Frontline

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MINIMIZE PEATLAND SITE DAMAGE WITH CAREFUL HARVEST PLANNING

by A. Groot and R.A. Haig

CATEGORY: silviculture
KEY WORDS: peatland sites, operational groups, forest ecosystem classification, rutting, slash cover, narrow or wide tires, bearing pressure.

INTRODUCTION

Timber harvesting operations can damage peatland forest sites and make them difficult to regenerate. Most serious is the deep rutting caused by wheeled skidders (Fig. 1), but heavy slash cover contributes to the regeneration problem. A report by the senior author (Groot 1987) indicated that site type and harvesting methods strongly influence the degree of site damage and slash loading, and that good planning and training of machine operators can reduce site damage.

Figure 1. Severe, deep rutting produced by narrow-tired skidders during summer harvesting.

METHODS

From 1982 to 1984, an experiment was conducted near Kapuskasing, Ontario, in uncut peatland black spruce (*Picea mariana* [Mill.] B.S.P.) stands scheduled for harvesting. The stands were in operational groups (OG) 11 and 12 (*Ledum* and *Alnus*/herb-poor, respectively), as defined in the Clay Belt Forest Ecosystem Classification (FEC) system (Jones et al. 1983), and they supported an understory well stocked with black spruce advance growth.

The stands were scheduled for harvesting by three different methods:

1. felling with a feller-buncher and full-tree forwarding in winter with a narrow-tired skidder.
2. felling with a feller-buncher and full-tree forwarding in summer with a wide-tired skidder.
3. felling manually with a chainsaw and tree-length skidding in summer with a narrow-tired skidder. Narrow tires were 60 cm wide and wide tires were 127 cm wide (Fig. 2).

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Figure 2. Skidders equipped with wide and narrow tires.

Precut assessments were made in summer and the stands were cut by one of the above methods within the subsequent half year. Harvesting operations were designed primarily for the efficient extraction of wood, and machinery operators were unaware that they were working in test plots.

During pre- and post-cut assessments, the following information was collected:

- percent cover by *Sphagnum* mosses, feathermosses, coniferous litter, deciduous litter, undisturbed bare organic matter, light slash (<15 cm deep), deep slash (>15 cm deep), deep ruts (machine ruts filled with water or deeply disturbed), shallow ruts, other disturbances (outside of tracks), and mineral soil.

- percent cover by *Alnus rugosa* (Du Roi) Spreng.; *Ledum groenlandicum* Oeder; *Chamaedaphne calyculata* (L.) Moench; other shrubs; *Typha latifolia* L.; grasses, sedges and rushes; and herbs.

In addition, the FEC Vegetation Type and operational group, peat depth and basal area (by species) were determined during the precut assessment.

ANALYSIS

The data were analyzed statistically by means of analysis of variance and multiple linear regression. The aim was to determine the factors that contributed most to site damage. Relationships were identified between the frequency and percent cover of deep ruts and other variables, particularly the harvesting methods and site conditions noted above.

RESULTS AND DISCUSSION

Table 1 shows the cover and frequency of deep ruts by FEC operational group and harvesting method. Both variables obviously had a significant effect, and both percent cover and frequency of ruts were greatest on OG12 sites harvested in summer by method 3 (with narrow-tired skidders). Rutting was less severe on plots in the *Ledum* operational group (OG11), and within this site type, differences among harvesting methods were not as great. The reduced damage on *Ledum* sites may be because these sites have more fibric peat (with greater bearing strength) than the more decomposed peat on *Alnus*/herb-poor sites. Snow cover and frozen ground accounted for the minimal rutting caused by harvesting in winter. The average amount of site damage was similar on winter-harvested areas and on those harvested in summer with wide-tired skidders. However, on the latter sites, damage was largely confined to the well-travelled skidways, whereas it was more widely distributed on the former sites.

From a silvicultural standpoint, deep rutting causes obvious problems (Fig. 3). Advance growth present before logging is almost certainly destroyed and the organic matter in the ruts is not a good seedbed, nor is it a suitable microsite for planting. Opportunities for seeding or planting are further reduced by slash cover. In this study, the summer operation with chainsaws and tree-length skidding with narrow-tired skidders produced the greatest amount of deep slash, and summer harvesting with feller-bunchers and full-tree forwarding by wide-tired skidders produced the least.

