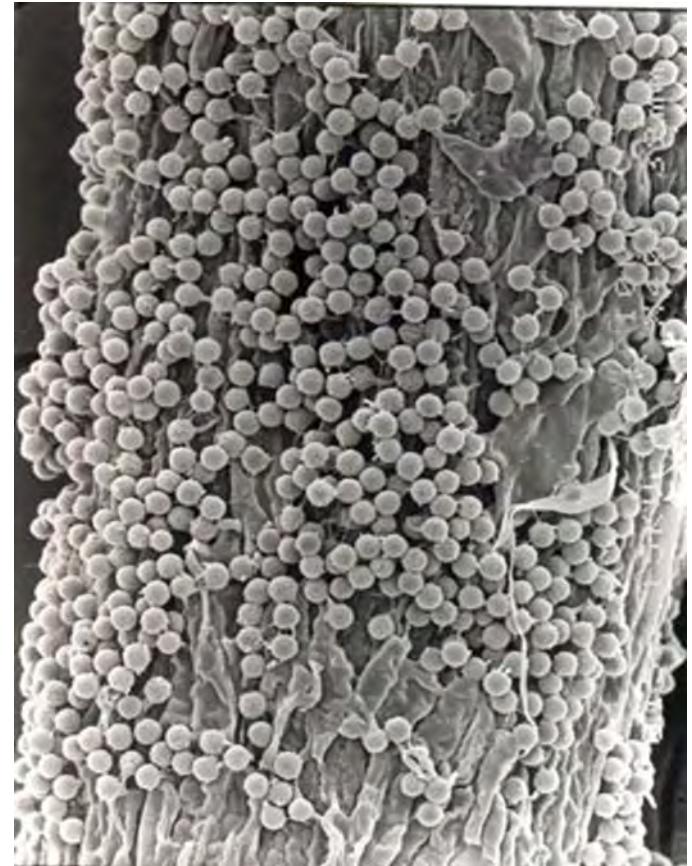


# ***Phytophthora* Dieback management in rehabilitation and revegetation projects**



Zoospore-cysts of *Phytophthora cinnamomi* amassed on a plant root. (Scanning electron micrograph: Professor A Hardham, The Australian National University, Canberra, A.C.T.).

