INDUSTRY CONTROL

NOTES

Dealing with the Industry

The Application of Management Principles

To Permit Control

Notes for Southern Region Staff Meeting at Manjimup, August, 1979.

By R.J. Underwood

1. Introduction

As a Forest Officer in charge of a logging operation in the hardwood bush, you are responsible for "the direction and control of the timber industry in the forest, the prevention of waste and the protection of the forest from damage and disease." (Foresters Manual, Pamphlet 14).

This is a complex and difficult job. It requires firstly that you have a very clear knowledge and understanding of Departmental standards and requiremer and secondly, considerable management skills in achieving these requirements through other people.

In this context,

1.1 "Departmental Requirements" means maximum utilization of the sawlog and chip resource off each hectare cut, but with minimum damage or disturban to the forest, the soil and other values such as water, fauna, landscape and scenery; and

1.2 "Other People" refers to the Bush Bosses, Fallers, and drivers of Skidde Loaders, Trucks, etc. who are employed by the timber companies to extrac maximum log value at minimum cost from the forest.

Thus, there is always a conflict of interests in any logging operation. Your job is to ensure that this conlift is resolved in the best interests of the forest and the Department.

To do this, you must be an efficient manager, i.e. one who can apply these bas management principles :-

1) Ensure everyone involved has a clear understanding of what is required of him. i.e. Train Industry personnel in correct standards and procedures.

2) Employ a control system to check whether required results are being achie i.e. make regular inspections to prepared checklists.

3) Take remedial action when unsatisfactory activities are discovered i.e. t not following your instructions must be identified and retrained or disciplined as required.

2. Industry Training

No-one can be expected to "do the right thing" if he has not first been thoroughly trained as to what is expected of him. Effective training is basic to all good management.

An effective training programme has five parts to it: (i) Decide what needs to be known and who needs to know it; (ii) Draw up a training format; (iii) Carry out the training; (iv) test to see that it has had the right effect; and (v) retrain where necessary.

Industry training must be carried out at three levels: by Region, by Division and by Permit (or Logging Operation). It is the responsibility of the Functional Leader (Industry Control) to co-ordinate these levels and to lay down required standards and specifications.

The permit O.I.C. is responsible for the training of the Industry personnel on the permit he controls.

Here, you should start by drawing up and maintaining a chart which lists the personnel on your permit, what they need to know, and records training carried out. - for example :

	Personnel				
	Bush Boss	Fallers	Skidder Drivers	Swampers	Grader Driver etc.
Log Specifications Erosion Control Dieback Hygiene Soil Disturbance Gravel Pit Working etc.		(Indicate Training Requirement and Progress)			

These charts can be filed in your Industry Control Manual where they can be constantly referred to and updated, and demonstrated to your senior officer when he visits the permit.

Training Methods can vary from a session in the office with slides to a chat around a stump with issue of notes or specifications.

In all cases you must plan and organise these sessions in conjunction with the Bush Boss. His cooperation will improve the chances of success.

By constant emphasis on Departmental standards and insisting that they are met, you will enhance your overall control, personnel management expertise, and ensure that each operator really knows what is expected of him.

3. Permit Inspections

A great deal of time can be wasted on inefficient permit inspections. To avoid this, you should always work to a checklist.

This ensures no aspects are overlooked and also forms a record you can refer back to, or discuss with a senior officer.

It is also very useful to give a copy of your completed checklist (or similar document with an enlarged H.O.C.S.'s sheet if necessary) to the Bush Boss if there are problems he must attend to, or if you wish to record his excellent performance. This eliminates misunderstandings and claims that "no-one told me so".

When inspections reveal serious errors or malpractice by the industry, you must decide :-

(i) Was it due to ignorance on the part of the operator or his supervisor? If so, training needs are revealed and must be immediately and thoroughly attended to.

(ii) Was it a deliberate or repetitive act despite warnings and training. In such cases tough action (eg:letter to his employer from your O.I.C.) is required, and essential. There have been cases when a Bush Boss deliberately sets up a young officer to see how much he can get away with. If you overlook a misdemeanour once, it becomes doubly hard to deal with next time.

All permit O.I.C.'s can be assured of strong backing from their senior officers in dealing with such cases.

4. Giving Instructions Properly

Experience over many years has shown that most management problems on permit (and elsewhere) can be avoided if the process known as "Giving instructions properly" is followed. This means ensuring that you follow three essential steps each time you arrange for a job to be done :-

1. Specify the Task

Clearly state your exact requirements. This is best done by issuing a written prescription or specification.

2. Reach Understanding about the Desired Result

Make sure the person you are dealing with really understands what you require of him. This is best done by asking questions or seeking his interpretation of the how and why and when of the job.

3. Set and Make Checkpoints

When the task is assigned or the instruction given, arrange an inspection at a set date and time.

Then you can check standards or progress and attend to unforeseen problems or changed circumstances if these occur.

I regard these three steps in "giving instructions properly" as the Golden Rules of personnel management. They should be applied throughout your work in the field, and then, as in dealing with the Industry, you will find many errors are avoided and valuable time saved.

5. Some Further Points

5.1 Goal and Target Setting

Superior management nearly always results when people have clear goals and targets to work to. Each officer controlling a permit should set himself a number or personal goals which he can positively strive to achieve. For example :-

(i) Set yourself production targets for completion of various tasks. These can be incorporated into the weekly programmes you draw up in conjunction with your D/F.

(ii) Set yourself a goal that no instances of poor utilization will be discovered by a senior officer inspection. (Prove to yourself that you can do as good a job as Jack McAlpine!).

(iii) Set yourself the goal of gaining a reputation as the most efficient permit manager in the Division. Develop a self-image that "you are the greatest" when it comes to supervising and controlling the Industry.

If high standards are set and achieved, morale and job satisfaction soars

5.2 Act Consistently

If you know the rules and always insist that they are followed, you will become known as that ideal manager who is "hard but fair", someone with whom "you know where you stand". An inconsistent boss who lets somethings go one time, but who rants and punishes the next, will never succeed as a manager.

In the same vein, learn to resist persistant pressure over certain issues. Certain sections of the industry have a long record of arguing and arguing over a particular ruling until the poor forester finally gives in to get a little peace. Recognise this tactic when it is used and handle it by being as tough and persistent in defence as they are in attack.

5.3 If in doubt, don't commit yourself

Problems will sometimes arise on the permit to which you don't have the answers. These most frequently involve interactions with other permits or the integrated logging plan. When this occurs, say "wait" and seek a ruling from a senior officer. It is always better that you do this, than try to bluff your way through a seeming little local issue which might have repercussions across the region.

5.4 Prevention is better than cure.

The good manager schools himself to look ahead, anticipate problems and then nip them in the bud, rather than wait until a crisis occurs.

This is particularly relevant to demarcation of coupe boundaries, and problems of soil damage or steep slopes.

5.5 Be Adaptable

The theme of much modern management training is "the challenge of Change". We live in dynamic times, with new problems and new ways of handling them cropping up almost daily. This is particularly true on the permits. The key to this situation is firstly, prepare yourself for, and expect changes to occur. Secondly, be flexible enough to adapt your techniques as new requirements are placed on you.

