P. BLANKENDAAL

Dieback Interpretation Procedures Manual

Department of
CONSERVATION & LAND MANAGEMENT

C O N T E N T S

		Page
INTRODUCTION		4
1.	Preparing For Interpretation:	5
1.1	Film	
1.2	Flight Line Maps.	
1.3	A.P.I. Type Maps.	
1.4	Cutting and Burning Records.	
1.5	Aerial Photographs.	
1.6	Landform & Vegetation Maps.	
1.7	Priority Areas.	
1.8	DRA Permits.	6
1.9	Cell Reconnaissance:	
	- I.S.D. Distribution.	
1.10	Interpretation Equipment.	
1.11	Previous Dieback Mapping.	7
2.	Interpretation:	
2.1	Office.	
2.2	I.S.D. Map.	
2.3	Field.	8
3.	Sampling:	9
3.1	Aim.	
3.2	Strategy.	
3.3	Procedure.	
3.4	Equipment	
3.5	Sites Visited and Not Sampled.	10
3.6	Office Procedures.	
	- Sampling Records Sheet.	
3.7	Sample Location Map.	11

.../2

			Page
4.	Hygiene Data:		
	4.1 Introduction.		12
	4.2 Legend.		13
	4.3 Mapping Categories:	1. Dieback. - P. citricola infections.	14
		2. Suspect.	
		3. High Potential Risk (H.P.R.).	
		4. Not effectively Quarantined (N.E.Q.).	
		5. Uninterpretable.	
		6. Low Potential Risk (L.P.R.).	16
		7. Secure Dieback-Free	
	4.4 Compiling Hygiene Data.		
5.	Impact Data:		
	5.1 Introduction.		18
	5.2 Legend:	1. No Impact.	
		2. Low Impact.	
		3. Moderate Impact.	
		4. High Impact.	
		5. Very High Impact.	
		6. Note.	
	5.3 Compiling Impact Data.		
6.	Vegetation Data:		
	6.1 General.		
	6.2 Vegetation Assessment Method 1 (Ground Survey)		19
	6.3 Vegetation Assessment Method 2 (Use of transparencies)		21
	6.4 Determination of Vegetation Segments at Plots.		22
	6.5 Conclusion.		23
7.	Armillaria Map:		24
8.	Presentation of Information to Mapping Branch. (Map Printing)		25

9. Cell Reports:

   9.1 Purpose.

   9.2 Distribution.

   9.3 Information Required.

10. Requests From Regions/Districts:

   - Dieback Demarcation.

APPENDICES

1. Storage Care and Handling of Film.
2. Care and Maintenance of Interpretation Equipment.
3. Motorbike Use and Safety.
4. Calculating Film Scale.
5. Sampling Procedure.
6. Sample Records Sheet.
7. Sampling Information Sheets.
8. Hygiene Map.
9. Impact Map.
10. Summary of Sample Results,
11. Demarcation Procedures.
12. Sample Location Map.
13. Vegetation Plot Assessment Sheet.
14. Vegetation Distribution Decision Sheet.

INTRODUCTION

This procedure manual has been prepared as a guide for all interpreters. As procedures change it will be necessary to issue revised or different procedures which should be inserted into this file. Old procedure information should be discarded at this time.

Though any procedure manual provides information that is appropriate to the most usual conditions that apply, it may be possible to practice methods or techniques not recorded in this manual. Where changes or improvements are noted, interpreters should notify O.I.C. Interpretation Standards for approval to make such changes. A written report should follow.

Interpreters are required to be thoroughly familiar with the procedures in this manual. These procedures are the benchmark of the dieback mapping work and must be rigorously adhered to.

The highest standard of work is required at all times from interpretation staff, anything less is not acceptable.

..../5

1. PREPARING FOR INTERPRETATION

1.1 Film:

The 230mm film will be sent to the interpreters. This will consist of one set of colour transparencies and one set of colour prints.

Ensure all frames have arrived. Record fact in photo records book. Check film quality on arrival and advise OIC Interpretation Standards immediately if you have any queries regarding the film. Refer Appendix 1 Storage and handling 230mm film.

1.2 Flight Line Maps:

Six flight line maps will be sent to the interpreters by Mapping Branch:
- office copy
- field copy
- Armillaria map
- sample location map
- two spare copies

1.3 API Type Map:

These give a broad indication of forest types and distribution.

1.4 Cutting and Burning Records:

These give the interpreter an overview of activities that have taken place in the forest. Provide background information on why the forest has a particular appearance at the time of photography.

1.5 Aerial Photographs:

Obtain a copy of the latest Lands Dept. photography over the cell. Records are kept by the Inventory Section and Mapping Branch at S.O.H.Q.

The photography is useful for
- general topography
- forest types
- preparing Hygiene Maps

1.6 Landform and Vegetation Maps;

If available the system 6 maps should be used as a guide to the Landforms present and the distribution of Havel Vegetation types. Check to see if previous vegetation studies have been done in the area by Alco, CSIRO or CALM

1.7 Priority Areas:

Liaise with R/L Operations, R/L Planning and Section Manage with regard to priorities placed on parts of cells ie. A section of the cell may be required urgently for logging or burning. Interpretation should be directed at completin these areas first.

1.8 DRA Permits:

If the Cell is within the Disease Risk Area (D.R.A.)

- determine the D.R.A. boundary.
- obtain a permit to enter and ensure all conditions are observed.
- obtain a list of current permit holders in the Cell Area and the locations of illegal entres, if known.

1.9 Cell Reconnaissance:

Traverse the cell boundaries and internal access roads. Note any irregularities such as burning, recent falling, road works. D.R.A. entries, disease infections and expressions, topography and gravel pits.

INDICATOR SPECIES DISTRIBUTION

Obtain an overview of Indicator Species Distribution (I.S.D.) throughout the cell, note any uninterpretable areas. It is useful to note the different forest types, landforms and vegetation complexes present, in relation to the density and the species present.

1.10 Interpretation Equipment:

The equipment to be used will be:

- Wild Aviopret ST4 Mirror Stereoscope mounted over a transmitted illumination light source - office stereoscope.

- Wild T.S.P.1. Pocket Mirror Stereoscope - field stereoscope.

- Translucent acrylic sheet, with carry strap and bulldog clips for holding transparencies - field light source.

See Appendix 2 for 'Care and Maintenance of Interpretation Equipment.'

1.11 Previous Dieback Mapping:

Check with Inventory to see if any high standard dieback mapping has been done in the area previously. This is relevant as it shows extent of disease distribution and areas of disease for checking impacton during reconnaissance.

2. INTERPRETATION.

2.1 Office:

Each interpreter must closely scan the 230mm frames. The second interpreter to view the frames must ensure he contributes to the interpretation by marking on the areas where he differs from his partner eg. - extra I.S.D.
- dieback and uninterpretable boundary differences
- extra check sites

On every frame viewed determine if there are sufficient indicator species visible to detect the presence of P. cinnamomi. If there are insufficient indicator species visible the area is to be called uninterpretable. All indicator species deaths (I.S.D's) are to be marked on the film using the following symbols.

