



MECHANICAL HARVESTING IN RIPARIAN ZONES IN WINTER

Logging Systems: streams/water quality

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INTRODUCTION: Significant amounts of timber volume and value are often located in riparian zones. Available harvest volumes are often restricted by regulations, BMPs or other forest management criteria to minimize soil disturbance and protect water quality and wildlife habitat. Conventional manual or mechanical cut-and-skid operations are often inadequate or too costly to achieve harvest outcomes. Canada's FPInnovations, FERIC division, evaluated experimental mechanized harvesting in riparian zones with cut-to-length harvesting equipment. The harvests followed two cutting patterns, the first with insertions perpendicular to the shore, and the second with a corridor parallel to and in the middle of the riparian zone. The trials showed that it was possible to operate forest machinery in riparian zones in winter without disturbing the soil.



Fig. 1: Harvest pattern with insertions every 66 feet.

OPERATION: The Canadian trials were carried out in winter, so that the frost and snow would limit soil disturbance in the riparian zones. In some regions, other seasons may offer better opportunities to harvest while minimizing soil disturbance.



Fig. 2: Harvest pattern with corridor parallel to the shore.

Fig. 1 illustrates the first method used in which harvesting is done from trails inserted perpendicular to the riparian zone and spaced every 66 feet. These insertions could measure up to 33 feet in length, or the equivalent of twice the harvester's length. The forwarder used the same insertions for extracting the wood.

The second method, shown in *Fig. 2*, consisted in creating a corridor parallel to the watercourse about 33 feet from the shore. Entry and exit points had to be established by taking into account the site's terrain and the forwarder's load capacity. The length of corridor sections was planned

to minimize the number of times the forwarder passed on a given section of corridor. Harvesting residues were spread on the trail to increase soil protection.

RESULTS: Harvesting productivity in the riparian zones was lower in both cases than productivity in stands harvested conventionally with similar protection of regeneration and soils. The loss of productivity associated with the parallel corridor method (11%) was lower than it was using the method with insertions (26%).

Harvester travel time was 10% higher for the insertion method. Processing also appeared to take longer and was another reason for the loss of productivity in the insertions. Forwarding showed a slight drop in productivity, of 7% with insertions and 5% for parallel corridor, compared with the conventional harvest.

Estimated direct costs at roadside for the two treatments were approximately 20% higher for the treatment with insertions and approximately 8% higher for the treatment with the parallel corridor. It is important to note that these estimates were made in an experimental context; it is reasonable to believe that differences in cost could decrease depending on operator experience and harvest prescription.

Residual stem damage was very low, roughly 4% for both methods, due to winter harvesting and operator experience. Soil disturbance was very minor and limited to a slight compression of the duff layer, with some exposure of the mineral soil. Snow cover offered good protection.

APPLICATION: Despite lower harvest costs, the method with parallel corridor was not recommended, since most of the volume comes from the corridor and only a small percentage comes from trees selected in the surrounding area, due to limited harvester reach, leaving behind higher-risk trees prone to windthrow.

The method with insertions makes it easier to select trees from the full riparian zone. This method is also feasible in the summer and fall, with proper planning that takes terrain conditions into account.

It is recommended to carry out the harvest of riparian zones at the same time as the harvest of the neighboring harvest block, to avoid additional logistical costs.

Either of these methods could be adapted to riparian zone harvests in different regions, while assuring protection of soil, water quality and residual stands. ***Note: Be sure to comply with applicable regulations and BMPs when operating in riparian zones.***

Reviewed by:
Joel Swanton
Northeast Region Manager

Adapted with permission of:
FPInnovations – FERIC
Eastern Region
580 boul. St-Jean
Pointe-Claire, QC, H9R 3J9
CANADA
514-694-1140
admin@mtl.feric.ca