Gnangara Sustainability Strategy

An across-government initiative

Groundwater – Biodiversity – Land use

MAPPING THE CURRENT EXTENT OF *PHYTOPHTHORA CINNAMOMI* IN *BANKSIA* WOODLANDS IN THE GSS STUDY AREA

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

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Mapping the current extent of *Phytophthora cinnamomi* in *Banksia* woodlands in the GSS study area

Introduction

As part of the regional scale "Project Dieback" study the Forest Management Branch within the Department of Environment and Conservation compiled spatial information on the extent of *Phytophthora cinnamomi* across the Swan and Northern Agricultural Regions. This mapping is part of a suite of information resources on *P. cinnamomi* extent and risk that are being made available to inform decision makers on how to invest the limited resources available for *P. cinnamomi* management.

The objective of this study was to examine the current extent of *P. cinnamomi* across the GSS study area (Gnangara groundwater system) including the landforms the disease is present on.

Databases and methods used

Project Dieback compiled mapping information (hereafter referred to as interpretation mapping) on the extent of *P. cinnamomi* by collating existing operational interpretation mapping and sample data, undertaking desktop aerial photographic interpretation and, in a limited number of areas, new field observations (Strelein *et al.* 2008). The status of areas were classed as: infested, uninfested, unmappable (disturbances present that mask the impact of *P. cinnamomi*), uninterpretable (lack of susceptible vegetation precluded disease expression) or not interpreted (less than 50 hectares therefore to small or cleared of remnant vegetation). For those areas classed as infested or uninfested a confidence code (low, medium or high confidence) was assigned depending on evidence of the disease pattern/expression, topography, presence of vectors and typical levels of rainfall and soil moisture. Those areas interpreted from ground survey information were generally assigned a high level of confidence as the field visits would have confirmed the presence or the absence of the pathogen. Summary statistics of the interpretation mapping were calculated for the GSS study area.

Using tools available in ArcView, soil and landform information was extracted for all areas assigned an interpretation mapping category (remnant vegetation and pine plantations) using 'Map Unit System information' in the DAFWA Soil-Landscape Mapping (see Table 1 for a list of soil-landscape maps that cover the GSS study area). The Soil-Landscape Systems are defined as "areas with recurring patterns of landforms, soils and vegetation" (Schoknecht *et al*. 2004) and therefore delineate the major soil and landform boundaries across the GSS study area (see Appendix A). The total area and proportion infested for each soil and landform type (soil-landscape System) was calculated.

Table 1: List of Soil-Landscape Mapping datasets that cover the GSS study area. Scale of mapping 1:50,000. DAFWA refers to Department of Agriculture and Food WA.

Dataset Title	**Custodian**
Chittering Land Resource Survey	DAFWA
Gingin Infill Land Resource Survey	DAFWA
Gingin West Soil Survey	DAFWA
Compilation of 1:50,000 Environmental Geology for the Perth inner metropolitan region	Department of Minerals and Energy – This version edited and adjusted by DAFWA
North Metropolitan Land Resources	DAFWA
Swan Valley Horticulture Study	DAFWA

P. cinnamomi occurence

GSS study area

The Project Dieback interpretation mapping reveals that 10% of the GSS study area is infected with the disease. The disease occurs across a range of land uses including small remnants within urban areas and large areas in the Conservation Estate (Table 2; Figure 1; Appendix B). The majority of the infested areas are classed as low or medium confidence reflecting the limited amount of operational interpretation mapping that has been undertaken especially on the Conservation Estate in the north of the GSS study area. Those areas that are classed as uninterpretable include the Quindalup Dunes and wetlands areas (Figure 1; Appendix A) and those classed as unmappable largely represent the pine plantations (Figure 1; Appendix B).

Table 2: *P. cinnamomi* interpretation status class summary for the GSS study area

Status Class	**Interpretation confidence categories**	**Total Area in GSS (ha)**	**Proportion of GSS study area (%)**	
			By confidence categories in each Status Class	**By Status Class**
Infested	High	2114	1.0	9.7
	Medium	7947	3.7	
	Low	10686	5.0	
Unmappable (includes pine plantations)		29421	13.7	13.7
Uninterpretable		17565	8.2	8.2
Uninfested	Low	38090	17.7	25.8
	Medium	15202	7.1	
	High	2105	1.0	
Not Interpreted		6373	3.0	3.0
Total area cleared of remnant vegetation (excluding pine plantations)		85393	39.7	39.7
Total area of GSS		**214896**	**100**	**100**

