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CABLE HARVESTING WINDTHROW

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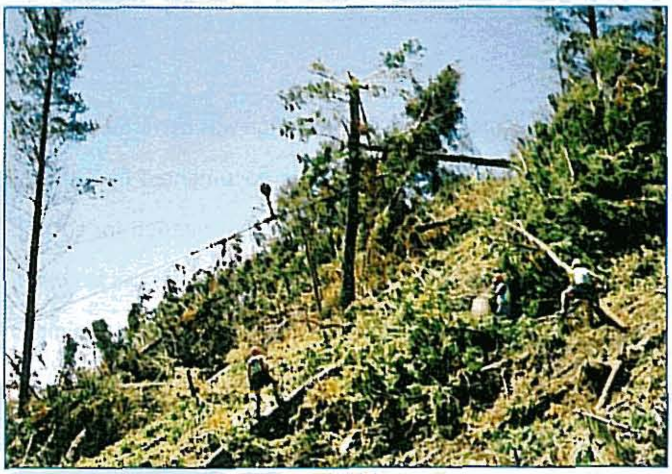
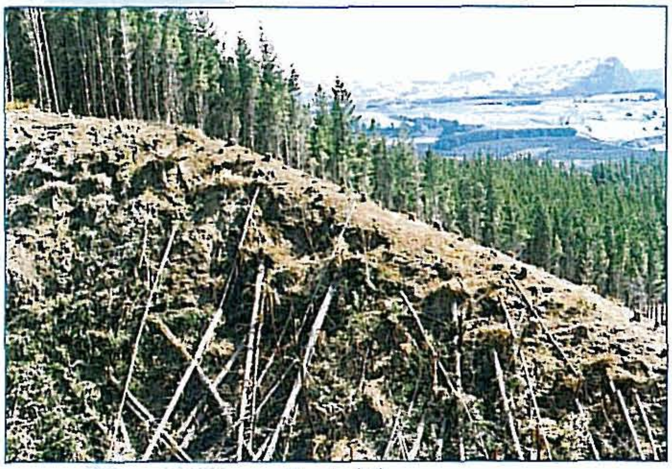


Photo (ii)



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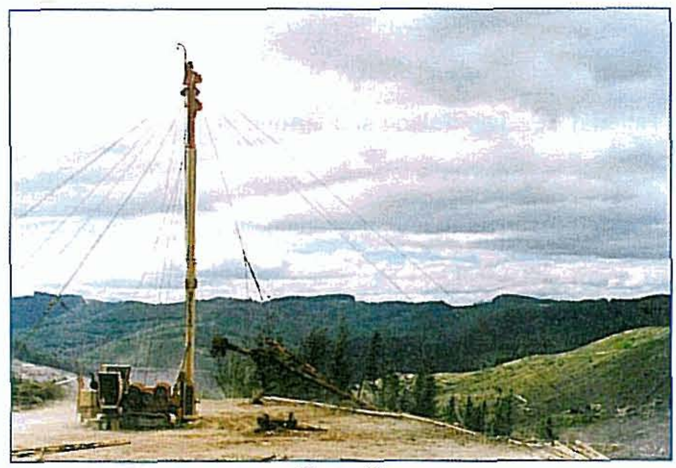

Photo (i)

Figure 1 - (i) Windthrown stand - Kinleith region
(ii) Breakerouts salvaging windthrow
(iii) Extracting stem with rootball still attached using high lead system

Introduction

Cable harvesting of wind-damaged stands requires innovative techniques and commitment to overcome the hazardous conditions faced by workers, the lack of stem presentation for extraction, and the pressure to extract timber before it degrades.

Approximately 300ha (104,000 m^3) of Carter Holt Harvey's Mohaka Forest was wind-damaged during a storm in November, 1994. This left settings with a mixture of standing trees, standing broken spars, toppled full-length trees with rootballs still attached, and an assortment of broken tops and pieces.

Liro Limited undertook a study of two hauler operations during the subsequent windthrow salvage, to identify the operational techniques used by two experienced cable logging crews. A continuous time study was performed on each crew, and the haul distance and volume for each drag was calculated. Activity sampling of the landing operations was also carried out. Fallers' and breakerouts' exposure to hazards was also assessed and reported (Kirk and Sullman, 1996)

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Liro's study results were presented to a discussion group of cable logging contractors, company trainers and managers who were involved in the windthrow salvage operation. That information was also published as a student dissertation (Fisher, 1995). This report contains extracts from that dissertation and suggestions from the discussion group and industry. The information may assist other contractors and forest companies faced with the difficulties of windthrow salvage in the future.

