# GEOTECHNICAL ASPECTS OF HARVEST PLANNING

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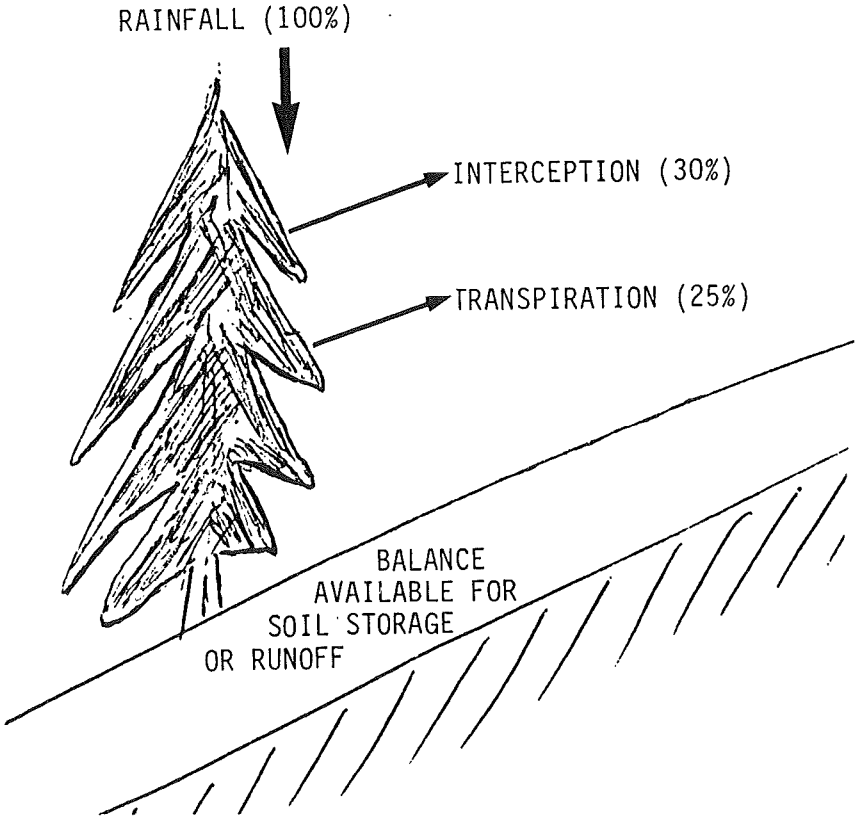
There are two elements in any harvesting operation which are largely beyond control. One is the soil type, on which the resource has been established, and the other is the rainfall intensity or frequency of high intensity storms which occur after harvesting.

On the other hand there are several things that can be done to minimise the effects and risks. One way of overcoming the soil type problem is to avoid it to varying degrees. A range of options is available from :

not planting
not harvesting
partial harvesting
delayed harvesting

Another way to reduce the risk is to carry out the operation in a manner which will minimise earthworks and surface runoff. If this is also the option that minimises costs then everyone wins.

A fundamental difference between forested and non forested land is that trees intercept a proportion of the rainfall; - that is, it never reaches the ground. Rainfall that does reach the ground is very efficiently used in tree growth via transpiration. Only if there is water surplus to the soil storage capacity will there be runoff. It is not as simple as the diagram below shows since



there are many variables, such as crop stocking, presence or absence of understory and climate. In Canterbury for instance there is probably not enough soil storage to sustain growth through the summer. A similar case probably occurs on most ridges on the Moutere gravels here in Nelson where the "soils" are thin.

The value of each component is of course site specific. High intensity storms give more throughfall while areas with light rainfall over many raindays will have much higher interception rates.

As soon as trees are removed, interception and transpiration ceases. The first significant rain may fill up soil storage and runoff commences. The result is that streams which have been dry for the last half of the rotation may now flow again.

It follows then, that prefelling roadlines well ahead of formation may allow the soil to become wetter and the best option is to "fell and form" as close together in mid summer (or other traditionally dry period) as possible.

Runoff will be intercepted by mid slope roads which create efficient drains to lead this accumulated water out through culverts. Where the option exists, the overloading of culverts and scouring of table drains can be reduced by leaving the trees on the upper side of the road as long as possible. There is little to be achieved by retaining trees on the lower side and in fact their removal may help dry the surface by letting in wind and sun. At this point we should make a distinction between surface drying necessary for traction and drying at depth.

Ridge roads by contrast don't intercept much runoff, shed it almost immediately, are more exposed and dry quicker. In addition earthworks are usually greatly reduced especially if steeper grades are allowable. Certainly a ridge road will be visible but a side cut road on a steep slope may have a batter almost as high as the road is wide and the side cast material will extend as far below. Despite the nuisance, if any, of this sediment the main impact is often visual.

Side castings are usually highly mobile as water initially replaces the air spaces in the disturbed material. As this repacks after 3 or 4 storms it may become semi-stable and be only a visual problem. This once again depends on the soil type, but our studies in the granite at Golden Downs indicate that seven years after road formation the rate of sediment production from road surface, batter and table drains is comparable to the natural background rate of erosion. Of course grading will renew sediment production and an increase in roading density for harvesting will change this stable situation. The point has already been made that it is not the logging method which produces sediment but the roads, tracks and landings to extract the logs.

A well compacted landing, of say 30 metres radius, could yield 140,000 litres of runoff in a 50 mm rainfall event. If this

drains from the landing through unconsolidated fill then slumping and loss of stocked area can result. Smaller landings mean less runoff, less fill and reduced costs of construction.

The capacity of tree roots to hold the soil together should not be underestimated. The risk of shallow slumping can be minimised by restocking immediately.