Department of
Environment and Conservation

Our environment, our future

Dieback Interpretation Report
Cape Arid, Kennedy, Alexander and Daniels Rd Reserves

Total area interpreted (ha)	557km
DRA	No
Method of interpretation	Transect Survey / Broadscale Survey
Re-Check	No
Date Commenced	10/02/09
Date Completed	16/06/09
Interpreters	Greg Freebury
	Malcom Grant
Map Expiry Date (recheck date)	**16/6/2010**

ALBANY DISTRICT
Department of Environment and Conservation
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1 Introduction

1.1 Background

Dieback disease caused by the pathogen *Phytophthora cinnamomi* is a major threat to the biodiversity of south-western Australia. The spread of this water mould is facilitated by the movement of soil infested with spores, particularly under warm, moist conditions. Consequently, a major component is the strategy to constrain this disease involves managing access and soil-disturbance activities within native vegetation. Knowledge of the occurrence of the disease in the landscape is therefore an essential prerequisite to formulating suitable hygiene management practices.

The Phytophthora Dieback Management Plan for the South Coast Region 2010-2017 (Viv Read & Associates 2009) identified 84 regional priority areas for further interpretation and potentially the implementation of risk reduction strategies. As a result, SCNRM put up a proposal for *Phytophthora* interpretation and mapping to be carried out for three of these priority areas.

A partnership agreement was then developed between SCNRM and the Department of Environment and Conservation (DEC) for the interpretation and mapping of *Phytophthora cinnamomi* to be undertaken for Cape Arid National Park and Alexander, Kennedy and Daniels Road Reserves by Greg Freebury. Mr Freebury is an accredited *Phytophthora* disease interpreter from the Department of Environment and Conservations (DEC) Albany District. Former DEC employee and interpreter Malcom Grant, assisted with the initial survey and interpretation work and provided valuable information with regards to previous interpretation and disease expression in the Esperance area.

1.2 Location and Size of Areas

A total of 557km of roads and tracks were assessed for *Phytophthora spp.* occurrence.

Interpretation commenced on the 10/2/2009 and was completed on 16/6/09. A total of 19 days was spent carrying out disease interpretation in the field. Opportunistic survey of vegetation adjacent to the roads and tracks also took place as part of the linear survey. In some areas drainage lines and ridges were surveyed in an attempt to increase the area covered by the higher confidence survey (Alexander, Daniels Rd).

1.3 Historical Land Use and Past Disturbances

DEC records show that there have been numerous Phytophthora (and other diseases) surveys within Cape Arid National Park (generally around the Thomas River / Tagon area in the west and the Poison Creek / Mount Arid area in the east). These surveys have been conducted by Science Division staff and dieback interpreters from the south west and south coast as well as opportunistic sampling over the years by various National Park Rangers. A more recent survey was carried out in September 2005, by dieback interpreters from Manjimup. This was only a brief 1 day reconnaissance aimed at providing some ground truthing of information for the broadscale interpretation and strategic mapping that occurred to produce the Project Dieback *Phytophthora cinnamomi* Strategic Atlas (Forest Management Branch 2008).

Part of the Eastern portion of Cape Arid National Park and the Daniels Road, Kennedy and Alexander Reserve system had been included in the Strategic Atlas, however it appears that these areas were only assessed from aerial photography and therefore the information had limited accuracy.

A portion of Alexander Reserve was burnt in December 2006, as was the central portion of Cape Arid NP (between Thomas River and Poison Creek Rd). Whilst these areas could have been classed as uninterpretable, doing so fails to provide any valuable information to the proponent for broadscale planning purposes. It was still possible to survey the area as there were numerous *Phytophthora* susceptible species either resprouting or germinating that would have been anticipated to be expressing some symptoms if *Phytophthora* was present, particularly in areas where infestations were present prior to the fire.

A significant part of the western portion of Cape Arid National Park was also burnt in a wildfire in November 2006 and based on sample results there were certainly sufficient visible symptoms present to be confident that if *Phytophthora* was present then it could be interpreted. However there remains the possibility that new infestations or very small infestations were not noticed in these areas, due to having a smaller relative footprint in amongst the regenerating vegetation.

2 Methods

2.1 Interpretation

Interpretation of roads and tracks followed the standard methods and operating procedures described in the document titled "Volume 2 - *Phytophthora cinnamomi* and disease caused by it: Interpreter guidelines for detection, diagnosis and mapping" (CALM 2001).

