FOREST IMPROVEMENT AND REHABILITATION SCHEME (FIRS)

PRESCRIPTION 87

1. INTRODUCTION

In the Wagerup ERMP Alcoa gave a commitment to finance the rehabilitation of dieback affected State Forests adjoining bauxite mines. This led to the initiation of the Forest Improvement and Rehabilitation Scheme (FIRS) in 1978.

The scheme is funded by Alcoa. Work is prescribed and implemented by the Department of Conservation and Land Management.

FIRS work is breaking new ground in the integration of site, land use and disease variables. Each annual prescription is therefore regarded as interim.

This prescription sets out objectives and guidelines for FIRS based on the best information available in November 1986.

2. OBJECTIVES

The Forest Improvement and Rehabilitation Scheme is applied to unmined forest within the bauxite mining envelope. The objectives are:-

. To treat the forest so as to render it less susceptible to dieback disease impact.

To rehabilitate forest in which the overstorey has been extensively destroyed by disease.

. To prevent erosion which contributed to stream turbidity.

. To identify areas for improvement treatment, in healthy unmined forest.

The overall objective of FIRS is to maintain or improve the capacity of the unmined forest to produce water, timber, recreation, conservation and/or other forest values. Emphasis will vary according to the management priority for each area.

3. TREATMENT SELECTION

. There are four basic F.I.R.S. treatments:-

. Stream Zone Protection.

. Dieback Protection via Understorey Manipulation.

Rehabilitation of Dieback Graveyards.

Identification of and Implementation of Improvement Treatment for Healthy Forest.

When planning the F.I.R.S. treatment for a particular compartment of forest the stream zones are selected first. The remainder of the unmined forest is to be given either the Dieback Protection treatment, (2), or the Graveyard Rehabilitation treatment, (3) or a variation of these two treatments. Improvement treatments of Healthy Forest, (4), are to be applied after mining and rehabilitation to some of the protected areas.

The choice between the Dieback Protection and the Graveyard Rehabilitation treatments depends on current dieback impact and on the likely consequences of treatment on dieback impact. Four situations are described below to illustrate how the choice might be made:-

- The most simple situation is where the forest is dieback free with a dense population of B. grandis, and where infection from mining is likely. The Dieback Protection treatment, (2), is then applied.

- The other simple situation is where the dieback impact is very high, with well over half the jarrah overstorey killed by dieback. The Graveyard Rehabilitation treatment, (3), is then applied.

- Where disease impact is low (understorey only affected) the Dieback Protection treatment, (2), should be chosen but will need to be modified to suit the situation.

- Where the overstorey is affected by dieback, but not more than half of it has been killed there is a risk that applying the Graveyard Rehabilitation treatment will further increase the disease impact. A conservative combination of the Dieback Protection and Graveyard Rehabilitation treatments is recommended. B. grandis numbers should be reduced, if applicable, and then understorey seed and seed of resistant eucalypts introduced. The disturbance to soil and to existing vegetation should be minimal.

The process of choosing the appropriate treatment is depicted in Figure 1. A treatment where little or nothing is done may be most appropriate in some areas where the disease is flourishing.

4. IMPLEMENTATION

A 5 year FIRS plan is to be developed for each minesite. This will be a rolling plan which must be updated in September of each year. At the same time an annual FIRS works programme will be drawn up in accordance with approved mining plans and available finance. The "FIRS Year" is regarded as running from the beginning of January to the end of December. Each plan will be subject to endorsement by Alcoa.

As soon as the areas to be treated are defined, each District Manager must ensure that:-

- The appropriate prescription is chosen or written.

- A detailed plan of proposals is prepared.

- A works programme covering manpower, machinery and season is drawn and priorities assigned.

- Staff responsibilities are made clear.

