Gnangara Sustainability Strategy

An across-government initiative

Groundwater – Biodiversity – Land use

PHYTOPHTHORA DIEBACK INTERPRETATION REPORT OF MELALEUCA BLOCK AND THE PROPOSED MELALEUCA NATURE RESERVE

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Phytophthora dieback interpretation report of Melaleuca block and the proposed Melaleuca Nature Reserve

Report to the Department of Environment and Conservation and the Gnangara Sustainability Strategy

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Phytophthora Dieback Interpretation Report of Melaleuca Forest Block and the Proposed Melaleuca Nature Reserve

Introduction

The banksia woodlands of the Swan Coastal Plain are especially at risk from the pathogenic root fungus *Phytophthora cinnamomi* as they contain many susceptible species. Dieback interpretation was undertaken to assess the impact of *P. cinnamomi* on the banksia woodland of the Gnangara Sustainability Strategy (GSS) study area. The Melaleuca forest block, proposed Melaleuca Nature Reserve (this report) and Yeal Nature Reserve (Meharry and Swinburn 2009) were chosen as representatives of the banksia woodland occurring in the GSS. Field interpretation results of dieback infestations will not only assist the Department of Environment and Conservation (DEC) in the ongoing management of these native woodlands, but also provide on-ground baseline data for integration into associated dieback and remote sensing projects underway for the GSS.

Site location

Phytophthora dieback interpretation was undertaken in the proposed Yongka (Melaleuca Park) Nature Reserve (Conservation Commission of Western Australia 2004) and Melaleuca State Forest by DEC interpreters Michael Pez and John Meharry (Forest Management Branch).

The 3422.8 hectares of interpreted area is bounded by Gallager Road to the north, the Gnangara pine plantation to the west, Bell Road and the Rocla sand mining operations to the south, and the eastern extent of DEC managed estate adjoining freehold land to the east. The area is within the medium rainfall zone, having an annual rainfall of 700mm to 900mm.

The dieback boundaries of seven research ground plots associated with GSS research into impacts of dieback on birds and terrestrial vertebrates were also delineated within this period. Five of these sites were located within the interpreted area, while two plots were located west of the interpreted area in an infested dampland north of Skink Road.

Methodology

Previous Dieback Interpretation

DEC records show that previous dieback interpretation of the area was carried out in 1996, 2000 and 2003. The south east corner of the proposed Melaleuca Park Nature Reserve was interpreted by Hart (Reynolds 2000a; b).

In 2000, Fieldview Nominees Pty Ltd assessed areas at risk of vectored inoculum spread such as roads, tracks, easements and trails and areas with a high probability of inoculum survival such as creeks, wetlands and drainage features (Reynolds 2000a). The monitoring sites of Hart, Simpson and Associates Pty Ltd from 1996 were also reassessed and the predicted impact of *P. cinnamomi* in the vegetation associations, disease distribution and impact, site disturbance and potential inoculum vectors were discussed (Reynolds 2000b). An assessment of a portion of this area by Glevan Dieback Consultancy Services also occurred in 2003. These assessments were broad area interpretations using aerial photography interpretation with no ground stripping of uninfested areas (ground stripping is commonly used in broad area interpretation where the entire area is traversed by foot to give 100% interpretation coverage of an area).

Recent Fire History

The single occurrence of a recent prescribed burn in the proposed nature reserve was a spring burn from the 2006/2007 fire season, resulting in a burn age of 2 years since last burnt (YSLB). Burn ages less than 4 YSLB can render the area uninterpretable by removing indicator species and masking disease expression. The area was therefore excluded from the interpretation survey. Numerous prescribed burns have occurred from 1985 through to 2005 in numerous locations with a variety of intensities and frequencies (Figure 1). These latter burns should not impact field interpretation surveys.