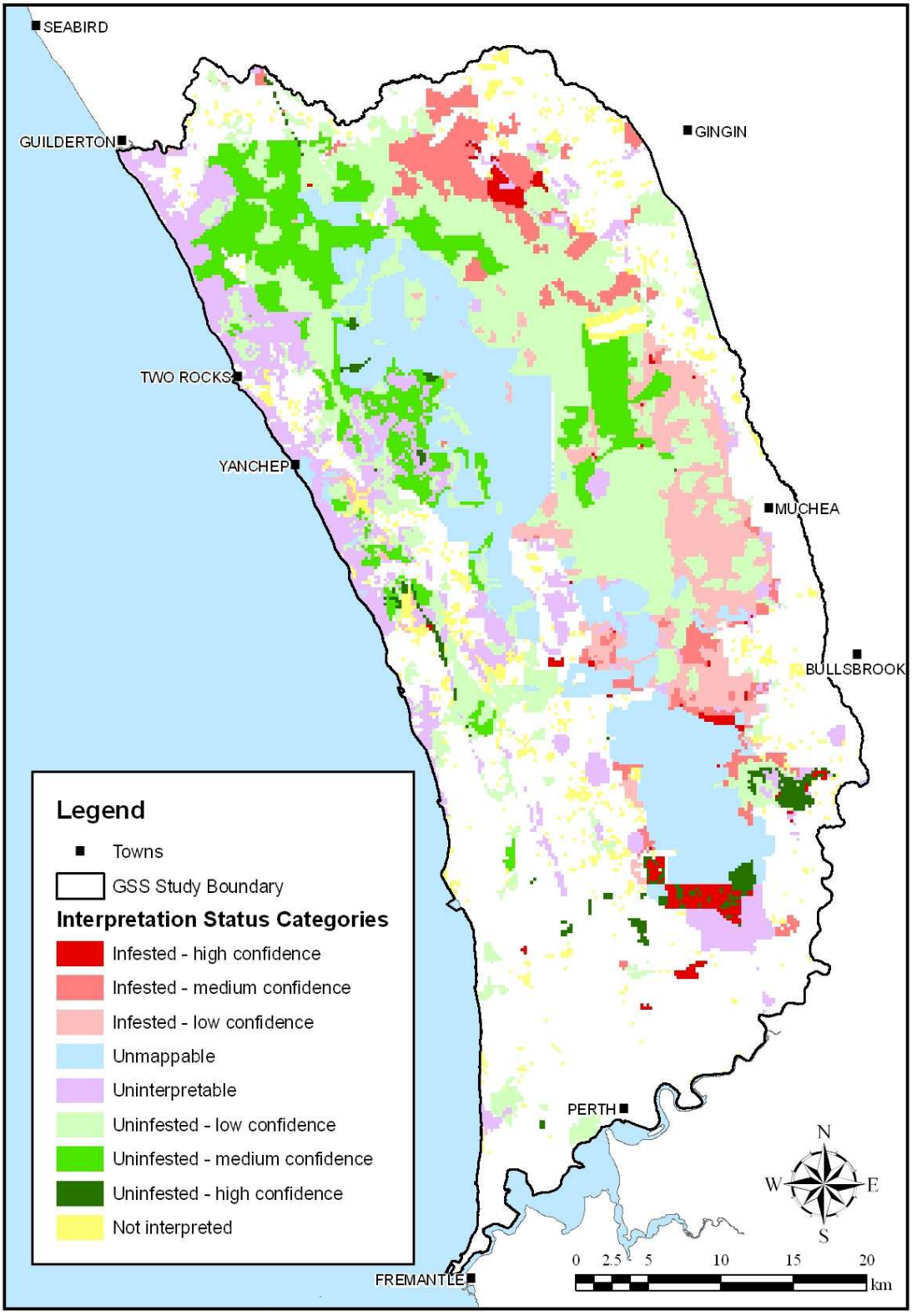

Figure 1: *P. cinnamomi* interpretation mapping for the GSS study area.