5.6 Accept Losses Gracefully

No-one wins all the time (though you should always aim to do so!). Factors beyond your control (or even the F.D.'s control) may sometimes mean you must temporarilly back down from a position of strength. The Department may sometimes see the need to create a strength somewhere else, which means accepting a loss in your area.

If this happens, whinging or sulking is not the answer. Accept that you are part of an overall offensive, whose broad implications you may not fully understand. However, this should not prevent you from listing the consequences in a calm and logical way to your senior officer, and with his help, plan your campaign to cut your losses in the most efficient way.

Similar situations are a fact of life in any organisation. You will face them again and again in such areas as Estimates and Works Programmes, Fire Control, Staff and Manpower availability.

5.7 Act the Part

That great soldier Sir William Slim, once said to his Army Commanders : "It is not simply enough to be efficient - you must also look efficient!".

When you go out onto your permit to deal with the industry, be proud of the fact that you are a highly trained forest officer, a representative of a determined and efficient organisation. You, not the Bush Boss or Skidder Driver, are the elite of the forest. Dress neatly, keep your vehicle and equipment in good order, speak with calm authority, being always courteous but firm.

Control, morale and authority is as much a psychological as a physical thing, (as Slim recognized) or a matter of age or bushcraft.

5.8 Giving Credit Where Due

Remember the old adage : "criticize in private, but praise in public". If the Industry on your permit performs well, or perhaps goes out of its way to do the right thing, get them together as a group (over crib, for example) and say so. Recognition or praise for a job well done is one of the most effective forms of encouragement. The men in the bush seek job satisfaction as much as you do.

However, public criticism has the opposite effect and can generate group resentment. It is far better to identify the problem person and deal with him and his immediate supervisor in private.

5. Conclucions

Efficient industry control at permit level can be one of the most satisfying jobs for a young officer. It is an invaluable opportunity to practise the skills of management, which can stand you in good stead in your future career as a forester.

On the other hand, when things on the permit get into a mess, a miserable time is had by all!

Because of the complexities of the operation, and conflicting interests, permit control is rarely simple and straightforward. But by the application of sound management principles, viz:

1. Know what you want;
2. Make sure the people under your control know what you expect of them; and
3. Give instructions properly.

Your control will be stronger, your time spent more efficiently and the rewards from your efforts greater.

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Clear Felling and Native Fauna in South west Forests

The eucalypt forest of south-eastern and south-western Australia and Tasmania probably form the single most important wildlife refuge in Australia. Some thirty five percent of native mammal species for example are confined to sclerophyll forest.

In terms of their dependence on forests, animals may be classified as transients, marginal, non-dependant residents and dependant residents. Transients are those species which only occasionally use the forest for food or shelter, for example some species of bats and some birds. Marginal species may use the forest edges for shelter whilst feeding elsewhere, e.g. kangaroos. Non-dependant residents are those species which live in the forest but also occur in other areas for example, coastal shrub or savannah woodland. Dependant residents are those species for which the forest is essential.

True forest dependant species are those which occur only within the forest, e.g. aboreal species such as the gliders and the Mountain possum (Trichosurus caninus) of the Eastern States. However in Western Australia several species, amongst them the Numbat (Murmecobius fasciatus) And the Woylie (Bettongia penicillata) have become forest dependant species as a result of agricultural clearing of their woodland areas of habitat. There are also species of birds, reptiles, amphibians and fish which occur only in forest areas.

Because of their close proximity to major population centres, forests are important for a variety of purposes, for example,

timber and pulpwood production, water catchment protection, recreation and as a wildlife habitat. The demand for these resources is continually increasing and there is a need for management to be directed at multi-purpose objectives. Obviously then, the entire forest estate cannot be set aside solely for the purpose of fauna conservation.

In Western Australia, two basic strategies have therefore been employed with regard to the welfare of forest wildlife.

(i) The setting aside of fauna priority areas such as Dryandra and the Perup forest (see Forest Focus 10).

(ii) Research and monitoring aimed at a better understanding of the effects of the various forest uses on forest fauna.

A necessary requirement before these two strategies can be put into practice is a knowledge of the occurence and distribution of forest fauna. In 1970 when this work started such basic information was fragmentary. Museum records were inadequate because no biological surveys had ever been carried out in any areas of State forests except Dryandra. The only information available was from specimens, mostly of mammals, sent to the Museum by private individuals. Some bird lists did exist for certain areas where naturalists, as individuals or groups, had assembled them.

With this dearth of knowledge the first task was to make up species lists for the vertebrate fauna of the forest. To accomplish this a continuing programme of biological surveys in selected areas of State forest was initiated. Initially for the

first few surveys the Department contracted naturalist Harry Butler. He helped make up the first lists and working in co-operation with Departmental personell helped to establish the basic framework for future biological surveys.

Some 17 biological surveys have now been carried out in various parts of State Forest. Teams of five to ten men camp in the area to be surveyed for a period of one to two weeks, working sometimes almost around the clock.

Areas to be surveyed are chosen on a priority basis, for example areas where it is believed that forest operations may pose a threat to the fauna, fauna rich areas or other places of interest being chosen first. Having selected an area, aerial photographs, map, Museum data and information from previous surveys, are all used in planning the survey. Specific forest communities most deserving of attention are selected and preliminary trips to the area are made to establish trap lines and to familiarize the survey team with the area.

The main object of the surveys is to collect and record all species of vertebrate fauna in the area but at the same time a collection of plants is also made. To collect fauna, a variety of traps are used to catch animals, mist nets are used for birds and bats, spotlights are used at night and shooting is also used sometimes to collect specimens. Frogs, lizards and small mammals are also collected by turning over rocks and logs and inspecting other likely hiding places. Fish are caught using a small hand net. A few more exotic methods, such as hair identification in fox scats, are also employed. To date some species of

To be filled in.

mammals species of birds, reptiles, frogs and fish have been recorded as occuring in forest areas.

These surveys provide some of the basic data on which decisions to set aside fauna or flora Management Priority Areas may be based. Thus species which have a restricted distribution may receive special attention, for example the decision to reserve the Perup Fauna Priority Area was based to a large extent on the occurence of the woylie and the numbat in the area. Many fauna and flora Management Priority Areas have now been set aside within State Forest (see map).

In addition to the collection of basic information on occurence and distribution of species, detailed research projects, are undertaken to gather data on the effects of forest activities on wildlife species.

Many of these projects are long term ones and mammals are most frequently chosen as the study species. This is because in general, mammals are more highly developed and are often more sensitive to change than the lower forms. There are other requirements also, forest dependant species receive priority, likewise animals which live in areas in immediate danger of disturbance may be chosen. Not least of the requirements is catchability, if an animal is difficulty to capture or observe it is often not possible to study it in detail.

Detailed studies have been carried out on the effect of fire on the woylie (Bettongia penicillata) and the tammar (Macropus eugenii). Information obtained from this study has been used to develop a species fire management plan for the Perup. This concept of selecting groups or ~~individual~~ individual species as

the specific objectives of management, in certain areas 'featured species management', is also being developed by the U.S. Forest Service.

Studies have also been done on the effects of fire on small mammals in particular the southern bush rat (Rattus fuscipes) and the yellow footed marsupial mouse (Antechinus flavipes). There are also research projects in progress involving the effect of clear felling on the quokka (Setonix brachyurus) and the mud minnow (Lepidogalaxias salamandroides).