Table 1. Cover and frequency of deep ruts, by operational group (OG) and harvesting method.

	OG11		OG12	
Harvesting method	Cover[a](%)	Rut freq.[b](%)	Cover[a](%)	Rut freq.[b] (%)
Winter harvest, narrow tires	1.0	6	3.9	23
Summer harvest, wide tires	1.4	8	4.5	23
Summer harvest, narrow tires	2.8	16	19.1	63

[a] percentage of ground covered by deep ruts

[b] percentage of 4-m^2 quadrats with >5% of their surface covered by deep ruts

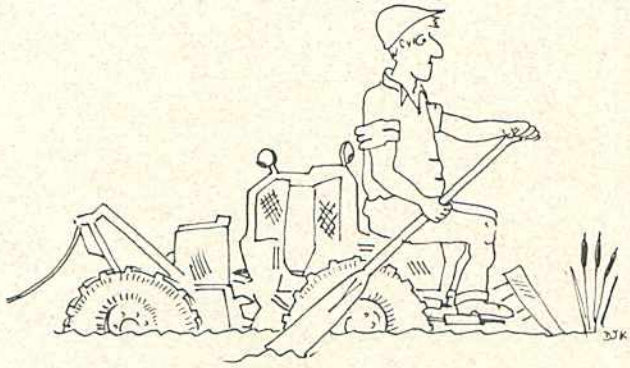

Fig. 3 Wheeled skidders may damage peatland forest sites

RECOMMENDATIONS

The study suggests that site damage can be reduced by careful harvest planning. FEC site-type maps provide information on the proportions of various site types in a given area. Ideally, areas with high proportions of peatland sites should be logged only in winter, when snow depth and frost penetration provide maximum site protection. If this is not feasible, summer harvesting using skidders with high-flotation tires can reduce site damage, particularly in the *Ledum* operational group (OG11). Skidder traffic should be minimized on *Alnus*/herb-poor sites (OG12) because of their susceptibility to rutting. Machinery selection or modification (e.g., changing to wide tires) and operator training will help to reduce damage to peatland sites. Alternative systems such as forwarding with tracked vehicles might also be considered for these areas.

REFERENCES AND FURTHER READING

Frisque, G., Weetman, G.F. and Clemmer, E. 1978. Reproduction and trial projected yields 10 years after cutting 36 pulpwood stands in eastern Canada. For. Eng. Res. Inst. Can., Pointe Claire, Que. Tech. Rep. No. TR-23. 63 p.

Groot, A., 1984. Stand and site conditions associated with abundance of black spruce advance growth in the Northern Clay Section of Ontario. Dep. Environ., Can. For. Serv., Sault Ste. Marie, Ont. Inf. Rep. O-X-358. 15 p.

Groot, A. 1987. Silvicultural consequences of forest harvesting on peatlands: site damage and slash conditions. Gov't of Can., Can. For. Serv., Sault Ste. Marie, Ont. Inf. Rep. 0-X-384. 20 p.

Jones, R.K., Pierpoint, G., Wickware, G.M., Jeglum, J.K., Arnup, R.W. and Bowles, J.M. 1983. Field guide to forest ecosystem classification for the clay belt, site region 3e. Ont. Min. Nat. Resour., Toronto, Ont. 122 p. + appendix.

Sleep, V. 1979. Logging on claybelt sites. p. 68-73 *in* Proc. Second Ont. Conf. on For. Regen., 6-8 March 1979, Kapuskasing, Ontario. Ont. Min. Nat. Resour., Toronto, Ont.

Art Groot has studied advance growth on lowland boreal forest cutovers and direct seeding of black spruce. He is completing a Ph. D. thesis on the microclimate of forest clearcuts.

Bob Haig was contracted by Forestry Canada, Ontario Region's (FCOR) Research Applications and Liaison Unit to prepare technical notes. Currently retired, he is a former Deputy Regional Director of FCOR.

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