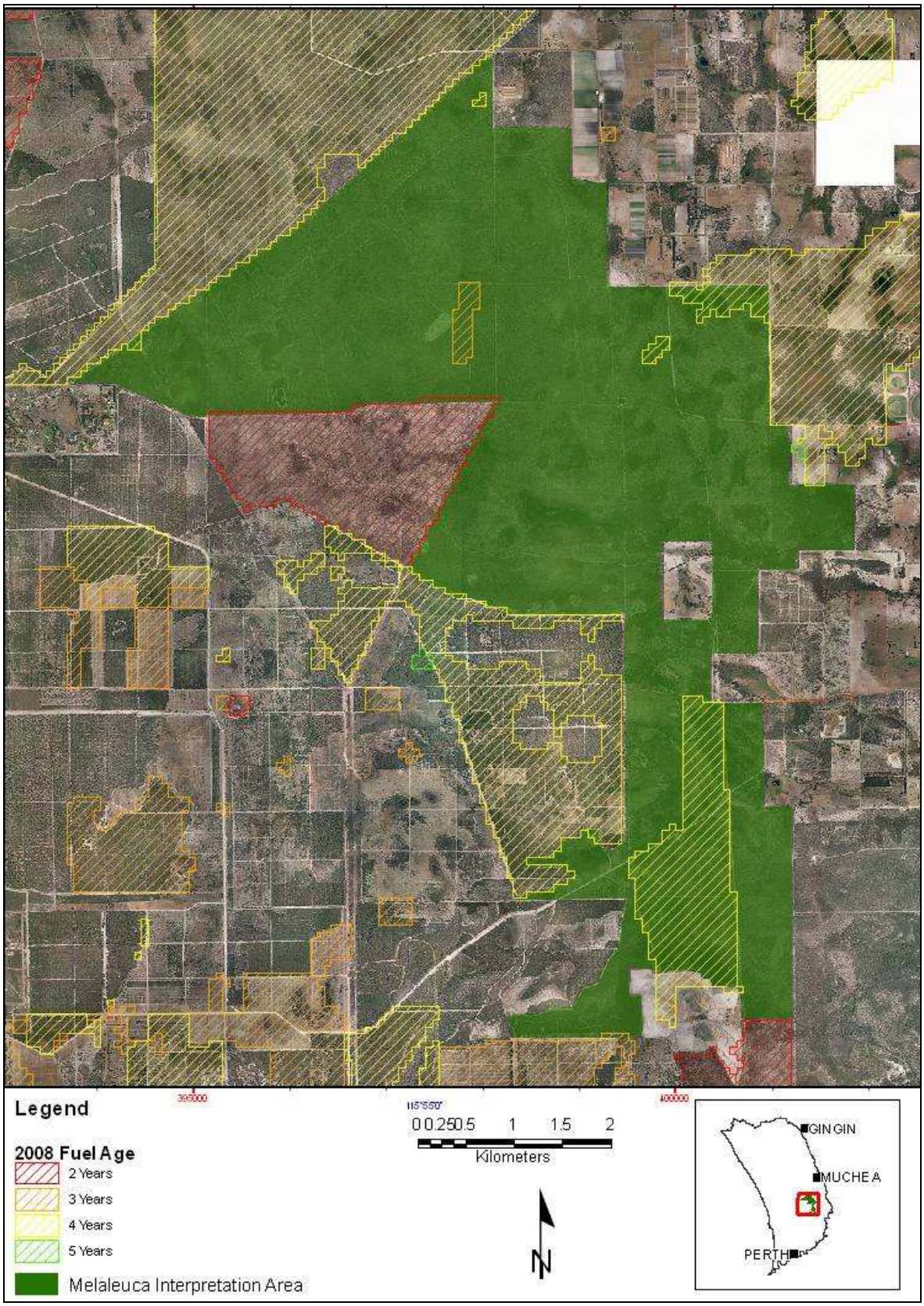

Figure 1. Fuel ages (<6 YSLB) across proposed dieback assessment area based on the year since last burnt (prescribed or wildfire).

Threatened Flora

The declared rare flora *Caladenia huegelii* and *Grevillea curviloba* subsp. *curviloba* occur in the area in single, isolated populations (Atkins 2008). A new population of the priority 1 species *Calectasia* sp. Pinjar has recently been discovered south of Neaves Road (Swinburn and Hoskins in prep.). There is a single unconfirmed record of the priority 2 species, *Schoenus griffinianus* (Western Australian Herbarium 2008).

Interpretation and Demarcation

In the field the area was interpreted by using linear survey techniques with obvious infestations recorded from aerial photography and then ground truthed. Broad areas of infested vegetation were mapped directly from digital aerial photography and then ground truthed. Only obvious infestations were mapped from the photography and no ground transects were walked in uninfested areas. Thus these boundaries are estimations and are not highly accurate (0 to 50m from actual).

Linear and broad area interpretation and mapping of the presence or absence of *Phytophthora cinnamomi* followed the standard methods and operating procedures for linear surveys described in the document titled "Volume 2 - *Phytophthora cinnamomi* and disease caused by it: Interpreter guidelines for detection, diagnosis and mapping" (CALM 2001). Interpretation commenced on the 28 August and was completed on the 11 September 2008.