## Presentation Outline

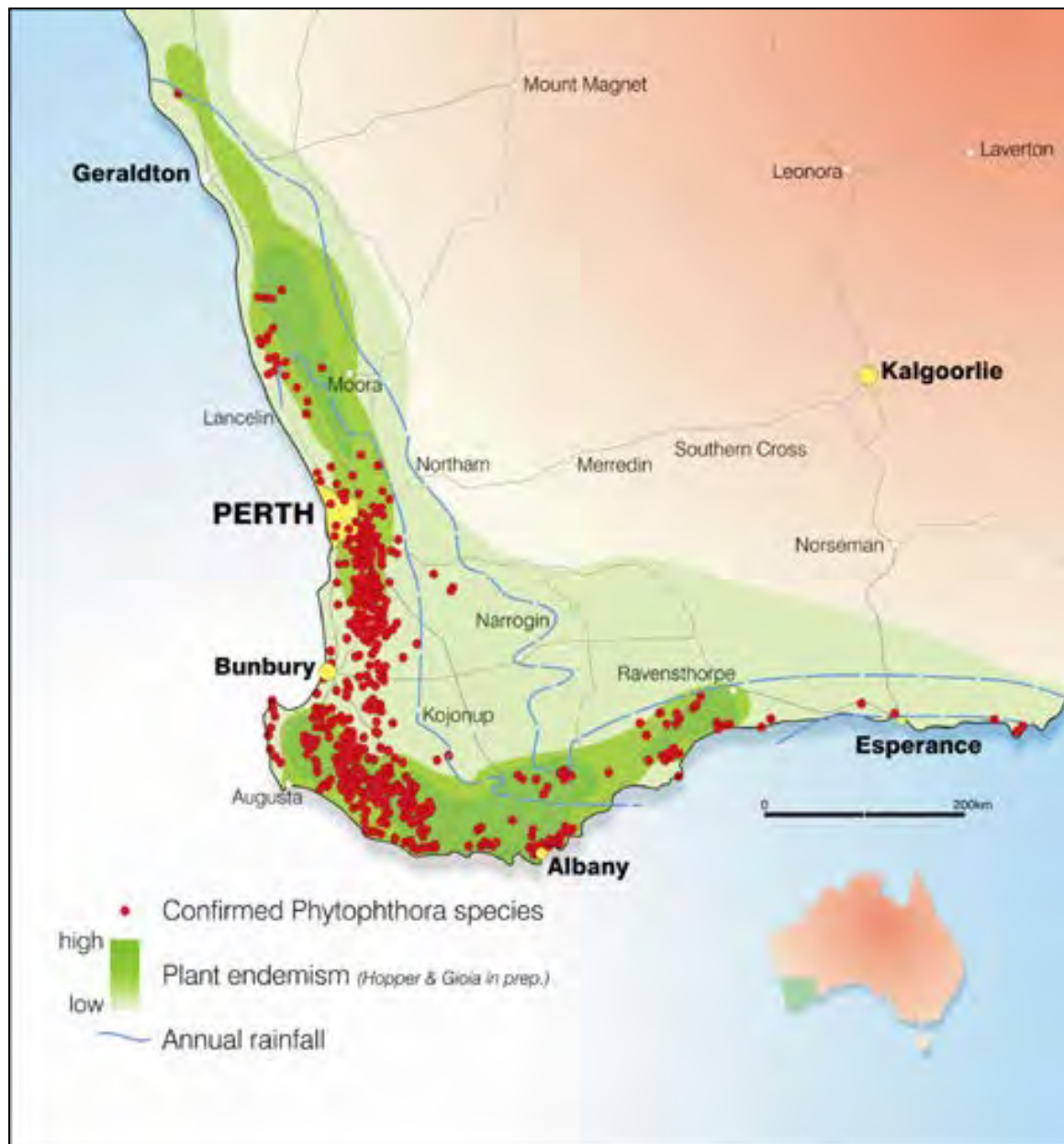
- Background- why is *Phytophthora* Dieback an issue that needs to be managed?
- Pathogen distribution and environmental variables that lead to disease
- Consideration at the start of a project
- Management strategies during a project
- Case Study-Iluka's Eneabba mine site