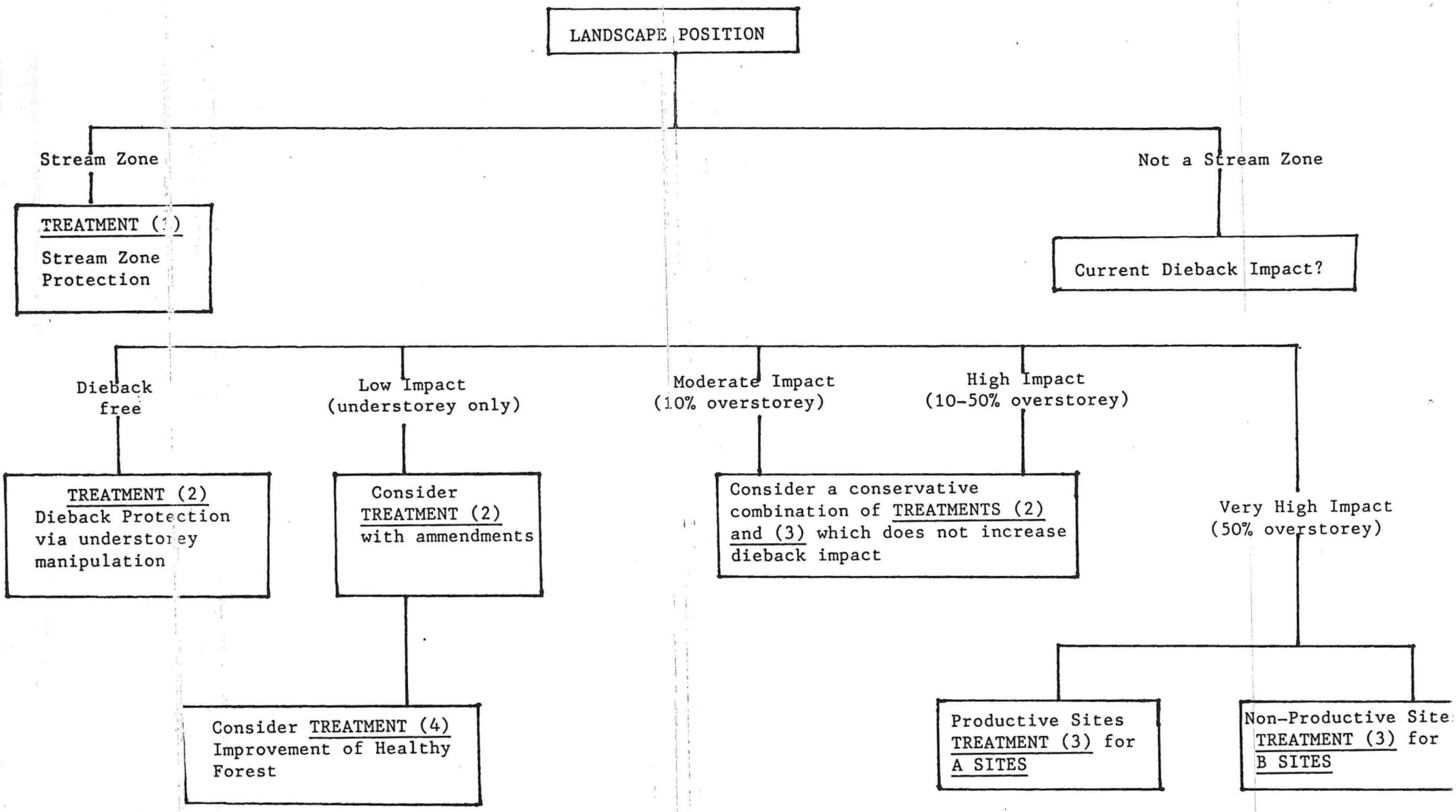

FIGURE 1: SELECTING THE APPROPRIATE FIRS TREATMENT

The following priorities apply:-

. Carry-over areas from previous year.

. Banksia control, autumn burn and drainage improvements in DB Free or lightly affected stands.

