DIG Conference 2013
Presentation abstracts

New Zealand Kauri *Agathis australis* under threat from *Phytophthora*

Presented By Dr Stan E. Bellgard

In this presentation, we describe how Kauri *Agathis australis*, an iconic tree of New Zealand, is threatened by an introduced, root- and collar-rot pathogen, *Phytophthora* "taxon Agathis" ("PTA"). This soil-borne, homothallic species parasitises the cork cambium, resulting in gummy lesions, yellowing and thinning of canopy-foliage, and death. Delimiting which kauri-forest remnants are infested by PTA has been the priority of the post-border response. Managing the spread of this pathogen requires reliable detection in soil and knowledge of how it spreads and survives. The resolution of the taxonomic affinities of this incursive *Phytophthora* also provides clues to its possible geographic origin.

The mechanisms used by *Phytophthora* pathogens to invade plants

Presented by Professor Adrienne Hardham

For most *Phytophthora* species, plant disease is initiated by motile zoospores that swim chemotactically to suitable infection sites. At the plant surface, rapid zoospore encystment is accompanied by loss of motility and secretion of adhesives and formation of a cell wall. Cyst germination is followed by penetration of the plant surface and colonisation of plant tissues, with both processes depending on the secretion and function of a wide range of plant cell wall degrading enzymes. Nutrients may be obtained from living plant cells by pathogen haustoria during biotrophic growth or from dead plant cells during necrotrophic growth.

Myrtle Rust

Presented by Sophie Moller

Myrtle rust, part of the eucalyptus/guava rust complex (*Puccinia psidii* sens lat.), is now established in New South Wales, Queensland and Victoria. Latest records show infestations on 200 host plant species in the family Myrtaceae and the number is growing. The disease is of serious concern to Australia due to the possible significant impact on native forests, parks, gardens, nurseries and plantations. Two thirds of Western Australia's Myrtaceae species occur in just 5 IBRA bioregions thought to be most at risk from this disease. Surveillance and early detection are critical to eradicating this disease should it enter this state.

City of Joondalup Pathogen Management Plan- A Holistic Approach to Pathogen Management

Presented by Ms Rebecca Maccario

The City of Joondalup recognises that local government has an important role to play in managing the spread of plant pathogens in order to protect biodiversity values within parks and natural areas. In order to protect native vegetation and ecosystems within the City of Joondalup a Pathogen Management Plan has been developed. The Plan identifies the level of risk for pathogens becoming introduced to City parks and natural areas and prioritises the areas for further on ground investigations. In developing the Pathogen Management Plan a holistic approach was taken with all City parks and natural areas being included in a Desktop Risk Analysis. The Pathogen Management Plan 2013-2016 provides guidance on the management of pathogens within the City, in order to minimise the spread of pathogens, and includes strategies to engage with the community in order to raise the awareness of pathogens within the City of Joondalup.

A species distribution model for *Phytophthora cinnamomi* in current and future climates

John K. Scott

Climate Adaptation Flagship & CSIRO Ecosystem Sciences, Private Bag 5, P.O. Wembley, WA 6913

Presented by Dr John K. Scott

By modelling the distribution of *Phytophthora cinnamomi* we can assess the potential to spread, at a continental scale, both under current and future climates. Modelling the distribution may also identify hypotheses that explain the climatic limits to where the species is found. The starting point for developing a distribution model for *P. cinnamomi* was the CLIMEX model published previously (Brasier and Scott 1994). Being a parameter-based mechanistic model, it is possible to re-visit this model for both the world and Australian distributions by incorporating new knowledge to modify the parameter values. This talk will report on a comparison of the old CLIMEX model with current present and absence distributions records and on progress towards developing a new model of the distribution of *P. cinnamomi* that can be used to project to current and future changed climates.