Non-differential, hand-held global positioning system (GPS) receivers were used for navigation and to record survey boundaries and waypoints for all linear demarcation boundaries and for the seven research ground plots. The infested areas intersecting interpreted tracks and the research ground plots were demarcated using 50 mm day-glo tape with the knots facing the infestation.

Soil and Plant Sampling

Soil and tissue samples of recently dead or dying indicator species were collected to confirm the presence or absence of *Phytophthora* species, thereby assisting in the

interpretation of the area. These soil and plant samples were forwarded to the DEC's Vegetation Health Service laboratory at Kensington, where diagnostic baiting was conducted. The sample point locations were recorded with GPS receivers (Table 2).

Mapping

For the linear survey and the seven research ground plots, demarcation lines were captured using non-differential GPS receivers. The infested areas outside of the linear survey were plotted directly onto the aerial photography during ground observations using a digital tablet. The field observations, boundaries, waypoints and survey data were downloaded into a Geographic Information System from the GPS and tablet data to generate a map of *P. cinnamomi* occurrence map.

Areas are attributed to one of several definitions:

- Infested with *P. cinnamomi;*
- Uninfested- (free of plant disease caused by *P. cinnamomi*);
- Uninterpretable (those areas where the presence or absence of *P. cinnamomi* cannot be determined);
- Unprotectable (infested areas and those areas where it is judged that autonomous spread of the pathogen will occur in the short term which is within a few years and up to 50 years); or
- Protectable (free of plant disease caused by *P. cinnamomi* and likely to remain so with the current determination based on 50 years spread up-slope) (CALM 2001)

Uninfested areas 25 metres either side of the tracks were mapped. Only infested areas were mapped for the broad area surveys. As only obvious infestations were mapped from the aerial photography it possible that there are infestations within the unmapped areas which were not visible from the photography, although remote sensing of the area from an associated GSS project did not identify additional suspected infestations.

Results

Disease Distribution

Of the 3422.8 hectares within the interpretation area, 1203.8 hectares were mapped either as linear surveys of tracks or broad interpretation of suspected *P. cinnamomi* infestations from aerial photography. The mapping identified 491.8 hectares as being infested with *P. cinnamomi* and 712.0 hectares interpreted as being uninfested. (Table 1, Figure 2). A large proportion of the area (2219.0 hectares) is assumed to be uninfested but was not surveyed to confirm this (unmapped areas) due to time and cost constraints.

Table 1. Breakdown of areas interpreted for *Phytophthora* dieback by linear and broad interpretation survey

Category	Area (ha)
Uninfested	712.0
Infested	491.8
Unmapped	2219.0
Total	**3422.8**

P. cinnamomi distribution was mainly associated with open tracks and moisture gaining sites. However there were at least two infestations that had no obvious vectors and were located well away from tracks and moisture gaining sites.

