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SKYLINE LOGGING TO MINIMISE IMPACTS ON NATIVE VEGETATION

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SUMMARY

This report describes the logging system used in a highly sensitive setting in Riwaka Forest, west of Nelson. A single skyline corridor (Figure 1) and the lateral pulling ability of an Eagle II motorised slackpulling carriage were used to minimise impacts to native vegetation in a gully. A tailrope attached to a butt rigging was used as lateral haul distances exceeded 100 m and some trees had to be broken out away from the hauler. Tree-lengths were fully suspended across the gully to the landing.

Pre- and post-harvest assessments showed that damage was limited to only 3% of the native vegetation. Furthermore, assessment of debris levels in the stream flowing through the gully showed that it was not impacted by logging.

INTRODUCTION

Innovative approaches are often needed when logging in environmentally sensitive areas. An example, is Carter Holt Harvey Forests Limited (CHHF) logging operation in Riwaka Forest, west of Nelson. Much of the forest is located on steep and broken terrain dissected by gullies with native vegetation. Soil in the area is formed on Separation Point Granites and is therefore very erodible. Streams flow from the forest into Riwaka River, which is a local trout fishery. Furthermore, much of the forest is visible from State Highway 60 which provides access to Golden Bay.

Figure 1 - The skyline corridor after harvest

CHHF planned to log a block of radiata pine on a steep spur surrounded by native vegetation. The block was most readily accessed from a landing 400 m away, requiring extraction over the native vegetation and a stream (Figure 2). To protect these features, a single skyline corridor and an Eagle II motorised slack pulling carriage were used. The skyline clamps and lateral pulling ability of this carriage would ensure a high degree of control during breakout and inhaul.

Although CHHF had the option of using a Christy carriage, it was not used as the carriage stopper might slip during breakout, damaging the skyline. North- and South-bend systems were ruled out because the mainrope follows the fall-block as it bridles away from the skyline, thus damaging more native vegetation. The Block-in-the-bight system would have eliminated this problem, but puts the skyline, mainrope and tagline (if used) in close proximity, increasing the chances of line wrap occurring. With all three fallblock systems, the carriage is free to roll on the skyline thus reducing control over drag movement. Although a tagline would give some control over carriage positioning, its use would not allow drags to be broken out away from the hauler. A mechanical slackpulling (MSP) type carriage connected to the tailrope and a tagline does provide control over carriage position. However, the use of a MSP carriage would require the slack to be pulled by hand.

This report describes the logging system and practices used, and the impacts of logging on the native vegetation.

ACKNOWLEDGMENTS

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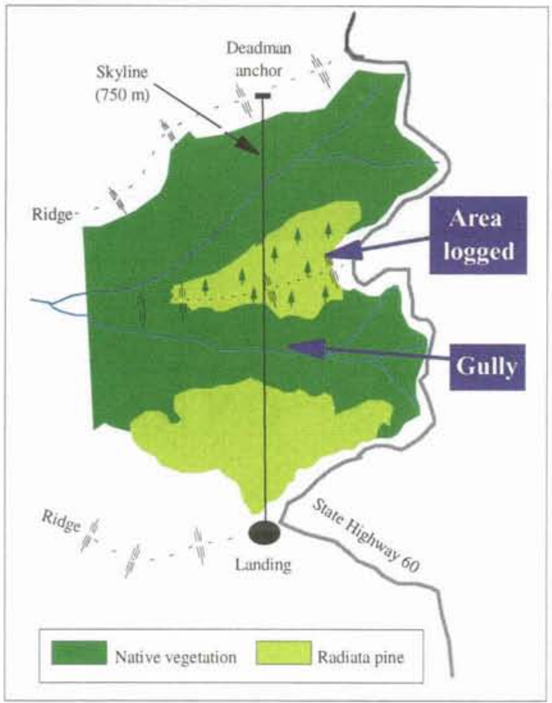

Figure 2 - Layout of logged area

SITE DESCRIPTION

The location of the 5.5 ha block of radiata pine is shown in Figure 2. The ground profile along the skyline corridor is shown in Figure 6. Final stocking in the block was 675 trees/ha, and average tree height and volume were 39.1 m and 1.27 m^3, respectively.

