

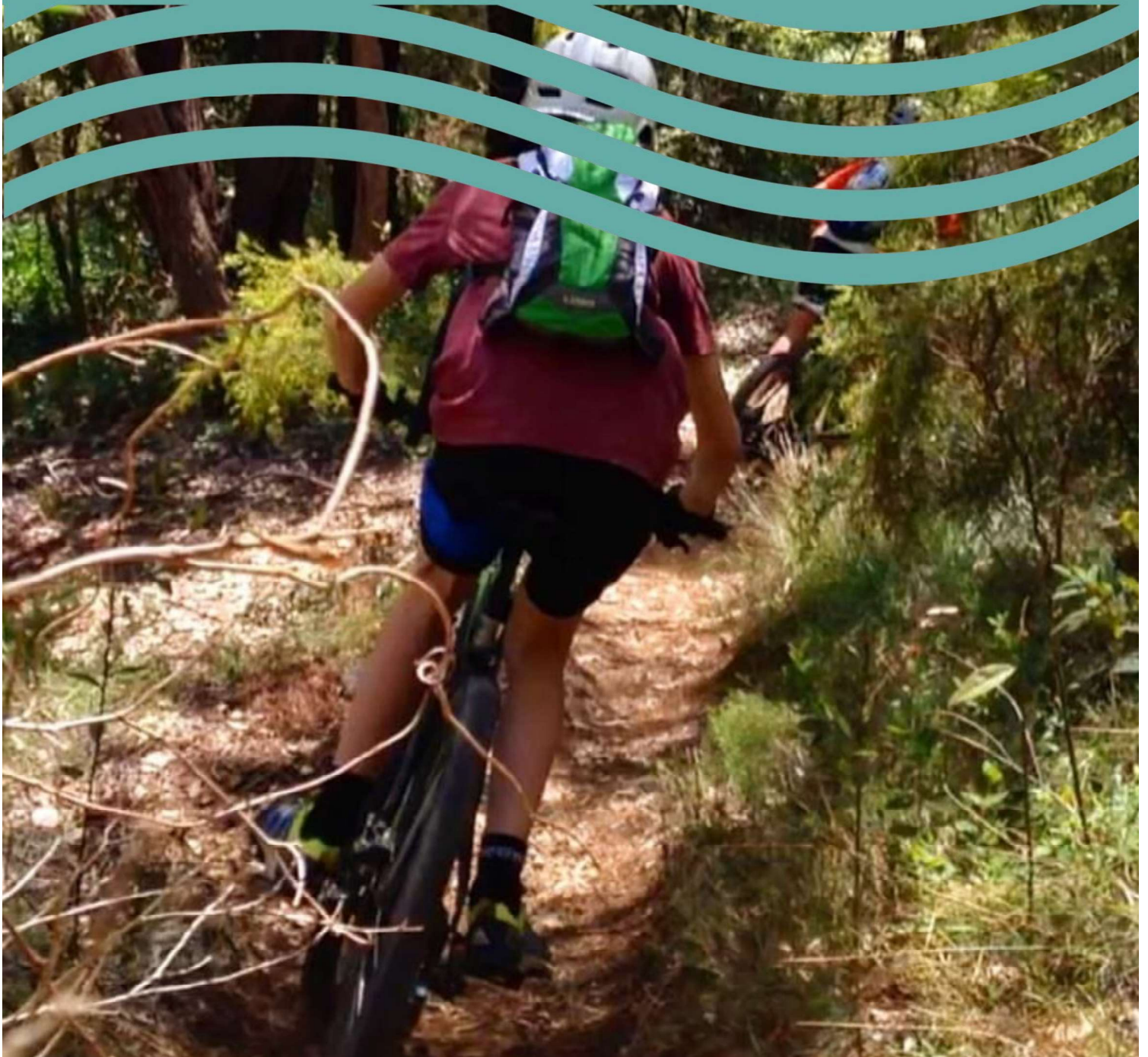


GREAT SOUTHERN  
**BIO LOGIC**  
*environmental solutions*

# Phytophthora Dieback Occurrence Survey

Albany Heritage Park

14 August 2018



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Albany Heritage Park

14 August 2018

Prepared for:

City of Albany



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## EXECUTIVE SUMMARY

The City of Albany plans to develop a mountain bike riding trail to link the Albany Central Business District (CBD) to Middleton Beach via the Albany Heritage Park, which incorporates various assets on Mount Clarence/Corndarup and Mount Adelaide/Irrerup. The project area defined for the Middleton Beach to Albany CBD link trail consists of two separate areas at either end of the existing mountain bike concept trail (Figure 1). It is understood that the final trail alignment will be sited within the current project area following consideration of the findings of biological surveys, including this *Phytophthora Dieback* survey.

The Albany Heritage Park is used for a broad range of activities and has experienced a high level of land use for an extended period time. Most notably, both mounts have memorials, artefacts and development dedicated to the ANZAC heritage of the region and the area is also used extensively for recreational walking and cycling with an extensive network of both formal and informal trails traversing the project area. Other significant land uses include land management access tracks, water supply infrastructure and open public roads.

In accordance with the agreed project scope of works, the field survey was undertaken using a methodology referred to as a comprehensive transect survey. The comprehensive transect survey method is defined in the DBCA guideline, *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015).

The survey results identified two areas of uninterpretable vegetation, both on the northern slopes of Mt Clarence and Mt Adelaide respectively. The remainder of the project area has been classified as infested on the basis of visual disease expression supported by the presence of new and historic positive soil and tissue sample results.

Due to the anticipated spread of the pathogen over time, it is considered likely that the disease would also be present within the uninterpretable areas of vegetation as these occur downslope of historic positive sample recoveries. However because there is no obvious disease evidence in these areas they have been classified as uninterpretable but are considered to be unprotectable from the disease.

A single sample was collected during the assessment and this returned a positive result for *P. multivora*. This sample demonstrates that *P. cinnamomi* is not the only species of *Phytophthora* that is active in the Albany Heritage Park.



# 1 INTRODUCTION

## 1.1 Background

The City of Albany plans to develop a mountain bike riding trail to link the Albany Central Business District (CBD) to Middleton Beach via the Albany Heritage Park, which incorporates various assets of Mount Clarence/Corndarup and Mount Adelaide/Irrerup. The proposed trail is shown in Figure 1 and will link with the recently developed mountain bike concept trail on Mount Clarence/Corndarup.

## 1.2 Objectives

The objective of the project of this study was to assess the extent of *Phytophthora Dieback* across the project area and determine the presence and distribution of areas that may be considered to be protectable from the disease.

## 1.3 Scope of Works

In order to achieve the project objective, the following scope of works was undertaken:

- completion of a detailed desktop assessment of the project area involving an analysis of known infestations, previous surveys, topography, geology, land use and access points.
- completion of a field based, comprehensive transect disease occurrence survey of the project area.

The survey involved:

- an assessment of all existing tracks and other potential vectoring infrastructure;
- a generalised site assessment over the area to identify and record disease evidence points using a hand held GPS; and
- traversing transect lines at no greater than 50m spacing across all areas where disease evidence points were not recorded to assess the possibly disease free status of such areas.