## Background

- *Phytophthora* Dieback is third biggest threat to biodiversity in WA behind Climate Change and Salinity
- Listed as a '**Key Threatening Process**' in the Australian environment (Environment Australia, 2001)
- Listed as a **Priority 1 Threat** in 2007 State of the Environment Report (EPA, 2008)
- Over **2,300** of the native plant species in SW are susceptible
- Half of the endangered plant species in SW are susceptible

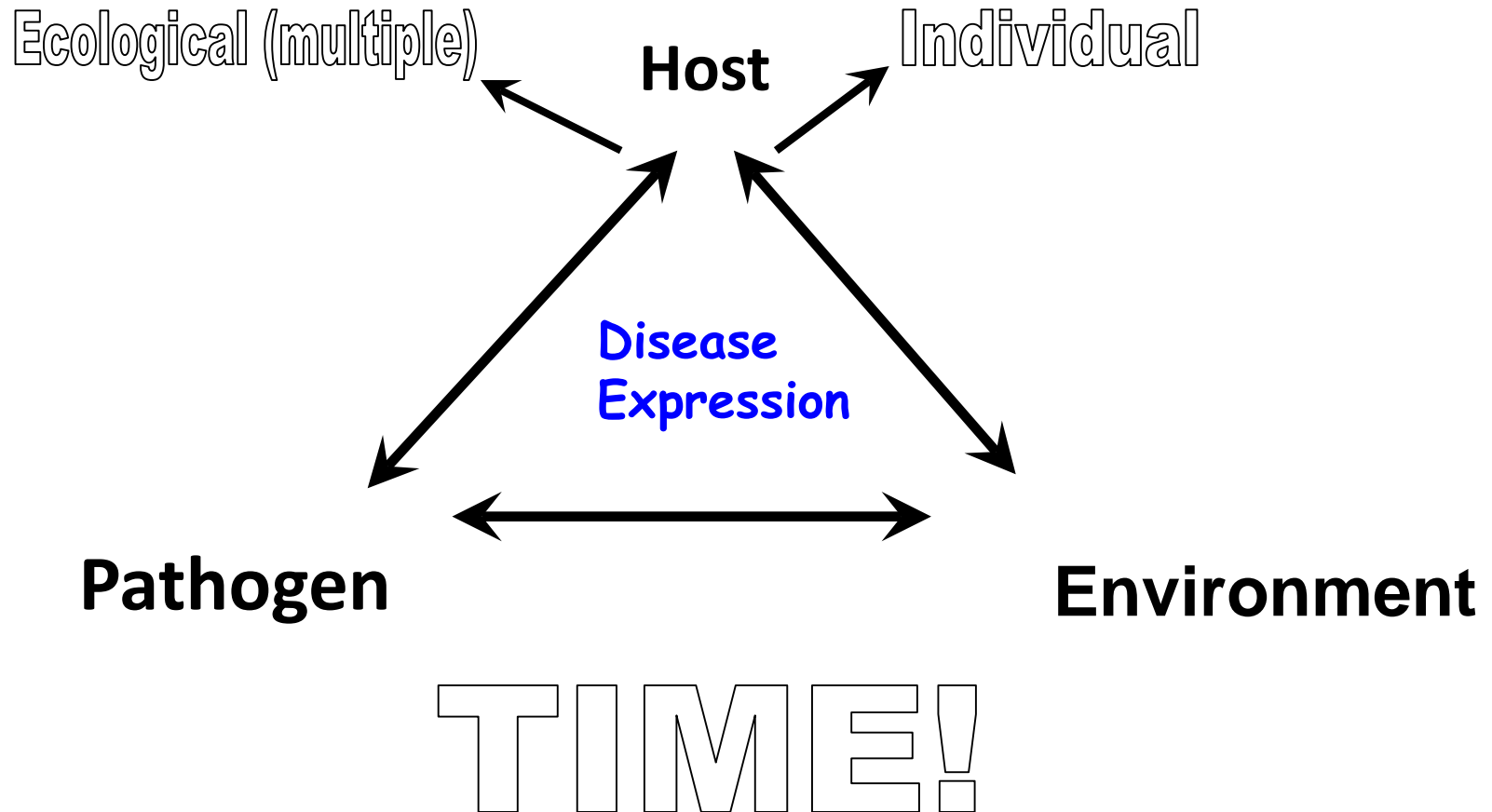
- Native species most affected belong to four families: Proteaceae, Ericaceae, Fabaceae & Myrtaceae
- Changes to vegetation community composition and structure cause impacts throughout the whole ecosystem, including impacts on the local fauna





Dieback Working Group 2008

# Environmental Variables



# Environmental Variables

## Temperature

- Optimum growth range 15-30°C
- Optimum for sporulation 25-30°C

## Soil

- pH 5-6 (acidic) optimum
- Calcareous sands are not favorable to the *P. cinnamomi* survival

**Note:** *P. multivora* can survive in calcareous soils.

# Considerations-Disease Status and Disturbance History

- Was a Dieback assessment undertaken prior to clearing, and is it up to date?
- What is the history of disturbance and has hygiene management been implemented throughout ?
- Have Protectable areas been defined within and adjacent to the site?
- How could *Phytophthora* spp. be vectored into the project area?

# Considerations-Current Disease Status

1. **Infested**: Areas determined to have plant disease symptoms consistent with the presence of the pathogen
2. **Uninfested**: Areas determined to be free of plant disease symptoms that indicate the presence of the pathogen.
3. **Uninterpretable**: Areas where indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora* sp.
4. **Unmappable**: Areas sufficiently disturbed so that Dieback occurrence mapping is not possible at the time of inspection
5. **Excluded**- Cleared areas and paddocks

# Considerations-Dieback Mapping

1. DPaW Registered Interpreters undergo annual standards assessments by DPaW Disease Standards & Hygiene Officers to maintain registration
2. The latest DPaW Dieback Interpreter guidelines are applied *Manual for detecting Phytophthora Dieback disease* (Procedures for DPaW managed lands) (2013 Working Draft)
3. Getting it wrong can have significant consequences in terms of revegetation success





