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LOGGING WITH HORSES IN RIPARIAN ZONES

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INTRODUCTION

Trees within riparian zones can represent a significant source of high-quality fiber. These areas were often by-passed by traditional logging operations because of steep slopes, poor bearing capacity, or generally difficult access. Now, however, companies often find themselves compelled to operate in these areas from the perspectives of timber supply or maintenance of ecosystem integrity. The question remains how to conduct these operations in an economically viable fashion, while mitigating impacts on the riparian ecosystem. This Field Note describes a horse-logging operation in the Rocky Brook region of Bowater Pulp and Paper Canada Inc.'s Boisetown (New Brunswick) operations that was evaluated as a potential solution.

STAND DESCRIPTION

The terrain in the study area ranged from CPPA class 3.2.1 close to the road right-of-way down to 4.2.1 directly adjacent to the watercourse. Rocks covered by Sphagnum and feather moss were interspersed with mossy silt loam soils. Significant blowdown of the overmature balsam fir component of this spruce–fir stand was scattered throughout portions of the riparian zone. The objective of the treatment was to salvage sawlog-quality material that would not survive through the next 10-year period. Approximately 30% of the basal area was removed in this operation (Table 1), with preference given to the removal of the balsam fir component. Considerable material was salvaged from the blowdown.

Figure 1. Horse logging in sensitive areas.

WORK TECHNIQUE

This operation employed three single-horse crews and one 20-year-old 5-tonne forwarder (Figure 1). The riparian zone was divided into working blocks that were generally 0.25 to 0.30 ha in size. Each block was approximately 40 m deep and 60 m wide. The sides of the blocks generally ran perpendicular to the stream, but extraction trails wandered where necessary to take into account the topography. An old logging road ran parallel to the stream, as did the current haul road.

Table 1. Pre- and post-treatment stand conditions

	Pretreatment	Post-treatment	Difference (%)
Density			
Total stems/ha	1470	1170	-20
Merchantable stems/ha	1180	890	-25
Basal area (m^2/ha)	36.0	24.4	-32
Merchantable volume (m^3/ha)	267	178	-33
Average DBH of merchantable stems (cm)	18.4	17.5	-5
Average volume (m^3/tree)	0.225	0.155	-31

Each crew consisted of one feller and one teamster, who were responsible for felling and skidding the logs or trees to the old logging road outside the riparian zone. The forwarder then brought the wood to the current haul road. Traditional logging tack was employed, including a bridle, collar, and whiffletree; traces were used occasionally, such as when the horse had to be turned around at the stump, but teamsters suggested these were only for difficult conditions or when horses required some calming down. Logging tongs were used instead of chain chokers except when log size prevented effective use of the tongs. Extraction trails were established by each crew so as to take advantage of ground and stand conditions. Trees were skidded as tree-length or log-length stems, depending on their size. Though landings were established, crews often deposited the logs wherever space permitted along the road. The forwarder circulated between crews to keep the landings clean, so the crews did not waste time decking logs in neat, sorted piles. The forwarder devoted 60 to 70% of its time to this operation, and spent the remainder forwarding wood from another operation in the area.

PRODUCTIVITY

The productivity of the horse-logging teams ranged from 3.0 to 3.7 m³ per productive hour (PH) (Table 2) and appeared to be primarily related to piece size. Skid distances beyond 30 m appeared to reduce productivity, but this could not be confirmed by the study. Once horses felt the tongs bite into the log, they bore down and traveled relatively fast to the landing. The horse then waited for the teamster to unhitch the load. On short skids, teamsters often ran, but as distance increased, they were more likely to walk, thus increasing cycle time and decreasing productivity. Longer skids were also more likely to have turns along the extraction trail, where the log often snagged, causing the horse to wait for "encouragement" from the teamster. The horses appeared to know two facts about their work: First, once a log is in motion, it is easier to keep moving than to stop and have to break it free again. Second, at the landing they can rest, whereas in the woods they would be hitched to another skid as soon as possible. The teamsters and horses appeared to work best when they could work at a steady pace, without the long periods of exertion that occur at longer skid distances. Based on FERIC's standard costing formula, the estimated combined manual-felling and horse-skidding costs for this study ranged from $17 to $21/m³.

Forwarder productivity ranged from 11 to 15 m³/PMH, for an estimated direct cost of $3.25 to $4.40 per m³. Although relatively old, the machine was capable of keeping the landing area clear for the crews. Given the productive capability of the horse crews, a newer (more productive) machine would likely prove uneconomical in such an operation.

Table 2. Productivity of the horse-logging teams

	Team		
	1	2	3
Total PH observed	5.2	6.9	6.1
Total trees	53	91	67
Trees/PH[a]	10.2	13.2	11.0
Average volume (m³/piece)	0.29	0.26	0.34
Productivity (m³/PH)	3.0	3.4	3.7

[a] Normalized extraction distance of 30 m.

STAND DISTURBANCE

Ground disturbance was assessed using FERIC's standard procedure. Based on sample plots, 37% of the area was covered by slash, and 54% showed no signs of disturbance to the litter layer or ground vegetation. Just less than 6% of the area had slightly disturbed vegetation or litter layers, whereas just over 3% of the area showed mineral-soil exposure. Mineral-soil exposure was confined to the main skid trails within 10 m of the landing. This operation effectively left the soil's protective vegetative cover intact. Outside the riparian zone, where forwarder travel took place, ground disturbance was considerably more visible.

Damage to residual trees was almost exclusively confined to the root area (11% of trees, with an average wound size of 45 cm²). Less than 2% of the residuals showed any stem damage, and the average wound size was 60 cm².

CONCLUSIONS

The use of horse crews to extract harvested material produced minimal ground disturbance. Productivity ranged from 3.0 to 3.7 m³/PH, and was directly affected by piece size and (probably) by skid distance. Careful attention must be paid to skid distances, as both the horse and the teamster must cover considerable ground over the course of the day, and fatigue caused by overly long distances will eventually reduce productivity.

Although horse logging appears to have a potential value to minimize environmental impacts in some situations, the crews observed in this study were all experienced horse loggers, and less-skilled crews may not attain equally favorable results.

The use of horses in remote logging operations presents new logistical challenges for a manager accustomed to working with heavy equipment, since adequate lodging, access to veterinary services and supplies, and an adequate supply of feed and water must be provided. The high risk of lower-leg injuries to both horses and teamsters are potential hazards of this occupation.