Soil and Landform Types

Of the 20,747 ha of infested areas within the GSS study area, 94% is located on the Bassendean Dune System (Table 3). Previous surveys of disease impact areas, on the Swan Coastal Plain, have found that the disease is more likely to occur on the *Banksia* woodlands of the leached sands of the Bassendean Dune system (Shearer and Dillon 1996; Shearer 1994). Studies undertaken elsewhere have revealed that abiotic and biotic characteristics of soils can directly or indirectly favour or inhibit reproduction, survival and infection of *P. cinnamomi* (Erwin *et al.* 1983 cited in Shearer and Dillon 1996). Generally the impact of *P. cinnamomi* is low in vegetation communities on coastal limestone and this is the case in the GSS study area with only minor amounts (3%) found on the Spearwood Dune System (Table 3). The majority of the coastal Quindalup Dune system was classed as uninterpretable and any areas of infestation on this soil type were classed as low or medium confidence (Table 4). Only 2% of infested areas were located on the soils of the Pinjarra Plain (Pinjarra and Yanga Soil and Landform Types in Table 3). The vegetation within this area is susceptible to the disease so the low levels of impact are probably reflecting the high levels of clearing that have occurred rather more so than any resistance to the disease. It is also reflecting that approximately 27% of the remaining remnant vegetation on the Pinjarra Plain is uninterpretable and approximately another 33% has not been interpreted (Table 4).

Table 3: Total area and proportion of areas infested by *P. cinnamomi* for the major soil and landform types across the GSS study area. Proportions are of total area infested.

Major Soil and Landform Types	**Total Area Infested**	
	ha	%
Quindalup	35	0.17
Spearwood	626	3.02
Bassendean	19557	94.26
Moore	31	0.15
Pinjarra	75	0.36
Yanga	421	2.03
Coonambidgee	0	0.00
Dandaragan	2	0.01
Grand Total	**20747**	**100**

Table 4: *P. cinnamomi* interpretation status class summary (total area and proportions) of major soil and landform types of the GSS study area. Proportions are of total area assigned an interpretation mapping category (remnant vegetation and pine plantations).

Status Class	Interpretation Confidence Categories	Major Soil and Landform Types																			
		Quindalup		Spearwood		Bassendean		Moore		Pinjarra		Yanga		Coonambidgee		Dandaragan		Unknown[+]		Grand Total	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Infested	High	0	0	65	0.05	1951	1.51	0	0	75	0.06	23	0.02	0	0	0	0	0	0	2114	1.63
	Medium	0	0	193	0.15	7623	5.89	1	0	0	0	127	0.1	0	0	2	0	0	0	7947	6.14
	Low	35	0.03	368	0.28	9982	7.71	30	0.02	0	0	270	0.21	0	0	0	0	0	0	10686	8.25
	Total Area	**35**	**0.03**	**626**	**0.48**	**19557**	**15.1**	**31**	**0.02**	**75**	**0.06**	**421**	**0.33**	**0**	**0**	**2**	**0**	**0**	**0**	**20747**	**16.02**
Uninfested	Low	1053	0.81	13233	10.22	23147	17.87	25	0.02	0	0	538	0.42	79	0.06	12	0.01	3	0	38090	29.41
	Medium	159	0.12	10806	8.34	4237	3.27	0	0	0	0	0	0	0	0	0	0	0	0	15202	11.74
	High	0	0	778	0.6	1289	1	0	0	0	0	38	0.03	0	0	0	0	0	0	2105	1.63
	Total Area	**1212**	**0.94**	**24816**	**19.16**	**28674**	**22.14**	**25**	**0.02**	**0**	**0**	**576**	**0.45**	**79**	**0.06**	**12**	**0.01**	**3**	**0**	**55397**	**42.78**
Unmappable (includes pine plantations)		**298**	**0.23**	**14402**	**11.12**	**14675**	**11.33**	**0**	**0**	**0**	**0**	**45**	**0.03**	**0**	**0**	**0**	**0**	**0**	**0**	**29421**	**22.72**
Uninterpretable		**6246**	**4.82**	**5968**	**4.61**	**4480**	**3.46**	**50**	**0.04**	**64**	**0.05**	**698**	**0.54**	**0**	**0**	**0**	**0**	**59**	**0.05**	**17565**	**13.56**
Not Interpreted		**522**	**0.4**	**2695**	**2.08**	**2086**	**1.61**	**123**	**0.09**	**69**	**0.05**	**851**	**0.66**	**0**	**0**	**13**	**0.01**	**16**	**0.01**	**6373**	**4.92**
Grand Total		**8313**	**6.42**	**48506**	**37.46**	**69471**	**53.64**	**229**	**0.18**	**208**	**0.16**	**2591**	**2**	**79**	**0.06**	**26**	**0.02**	**78**	**0.06**	**129503**	**100**

[+] Soil and Lanform Type unknown as either DAFWA Soil-Landscape Mapping did not cover some areas along the coast and waterways or due to holes (slivers) in this same mapping dataset.