O	Banksia Death
□	Blackboy Death
J	Jarrah Death
◇	Emu Bush
X	Dryandra sessilis
V	Hakea sp. or any local indicator species used

Due to the large area covered by each frame, great care is to be exercised when scanning for I.S.D's and Check Sites. A grid (50 x 50mm) is to be marked on the office light source and a system of scanning these squares be adopted by each interpreter. All frames are to be scanned by both interpreters. Any suspicious areas that require field checking and are not associated with I.S.D's should be shown thus

CHECK

These areas could be old gravel pits or landings etc.

2.2 I.S.D. Map:

The principal point of each photo that has any I.S.D, check sites or uninterpretable information, is highlighted on the 230mm principal point map.

This map is used along with the film as the basis for all field checking. EXAMPLE

..../8

2.3 Field Checking:

All dieback and suspect boundaries will be checked and plotted onto the color transparencies in the field.

The boundaries are to be plotted onto the transparencies using distinct features such as logs, tracks, stags etc.

Motorcycles are extremely useful in moving from one sample point to the next. The motorcycles should be used at low speed with appropriate safety equipment. Boundary plotting should not be attempted from the motorcycle.
Refer also to Appendix 3 'Motorbike Use and Safety'.

To determine the scale of the frame see Appendix 4 'Calculating Film Scale'.

The color transparencies are to be retained by the interpreters at all times. They are the record of I.S.D's found, boundaries plotted, sites visited, checked and sampled, for the interpreters. All this information is to be retained on the transparencies at the completion of interpretation for future reference and enquiries.

3. SAMPLING.

3.1 Aim:

Sampling is used initially to ensure P. cinnamomi can be recovered by the laboratory from certain species and to establish the reliability of indicator plants in a particular cell. Once this is achieved samples should be taken to maintain interpretation standards within the cell. In most cases sampling isolated dead plants is the only way of determining if P. cinnamomi present. Samples should be used to verify that the interpretation was correct.

3.2 Strategy:

Interpreters should use soil and root tissue samples to set and then to verify interpretation standards.

Therefore samples should cover all I.S.D. categories and cover a range of plant species on various landforms.

3.3 Procedure:

Navigate to the dead plant or plants using the 230mm film. Once the plant has been located, thoroughly investigate the site.

Identify the sample with cell, run, frame No. and frame sample number.

Sample a recent dead plant. This procedure is detailed in Appendix 5.

Complete a field sheet. This procedure is detailed in Appendix 6.

3.4 Sampling Equipment:

This should include:

(a) Suitable back pack.
(b) First aid kit.
(c) Sterilant - alcohol.
(d) Aluminium tags.
(e) Heavy duty plastic bags.
(f) Cable ties.
(g) Artline 70 or similar permanent marker.
(h) Clipboard, ball point pen, fieldsheets.

(i) Flagging tape.

(j) Thin wire for attaching aluminium tag to sampled plant or nearby tree.

(k) Mattock.

3.5 Sites Visited and Not Sampled:

The situation often occurs where plant deaths marked on the film are investigated and no sample is taken. This occurs when the death detected is too old to sample and there are no recent deaths or, false symptoms were detected. False symptoms could be other features resembling I.S.D's (ant nest resembling a Blackboy), or I.S's that have recovered eg. Fire killed Banksias with a large number of Epicormics. A brief description of the area can be written on the photograph ie. NOT P.C. epicormics present all other indicator species healthy.

3.6 Office Procedure:

Sampling Records Sheet: .

For each sample collected, the following details are entered on the Sampling Records Sheet, Appendix 7, prior to despatch to the Research Section at Dwellingup.

1) Frame and sample number.

2) Date the sample was taken.

3) The topographical location class.

4) The symptom class the sample was taken from eg. Isolated, Multiple.

- One of these sheets will be used per run (if 230mm) or roll (if 70mm).

- Samples and the photocopies of the Sampling Records Sheet will then be despatched together to Dwellingup Research.

- The processing results will be sent on a photocopy sheet from Dwellingup to the interpreters.

- For subsequent samples on the same run, rule off under the previous samples, enter the new details, photocopy the sheet and send this with the samples.

3.7 Sample Location Map:

A flight line diagram will be provided by Mapping Branch and details of samples taken will be recorded as follows by the interpreters:

1. For each frame, record the sample number and beside this, record the relevant sample information by use of a symbol.

   Eg. 1 ⊕
   2 O

2. This map should be kept uptodate and stored at the interpreters office.

3. The index for colours and symbols used is in Appendix 12 along with an example of a sample map.

4 HYGIENE DATA.

4.1 Introduction:

The Hygiene Map provides information that can be classified into two areas.

1. It accurately show the location of P. cinnamomi infections at a point in time. The boundaries are precise and are easily recognized by the trained interpreter.

2. It provides information about the possible presence of the disease (Uninterpretable, N.E.Q.) and the risk of disease spread by natural and artificial means.

   The categories that are used do not have precise, easily recognized boundaries, as do area of Dieback. They are zones with an accuracy of around 50m. The define areas of functional co-herance. They are intellectual creations that enable us to order particular places within general frames and are mapped to assist planners in recognizing (at least to some degree) what the of the disease might be. Operations personnel cannot place an exact boundary on these conceptual categories, and probably need a good deal of training in understanding the concepts and limitations of such maps.

The map categories are listed in a particular order. This was done with the intention of assigning a priority to each category that is relative to diease presence. The category considered to have the least likelihood of Dieback presence and is not considered at risk from natural spread is at one end of the scale of priorities, while at the other end is the Dieback category. Relating this to operations then, it is considered there is little or no risk of spreading Dieback from secure Dieback-free forest, but there is certain risk of spreading disease from Dieback areas. The categories between are considered to have different levels or risk equated to the position within the hierarchy of categories.

In working with the low and high potential risk categories the interpreter is stretching his knowledge of disease behaviour to the limit. What he is predicting may in fact not occur, relative to degree or place.

Though the definitions of the categories set down guidelines for the determination of particular risk, they must be considered guidelines only, and not as institutionalizes laws. The interpreter

is the judge and jury alone. What he determines to be the risk is final. No one else has the local knowledge and insight to disease behaviour to do anything different.

4.2 Legend:

Secure Dieback-Free: Forest apparently free of Dieback and upslope from Dieback, Suspect, Uninterpretable, and N.E.Q. roads.

Low Potential Risk: Forest apparently free of Dieback but downslope from Dieback, Suspect, Uninterpretable or N.E.Q. Considered to have a low potential for infection by P. cinnamomi by natural spread.

Uninterpretable: Forest in which susceptible plants are absent or too few to enable the interpretation of P. cinnamomi presence or absence.

N.E.Q: Forest adjacent to roads in which there is a potential for incipient disease.

High Potential Risk: Forest apparently free of Dieback or uninterpretable, but downslope from or in the same swamp as dieback or suspect. Considered to have a high potential for infection by P. cinnamomi by natural spread, in free water.

Suspect: Forest in which the evidence for P. cinnamomi presence or absence is inconclusive.

Dieback: Forest areas which show current Dieback symptoms and are supported by laboratory recoveries of P. cinnamomi from soil and tissue samples.