The gully was approximately 120 m wide and 400 m long, with side slopes ranging from 30° to 45°. Native vegetation in the gully was dominated by mature rimu and beech, with a dense understorey including supplejack, tree ferns and mahoe (whiteywood). The stream bed comprised coarse gravel, and the channel contained very little pine debris.

SYSTEM DESCRIPTION

The logging system consisted of a Madill 071 hauler, Hahn 300HTL processor, Komatsu PC220 hydraulic loader and a Bell Ultralogger (Figure 3). The steep and erodible terrain meant that the landing area was limited to approximately 0.075 ha (35 x 22 m). Consequently, log stocks on the landing were kept to a minimum with priority trucking and the ability to transport mixed loads of sawlogs.

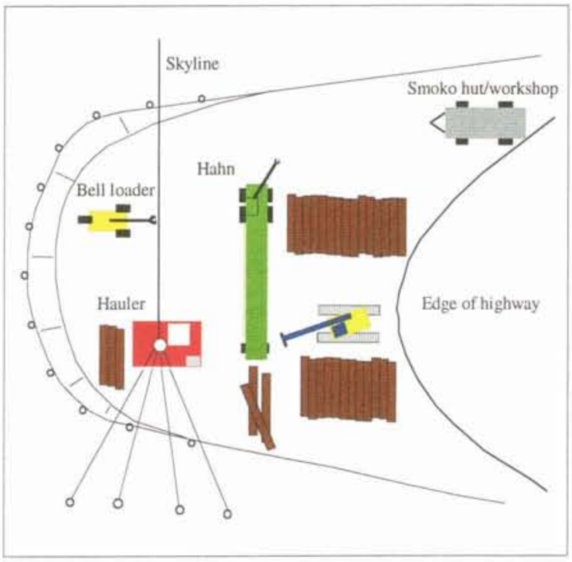

Figure 3 - Landing layout

The hauler was fitted with:

- 600 m of 26 mm (swaged) skyline, with two 100 m extensions
- 800 m of 19 mm mainrope
- 1400 m of 16 mm tailrope.

The crew comprised four machine operators, two breakerouts and one prefaller. The Bell operator doubled as the sole skid worker.

Recognising that environmental performance was paramount in this operation, CHHF engaged the contractor (Kelly Logging) on a daily-rate basis.

A radio controlled Eagle II motorised slackpulling carriage was used. This carriage is powered by an 11 kW air-cooled Deutz diesel engine, which powers the slackpuller and skyline clamps. The carriage weighs approximately 1180 kg and has a load capacity of about 6810 kg. The skyline clamping ability enables drags to be broken-out from any direction with minimal risk of the clamp slipping, which may cause damage to the skyline.

Rope Setup

The skyline was attached to a deadman anchor on a ridge approximately 750 m from the hauler (Figure 2). A helicopter was used to lay out the tailrope, and strawline out to the skyline deadman. The use of the helicopter minimised setup time and damage by laying the ropes over the native vegetation canopy, rather than under it when done by hand.

Prefalling and Breaking Out

The setting was felled in thirds (Figure 4), with the middle section being felled first to enable the skyline and tailrope to be rigged. Most trees were felled across the slope so they would not slide across others and into the surrounding native vegetation. If it became necessary to fell trees toward the native vegetation, one spot was chosen and several trees were felled into it.

There were two breakerouts, each with a Talkie-tooter. One signalled the hauler, while the other signalled the carriage. Block shifts were performed by hand, with one breakerout pre-rigging to keep shift times to a minimum. The skyline clearance on the spur constrained drag volumes extracted from the back of the setting. Consequently, some of the larger trees along the backline were cut in half for extraction.

