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FERIC

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Field Note No.: Cable Yarding-12

CABLE YARDING USING INTERMEDIATE SUPPORTS

Introduction. Cable yarding with small yarders in the Interior of British Columbia is becoming more prevalent because ground-based systems cannot meet current site-disturbance guidelines on many sensitive sites, and using large yarders to harvest low-volume trees on steep slopes is too expensive. Operators in the Interior are also looking for equipment that can extract stems from areas with little or no natural deflection, such as broken slopes and long, flat, wet areas. When natural deflection is poor, lift can be provided by using a skyline yarding system, by installing intermediate supports, and by using a carriage that can operate with the intermediate support. During the summer of 1992, the Forest Engineering Research Institute of Canada (FERIC) observed an intermediate-support skyline operation using a Thunderbird TMY 45 yarder with a Maki Mini-Mak II slack-pulling carriage to increase yarding distance on a steep and somewhat convex slope. The contractor, Jay-Vee Yarding of Lumby, British Columbia, was harvesting the block for Bell Pole Company Ltd. near Salmon Arm, British Columbia. Because this was both the company's and the contractor's first experience rigging intermediate supports, Bell Pole Co. called upon the experience of Forest Engineering Incorporated, a consultant from Corvallis, Oregon, to advise on their application.

Equipment Description. The Thunderbird TMY 45 yarder has a 13.7-m tower and is powered by a Cummins 220-kW diesel engine. For the operation observed, the winch set was spooled with 549 m of 25.4-mm skyline, 670 m of 19.1-mm mainline, 1536 m of 15.9-mm haulback, and 1219 m of 9.5-mm strawline. Three guyline drums each held 61 m of 28.6-mm cable. The Maki Mini-Mak II carriage has a 7.5-kW diesel engine for slack pulling 13- to 19-mm line at speeds from 46 to 91 m/min, and is designed to pass over intermediate supports. It weighs approximately 568 kg, with a load capacity of 6.8 t. The cost of this carriage and two support jacks is approximately C$33 500. Other equipment on site included a Drott tracked hydraulic loader, a Timberjack 450 grapple skidder, and a Caterpillar D8 bulldozer. The yarding crew was comprised of one yarder operator, one chaser, one full-time and one part-time rigger, and two chokermen. The system was rigged as a standing skyline with gravity outhaul.

Site Description. The skyline yarding operation was located at Stukemapten Lake north of Salmon Arm. Slopes within the two blocks ranged from 30 to 70% and averaged 55%. The average gross volume/ha was 372 m^3. Table 1 shows that most of this volume was represented by Douglas-fir. Approximately 23% of the area was harvested using intermediate supports.

Selection and Rigging of Intermediate Supports. Planning is essential before engineering a setting where intermediate supports for the skyline are required. Good maps and numerous ground profiles will help locate slope breaks where the intermediate supports will be needed.

Two trees are selected for each support (other configurations are possible). They should be approximately 6 m apart (maximum), straight boled, 50 to 60 cm dbh, 38 cm minimum diameter inside bark where the support cable blocks are hung, and free of rot. Prior to rigging the intermediate support the trees are climbed and delimbed. Figures 1 and 2 illustrate the final cable configuration. The upper cables are guylines that are crossed to add support during lateral yarding. Lateral yarding should be confined to 30 m either side of the skyline for ease of choker setting and to reduce the chance of hang ups on stumps. The lower cable is the skyline support cable shown going through blocks and then to the ground, ending up in an 'M' configuration. The skyline support cable is tensioned with the help of a chain-saw winch after the skyline has been secured behind the backspar.

