Department of
Environment and Conservation

Our environment, our future

Dieback Interpretation Report

Total area interpreted (ha)	1400 ha (approx)
DRA	No
Method of interpretation	Transect Survey / Broadscale
Re-Check	No
Date Commenced	25/4/09
Date Completed	17/6/09
Interpreters	Greg Freebury
Map Expiry Date (recheck date)	**17/6/2010**

Albany District
Department of Environment and Conservation
Release 1.00
25 May 2010

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 in 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.

Greg Freebury from the Department of Environment and Conservation (DEC) was requested by John Lizamore, Esperance Catchment Recovery Officer, to map the occurrence of *Phytophthora cinnamomi* within various Esperance Nature Reserves for general planning purposes.

1.2 Location and Size of Areas

RAMSAR listed wetlands near Esperance, in particular Lake Warden, Mullet Lake, Woody Lake and Lake Gore Nature Reserves and the area surrounding Lake Quallilup.

The total area interpreted was approximately 1400 hectares. Interpretation commenced on the 25/4/09 and was completed on the 17/6/09.

1.3 Historical Land Use and Past Disturbances

DEC records show that there was some previous dieback interpretation of the area in 1994 and in the mid 1980's (Mal Grant pers comm.). The 1994 interpretation was predominantly associated with Lake Rd, the Lake Windabout access track and the Kepwari walktrail. Records from the 1980's interpretation were not able to be located and it appears that while some sampling took place there was no actual mapping of disease occurrence.

The area is in the 600 mm rainfall zone.

2 Methods

2.1 Interpretation

The majority of the field interpretation 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). However, due to time considerations and the intended purpose for the information, some of the area was mapped more broadly using binoculars and aerial photographs. Hence the areas categorised as medium confidence uninfested or moderate confidence infested.

Background information was sought through DEC records prior to engaging in field work. Presence or absence was determined not only through observation but by sampling of recently-dead plant species.

Non-differential, hand-held global positioning system (GPS) receivers were used for navigation and to record survey boundaries and waypoints within the areas.

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 not demarcated in the field.

2.3 Soil and Tissue Sampling

Twenty eight 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. The sample point locations were recorded with GPS receivers. Appendix I summarizes the laboratory results of the sampling and a Geographic Information System (GIS) layer has been developed for this information (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 layer within ARCVIEW for the area. *Phytophthora cinnamomi* occurrence maps can now be produced using the ARCVIEW layer. However the date of the interpretation must be referenced on the map.

Any maps that are produced using this layer 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 category 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 layer 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.

3 Results

3.1 Disease Distribution

Phytophthora cinnamomi distribution was generally associated with watercourses, lake margins, roads, tracks and walktrails.

The lake margins and broad drainage areas that are dominated by species such as *Melaleuca cuticularis, M. lanceolata, M. pentagona Acacia saligna, Leptocarpus spp. Templetonia retusa, Sarcocornia quinqueflora and Tecticornia spp.* have been classed as uninterpretable. This is due to there being insufficient *Phytophthora* susceptible species present within these vegetation associations to be able to reliably determine *Phytophthora spp.* presence or absence from field observations. However it is highly likely that some of these areas will be infested, particularly those areas that are down slope of, or immediately adjacent to, an infestation.

Areas with a consolidated limestone sub soil containing species such as *Eucalyptus angulosa* and *E. uncinata* and semi consolidated limestone with *Calothamnus quadrifidus, Acacia Cyclops, Templetonia retusa* and *Melaleuca thymoides* have also been classified as uninterpretable due to insufficient *Phytophthora* susceptible species being present. Some of these areas may also be infested, although it is less likely as the alkaline soils are not conducive to *Phytophthora cinnamomi*.

A small area adjacent to Lake Rd that was burnt in wildfire in 2007 has been classified as uninterpretable due to the age of the vegetation making it difficult to determine *Phytophthora* presence/absence. It is likely that most of this area is uninfested, however the portion immediately adjacent to Lake Rd is infested and it is also possible that *Phytophthora* may have been spread during the construction and/or rehabilitation of fire breaks.

There are still some significant areas of uninfested protectable vegetation within the areas surveyed, predominantly within Woody Lake Nature Reserve, Lake Warden N/R and surrounding Lake Quallilup.