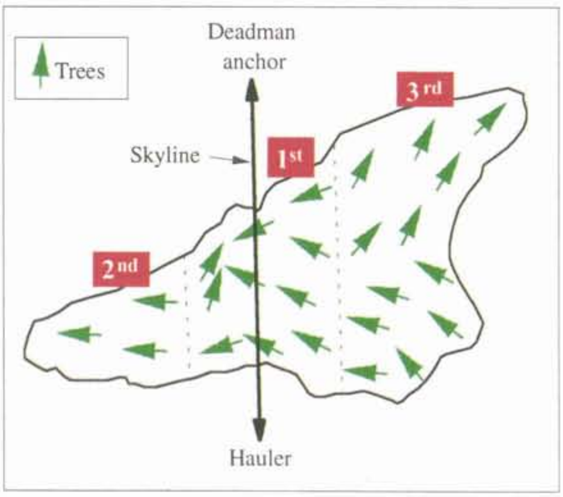

Figure 4 - Felling pattern and sequence

When using a motorised slackpulling carriage, the mainrope is usually fed out while the strops are pulled manually to the stems. This is an efficient method when pulling slack relatively short distances. However, lateral pulling distances in this setting exceeded 100 m. To avoid pulling this slack by hand, a butt rigging was attached to the mainrope, with the tailrope connected to the butt rigging rather than the carriage (Figure 5). When clamped, the carriage fed out the mainrope which was pulled simultaneously by the tailrope. The position of the tailblock determined the direction in which the chain travelled from the carriage.

Drags were able to be broken out away from the hauler by allowing the carriage to freewheel out past the point the tailrope would normally have pulled it to (that is, past the backline of the tailrope). During outhaul, tailrope speed was increased and the mainrope brake was released at a verbal signal from the breakerouts. The carriage would be clamped before it rolled back.

To reduce the likelihood of stems falling from the butt rigging during extraction, the breakerouts used 'Logging Chain' choker-hooks on the chains. This type of hook, while taking slightly longer to hook up, does not come undone by itself (Rex Kelly, pers comm).

STUDY METHODS

The condition of the stream and the native-pine boundary was assessed prior to the operation. The site was again visited during the operation, during which a four-day (132 cycles) time study was completed. After the completion of logging, damage to the native vegetation and the stream was reassessed, and a disturbance strip map was drawn for the extraction pathway.

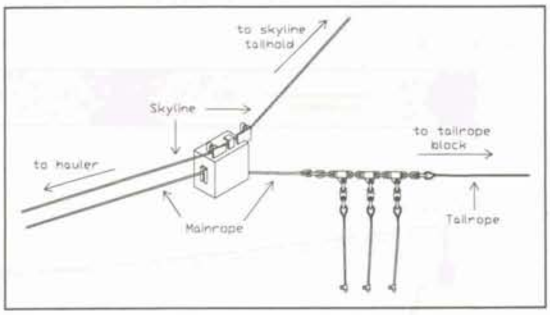

Figure 5 - The butt rigging and tailrope

RESULTS

Logging Impacts

Damage to the native vegetation in the gully was concentrated at the entry and exit points of the single skyline corridor. This area extended approximately 35 m down into the native vegetation (Figure 6). In addition, minor felling damage occurred in five small areas around the native-pine boundary.

Slash (mainly heads) accumulated up to a metre deep in the corridor. As full suspension was achieved over the centre of the gully, damage in this area was confined to heads of the larger trees. The stream was clear of logging debris.

Mapping the disturbance along the extraction pathway showed deep disturbance (with rutting) on the top of the logged spur and on the slope beneath the landing.

