

PLANNING FOR STEEP COUNTRY THINNING

D.LAMBERTON
Supervisor - Logging Dept.
N.Z.Forest Products Limited

The policy of my Company, N.Z.Forest Products Limited, is to production thin the whole forest, or as much of it as is physically and economically possible.

Four years ago the first small hauler commenced thinning. Today six hauler, one tractor and three chute crews are thinning steep country. These are all owned and operated by independant contractors.

The cost of this wood is twice that of normal thinning on flat country. The species is *Pinus radiata* and the age set for this thinning is 14 years. This reduces the stand to a final stocking of 280-350 s.p.h.

All the wood produced is classed as pulpwood although some of the more suitable of this is processed as roundwood for posts and poles.

Experience has shown that thinnings younger than 14 years make the cost of steep country thinning unacceptable to my Company. Chuting can work in a wider range of age class, e.g., 11 year old to 17 year old stands.

75% of the wood thinned from steep country at the present time is with small haulers. In the past these small haulers were used exclusively so other means of extracting this wood at a lesser cost were examined. Chutes and small tractors have now established a place for themselves although they are restricted in their application.

Criteria used in determining areas:

- Chutes - a. slopes over 18° and not steeper than 35°
b. slopes not longer than 120 m
c. slopes that lead onto roading.

Tractors - areas so far allocated for this operation have been the easier of the steep country allocation with generally shorter slopes.

Haulers - do the remainder.

(A) Haulers

There are three makes used.

Wilhaul 130 H.P.

Timbermaster 70-90 H.P.

Lotus 90 H.P.

They all use 9 mm rope for main and tail ropes with a 16 mm skyline. They are truck mounted and have a maximum haul distance of 350 metres.

The basic crew is 6 men. Each gang also has a tractor (D4 size) or skidder (Clark 664 size). This machine is used to haul the logs away from the hauler to a load-out site. A cranab type crane can be mounted to the hauler and in some situations can be used instead of the secondary machine.

Preparing Logging Plan

1. Areas scheduled for steep country thinning are inspected to ensure that this can be achieved, considerations being access, stocking and topography.

Access: NZFP Co. planning policy is to permanent road only for clearfell so this means that some areas e.g., skyline blocks, may have some pockets that cannot be reached because of lack of access.

Stocking: Usually need to be over 800 s.p.h.

Topography: Large areas with rock faces and bluffs, generally excluded. (Above and below can be thinned where this is possible). Difficult broken country is looked at closely. This inspection needs to be far enough in advance so roading and site preparation can be organised before thinning commences.

2. Roothing. Attempt to be 12 months ahead of the thinning crews. Previously logged areas need very little preparation as the majority of these have been previously clearfelled with large highlead or skyline machines. Existing roads and dumps are opened up and reused. Newly planted areas with little permanent roading, require at least 12 months prior notice to prepare.

3. Production data. Before work commences a target or standard is set for each area. A wide difference in height, diameter and stocking can mean a difference in production of between 28 tonne daily to 40 tonne daily for haulers. An assessment is run through each area which determines:

- a. Piece size (range .15 m³ - .23 m³)
- b. Volume to be removed (range 90 m³ - 200 m³ per ha)

This together with the average length of haul determines the daily production standard. The rates are set accordingly.

4. Hauling. Uphill or downhill hauling is possible with preference to downhill as it produces more wood easier than uphill.

There are three types of conditions:

- a. Working from clearfell skyline or hauler sites. These are generally good winter areas as the roads are well stabilized and many of the loading sites metalled.
 - b. Working onto roads.
 - c. Working from tracks. There are times when haulers are required to work on tracks sometimes up to 300 metres from the load-out area. Most operators prefer to form these tracks themselves just prior to logging as most have a crawler tractor.
5. Planning options. Small thinning haulers can be fitted into varying condition to suit their individual characteristics. Haulers with a crane are well suited to working along roads where the wood can be stockpiled ready for load-out without using a secondary hauling tractor. Also working along the lip of a steep slope the crane can hold the logs, to stop them slipping back down the slope until they are unstropped and then position them for further processing. They can also load direct into cradles when the multilift transportation system is used. The choice of a skidder or tractor also allows for optional placing of these machines to the best advantage.

Winter and summer areas usually relate directly to road and dump conditions which can effect the load-out.

6. Load-out. This must be regular. Most crews produce between 1-2 loads daily and for these reasons the Company use self-loading trucks to ensure each crew gets a daily load-out.
7. Marking. Some marking for selection of crop trees is done from time to time but the majority of the areas are selectively thinned by the individual crews to a defined pattern.
8. Quality control. Weekly checks with attention to
 - a. tree damage
 - b. tree selection
 - c. safety procedures
 - d. log presentation.