Information from such studies, the biological surveys and other ~~minor~~ less extensive studies on other species, is all being used in relation to the clear felling which is taking place, particularly within the Woodchip Licence Area (see map)

The biological surveys indicate that the high quality timber forests are the poorest habitat in terms of numbers of vertebrate species in the southern forest area. For example only of the species of birds listed within the Chipwood Licence Area were recorded in the karri forest. Likwise the karri forest as such, is comparatively poor in species of mammals, frogs and fish and only very few reptiles occur there. The highest diversity of species ~~exists~~ occurs along the coastal strip of consolidated sand dune country, in the poor scrubby forest and woodland communities of the south, and the jarrah wandoo areas of the north east Perup (see map).

All these communities are excluded from cleafelling operations either by reason of there being no timber species in them or in the case of the Perup, through having been declared M.P.A.'s. In spite of this representative areas of all major

forest and non-forest communities have still been set aside as M.P.A.'s as as added precaution and for other reasons. These M.P.A. areas total some 30,000 hectares within the area of the Woodchip Licence area alone.

In addition to the M.P.A.'s, strips of forest have been left along all major rivers and some minor rivers, and on selected roads within the chipwood licence area. Stream-side vegetation communities are richer in fauna than the adjacent ridges. The total area being left uncut amounts to ~~in~~ an excess of 20 percent of the area in each forest block. These strips to be left uncut are allocated prior to felling and mapped on a block (4000 hectares) by block basis, in such a way as to create a network of uncut corridors of stream and road reserves which connect with the M.P.A.'s (see map). Approximately 30 percent of the karri forest within the State Forest has now been withdrawn from cutting on this system, and will remain in a substantially mature condition indefinitely. As a further safeguard, cutting proceeds in several different areas at any one time, and the longest possible lapse of time is allowed before felling occurs in adjacent cutting coupes. This allows re-invasion of fauna from uncut areas onto the regenerating coupes (see map).

These measures are not all or entirely for the benefit of the fauna, for example, stream-side strips also act as erosion and silt barriers and they have a recreation potential also.

When the Manjimup Woodchip Management was drawn up, faunal lists were examined for possible forest dependant species and further survey work was done to check the area for species which might previously have been missed. Two species were

nominated as forest dependant species in addition to being considered sensitive to clear felling, the numbat and the woylie. For this reason clear felling was excluded from the already established Perup Management Priority Area.

With the possible exception of the little brown snake (Elapognathus minor) and two small frogs Crinea rosea and C. lutea no vertebrate species have been recorded whose range is entirely restricted within the Chipwood Licence Area. Three species have the centre of their distribution with the licence area, but occur outside the area also. These are muellers snake (Rhinho-plocephalus bicolor), the small frog (Metacrinea nicholsii) and the Shannon mud minnow (Lepidogalaxis salmandroides).

Very few specimens of the little brown snake have ever been collected. The three collected by the Forests Department in recent years have all come from a restricted woodland ecotype on grey sands near the south coast. Muellers snake occurs in a similar ecotype. These forest types although within the licence area are not affected by any logging activity. The Shannon mud minnow occurs primarily in the 'brown water' streams, high in organic content, of the southern non forested flats. These areas are not affected by clear felling operation and a number of the streams, those east of the Frankland River, are outside the licence area.

Both C. rosea and M nicholsii have been collected or recorded recently in areas of young karri, areas regenerated following clear felling and burning during the last ten years. This demonstrates their ability to cope with clear felling.

Before attempting to understand the direct effects of clear felling on fauna it is necessary to first appreciate certain basic characteristics of animal populations. Most animals are extremely adaptable and have evolved characteristics and behaviour patterns which allow them to cope with most situations.

Cruel and heartless as it may seem, in nature, the welfare of the individual is not important in itself. The survival of individual birds or animals is only important when it affects the survival of the population. Thus, in most populations, under natural conditions only a very small proportion of the total number of young survive to adulthood. For example, approximately only 15 of every 100 joeys born in woylie populations survive to live for more than a few months after leaving their mothers. There simply is not room for them. Nature produces enormous numbers of excess young as an insurance policy in order that these may be available to re-populate areas where natural disaster has reduced the population. Thus following fire, as the vegetation regenerates, the survival of young woylies in areas surrounding the burn may increase to 40 out of 100. This is because many of the young which would otherwise die, find a home on the regenerating area, from whence the adults disappeared following the fire.

This pattern is typical of most animals, and what may be a disaster to the present population, a wildfire or clear felling, is a boon for later populations, provided the habitat is allowed to regenerate. It is the re-population of the regenerating habitat which is important, not the immediate disturbance, disastrous as it may appear to be to the individual. If these facts are appreciated, the apparent devastation of clear felling

may be seen as a transitory stage.

The studies which have been done have ~~It has been basically~~ confirmed that these characteristics of animal populations are allowing them to cope successfully with the clearfelling system. In a two year study the flora and fauna of regenerated forests ranging in age from year one to over 100 years, was compared to that of uncut virgin stands. The study showed that although the immediate effect on the individual animals living in an area which is cleafelled is devastating, this effect is transitory.

At no stage, even directly following felling and regeneration burning, is there no fauna present. Regeneration occurs rapidly, the relative abundance of mammals, and to a certain extent also the insects, follows a pattern of change almost identical to that following fire in uncut forest. Thus species return to the area as suitable habitat regenerates, the greater proportion returning within the first few years following the regeneration burn.

Bird populations likewise, depend on the stage of succession or development of the new forest. As a particular niche or habitat develops it is occupied by species favouring that habitat. Thus for example, wrens, which favour dense low habitat, are early colonizers of the regenerated stands.

Birds were found in greatest numbers in virgin or mature karri forest. However, numbers of bird species, different kinds of birds, are highest in forest recently logged to seed trees, and in two year old regeneration. Lowest numbers of bird species were recorded in the pole stands, thirty to fifty

years after regeneration.

For mammals and birds results appear to be fairly conclusive. The insect work is preliminary only and further work needs to be done to confirm and extend the results. However indirect evidence in the form of the return of vertebrate fauna to the area, many species of which feed on insects, suggest that the insects also return.

Hole nesters ~~are an area~~ fauna groups of special concern, and although there appears to be no mammal species affected, several species of birds need hollow trees for nests. The numbers of hole nesting birds were not seriously affected, but it is presumed that they nested in surrounding uncut forest and only used the regenerated areas for feeding. The value of M.P.A. areas and the uncut strips is obvious in this regard.

Reptiles, amphibia and fish were not covered to any great extent in this study but survey data indicates that the fish are unaffected by clear felling and that the other two groups follow a succession similar to that observed of mammals.

The effect of clear felling on fauna, like those of a wildfire appear to be temporary. Areas of regenerated forest of different ages favour different species and groups of fauna. The mosaic or mix of different aged forest created, is capable of supporting the full range of species present in the uncut virgin stand, providing a percentage of uncut forest is left in all areas. This is necessary in order to supply the full range of habitat and to provide nest sites for the hole nesters and other species requiring mature trees.