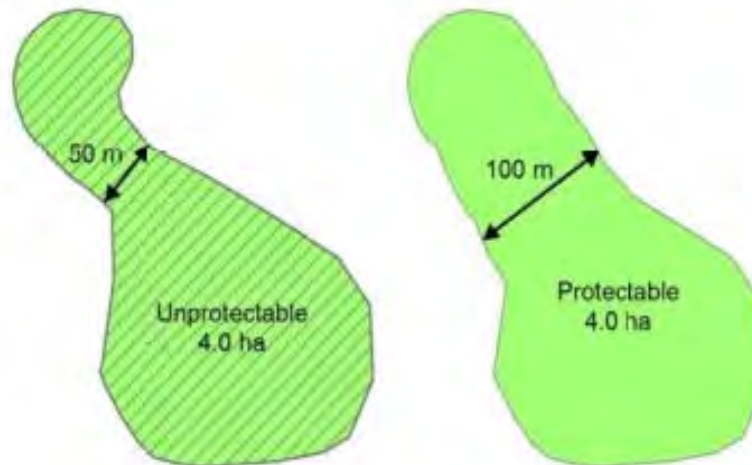
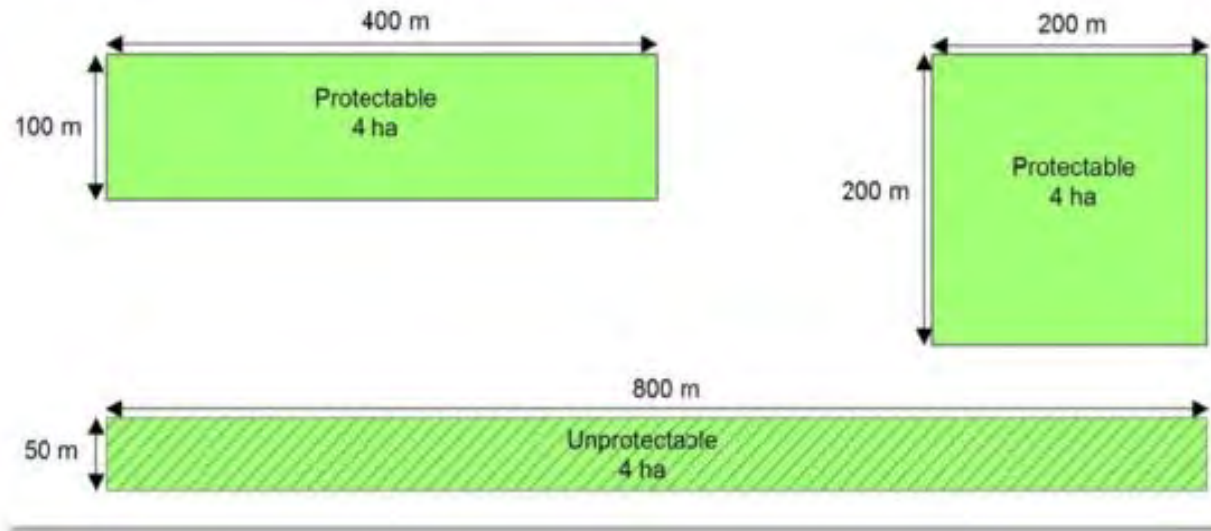
# Considerations-Pathogen Vectoring

- Mycelium root to root growth
- Zoospores autonomous mobility
- Humans move infected material
- Animals move infected material



## Considerations-Protectable Areas

- **Disease status** – Has the area been determined to be uninfested or uninterpretable by a registered Dieback Interpreter?
- **Size** - Is the area greater than 4 ha?
- **Final landform**- Is it topographically protectable?



Department of Parks and Wildlife (2013 Working Draft) *Manual for detecting Phytophthora Dieback disease* (Procedures for DPaW managed lands)

# Management Strategies rehabilitation and revegetation projects



## Management Strategies-Soil

- Certified Dieback free soil- have BRM pits or disturbed areas been assessed prior to disturbance by a Dieback Interpreter ?
- Soil sampling is unlikely to provide statistical confidence high enough for management decisions to be made (Tay and Davidson, 2005)
- Undertake a risk assessment of the project area

## Management Strategies-Soil (cont'd)

- Manage soil storage, movement and application in accordance with disease status of the area from which it is derived
- Adopt a precautionary approach where past disturbance history and hygiene practices are unknown

## Management Strategies- Plants

- Know the susceptibility or resistance of species to be used in revegetation
- Prepare species lists so as not to waste highly susceptible species in infested or high risk areas
- Substitute susceptible with more resistant species that perform similar ecological function

## Management Strategies- Plants (cont'd)

- Monitor susceptible species in areas considered to be Moderate or Low risk of being infested
- Keep Dieback mapping up to date
- Phosphite treatment-expensive but can be used for mature trees and high conservation value remnant areas

