Frontline

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ECOSYSTEM CLASSIFICATION SYSTEMS CAN ASSIST IN PLANNING PRESCRIBED BURNS ON BLACK SPRUCE SITES

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CATEGORY: Site preparation
KEY WORDS: Black spruce, ecosystem classification, prescribed fire, site preparation

INTRODUCTION

With varying degrees of success, prescribed burning has been used as a silvicultural tool on harvested black spruce (*Picea mariana* [Mill.] B.S.P.) sites in Ontario. However, success has varied because black spruce occurs on a number of site types. Conducting a successful prescribed burn can be difficult if high moisture levels exist or if there is an abundance of live vegetation on the forest floor. Both of these conditions can prevent good fire spread.

This history of success can be better understood by examining the ecological diversity of black spruce sites found in the two Forest Ecosystem Classification (FEC) systems now used in Ontario: one for the northwest (Sims et al. 1989) and the other for the Clay Belt region (Jones et al. 1983). Additional FEC guidelines are currently being developed for other parts of Ontario.

Forest managers wishing to use prescribed fire, and Ontario Ministry of Natural Resources fire personnel (who in Ontario plan and conduct burns following procedures contained in the provincial prescribed burn planning manual [Ontario Ministry of Natural Resources 1987]), need to understand the constraints associated with burning a particular ecosystem site type. They must be familiar with and apply the proper prescribed burning techniques for a specific ecosystem in order to achieve desired objectives.

PLANNING FOR BURNS USING FEC SYSTEMS

Figure 1 is an ordination diagram from Sims et al. (1989). It shows the forest ecosystems of northwestern Ontario that contain an abundance of black spruce, and the associated preharvest forest floor duff types (L, F, and H soil layers). Duff is an important fuel that contributes to fire spread (McRae 1986).

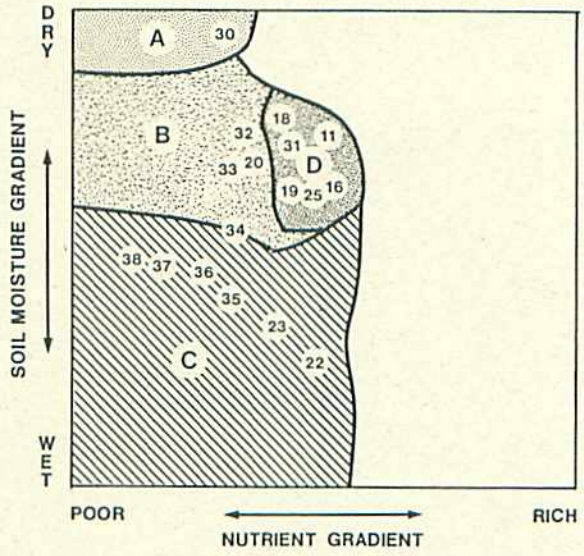

*Figure 1. An ordination diagram for the northwestern Ontario FEC (*adapted from *Sims et al. 1989) showing only those vegetation types with a black spruce component and their most commonly associated forest floor duff types (A-lichen, B-feathermoss, C-*Sphagnum, *and D-feathermoss/litter transition).*

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Northwestern Ontario FEC

Lichen Type

When setting objectives for the shallow-soil vegetation type (V-type) V30, forest managers should specify that only prescribed burns that result in minimal duff removal (i.e., minimal depth of burning into the duff), can be tolerated. Fire managers are able to tailor the prescribed fire to permit burning of surface slash fuels with little depth of burn when Duff Moisture Codes (DMC) and Drought Codes (DC) of the Canadian Forest Fire Weather Index (FWI) System (Canadian Forestry Service 1987) are low. Lichen duff dries quickly after precipitation and is a good carrier of fire (Alexander et al. 1991).

Feathermoss Type

Vegetation types V20, V32, and V33 encompass sites covered predominantly by a feathermoss *(Pleurozium schreberi* [B.S.G.] Mitt. and other species) duff type. Even in the absence of slash fuels, feathermoss is a good carrier of fire and enables successful burns even on full-tree harvested sites. Feathermoss also dries quickly after precipitation, thereby allowing such sites to reach fire prescription values much more quickly than other duff types (McRae 1986). The V34 site is comprised of extensive areas of feathermoss, but may be broken up by patches of *Sphagnum* sp. The abundance of live shrubs and herbs influences ground microclimate, which ultimately determines how well the fire will carry. Careful consideration of vegetation regrowth must be given when a prescribed burn is delayed past the first growing season following harvest (Fig. 2). Vegetation development occurs slowly in the first couple of years after harvest of V-types V20, V30, V32, V33, and V34. Burning of these sites can be delayed a year with little consequence.