Background information was sought through DEC records prior to engaging in field work and the experience of Malcom Grant was of great assistance in this regard.

In addition to the linear survey, binocular survey and survey of some watercourses and depressions was used to try and extend the area of interpretation. Where time permitted, areas were revisited post sampling and ridges away from tracks were walked to further extend the area of interpretation (Alexander).

Phytophthora species presence or absence was determined through a combination of observation and sampling of recently-dead plant species.

2.2 Demarcation

Because the interpretation was only intended for general planning purposes, with no specific operations planned for the immediate future, disease category boundaries were generally not demarcated in the field.

However some demarcation occurred at strategic places in anticipation of the installation of dieback signage. The infested areas were demarcated using 25mm day-glo orange tape with the knots facing the infestation.

The 2 small infestations on the northern firebreak of Cape Arid (the southernmost of the 2 parallel firebreaks adjacent to Merivale Rd) and the southernmost infested creek crossing on the western boundary (the internal firebreak) of Cape Arid National Park, were identified using the Standard Dieback Signage (Muir 2009).

2.3 Soil and Tissue Sampling

Ninety four soil and tissue sample(s) associated with dead or dying plants were taken to confirm the presence or absence of the *Phytophthora spp.* These soil and plant samples were forwarded to the Vegetation Health Service laboratory at Kensington, where diagnostic baiting was conducted. The samples were used as evidence for the presence of *Phytophthora cinnamomi* in the area.

Information regarding these samples is compiled in the ARCVIEW shapefile titled 'Esperance_09_Samples'.

2.4 Mapping

The field observations, boundaries, waypoints and survey data were downloaded from a Global Positioning System unit (GPS) to generate a *Phytophthora cinnamomi* occurrence shapefile within ARCVIEW for the area. *Phytophthora cinnamomi* occurrence maps can now be produced using the ARCVIEW shapefile titled 'Esperance_Interp_Clip_2009'. However the date of the interpretation and the level of accuracy of the interpretation (ie not for operational purposes) must be referenced on the map.

Any maps that are produced using this shapefile should have a disclaimer in the legend regarding the currency of the information. Because *Phytophthora cinnamomi* has the ability to spread autonomously and through vectors such as machinery, vehicles and animals the disease boundaries will shift over time. Therefore the DEC standard for Phytophthora information and mapping is for **boundaries to be re checked if the interpretation is more than 1 year old (20/06/2010),** if operations are planned to occur that may involve the movement of soil adjacent to, or between boundaries. **A full interpretation is to be done after three years (20/06/2012), if there are new or continuing activities planned within the area of interpretation.**

A 'Protectable Areas' map or GIS shapefile has not been produced in this instance as there is no particular operation planned that requires this information. DEC guidelines for determining Protectable Area boundaries should be followed for the production of a Protectable Areas Map for hygiene planning purposes if any operations are proposed within the above timeframes.

It should also be noted that due to the size of the area covered by the mapping relative to the size of some of the small infestations, any large or medium scale maps produced using the 'Esperance_Interp_Clip_2009' shapefile are unlikely to adequately show any of the small infestations. Therefore it is recommended that for medium to large scale maps the sample data shapefile (Esperance_09_Samples) is also included so that most of the small infestations will then be noticeable.

3 Results

3.1 Disease Distribution

Daniels Road Reserve

Then main infestation at Daniels Road Reserve is associated with Daniels Rd which is infested from approximately 700m north of the Reserve to the tracks that access the beach. The infestation extends south of Daniels Rd to the sand dunes and north to the private property. The area east of Daniels Rd appears to be largely uninfested except for infestations associated with a track running parallel with the private property and a track running parallel with Mungliginup creek.

A lime pit adjacent to Daniels Rd has infested vegetation surrounding it. The pit has had an unknown level of hygiene during the construction and utilisation phases and it is likely to have been accessible to the public since it's establishment. Therefore this pit has been classified as infested.

Alexander Reserve

There currently appears to be only two infested areas within the Alexander Reserve. One relatively small infestation (approx 0.5ha) exists towards Mungliginup Creek and it is highly likely that this infestation has come, via vehicles or machinery, from the infested areas immediately west of Mungliginup Creek within the Daniels Road Reserve.

The other infestation is more extensive (approx 27ha) and is associated with a drainage line that crosses Alexander Road in several places. This infestation also extends out to the east along a track that runs from Alexander Road to the Alexander River.

The remainder of the Reserve currently appears to be uninfested.