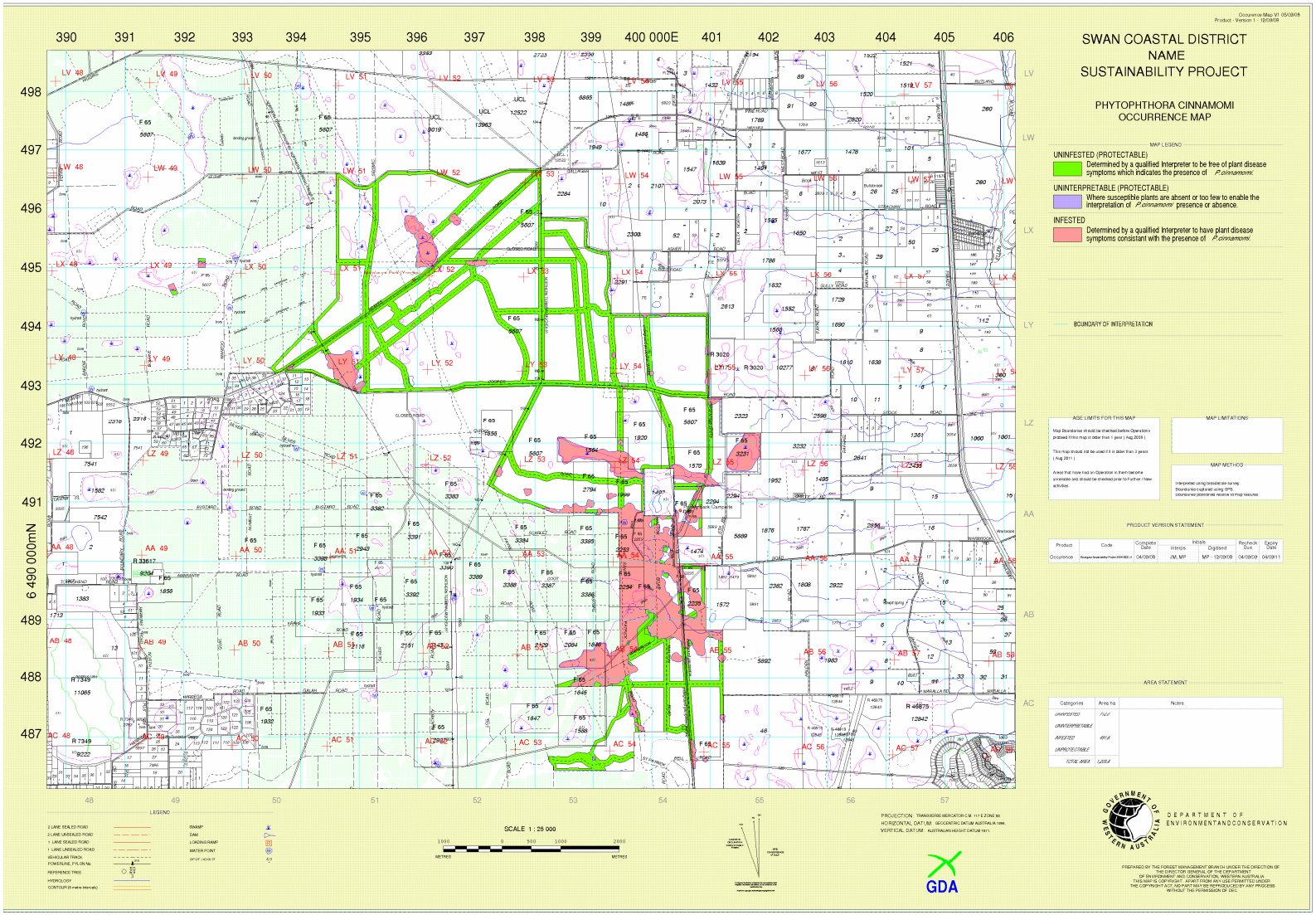

Figure 2. *Phytophthora* dieback occurrence map of Melaleuca state forest and the proposed Melaleuca Nature Reserve.

Research Ground Plots

The dieback infection front within each of the seven research ground plots were walked with a GPS unit (Figure 3).