N.B. **N.E.Q. Not Effectively Quarantine** - Roads, tracks within the disease risk area that have had considerable use throughout all seasons with an unknown degree of Hygiene.

Incipient Disease - Forest in which P. cinnamomi may be present but symptoms are yet to appear.

Appendix 8 shows an example of a Hygiene Map.

..../14

4.3 MAPPING CATEGORIES.

1. Dieback:

Forest areas which show dieback symptoms and are supported by laboratory recoveries of P. cinnamomi from the soil and tissue samples.

- P. citricola infections are shown on the Hygiene plan as the same color as P. cinnamomi infections with a notation identifying the infection as P. citricola.

2. Suspect:

Forest in which the evidence for P. cinnamomi presence or absence is inconclusive. (Blue on dieback-free forest maps). The suspect category is a legitimate category, not a haven for indecision. Some sites will exhibit some but not all the diagnostic elements of an infection - these sites are most accurately described as suspect. Intensive sampling can often be used to determine if P. cinnamomi is present in these areas.

3. High Potential Risk (H.P.R):

The high potential risk category is determined from local knowledge and 1:25,000 Black and White aerial photographs. That forest downslope from or in the same swamp as Dieback or Suspect. Considered to have a high potential for infection by P. cinnamomi by natural spread, in free water. The water can be above or below ground flow.

4. N.E.Q:

Roads and tracks within the cell that have had considerable use during all seasons with an unknown degree of Hygiene are shown as not effectively quarantined. The forest adjacent to these roads is shown as N.E.Q. on the map. All open access roads (purple on coloured 1:50,000 scale maps) fall into this category plus roads and tracks where breaches of quarantine have occurred. The N.E.Q. Zone is approximately 50 metres wide on both sides of N.E.Q. roads and tracks.

5. Uninterpretable:

This category is used to account for a number of situations.

(a) Forest recently burnt or logged will be delineated and identified by the words burnt or logged and the date this occurred. Such areas are considered to be temporarily uninterpretable and may require further interpretation some time after burning or logging.

2. Areas of non forest such as gravel pits, transmission lines, roads, areas of rock, areas of forest cleared.

3. Forest in which susceptible indicator plants are absent or too few to enable interpretation for the presence or absence of P. cinnamomi.

Within all ~~categories~~ these situations, areas less than 1 hectare are not considered, but are mapped in conjunction with the forest around the area. To map such small areas would require a change in the map scale.

It is the third category (above) which requires considerable investigation. Interpreters must interpret dieback-free forest on the basis of the live indicator plants present. It is not possible in some forest types to detect indicator plants due to their absence (as in karri, wandoo forests, swamps), scattered nature (as in some eastern forest types), or by the fact that they may be obscured by dense canopy or scrub. Field investigations are necessary in some of these forest types. Within some of these forest types ie. within dense karri, karri-marri or dense swamps, it is not possible to detect indicator plants, indeed they often do not occur in such situations.

In situations where field investigations are to be carried out it is necessary to consider the distribution, reliability and the stature of the indicator plants present. It is necessary to use the "strip line" approach with the parallel lines about 15-20m apart. Where there is any doubt about the reliability of decision relative to disease presence or absence, the area should be classified as uninterpretable.

Over larger areas it may be possible to classify the forest using photo-interpretation with field checks to verify the interpreted decisions. Field checks should be made within all the different landform/vegetation segments that are being mapped. Where film interpretation cannot be verified, considerable work will be necessary to adjust interpretation standards, or begin detailed "strip line" surveys.

The boundaries of uninterpretable forest are often difficult to determine. In such situations boundaries should be shown at a point where interpreters are absolutely sure that it is possible to detect, interpret and map disease occurrence.

..../16

This mapping category must be used with the same degree of reliability as any other. This will mean considerable time must be expended in accurately determining the degree of interpretability and the boundaries of such areas.

Uninterpretable will have a hatch over it. Where it is covered by a category that is higher in priority relative to disease presence (H.P.R. or N.E.Q.) the hatch and the boundary will continue.

This will ensure that all uninterpretable areas can be located on the map by the users.

6. Low Potential Risk:

Areas of forest downslope from Dieback and Suspect but considered to have ~~a low~~ potential for infection by P. cinnamomi by natural spread. Areas downslope from uninterpretable and N.E.Q. are also included in this category.

7. Secure Dieback-free:

The area of forest apparently free of Dieback, and upslope from Dieback, Suspect, Uninterpretable and N.E.Q.

4.4 Compiling Hygiene Data:

1:25,000 scale Black and White aerial photographs are available from Mapping Branch. These should be used in conjunction with contour plans and local knowledge acquired during interpretation.

The following procedures should be rigorously applied by all interpreters.

1. Areas of forest that are known to be infected with P.c. and ajoining the area mapped, but are outside the existing mapping boundary, should be included and plotted to approximately 50 metres outside mapping boundary. Mapping Branch staff will then amend the boundary to include such areas.

..../17

2. Areas of forest known to be infected with P.c. that are outside the mapping boundary and do not adjoin any part of the mapping areas, but will influence that area are not to be shown on the map. The influence zone from this infection will appear on the Hygiene map within the boundary of the mapping cell.

3. N.E.Q. roads will continue to be plotted on both sides of the road, even when this means that one half of the road will be shown as yellow colour outside the mapping boundary.

..../18

5. IMPACT DATA.

5.1 Introduction:

A map showing the current situation in terms of overstorey impact related to P. cinnamomi infections provides information on the effect the disease is having on the forest. (That is the number of plants being killed). Also provides information relating to the area of forest being affected severely, less severely or hardly at all. Provides planning and operations staff with an accurate graphical representation of areas of forest that are affected to varying degrees, enabling logging, and road operations to be directed to particular areas of forest. This information is an important step to providing potential impact in areas of forest not yet affected.

5.2 Legend:

No Impact: This includes areas of Dieback-free, Uninterpretable, Suspect P. citricola and Armillaria affected forest.

Low Impact: Some susceptible plants in the understorey killed by Phytophthora cinnamomi.

Moderate Impact: Many susceptible plants in the understorey killed by P. cinnamomi with less than 10 percent of overstorey dead or dying.

High Impact: Many susceptible plants in the understorey killed by P. cinnamomi with greater than 10 percent but less than 50 percent of the overstorey dead or dying.

Very High Impact: Most susceptible plants in the understorey killed by P. cinnamomi with greater than 50 percent of the overstorey dead or dying.

N.B: Within the forest there are always a number of dead and dying trees. These do not necessarily die as a result of P. cinnamomi infection and are referred to as "Background Deaths". In determining the percentage of dead or dying trees within an area of diseased forest, the level of background deaths are considered.

Appendix 9 shows an example of an Impact Map.

5.3 Compiling Impact Data:

The information is compiled from local knowledge acquired during interpretation of the cell and plant deaths visible on the film. The boundaries will be a zone rather than a distinct line.

..../19

6. VEGETATION DATA.

Interpreters are required to provide vegetation distribution data for the purpose of predicting disease impact, both within and outside State Forest.