The lime pit adjacent to Alexander Rd is just outside of the area that is currently showing signs of *Phytophthora* infestation and the vegetation immediately surrounding the pit currently appears to be uninfested. However, because the pit has had an unknown level of hygiene during the construction and utilisation phases and because it has been accessible to the public since it's establishment, it cannot reliably be assumed to be Phytophthora free. Therefore this pit should be treated as infested and material from this pit only used on the infested portions of roads and tracks in the area.

Kennedy Reserve

There currently appears to be only two infested areas within the Kennedy Reserve. However, the main access road and associated road verge into Kennedy's (Exchange Rd) is infested from Merivale Rd south for approximately 2.2km. The remainder of Exchange Rd (to the point where it enters the Reserve) currently appears to be uninfested. However, because the infested portion has numerous boggy sections and has been used under all weather conditions, it is highly likely that the disease has been spread further along the road, but that it is yet to express itself.

The two known infestations within Kennedy Reserve are associated with tracks heading towards the beach from Exchange Rd. Both infestations are still relatively small (0.5ha and 2.5ha).

The remainder of Kennedy Reserve currently appears to be uninfested. However, there remains a strong possibility that *Phytophthora* has been introduced to other areas along the track due to vehicles transporting infested material from the boggy sections of Exchange Rd, but the vegetation is yet to show any symptoms of infection.

There were also a couple of old tracks that were not noticeable at the time of interpretation that were not surveyed. These tracks and the associated vegetation have therefore been classed as low confidence uninfested.

Cape Arid National Park

Prior to this survey, *Phytophthora cinnamomi* was known to occur in four places within the Park:

- Mt Arid / Poison Creek area
- on the walktrail to Boolenup Lake
- below the Rangers residence
- where Telegraph Track crosses Fern Creek.

There is also a record of a positive Phytophthora cinnamomi recovery north of Thomas River Rd (at approximately 497344E, 6259054N). However, after discussion with Mal Grant and other interpreters that have worked in the area it appears that this may be an incorrect plot, particularly as the sample was taken pre GPS. Therefore that infested polygon has not been included in the ARCVIEW shapefile produced as part of this project.

This survey identified at least 7 new infestations. Three were associated with drainage lines or firebreaks at the western boundary of the Park. Two relatively small infestations (approx 0.14ha and 0.003ha) on the southernmost of the two northern firelines that run parallel with Merivale Rd. Also two relatively small infestations associated with Telegraph Track, one situated approximately 1km west of Fern Creek and 80m south of Telegraph Tack (approx 0.01ha) and one where Weamerjungup Creek crosses Telegraph Track (approx 0.3ha).

There were numerous other 'new' infestations located, but these are all basically just new outbreaks and extensions from the existing Poison Creek / Mt Arid infestation along Poison Creek Rd, the old Poison Creek Rd and the firebreak / management track that runs from Poison Creek Rd to Poison Creek. The disease has moved significantly over the past 10 years (Mal Grant pers comm) and has extended up to 6.5 km north along Poison Creek Rd and 4km up the old Poison Creek Rd. This spread is likely to be attributable to the movement of infested soil by vehicles or machinery (graders) as all of the new outbreaks, in this area, are associated with existing roads or tracks and have extended into the broad drainage lines / depressions adjacent to the tracks. It should be noted that this extension is not continuous and most of the sandy ridges in between these broad depressions are currently uninfested.

Phytophthora multivora was identified from a couple of locations within the Park. One was adjacent to Thomas River Road and the other was on a firebreak near the lime pit at the western end of the Park

There was also a positive recovery for *Phytophthora cryptogea* from a sample taken on the internal firebreak near the north western corner of Cape Arid National Park.

At the time of writing this report, there was still one unconfirmed sample result (Cape Arid Sample 59). This sample was taken in a gully adjacent to one of the firebreaks south west of Thomas River Rd. There are multiple deaths at this site and it certainly looks like a *Phytophthora* infection – perhaps cryptogea, megasperma or multivora (unlikely to be cinnamomi as that would have been confirmed by now).

Surprisingly (given the state of the road), Fisheries Road from where it enters Cape Arid National Park through to Israelite Bay currently appears to be uninfested. The condition of this track (particularly when wet) is of concern particularly if *Phytophthora* is ever introduced, as it could very quickly be spread along the length of the road by vehicles or machinery. It would also then be a vector for the potential spread of *Phytophthora* into the large, apparently uninfested, eastern portion of Cape Arid National Park.