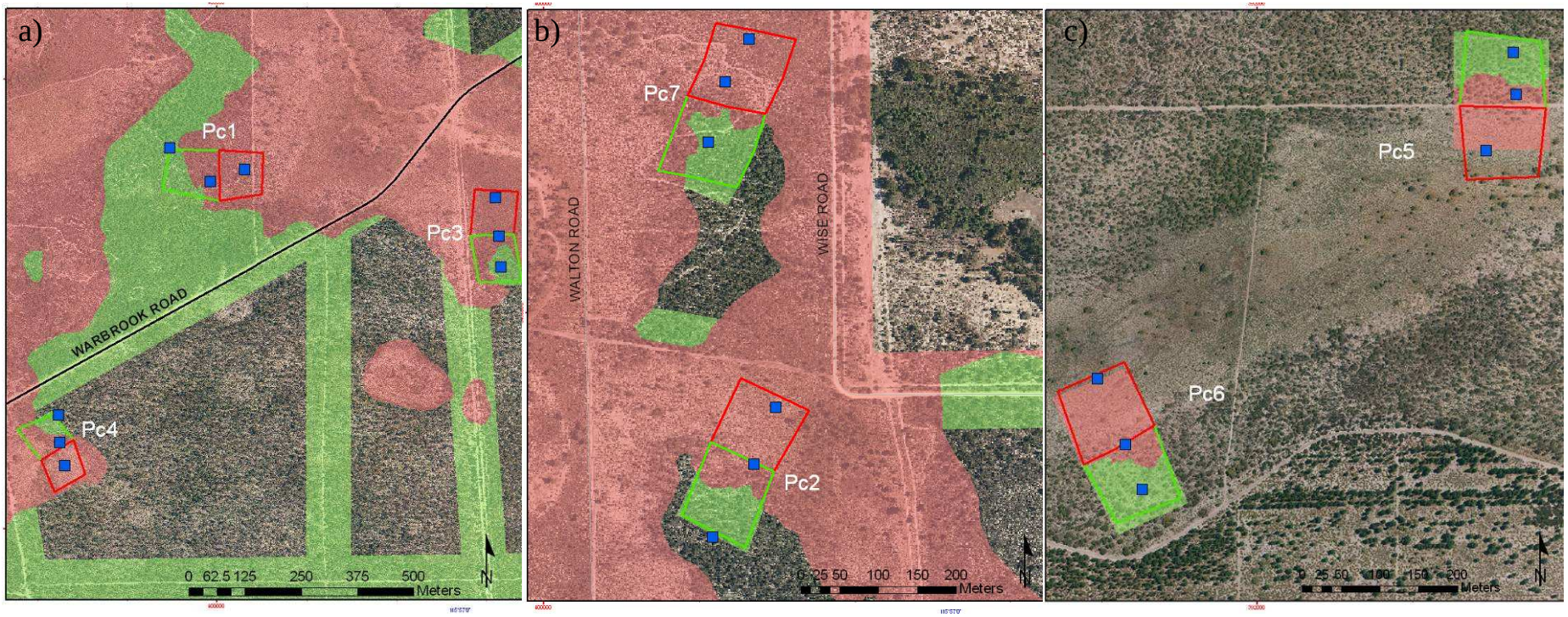

Figure 3. Research ground plots with *Phytophthora* dieback interpretation (background red is infested; background green is uninfested, clear is unmapped) by Forest Management Branch (DEC); a) sites Pc1, Pc3 & Pc4 adjacent to Warbrook Road; b) sites Pc2 & Pc7 between Walton and Wise Roads; and c) sites Pc5 and Pc6 outside of the broadscale interpretation.

Disease expression and impact

The disease expression was generally good with a number of fresh deaths of indicator species along many sections of the infested boundary. There were however many background deaths, possibly drought-related, which made interpretation in some areas more difficult. Fire related deaths were also observed throughout the area. Both fire and drought deaths can be ruled-out as disease deaths by the lack of pattern and chronology.

In some sections of the infestation an endemic or 'graveyard' effect was observed with a significant decrease in biomass and biodiversity. Disease impact within the infestations is expected to be high as the disease progresses. This is due to the high number of susceptible species found within most of the infested Banksia woodland areas. Some of the infested wetlands will show little or no obvious signs of disease due to a lack of susceptible species naturally occurring within wetlands; however these areas are obviously infested due to the disease expressing itself in the surrounding vegetation.

Sample Results

Three soil and tissue samples from recently dead *Banksia grandis* were collected and analysed for presence of the *P. cinnamomi* pathogen. The samples were taken to aid interpretation of areas where the disease expression was not obvious. Two samples tested positive for the pathogen (Table 1; Table 3).

Table 2. Results of tested samples.

Sample No.	Indicator Species Sampled	Coordinates	Result
1	Banksia grandis	E 401 030 N 6429 763	Positive
2	Banksia grandis	E 400 792 N 6491 257	Positive
3	Banksia grandis	E 400 157 N 6491 581	Negative

Table 3. Sample summary from Vegetation Health Service laboratory (DEC) analysis. ISD= indicator species death; Pc = *Phytophthora cinnamomi*; M = Multiple; C = Cluster; S = Scattered and I = Isolated.

Species	No. of samples	No. positive	Pc %	ISD Pc positive				ISD Pc negative			
				M	C	S	I	M	C	S	I
Banksia grandis	3	2	66.7	0	2	0	0	1	0	0	0

Recommendations

Hygiene Management

Apply and maintain hygiene standards for movement of vehicles along all of the current tracks and for entry into the research ground plots. Unmapped areas should be considered protectable and be treated with the same hygiene as uninfested areas.

Swan Coastal District to demarcate the tracks within 4 months of the interpretation with standardized dieback posts.

The following options should be considered to reduce the impact of *P. cinnamomi* in protectable areas:

1. Application of phosphite
2. Upgrade of tracks that intersect known infestations (e.g. with limestone base material), particularly tracks traversing wetland and moisture gaining sites.
3. Closure of tracks that intersect with known infestations

Use of Interpretation Map

A map has been prepared to show disease boundaries. This map is valid until August 2011. However because *P. cinnamomi* has the ability to spread autonomously and through vectors such as machinery, vehicles and animals the map boundaries should be re checked if the map is more than 1 year old (Aug 2009). A full interpretation is to be done after three years (August 2011), if there are continuing or new activities within the interpretation boundaries.

Conclusion

The predominantly *Banksia* woodland of the proposed Yongka (Melaleuca Park) Nature Reserve and Melaleuca State Forest, on the Swan Coastal Plain was interpreted in August/September 2008 for the presence/absence of *Phytophthora cinnamomi*. A significant amount of the area is infested. Large areas are probably uninfested but were not walked to confirm this (unmapped areas) It is possible that there are infestations within the unmapped areas that did not show up on the aerial photography and were therefore not mapped.

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