The comprehensive transect survey method is defined in the Department of Biodiversity Conservation and Attractions (DBCA) guideline, *Phytophthora Dieback Interpreters Manual for lands managed by the Department (2015)*. The information produced using this method of survey provides operational level disease hygiene information for application across the entire project area.

- completion of a soil and tissue sampling program to verify field interpretation decisions. All samples were transported to the DBCA Vegetation Health Service (VHS) in Perth for analysis;
- application of protectable area criteria to the project area to identify areas that may be considered protectable from future infestation by *Phytophthora* species; and
- development of this report detailing project methodology and inclusive of figures illustrating disease occurrence, protectable areas, and soil and tissue sample locations.

## 1.4 Site Characteristics

### 1.4.1 Project Area

The project area defined for the Middleton Beach to Albany CBD link trail consists of two separate areas at either end of the existing mountain bike concept trail (Figure 1). It is understood that the final trail alignment will be sited within the current project area following consideration of the findings of biological surveys, including this *Phytophthora Dieback* survey.



### 1.4.2 Climate

The Bureau of Meteorology (BoM) broadly classifies the climate across the south west region of Western Australia as warm summers with cold winters. The BoM maintains a network of weather stations across Australia to record weather data, with the nearest station to the project area being Albany. The long term average annual rainfall data from Albany shows that that annual average rainfall is 947.6mm/yr. while the average maximum temperatures range from 15.1°C (July) to 21.9°C (Feb).

These are important figures as the accepted distribution of *Phytophthora* is generally restricted by the 400mm isohyet with distribution in the 400-600mm/yr zone further restricted to sites with high summer rainfall averages or associated with water gaining sites. Based on the BoM climate classification and rainfall data it can be seen that the survey area experiences suitable conditions for *Phytophthora* to have a significant impact.

### 1.4.3 Land Use

The project area is used for a broad range of activities and has experienced a high level of land use for an extended period time. Most notably, both mounts have memorials, artefacts and development dedicated to the ANZAC heritage of the region. Recently, the National ANZAC Centre and associated infrastructure have been developed across these regions. Historical military sites including gun emplacements, bunkers and lookouts are also distributed across Mt Adelaide/Irrerup.

The area is also used extensively for recreational walking and cycling, and an extensive network of both formal and informal trails traverse the project area. Access to this network can be gained from all faces of the project area through entrance points from residential areas and access roads. No disease hygiene infrastructure is in place to limit the human vectoring of vegetation diseases.

The CoA maintain a series of strategic firebreaks across the project area and the Water Corporation also maintains a water pipeline that leads to a storage tank situated on the flanks of Mt Clarence/Corndarup. Marine Drive traverses the eastern and southern portions of the project area, forming a major link between the CBD and Middleton beach, while Apex Drive and Forts Road are sealed roads with imported gravel sub-bases that run nearly to the summit of Mount Clarence/Corndarup and Mount Adelaide/Irrerup respectively.





## 2 METHOD

In accordance with the agreed project scope of works, the field survey was undertaken using a methodology referred to as a comprehensive transect survey. The comprehensive transect survey method is defined in the DBCA guideline, *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015). A summary of key survey activities is provided below.

### 2.1 Desktop Interpretation

The project area was subject to an initial desktop assessment involving a review of the Vegetation Health Service (VHS) *Phytophthora* sample database, review of previous disease occurrence assessments across the area and examination of available aerial imagery to assess:

- the known occurrence of *Phytophthora Dieback* on or near the subject areas;
- the occurrence of site specific vectors including but not limited to roads, creek lines, gravel pits and other potentially threatening features;
- evidence of existing disease signatures such as areas of obvious vegetation decline.

### 2.2 Field Survey

The comprehensive transect survey was undertaken by a DBCA registered disease interpreter and involved mapping of all disease hygiene category boundaries together with ground coverage of all potentially uninfested or uninterpretable areas upslope of infestations, to survey for evidence of the disease. The survey of areas with limited or no obvious disease evidence was performed by walking transect lines spaced at a maximum distance of 50m apart, as required for DBCA operational survey methods (DBCA, 2015).

Field data including disease presence and vegetation information was collected using a hand held GPS unit and converted to ArcGIS™ shapefiles. Collected field data included all sample locations, a point file of all identified individual plant deaths attributed to *Phytophthora* and track files of the area covered during survey.

The survey method provides operational scale disease occurrence information. This operational scale information is suitable for development of an operational hygiene plan to be implemented during soil movement activities.

### 2.3 Sampling Program

Sampling for *Phytophthora Dieback* involves the collection of soil and tissue samples from fresh deaths of plants considered to be reliable indicator species of *Phytophthora* expression. Where suspicious deaths were identified, soil and root tissue material was collected into heavy duty plastic bags and forwarded to the Vegetation Health Service (VHS) laboratory for analysis.

All sampling undertaken was performed in accordance with the methods described in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (DBCA, 2015).

### 2.4 Demarcation

Demarcation of hygiene boundaries was completed in accordance with guidelines defined in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (DBCA, 2015). Demarcation involves the placement of flagging tape on trees or bushes to form a line across the hygiene category boundary. The tapes are tied around the trees or shrubs with the knot facing the demarcated category. The hygiene category and associated flagging tape colours are presented below.



- Infested Category – Dayglo Pink flagging tape with knots facing infested vegetation.
- Uninterpretable category – Pink and black striped tape with knots facing uninterpretable vegetation.
- Uninfested category – Not demarcated.



### 3 ASSESSMENT CRITERIA

DBCA (2015) guidelines identify six potential disease hygiene categories based on presence/absence of the disease, or the unknown disease status of an area. An area can have an unknown disease status if the vegetation at the site is not susceptible to the disease or it cannot be assessed because of disturbance, e.g. recent fire. As a result, even if the pathogen is present, there may be no interpretable signs.

Only areas with suitable remnant native vegetation can be assessed. Areas that have been cleared or significantly altered are excluded from survey. In some cases small excluded areas may be afforded a hygiene category if they are small enough to be influenced by adjacent surveyed vegetation or situated such that topographical influences can be used to determine disease presence or absence.

The six possible disease categories are listed and described below:

1. **Infested** – Areas a registered interpreter determines to have plant disease symptoms consistent with the presence of *Phytophthora cinnamomi*.
2. **Uninfested** – Areas determined by a registered interpreter to be free of plant disease symptoms that indicate the presence of *P. cinnamomi*.
3. **Uninterpretable** – Natural, undisturbed areas where susceptible plants are absent, or are too few to make a determination of the presence or absence of *P. cinnamomi*.
4. **Temporarily uninterpretable** – Areas where disease presence or absence cannot be determined due to a level and type of site disturbance that will recover within the short to medium term, eg fire, rehabilitation.
5. **Not yet resolved** – *Phytophthora* occurrence diagnosis cannot be made because of inconsistent or incomplete evidence (including sample results). The category is only to be used in low interpretability zones (400mm to 600mm rainfall range).
6. **Disease risk roads (DRR)** – Interpreters will use the DRR category to show the disease status is unknown because of suspected or apparent recent use under unknown hygiene conditions.