System Performance

Performance figures for the operation, based on the time study and company records are summarised as follows:

Days on landing	*51 (including locating time)*
Pieces per cycle	*2.2*
Mean drag volume	*2.4 m^3*

During the observation period, drags were broken out uphill, and both towards and away from the landing. It was found that the distance the butt rigging was deployed laterally from the skyline did not significantly affect total cycle time.

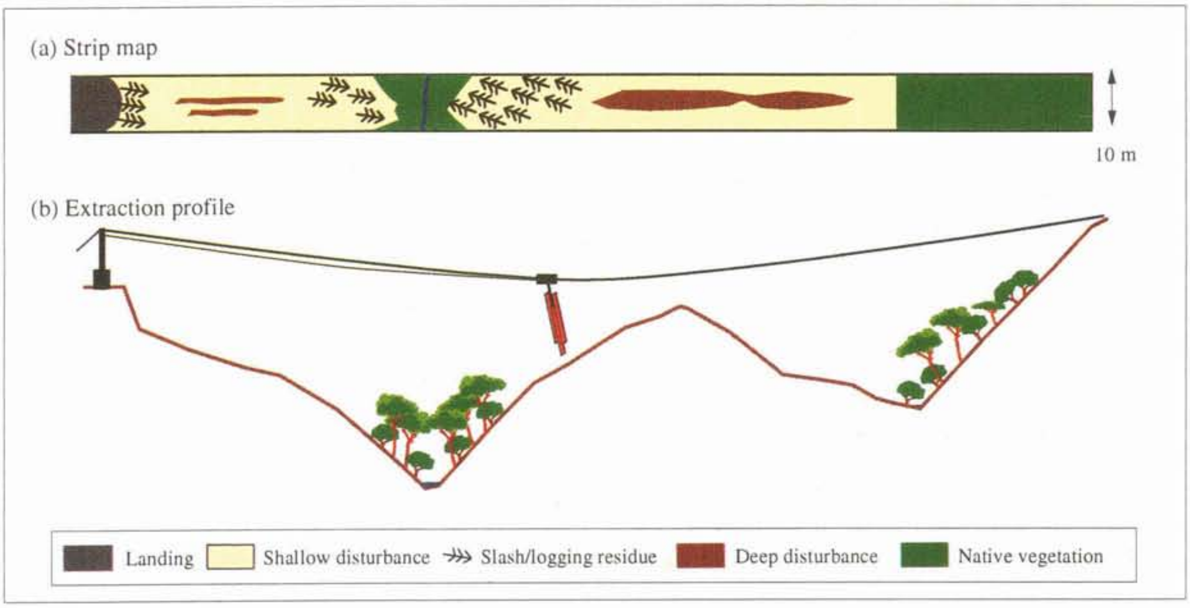

Figure 6 - Soil disturbance strip map and extraction profile

DISCUSSION

The logging operation achieved the environmental objective of minimising damage to the native vegetation and protecting the stream. Only one skyline corridor was used and drags were fully suspended over the centre of the gully. Consequently, logging resulted in damage to only 3% of the native vegetation between the block and the landing. Deep soil disturbance on the logged spur (beneath the skyline) was inevitable given the poor skyline clearance. The Eagle II motorised slackpulling carriage used in this operation did not have the ability to pass over intermediate support jacks, precluding the use of a support on the spur to increase skyline clearance.

The use of the motorised slackpulling carriage made this operation possible. The carriage's skyline clamping ability gave good control over the drags during breakout and inhaul.

The breakerouts used the carriage's skyline clamping ability to change breakout direction effectively without shifting the tailblock, and to fine tune the breakout angle of each drag. Having the tailrope attached to the butt rigging and mainrope, meant that the lateral (from the skyline) distance that chains had to be pulled had no significant effect on overall cycle time.

CONCLUSIONS

The planning and execution of logging operations in environmentally sensitive areas requires innovation and cooperation. The use of the motorised slackpulling carriage and a single skyline corridor was key to minimising impacts to the native vegetation. Equally important was the commitment shown by both CHHF and Kelly Logging.

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