The following is a description of the assessment methods that may be used.

6.1 General:

- Collect all broadscale vegetation information that is available for the area eg. System 6, joint C.S.I.R.O. studies.

- Check with State Headquarters and other Sections within the Department to see if any detailed vegetation work has been done in the area previously. If so check with the relevant supervisors to see if the information is sufficient. (eg. R/L Operations, Section Manager Inventory, Forester - Standards A.P. & I.)

- If more is required then a vegetation assessment is to be done.

6.2 Vegetation Assessment Method 1:

6.2.1 Preliminary Office Procedure:

- Use vegetation information above (if available) to indicate possible trends and classifications of vegetation to be expected in the area.

- Use 1:25,000 (or 1:12,500) scale plan of area to record and direct assessment work.

- Plan and draw in intended assessment lines at 200m intervals. These should be drawn <u>across</u> contours where possible to facilitate assessment of greatest variance in vegetation due to topography change.

- Topography changes can be detected using large scale aerial photography (1:25,000, 1:50,000) or contour plans where available.

- If area is DRA ensure that a current permit for entry has been issued.

- Check which rainfall zone the area is in as this will affect the present or absence of certain vegetation segments.

..../20

6.2.2 Preliminary Field Procedure:

- Do a reconnaissance of the area by vehicle.
- Check for openness of tracks, vegetation segments present and the current impact status on any areas of dieback. Check what vegetation segment occurs on these dieback sites. (See 6.4 below)
- Check that roads intended for use as end points of assessment lines are present and trafficable (if vehicle access is necessary).
- Alter positions of assessment lines if necessary to accommodate changes due to inaccessibility.

6.2.3 Field Procedure:

- Using a compass and hipchain walk along each assessment line recording the vegetation segment that is present at each 100m interval and at any perceived point of change in the vegetation segment along the line.
- If the vegetation segments are very familiar to the assessor then there is no requirement to work through the Vegetation Distribution Decision Sheet. If not then the Decision Sheet should be used until the assessor is thoroughly confident in naming the segments in the area.
- The Vegetation Distribution Decision Sheet (V.D.D.S.) should be used where there may be subtle changes in the vegetation segment, but the exact nature of the change is not known.
- Any sites off the assessment lines that show possible differences in segment than what is on the line, should be checked and a field plot done if necessary.
- The process for deciding the vegetation segment at any site using the V.D.D.S. was described in section 6.4.

6.2.4 Office Procedure:

- Transfer assessment data onto a plan and join up common points on boundaries where applicable.

..../21

6.3 Method 2:

This method incorporates the use of 70mm or 230mm aerial photography that has been taken of the area to be assessed.

6.3.1 Preliminary Office Procedure:

- Use vegetation information above (6.1) to indicate possible trends and classifications of vegetation to be expected in the area.
- Choose random sites on the flight line diagram to do plots.
- Choose random areas, across contours, to do sample assessment lines. Mark on the flight line diagram.
- If area is DRA ensure that a current permit for entry has been issued.
- Check which rainfall zone the area is in as this will affect the presence or absence of certain vegetation segments.

6.3.2 Preliminary Field Procedure:

- Do a reconnaissance of the area by vehicle.
- When travelling through and around the area do sample plots at the preselected (random) sites. Record exact position of plot on film.
- Do a number of assessment lines at the predetermined positions. Record exact position of lines and plots on film.
- Determine the vegetation segment classifications for individual and line plots.
- By the end of the reconnaissance an appreication of general vegetation segment presence and distribution should have been gained.

6.3.3 Office Procedure:

- Check the plot sites on film to establish the visual attributes of the vegetation segment that is at each plot.

..../22

- Note any areas where the vegetation segments in the field are different but the visual attributes on film are the same. These areas must be set aside for strip line assessment to determine boundary positions.

- The remainder of the film should be viewed, with intermittent checks in the field at sites which prove difficult to determine from the film.

- It is important that interpreters take a lot of care in defining vegetation segments from the film. Decisions on vegetation segments should only be made after a thorough investigation of such in the field and on film has been done, and a reliable correlation established. The golden rule is "If in doubt, check".

- The final data should be shown on an overlay over the prints (230mm) that are sent to Mapping Branch showing the dieback information for the cell.

6.4 Determination of Vegetation Segment at Plots:

6.4.1 On the plot sheet (Appendix 13) record vertically the occurrence of trees and undergrowth. The ratings are:

- For trees, an area of 40m radius from the observation point.

  0 - Absent.
  1 - One or two trees.
  2 - Three to five trees.
  3 - More than five trees, but contributing less than one third of total stand.
  4 - Between one third and one half of total stand.
  5 - More than one half of the total stand.

- For undergrowth, an area of 20m radius from the observation point.

  0 - Absent.
  1 - Very rare, seen only after careful search.
  2 - Present, observable, but in small numbers only.
  3 - Common locally, but not uniformly over the whole area.
  4 - Common over the whole area.
  5 - Completely dominating the undergrowth.

  (Havel 1975 : page 70)

6.4.2 Record for the plot the number of representatives from each Indicator Group (shown on right hand side of plot sheet) and their occurrence rates on the Vegetation Distribution Decision Sheet.

6.4.3 Cross out any indicator groups that are not represented.

6.4.4 Cross out obvious non-types eg. Wandoo on Blackbutt presence or absence is indicative of certain types. Directly opposing types in relation to topography (eg S and E).

6.4.5 Underneath the table in the Decision Sheet, record the number of occurrences of each vegetation segment across the eight colums. Eg. Z-1, T-4, U-1 etc.

6.4.6 There will usually be a small number of segments left with higher ratings than the others. Again, eliminate the very low occurrence level indicators.

6.4.7 The remaining segments can then each be individually examined in Bulletin to see which most closely matches the plot site.

6.4.8 Admixtures of two types can also be calculated this way.

CAUTION: Be careful not to eliminate segments with one or two high occurrence wet site indicators.

6.5 CONCLUSION:

The two methods of vegetation assessment currently being used by interpreters are described above. There are possible variations within each of these methods, but these variations should be discussed with the Forester in Charge of standards at A.P. & I.

The decision on which method to use in a given area will depend on when the information is required, how much interpreter time is available and the degree of accuracy that is required by the user of the data.

Because of these factors the decision on which method to use should be made by the appropriate Section Managers in conjunction with the intended user (eg. R/L Operations).

REFERENCE: HAVEL J.J. (1975)
Site Vegetation Mapping in the Northern Jarrah Forest (Darling Range)
1. Definition of site vegetation types.

..../24

7. ARMILLARIA MAP.

The purpose of the map is to show the distribution of Armillaria throughout a mapping cell. This information is useful for (Dwellingup) Research and should be of use to land managers.

When Armillaria is detected a boundary should be plotted around the plant deaths on the color transparencies.

This information is then transferred onto a flight line map. Single plant deaths attributed to Armillaria infection should be shown as a circle (2mm radius) centred on the plant death. The area infected is then coloured brown.

Information on the recognition of Armillaria is available from Dwellingup Research (B. Shearer).