Following the determination of disease categories, protectable areas are identified to determine areas that are likely to remain free from the disease with the application of appropriate disease hygiene as required.

Protectable areas are defined in the *Phytophthora Dieback Interpreters Manual for lands managed by the Department* (2015) as areas that:

- Have greater than 600mm of annual rainfall or are water gaining sites in the 400mm - 600mm rainfall zone;
- Are determined to be free from *Phytophthora cinnamomi* by a DBCA registered disease interpreter;
- May be classified as uninterpretable;
- Are positioned in the landscape and are of sufficient size that they will not be engulfed by *Phytophthora* via autonomous spread. Such an area is defined as being greater than 4ha with a minimum axis of 100m, and not down slope of an infested area;
- Have controllable human vectors; and
- Include high conservation and/or socio economic values.



## 4 RESULTS AND DISCUSSION

The disease occurrence, including the location of positive sample results and the location of protectable vegetation across the project area is shown in Figure 1. Appendix A presents the VHS laboratory certificates for all samples collected during the current comprehensive survey.

### 4.1 Desktop

#### 4.1.1 Previous interpretation data

Great Southern Bio Logic has previously undertaken two *Phytophthora* Dieback surveys across the Albany Heritage Park. The first, (GSBL 2013), was associated with the construction of the Padre White Lookout on Mount Clarence/Corndarup. This was followed by a broad scale survey on both Mount Clarence/Corndarup and Mount Adelaide/Irrerup during project management for the proposed Albany Mountain Bike Trails project (GSBL 2016a, GSBL 2016b). Of the two previous assessments only GSBL 2016a, the broad scale assessment, included the current project area. This assessment identified the entire project area as being unprotectable.

During these projects a combined number of 16 positive *Phytophthora* sample recoveries were collected from across the Albany Heritage Park and a review of the VHS positive sample data base identifies an additional positive sample recovery on Mt Clarence/Corndarup collected in 2011. All historic positive sample sites are shown on Figure 1.

From these 17 positive samples, there are ten on Mount Clarence/Corndaup and seven on Mount Adelaide/Irrerup. Three occur within the defined project area while a further seven would typically be defined as being directly influential on the project area. Disease spread from the seven potentially influential samples would normally be extrapolated across the project area based on the local topography. However, due to the manipulated drainage patterns associated with Apex Drive and the influence of extensive granite extrusions, it is acknowledged that the movement of the disease may not follow typical topographical patterns. The number of positive samples across the Albany Heritage Park, some located near the very top of the peaks does, however, demonstrate that the disease is spread very broadly across the entire the park.

#### 4.1.2 Previous Land Use

As described in Section 1.4.3 the Albany Heritage Park has had a very high level of historic land-uses including military defence. Contemporary land uses include recreation and public memorial sites, and utilities infrastructure including telecommunications towers, water tanks and power transmission lines. The City of Albany also maintains a series of management access tracks and firebreaks.

It is believed that none of these land uses and associated activities are performed in accordance with the prescribed hygiene that would be required to limit the introduction and spread of vegetation disease across the area.

#### 4.1.3 Vegetation

As a part of the environmental assessment associated with the proposed trail development project, the City of Albany commissioned a flora and vegetation survey across the project area. The survey was performed by Damien Rathbone in 2017 and the report identified three distinct vegetation types within the project area. These include a *Eucalyptus/Corymbia* forest, a *Gastrolobium/Hakea* shrubland and a Granite shrubland and herbland.

The vegetation across the project has also previously been mapped in detail as a part of the Albany Regional Vegetation Survey (ARVS) (Sandiford and Barrett, 2010). This survey identifies





four primary vegetation categories with multiple vegetation units within each category. The primary vegetation categories consist of:

- Granite outcrops;
- Upland Eucalypt woodland and forest;
- Coastal dune systems; and
- Wetlands and damplands.

## 4.2 Comprehensive Transect Survey results

### 4.2.1 Vegetation

During the field survey, vegetation was observed to be consistent with the descriptions provided in previous floristic studies. The upland woodland and forest areas were typically dominated by an overstorey of Jarrah/Marri/Sheoak over tall open scrub, open heath, low shrubland, sedgeland or herbland. To the north of the project area the upland vegetation transitioned into Sheoak dominated woodland over an open understorey with minimal indicator species.

It is noted that the vegetation descriptions presented in the ARVS list included *Banksia attenuata*, *B. coccinea*, *B. grandis* and *Persoonia longifolia* as common species in the secondary tree strata and shrub layers. While these species were observed across the project area they were not noted in significant numbers and long dead individuals were often recorded.

### 4.2.2 Disease Expression

Expression of the disease varied across the vegetation communities and was most obvious in the *Eucalyptus/Corymbia* woodland, particularly on the lower slopes where disease indicator species were more common. In this vegetation unit the upper slopes were also influenced by *Allocasuarina fraseriana*, which was considered to be a co-dominant species in some areas on Mount Adelaide/Irrerup. The *Allocasuarina* communities were associated with an open understorey with a high proportion of sedges and other non-susceptible species, however, occasional disease indicator species were present. These occasional indicator species included *Patersonia occidentalis* and *Adenanthos obovatus* and, where present, some deaths of these species were noted.

Disease expression on the lower slopes of the *Eucalyptus/Corymbia* forest was considered to be very good with multiple deaths of *Banksia formosa*, *Xanthorrhoea gracilis* and *X. platyphylla* all noted. Deaths of these species ranged in time since death and were distributed broadly across the lower slopes of this vegetation community.

The *Gastrolobium/Hakea* shrubland is considered to be mostly uninterpretable due to the lack of disease indicator species and therefore disease expression cannot be assessed in that community. There is one exception to this, which occurs on the upper slopes of the western flank of Mount Clarence/Corndarup where *X. platyphylla* occur quite commonly.

In this area there is widespread impact to this species and individual deaths ranged significantly in time since death, indicating that the impact has been occurring across an ongoing period of time. This is consistent with *Phytophthora* impact, rather than evidence of seasonal impacts, which are consistent with the expression of drought. It is, however, acknowledged that some of the observed deaths may be attributable to shallow soils and water stress due to the influence of extensive granite outcropping.

No individual *X. platyphylla* deaths were found in this area that were considered to be recent enough for sampling, however, six historic positive sample results occur in the near vicinity, with the closest being almost at the top of the hill and only 100m from the subject area. There is also a historic positive sample in similar vegetation, on the western flank but on the mid slopes.



On the basis of this evidence it is considered highly probable that the vegetation decline on the upper western flanks is caused by *Phytophthora*.

The vegetation community described as a Granite shrubland and herbland does contain species from genera that are known to be susceptible to the disease including *Andersonia*, *Leucopogon* and *Verticordia*. However, susceptibility to the disease varies across species within the same genera and not all representative species are known to be susceptible.

In addition to this, the granite communities can be highly vulnerable to drought impact which can often mask disease symptoms or present false disease symptoms. For these reasons disease expression was very difficult to identify across the granite vegetation community, which has been classified as uninterpretable.

#### 4.2.3 Disease Occurrence and Hygiene categories

As shown on Figure 1, *Phytophthora* Dieback disease has been confirmed through visual assessment of disease expression and positive sample recoveries across the project area.