. Rehabilitation of advanced dieback in pipehead catchments.

The Regional Leader will review progress each quarter in each District to ensure that programmes are completed according to prescription and budgets not overspent.

The Regional Leader will prepare a report for Alcoa at the completion of each financial year which will describe: areas treated, costs and treatments used.

Completed work is to be recorded on the Bauxite HOGS (1:10,000). The amended plans and Register are to be forwarded to Inventory and Planning in June each year.

Divisional staff will maintain fortnightly records of costs and works progress and input this on the 097 report.

A joint Alcoa/CALM inspection of works programmes will normally be made each 6 months and written comments exchanged.

5. REVIEW AND CONTROL

This prescription will be reviewed in July each year and updated as necessary, on the basis of:-

. Changes in emphasis.

. New research findings.

. The need to correct inadequacies in the existing prescription.

It is acknowledged that the prescriptions contained in the following pages are guidelines only. Due to the nature of each minesite the prescriptions will vary to accomodate the needs of the particular site. However major deviations from these prescriptions must be operationally trialed so that they can be assessed and input into the annual FIRS review.

Communication between the minesites and Research Branch must be maintained so that trials are not duplicated where this is deemed inappropriate.

6. FIRS CHECKLIST

Prior to any FIRS work taking place the following information should be consulted or written. Some of this information may not, as yet, be available, but it should become the long term requirement for all FIRS work.

- landforms
- site vegetation types
- hygiene map
- predicted impact map
- 7 - way test

7. FIRS PRESCRIPTIONS

Treatment (1) - Stream Zone Protection

Preamble

Stream Zones are to be selected so as to prevent turbid water from roads and bauxite pits entering streams. They need to be more extensive and secure in harnessed catchments than elsewhere.

Gravel pits, roads, earth dumps etc., which may contribute to stream turbidity should be treated to prevent erosion. Treatment may include closure or relocation if appropriate, earthworks if necessary, and stabilizing soil with vegetation.

Aim

To protect the existing vegetation in the stream zone so that it can filter sediment.

Method

1. Where necessary, and particularly in catchment areas, bare areas within stream zones may be seeded with understorey to enhance their ability to filter out sediment.

2. Where there is a recreation facility within or adjacent to a stream zone it may be necessary to:-

   . fall dead or dangerous overhanging trees.

   . control erosion from car parks and access roads.

   . do limited hazard reduction burning to prevent a dangerous hazard adjacent to picnic areas.

3. If adjacent treatment areas are to be burnt it may be necessary to protect the stream zone by either a burnt edge or a fuel reduction burn in cool conditions. Machine graded firelines are to be avoided if possible. It is recognized however that some stream zones may need to be hazard reduction burnt for protection management purposes. These burns must be programmed so as to avoid the possibility of erosion e.g. early spring. These burns must be broken up in both time and space to avoid disturbing an entire stream habitat.

   The W.A.W.A. must be notified of any burns which are to take place in stream zones.

4. Records of all stages of the treatment are to be kept in a central filing system in the District Office.

Treatment (2) - Dieback Protection via Understorey Manipulation

Preamble

Dieback research has shown that Banksia grandis is highly susceptible to Phytophthora cinnamomi as it is a host tissue from which the dieback fungus can readily sporulate and spread. Dieback research has also indicated that a legume understorey should disfavour the survival and spread of P. cinnomomi. The aim of the treatment, therefore, is to reduce the population of B. grandis and increase the density of legumes in the understorey, thus tipping the balance in favour of the forest rather than the fungus. It is recognized that there are other factors, such as a highly susceptible site or increased drainage from roads and pits, which increase the likelihood of severe disease expression. However, B. grandis will be replaced by legumes unless it is clear that these other factors over-ride the likely benefits from the FIRS treatment.

Aim

To reduce (not eliminate) the B.grandis populations using a combination of machines, fire and herbicide. This is best carried out 3 - 4 years prior to mining and priorities should be assigned accordingly.