Phosphorus nutrition of P-sensitive Australian native plants: threats to plant communities in a global biodiversity hotspot

Presented by Professor Hans Lambers

SW Australia harbours a biodiversity hotspot on the world's most phosphorus-impoverished soils. The greatest biodiversity occurs on the most severely nutrient-impoverished soils. A threat to biodiversity in this region includes eutrophication due to enrichment with P. Many plants in SW Australia are extremely sensitive to P. Species from the most P-impoverished soils are also poor competitors at higher P availability, giving way to more competitive species when soil P concentrations increase. Sources of increased soil P concentrations include the P-fertilising effect of spraying natural environments with phosphite to reduce the impacts of *Phytophthora cinnamomi*, which itself is a threat to biodiversity. Alternatives to phosphite for *P. cinnamomi* management are needed urgently; we propose a strategy towards such alternatives, based on a sound understanding of the mechanisms of the action of phosphite.

The future of Phosphite treatment of natural ecosystems in WA: conservation outcomes, management issues and future challenges

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Presented by Dr Chris Dunne

The plant pathogen, *Phytophthora cinnamomi*, was introduced into the south-west of WA during European settlement. The pathogen has infested over 1 million ha of remnant native vegetation across the south-west and is currently impacting many rare flora populations, threatened ecological communities and important conservation areas. Since the mid 1990's the Department of Environment and Conservation has implemented an aerial phosphite application program targeting a number of critically endangered flora and threatened ecological communities. Phosphite reduces disease impact within infested communities and allows for collection of genetic material for use in other conservation programs such as flora translocation.
Monitoring conducted by the DEC to date has shown phosphite to be an effective treatment by reducing mortality rates in susceptible species and ameliorating the pathogens' impact on plant community composition, diversity and structure. However, the on-going use of phosphite as a fungicide to control *P. cinnamomi* in native plant communities will require a number of management issues to be addressed. Further research is necessary to monitor the affect of phosphite in natural ecosystems over time and search for alternative control treatments.

Smartphone applications to monitor tree health: Citizen science for the love of marri trees.

Presented by Mrs Cielito Marbus

The East Metropolitan Regional Council with Murdoch University have been developing a new smartphone app – the first of its kind – to monitor the incidence and severity of two diseases affecting marri (*Corymbia calophylla)* in Western Australia. Marri canker disease and Quambalaria shoot blight present two distinct threats to the health of marri and the ecosystem services they support. The app allows participants to quickly and easily contribute to the research effort by snapping a few pictures and recording symptoms in a scientifically valid manner. Future updates of the app will enable app users to participate in treatment trials.

The association of *Phytophthora* species in the blackberry (*Rubus anglocandicans*) decline in the South-West of Western Australia

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Presented by Ms Sonia Aghighi

Rubus anglocandicans is the most widespread species of European blackberry in the south-west of Western Australia (WA). This Weed of National Significance in WA primarily invades river banks in conservation, forestry and agricultural areas. Exotic strains of the blackberry rust, *Phragmidium violaceum*, were introduced to WA as biological control agents, but in most areas the rust was not effective. In 2007 while monitoring establishment of the released rust strains, unexplained dead and diseased blackberry plants were discovered at two locations on the banks of the Warren and Donnelly Rivers in the south-west. The extent of the disease following the removal of dense blackberry infestations has lead to it being called “blackberry decline”. Surveys between 2010 and 2012 led to the recovery of different *Phytophthora* species as well as other abiotic and biotic factors that appear associated with the decline. We propose a conceptual model to describe the factors that are hypothesised to be involved in the decline phenomenon of *R*. *anglocandicans*.

Determining the origin of the emerging pathogen, *Phytophthora multivora*

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Presented by Dr Treena Burgess

Phytophthora multivora is widespread in Western Australia (WA); it has a wide host range and considerably variability in the sequence of the mitochondrial gene *cox*1 led to the hypothesis that it may be endemic to the region. To test this hypothesis, four nuclear (ITS, enolase, HSP90 and r*as*) and three mitochondrial (*cox*I, c*ox*IGS and *nadh*1) loci were sequenced for 80 isolates of *P. multivora* isolated from Australia, South Africa (RSA), North America, Canary Islands, New Zealand and Europe and the data were subjected to phylogenetic, coalescent-based and population genetic analyses. Isolates from RSA possess greater nucleotide diversity and a greater number of alleles at three of the nuclear loci and at all three mitochondrial loci than those from WA. In addition, the RSA population had more unique multilocus genotypes than the WA population. While *P. multivora* is widely distributed in natural ecosystems in WA and RSA, it is usually isolated from nurseries or horticulture elsewhere in the world. Additionally, *P. multivora* is consistently isolated from cankers and dead and dying plants of numerous endemic hosts in WA, but is predominantly isolated from soil associated with asymptomatic plants in RSA. Based on this evidence it is proposed that *P. multivora* is endemic to RSA and has been introduced to Western Australia.

