relative to purpose, weather, and fire control.

The last stage of the present experiment will be to evaluate the quality of seedbeds produced by the individual burns in terms of jack pine establishment and growth. On completion of this stage, a series of operational trials with burning and other treatments will be required to determine the economic feasibility of their application on a large scale.

SUMMARY

Between 1960 and 1963, several burning and seeding treatments were experimentally tested on two clear-cut jack pine sites in central Ontario. The objectives were (1) to determine the drought conditions for burning raw humus of variable types and depths, (2) to evaluate the individual burns in terms of humus disposal relative to factors involved, and (3) to ascertain the quality of resultant seedbeds in terms of jack pine establishment and growth.

Briefly, the results of burning revealed that:

1. A reasonably good representation of drought conditions and associated humus moisture was obtained by the use of drought index — fire danger combinations.
2. The rates of humus disposal by burning varied with the drought index — fire danger combinations, the textural humus types, the original humus depths and the major fuels present.

Apart from the presentation of results based on burning operations, this report includes suggestions for their practical application. The studies of jack pine regeneration are continuing, and further results concerning the qualitative evaluation of the fire-produced seedbeds will be reported later.

SOMMAIRE

L'auteur a effectué entre 1960 et 1963 plusieurs ensemencements et brûlages expérimentaux dans des terrains, en Ontario central, où des peuplements de Pin gris avaient été récemment coupés à blanc. Le but partiel de ces expériences était 1° de connaître les conditions de sécheresse favorables au brûlage de types dissemblables d'humus dont l'épaisseur diffère, 2° d'évaluer les brûlages individuels, en termes de destruction de l'humus, par rapport aux facteurs étudiés, et 3° de constater, en termes d'établissement et de croissance de Pin gris, la qualité des semis obtenus.

Voici en quelques mots les résultats obtenus:

1. Au moyen de formules combinant le danger de feu et l'indice de sécheresse, il a réussi à connaître suffisamment les dites conditions de sécheresse et le degré d'humidité dans l'humus.
2. Le taux de destruction de l'humus au moyen d'un brûlage a varié selon le danger de feu, l'indice de sécheresse, le type d'humus (selon sa texture) et son épaisseur, et les principaux combustibles trouvés sur place.

Cet article, en plus de décrire les résultats obtenus des brûlages, traite de leur application pratique. L'auteur continue ses recherches et publiera plus tard ce qui ressortira d'une étude en cours sur la qualité des semis de Pin gris que produira le sol brûlé.

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