Table 1. Stand Characteristics

	Species					
	Hemlock	Spruce	White pine	Douglas-fir	Red cedar	All species
Average gross volume/stem (m^3)	0.25	0.17	0.70	2.14	0.48	1.17
Species by gross volume/ha (%)	3	-	3	81	13	100
Stems/ha	39.3	7.6	12.9	137.3	121.4	318.5

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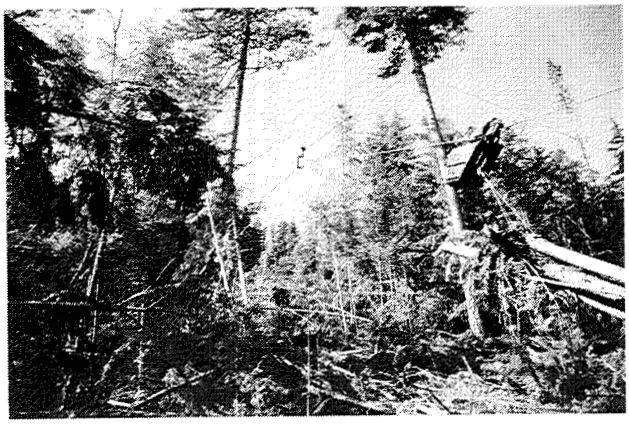

Figure 1. Intermediate support with incoming turn.

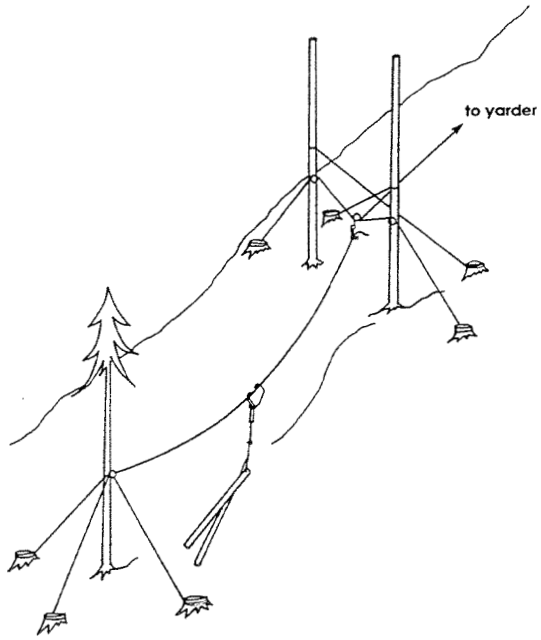

Figure 2. Cable configuration of intermediate support.

System Productivity. Bell Pole Co. kept extensive records of the yarding operation, and supplied FERIC with the following information on system productivity.

The productivities (Table 2) represent 67.5 shifts, including nine early shifts and three days of fire-hazard shutdown. July had the lowest average shift production at 102.5 m^3 even though no supports were used and the volume/ha was higher. Because the crew was unfamiliar with the Maki II carriage this low production represents the bottom end of the learning curve. Production increased to a high of 189.0 m^3/shift in October. Average production over the last three months, which included all 23% of the area harvested using intermediate supports, totalled 166 m^3/shift (or 176.8 m^3/shift if the three fire-hazard shifts are removed).

Table 2. System Productivity

Month	Monthly production (m^3)	Productive shifts (no.)	Avg. shift production (m^3)
July	1743.32	17.0	102.5
August	2247.89	16.0	140.5
September	3596.61	21.0	171.3
October	2551.40	13.5	189.0

Table 3. Productivity Comparison

	Shift productivity (m^3)	Average stem size (m^3)	Crew size	Man-day production (m^3)
TMY 45	176.8	1.17	5.5	32.1
Skylead, Vernon	136.0	0.50	3.0	45.3
Skylead, Lumby	155.8	0.82	3.0	51.9

Discussion. To compare the productivity of the Thunderbird TMY 45 yarder to other small skyline systems observed by FERIC[1], it is more representative to consider man-day values due to the variation in crew size (Table 3). However, if the rigging crew is removed from the calculation, productivity for the TMY 45 increases to 44.2 m^3/md, which is more comparable to the other systems studied. This variation in man-day productivity is a good illustration of the increased cost of using intermediate supports to harvest timber on difficult slopes.

Information. The information contained in this report is based on limited field observations and is published solely to disseminate information to FERIC members. It is not intended as an endorsement or approval by FERIC of any product or service to the exclusion of others that may be suitable. More information may be obtained from:

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[1] Forrester, P.D. *Observations of Two Skylead C40 Cable Yarders.* FERIC, Vancouver. Technical Note TN-201. 8pp.

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