LOGGING INDUSTRY RESEARCH ASSOCIATION NEW ZEALAND

REPORT

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PROTECTION LOGGING CASE STUDY 1

(From a report by John Day, N.Z.Forest Products Limited)

LIRA has initiated a series of case studies aimed at investigating the methods and assessing the costs and benefits of specialised logging for the protection of streams or other environmentally sensitive areas.

Case Study 1 was carried out by logging contractor, C.Sycamore, above the banks of the Waikato River in NZFP's forest. In the trial area, a logging road ran parallel to the river with the terrain sloping downwards 50-75 metres away from the road to drop over a 50 metre cliff face. The specific objectives of this particular trial were:

1. To compare the productivity and costs of methods required to prevent trees falling over the escarpment into the river.

2. To study two methods of directional felling against the natural lean examining the safety requirements for this type of felling.

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A full report on protection logging will be compiled on completion of the first series of case studies.

METHOD 1:

Method 1 had been the normally used method for riverside logging. The tractor was brought as near to the tree as possible to minimise handling of winch rope and strops, and the arch, where it could be used, helped in placing strops as high as possible on the stems. The felling scarf aimed the tree uphill approximately 45° to the slope and the tractor was positioned at an acute angle uphill to this direction. The main rope was tensioned to take the strain and the faller proceeded to put in the backcut keeping holding wood on the side away from the tractor to prevent the tree swinging toward the tractor. Once nearly cut up, only a gentle pull was required to topple the tree in the right direction. The faller stood on the downhill side whilst making the backcut to ensure he was not between tree and tractor. If the butt jumped or slipped back it would be held from him by the rope. Positioning the tractor close to the tree, even though this practice did not conform to that recommended in the Safety Code*, was considered safe as the falling stem had limited momentum at this point.

* *Safety Code for Bush Undertakings, Dept. of Labour, New Zealand, 1972*

For very heavily branched or badly leaning trees, the tractor positioned directly uphill with the strop, or in some cases two strops, placed around the tree as high as possible using a ladder. After taking the strain the tree was directionally felled across the slope slightly uphill. Winching speed was important to counter gravitational force once the tree started to move. As each drag of trees was felled it was skidded to the landing to give the tractor room to operate on the next group.

Method 1. Tractor and Arch close up to the tree.

METHOD 2:

The tractor was restricted to the roadside and 70 metres of 19mm. rope was used for pulling the trees over. On the smaller trees the strop was placed around the tree as high as a man could reach but on bigger trees or heavier leaners, a ladder was used to place the strops about 6 metres up the tree. Two strops were used on the bigger trees although there was some difficulty in getting even tension on both strops. The trees were scarfed to fall approximately 80° to the tractor winch rope and the tension was taken up by the tractor prior to the backcut being put in. As the backcut was made and the tree began to move, the tractor was moved forward to pull the tree over. The tractor movement was in this case considered more positive than using the winch.

TIME STUDY:

The studies indicated that nearly one third of the total time available for both tractor and men was taken up with the felling elements leaving two thirds for the other procedures of breaking out, skidding, skidwork and contingencies. This compares with a normal clearfelling operation where no tractor time and less than 25% of manpower is so involved. A further notable factor was that approximately 50% of machine time with both methods was waiting time which indicated the difficulty in co-ordinating this type of work. Given the optimum crew size of three men with a tractor on this type of work, the equivalent felling rate of one man on normal work cannot be maintained, thus the cost of this felling phase increases dramatically. The time used on these specialised felling procedures also reduces normal productivity and thus increases cost proportionately. In this case tractor availability was reduced by one third in the study areas. Also, because of the increased danger factor, requirements for more skill and care, disruption of normal operations and relative unpopularity of this type of exercise, employers might give extra incentives to get the job done. NZFP in fact gave a premium above calculated rates for this.

Crew numbers during the study fluctuated. Although three men proved the best combination with least idle time, it should be noted that if a large crew were normal the options for employing them whilst such directional tree pulling is

being carried out is limited and thus greater costs would be incurred.