An important reason for having the uncut area left in a

pattern of interconnecting strips and blocks is to provide mature trees in close proximity to all regenerated coupes. This is particularly important for the hole nesters. If the total 30 percent of uncut forest were to be left as one or two very large blocks, hole nesting species would only be able to live in those coupes close to the uncut areas. The rest of the regenerated forest would be too far away.

The present plan based on the best available information fulfills the current need. However nothing is static and as needs change and the results of further research comes to hand changes may be made to ~~accumulate~~ accomodate the new needs as they arise. A continued process of monitoring allows for the identifi~~ed~~cation of problem areas which may develop in future.

FUTURE TRENDS IN HARDWOOD LOGGING

"January is a dangerous month in which to speculate the future. So are February, March, April, May ..... " MARK TWAIN

Prior to 1840 trees felled in W.A.'s forest were processed on site by pit sawing. Following the establishment of various sawmills, pit sawing, not surprisingly, fell into disfavour and logs were then pulled from the bush, loaded on to some form of transport and taken to the mill. Although each phase of the operation has suffered the effect of technological change and mechanisation,the basic principles of the operation remain unaltered today.

In this paper it is proposed to deal with each of the elements of the operation by examining the historical methods, current practice and how technological change and ever increasing industrial sophistication could affect the logging scene. Training of bush workers is dealt with but not in great detail.

Felling

Hand felling with the axe, crosscut hammer and wedges was the accepted, and indeed, only method used for almost a century. In the 1930's the first mechanical saws were introduced. These included the drag saw and later the Dennis and Schulstad circular saws. Fore runners of the current breed of one man chain saws were not imported until 1959, although the two man Blue Streaks came on the scene about 1947.

Today's one man saw is comparatively safe, dependable and light. It has a capacity of 12 KW or 16 Hp and enables one man to fell and dress logs which would otherwise occupy up to ten skilled hand fallers. The problems of noise generation and vibration from modern chain saws are well documented, but their major draw back is the speed at which they can cut wood, leading to trees being felled off the mark, sometimes with fatal results to the unfortunate operator.

It is unlikely that shears will ever replace the saw in the felling of large diameter dense hardwoods over 750 mm diameter, however, an application for shears or hydraulic saws can be confidently forecast for Karri thinning. These units not only have a very high production capacity but have a definite advantage when directional felling is deemed necessary.

Snigging

The initial exploitation of the forest saw bullock and horse teams, some with whims, pull the logs from the stump to the landing. Their main advantage was that wastes produced were biodegradeable, but looking after animals is a seven day a week job, unlike machines which can be parked under a tree, and ever increasing wages costs and low production rates saw the teams replaced by tractors about 1935. This method persisted for about twenty five years when the first rubber tyred skidders were introduced. The impact of this change was not immediately appreciated, but we now know that heavier ground pressures exerted by skidders is a major contributor in compaction and disturbanceof forest soils. The horse power of skidders has increased dramatically over the last ten years and are gradually replacing the few remaining D8's and arches used in the industry. Grapples, fitted to the rear of the skidder, have replaced some of the conventional winch and fair lead systems, and as a consequence the swamper or ropeman has been made redundant in these operations.

The future of skidders in the forest seems bound up with the ability of the manufacturer to produce a unit which has a lower ground pressure, equivalent speed and lower maintenance than the conventional skidder and at a competitive price. There are such machines available, and it is believed that they will be introduced here in the near future. Forwarders will play a role in the thinning area and also in prelogging of small size wood, but the sheer size and weight of the larger logs will always demand a powerful snigging unit. High lead systems, although capable of doing the job, are unlikely to succeed here due to inherent utilization problems, a fairly high fire risk factor and exhorbitant capital cost. Similarly, baloon and helicopter logging are unlikely to take over in the short term, but they may do so in future.

Loading

The first loading efforts were simply parbuckling logs up bush skids onto the transport vehicle. Later, steam winches were used usually in conjunction with the rakes. The advent of the bulldozer saw most logs push loaded up prepared ramps and it was not until about 1960 that the first log forks were introduced. Since then, the capacity of this type of machine has increased at a tremendous rate and this in turn has given rise to the problem of severe soil compaction on the loading site. Recently, a heel boom loader has been introduced and another unit is in process of experimental conversion. This type of loader has advantages over the wheeled machine. Its ground pressure is very low (6 psi) and the loading position is fixed. On the debit side however, it has a very high capital cost and must load out at rates of up to 80m^3/hour to make it an economical proposition.

It is therefore suited only for a very large scale operation.

It is forecast that loading methods in the future will tend towards the heel boom approach when the operation is of sufficient size to justify the capital cost,but otherwise, conventional loaders will continue. There will probably be a marked rise in the sophistication of the gear which will act as a skidding unit as well.

Transportation

We have seen a progression take place from Bullock Carts, railway rakes to trucks and now all logs are hauled by truck to the mills. Alarming increases in oil prices of late, must inevitably see fewer trucks on the road, but they will be more efficient and probably carry greater loads. The road train principle, already in use, should increase. It is likely that jinkers will be hinged and piggy backed on the return trip, a trend already firmly established in the Eastern States and indeed a legal requirement in some states.

Karri Thinning and Small Log Procurement

It is likely that Karri Thinning will be undertaken by heavilly mechanised and highly productive gear, in what is known as an integrated system. This is due to the need to handle many small logs for a low volume. Initial trials have taken place with a Logma Processor, which picks up entire trees and strips off bark and limbs and can dock the log to required lengths. The trees are first felled by shears. This system has great application in the thinning operation and it may be possible to utilize small diameter stems to 75mm CD. With high wages, this would be totally uneconomic in a manual system. The advantage of supplying debarked small diameter material to the chip company is self evident.

We have conducted trials with forwarders in small log harvesting in the hardwood forest and production rates of up to 220m^3/day were achieved, but the real advantage came when only large diameter logs were left for the skidders and they produced an average of 385m^3/machine/day, with minimal effect on the soil even in mid winter.

Whole tree chipping, although practiced in some states, is not foreseen as a real possibility here, since our stems can be economically processed and extracted by the more conventional methods described above.

Environmental Considerations

Departmental requirements with regard to soil disturbance or compaction will become tighter if research work shows that the regeneration and other forest values have been adversely affected. The likely affect of such a move will inevitably lead to greater stockpiles both in the bush and at the mill. It is predicted that the transfer stockpile system will develop and increase over the next five years. The attitude to dieback spread in logging operations is also likely to harden thus increasing the stockpiling requirement and adding to Departmental Staffing problems which are already acute in some instances.

Training

It is interesting and of value to consider and compare a modern logging operation, with that of one conducted fifty years ago. The modern bush worker is really a technician, charged by his employer to operate a valuable and sophisticated machine at maximum output with minimum ill effect to the machine. He is not trained in environmental care and sometimes is not even sympathetic nor receptive to that cause. He could be a city dweller, never in the bush before, yet he is trusted to play his vital part in harvesting a tree crop. As a contrast the old time operation was conducted at a lesser pace with more rudimetary equipment, by a stable crew who had a good background to bush life and a new member of the crew could expect to spend a year or more as a swamper before graduating to a more responsible position.

The need to train and educate the industry personnel is not just the job of the Company, nor the Timber Industry Regulations Inspector, it is also ours. We must accept this responsibility and I believe it will be time well spent. The training function will therefore increase in the near and long term.