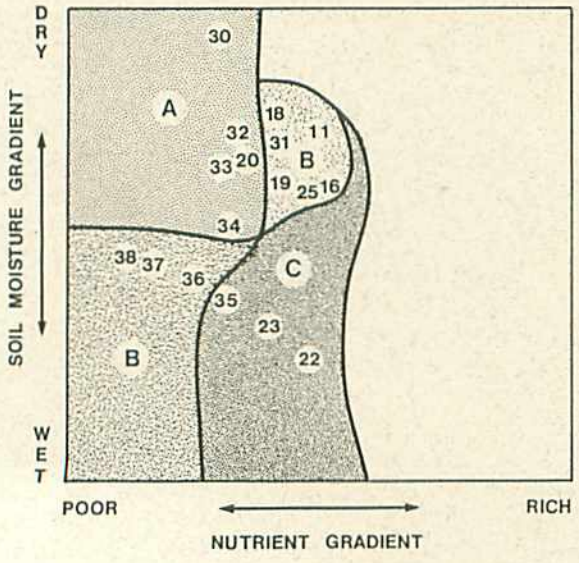

Figure 2. Vegetation development potential after harvesting for the northwestern Ontario FEC: low (A), moderate (B), and high (C). Abundant herbs and shrubs may hinder the spread of fire.

Sphagnum Type

Burning on *Sphagnum* sites (V22, V23, V35, V36, V37, and V38) may not be possible if full-tree harvesting has taken place. To be successful, slash fuels are usually required to carry the fire because the ground fuels (duff) here are often wet. Use of an Ontario Aerial Ignition Device (OAID) may not be a good choice on wet sites, since many of the ping-pong incendiaries are extinguished when they fall into water. The use of a helitorch would provide better burn coverage because the number of incendiaries dropped by this aerial technique is much greater than by the OAID method; this compensates for some that are extinguished by wetter fuel conditions. V-types V37 and V38 may have a moderate amount of vegetation after harvesting, but not as much as found on other *Sphagnum* sites.

V-types other than V37 and V38 may have sufficient ground vegetation to modify the forest floor microclimate to a point where fire will not spread well. If prescribed burning is considered for these sites, an application of herbicide may be necessary to desiccate the foliage and thus improve microclimate burning conditions. These sites can be burned without an application of herbicide, but higher codes and indices of the FWI System than those normally used may be required to attain the burn objectives. Burning of such sites should be carried out during the summer following harvesting.

Transition Type

V-types V11, V16, V18, V19, V25, and V31 may, to some degree, have a black spruce component and the duff types are mainly a transition between feathermoss and litter. Prescribed burning of these sites is possible, but following precipitation the duff will not dry out as quickly as it will on pure feathermoss sites.

Clay Belt FEC

Figure 3, an ordination diagram for the Clay Belt region of Ontario (an area where black spruce is a dominant tree species), shows the ability of prescribed fire to spread on these sites based upon forest floor duff type. Black spruce operational groups (OGs) may be divided into the lichen duff type (OG1), feathermoss duff type (all of OG2 and parts of OGs 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13), *Sphagnum* duff type (all of OGs 11, 12, 14 and parts of OGs 5, 7, 8, 9, and 13), and a feathermoss/litter transition duff type (part of OGs 2, 3, 5, 6, 7, and 10). Prescribed fire is not well suited for site preparation on full-tree harvested *Sphagnum* sites because slash fuels may be lacking. If burning is attempted a helitorch, not OAID, may be the best aerial ignition technique.

Vegetation abundance after harvesting can have a direct effect on how prescribed fire will spread in the Clay Belt region (Fig. 4). Springer et al. (1983) recommend a herbicide treatment prior to burning for OGs 7, 9, 10, and 13; a possible herbicide application for OGs 3, 6, 12, and 14 if these sites have not been burned by the second growing season; and a possible herbicide application for OGs 1, 2, 4, 5, 8, and 11 if

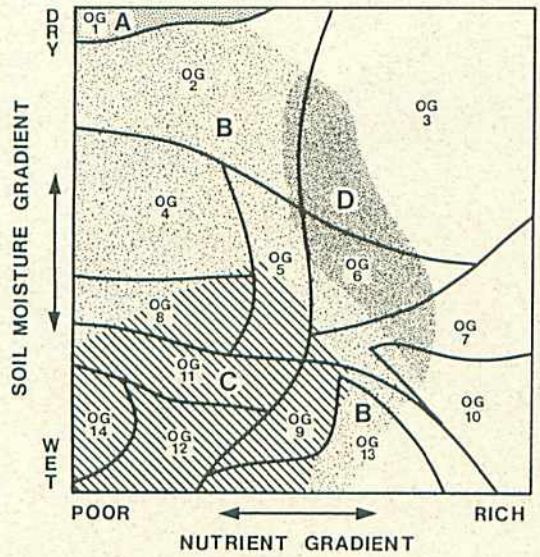

*Figure 3. An ordination diagram for the Clay Belt region FEC (*adapted from *Jones et al. 1983) showing OGs that have a black spruce component and their most commonly associated forest floor duff types. (Key as in Fig. 1.)*

these sites have not been burned by the third growing season. For years when scheduling all prescribed burns will not be possible, the latter OGs are best held over until the following year because of their reduced vegetation problem. Such priority setting can reduce herbicide costs.