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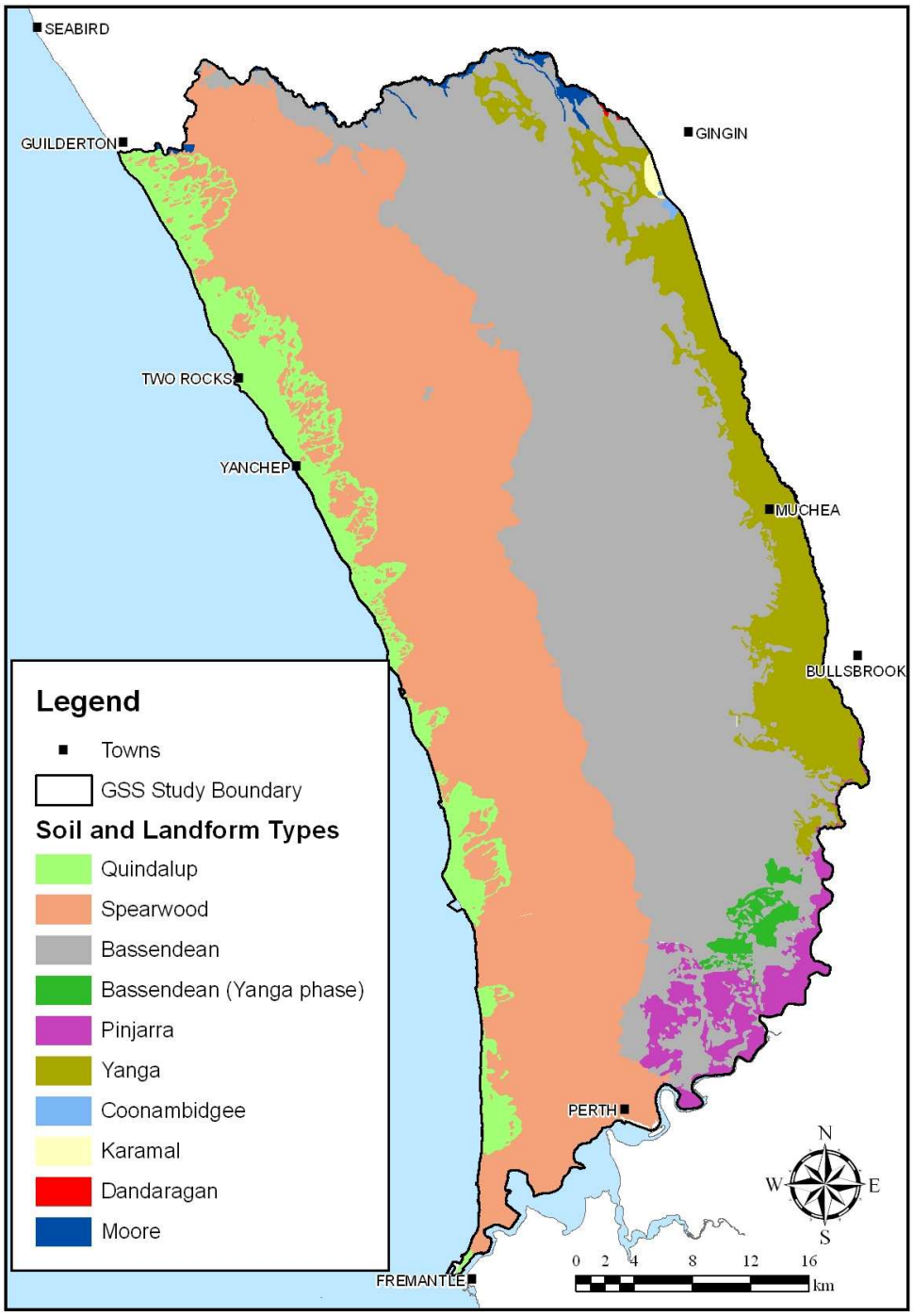
Appendices

Appendix A: Soil and Landform Types (DAFWA Soil-Landscape Systems)



Appendix B: Conservation Reserves and Pine Plantations across the GSS Study Area