Useful further reading on this subject can be obtained in a booklet "Woodchips and the Environment - Report from the Senate Standing Committee on Science and the Environment" p 210-235 in particular. Each Division should have a copy of the publication.

Conclusion

We can look forward to bigger, faster and more powerful machines in bush operations but probably fewer of them. With well trained operators and better design of machinery, the impact of logging on the fairly fragile forest soils can be lessened. We can look forward to greater stockpiles and their attendant problems. Much work will have to be done on logging systems and method and the Departmental role in these studies must also increase.

Further Reading

Environmental Considerations for Forest Harvesting. Cameron and Henderson
C.S.I.R.O. For The Australian Forestry Council.

SOUTHERN REGION INDUSTRY CONTROL SEMINAR, MANJIMUP
AUGUST 15, 1979.

Environmental Considerations in Logging: The Landscape

I. Introduction

1. Objectives.

1.1 To introduce the subject of landscape management as it applies to forest areas and to briefly explain some of the basic concepts and terminology.

1.2 To demonstrate the existence of a need for this type of management in State forest areas.

1.3 To discuss how landscape management principles can be applied to forest operations such as logging and road building programmes.

1.4 To create a greater understanding and awareness of forest landscape management objectives and principles among Departmental staff.

II. The Need for Forest Landscape Management

1. Forest landscape management - based on the premise that forest landscapes are a resource in their own right. As such, they need to be evaluated and managed in much the same way as other forest resource values such as timber, water, fauna and recreation.

2. There is a growing recognition of the need, particularly among western countries, to manage and conserve forest landscape values - due to several factors:

2.1 The widespread loss and/or misuse of forest land which is in part linked to western man's attitude towards the land.

2.2 The increasing level of public involvement with the natural environment - greater public concern over and participation in environmental matters.

2.3 The high degree of visual changes generally associated with many forestry operations.

3. Examples of how the need for management of forest landscapes is being catered for on the state, national and international level.

III. The Basis for Forest Landscape Management

1. Definition - in its simplest terms, forest landscape management is concerned with the utilisation and management of all forest resource values in ways that either maintain or upgrade the visual quality of the environment. Forest landscape management is not and should not be thought of as a cosmetic addition or frill.

   The art and science of landscape management is dependent on ...

   1.1 A knowledge and assessment of the various visual attributes which collectively determine the appearance of any landscape.

   1.2 A thorough understanding of the land use(s) to be accommodated on the landscape (various management objectives and constraints).

   Providing these factors can be identified and assessed, it is possible to evaluate how particular land use options will alter the appearance of the landscape and to subsequently develop appropriate landscape prescriptions.

2. Landscape character or appearance - all landscapes have an identifiable and describable character, regardless of the size of segment of the landscape viewed. The character of the landscape which is the overall impression created by its unique combination of visual features, can be described in terms of the following variables:

   2.1 Visual dominance elements - there are 4 elements usually present in all landscapes which compete for dominance:

      (i) Form - the mass of an object or of a combination of objects that appear unified. When seen in only two dimensions, it is referred to as shape.

      (ii) Line - represents an extended series of points arranged in a row or close sequence. Line can make up the silhouette of a form or can be considered separately. Lines are also defined by the intersection of 2 plans; examples of lines - ridge lines, timberlines, shorelines, powerlines, etc.

      (iii) Colour - permits the differentiation of objects even though they may have similar form, line and texture. Distant colours are often muted by a bluish haze caused by dust and moisture in the air; foreground colours are stronger and more dominant.

      (iv) Texture - represents the structure and minute moulding of the landscape surface. Textures range from fine and smooth to coarse and rough.

   2.2 There are a number of other factors which affect how the dominance elements are seen. These include motion, light, atmospheric conditions, season of year, scale, distance and position of observer.

3. Compositional landscapes - there are 7 basic compositional types of landscape. The first four are fundamental types and of a larger scale while the remaining three are essentially secondary, supportive or transitory in nature and of a smaller scale. Compositional type is dependent both on the dominance elements and other visual variables, particularly the position of the viewer in the landscape (ie viewing context).

   The seven compositional types are as follows:

   3.1 Panoramic landscape - wide sweeping views; little sense of boundary or restriction; foreground or middle ground objects do not block views of background objects; macro scale.

   3.2 Feature landscape - one or more features stand out when compared with surrounding area - e.g. snow-capped mountain, lone tree.

   3.3 Enclosed landscape - may be seen within the context of spaces or openings that are enclosed by continuous groupings of objects.

   3.4 Focal landscape - line of sight is focussed or funnelled toward an end point in the distance - e.g. gorges, roads through forests, etc.

   3.5 Canopied landscape - overhead ceiling or plane provides a canopy; tends to restrict the view to small or micro scale landscapes which are more clearly seen on foot or at low speeds. e.g. trees overhanging roadway.

   3.6 Detailed landscape - landscape where small objects are observed in the immediate foreground.

   3.7 Ephemeral landscapes - landscapes in which short term changes in nature alter the appearance of the view - e.g. weather, projected or reflected images, displacements, animal signs or sightings.

4. Once a landscape has been assessed in terms of its visual characteristics, next step in formulating landscape management prescriptions is to ...

   4.1 Evaluate the proposed operation or project in purely landscape terms - try not to let management constraints or professional bias influence your thoughts yet. Take note of landscape patterns which may be useful and try to recognise and build upon existing patterns or features.

   4.2 Apply what you have observed. At this stage, landscape needs and constraints should be clear. Integrate these with other management requirements and constraints.

IV Forest Landscape Management: Application to Logging and Roading Operations.

1. Within the Southern Region, there are several major landform types within State forest.

Included are the -

1.1 Southern Tableland

1.2 Swan and Southern Coastal Plains

1.3 River valleys (moderately dissected)

1.4 Granite peaks.

These landforms support a range of forest landscape types (brief description of major visual characteristics and how these have helped in many instances, to moderate the visual impact of felling and roading programmes.

2. Landscape management considerations with respect to seed tree and clearfelling operations.

2.1 Shape of cutting coupes - most desirable approach is to allow the natural soil/vegetation patterns to dictate the shape of coupes; openings which mirror the natural landform will generally have the least negative visual impact.

2.2 Size of cutting coupes - dependent on the scale of the landscape itself. Coupes should not be permitted to visually dominate the surrounding landscape - use of adjoining hillsides or leave strips to provide visual enclosure and reduce scale of cutting units.

2.3 Position of cutting coupes in the landscape - Keystone Hill and the Brockman Block Study.

2.4 Special problem areas - location and rehabilitation of landings and cutting in jarrah-marri type.

3. Landscape management considerations with respect to road design and construction.

3.1 The Department's roading programme is, in the long term, likely to contribute more to the public's impressions of forest land management in the southwest than any other single operation we are involved in. Most visitors' impressions are gained from what they see from their car - particularly true in the Southern Region. Important to keep in mind that the timber road of today may be the tourist road of tomorrow.

3.2 Road construction practices - current road clearing practices in some instances tend to reinforce negative public impressions of forestry.