In the western portion of the project area the disease extends from Watkins and Hill Streets on the western edge up to the top of Mount Clarence/Corndarup. As the project area alignment heads to the north of the summit of Mount Clarence/Corndarup, the disease hygiene category changes to uninterpretable due to the absence of *X. platyphylla* in the vegetation. The uninterpretable category extends for a distance of approximately 400m to the east, across the northern flank of Mt Clarence, before once again changing to infested on the basis of a positive sample recovery that was collected during the current assessment, and the presence of a historic positive sample situated on the opposite side of Apex Drive. As discussed below in Section 4.3, the recent positive sample recovery confirms the presence of *P. multivora* within the project area while the historic sample result confirms the presence of *P. cinnamomi* immediately upslope, supporting the application of the infested category within vegetation that would otherwise be considered uninterpretable.

The portion of the project area that extends from the east of the existing concept trail to Middleton Beach is classified as infested where it adjoins the concept trail. The initial infested category only extends for approximately 50m before the alignment crosses a granite outcrop with uninterpretable vegetation. The vegetation to the east of this granite outcrop is a mixed forest with *Allocasuarina* as described in Section 4.2.1 above, which is also classified as uninterpretable. As the project area alignment turns north east and heads down hill, more disease indicators become present within the vegetation and the disease is once again visually detectable. At this point, the hygiene category changes from uninterpretable back to infested and extends down to the carpark at Middleton Beach.

#### 4.3 Sample Program

As previously discussed, there are 17 historic positive sample sites across the Albany Heritage Park and many of these are considered to either directly influence or be likely to influence the current project area. This number of samples is considered sufficient to demonstrate the widespread distribution of the disease across the project area, however, an additional single sample was collected from within the project area on Mount Clarence/Corndarup. The new sample site is shown on Figure 1 and returned a positive result for *P. multivora*.

The *Phytophthora* species *P. multivora* has a wider geographical range than *P. cinnamomi*. Although not typically as aggressive as *P. cinnamomi*, *P. multivora* has been linked to three major tree decline events in the south west of Australia, impacting *Eucalyptus gomphocephala* (tuart), *Agonis flexuosa* (WA peppermint) and *Corymbia calophylla* (marri) (Barber et al, 2013).



The positive recovery of *P. multivora* on Mount Clarence demonstrates that there is more than one species of *Phytophthora* potentially responsible for the vegetation decline apparent across the Albany Heritage Park

#### 4.4 Protectable Area Assessment

Application of the protectable area criteria presented in Section 3 results in the entire area being classified as unprotectable. The justification for this classification is presented below.

Infested vegetation cannot be classified as protectable as the disease is already present. Conservation significant species, priority communities and areas with significant social value occurring within infested areas may be protected through the implementation of appropriate *Phytophthora* Dieback treatment programs.

While uninterpretable vegetation may be classified as protectable, all of the uninterpretable areas within the project area are traversed by uncontrollable human vectors including:

- existing trails for both walking and mountain biking;
- drainage from Apex Drive including areas of confirmed infestation;
- drainage from the Mount Adelaide/Irrerup historical precinct; and
- City of Albany management access tracks and trails.

All of these vectors are associated with positive sample recoveries and visual expression of the disease, and it is highly probable that these vectors have compromised the disease status of uninterpretable areas.

The uninterpretable vegetation on Mount Clarence/Corndarup is located downslope of four positive sample recovery sites located along Apex Drive and the staircase to the Mounted Horse Memorial. The presence of these positive sample locations in an upslope position would typically be considered suitable evidence upon which to justify the extrapolation of the infested category across the area classified as uninterpretable. The decision to classify the vegetation as uninterpretable instead of infested was made on the basis that the manipulated drainage along Apex Drive and the influence of extensive granite outcropping would potentially protect some areas from infested runoff.

While this may be true, the immediate topography and proximity of known infestation makes it physically impossible for all of the infested drainage to flow away from the uninterpretable vegetation. This means infested drainage is entering the uninterpretable areas, allowing the disease to be spread through these uninterpretable areas by other vectoring processes such as foot and bike traffic. Due to the uninterpretable nature of the vegetation in these areas it is not possible to delineate between the possibly uninfested uninterpretable and infested uninterpretable, and so the establishment of protectable areas and application of hygiene to protect them is not possible.



## 5 REFERENCES

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## 6 LIMITATIONS

This report was prepared for the City of Albany, solely for the purposes set out in the scope of works and it is not intended that any other person use or rely on the contents of this report.

Whilst the information contained in the Report is accurate to the best of our knowledge and belief, Great Southern Bio Logic and its agents cannot guarantee the completeness or accuracy of any of the descriptions or conclusions based on the information supplied to it or obtained during the site investigations, site surveys, visits and interviews. Furthermore, field and / or regulatory conditions are subject to change over time, and this should be considered if this report is to be used after any significant time period after its issue.

Great Southern Bio Logic and its agents have exercised reasonable care, skill and diligence in the conduct of project activities and preparation of this report. However, except for any non-excludable statutory provision, Great Southern Bio Logic and its agents provided no warranty in relation to its services or the report, and is not liable for any loss, damage, injury or death suffered by any party (whether caused by negligence or otherwise) arising from or relating to the services or the use or otherwise of this Report.

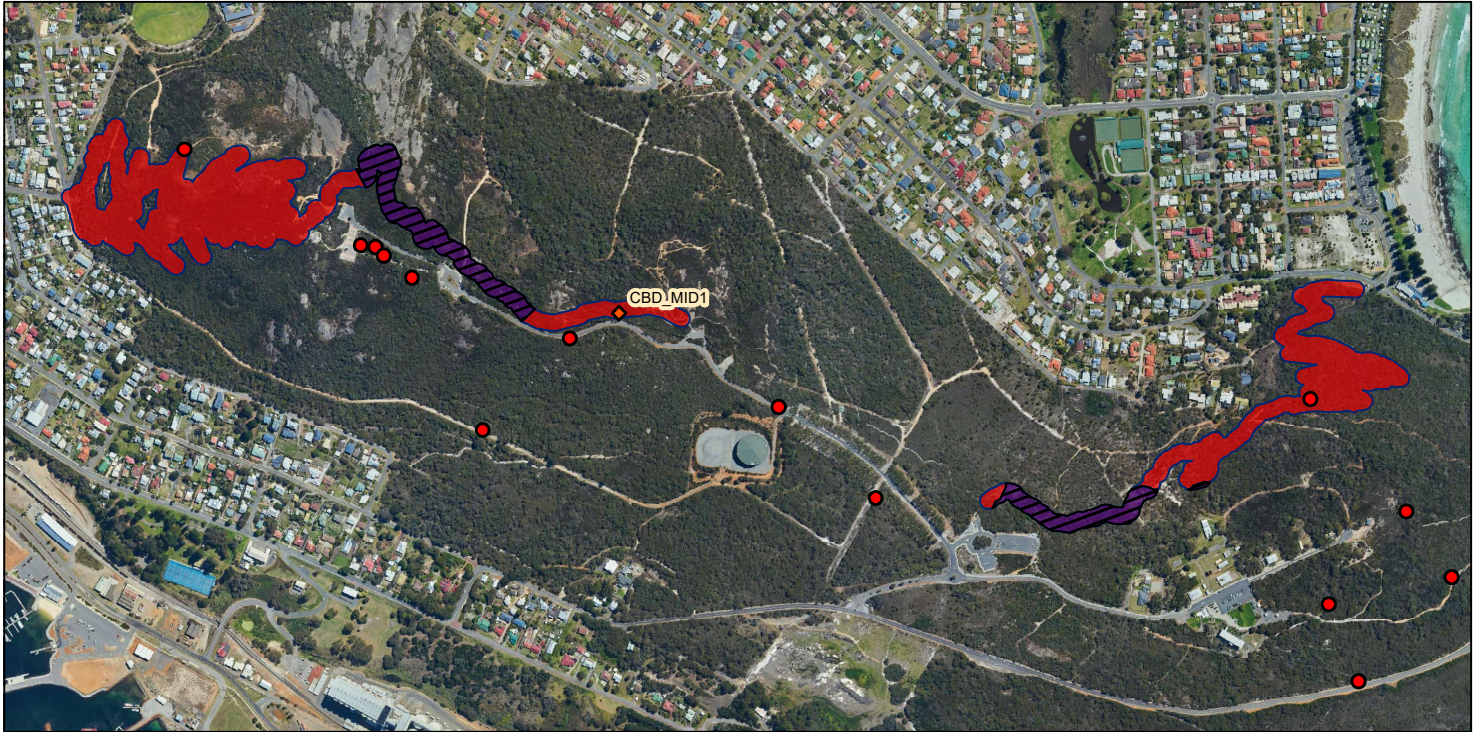
This report must be read, copied, distributed and referred in its entirety.