Study Crew Composition

Crew one:

Hauler	Madill 171: 21m (70') tower, five drum winch-set (28mm ($1\frac{1}{8}$") swaged skyline, 22mm ($\frac{7}{8}$") swaged mainrope, 19mm ($\frac{3}{4}$") tailrope and a 13mm ($\frac{1}{2}$") dropline). 323kW (430hp) engine.
Faller(s)	Two. Felling and butting off; no trimming - all discretionary.
Breakerouts	Two to four, depending on the number of strops used.
Landing	Mechanised processing with a Waratah 234 on a CAT EL300B, two skid workers and a CAT EL300B grapple excavator.
Systems observed	Scab skyline, North bend and Drop line carriage.

Crew two:

Hauler	Madill 009: 27m (90') tower, three drum winch-set (28mm ($1\frac{1}{8}$") swaged mainrope, 22mm ($\frac{7}{8}$") tailrope and 22mm ($\frac{7}{8}$") strops). 338kW (450hp) engine.
Faller(s)	Two. Felling, butting off and trimming - all discretionary.
Breakerouts	Two.
Landing	Kato 1250 grapple excavator (30 tonne), CAT 950B rubber tyred front-end loader (RTFEL) and four skid workers who processed motor-manually.
Systems observed	Scab skyline

Felling

All tree felling and preparation for extraction was performed motor-manually and safety implications were documented by Kirk and Sullman (1996). Each faller used the step-cut method for cutting off rootballs. This technique reduces the risk of chainsaws jamming, allows the saw operator to release stem tension slowly and minimises injury risk. A thin layer of 'hinge-wood' between the two cuts usually breaks off upon inhaul, leaving the rootball behind on the cutover.

The fallers highlighted each step-cut using fluorescent paint. This helped the breakerouts to identify where strops should be attached.

Further Suggestions

- Excavators or feller-bunchers can be used to bunch pieces, push over spars and standing trees and align these ready for extraction or safe removal of the rootball. If used on only part of a setting, this technique will still make a major contribution to the safety of fallers, breakerouts and to hauler productivity.
- An alternative felling method is to use a 'Bat-wing' (Baillie, 1996). This device is attached to the carriage or butt-rigging and can be used to pull over the remaining standing trees and spars, prior to breaking out each extraction corridor.

Figure 2 - Bat-wing carriage in use, Glenbervie Forest.

Systems

Three different cable systems were observed: a three drum drop-line carriage, North bend and Scab skyline systems (run exclusively by the Madill 009 crew, during the study) and mobile tailholds were used wherever possible.

It is easy to overload components of the rigging system when extracting windthrow. The smaller hauler in this study (Madill 171) had a similar power output to the Madill 009. However, its lighter rigging (especially the dropline), meant the fallers had to fell and/or butt-off a higher percentage of dangerously leaning stems, increasing the fallers' hazard exposure (Kirk and Sullman, 1996). Both crews used their haulers to pull over standing trees or spars. The scab system was preferred for rocking the spars loose because of the simplicity of the system, and there are less working lines to tangle. However, uprooting spars with the hauler was particularly slow and was only done when deemed to be less hazardous than alternative options.

Further Suggestions

- The most important extraction parameter is deflection so planning must maximise deflection and therefore allow choice in extraction systems.
- Hauler extraction of windthrow requires cable systems that can cope with:

  (1) Uprooting stems
  (2) Extracting stems with the rootballs still attached
  (3) Extracting 'normal' felled stems and broken tops.

- Therefore extraction machines and systems that give the highest payloads should be used and their effective utilisation planned for. True fallblock systems (for example, North bend) obtain better payloads than running skyline systems (for example, Scab skyline),

  given the same deflection, hauler, safe working load of ropes.
- Limited lateral reach with North bend and Scab skyline systems could be improved through using longer stops, where deflection allows.
- North bend lateral reach can also be improved through bridling. Bridle stumps may have been weakened however and an option may be is to use deadman skyline anchor(s) and bridle off a mobile tailhold.

Breaking Out

Usually there were two breakerouts and three strops with all of the extraction methods, but at times four strops were used when extracting a high number of small or broken pieces. On these occasions an extra breakerout would assist, to help reduce hook-on times.

Upon inhaul, stems with rootballs still attached often swung about until the long length (head) of the stem was facing toward the hauler. This occurred because the rootball was often heavier than the stem and created several hazards:

(1) Swinging stem, endangering the breakerouts during breakout and inhaul
(2) Tangling the stem in the working ropes
(3) Landing the stems backward (by the time the butt rigging and rootball are landed in the chute, the end of the stem may have protruded past the hauler into the processing area).

The use of the drop-line carriage required greater drag preparation, but did allow some lateral reach, enabling strops to be attached closer (within one to three metres) to step-cuts or butts. This made it easier for the hauler (Madill 171) to break off the rootballs because a more direct power force could be applied.