# Case Study-Iluka Resources Eneabba mine site

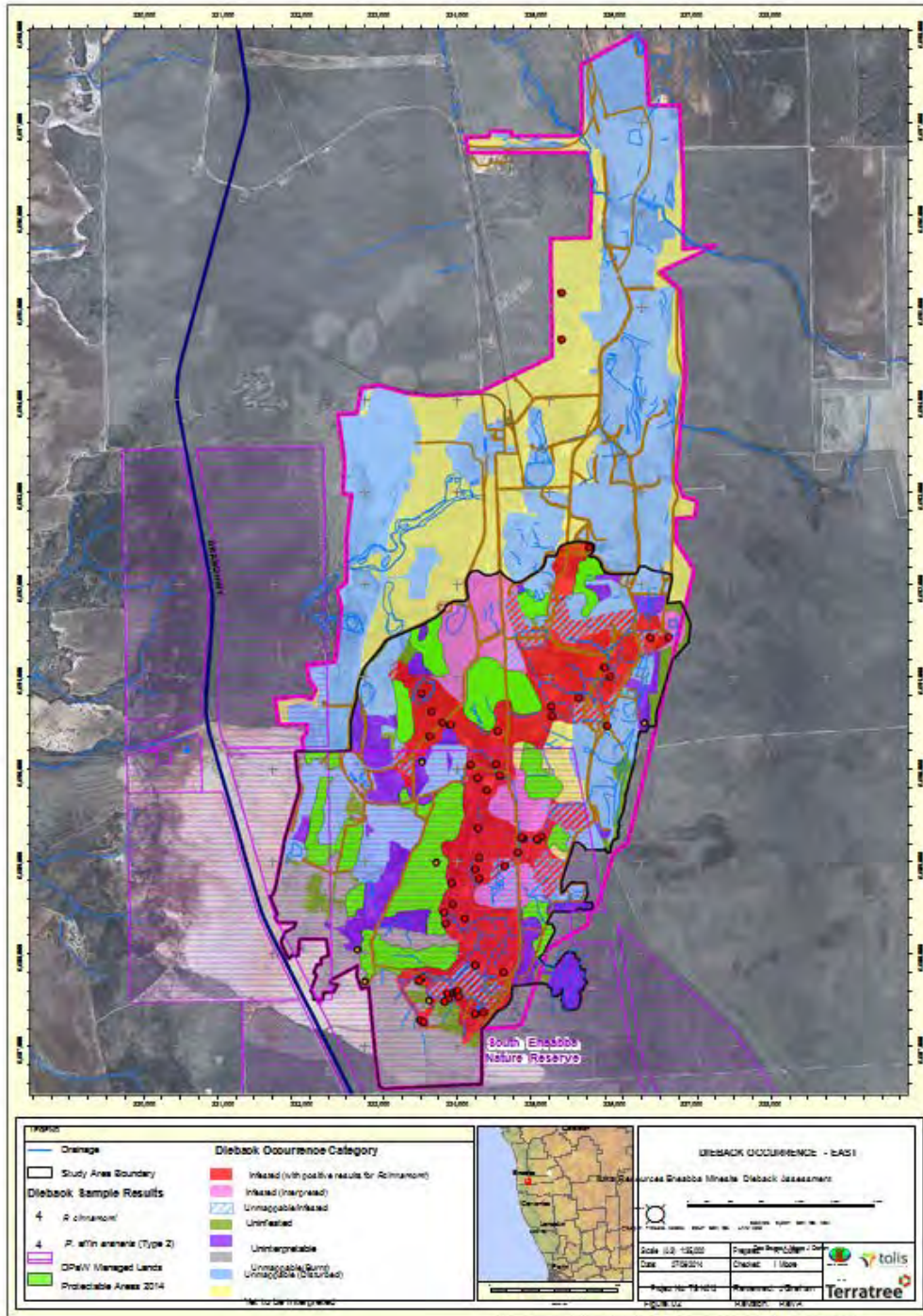


# Background

- Mining operations commenced in 1975
- Dieback first detected and diagnosed on site in 1990
- First management plan implemented in 1991
- A risk-based Dieback management plan for the site was approved by DEC in 2009
- Mine moved from production to 'care and maintenance' in 2012
- Change in focus from operations to rehabilitation also changed the Dieback management context

# Dieback Management Categories at Eneabba

- Uninfested and Infested areas of native vegetation
- Uninfested and Infested rehabilitation areas
- Uninterpretable rehabilitation areas and areas of native vegetation
- Unmappable areas due to fire and disturbance
- Excluded areas-cleared areas and paddocks