Balladonia Road is in a similar condition to Fisheries Road and as it currently appears to be uninfested, it is also of serious concern as a potential vector for disease spread if *Phytophthora* was introduced. There was a cluster of *Phytophthora* susceptible species deaths near the intersection of Balladonia Rd and Gora Track (540790E, 6297 338N). A sample (Cape Arid Sample 42) taken here returned a negative result for *Phytophthora*, however the soil was very dry at the time and it would be adviseable to monitor this spot, given it's proximity to Mt Ragged.

The track into Mt Ragged and the Mt Ragged walk trail currently appear to be uninfested.

3.2 Disease Expression and Impact

The disease expression was generally quite obvious with numerous fresh indicator species deaths and a strong chronology of deaths within established infestations. The timing of the survey was perfect given the big rainfall event that occurred across the area in January.

Disease impact across the area is expected to be quite variable given the significant changes in vegetation, soil type and rainfall across such a large area. The higher rainfall areas closer to the coast are expected to be highly impacted by *Phytophthora* and indeed that is what is occurring at sites that are already infested. The exception to this will be vegetation growing on calcareous soils, although *Phytophthora multivora* has been shown to proliferate on calcareous soils (Scott and Hardy, 2009) and only time will tell what sort of impact this *Phytophthora* will have in the Cape Arid area.

It is also expected that as you move further to the north and east into the lower rainfall areas, there will be less overall impact from *Phytophthora*. It may still have a reasonably significant impact around drainage lines and where water pools, but you would expect there to generally be a lot less disease activity and a lot slower autonomous spread. This is particularly relevant for Fisheries Rd and Balladonia Rd where water pooling is evident.

Armillaria luteobubalina, a naturally occurring plant disease, was identified in several locations through field observations. These locations are included in the Esperance_09_Samples GIS shapefile. Armillaria can kill different species to Phytophthora (but also the same species) and generally has a lower impact on native vegetation than *Phytophthora cinnamomi.*

3.3 Sample Results

Sample results are compiled in the ARCVIEW shapefile titled 'Esperance_09_Samples'. Generally, results were as anticipated, although 5 samples taken from dead and dying plants along Thomas River Rd that were expressing *Phytophthora cinnamomi* like symptoms did not return positive recoveries as expected. However one of these samples did return a positive recovery for *Phytophthora multivora.*

P. multivora has been shown to proliferate on calcareous soils, which are believed to be suppressive to other *Phytophthora* species including *Phytophthora cinnamomi.* It is also found in a range of other soil types (Scott and Hardy).

There was another positive recovery of *P. multivora* from a sample taken approximately 200m north east of the limestone pit off Thomas River Rd. This was from an isolated *Xanthorrhoea* death and there are currently no other disease symptoms at this site.

There was also a positive recovery for *Phytophthora cryptogea* from a sample taken on the internal firebreak near the north western corner of Cape Arid National Park.

4 Recommendation

4.1 Hygiene Management

Applying and maintaining hygiene standards for activities in the area will greatly reduce the risk of spreading or introducing the disease.

4.2 General Recommendations

DANIELS RD

- Only use material from the limestone pit on the infested sections of Daniels Rd and on infested tracks in the area
- Close the track that runs parallel with the northern boundary of the Reserve at the point where it crosses Mungliginup Creek to prevent infested material being transported into Alexander Reserve from Daniels Rd Reserve.
- Close the track that runs parallel with Mungliginup Creek at a suitable point (this track is already overgrown to the point where it is almost impassable anyway – although ideally it should be closed before the infested section at 468324E, 6251028N).

ALEXANDER

- Continue to monitor Alexander Road for disease occurrence – particularly the section from the end of the current infestation to the campground. Possibly something about that bit is currently unprotectable – so maybe O.K to use the limestone from the existing pit.
- Use material from the existing limepit to upgrade the track that runs from Alexander Road to the Alexander River as this track has a number of infested boggy sections and is therefore a potential vector for the further spread of *Phytophthora.*
- Close the section of track that runs off Alexander Rd (at the point where the old gravel pit was – which has recently been rehabilitated) across in a south westerly direction to the track that heads north east out of the Campground.
- Close the track that heads from Alexander to Daniels Rd Reserve at the point where it crosses Mungliginup Creek to prevent infested material being transported into Alexander from Daniels Rd Reserve.
- Erect Standard Dieback Signage (Muir 2009) at the small infestation on the north western firebreak.