10. REQUESTS BY REGIONS/DISTRICTS.

Interpreters are often required to assist regional and District staff with disease protection and dieback demarcation, see Appendix 11 'Demarcation Procedures'. It is important that interpreters ensure that the request contains the following:

The type of information or level of assistance required is clearly stated together with the purpose of the request. It is important to identify who will be using the information.

When the information is required or completion date.

Format for information (ie. Map, table, short report etc.).

Accuracy level.

The interpreters involved should liaise with their Section Manager with regard to the current works programme before undertaking additional work.

APPENDIX 1.

STORAGE, CARE AND HANDLING OF FILM.

Synopsis:

The introduction of the 230mm format for Dieback interpretation and mapping should be seen as a further refinement of the overall photography programme. The generated forms in which photography is now presented to interpreters, inherits considerable advantages over the earlier 70mm format; physical care and handling being foremost.

As a major characteristic of the new system, and perhaps the main difference between the two formats - the film, upon which the initial image is acquired, is now safely stored as the "Master Copy" without the dangers inherent in using the Master for office and field use. Interpretation and mapping now uses first generation reproductions in the form of color transparencies and prints; the transparencies in particular being high quality and robust products ideally suited to the exacting procedures, of office and field, necessary for accurate interpretation.

Transparencies:

These are currently produced on an Agfa film, but Kodak manufacture a similar product. Both mediums are suitable and either may be used in future contracts.

The manufacturers describe the film base as dimensionally stable and colour fast ie. considerable, (for photographic film) variation in temperature can be experienced without change in lateral dimension or colour drift. As a product specifically designed for backlit display purposes the film will endure temperatures up to 50^{o}c before irrevicable damage, in the form of buckling or curling, is sustained.

The actual emulsion surface is vulnerable to physical damage and abrasion, so for extra protection the transparencies are presented in a laminated form, which renders the film virtually waterproof.

GUIDELINES TO BE OBSERVED.

*Storage:

- Transparencies should be kept in the flat envelope sachel provided - whenever not in use.

- In the field, the same envelope should be used for carriage and storage. This envelope should further be enclosed in a large plastic bag as protection from excessive dust and moisture.

..../2

- Ensure (at all times) that the transparencies are stored in a cool dry and dark place whenever possible.

- Protect from extreme heat (eg. vehicle dashboard) and prolonged exposure to extreme sunlight.

*Handling:

- Avoid excessive dust and dirt (especially in the field) - this will scratch the laminated surface with resultant loss in image quality and stereo clarity.

- If excessive moisture is encountered (rain, waterholes, dams, flood) - wipe excess off with a soft cloth and separate to dry individually as soon as possible. (If the product dries while stuck together there is a risk of the lamination lifting when separated).

- Remove transparencies from light tables (portable) if the job is left for any length of time. Do not leave transparencies on illuminated light table for extended periods - (switch off).

***N.B.** The larger format of the 230mm photography is more vulnerable to uneven variations in temperature. This will be observed first by curling at the corners. Extremes in temperature may cause perminance of the curling and other faults such as lifting of the laminate. To ensure proper imaging and stereo vision, it is essential that this distortion is avoided and that the diapositives are maintained in a flat condition.

Cleaning:

- Dust and dirt should be removed using water, a mild detergent and a soft cloth - sparingly. Stack individually to dry.

- For removal of pen markings - use either methylated spirits or turps, sparingly - dependant upon the pen type used. If possible use cotton wool with these liquids as it is the least abrasive.

* - Do not use solvents of any type.
Remember, although the product is described as being "robust", reproduction of damaged frames will cost approx. $15.00 with associated admin. charges. Do not be tempted to deliberately subject the diapositives to "fatigue testing".

..../3

Prints:

Used for boundary transfer at the mapping stage, the prints are produced on a "Resin coated" paper, made by either Agfa or Kodak. "R.C" papers virtually a type of plastic, but the emulsion surface will become soft and sticky in contact with water.

- If moisture is encountered separate, carefully and dry naturally as individual sheets.

- To erase pen marking use turps or methylated spirits sparingly.
  (Most rubber erasers will remove the pigment layers of the emulsion).

APPENDIX 2.

CARE & MAINTENANCE OF INTERPRETATION EQUIPMENT.

1. WILD AVIOPRET - with Mirror Stereoscope.

The most vulnerable part of this equipment are the mirrored surfaces. The mirrors are surface coated to ensure a distortion free image, therefore, scratches and abrasion of the mirror will adversely effect the image reproduced.

Handling:

When not in use:

- Swing shadow wings up to protect mirrors.
- Fit dust cover provided.
- Place mobile light table under stereoscope assembly.
- Disconnect power supply.

In use:

- When swinging 3 x lens pods avoid dropping to the viewing position.
- Avoid touching any of the mirrored surfaces - the grease of fingerprints is extremely difficult to completely remove and continued cleaning may result in deterioration of the reflective surface.

Cleaning:

- Dust should be removed from lenses and mirrors with the lens brush provided; excess can then be expelled using air from the pressurized "Dust off" cylinder. **NOTE:** When using these pressurized cylinders, observe the operating instruction carefully - **Keep upright, Do not shake.**
- Lenses should be cleaned carefully using lens cleaning tissue. This tissue is designed specifically to be non-abrasive and lint free. Most other materials available do not meet these constraints. Used in conjunction with lens cleaning fluid, grease and finger-prints are easily removed.

..../2

POCKET MIRROR STEREOSCOPE.

The same principles of handling and cleaning apply to this unit: the same type of mirrored surfaces are used and are just as vulnerable. The outer mirrors, particularly, are susceptible to finger prints during handling. A Teflon strip is added to the magnetic feet of the stereoscope to protect the transparencies. Ensure this teflon is maintained in good condition - replace if necessary.

The unit should be stored in its carrying case when not in use.

*** Special Note:**

If mirrors from either piece of equipment require any cleaning other than the "dusting" already described, the matter should be referred to the O.I.C. Interpretation Standards who will make arrangements for cleaning.

AVAILABILITY OF CLEANING STORES.

*FALCON "Dust Off II" Dust Propellant Cylinders.
from Perth Professional Photographics
268 Lord St., East Perth
Approx. cost $5.50/can

*Kodak Lens Cleaner (Fluid) (Kodak Cat # 4151494)
from Kodak A/Asia:
Chivas St., Kewdale
Approx. cast $1.50/100 ml bottle

*Kodak Lens Cleaning Paper (40 packet carton)
(Kodak Cat # 1546027)
from Kodak A/Asia:
Chivas St., Kewdale
Approx. cost $23.00/carton

APPENDIX 3.

MOTORBIKE USE AND SAFETY.

MOTORBIKE USE IN D.R.A.

1. Bikes must be cleaned down regularly. Whenever soil or plant tissue is adhering to the machine it must be cleaned.

2. Bikes must be used only when dry soil conditions occur.

3. Creeks and wet areas must not be crossed when it is likely that soil will adhere to the bike and be transported elsewhere.

4. Bikes should only be used when it is known that time will be saved. Several aspects are relevant here:

   i Pressure to get the work done - in some situations, work pressure may not be great.

   ii Risks involved in using bikes off the road.

   iii Time taken to load/unload bikes and equipment.

   iv Additional plant costs in using bikes.