3.2.1 Examples of "bulldozer engineering"

3.2.2 Alternative clearing and construction methods to minimise visual impacts.

3.3 Location and design of roads in the landscape - how the road fits into the landscape is of major importance.

3.3.1 Roads should be designed so they curve with the form of the land - i.e. follow the "grain of

the landscape" and minimise cut and fill. It is desirable to avoid long tangents that visually bisect the landscape.

3.3.2 Discussion of alternatives for creating greater visual interest along existing alignments.

3.3.3 Relationship of roads to cutting coupes - techniques for minimising visual impacts.

In summary, there is a need to ensure that all new logging road systems are fully integrated with future harvesting requirements - road design and location should take into account such consideration as the extent, sequence and timing of cutting.

SAWMILLING TODAY AND TOMORROW - ED SPRENGEL

1. OBJECTIVE - Sawmilling today and tomorrow depends entirely on th forest resource and the potential resource. The technologies for conversion are considered available The objectives of the sawmiller then need to follow that of the F.D. Working Plan which is interpreted to be a philosophy of stability with growth.

   This has been and is the main management objective and difficulty.

   The cost is significant related to stock holding. The forward planning to reduce these costs are based on premises often out of our control often due to Government policies related to the national economy.

   The sawmiller's strategic plan is to maintain a modest profit improvement and to reduce the cyclic fluctuations of the market.

2. STRATEGIES - The sawmiller's strategy has therefore to be in step with Forest Department's working plan, both the objectives are similar in nature. e.g. If resource availability is fluctuating we cannot have an objective of stability. Hence we apply pressure on the Forester for this stability.

   The mill log intake figures over the years on F.D. Annual reports gives a good indication of the stability maintained. The future market is dependent on the potential forest resource to a very large extent.

   We believe more information should be made available on the resource with periodic updating. It is vital for our planning.

   The strategies used by the sawmiller to maintain stability are:

   1. The overseas and interstate export markets
   2. The importing of sawn timber
   3. The purchase of private property logs
   4. The use of large stocks of sawn timber as a buffer
   5. The utilisation of residues to retain competitiveness.

3. THE MARKETS -

   3.1 Our predictions for W.A. are based on a 2% net population increase with an average need of some 17,000 houses and dwellings a year plus a difficult to read continuing increase in house improvements demand. So we don't believe the local demand will be as high as suggested in WP No. 86 which was taken from the 1975 Borrie Report.

   An export market will be maintained as the major cushion to local fluctuations in demand. There is a world wide shortage of hardwoods and as prices improve and quality requirements less stringent we will be able to continue to export. The local market would need to increase 25% before present export volume was utilised in W.A.

../:

3. THE MARKETS (Contd)

3.2 The imports of special purpose woods will continue but imports of mouldings and other housing timbers will fluctuate depending on prices and ability to service the market with local production. Unless a more stable source of supply can be found overseas or interstate. The north west markets are well placed for imports from S.E. Asia.

3.3 To maintain the hardwood resource by the purchase of private property logs in quantity is a recent experience for Millars.

The two factors that have made it possible are the sale of logs unsuitable for sawmilling for the wood chip industry making the logging of scattered mill logs economic and the recent legislation related to clearing restrictions on certain catchments. It is unfortunate but true that the second factor has brought a large number of offers of logs to us.

We have no measure of the limit of the private property resource at present.

3.4 Stock build up in depressed market conditions is a practice carried out since inception. The graph indicates the recent upward trend in stock holding in our organisation and an indication of direct costs incurred can be estimated.

The cash flow required to accommodate such fluctuations is in millions of dollars and can run over long periods.

3.5 The sale of sawmill residues for profit will be vital for containing production costs. Jarrah wood chips could be feasible inside 18 months from mill residues.

4. THE MILLS - The working plan sawlog production strategy was set out three years ago now and we believe some expectations will be revised for the next working plan. Vide W.P. Page 71.

4.1 The amalgamation of sawmills into reduced number of units of economic size may not develop further. The mill capable of economically dealing with a scratchy smaller log supply is a small mill with low over-heads. There is expected to be a place for such units as forest management needs to cover larger areas for small volumes of mature wood after the large mill has reached the end of its life.

However there will be an ongoing need for the big sawmiller to develop the new resources needing large capital and assured intakes.

5. SUMMARY -

5.1 Hardwood exports are expected to be maintained at similar levels in relation to resource availability, i.e. as a % of production although with a larger proportion of smaller sections.

5.2 Major changes in G.P. mills (locations or size) operating on the original resource are not foreseen although attempts may be made to segregate small diameter logs to be milled in specialised annexes to the major mill - where the resource will allow.

5.3 Small mills are seen to have a scavenging role over the large cut over areas.

5.4 We expect to see the special purpose mill develop as the new forest (hardwood and softwood) comes of size. This mill will need a large uniform sized log resource presorted for production runs and a uniform sawn product output.

A profitable residue market will be needed for its feasibility because of the high capital cost yieldi an ordinarily priced product, and the high cost of of having grown the tree.

5.5 Sawmilling changes will take place as the resource becomes available or diminishes in availability. As the forester will have a large say in the availability or otherwise of the forest resource to the sawmiller he has a responsibility, I believe to keep the sawmiller informed as well as he is able on the details of the potential resource.

NOTES FOR INDUSTRY CONTROL STAFF SEMINAR - MANJIMUP

15th SEPTEMBER 1979

STOCKPILING

BY

N.G. Ashcroft

1. Magnitude of the Problem

The greatest single logging problem is the problem of how to obtain winter supplies without causing permanent damage to forest environment.

Damage can be either:

a) Reversible - such as erosion or mechanical mamage (to a lesser extent).

b) Irreversible - such as the introduction and intensification of dieback disease.

Summer stockpiling will avoid these problems. Summer stockpiling refers to the assembling of logs into dumps at specified areas so as to avoid the use of machinery in certain forest areas in winter. This discussion refers essentially to the question of stockpiling to avoid further spread of jarrah dieback although similar facts emerge from a consideration of stockpiling to avoid floatation problems. The facts and consideration presented therefore relate to jarrah only; costs are those based on the Forests Department's accounting system and were determined from trials carried out by the Forests Department Dwellingup sawmill and logging operation.

2. Objective of Session

The aim of this segment of the programme is to examine the summer stockpiling question and attempt to place its impact on industry economics in perspective.

3. Review of Factors of Dieback Spread and Control

A series of slides is used to emphasise the problems and effects of disease spread particularly as it is related to logging and associated roading operations.

Control is based on a hygienic approach to operations and these include:

a) Vehicle cleaning.

b) Planning of coupes to ensure those areas that may be logged in winter are not cut in summer.

c) Quarantining of forest areas to accurately locate all infection.

d) Upgrading (stabilizing) roads.

e) Segregating hauling and snigging phases of logging operations.

f) Stockpiling - this is most effective as it effectively quarantines selected cutting coupes.

4. Forests Department Commitment

The Forests Department is commited to reduce damage from winter logging and references can be found to this in the General Working Plan No. 86 of 1977, for example:

a) Pole Supply Strategy No. 1 - "Introduce management strategies which allow for extraction of jarrah poles largely during summer.

b) Dieback Management Strategy No. 3 - "Continue to apply hygiene restraints into all permits, licences and contract operations which involve vehicular movement on State Forests".

c) Dieback Management Strategy No. 5 - "Extend practical trials of various operation hygiene techniques to test their effectiveness".

d) Objective of Management for Conservation of the Forest Physical Environment - "To minimise the deleterious effects of land use and management on the soil, air and water components of the forest, and adjacent, environment".