## Figures

*Phytophthora Dieback occurrence showing current and historic sample locations –*

*Albany Heritage Park*





**Figure 1: Phytophthora Dieback occurrence showing current and historic sample locations - Albany Heritage Park**



GREAT SOUTHERN  
BIO LOGIC  
Great Southern Bio Logic does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.  
Ref: GSBL340  
Date: 09-Aug-18

Phytophthora Dieback Occurrence Survey  
Albany Heritage Park - prepared for the  
City of Albany, August, 2018

**LEGEND**

**STATUS**

■ Infested

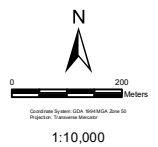
■ Uninterpretable

□ Unprotectable

**RESULT**

◆ Phytophthora multivora

● Historic *P. cinnamomi*





# Standard Dieback Signage Protocol

For the use of Standard *Phytophthora* Dieback Signage on all land tenures in Western Australia.

10 March 2009



**Project DIEBACK**  
NATURAL RESOURCE MANAGEMENT  
WESTERN AUSTRALIA  
[www.dieback.net.au](http://www.dieback.net.au)

**SOUTH COAST** NATURAL RESOURCE MANAGEMENT  
**Perth Region NRM**  
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**AVON** CATCHMENTS COUNCIL  
**SOUTH WEST CATCHMENTS COUNCIL**

Project Dieback is delivered by South Coast Region NRM Inc., funded by the Australian Government and Government of Western Australia.

**Australian Government**

**Department of Environment and Conservation**  
*Our environment, our future*

**DIEBACK CONSULTATIVE COUNCIL**  
WESTERN AUSTRALIA

**Dieback**  
MANAGEMENT GROUP

## Summary

Any person or organisation responsible for the management of lands either with or neighbouring native vegetation in the South West of Western Australia should consider the threat that *Phytophthora Dieback* presents to the maintenance of biodiversity. This is important particularly for areas receiving more than an average annual rainfall of 400mm.

A professional assessment should first be made to determine the disease status of an area. Standard signage is then available which can be used to insure protection of disease free areas.

A range of signs are available depending on the management objectives for an area or works and activities planned.

The signage system is based on the following status symbols:



Soil, gravel, sand and plant material should never be moved from areas that are known to be infested to areas known to be disease free. It is important to get the message across “Be Clean in the Green” and “Don’t Spread the Red”.

Interpreting the disease status of areas can be difficult especially as many areas of the South West have been affected for many decades. Signage should only be used if qualified environmental consultants have sampled and verified the disease situation in an area.

There are many reasons for the cause of plant deaths so it is important to confirm presence of *Phytophthora cinnamomi* in any candidate areas for signage. However, if field interpretation is not available in the short term for a potentially threatened area, non-mapped “Dieback Protection Area” signs are available until a *Phytophthora Dieback* assessment can be made.

Project Dieback NRM, in conjunction with the State Dieback Consultative Council (DCC), Dieback Working Group (DWG) and Department of Environment & Conservation (DEC), have developed this standard dieback signage system to assist in the management of *Phytophthora Dieback*. Project Dieback is a Natural Resource Management (NRM) initiative to protect environmental, social and economic values from the dieback threat in Western Australia. The Australian Government and Western Australian Government fund the project through the joint National Action Plan for Salinity and Water Quality programme and the Natural Heritage Trust.

## Introduction

The south west of Australia is extensively invaded by the introduced soil borne water mould *Phytophthora cinnamomi* known as Phytophthora Dieback. The pathogen is recognised as one of the key threatening processes to Australian biodiversity.

Humans are the greatest vectors in spreading Phytophthora Dieback. People can carry the plant pathogen from infested areas in many ways. Often by mud on footwear or vehicles, shifting infested soil or gravel, grading roads or moving infected plant material.

The aim of the signage is to raise dieback awareness and to assist land managers, operations staff and contractors involved in any earthworks to minimise the risk of spreading existing infestations and protecting areas still free from this invasive species.

The Western Australian Standard Dieback Signage System has been developed for use across all land tenures, including areas managed by local and state government, private property and mining areas. Land managers, government agencies, extractive industries and developers should use the signage system as part of an overall disease risk management plan to minimise the risks of establishing new infestations as a result of human activity.

The signage system is designed particularly to protect valued areas threatened by dieback following the field interpretation and mapping of *Phytophthora cinnamomi*. These areas may be identified as Dieback Protection Areas and dieback infestations can be delineated from dieback free areas using the signs.

The signage has a standardised series of designs to ensure consistency across land tenures and therefore higher recognition and understanding of the threat. Consequently, the signage will be the same format in national parks and reserves, mine sites, along road sides and in local government parks.

To be effective, signs must be considered an integral part of an area's overall management. Use of signage to guide public staff and contractors should be one component of management. Managers, government agencies and developers are advised to also adopt best practise disease management to minimise the risks of establishing new infestations as a result of soil movements.

This protocol describes the signage system, sets out a flow chart to graphically represent the sequencing of steps required to use the signs and provides information required for signage application, installation and management.



## Standard Dieback Signage System

The signage system was designed as part of a state communication plan that aims to have consistent relevant themes and messages for stakeholder groups to use in Western Australia in regard to Phytophthora Dieback management.

The signs aim to enable people to gain the right message, do the right actions and be aware of Phytophthora Dieback in the environment.

The signage system is based on the following status symbols:



A range of signs and markers are available depending on an area's requirements including for roadsides, walk tracks and Dieback Protection Areas. (Section 1: Dieback Signs and markers.)



