Advantage
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Contents



# Skid forwarding-grapple yarding system in interior British Columbia

**Abstract**

The Forest Engineering Research Institute of Canada (FERIC) observed a skid forwarding-grapple yarding harvest system near Grand Forks, B.C. used to access a small pocket of wood that was beyond the yarder's reach. Stems were skidded with a rubber-tired grapple skidder to the yarder's mobile backspar, a loader placed the stems within reach of the yarder's grapple, then the stems were grapple yarded to roadside for processing and loading. This report includes productivity information, as well as suggestions to make the system more effective.

**Keywords**

Skid forward, Grapple yarders, Cable yarding, Interior British Columbia.

**Author**

Brian Boswell,
Western Division

## Introduction

In November 2000, FERIC visited Pope & Talbot Limited's Boundary Woodlands Division near Grand Forks, B.C. to observe a skid forwarding-grapple yarding operation, conducted by Lime Creek Logging Limited. The system used a rubber-tired grapple skidder to skid stems within reach of a swing-yarder, which then grapple-yarded the stems to roadside. Pope & Talbot used this system to access small pockets of wood that could not be reached by the yarder due to poor deflection or long distances. This report summarizes FERIC's observations.

## Site and stand description

The 16.2-ha block was divided into three areas: 5.2 ha were ground skidded, 9.3 ha were cable yarded, and 1.7 ha were skid forwarded (Figure 1). The cable portion near the skid forward area was approximately 200 m long by 300 m wide. The skid forward area was located above the cable yard area beyond a slight ground break, extending 50 to 75 m beyond the yarding area and approximately 250 m wide.

The block was located in the Engelmann Spruce Subalpine Fir biogeoclimatic zone (ESSF dcl 04). Net volume was 278 m³/ha with 29% decay, waste, and breakage (Table 1). The species distribution was 40% Engelmann spruce and 60% subalpine fir. Ground slopes ranged from 20 to 40% and averaged 20% in the ground skid area, 35–40% in the cable yard area, and 25% in the skid forward area. There were many large boulders in the skid forward area. Snowcover was 5 cm when FERIC visited the site.

## System description

The equipment used to harvest the skid forward area is described in Table 2. First, all trees were felled and bunched. Next, stems in the cable yard area adjacent to the skid forward area were grapple yarded downhill approximately 150 m to roadside (Figure 2). After yarding in this area was completed, the yarder and running lines were repositioned on the yarding road with the best ground profile for yarding. Next, the stems in the

Figure 1. Block layout for harvesting.

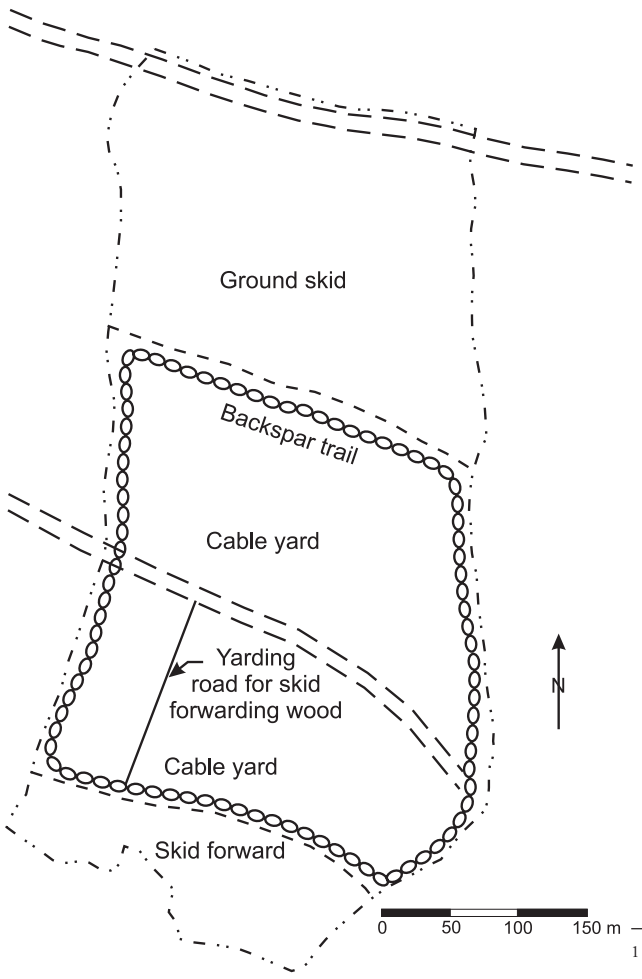


**Table 1. Stand description**

| | |
|---|---|
| Avg net volume ($m^3$/ha) | 278 |
| Avg merchantable tree height (m) | 23 |
| Avg tree height (m) | 28 |
| Avg live tree dbh (cm) | 32 |
| Avg net tree size ($m^3$) | 0.57 |
| Avg gross tree size ($m^3$) | 0.80 |
| Avg density (trees/ha) | 487 |

skid forward area were skidded, up to 175 m down or across the hill to a location near the end of the yarding road (Figure 3). A loader moved the stems into position on the yarding road within reach of the yarder's grapple. These stems were then grapple yarded to roadside where they were processed and loaded on logging trucks. Skidding and grapple yarding of skid-forwarded stems occurred concurrently.