However, stockpiling is directly referred to in Sawlog Production Strategy (No. 8) - "Prevent damage to soil values and further spread of dieback by reducing winter logging operations and developing summer stockpiling techniques".

5. Progress to Date

The Forests Department has been attempting to encourage industry to see the environmental necessity of stockpiling and to find ways of overcoming the considerable social or economic problems that are apparent under that system.

Direction has been given by the Department in some areas and operational trials have been conducted. Progress has been made in relation to floatation and soil damage (Southern Region and Sunklands) where the effects are tangible and predictable. By comparison the spreading of dieback is an intangible problem and in this arena little progress has been made.

However, time is important and there are serious questions to be asked about future winter logging on some permits who now have mainly healthy forest in the path of their operations.

We, as users, do not have a mandate to damage the forest permanently. We, as the user, must accept the inconvenience that reduction of damage will cause i.e. we (the sawmiller) will have to accept the extra cost.

It is because of this that the various costs and benefits must be closely examined so the whole problem can be placed in perspective.

6. Advantages of Stockpiling

The more important advantages are listed as follows:

a) A very effective method of avoiding soil damage and dieback spread. In the long term this will effectively avoid reduction of mill life which might otherwise have occurred.

b) Other environmental benefits will also accrue e.g. reduction in erosion and hence turbidity in streams, does not reduce forest growth, aesthetic considerations, etc.

c) Reduces Company roading costs. In the Dwellingup operation this approximates $\$1/m^3$ (round measure).

d) Reduces public roading costs - these are unknown but it would be reasonable to assume they would be at least $\$1/m^3$ where similar distances are used.

e) Reduces maintenance requirements for plant and equipment. This is generally accepted as a major advantage particularly in the karri operations. It has not shown to be significant in the Dwellingup operation. More work is required to determine the levels of this benefit.

f) Stockpiling allows the pre-selection of logs which therefore allows the matching of the resource to orders.

There is considerable room to determine the level of this advantage and logically it should be considerable.

Since the Dwellingup Forests Department mill does not cut to orders, this has not been tried to date. There may be some scope and this is to be looked at. However, it is seen as an excellent exercise to encourage the industry to undertake.

g) Costs incurred by private companies can be construed as monies expended in producing revenue. As such these costs are tax deductible. This can only be accurately determined internally by companies as accounting systems will vary considerably, as will comapny investment programmes, all of which affect the tax benefit (or disbenefit).

7. Problems Associated with Stockpiling

The more important problems are as follows:

A. Drop in Recovery

The amount of recovery drop is related to the technique used to build the stockpile and the treatment afforded the logs. A series of trials at Dwellingup have shown the best treatment to be close, wide (end on end) stacks, logs end coated prior to stacking and the logs kept moist by watering. Watering has the effect of reducing and or side checking and prevention of conditions suitable to bardee (*Phoracantha semipunctata*) attack. Bardee have not shown to be a problem in stockpiles commenced after February. Figure 1 illustrates the value of end coating in a large trial with no preselection of logs.

The figure shows an average recovery of 33.8% from end coated logs which represented a drop of only 0.8% over the control (fresh logs).

FIGURE 1

1977 End coating stockpile trial

Stockpile constructed February/March 1977
Stockpile milled July-October (5½ - 7 months)
600 m^3/treatment
No preselection of logs

Stockpile treatment	Average recovery %	Average recovery drop %	Remarks
End coated	33.8	0.8	Batch recovery drop varied 0.7 - 1.0
Untreated	29.4	5.2	Batch recovery drop varied 0.5 - 8.0
Control (fresh logs)	34.6	-	-

At the same time that this trial was in progress another trial to test the effectiveness of a number of treatments on small logs was carried out. Figure 2 outlines the results. This trial differs in that logs were selected to obtain as uniform a log quality as possible in order that the natural defect variability between logs could be reduced. This was necessary to overcome the disadvantage of smaller (30 logs) sample sizes.

FIGURE 2

1977 Small log stockpile trial

30 similar logs per treatment - 3 m long
Stockpiled 7 months under cover logs

Stockpile treatment	Recovery % 300-375 mm	375-450 mm	450-525 mm	Recovery all sizes	Recovery 375-525 sizes
Control (fresh logs)	30.8	28.0	40.9	34.6	35.5
No treatment	27.8	28.0	29.2	28.5	28.7
End coat	29.7	29.8	40.1	34.3	35.8
Debark - end coat	24.8	30.7	36.7	32.1	34.2
End coat - water	-	35.8	44.1	-	40.8

This trial shows:

a) log quality variation did occur

b) the recovery is very sensitive to size

c) end-coating and watering give a very acceptable result in small logs

d) without these treatments significant recovery drops are likely.

It is therefore possible to conclude that provided treatments as recommended are adopted very little recovery drop should result. This figure should be of the order of 1% (or 2% at the most) which is acceptable. However, it does represent a direct cost increase for sawn production and also a resource cost in terms of lost volume in conversion.

B. Stockpile Costs

It is usually expounded that stockpiling will add significantly to the cost of sawn timber. What exactly is this cost?

Whilst this question cannot be answered fully, we can go much of the way to identifying the direct costs. Figure 3 is the result of various trials in Dwellingup where costs were recorded (these costs have been inflated to 1979 values and converted into square volume on the basis of a 33.3% recovery).

FIGURE 3

Direct costs of stockpiling* (1979 costs)

Factor	Cost per stockpiled m^3 (round)	Average annual cost/m^3		
		Stockpile 1 month	Stockpile 3 months	Stockpile 6 months
Capital costs 2 years write-off	$0.62	$0.16	$0.46	$0.93
Construct and maintain pile	$2.70	$0.68	$2.03	$4.05
Insurance of pile	$0.06	$0.02	$0.05	$0.09
Recovery drop (2%)	$3.05	$1.15	$2.29	$4.57
Roading (saving)	-$1.00	-$0.25	-$0.75	-$1.50
Net direct costs	$6.05	$2.16	$4.08	$8.14
% mill skid cost approx.	-	1.4%	2.7%	5.4%

* Assumptions

Capital costs deal with 10 000 m^3 stockpile
Sawn conversion costs $150/$m^3$
Recovery drop is 2%

Whilst these figures may not reflect accurately that which can be expected in private industry they are expected to be similar and therefore indicative of the level of the problem.

If only the factors in Figure 3 are considered, then even for a significant period of stockpiling the average annual unit cost is only increased some 5%. The acceptability of such an increase must be seen in relation to the considered environmental benefit.

C. Competitiveness of Companies

The Forests Department must ensure that its policies do not cause instability in the timber industry. There must therefore be concern if a policy of stockpiling will influence the relative competitiveness of the various companies in the State.

This can occur if it so happened that there was a greater pressure to stockpile for one company against the other.

It is unlikely that we know the overall picture at this stage so there is some conjecture in the question.

It is proposed that any such problem could be resolved by scrapping the present permit system and re-allocating the resource in the most equitable manner. A system of licences coupled with some form of security of tenure on which companies may base their long term investment plans will be necessary to replace the present system.