Picture 1: Example of Dieback Protection Area sign.

There is an option to have management logos integrated into Dieback Protection Area signs and changes to wording for specific area requirements. These wording changes however still need to be approved to ensure messages and themes are accurate and consistent with Phytophthora Dieback management.

The Dieback Signage flow chart sets out the procedure to follow in regard to using the signs.

## Protocol Flowchart

The following flowchart provides guidance for incorporating the Standard Dieback Signage System into an area.



## **Section 1: Values Threatened by Dieback**

Phytophthora Dieback impacts over 40% of the plant species in Southwest Australia, which consequently threatens many environmental values including changes to ecosystems and destruction of habitats. Dieback threatens social and economic values impacting natural resources and horticultural industry.

When assessing the risks from Phytophthora Dieback, values should to be prioritised to ensure management resources are designated effectively.

Area may have access roads, tracks or drainage lines into other areas with values that are threatened by Phytophthora dieback and therefore neighbouring areas should to be taken into consideration in surveying values and Dieback Management planning. Hygiene control is advised during any ground survey.

An overall strategic risk assessment has been carried out for the south west of WA and is also a resource that can assist in value assessment. Details can be accessed through the [www.dieback.net.au](http://www.dieback.net.au) website as well as a list of the most susceptible species threatened by Phytophthora Dieback. The following lists some of the values that may be impacted.

### **Environmental Values**

Environmental Values may include:

- healthy bushlands with susceptible plant communities,
- endangered plants,
- rare animal habitats.

A susceptible plant species list is available on [www.dieback.net.au](http://www.dieback.net.au). Technical advice is available through your NRM Dieback officer, DEC or local environmental officer.

### **Social Values**

Social Values may include:

- wildflower viewing areas,
- cultural places,
- bush products.
- 

### **Economic Values**

Economic Values may include:

- tourist areas,
- timber resources,
- nurseries,
- susceptible horticultural plantations
- honey production.

## Section 2: Dieback Interpretation and Mapping

Dieback Interpreters carry out a detailed procedure to determine the presence of Phytophthora Dieback (*Phytophthora cinnamomi*) in bushland and forest areas.

The presence of this soil borne pathogen is typically undertaken using a combination of aerial photography interpretation (API), assessment of existing vegetation using certain susceptible species as indicators and sampling soil and plants to confirm infestation through laboratory testing.

The determination of the presence of Phytophthora dieback requires significant technical knowledge and it is recommended that suitably qualified and experienced professionals undertake this assessment.

Consultants provide a dieback report, management recommendations, detailed maps of dieback status/protectable areas and ground demarcation usually with coloured tape. Old mapping and demarcation may need to be refreshed as dieback has been known to move downhill over ten metres a year and even uphill one metre a year though root to root contact. Dieback status signage should only be used in areas where the dieback has been recently verified.

Phytophthora Dieback indicator plants include members of the Proteaceae, (*Banksia, Grevillea, Hakea etc*), Myrtaceae (*Eucalyptus, Verticordia, Calothamnus etc*), as well as species such as grasstrees (*Xanthorrhoea sp.*), and zamia palms (*Macrozamia sp.*). More details of susceptible can be found at [www.dieback.org.au](http://www.dieback.org.au).

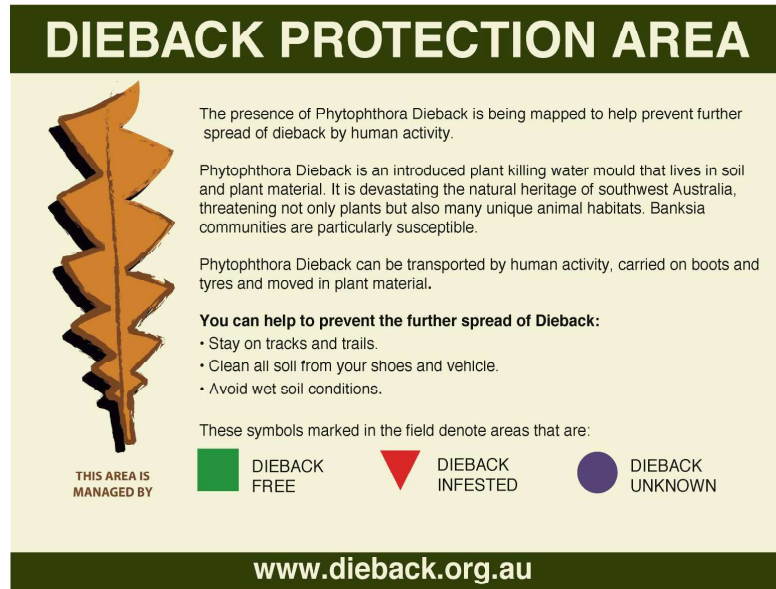
Consultants that can provide assessment of lands and arrange analysis of soil samples for dieback can be found in Section 9: Contacts.

## Section 3: Dieback Signs and Markers

### 1. Dieback Protection Area (DPA) Signs

DPA Signs are digitally printed on 600 x 450 aluminium panels.

#### 1.1 DPA Boundary Entry Signs for dieback mapped areas:



Item Code: DPA07-1

#### 1.2 DPA Boundary Entry sign for non-mapped areas



Item Code: DPA07-2

### 1.3 DPA Boundary Entry Signs for Access By Permit Only Areas:



**DIEBACK PROTECTION AREA**



**Access By Permit Only**

This is an area being protected against the threat of Phytophthora Dieback.

A permit system is in place to help prevent further spread of dieback by human activity.

Phytophthora Dieback can be transported in soil, mud and plant material.

Spreading dieback threatens not only plants but also many animal habitats.

**Contact management for more information and permits.**

THIS AREA IS  
MANAGED BY

[www.dieback.org.au](http://www.dieback.org.au)

*Item Code: DPA07-3*

### 1.4 DPA Boundary Entry Signs for Hygiene Stations - Footwear:



**DIEBACK PROTECTION AREA**



**Boot Cleaning Station**

Phytophthora Dieback killing our native plants.

Plants in this area are threatened by this water mould.

Your footwear can bring in or pick up carry infested soil and spread the pathogen.

**Help by scrubbing your boots clean here before you walk.**

THIS AREA IS  
MANAGED BY



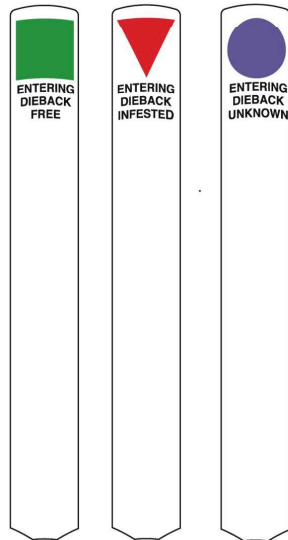
[www.dieback.org.au](http://www.dieback.org.au)

*Item Code: BCS-1*



## 2. Dieback Status Markers and Symbols

2.1 Dieback status boundary markers for roads and walk tracks are indicated using status stickers on white steelflex guideposts.