A tooter signal warned the landing crew if the drag entering the chute posed any danger (such as, long-hooked stems and stems with rootballs attached would often strike the edge of the landing and swing around).

Further Suggestions

- In addition to the safety aspects, long-hooked stems often break during extraction and require re-stropping, especially if entangled in surrounding rootballs. Stems that would otherwise be long-stropped should be left until the next extraction corridor, or cut where possible
- Before signalling the hauler to break out each drag, all personnel must be beyond the reach of the longest piece being broken out.

- Extra breakerouts should be utilised to help combat fatigue and improve windthrow productivity.
- At least one breakerout should be equipped with a chainsaw (this can be a light saw), to take advantage of the cutting opportunities that will arise as extraction progresses.

Landing Operations

It was found that if the Waratah (crew one) had to clear the chute of seven consecutive stems with rootballs attached, process the stems and dispose of each rootball into a slash pile, it would fall behind the productivity of the Madill 171 hauler. The Waratah made a surge pile of unprocessed stems which was processed at a later time, usually during smoko, a line shift or a particularly slow extraction cycle. The Waratah removed rootballs and limbs, so the windthrow conditions had little impact on skid workers' duties. However, extra slash accumulated around and under the Waratah, and sometimes resulted in an unstable working surface for the carrier. As a result, bar bending and chain breakage often occurred when the carrier rocked while cutting logs to length, increasing the Waratah's mechanical delay time.

Rootballs cut off at the landing were thrown over the edge by the Waratah in an attempt to keep the landing clear. However, the landing shape and layout meant this bird's nest of rootballs was above felled timber which had not been extracted. This created a potential hazard for the breakerouts when working below the landing, and often hindered the extraction and landing subsequent drags.

Loaders in both crews were not under any added pressure resulting from the windthrow conditions as daily production was lower than usual, giving plenty of time for any additional duties.

There were three skid workers and one logmaker on the motor-manual landing (crew two), cutting 10 log types and all shared the task of unhooking the extracted stems. The Kato 1250 Grapple Loader (30 tonne) cleared the chute while the Cat 950B RTFEL fleeted and stacked logs. The grapple loader placed rootballs, cut off on the landing, where the RTFEL loader could pick them up. The rootballs were then carried a short distance up the road and dumped in the cutover.

Further Suggestions

- Surge pile areas should be planned into the landing layout.
- Activity sampling of skid workers showed that unhooking of stems with a rootball still attached took on average 60% longer than full tree lengths without rootballs.
- Motor-manual removal of rootballs was at times hazardous on the landing. This could be made safer by:
  (1) removing rootballs (where possible) before breakout
  (2) mechanisation.
- Disposal of rootballs should be in a way which does not create a hazard for subsequent operations (such as, breakerouts or planters). Means of transporting the rootballs away from the landing is highly recommended , for example, the faster travel speeds of an RTFEL (such as in crew two) or perhaps a truck with a tub-deck ('bath-tub') that the grapple excavators can load quickly.
- Extra resources (machinery/manpower/time) should be allocated to ensure a clear work environment is maintained on the skid.
- When rootballs must be disposed of on or around the landing, adequate space must be available for their storage. This may necessitate reducing the number of log lengths cut and ensuring windthrow crews have priority trucking.

General Suggestions

- The key element in managing any harvesting operation is communication, and this is especially true of windthrow salvage. Communication must be open and effective at all levels, from management to contractors to crews, so that each knows and understands the others' position.
- The exchange between companies of small haulers for large haulers should be given serious consideration when faced with a large scale windthrow salvage.
- Stump anchors are more likely to have been weakened by wind damage. Therefore the use of artificial anchors is recommended, for example, mobile plant, deadmen, earth anchors, etc.
- Grapple logging is the safest cable extraction method as no breakerouts are needed in the cutover. The grapple logging

option in New Zealand is becoming more feasible, as more suitable swing yarders are imported. Within each setting, the hauler could be used to grapple or, with a quick change of rigging, use breakerouts to pull rope with a mechanical or motorised slackpulling carriage. A 'spotter' may be used where visibility is restricted, but as no logs are stropped, this person can stay at a safe distance during extraction.

- It is important that increased production pressures or longer hours are not imposed on fallers and breakerouts. Their daily tasks are already extremely hazardous without such additional pressures (Kirk and Sullman, 1996)
- MARVL assessments were unable to predict piece size because of the extra breakage associated with windthrow. This is an important consideration when setting logging rates.

It is important to plan each windthrow salvage operation individually. Extraction options for each situation can then be assessed according to their relative merits.

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