## Uninfested rehabilitation area



# Infested rehabilitation area



# Unmappable area due to fire



# Unmappable due to substrate



# Uninterpretable Rehabilitation Area



## Disease Risk Area

*“any area of public land where the Executive Director considers that the earth, soil or trees **may be**, or may become infected with a forest disease”. (CALM Act 1984).*

# Objectives of Dieback Management

Overarching objectives were to:

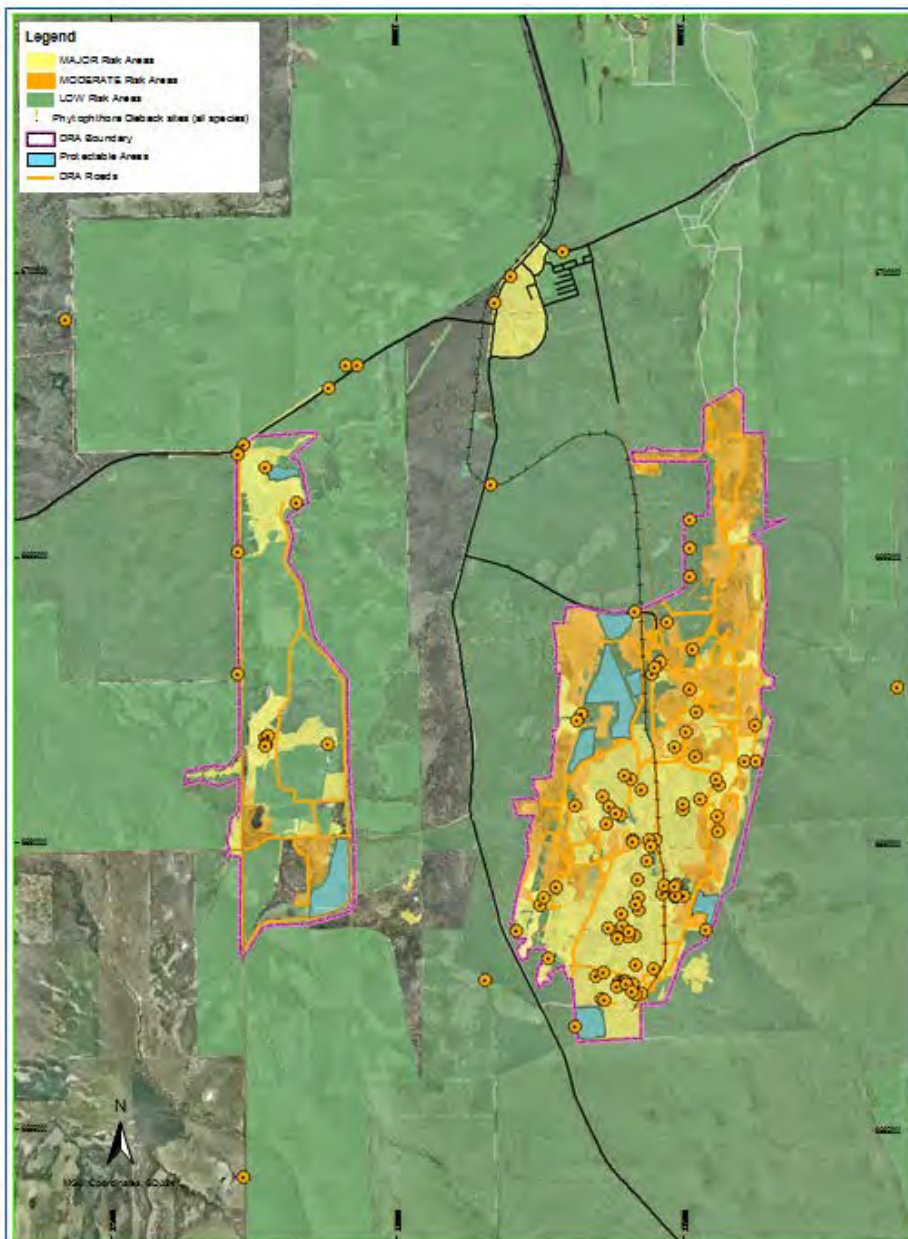
- simplify and improve management
- prevent new infestations
- protect the protectable

To achieve the objectives:

- A risk assessment of the site was undertaken to determine the risk associated with each Dieback management category
- A Disease Risk Area (DRA) was defined
- Protectable areas were identified and delineated