### Item Codes:

Steelflex Posts - EDSF1300-WHT

Vinyl Stickers -

- Entering Dieback Free – EDF-TV
- Entering Dieback Infested – EDI-TV
- Entering Dieback Unknown – EDU-TV

2.2 Dieback status symbol alternative for roads and walktracks are on 95 x 140mm aluminium panels.



### Item Codes:

Aluminium Panels -

- Entering Dieback Free – EDF-TA
- Entering Dieback Infested – EDI-TA
- Entering Dieback Unknown – EDU-TA

2.3 Dieback status symbol indicators used within dieback status areas on 95 x 140mm aluminium panels or vinyl stickers.



### Item Codes:

Aluminium Symbol Panels -

- Dieback Free Symbol – DF-SA
- Dieback Infested Symbol – DI-SA
- Dieback Unknown Symbol – DU-SA

Vinyl Symbol Stickers

- Dieback Free Symbol – DF-SV
- Dieback Infested Symbol – DI-SV
- Dieback Unknown Symbol – DU-SV

See Appendix 1 for current Signs ordering form.

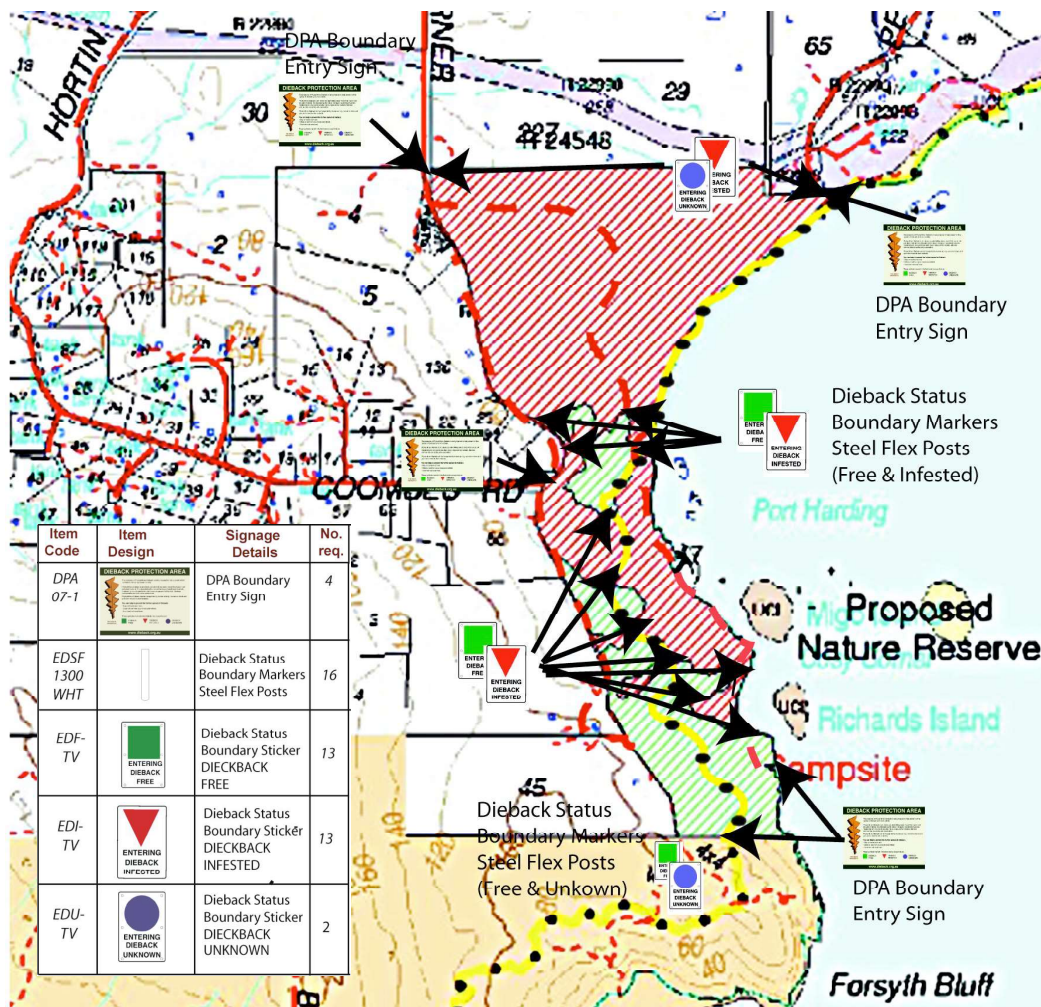
## Section 4: Dieback Management and Signs Plan

A signs plan is done in conjunction with the area's overall management plan. The Signs plan records required signs in regard to access points, awareness objectives, restrictions, hygiene stations and future predicted autonomous spread.

The Area Signage Plan should also designate hygiene requirements for installation and future dieback monitoring and signs review. It is essential that signs are maintained in good condition and a register of installations be made. All Dieback Signage used in any area is to be documented as part of the signs plan and a summary is requested to be sent to the DCC State Register (Appendix 1).

*Example of a Signs Plan Map*

### Phytophthora Dieback Signs Plan Map Cosy Corner Reserve, Albany



## Section 5: Signage Installation Guidelines

The correct placement of signs along the dieback boundary and at entrances to areas affected by Dieback is important assist in reducing the spread of Phytophthora Dieback.

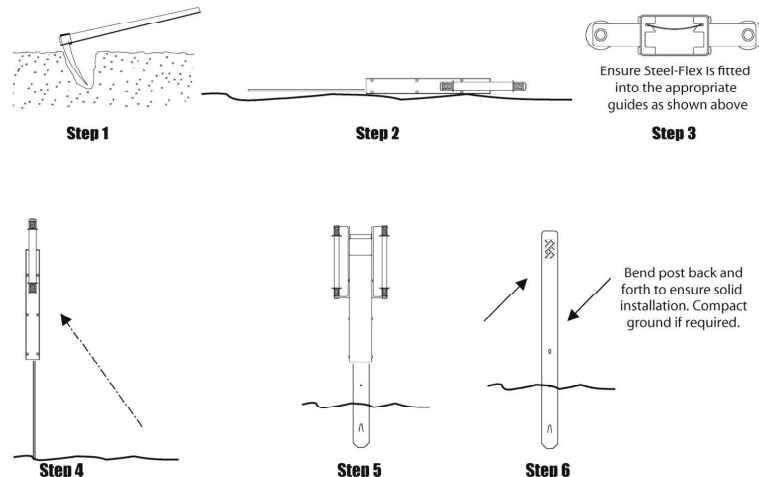
Dieback Protection Area Entry signs (DPA-071, DPA-072;) should be placed at road and walking trail entrances. This should be at a location where vehicle speeds are at a minimum such as a gate, or walking trail entrance. These signs should be installed on posts of sufficient length to enable them to be visible over any vegetation. 4x4 wooden posts are acceptable or the 2250 mm steel posts (code Calm2250-csa) which can be driven directly into the ground.

Posts for the delineation of the dieback front are to be Ezydrive Steel Flex posts. (Code EDSF1300-WHT) with self adhesive symbols (code DF-SA, DI-SA, and DU-SA) to be applied to the posts. These should be installed so that the posts are aligned with the axis of the dieback front as demarcated by the Dieback Interpreters.

