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Cable Yarding Small Timber with the RMS Ecologger

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Traditionally, small timber located on steep slopes was considered as uneconomical to harvest, and was therefore bypassed. Now the growing demand for wood fibre calls for a re-evaluation of the situation. It is no longer feasible to ignore these possible supplementary timber reserves. Cable logging offers the potential to harvest these reserves with a minimum of environmental impact.

While most North American cable logging equipment has been designed for the large-timber operations of western Canada and the U.S.A., the relatively smaller Rosedale Machine Shop (RMS) Ecologger holds promise for application in eastern Canada's smaller wood. This report summarizes the results of cooperative trials of the RMS Ecologger conducted by the Newfoundland Forest Service (owners of the machine) and Price (Nfld.) Pulp and Paper Limited on Price's timber limits in central Newfoundland, during the summers of 1976 and 1977.

Fig. 1. RMS Ecologger mounted on a C7D Tree Farmer, yarding full trees.

Machine

Manufactured by Rosedale Machine Shop, Rosedale, B.C., the Ecologger is a self-contained portable yarder mounted on a carrier, usually, as during these trials, a C7D Tree Farmer skidder. Since it is equipped with separate mainline, haulback line and strawline winches, it is adaptable to both skyline and high-lead yarding systems (Figure 1).

The Ecologger features a 13 m (42 ft) spar which may be hydraulically lowered when moving. The machine may be operated either by standard manual controls or, as on the trial operations, by a digital remote control option. Its price, equipped as during these trials, is approximately $110,000, carrier included. Additional information on machine specifications is available from the manufacturer upon request.

Operation

The Ecologger was being used in a shotgun configuration to yard full trees (partially limbed in the 1977 trial) uphill out of river valleys. The shotgun or gravity slackline system (Figure 2) is a simple live skyline system with solely gravitational outhaul of the carriage. Therefore, the system can only be employed in uphill yarding. The Ecologger is rigged for this system by using the mainline as the skyline and the haulback line as the mainline or skidding line. On this operation, a "Maki" carriage was used in conjunction with a simple carriage stop.

The Ecologger was logging small (<4 ha (10 ac)) clear cuts on the valley sides. Since roads were located on the ridges between valleys for conventional logging, the machine was yarding to intermediate landings part way down the slope. A fantail yarding road arrangement was used, the trees in the yarding area having been pre-felled in herringbone configuration along the