Method

One method by which understorey manipulation takes place is currently in use. This is:-

Strategy A - manual kill of Banksia, burning, followup foliar spraying.

1. Select area of uniform treatment

2. Work through FIRS checklist

3. Identify:- dieback categories
   B. grandis populations
   legume occurrence
   jarrah lignotubers occurrence

4. Using rubber tyred machine or chainsaw push or cut-down all B. grandis more than 2m tall. (Notching using Roundup is another method being trialed at Harvey, but is not a preferred method).

5. Prepare tracks and edges for burn. Carry out falling of stags within 100m of burn boundary and where dangerous to FIRS operations.

6. Carry out erosion control works as required and close unwanted roads. Avoid draining water into dieback-free or lightly affected areas.

7. Burn at least one year after the above when Banksia cones are dry and seeds have germinated. Burn in summer - autumn using the following guidelines:

   . Fire Danger Index (FDI) 30 - 35
   . Tower Winds 10 - 20 kph.
   . Soil Dryness Index 1200.
   . Surface moisture content 10 - 12%.
   . Ignite about 1 hour after the peak of the day.

. Light fires sufficent distance apart so that they meet towards dusk.
. Record the following details about the burn on the FIRS Register: Date of burn, SMC, RH%, SDI, time of ignition, winds and temperature during the burn, Rate of Spread.

8. The following winter after rain apply legume seed where necessary at 0.25kg/ha of major mix. As a guideline presume legume seed to be deficient unless there is at least one plant every 20m of Acacia pulchella, A. europhylla, A. lateriticola or Bossiae aquifolium. The following is a guide to species which should be added to different sites, though it is probably best to have a basic mixture of local legumes and to add the following in greater proportions for the specific sites.

SITE	SPECIES
Moisture gaining	Acacia extensa, A. alata
Havel T & Q	A. europhylla, Bossiaea aquifolium, Kennedia coccineae
Havel P & S	A. pulchella, A. lateriticola

Where there are insufficient jarrah lignotubers (ie. 1 every $10m^2$), jarrah seeding will be done in conjunction with legume seeding, by hand or aerial application.

9. In the spring-summer following the burn using Roundup poison any B. grandis coppice from cut stumps or lignotubers if necessary.

10. The timing of subsequent burning is dependant upon the objective of the burn:-

(i) reduce fuel below 8 tonnes/ha.
(ii) maintain B. grandis at a height that it doesn't seed i.e. < 4cm dbhob.
(iii) regenerate legumes.

Further research on objective (ii) and (iii) will be necessary to determine just when is the appropriate time to carry out this burning so as not to effect jarrah establishment. Prior to any subsequent burning an assessment of banksia regeneration and the extent and quality of jarrah/marri regeneration should be carried out.

11. Records of all stages of the treatment are to be kept in a central filing system in the District Office.

Treatment (3) - Rehabilitation of Dieback Graveyards

Preamble

Rehabilitation on advanced dieback areas should not be expected to grow fast, as the underlying causes of dieback disease also lead to less than ideal conditions for tree growth. In most areas intensive effort to establish fast growing trees is inappropriate.

Planting of eucalypts is suitable only on those advanced dieback sites where tree growth is expected to be good. On most sites planting and fertilizing will encourage shoot growth at the expense of root development. Root development is considered the priority for survival and growth on infertile upland sites and to facilitate root development trees should be grown from seed on site. It is hoped that trees will develop their above ground parts only when they are capable of supporting that shoot growth.

Tree species for rehabilitation need to be selected to suit the particular advanced dieback sites so that long term growth is maximized. The success of different species beyond the establishment phase needs to be rigorously evaluated on different sites.

Aim

Rehabilitation should aim to increase the potential for recreation and fauna conservation, without compromising the primary landuse of water production where applicable. Rehabilitation should also aim to improve the timber production potential, but the amount of effort should be appropriate to the expected tree growth. Where natural regeneration is occurring the treatment should aim to encourage that regeneration and supplement it if necessary.