5. Bikes must be used as transport in the field. No disease detection and plotting should be attempted while riding a bike because:

   i It is unsafe.

   ii It may be less accurate.

Above all else, interpreters must be aware that the situation in which they intend using a motorbike must pass a 7 Way Test.

MOTORBIKE SAFETY.

Loading - Unloading:

1. Motorbikes must **NEVER BE RIDDEN** onto or off the back of a ute or trailer.

2. Motorbikes must be loaded and unloaded by **TWO** people.

3. Motorbikes should be loaded front first onto the ute or trailer. One person is required to step onto the vehicle while the other holds the bike then both proceed to complete the loading operation.

..../2

4. Motorbikes should be secured to the vehicle by "tiedown" straps on both sides and at both ends of the bike.

5. Unloading the bike is a reversal of the loading procedure.

Riding:

1. Helmets, boots, long trousers **MUST BE WORN AT ALL TIMES** when riding. Goggles and gloves are not compulsory but riders are encouraged to use them.

2. **NEVER** ride alone.

3. **NEVER** ride two abreast. Always ride one behind the other, and at a distance that will allow evasive action.

4. Though speed is determined by terrain and track condition, always exercise extreme care and **NEVER** ride so fast that serious injury may result from falling from a bike.

5. **NEVER** attempt to detect and plot disease from a moving bike. The bike must be stopped and the interpreter proceed with investigations on foot.

6. **ALWAYS** have bike correctly maintained.

7. Every rider must **KNOW** his capabilities and be prepared to **STOP** the bike and **WALK** when riding conditions become difficult.

8. If it is necessary to ride along a public road **ALWAYS** ride with the **LIGHT ON.**

9. **DO NOT** attempt to ride bikes over large logs. If it is not possible to go around the log safely then stop and walk.

10. **DO NOT** carry heavy loads in packs or boxes on the rear carrier of the bike. Heavy loads can alter the handling characteristics of the bike. It is recommended that a sturdy bag be attached to the bike rather than a metal box. In the event of an accident, large metal boxes can inflict serious injury.

11. If dusty conditions prevail the second rider should immediately slow down to allow the distance between the bikes to increase until it is possible to proceed with normal visibility.

12. Riders must be **ALERT AT ALL TIMES** to track conditions, overhanging vegetation, proximity of animals and adjust speed accordingly.

REMEMBER, THINK SAFETY AT ALL TIMES.

APPENDIX 4.

CALCULATING FILM SCALE.

Locate two easily identified features in the field.

Measure the distance between the features in the field and on the film.

$$\text{SCALE} = \frac{\text{LENGTH IN FIELD}}{\text{LENGTH ON FILM}}$$

Eg: Length on film - 5.8 cm

Actual length - 246 m

$$\text{SCALE} = \frac{246 \text{ m}}{0.058 \text{ m}} = 1:4241$$

APPENDIX 5.

SAMPLING PROCEDURE.

Upon reaching the site and having thoroughly investigated the area. Select a recently killed plant for sampling.

a) Ensure the mattock has been sterilised.

b) Clean leaves, twigs and soil from around the base of the plant.

c) Chop sections of root, bark and cambium from all sides of the plant.

Banksia species: Collect sections of the collar region, include lateral roots.

Xanthorrhoea gracilis: Collect small radiating brittle roots and pithy plant core.

X. preissei: Collect small radiating brittle roots and sections of the pithy core.

Patersonia species: Collect all the below ground sections of the plant, include the small brittle roots.

Persoonia longifolia: Collect sections of root, bark and cambium similar to Banksia.

Podocarpus drouyniana: Collect sections of large underground stem, lower stem sections and roots.

Macrozamia riedlei: Collect sections of fibrous tissue from the bole and roots.

d) Collect several handfuls of soil from around the base of the plant. The mattock can be used to lift soil into the sample bag. This reduces the risk of cross contamination due to infected material on the hands.

e) All plant tissue and soil is placed in a plastic bag with an aluminium tag showing the date, cell, roll and frame number, and frame reference. Irrigate sample with distilled or de-ionized water if necessary.

f) Label the outside of the bag with a permanent marker showing cell, roll and frame number, frame reference and date.

g) Attach an aluminium tag to the sampled plant or to a nearby plant showing the cell, roll and frame number, frame reference and the date.

..../2

Sampling of plants suspected to be susceptible to P. cinnamomi.

1. If plant identity is unknown, collect a part of the branch/leaf section and if possible a specimen of the flower. These may be identified by The West Australian Herbarium if need be.

2. Collect root and collar tissue plus a soil sample from around the plant.

3. Sample is processed in the normal fashion except for:

   i) Dwellingup Research is to be informed of the nature of the sample ie. a plant being tested for susceptibility as an indicator of P. cinnamomi.

   ii) Ask for the roots to be surface sterilized and then plated.

   iii) If root material is found to have P. cinnamomi then the number of cuttings plated and the number of cuttings showing fungal growth are to be recorded.

   iv) If a sample returns a positive result only in the cup on the first process, it **must** be processed again as a positive result on the plate is essential.

   v) It is important to know the P. cinnamomi condition of the area that the sample is taken from as this affects later calculation of the plants susceptibility rating.

   vi) It is essential that the sampler keep clear, accurate records of all sampling done to test reliability or susceptibility of plants as P. cinnamomi indicators.

APPENDIX 6.

COMPLETING SAMPLE INFORMATION SHEETS.

The information recorded must provide the reader with a brief, but detailed insight to the forest within close proximity, ie. the site characteristics - the factors that determined why the sample was taken; the factors that were reviewed in making the interpretion; perhaps a comment about what the disease might do in the future ie. R.O.S., impacts; and what type of activity has taken place in the past - where this can be determined. Interpreters must be instructed in, and be able to complete, filling out these sheets to a satisfactory, standard. The standards control officer must be able to quickly and easily gain an insight to the salient features occurring at any site.

APPENDIX 6

SAMPLE INFORMATION SHEET

INTERPRETER	J. RIDLEY	CELL NUMBER 861016	DATE 12/2/82
TOPOGRAPHICAL SITUATION	MIDSLOPE		RUN 4
I.S.D. CLASS	MULTIPLE I.S.D.'s		FRAME 1435
PROBABLE DISEASE VECTOR	OLD LOGGING OPS.		F. REFERENCE NUMBER 3
PLANT SAMPLED	B. GRANDIS		

SITE DESCRIPTION & INTERPRETATION FACTORS:

Site shows a clear pattern of deaths with multiple I.S.D.'s including Persoonia, Banksia, Emu bush. Deaths range fron old and rotten stumps to recent deaths - Some plants still dying - changing colour of leaves would indicate this. No evidence to suggest drought as the stand of Jarrah is quite dense. Most probable disease vector is an old snig track upslope from this site. Disease extension will probably be slow due to dense crown cover and understorey. Disease impact is low and prabably will not amount to much more than a few dead Banksias. There is no effect (apparently) on the Jarrah trees.