A re-evaluation of the *Phytophthora alticola-P. arenaria* species complex

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Presented by Dr Trudy Paap

Phytophthora alticola was first isolated and described from plantation eucalypts in South Africa (RSA), and has more recently been found in Western Australia (WA), where it has only been isolated from nurseries and urban tree plantings, predominantly from eucalypts. *Phytophthora arenaria* has been isolated from vegetation occurring on the northern sandplains of southwest WA, predominantly from *Banksia* spp. A number of isolates with similar morphological characters to *P. arenaria* have been isolated, but with some variation in ITS region sequences, and have been referred to as *P.* aff *arenaria* type I (with the vast majority of isolates coming from nurseries and urban tree plantings) and type II (predominantly from the northern sandplains). A re-evaluation of these species suggests that type I isolates are *P. alticola,* while type II isolates are *P. arenaria.* A detailed overview of how this taxonomical evaluation has been undertaken will be discussed. While it is thought that *P. arenaria* is endemic, we are still to ascertain whether *P. alticola* is endemic or has been introduced to Western Australia.

Is *Phytophthora cinnamomi* a biological bulldozer for bird communities in south-west Western Australia?

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Presented by Dr Michael Craig

Phytophthora cinnamomi can fundamentally affect habitat structure and floristics and, therefore, potentially has significant indirect effects on faunal communities. We examined the effects of *P. cinnamomi* infestation on bird communities in infested and uninfested sites in the jarrah forest and *Banksia* woodland and found that infested and uninfested sites had different bird communities, as well as differences in the abundances of some species, in both habitats. The significant differences between bird communities in infested and uninfested sites occurred although the infested sites were small and surrounded by extensive uninfested areas and we discuss the management implications of our findings.

How does Phytophthora Dieback affect the dibbler?

Tony Friend, Principal Research Scientist, Fauna Conservation Program, Department of Environment and Conservation, Albany.

Presented By Dr Tony Friend

The dibbler was once found in coastal regions from Shark Bay to the Eyre Peninsula. It became very rare and was thought extinct before its rediscovery at Cheyne Beach near Albany in 1967. It also turned up in the Fitzgerald River National Park in 1984 where the vast majority of dibblers are now found. The dibbler's stronghold in the Fitzgerald is vulnerable to Phytophthora dieback, as death of susceptible plants makes the habitat structurally unsuitable for this species. Proteaceous plants are also important in its diet. While reintroductions can avoid heavily infested areas, research is required to clarify the risk that Phytophthora poses to dibbler recovery.

Discovering Dieback with Armadale Primary School

Presented by Mrs Mady Colquhoun, Rose Gorman, Talia-Marie Abson, Liam Martin and Lilly Dalton

In 2006, 3 teachers and 60 fantastic students created "*Stop the Rot*" – (or "*Dieback - the Musical*" as it is often referred to) for a J Rock Eisteddfod. In response to this, the DWG approached us to develop an educational program which would fit into the primary school curriculum. ***Discovering Dieback*** was produced, winning the Westpac State Landcare Education Award for 2008. This program has been freely available to schools and this will be the 8th year our Year 6 students have learned about Dieback, how not to spread it and what to do to help conserve our amazing bushland. Does this program have a place in your child's school?

Project Dieback: action and opportunities to protect biodiversity assets

Presented by Mrs Kirsten Murray

An overview of the project, the framework and what we are aiming to achieve over the next 2 years through the project for the south-west of Western Australia. In particular, I will discuss the development of the State Dieback Management and Investment Framework currently in development.