Problem Areas

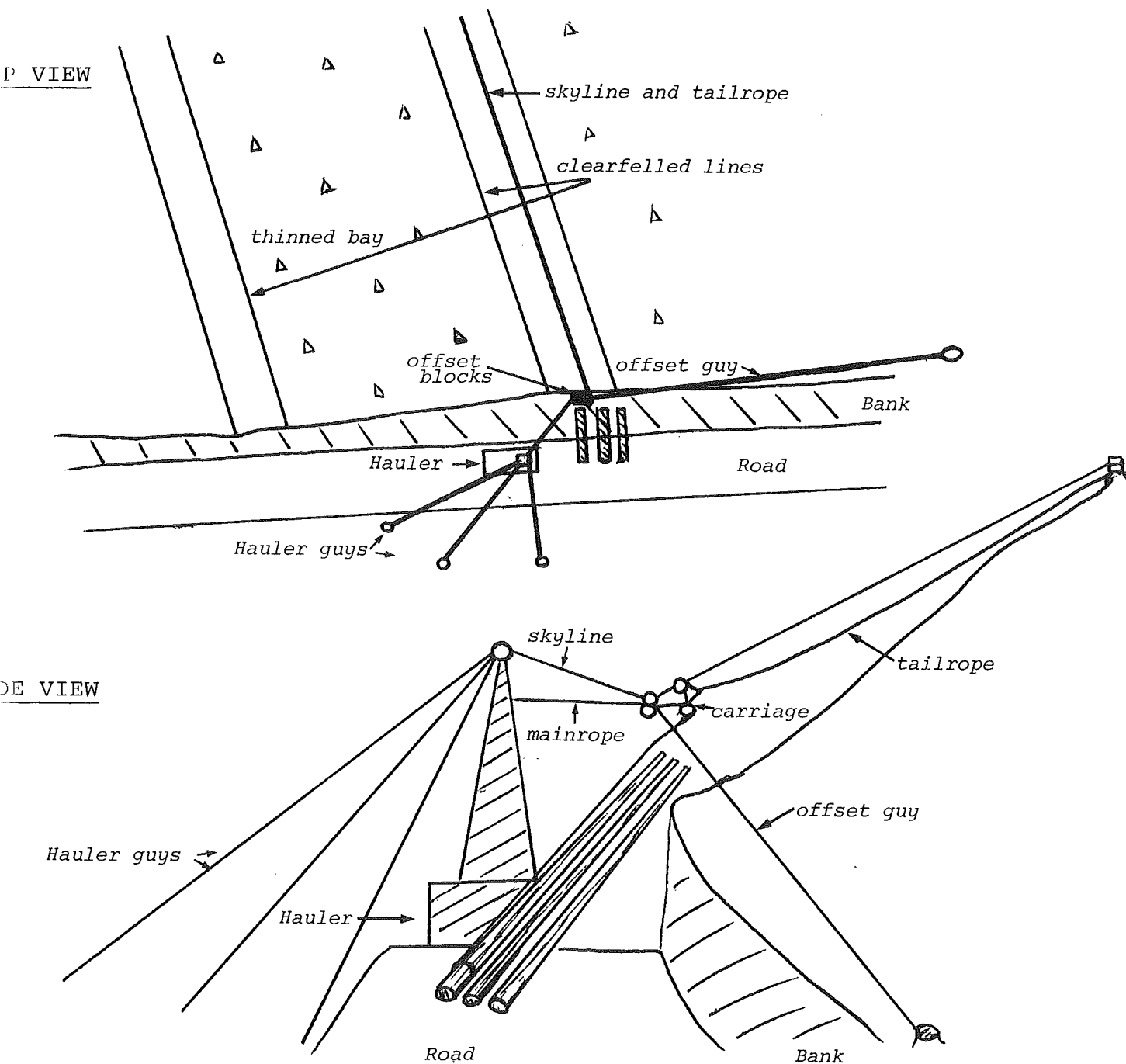
There are several of these where conditions are such that either the area is not thinned at all or the thinning is accomplished at a reduced production.

1. Hauling across rock outcrops. Uphill hauling can be achieved but at a reduced production because where rock faces are found the slopes are very steep so the average haul size is reduced.

Downhill hauling causes trouble because of the difficulty in controlling the logs coming over these rock faces. The usual result is a great deal of broken wood requiring double handling and generally high tree damage.