# Management Strategies at Eneabba

- Soil movement managed through Ground Disturbance Permits
- Avoid entering Protectable areas during wet soil conditions
- Enforce hygiene control measures
- All Dieback management areas to be signposted
- Education and training of personnel

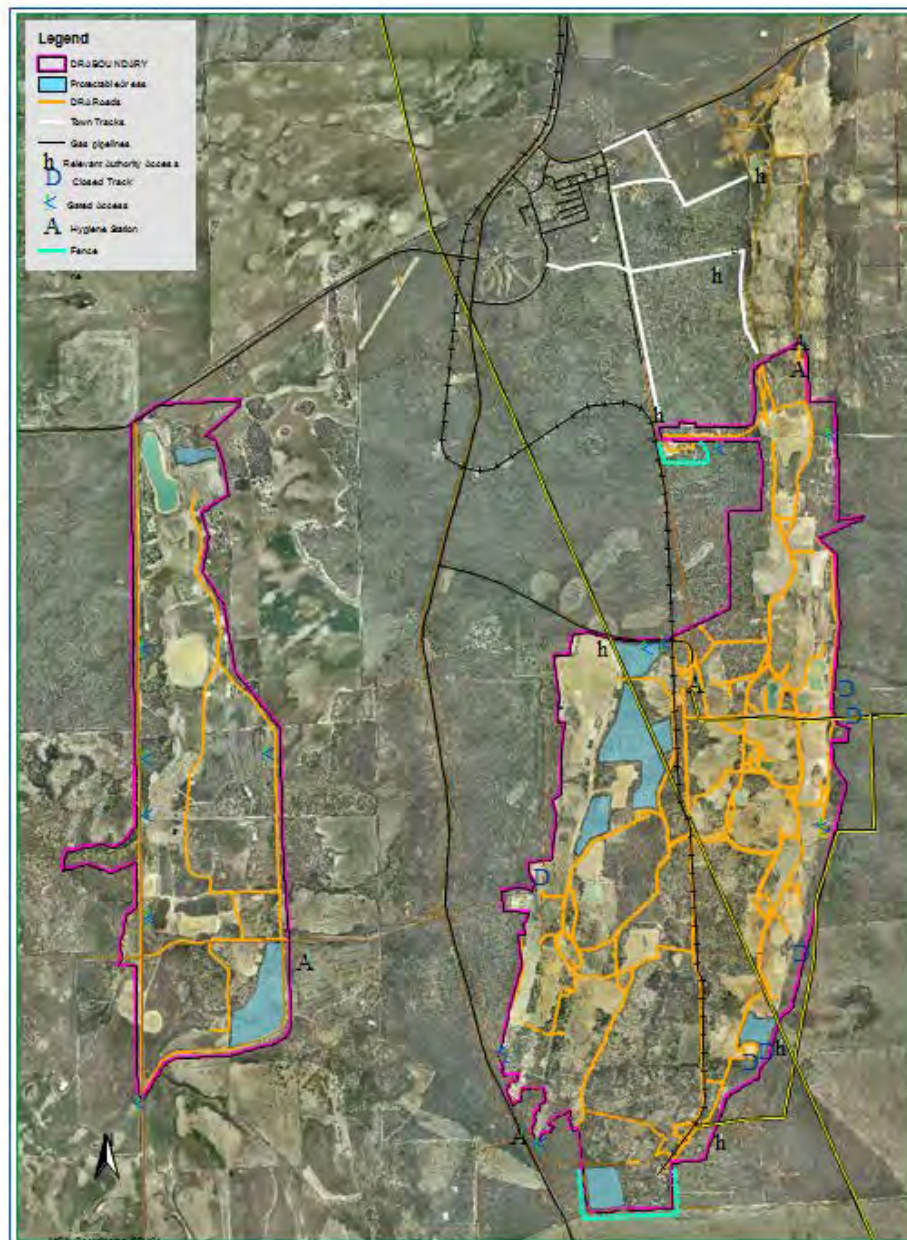


**Risk Assessment Map**  
**Showing Disease Risk and Protectable Areas**



# Practicalities

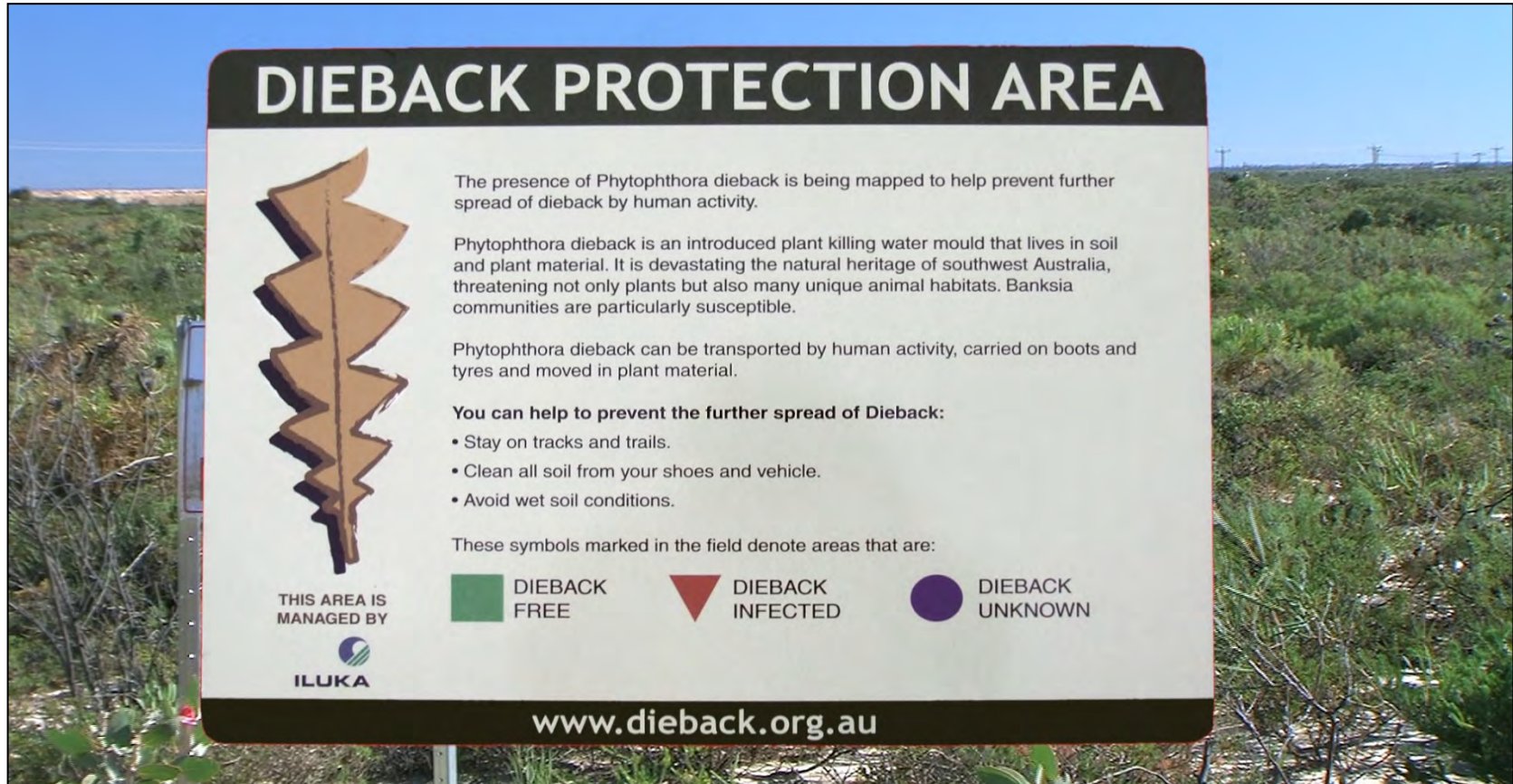
- Unmappable , previously disturbed Uninterpretable areas and Unprotectable areas within the DRA are managed under the assumption that they are Infested
- Outside the DRA roads are maintained as Uninfested- 'Clean on Exit' from DRA
- Access management strategy- an audit of all tracks intersecting the DRA was undertaken to identify ones that could be closed off



# **ACCESS MANAGEMENT STRATEGY for** **Controlling all vehicles, machinery and personnel exiting the DRA**



# Signage-option 1



## Signage- option 2



# Signage-option 3



## Conclusion

To be effective, *Phytophthora* Dieback management in rehabilitation and revegetation projects needs to be based on high confidence Dieback mapping and risk assessment; relevant research but also needs to be pragmatic and adaptive.

# Thank you!

Also thanks to the following organisations:



Department of  
**Parks and Wildlife**