KENNEDY

- Upgrade the boggy sections of Exchange Rd (may have already been completed) and consider erecting Standard Dieback Signage (Muir 2009) for this infested section.
- Closure, or at least seasonal closure, of the eastern loop (the track that goes past the lakes) and erection of Standard Dieback Signage (Muir 2009) at this point.
- Opportunistic monitoring of the Kennedy's Track and where possible upgrade of any boggy sections along the track
- Consider re-aligning the track around the infested section (486018E, 6256356N) or upgrading this section to reduce the potential for vehicles to pick up and transport infested material and erection of Standard Dieback Signage (Muir 2009) to identify this infestation.

CAPE ARID

- That Thomas River Rd continue to be monitored with opportunistic sampling, particularly adjacent to the samples that returned negative recoveries, in an attempt to determine the cause of the deaths.
- Monitor the *Phytophthora multivora* spot infestation near the limestone pit and continue to look for any deaths within, or immediately adjacent to the pit, as it is possible that the

Phytophthora multivora infection on the side of Thomas River Rd came from the limestone re-sheeting operation

- Monitor Diamond Hill Trk, particularly around where sample 51 was taken (6276569N, 546207E) and opportunistically sample any fresh deaths – particularly when the soil is warm and moist
- Monitor Baladonia Rd, in particular the cluster of deaths near the intersection with Gora Track (540790E, 6297338N) with opportunistic sampling in an attempt to determine the cause of the deaths there.
- That grading of Poison Creek Rd is managed with appropriate hygiene to avoid the movement of infested gravel or soil any further to the north.
- That grading of Thomas River Rd is managed with appropriate hygiene to avoid the movement of infested material any further to the west
- Machinery (in particular graders) be cleaned down after grading infested sections within the Park prior to working anywhere else.
- That the roads associated with the Ranger Station be bitumised or suitable upgraded to avoid transportation of infested material from that site – particularly adjacent to the wash down bay, the house and the sheds.
- That slashing of firebreaks around the Ranger Station only be conducted under dry soil conditions and appropriate hygiene measures implemented so that no soil or root material from below the Rangers house, washdown bay or sheds is transported elsewhere.
- Continue to implement seasonal (or significant rainfall event) track closures for Telegraph Track, Gabdobitch / Thomas Fishery, Western Boundary etc
- Upgrade infested sections of Telegraph Track (may have already been completed)
- Upgrade 'boggy' sections of Fisheries Road by forming up the clay sections, putting effective drainage in place and sheeting with uninfested gravel or limestone. It is recognised that upgrading the road could potentially have a negative impact (ie more traffic, more vectors, more potential for disease introduction) however, if the sandy sections are not upgraded then it may help to minimise any increase in the number of road users.
- Upgrade 'boggy' sections of Balladonia Rd.
- Develop a Disease Signage Plan to determine the most appropriate places to install the Standard Dieback Signage (Muir 2009).

- Due to the size of the area covered by the mapping relative to the size of some of the small infestations, any large or medium scale maps produced using the 'Esperance_Interp_Clip_2009' shapefile are unlikely to adequately show any of the small infestations. Therefore it is recommended that for medium to large scale maps the sample data shapefile (Esperance_09_Samples) is also included so that most of the small infestations will then be noticeable.
- Look at funding opportunities to treat the small new isolated infestations with phosphite and also to look at some eradication type trials.

5 Conclusion

Cape Arid National Park and Alexander, Kennedy and Daniels Road Reserves were interpreted during Febuary to June 2009 for the presence/absence of *Phytophthora cinnamomi*. Whilst Phytophthora is scattered throughout the area in varying degrees, with the exception of Daniels Rd Reserve and the Mt Arid / Poison Creek area, the area is largely uninfested. A significant proportion of this uninfested vegetation is likely to be highly impacted by *Phytophthora* and a complete vegetation change will occur over time if *Phytophthora* is introduced. It is therefore essential for the ongoing protection of the biodiversity of this area for effective Phytophthora management strategies to be implemented and maintained.

An ARCVIEW shapefile (Esperance_Interp_Clip_2009) has been produced to show disease boundaries. This information is valid until June 2012. However because *Phytophthora cinnamomi* has the ability to spread autonomously and through vectors such as machinery, vehicles and animals, if there are new activities proposed within the area disease boundaries should be re checked prior to operations occurring that have the potential to introduce or move infested material.

I would also like to acknowledge the support and assistance provided by Annabelle Bushell and Robyn Cail from SCNRM, Dave Chadwick, Emma Adams and Klaus Tiedeman from DEC Esperance, the Vegetation Health Service and Malcom Grant.

6 References

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