Because of the danger to both fellers and breaker out, many of these very steep areas are not thinned.

2. Hauling downhill over a steep bank with the hauler in line with the incoming logs and not enough space to land the wood safely without hitting the hauler. Some areas can be thinned by positioning the hauler off the line by several metres and offsetting the skyline and mainrope. This offsetting is usually achieved with the aid of a long strop, one end with a block attached, pulling both skyline and main rope over into the haul line and the other end attached to a large tree or stump.



There must be sufficient lift to maintain the skyline well clear of the ground, as this offsetting reduces the effective hauler tower height.

3. Across gully hauling, i.e., hauling downhill then uphill, or fully suspended. Where the wood is hauled fully suspended the haul size is reduced and the tree damage high due to lack of lateral control.

Where the logs are hauled one end up much breakage and logs diving into the ground occurs.

Rigging time is also slower so altogether production is low. Where possible these situations are avoided.

4. Convex slopes. These usually restrict the length of haul. The use of an intermediate support extends this length and is an important attachment to thinning haulers.
5. Downhill hauling into a basin. This requires the haul lines to be cut in a fan pattern. This causes the lines to be too close together at the foot of the slope and wide at the top. Difficulties in getting the haul rope into this wide area means that several things can happen.
 - a. two men may be required to pull the rope
 - b. cut and trimmed logs may be left if they cannot be reached.

Normal downhill pulling is preferred as better production can be achieved. i.e. parallel lines with 20 m line centres.

(B) Chute Thinning

The use of chutes for extracting wood from steep slopes is not new. The new element in the current operation is the material the chutes are made of, instead of wood, polyethylene or alkathene is used.

Lengths of 6 m of 455 mm diameter pipe with a wall thickness of 12 mm are split length wise into three pieces or chutes. These chutes are overlapped and joined together with two bolts with wing nuts with handle attachment welded onto them. When installed on the slope the chute line is tied down to trees and stumps usually to the handle on the wing nuts. This is necessary to stop the whole chute line working its way down the slope.

Gang size is usually 2 or 3 men. A two man gang is the most efficient but the disadvantage being any absenteeism puts the crew out of action.

Pulpwood will not slide easily on slopes less than 18° and on slopes over 35° it is very difficult to get men to cut and carry pulpwood billets. These chutes can handle wood up to 300 mm (12 inches) in diameter.

On long slopes which are reasonably steep there is a problem with the speed of the pulpwood travelling down the chute line and at present no method has been found for successfully slowing them down.

The need for chuting onto roading is solely economic as the wood is then stacked into heaps along the road side ready for uplifting by self-loading trucks.

Production Standards

Undergrowth conditions vary and this is one factor regulating production the other one being stocking, and high stocking (over 1100 s.p.h.) invariably make underfoot conditions good. Production (and cost of wood) relate directly to these factors. Present standards are set by eyeball evaluation by the supervisor.

(C) Tractor Thinning

One tractor, a Komatsu D45A, has been in use for several months thinning 14 year old *Pinus radiata* on steep country. The crew size is four men and may be increased to five. A small trailing arch was used but it was found unsatisfactory mainly because of its poor maneuverability. Tractor is fitted with a bull blade.

Hauling: The tractor first attempts to get as much wood as possible from either the top or bottom of the slope. The remainder requires tracking. Each area has different characteristics but tracks formed on a grade of 15°-18° and spaced 40 metres apart are working well. The trackwidth is just wide enough to take the tractor. At present tracks are marked in by the supervisor.

Production standards are based on the same information as for the haulers but the production range is normally between 30-45 tonne daily. Cost is lower than the haulers by about 25%.

Observations: The D45 Komatsu is ideal for the tracking but is probably overpower for this size wood. An integral arch would probably be an advantage. To date soil disturbance caused by tracking has caused no apparent erosion damage. Cutoffs are placed at regular intervals on the completed pulling tracks. The soil type mostly encountered is clay/pumice.

Conclusions

The current haulers appear to be the optimum size and horsepower for the pulling of 14 year old thinnings. Although they produce expensive wood, they still thin 75% of our programme. There are still many problem areas, but with well organised and detailed planning and execution, many of these situations can successfully be thinned.

Chute thinning is a low capital cost operation and as such must be favoured for suitable areas. The availability of men who will work constantly on steep slopes is a question yet to be answered.

Tractor thinning. There is a great deal more information yet to be learned on what size and types of machines will be best suited for varying types of ground conditions. In NZFP setup there is a place for this operation as it allows the easier of the hauler slopes to be thinned at a lower cost.