DECISION DIEBACK	RESULT: +ve

Relative Importance of Observable Factors

Associated with the Interpretation for Presence or Absence of *P. cinnamomi*

Observable factor indicating high likelihood of *P. cinnamomi* presence ⟷ Observable factor indicating low likelihood of *P. cinnamomi* presence

	Observation Factors			
ISD TYPE	Multiple ISD'S	Cluster	Scattered	Isolated
SPECIES	Some or most indicator plants	Any one indicator plant	Any indicator plant	Any indicator plant
PATTERN DEVELOPMENT	Obvious			Not obvious
TOPOGRAPHIC SITUATION	Gully/Flat	Lower to Mid Slope	Midslope to Upper Slope	Ridge
CAUSAL AGENT	Obvious			Not obvious
INTERPRETATION RESULTING FROM OBSERVATION:	High likelihood of *P. cinnamomi* Presence			Low likelihood of *P. cinnamomi* presence.
REQUIREMENT FOR SOIL AND TISSUE SAMPLE	Low Requirement For Soil and Tissue Sample	High requirement for Soil and Tissue Sample	High requirement for Soil and Tissue Sample	Low requirement for Soil and Tissue Sample

SAMPLING RECORDS SHEET.

CELL NUMBER:-

RUN NUMBER:-

PAGE NUMBER:-

APPENDIX 7

FRAME & SAMPLE No.	DATE	LN	SY	FIELD INT.	DATE REC.	DATE OF PROCESSING			RESULT	
						1ST	2ND	SUBS	PLATE	CUP

1. LN - LOCATION CLASS
2. SY - SYMPTOM CLASS
3. FIELD INT - FIELD INTERPRETATION BY INTERPRETER
4. DATE REC - THE DATE THE SAMPLE IS RECEIVED AT DWELLINGUP RESEARCH.

I. D. TYPE - MULTIPLE/CLUSTERED/SCATTERED/ISOLATED

TOPOGRAPHIC LOCATION	DISEASE FACTOR	FIELD INTERPRETATION				SAMPLES WITH +ve LABORATORY RESULT				PERCENT +ve RESULTS			
		NOT Pc	SUS	Pc	TOTAL	NOT Pc	SUS	Pc	TOTAL	NOT Pc	SUS	Pc	TOTAL
Gully (including water gaining depression)	Roading												
	Logging												
	Mining												
	Water												
	Animal												
	Other												
FLAT	Roading												
	Logging												
	Mining												
	Water												
	Animal												
	Other												
LOWER TO MID SLOPE	Roading												
	Logging												
	Mining												
	Water												
	Animal												
	Other												
MID SLOPE TO UPPER SLOPE	Roading												
	Logging												
	Mining												
	Water												
	Animal												
	Other												
RIDGE PLATEAU	Roading												
	Logging												
	Mining												
	Water												
	Animal												
	Other												

APPENDIX 11.

'DIEBACK DEMARCATION PROCEDURES'.

The currently approved 'Dieback Demarcation Procedures' for our Department are shown below! They are taken from page 21 of "Working Arrangements and Environmental Control Specifications for Burning, Logging Operations in the Northern Jarrah Forest" Oct. 1st, 1985. MHRS. 1990

4. Pre-Logging Operations:

A C.A.L.M. officer is responsible for establishment and supervision of coupes.

4.1 Coupe boundaries to be identified by white painted crosses around total cutting area - crosses facing into coupe.

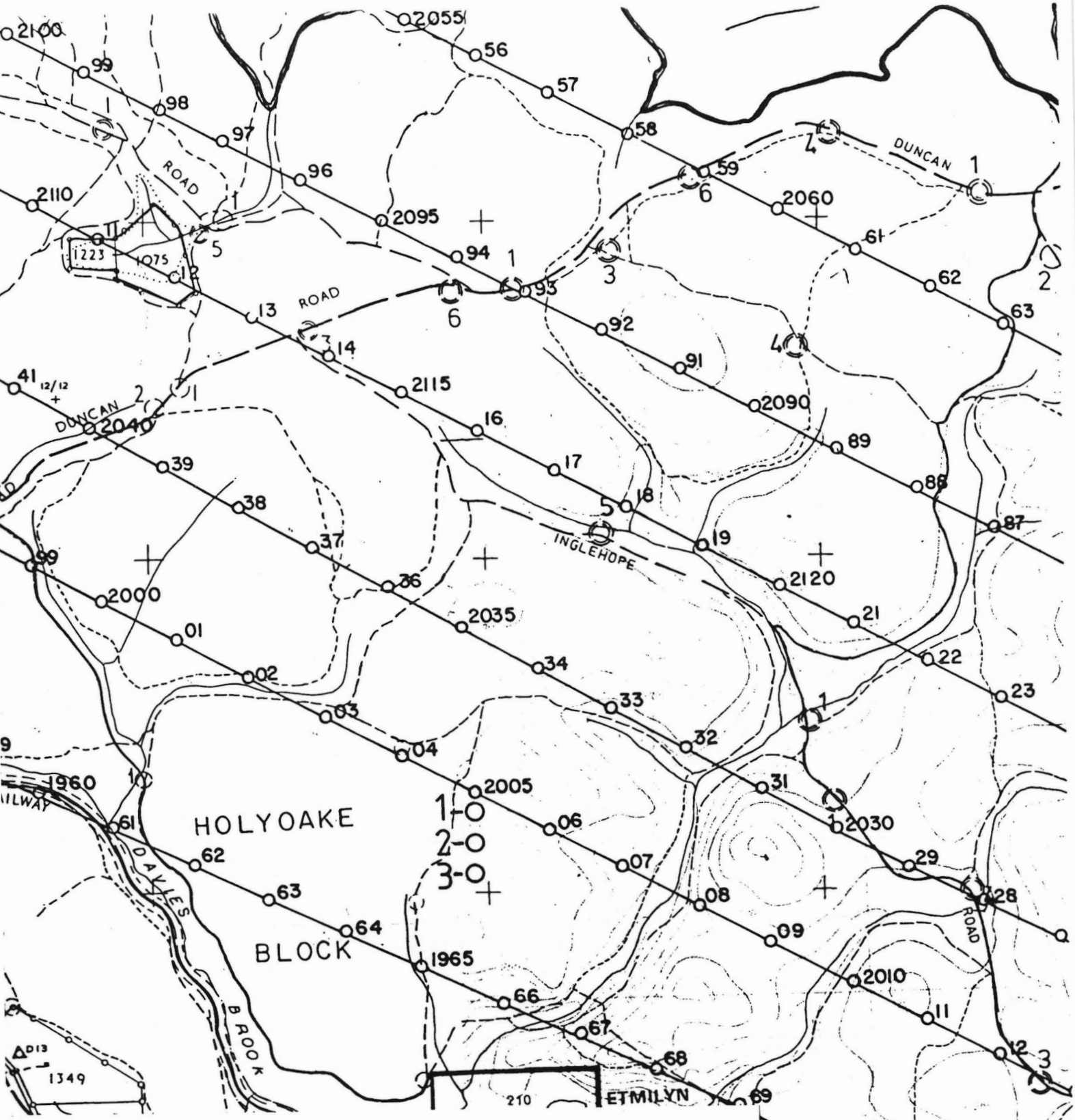
4.2 - Dieback risk boundaries must correspond to hygiene plan boundaries. These are demarcated by C.A.L.M. officer. These should be checked by experienced interpreters (or experienced District personnel) for accuracy before operations commence.