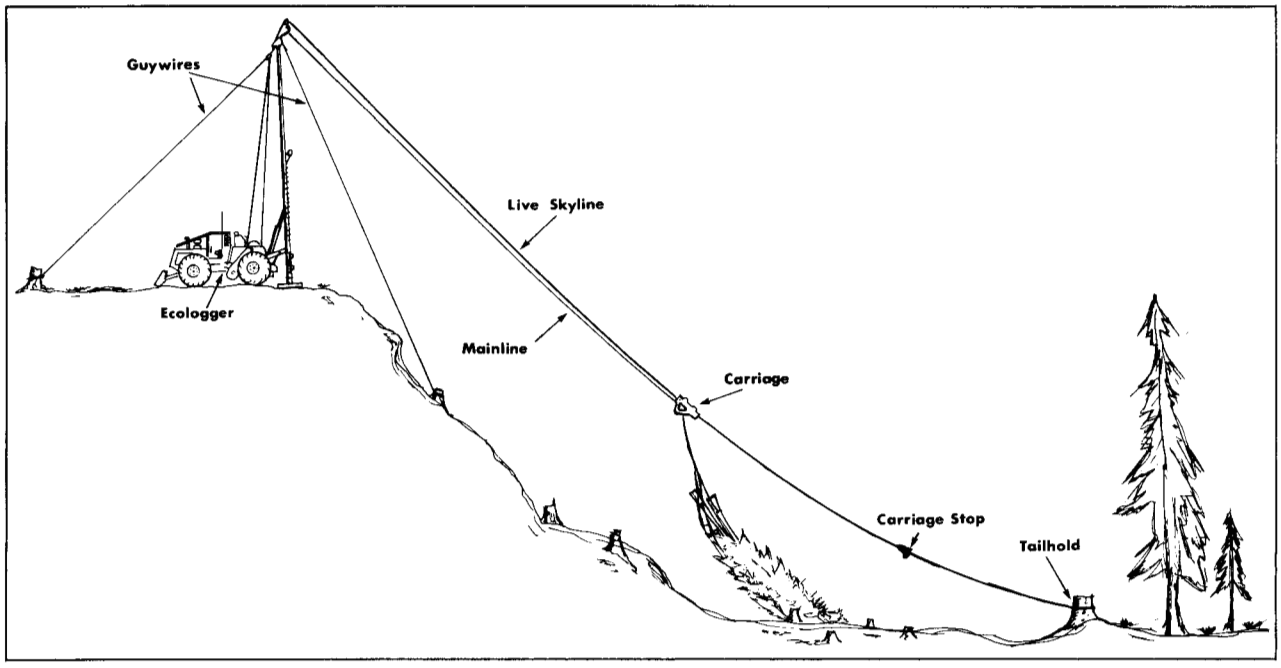

Fig. 2. The shotgun yarding system employed during the Ecologger trial.

yarding roads. At these landings, a choker skidder immediately swung the trees to roadside (30-120 m (100-400 ft)), usually skidding two yarder turns at a time (skidder mainline used to sling entire load). In the 1977 trial, during periods of extended Ecologger downtime (>½ shift), the Ecologger crew worked as a conventional cut-and-skid crew using the swing skidder.

Slopes in the area varied from 12 to 75%, while the stand volume averaged 140 to 175 m^3/ha (20 to 25 ct/ac). External yarding distance ranged to 120 m (400 ft) line distance during the 1976 trial and 180 m (600 ft) in 1977. Species composition was predominantly balsam fir, with some black spruce.

The 1976 and 1977 crews each consisted of two fallers, two chokermen, one operator-chaser and one skidder operator. Neither crew had any prior cable logging experience.

Results

Table 1 highlights the results of both trials. Figures for the 1976 trial are based on a FERIC shift level monitoring program, while those for 1977 are based on Price and NFS weekly records. Additional details of time distributions, production rates and causes of nonproductive time are available from FERIC upon request.

As shown by the figures below, 1977 productivity was double that of 1976. In fact, after the 28-shift training period in 1977, productivity averaged 51 m^3 (18.1 ct) or 379 trees per shift, with some weeks as high as 73 m^3 (25.4 ct) per shift. In the earlier trial there was no significant pro-

Table 1. Operation Summary

Factor	1976	1977
Type of operation	Ecologger	Ecologger (74%) — Conventional (26%)
Number of scheduled shifts (7 hr)	45	56
Average piece size, m^3 (ft^3)	.15 (5.2)	.13 (4.7)
Volume during study, m^3 (ct)	952 (336)	2222 (785)
Piece count during study	6452	16738
Volume per shift, m^3 (ct)	21 (7.5)	40 (14.0)
Piece count per shift	143	299
Piece count per turn	5.1	6.3
Ecologger availability, %	84	84
Ecologger utilization, %	66	62

ductivity difference between the training and production periods.

This increased 1977 productivity largely accounted for the decrease in the cost of tree-lengths to roadside from approximately $30/m^3$ ($85/ct) in 1976 to $16/m^3$ ($46/ct) in 1977 overall and $13/m^3$ ($35/ct) in the production period. Costs include all fixed, operating, maintenance and repair costs, but with no allowance for engineering, roads, overhead or profit.

Ecologger availability was 84% during both trials, with the most troublesome component in both cases being the remote controls (73% of mechanical downtime in 1976, 67% in 1977). Remote controls in logging applications have usually proved troublesome. Therefore, the use of manual controls might be recommended, especially considering eastern Canada's remoteness from the technical backup available in traditional cable-yarding centers.

Comparison of Trials

Since both trials were conducted in the same area, under essentially similar conditions, what accounted for the substantially higher productivity during the 1977 trial? The following section provides some answers to the question.