Method

1. Select area to receive a rehabilitation treatment over one season.
2. Work through FIRS Checklist.
3. Identify:-
   - advanced dieback boundary
   - Site types
   - areas of good natural regeneration
   - areas upslope of dieback-free or lightly affected forest.
   - areas where more than 50% of the original jarrah canopy remains.
4. Subdivide area into:-

   A Sites - productive sites
   B Sites - non-productive sites

5. Site Preparation

   A Sites - may undergo more intensive site preparation through the creation of ashbeds and the preparation of rip lines for planting. However, where trees are healthy and growing well, they are not to be fallen.

   B Sites - should undergo little site preparation. If there is little understorey, scarifying for seed establishment may be the only treatment. Areas of advanced dieback upslope of dieback-free or less affected forest should be treated conservatively so as not to increase the risk to downslope forest.

6. Carry out felling of stags within 100m of burn boundary and where dangerous to FIRS operation.

7. Carry out erosion control works as required and close unwanted roads. Avoid draining water into dieback-free or lightly affected forest.

8. Burn if necessary to reduce the hazard for young rehabilitation or to create ashbeds.

9. A Sites - spread 500g seed (FIRS mix) with 500kg/ha of Super No. 1 (including Copper) by tractor. Plant 625 spha and fertilize using 200g of DAP/plant, following the onset of winter rains.
B Sites - seed with 1.5kg/ha understorey (Rehab major mix) and .4kg/ha eucalypt seed, bulked with 500kg/ha of Super No. 1 (including Copper) following winter rains.

10. Tree species currently being used in graveyard rehabilitation include:-

Local	E. megacarpa	- bullich
	E. diversicolor	- Karri
	E. calophylla	- marri
	E. patens	- blackbutt
	E. laeliae	- Darling Range ghost sum
	E. wandoo	- wandoo
East.	E. maculata	- spotted gum
States	E. resinifera	- red mahogany
	E. muellerana	- yellow stringybark
	E. agglomerata	- blue leaved stringybark

11. Records of all stages of the treatment are to be kept in a FIRS Central filing system in the District Office.

Treatment (4) - Identification and Implementation of Improvement Treatment for Healthy Forest

1. Three to five years after a particular area has been mined and rehabilitated the remaining adjacent forest should be surveyed to identify areas for improvement treatment. This time scale is necessary to allow any new dieback infections time to express themselves.

2. Where thinning is proposed, it should be added to the District's J.S.I. programme. If there are additional costs to this treatment due to the mining operation, they should be born by ALCOA.

3. In areas which are known to be protectable, a combined thinning and understorey manipulation treatment may be carried out prior to mining.

8. RECORDING

Recording may take on a variety of forms i.e.:-

- documentation on the Bauxite HOCS and FIRS Register.
- research working plans
- permanent plots in the field
- formal/informal interflow of ideas between Districts, Alcoa and Research.

9. CURRENT FIELD TRIALS

1. Winter cut-stump banksia eradication trial in Dwellingup District.

2. Fire intensity vs rates of understorey seeding establishment following banksia pushdown.
   Co-ordinator, Les Robson.

3. Stumphole Treatment: on black gravels push out stumps, scrubroll, autumn burn, seed and/or plant. Harvey District.

4. Scarifying vs not scarifying in productive (A Site) graveyard areas. (Treatment 3). This has been established at Jarrahdale at Location H.38.05/11 and will be monitored by Alcoa in Autumn 1987.

10. RESEARCH/FIELD TRIAL INFORMATION REQUIREMENTS

1. Species selection especially infertile upland sites. (Treatment 3).

2. Seeding vs planting. (Treatment 3).

3. Seedfall in banksias with respect to notching and burning. (Treatment 2).

4. Time it takes banksias to reach 4cm dbhob. (Treatment 2).