When making interpretations, it should be understood that Figures 1 to 4 are meant to be general guidelines. While sites have been differentiated into specific categories, in reality this never occurs as neatly as one would hope. Much variation can occur, especially in transition areas. This points to the need for preburn field reconnaissance to verify actual conditions.

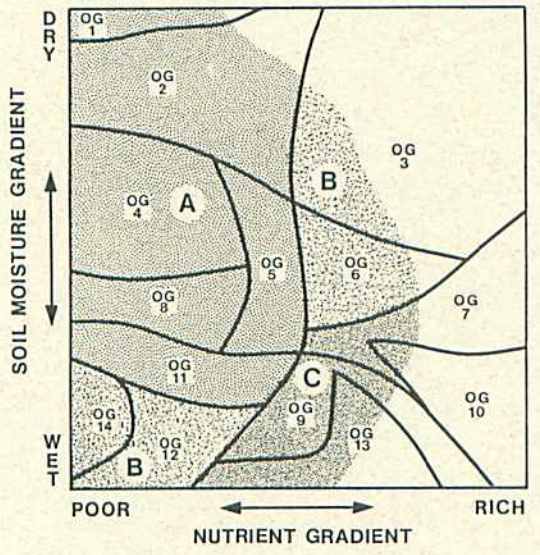

Figure 4. An ordination diagram indicating potential fire spread problems in association with the abundance of understory species of shrubs and herbs in northeastern Ontario (adapted from Springer et al. 1983). (Key as in Fig. 2.)

MANAGEMENT IMPLICATIONS

Prescribed burn practitioners must recognize the variety of black spruce ecosystems in Ontario. By incorporating the FEC systems in the prescribed burn planning process, the technique could be successfully implemented more often. A more realistic prediction of expected prescribed fire behavior may be achieved with this approach.

By identifying the ecosystem on which the prescribed burn will be conducted, a better understanding will be developed for potential vegetation regrowth. The concepts presented in this note should assist managers to make better choices prior to igniting the prescribed burn, and improve the chances of attaining stated objectives. Use of the FEC system may help to identify certain areas that are not suited for prescribed burning.

Forest ecosystem classification systems that are now being developed for other parts of the province may be similarly interpreted, in light of prescribed burning, using the approach described here.

REFERENCES AND FURTHER READING

Alexander, M.E.; Stocks, B.J.; Lawson, B.D. 1991. Fire behavior in black spruce-lichen woodland: The Porter Lake Project. For. Can., Northwest Region, Edmonton, AB. Inf. Rep. NOR–X–310. 44 p.

Canadian Forest Service. 1987. Tables for the Canadian Forest Fire Weather Index System. 4th ed. Ottawa, ON. For. Tech. Rep. No. 25. 48p.

Jones, R.K.; Pierpoint, G.; Wickware, G.M.; Jeglum, J.K.; Arnup, R.W.; Bowles, J.M. 1983. Field guide to forest ecosystem classification for the Clay Belt, site region 3e. Ont. Min. Nat. Resour., Toronto, ON. 122 p. + appendices.

McRae, D.J. 1986. Potential use of prescribed fire on full-tree harvested jack pine sites. p. 34–37 *in* A.L. Koonce, ed. Proc. Prescribed Burning in the Midwest: State of the Art Symp. 3–6 March 1986, Univ. Wisconsin, Steven's Point, WI. Wisconsin Dept. Nat. Resour., U.S. For. Serv., Univ. Wisconsin. 162 p.

Ontario Ministry of Natural Resources. 1987. Prescribed burn planning manual. Ont. Min. Nat. Resour., Sault Ste. Marie, ON.

Sims, R.A.; Towill, W.D.; Baldwin, K.A.; Wickware, G.M. 1989. Field guide to the forest ecosystem classification for northwestern Ontario. Ont. Min. Nat. Resour., Northwestern Ont. For. Tech. Dev. Unit, Thunder Bay, ON. 191 p.

Springer, E.A.; Wearn, V.H.; Arnup, R.W.; Tarini, A.M. 1983. Supplement #1-1983. p. 49–72 *in* V.H. Wearn, E.A. Springer and A.J. Lesage. Forest Managers Photo Guide to Prescribed Burn Planning. Ont. Min. Nat. Resour., Toronto, ON.

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