3.2 Disease Expression and Impact

Disease expression ranged from being quite obvious to very cryptic. Disease expression was generally quite obvious in the younger vegetation (4 – 10yo) and more suppressed in the older vegetation. However this was not always the case and some areas of older vegetation were severely impacted by the disease. The reason for some of this unusual disease expression may relate to changes in soil type and/or soil PH and it may be worthwhile investigating this further. Some areas, such as north of Lake Wheatfield, expressed obvious symptoms with numerous susceptible species deaths with chronology. Other areas, such as south of Lake Wheatfield, showed little sign of the presence of *Phytophthora* with only a couple of very old deaths and very few signs of recent activity. This was particularly surprising given the amount of summer rainfall that had occurred.

Also notable were a couple of small areas (the ridge south of Lake Wheatfield is one) where *Banksia speciosa* was absent, but should have been present. The areas did not appear to be infested as there were numerous healthy *Leucopogon's* and *Xanthorrhoea's* present and sampling conducted at one of the sites returned a negative result for *Phytophthora.* However because there is evidence of previous disturbance at the sites (an old track at the Lake Wheatfield site), at

some stage there may have been some clearing adjacent to the track or a couple of fire events in close succession that may have caused the disappearance of the Banksia's.

Disease impact across the susceptible vegetation types within the Reserves is generally expected to be high, particularly for the areas of *Banksia speciosa* or Proteaceous heath growing on acidic soils. The exception will be for the uninterpretable areas (with none, or very few, phytophthora susceptible species present) and the calcareous soils where there will be little to no apparent impact from *Phytophthora*.

Armillaria luteobubalina, an endemic plant disease, was identified in a couple of locations through field observations. In some instances it occurs in conjunction with an existing Phytophthora infestation and in other areas it occurs as isolated deaths. There appears to be a reasonably significant occurrence of *Armillaria* adjacent to the Golf Course (Sample 19 is an *Armillaria* death), although there also appears to be some other factor that has caused the vegetation change at this site (ie general lack of *Banksia speciosa*). Again, it is suspected that the main reason for the lack of *Banksia speciosa* in this area is attributable to some clearing that may have occurred in the past or a couple of fire events in close succession.

4 Recommendation

4.1 Hygiene Management

Any vehicles, machinery or equipment should be free of soil and plant material prior to entering uninfested areas. Departmental staff, research students and other users (those other than the general public operating under some form of Licence ie Reg 4) should avoid working in or adjacent to uninfested areas during wet conditions or when soil is likely to be transported on footwear. The general public should be discouraged from entering uninfested areas where possible. Cleaning vehicles and equipment when leaving infested or uninterpretable areas will also help to prevent the potential spread of disease and/or weeds.

Applying and maintaining hygiene standards for activities in the area will greatly reduce the risk of spreading or introducing the disease. Accurate mapping and demarcation of disease boundaries should occur prior to any operational activities occurring, particularly if they are likely to be within, or immediately adjacent to, an uninfested area.

The powerline that passes through the western end of Woody Lake Nature Reserve is a potential vector for the introduction of *Phytophthora* into a predominantly uninfested portion of the Reserve. Particularly given that there is a seasonally boggy section at the start of the powerline access track. If possible Verve Energy should be contacted and advised of the situation and perhaps some sort of temporary track closure (ie gate) put in place in an attempt to reduce the amount of access by the general public.

A Hygiene Management Plan should be produced for any operations that are likely to involve the movement of soil or root material.

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5 Conclusion

Mullet Lake, Woody Lake and Lake Gore Nature Reserves as well as the area surrounding Lake Quallilup were interpreted during April and June 2009 for the presence/absence of *Phytophthora cinnamomi*. Whilst a considerable proportion of the area has been classed as infested or uninterpretable, there is still a significant amount of uninfested vegetation present. The majority of this uninfested vegetation is protectable and should therefore be managed to ensure it is protected.

An ARCVIEW layer has been developed to show disease boundaries and disease occurrence maps can be produced using this information provided that the requirements of Section 3.4 are met.