### Installation of the Posts

The easy drive steel flex posts from Rondo Building services are easy to install using a hand driver. It is critical that care is taken to ensure all equipment is clean before use in installation of posts. Signage should be installed under dry soil conditions and no soil should be moved on vehicles or equipment away from infested areas. Always install signs into disease free areas prior to any with in infested areas. Advice on hygiene and sterilants is provided in Section 7.

It is preferable to locate the correct location for the sign by GPS and ground demarcation. This information is to be provided by the mapping consultants. Be sure to place signs at the correct buffer width from the visible disease front (15m up slope or cross slope, and 25m + down slope depending on rate of spread.) This allows for cryptic disease which will be present but not showing symptoms. Buffers also allow for some movement of the disease as it grows.



## Section 6: Standard Hygiene and Management

To manage Phytophthora Dieback in any area, there is a need to plan ahead. The introduction or human-assisted spread of the pathogen can be avoided if activities are well planned and management procedures are in place. Phytophthora Dieback management procedures must be integrated into all land management activities if the spread and impact of this organism is to be minimised.

Organisations such as the Department of Environment and Conservation (DEC), Alcoa World Alumina Australia and Main Roads WA follow procedures to minimise the risk of their activities spreading the pathogen. Many local governments are also adopting Phytophthora Dieback management policies and implementing management procedures. Anyone who owns, manages or uses a bushland area can also take steps to ensure that their activities don't introduce or spread the pathogen. Any operations which involve soil movement can put disease free areas at risk.

*Standard hygiene and management may vary for each status area.*

DIEBACK FREE	DIEBACK INFESTED	DIEBACK UNKNOWN
<p>Cleandown stations should be used to remove or sterilize mud and soil from footwear, equipment and vehicles when <b>entering</b> Dieback Free.</p> <p>Avoid moist soil conditions. Access may be restricted.</p>	<p>An effective hygiene cleandown must be carried out when <b>leaving</b> a Dieback Infested area into Dieback Free.</p> <p>Ensure no infested soil, gravel or plant material crosses the dieback boundary.</p>	<p>Areas are unknown if they have not been mapped or do not have indicators that identify the presence of Phytophthora Dieback.</p> <p>Areas may still have hygiene and access restrictions.</p>

Hygiene is essential to any operation or activity aiming to minimise the spread of Phytophthora Dieback. Next section details some guidelines applicable to the cleaning of vehicles, equipment and footwear. Also included are some points about sterilisation of water, equipment and footwear. Where practical it is preferable to use the dry cleaning methods (air compressor, brushes) rather than cleaning with water as it has a significantly lower chance of accidentally spreading the pathogen.

It should be noted that dust and grime on vehicles or equipment is not a threat in terms of spreading Phytophthora Dieback.

## **Section 7: Guidelines for cleaning vehicles/equipment**

- Cleaning will be easier and more effective if completed at a depot or designated cleaning area.
- Field-based cleaning requires:
  - A hard, well-drained surface (e.g. road) that is well away from native vegetation. Any washdown effluent should be collected on-site and must not be allowed to drain bushland.
  - Minimise water use to remove soil and mud from equipment/vehicles. This can be achieved by preferentially dry cleaning techniques e.g. stiff brushes.
  - Washdown on ramps if possible.
  - Prevention of mud and slurry from entering into uninfested or uninterpretable bushland. Soil and waster can be collected for sterilisation (see guidelines for sterilising below).
  - Pay particular attention to mudflaps and tyres.
  - Do not drive through effluent generated from cleaning when exiting the washdown facility.

### **Guidelines for cleaning footwear**

- Try to remove mud and soil when it is dry. Remove as much mud and soil as possible with a stiff brush or stick and minimise the amount of water used.
- Collect all mud and soil removed and place in a bucket or bag for later disposal at a site that is infested with *P. cinnamomi* or that contains no native vegetation.

### **Guidelines for sterilising**

- Sterilisation of equipment, footwear and vehicle tyres can be used to take an extra precaution. Sterilisation of nursery equipment using steam is common practice, however the use of steam is not practical in the field. The following sterilisation methods can be used in the field.
- Spray methylated spirits on small hand tools and footwear covering all surfaces and allowing a few minutes for it to soak into all soil material.
- Spray diluted bleach (sodium hypochlorite) onto equipment and footwear allowing a few minutes before rinsing the bleach off using water. Dilute bleach so that solution contains 1% active ingredient sodium hypochlorite. Be sure to follow any of the manufacturer's safety instructions provided on the bleach container.
- Spray Phytoclean® can be used in footbaths, washdown facilities and during the cleaning of equipment. See the manufacturer's details for directions.



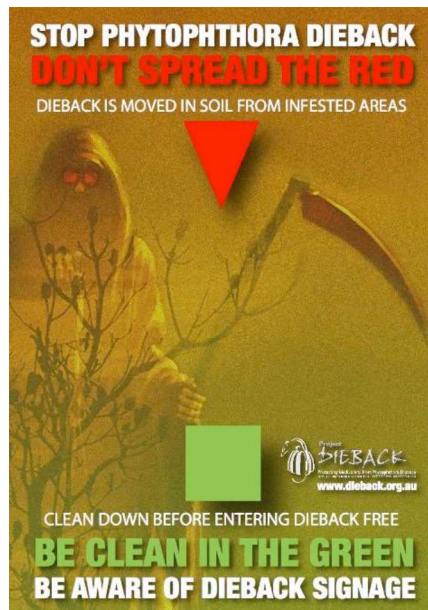
## Section 8: Publications and resources

- “Signage For All” DL Pamphlet



Produced by Project Dieback April 2008

- “Botanical Grim Reaper Signage Awareness” A3 Posters



- Project dieback website [www.dieback.net.au](http://www.dieback.net.au)

Pamphlets and posters are free on request from South Coast NRM Inc. on Mercer Rd., Albany or Cranmill Environmental Services.



# State Dieback Signs Register

The following Signage Summary Sheet should be completed and copied for each area where signage is installed. A copy should be sent to Cranmill Environmental Services who are coordinating the state register funded by Project Dieback on behalf of the Dieback Consultative Council.

<b>Reserve or Location:</b>	
Central GPS Reading:	Closest road name:
Contact person or position:	
Organisation:	
Phone:	
Email:	
Values at risk:	
 DPA Entry with Status Symbols	Total Number Used: <input type="text"/>
 DPA Entry without Status symbols	Total Number Used: <input type="text"/>
 Boot Cleaning Station	Total Number Used: <input type="text"/>
 Road/Track Posts	Total Number Used: <input type="text"/>
 Track Markers Panels 95 x 140 (Aluminium)	Total Number used: <input type="text"/>
 Track Markers 95 x 95 (Aluminium)	Total Number Used: <input type="text"/>
Dieback interpretation done by:	
Date of installation:	
Monitoring of disease fronts in vicinity of signs.	Dates to be visited by officer responsible.
Comments/Requests:	

## Acknowledgements



Great Southern TAFE

Students assisted in developing this system and have also developed icons representing values and threats which could be made available if any land managers felt they would assist them in communicating with the public.