1. Efficient planning is the key to the successful application of cable logging systems. The Price-NFS supervisors learned from their 1976 difficulties to conduct the 1977 test as part of a planned production operation, and not on a trial basis. This feature of the later trial is exemplified by the decision to reserve areas on skiddable terrain to allow for a conventional cut-and-skid operation with the swing skidder during extended Ecologger downtime. Thus, even though Ecologger utilization in 1977 was down from 66% to 62% (because wet conditions frequently hindered the Ecologger's access to the operating area), the overall system utilization was 83%.
2. Proper selection and strong motivation of the operating crew is vital to the successful introduction of any new machine or system, especially when it is as unfamiliar as cable yarding in Newfoundland. In addition to a mastery of basic logging skills, the crew members must be willing to accept a new approach to logging, and they must have a deep-seated incentive to make the new method work, rather than demonstrating that "it can't work". To a much greater extent than the earlier crew, the 1977 group were committed to the Ecologger and were ready to make it succeed.
3. Yarding distance was generally greater in 1977 than in the earlier trial. Within the trial limits, increased yarding distance reduces road change and landing change time without appreciably adding to the cycle time.
4. Due to the high frequency of failures of the hydraulic carriage stop jack, the small 4.5 tonne (5 ton) jack used previously was replaced with an 11.3 tonne (12.5 ton) jack, and the housing on the stop was rebuilt. The elimination of this problem resulted in a saving of 27¢ per m^3 (76¢ per ct), plus the previously lost production time.
5. Since the heavier line was unnecessary in the operation's small timber conditions, the 19 mm (¾") swaged skyline and the 16 mm (⅝") swaged mainline were reduced to 16 mm (⅝") and 14 mm (9/16") respectively. This resulted in much easier handling during choking (the longest element of the yarding cycle) and yarding road changes, plus reduced strain on the system as a whole.
6. Choking was conducted with a number of chokers attached to a split 6 m (20 ft) extension. While one set of chokers was in transit, a second set was usually being set downhill. In 1976, the crew were flying four chokers (two on each end of split), while in 1977, they were flying five or six. This change partially accounted for the increase in trees per turn from 5.1 to 6.3. Also in the 1977 trial, prechoking increased thereby cutting down substantially on the hook-up delays.

   The 6 m (20 ft) extension allows for increased reach, thereby enhancing lateral yarding ability. However, lift capacity is reduced. Since the shotgun system requires good deflection slopes to provide adequate clearance, this factor becomes critical on marginal slopes.
7. Anchoring has inherently been a problem with cable yarding in areas with small trees.

However, the method used in 1977 for securing the skyline resulted in a reduction of pulled tailholds from an average of one for each yarding road in 1976 to one for the entire 1977 trial. The method used involves the girding of a groupe of trees when inadequate single-tree trailholds are available (Figure 3).

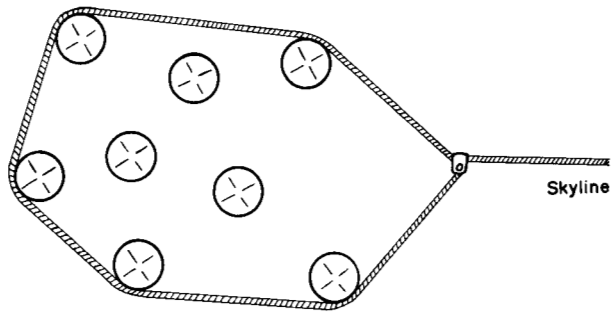

Fig. 3. Small timber anchoring system.

Conclusions

With a significant proportion of eastern Canada's wood supply situated on slopes exceeding 30%, cable logging is gaining interest as a potential solution for harvesting these traditionally "inaccessible" timber reserves. Many of the steeper areas are along stream banks with the best growing sites. Cable logging permits harvesting these areas with a minimum of site damage. The RMS Ecologger is one machine which shows promise for application in the East's small-tree conditions.

The number of pieces that can be handled, not piece size, usually limits cable logging production, so tree size is critical. Even though the Ecologger is one of the smallest western Canadian machines, it is designed to handle "medium-sized" wood. Consequently, it is over-powered, over-sized, and thus over-priced to yard effectively in timber averaging less than 14 m^3 (5 ft^3) per tree. The ultimate success of this and similar machines depends on their being introduced in areas of suitable tree size. There are areas in eastern Canada which could support the Ecologger, and effective planning is required to ensure that the machine is applied there.

Nevertheless, the relative success of the 1977 trial gives an indication of the machine's potential. The high piece production rate exhibited in 1977 is the key to cable logging in smaller timber. Granted, even \$13/m^3 (\$35/ct) is a high price to pay for treelengths at roadside. However, it costs more to log by any method on steep slopes than on flatter ground. The increased wood cost must be weighed against environmental concerns and the availability of an otherwise "inaccessible" wood fibre source, especially as this source may be closer to the processing center thereby potentially reducing transportation cost.

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