

Cut-to-length partial-cutting trial in the Okanagan

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INTRODUCTION

Partial cutting is required in areas where forest cover must be maintained to meet silvicultural objectives or to support non-timber values. The Okanagan has an arid climate and water quality is often a concern, requiring cut-and-leave patterns to meet hydrological considerations. Large areas of mature pine are harvested in sections (two or more passes) to meet cutblock size and green-up requirements. Second-pass lodgepole pine stands are often overmature, and are subject to stand disintegration through insect and disease attack, thereby reducing the timber volume available for utilization. This study looks at the economics and site effects of partially cutting stands with a cut-to-length (short-wood) system.

Harvester/forwarder harvesting systems are costly to purchase and maintain, but have potential to increase operator safety, eliminate roadside debris piles, and minimize site disturbance. The goal of this study was to identify some of the limitations of the equipment.

The objectives of the study were to:

- investigate several applications for mechanized short-wood systems in partial cutting applications;
- determine the overall productivity of the harvesting/forwarding system on a variety of sites, and calculate phase costs;
- obtain detailed information on the harvesting phase of the operation and the effect of critical site conditions on productivity;
- report on the operational factors associated with the harvesting, including post-harvest soil surface condition, residual tree damage, and slash loading; and
- establish plots to describe development of vegetation following harvest.

MATERIALS AND METHODS

Cut-to-length harvesting with a Timberjack harvester and forwarder was studied on nine harvesting blocks in the Okanagan region of British Columbia from 1996 to 1999 with funding from Forest Renewal BC. The study blocks included patch cuts, partial cuts, and clearcuts, which were prescribed to salvage tree mortality resulting from insect attack and windthrow.

The operational logistics, cost, and productivity of harvesting were studied on a shift basis using a machine activity recorder and daily logbooks, and on a cycle-by-cycle basis (detailed timing) using stopwatches and hand-held data recorders. The cost per hour (\$ per scheduled machine hour) was calculated using the Forest Engineering Research Institute of Canada's (FERIC) costing model. Volumes were determined from log counts and roadside scaling.

A rectangular grid was established in each treatment. At each grid intersection point, a circular plot

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was established to assess vegetation by layer and to measure residual tree characteristics, including damage measured by depth class and size (Mitchell 1994). Slash loading was measured by diameter and decay class using the line-intersect method (Sutherland 1986; Hopwood 1991) along two transects radiating from each grid point. Soil surface condition was point-sampled along the slash lines (Curran and Thompson 1991). Changes in whole-soil (total soil) bulk density were measured in place on the major forwarding trails using a single-probe nuclear densiometer with paired disturbed/undisturbed sampling.

RESULTS AND DISCUSSION

The cut-to-length system was used successfully to harvest portions of stands and windthrow, meeting numerous silvicultural objectives. The nine blocks had a variety of terrain and operational limiting factors. These included swampy areas, irregular block boundaries, steep favourable and adverse slopes, deep snow, complete and partial windthrown stands, and feathered edges. The system adapted to each of these constraints, but cost to roadside was 11–78% higher than the cost of clearcutting under favourable conditions (Table 1).

Patchcutting alone did not appear to affect the harvester’s productivity, but did affect that of the forwarder, which resulted in an 11% overall cost increase. Deep snowpack affected both harvester and forwarder productivity, as did slope. Average tree size was the single factor that most affected harvester productivity. However, the highest cost was recorded when the harvester was not operating at peak mechanical efficiency. The cost of salvaging windthrown trees, with their lack of uniform orientation, added about 20% to the base cost. Steep slopes alone increased costs another 20%.

Soil surface effects were confined primarily to forwarding trails, and represented 11–27% of the area sampled. The significance of these effects varied depending on the sensitivity of the soils to compaction. The lowest levels of disturbance were recorded in the patch and partial cutblocks.

The greatest amount of residual tree damage was recorded in the windthrow partial cutblock, where approximately five times as many trees did not meet the Forest Practices Code (FPC) “short-term

TABLE 1 *Cost and site limitation comparison*

Treatment	% Increase from base cost	Site limitations
Clearcut 1	0	Gentle terrain; good access; well-drained soil
Patch cut 1	11	Gentle terrain with a small wet area
Partial cut 1	38	Gentle terrain, irregularly shaped block fragmented by swamp
Clearcut 2	38	Steep favourable slopes, some adverse, some wet areas; small non-merchantable material
Partial cut 3	41	Steep favourable slopes, wet patches; windthrow salvage
Partial cut 2	48	Steep favourable slope with benches
Partial cut 4	58	Gentle slopes; deep snow
Patch cut 3	64	Gentle slope, but steep drop on margin; feathered edge; large non-merchantable material
Patch cut 2	78	Gentle adverse slope; mechanical problems slowed harvesting; irregular block boundary

retention” requirements compared to the two partial cutblocks harvested. Harvesting when the sap was running in the spring increased the number of trees not meeting FPC short-term retention requirements by two to three times.

Slash loading varied between treatments, but was highest in the windthrow salvage.

Longer-term vegetation plots will determine the influence of the treatments on the remaining stand and vegetation succession. In all blocks, the cut-to-length harvesting method met the silvicultural objectives without compromising worker safety.

Complete results will be summarized in a forthcoming FERIC technical report.

REFERENCES

- British Columbia Ministry of Forests and B.C. Ministry of Environment, Lands and Parks. 1997. Tree wounding and decay guidebook. Forest Practices Code. Victoria, B.C.
- Curran, M. and S. Thompson. 1991. Measuring soil disturbance following timber harvesting. B.C. Ministry of Forests, Victoria, B.C. Field Guide Insert No. 5.
- Hopwood, D. 1991. Principles and practices of new forestry. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Land Management Report No. 71.
- Mitchell, J.L. 1994. Commercial thinning of mature lodgepole pine to reduce susceptibility to mountain pine beetle. Forest Engineering Research Institute of Canada, Vancouver, B.C. Special Report SR-94.
- Sutherland, B.J. 1986. Standard assessment procedures for evaluating silvicultural equipment: a handbook. Canadian Forest Service, Sault Ste. Marie, Ont.

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