D. Downtime of Equipment

Specialised and expensive equipment are needed for a modern logging operation. Stockpiling will mean downtime for this machinery. It has been noted that considerable amount of additional plant would be required during the stockpile phase.

Factors we need to consider here are:

a) Currently plant works 8-9 hours; in summer we have the potential to work 14-15 hours together with Saturdays. therefore there is the potential for 2 shifts and hence the same equipment can log the same volume and thence have less effect on depreciation than might be expected.

b) Annual leave in winter will reduce the impact of stockpiling.

c) The overall level of stockpiling in the State, if significant will have a bearing on the general availability of existing plant.

D. Difficulty in Retaining Trained Manpower

This will be a problem as it is difficult now to retain skilled men against competition from other industries. There will be an additional pressure to maintain training after periods of stand down. There will be a need to increase manpower during the period of stockpiling.

However, the social problem here has some features which relieve what otherwise might be a bleak picture:

a) Winter leave will reduce the problem. Unions will need to be consulted.

b) Fallers may continue all year with logs laying in bush.

c) Loader operators may have to be retained depending on the amount of double handling the stockpile system requires. Similarly, some minor haulage might be required even though costs will increase.

d) The possibility of switching these men to other skilled jobs such as hauling sawn production (Westrail consultation required) will assist.

e) Creation of bush stockpiles is likely to be less of a problem of manpower than those created close to the mill.

However, it is the problem of manpower and machinery which is the greatest one facing any programme of stockpiling over considerable periods and it is in this area that most effort must be directed to find a solution. It is not related to the industry alone either, as the pressure on the Department under a stockpile system will coincide with the busiest period of the year for staff and employees (e.g. fire control, regeneration burning, plantation establishment etc).

8. Level of Stockpiling

Those in favour of stockpiling are generally Forests Department Officers and those against are generally sawmillers, for obvious reasons.

I think, however, it is not stockpiling *per se* that is being opposed but rather, the level to which they fear it is to be imposed upon them.

This is natural when you consider that research results indicate a theoretical maximum of 7-8 months of the year when dieback can be spread.

However, the picture is not as bleak as this for a number of reasons:

a) There is usually some forest within a licence or permit area which can be logged in winter without placing further forest at risk (e.g. areas where mining has been approved, resistant soils, dieback infected forest and possibly even non-protectable forest).

b) Taking annual leave in mid-winter will reduce winter logging automatically by one month.

c) Using alternative methods to relieve the situation. These are discussed separately.

9. Alternative Methods

Whilst no method will give the same effectiveness as stockpiling from an environmental viewpoint, there are ways of reducing the risk and impact.

A. Split Phase Logging

This term is used to describe the segregation of the hauling and snigging phases and has the advantage that infections introduced to low landings are not then transmitted upslope by snigging machines.

The increase in costs following a Dwellingup trial are shown in Figure 4. These costs are converted to 1979 values and the effect on average sawn cost is shown to be relatively slight (0.8%).

FIGURE 4

Split phase logging
(Max. skid distance 400 m)

Skidding method	Snig/load/ cart (1976 costs)	Extra cost of sawn timber (1979 costs)	% increase on sawn cost ($150)
Control	$2.45/m^3	-	-
Skidder and log ladder	$2.74/m^3	$1.22m/^{3}	0.8%
D7 snigging	$3.47/m^3	$4.28/m^3	2.9%

B. Road Stabilization

Where winter maintenance can be avoided on roads obviously the chance of spreading disease is minimised. A series of trials (1977 and 1979) in Dwellingup on major roads have indicated the effectiveness of various treatments together with relative costs. These are broadly summarised in Figures 5 and 6.

In Figure 5 costs can only be considered relative due to the short section of road per treatment (50 m). This is not so marked in Figure 6 (300 m sections) but it can be expected that for normal treatment of longer sections of roads, unit costs would fall.

What these results indicate is:

a) Additions of bitumen, oil or cement will give an effective but costly stabilised road surface.

b) Choosing gravel with a suitable binding fraction, water-binding and compacting with vibrating rollers, will markedly increase the stability of a road surface at an acceptable cost.

c) Use of additives can be considered for troublesome spots an an acceptable cost.

FIGURE 5

1977 Road stabilization trials
50 m sections - 4500 vehicles

Treatment	Cost $/km	Maintenance			Results
		Pot-holes	Corrugat.	Mtce. required	
Control (Rip-grade only)	$ 380	Yes	Yes	Yes	Not effective
Reform-water bind-compact	$2800	Yes	Yes	Yes	Not effective
3% lime added	$7600	Yes	Yes	Yes	Not effective
Special gravel - water bind - compact	$6200	Yes	No	No	Fairly effective
Sump oil added	$5100	Few	No	No	Fairly effective
3% to 6% cement added	$6200 $8700	No	Few	No	Effective
Bitumen prime gravel seal	$7800	No	No	No	Very effective
3½% bitumen added	$9700	No	No	No	Very effective
Bitumen prime-diorite seal	$12000	No	No	No	Very effective

FIGURE 6

1979 Road stabilization trials
300 m sections - 1000 heavy vehicles approx.
(= 5800 heavy vehicles/annum)

Treatment	Cost $/km	Maintenance		Result to August 1979
		Pot-holes corrugat. collapse	Mtce. required	
Grade only	$ 30	Yes	Yes	Not effective
Regravel	$2100	Yes	Yes	Not effective
Regravel-waterbind compact	$2600	No	No	Very effective
Vegetable oil added (4%)	$7400	No	No	Very effective
Bitumen added (5%)	$11 300	No	No	Very effective
Cement added (3%)	$7400	No	No	Very effective

10. The Future

I believe four main requirements are now necessary for responsible decision-making and co-ordinated progress to be made on the question of stockpiling for dieback control and reduction in soil damage.

a) A statement by industry of commitment to reducing environmental damage from winter logging operations.

b) A need for planners to identify the level of the winter logging problem on a permit, company and State basis. There is a need to view the problem in full perspective.

c) An immediate and direct involvement by relevant unions to become familiar with the problem and to participate in its solution.

d) Undertake a joint Forest Department/Industry/Union analysis of the impact (social and economic) of stockpiling at both field and executive level. Field level analysis is being conducted in the Southern Region now.

A full analysis must include study and documentation from states/countries where stockpiling has been the norm for industry.

The future, I believe, will result in greater environmental protective measures being required for the industry. The techniques utilised will be varied to suit particular circumstances.

SUMMARY

The reduction of winter logging damage by dieback spread and soil disturbance is the major single problem for hardwood loggers.

The Forests Department has been active in encouraging industry to stockpile as a means of overcoming this but has had limited success only in the Southern Region and the Sunklands where floatation problems are more tangible and negate many alternatives.

The Department has carried out trials to determine effects of stockpiling on recovery and costs as well as looking at additional hygiene techniques. Costs and impact depend on the level of stockpiling required but would appear to be a reasonable "environmental cost". Some costs and social effects have not yet

been identified such as the effect of manpower and machinery being stood down for extended periods. There is an urgency to study this.

Four key requirements have been suggested as necessary for rational decision-making and co-ordinated progress on this question.

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