6 References

Department of Conservation and Land Management (2000) Phytophthora cinnamomi and disease caused by it. Volume I Management Guidelines

Department of Conservation and Land Management (2001) Phytophthora cinnamomi and disease caused by it. Volume II Interpreter guidelines for detection, diagnosis and mapping

Havel, J.J. (1975) Site Vegetation Mapping in the Northern Jarrah Forest (Darling Range). 2. Location and Mapping of Site-Vegetation Types.

Botanic Gardens Trust Sydney NSW. Armillaria root Rot – fact sheet. http://www.rbgsyd.gov.au/information about plants/pests diseases/fact sheets/armillaria root rot

7 Appendices

7.1 Summary of Soil and Tissue Samples

SAMPLE SUMMARY

Species	No. of samples	No. positive	Pc. %
Banksia speciosa	15	10	66.6
Xanthorrhoea platyphylla	7	6	85.7
Banksia violaceae	1	1	100
Leucopogon revolutus	3	3	100
Calothamnus quadrifidus.	2	0	0
TOTALS	**28**	**20**	**71.4**

Sample Name	Plant Sampled	Reference No	Result (cin, neg)
Mullet Lake Sample 1	*Banksia speciosa*	**E** 404 960 **N** 6260 033	CIN
Mullet Lake Sample 2	*Banksia speciosa*	**E** 407 004 **N** 6260 548	NEG
Mullet Lake Sample 3	*Xanthorrhoea platyphylla*	**E** 407 693 **N** 6260 625	CIN
Mullet Lake Sample 4	*Xanthorrhoea platyphylla*	**E** 403 526 **N** 6259 808	CIN
Mullet Lake Sample 5	*Banksia speciosa*	**E** 404 696 **N** 6260 055	CIN
Lake Warden Sample 1	*Banksia speciosa*	**E** 395 862 **N** 6258 749	CIN

Lake Warden Sample 2	*Calothamnus quadrifidus*	**E** 393 915 **N** 6256 590	NEG
Lake Warden Sample 3	*Banksia speciosa*	**E** 394 292 **N** 6256 081	NEG
Lake Warden Sample 4	*Calothamnus quadrifidus*	**E** 397 092 **N** 6257 871	NEG
Esp Lakes Sample 1	*Leucopogon revolutus*	**E** 401 123 **N** 6258 363	CIN
Esp Lakes Sample 2	*Banksia speciosa*	**E** 401 162 **N** 6258 483	CIN
Esp Lakes Sample3	*Banksia speciosa*	**E** 401 140 **N** 6258 679	CIN
Esp Lakes Sample 4	*Banksia speciosa*	**E** 400 906 **N** 6258 078	NEG
Esp Lakes Sample 5	*Banksia speciosa*	**E** 398 917 **N** 6258 750	CIN
Esp Lakes Sample 6	*Xanthorrhoea platyphylla*	**E** 398 935 **N** 6258 513	CIN
Esp Lakes Sample 7	*Banksia speciosa*	**E** 399 459 **N** 6261 268	CIN
Esp Lakes Sample 8	*Xanthorrhoea platyphylla*	**E** 399 459 **N** 6261 268	CIN
Esp Lakes Sample 9	*Banksia speciosa*	**E** 399 596 **N** 6260 731	CIN
Esp Lakes Sample 10	*Xanthorrhoea platyphylla*	**E** 399 545 **N** 6260 708	CIN
Esp Lakes Sample 11	*Leucopogon revolutus*	**E** 397 272 **N** 6258 511	CIN
Esp Lakes Sample 12	*Xanthorrhoea platyphylla*	**E** 397 341 **N** 6258 330	CIN
Esp Lakes Sample 13	*Banksia speciosa*	**E** 399 434 **N** 6257 558	CIN
Esp Lakes Sample 14	*Xanthorrhoea platyphylla*	**E** 397 229 **N** 6257 964	NEG

Esp Lakes Sample 15	*Banksia violaceae*	**E** 396 930 **N** 6258 810	CIN
Esp Lakes Sample 16	*Banksia speciosa*	**E** 399 800 **N** 6258 423	CIN
Esp Lakes Sample 17	*Leucopogon revolutus*	**E** 400 309 **N** 6258 194	CIN
Esp Lakes Sample 18	*Banksia speciosa*	**E** 398 914 **N** 6257 367	NEG
Esp Lakes Sample 19	*Banksia speciosa*	**E** 398 653 **N** 6257 219	NEG