- These boundaries are to be taped yellow and blazed on 3 sides - 2 blazes will face along the line and the third will face away from dieback bush. All blazes to be painted yellow.

4.3 - C.A.L.M. officer and Bunnings Foreman demarcate sub-coupe boundaries with red flagging tape increasing to three red tapes on corners and defined junction points.

- "Special care zones" are demarcated by C.A.L.M. tree marker with white painted crosses on one side facing sub-coupe area.

These Department 'approved' procedures should be implemented until revised!



LEGEND - **SAMPLE LOCATION MAP**

APPENDIX 12

- ◉ Sampled Called Dieback
- ◉ Sampled Called Suspect
- ○ Sampled Called Not Dieback
- ⊕ Proven Dieback By Laboratory Analysis
- ● Visited Not Sampled Called Diebackfree
- ○ Visited Not Sampled Called Dieback
- ○ Visited Not Sampled Called Uninterpretable
- ◉ Visited Called Armillaria

POSITION	INDICATOR GROUP	
(Astartea fasicularis*	Very wet	VERWET
(Banksia littoralis*		
(Hakea ceratophylla*		
(Hakea varia*		
(Melaleuca preissiana*		
Acacia alata	Wet alluvium	WETAL
Agonis linearifolia*		
Eucalyptus megacarpa*		
Lepidosperma tetraquetrum*		
(Leptocarpus scariosus*	Broadly wet	BROWET
(Leptospermum ellipticum*		
Acacia extensa	Fertile moist	FERMO
Baeckea camphorosmae		BROFEM
Dampiera alata		
Eucalyptus patens*		FERMO
Hypocalymma angustifolium*		
(Adenanthos obovata*	Sand moist	SAMORG
(Dasypogon bromeliaefolius*		
(Kingia australis*	Broadly moist	BROMO
(Lepidosperma angustatum		
(Mesomelaena tetragona*		
(Synapheae petiolaris		
Chorizema ilicifolium*	Fertility H/R	FEHIRA
Trymalium spathulatum*		
(Diplolaena drummondii*	Fertility low rainfall	DRYFER
(Eucalyptus wandoo*		BROFER
(Hakea lissocarpha*		
(Hibbertia lineata*		DRYFER
Clematis pubescens	Fresh gravels	HIGRA
Leucopogon capitellatus*		FREGRA
Leucopogon propinquus*		
Macrozamia riedlei*		
Phyllanthus calycinus*		
Trymalium ledifolium		
(Acacia urophylla	Gravels high rainfall	GRAHIR
(Adenanthos barbigera*		GRAMED
(Banksia grandis*		GRAHIR
(Bossiaea aquifolium		GRAMED
(Hovea chorizemifolia		GRAHIR
(Lasiopetalum floribundum*		GRAMED
(Leptomeria cunninghamii		HIGRA
(Leucopogon verticillatus*		P TYPE
(Leucopogon oxycedrus		GRAMED
(Persoonia longifolia		HIGRA
(Pteridium esculentum*		
Acacia strigosa	Gravels dry	DRYGRA
Petrophile striata *		
(Casuarina fraserana*	Gravels deep	SANGRA
(Grevillea wilsonii*		DRYGRA
(Patersonia rudis		JARRAH
(Styphelia tenuiflora*		
(Xanthorrhoea gracilis*		
Hakea undulata*	Exposed surface	G TYPE
Casuarina humilis*		DRINF
(Daviesia pectinata	Yellow sand ± gravel	DRYSAG
(Hakea cyclocarpa*		EAGSAN
(Hakea ruscifolia*		DRYSAG
(Isopogon dubius*		EAGSAN
(Sphaerolobium medium		
(Stirlingia latifolia*		
Banksia attenuata*	Leached sand	SANLEA
Caustis dioida*		
Conospermum stoechadis*		
Hibbertia polystachya		
Leucopogon cordatus*		
Lyginia tenax*		
Nuytsia floribunda		
Patersonia occidentalis		
Gastrolobium calycinum	[illegible]	DRYFER
Pimelea suavolens		DRYGRA
(Eucalyptus marginata		
(Eucalyptus calophylla		
Dillwynia cinarescens		DRINF
Grevillea bipinnatifida		
Hakea elliptica		GRANITE G TYPE
Hakea trifurcata		
Casuarina huegliana		
Eucalyptus laeliae		
Lechenaultia biloba		BROMO
Phlebocarya ciliata, Jacksonia furc[a]		GREY SAND
Petrophile linearis		SAMORG
Pimelea suavolens		DRYGRA

VEGETATION DISTRIBUTION DECISION SHEET

PLOT No:

No. of Segment Present	Occurrence Rate	Indicator Groups	Order Of Occurrence In Vegetation Segment. 1	2	3	4	5	6	7	8
@		VERWET	A							
@		WETAL			C				D	
@		BROWET	B D C	A F	J	W		E		
@		BROFEM		E	D Y		W C M	J H	B	
@		FERMO	U Q	L Y	E W	C D M	A B	T		
@		SAMORG			B	A				
@		BROMO	E W H P	B D C J	A R	F Z S	Y		Q	
@		FEHIRA		Q		T				
@		DRYFER			M L	Y Q——Q				
@		BROFER	M L Y	W Z R	D H					T
@		FREGRA	Z R	S T U M	Q				P	
@		HIGRA	T		U			Q	S	
@		GRAHIR			T			P S		Q
@		GRAMED	S			P	T R		E	
@		DRYGRA			P Z S	J H R		M	T	
@		SANGRA		P			S		H	
@		EAGSAN	F	H		E	J	B		
@		DRYSAG			H		F P E	D	S	
@		SANLEA	J		F	B		A Y		E

NOTES: _____

PLOT No:

No. of Segment Present	Occurrence Rate	Indicator Groups	Order Of Occurrence In Vegetation Segment. 1	2	3	4	5	6	7	8
@		VERWET	A							
@		WETAL			C				D	
@		BROWET	B D C	A F	J	W		E		
@		BROFEM		E	D Y		W C M	J H	B	
@		FERMO	U Q	L Y	E W	C D M	A B	T		
@		SAMORG			B	A				
@		BROMO	E W H P	B D C J	A R	F Z S	Y		Q	
@		FEHIRA		Q		T				
@		DRYFER			M L	Y Q——Q				
@		BROFER	M L Y	W Z R	D H					T
@		FREGRA	Z R	S T U M	Q				P	
@		HIGRA	T		U			Q	S	
@		GRAHIR			T			P S		Q
@		GRAMED	S			P	T R		E	
@		DRYGRA			P Z S	J H R		M	T	
@		SANGRA		P			S		H	
@		EAGSAN	F	H		E	J	B		
@		DRYSAG			H		F P E	D	S	
@		SANLEA	J		F	B		A Y		E

NOTES: _____