In other cutblocks where this system was used, some of the stems in the skid forward area were skidded to roadside using a backspar trail.[1] The backspar trail was ripped to de-compact the soil after logging was completed. A second variation

[1] Trail used by a mobile backspar extending from the road to the back of the block and along the back of the block.

**Table 2. Equipment used**

| | |
|---|---|
| Falling | Timbco T455-D feller-buncher |
| Yarder | Madill 121 swing yarder on tracks with 96" Esco grapple |
| Mobile backspar | John Deere 892 LC excavator |
| Guyline anchor machine | Caterpillar FB227 feller-buncher |
| Skidder | Caterpillar 518 rubber-tired grapple skidder equipped with tire chains |
| Loader to swing stems in woods | Hitachi EX200 hydraulic loader |
| Processor at roadside | Linkbelt 2800 with Denharco 3500 stroke delimber |
| Loader at roadside | Hyundai 250LC-3 hydraulic loader with butt-n-top grapple |

Forest Engineering Research Institute of Canada (FERIC)

**Eastern Division and Head Office**
580 boul. St-Jean
Pointe-Claire, QC, H9R 3J9
(514) 694-1140
(514) 694-4351
admin@mtl.feric.ca

**Western Division**
2601 East Mall
Vancouver, BC, V6T 1Z4
(604) 228-1555
(604) 228-0999
admin@vcr.feric.ca



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of the system is to forward the stems to the yarder with an excavator. In the cutblock observed by FERIC, large boulders prevented this option.

## Productivity and cost

The contractor estimated that average productivity for the yarder under conventional operation is approximately 350 m³/10-h day. When yarding skid-forwarded wood, the contractor estimated yarder productivity decreased to about 250 m³/10-h day on this operation.[2]

FERIC conducted a short time study of 12 turns in 45 minutes. The slope yarding distance was 179 m from the skidder/yarder stem transfer point to the road. The average turn size was 3.2 stems or an estimated 1.2 m³/turn. The subalpine fir trees in the skid forward area were smaller (0.37 m³) than the average tree in the block. System productivity was estimated to be 19 m³/scheduled machine hour (190 m³/10-h day). No yarder set-up time was attributed to the system as the yarder was already in place.

The yarder spent 53% of the time waiting for the skidder to deliver wood. The skidder could not travel directly uphill because the ground was frozen and too slippery. This increased the skidding distance and turn times. Some delay time was incurred as the skidder improved the skid trail. Yarder productivity was estimated to be 40 m³/productive machine hour when time for these delays is deducted.

## Conclusion

The application of the skid forwarding-grapple yarding system described in this report incurred extra cost because a loader was needed at the wood transfer point, and productivity was reduced due to yarder delays when waiting for the skidder. However, with careful planning and execution this system can be an effective technique to access small areas of timber that would otherwise require building extra roads or using intermediate supports.

Figure 2. Madill 121 swing yarder.

Figure 3. Skidder delivers stems to the loader for transfer to the yarder's grapple. The yarder's grapple grabs stems previously placed in position.

## Implementation

This system is applicable where small patches of timber cannot be yarded or skidded directly to the road and additional road construction cannot be justified.[3] This system may prevent such patches from becoming isolated. It may also be used to avoid road construction on unstable terrain. Pope & Talbot uses the system as an alternative to extending yarding distances with intermediate supports, therefore achieving higher productivity and lower costs. For this system to be effective:

- Coordinate the system to maximize yarder productivity. Skid some of the stems ahead of time or use more skidders to ensure the yarder is not waiting for wood. It may be more productive overall to move the yarder to a new yarding road to minimize skidding distances.

[2] Dale McIver, Lime Creek Logging, personal communication, November 22, 2000.

[3] In British Columbia's stumpage appraisal system, this logging method is considered a "specified operation". In this case, $3.38/m³ was added to the "tree-to-truck phase" cost estimate used in the stumpage rate calculation for the volume of wood that was skid-forwarded.

- Plan cutblocks to make the transition between skidding and yarding as smooth as possible without delays. Locate skid trails and the boundary between logging systems to allow the skidder to travel one tree length into the yarding area. This will allow the skidder to drop the wood within reach of the yarder's grapple and eliminate the need for a loader to transfer the wood to the yarder.
- Take care if yarding stems downhill out of the deck to reduce lost stems and log cleanup time.

Eliminate delays at the skidder/yarder interface to achieve higher productivity and lower costs. If stems are consistently available for the yarder, overall productivity may be higher than in the cable yarding area because road changes are not necessary. Larger decks should also be quicker to grapple, resulting in faster turn times and larger turn volumes.

## Acknowledgements

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