The actual felling time elements as a percentage of total time were:

TRACTOR TIME:	Method 1.	Method 2.	MAN TIME:	Method 1.	Method 2.
Waiting time whilst men use saw or position ropes.	20%	17%	Directing Tractor.	-	4%
Winch trees over.	7%	10%	Strop on Tree.	13%	17%
Re-position tractor	5%	3%	Clear and Scarf.	5%	5%
Total percentage of time on felling:	32%	30%	Backcut.	3%	3%
			Wait (includes waiting whilst tractor skidding).	43%	29%

Method 1 had been used because it minimised the man work involved in placing ropes and strops on trees to be pulled and enabled more direct communications between tractor operator and faller. Its disadvantages were the extra manoeuvreing time required to position the tractor correctly for each tree and that because of limitations imposed on manoeuvreing by already felled trees the felling operation had to be disrupted to extract trees which in turn meant increased wait time for the felling crew. Although the tractor and operator are within range of the falling tree, control of pulling is more positive and the closeness to the stump protects both from any high impact blow. Nevertheless a potential hazard is there which would be avoided if the machine was outside the striking range of the tree as in Method 2.

Method 2 had advantages in keeping the tractor and operator in the clear but this was offset to some extent because of more difficulty in control and communications. Although more man time was involved in moving rope and setting chokers for each tree, it was possible to co-ordinate the operation better because little time was involved in repositioning the tractor and a whole face could be pulled without the necessity of clearing logs to make room for the machine. Control of pulling from the distance was better effected by moving the tractor forward rather than winching.

Method 2. Tractor out of striking range with faller and signalman at butt.

Both methods required careful control of back cutting by the faller to ensure the tree fell in the direction intended which meant that both he and the signalman remained in the vicinity of the butt.

DISCUSSION:

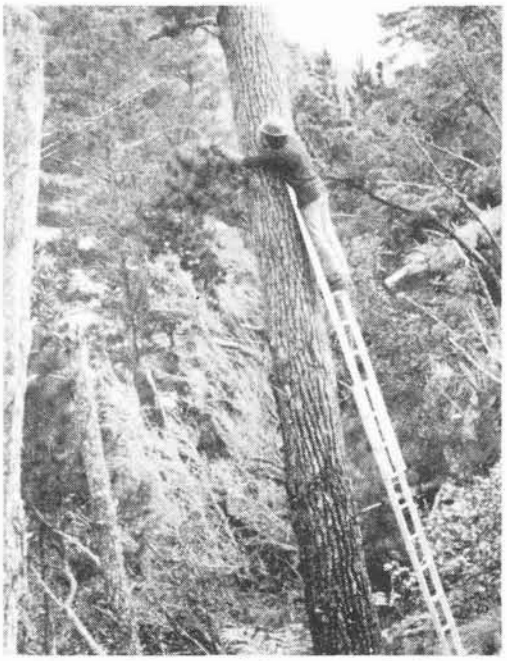
A significant finding of the study was the improved production figures achieved in Method 2. Much of the improvement could be attributed to better co-ordinated and lower manning levels. A three man gang was used for more than half the time compared to a four man gang during the whole 10 days on Method 1.

A significant time factor emerged in the the time taken to strop on heavy leaners. Where a ladder was necessary, average time increased from 3.0 minutes to 9.7 minutes in Method 2.

SAFETY:

Safe practice must be a major consideration in implementing such an operation.

The potentially hazardous conditions demand experience, good equipment and strict control.



The men under the tree were exposed to increased hazards. When the winch rope was tightened immediately following stropping on, pieces of flying bark caused potential dangers. At the point when the backcut was nearing completion and the strain was taken up by the winch rope, violent shaking of the treetop sometimes occurred and on two occasions limbs were dislodged from above. The man directing the tractor was often required to stand in a potentially dangerous area in order to sight both the faller and tractor driver. Although the faller maintained good directional control by co-ordinating his cutting with tractor pull his position posed some hazards. Stropping of heavy leaners using a ladder was often precarious because of the type of ladder used, the weight of rope and the difficulty in getting the strop around the tree.

LIRA would consider the following basic requisits for safety in such operations.

1. The faller and tractor driver be experienced and competent.
2. That an effective immediate system of communications between the above two is essential, preferably by radio.
3. That ropes and fittings be checked for strength and effectiveness prior to commencement.
4. That a tractor winch rope significantly longer than the tallest tree to be pulled be used.
5. That each tree be inspected closely for "sailors" and that the men stand well clear of the butt when the rope is initially tightened.
6. That a tree climbing ladder be used.

It is evident that further work on development of techniques and equipment is required and this is intended during the course of other Case Studies on this project.

CONCLUSIONS:

Costs of protective logging whereby trees have to be pulled against their natural lean are significantly higher than in normal operations. Production was less than half that expected in a normal operation.

These operations pose abnormal hazards that require highly skilled crews and strict adherence to safe procedures. Techniques and equipment to improve safety and productivity need development.

The method whereby tractor manoeuvreing was restricted and a long rope used showed reduced soil disturbance and erosion potential, plus indications for quicker vegetation recovery.

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