WERSTERN AUSTRALIA

PLANTATIONS

Pinus spp.

Insect Pests

Sirex

The installation of detection and monitoring systems for Sirex will recommence in December 2005. (FPC)

Ips grandicollis

No reports on high numbers have been received for this past year. (JF, FPC)

Monterey Pine Aphid (Essigella californica)

Nothing to report.

Pinus Pinaster

Wingless Grasshopper (Phaulacridium.sp)

November 2004 to January 2005 Midwest plantations had incursions of Wingless grasshopper on plantations in the Brookton, Muchea and Gingin areas, misting with alphacypermethrin was undertaken on affected properties on a fortnightly basis approx 250ha misted and baited. (FPC)

Rutherglen Bug (Nysius vinitor)

October to late December Midwest plantations misted approx 250ha in conjunction with wingless grasshopper control. (FPC)

Port Lincoln (28) Parrot

Trapping and shooting has taken place in the Midwest Plantation areas over the last 12 months on 4 properties. (FPC)

Diseases

No major problems reported.

Eucalyptus species

Insect Pests

Psyllids

The blue gum psyllid is common across the plantation estate but has not been a significant pest during 2004-05. (FPC, GSP, APFL, WAPRes, Timbercorp)

Autumn gum moth

Autumn gum moth has not been a significant pest during 2004-05. This species occurs mostly around Albany, especially east of Albany. Adults are observed mostly in March and April. A plantation east of Albany received severe damage in 2002, and a high density of late instar larvae were found in the same plantation in July 2003. In other plantations, a virus killed most late instar larvae. Diversity of parasitoid wasps of AGM seems to be limited in SW WA. (FPC, GSP, APFL, WAPRes, Timbercorp)

Leaf beetles

Although *Cadmus* and *Chrysophtharta* have not been considered to cause significant defoliation, adult beetles of these species were found to cause nearly as much defoliation of growing tips in January – March as larvae of *Eucalyptus* weevil in October. The damage by the adult beetles was detected in two year old plantations around Albany. There were no observation from other plantations, and therefore, the status of these beetles in other plantations is unknown at present. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Eucalyptus weevil

Weevil control was carried out on at least 3500 Ha with the ages varying from 2 to 4 years old. This species is continuing to expand its range northward and westward. During the annual population assessment in late September to early October, the number of egg cases per shoot tended to be much greater in 2004 than in previous years. Because of poor weather conditions, very small number of plantations were sprayed or misted in 2004; however, damage levels were low to modest, even in plantations in which the egg case numbers were high enough to rigger spraying but not sprayed due to poor weather. Along with chrysomelid beetles and *Heteronyx* beetles, adult *Eucalyptus* weevils defoliate tips of trees in January – March. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Heteronyx spp

Only a small number of plantations were defoliated by *Heteronyx* beetles in 2004-05. This is possibly due to dry summer, making it difficult for adult beetles to emerge from their pupation chambers. A species of small scarab beetle (probably *Heteronyx* sp.) was observed feeding on new leaves near tree tops at one plantation east of

Albany. This species has never been found feeding on blue gum. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

African Black Beetle (Heteronychus arator)

The use of "socks" on seedlings prior to planting in known african black beetle areas continues to be effective. The impact of this insect has now been reduced to nil. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Leaf Blister Sawfly

Very little damage was caused by LBS in Great Southern and South Coast in 2004-05. There was moderate damage by LBS around Esperance (the information has not been available previously.) (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Wingless Grasshopper

Wingless grasshoppers caused damage in P2004 plantations from Bremer Bay to Esperance. (GSP, ITC)

"Spring" Beetle (Liparetrus jenkinsi)

Damage caused by this species in 2004-05 was roughly equivalent to that in 2003-04. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Diseases

Mycosphaerella

Mycosphaerella predominantly causes damage to the juvenile leaves of blue gums. Plantations east of Albany affected by AGM and LBS are often also affected by *Mycosphaerella*. Another high risk area is near Northcliffe. *Mycosphaerella* is also found throughout the region at low levels. Damage by *Mycosphaerella* was less extensive and intensive in 2004-05 than in the previous season. Seedlings seem to be infected in nursery. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Research at Universities continues on *Mycosphaerella* leaf blights and *Endothia gyrosa* and other cankers in *Eucalyptus globulus* plantations (see Research and Development).

MANAGED NATURAL FORESTS

Eucalyptus marginata

Jarrah leaf miner

Jarrah leaf miner is still in outbreak in some areas of the central and northern Jarrah forest. The northern boundary of JLM infestation was surveyed in October 2004. No significant northward movement of the infestation had occurred. It is anticipated that the next survey will be conducted in October 2009. Maintenance of a project investigating the control of Jarrah leaf miner through selective retention of resistant trees continues. (A. Wills, T. Burbidge).

Uraba lugens

Populations of gum leaf skeletonizer (*U. lugens*) remain low in the southern Jarrah forest. Isolated populations were encountered in Surprise forest block near Walpole in Dec 2004. (JF)

Biodiversity study (Forestcheck)

The biodiversity study FORESTCHECK, has now completed its 4th sampling season with over 1200 morpho-species collected. A new study investigating the impact of mosaic burning on native forest has been initiated near Walpole incorporating a range of 3 forest site types. (JF)

Jarrah forest (Eucalyptus marginata)

No new major pathological problems reported. Management and survey of *Phytopthora* root disease in jarrah (*Eucalyptus marginata*) forests continues to command attention (see Forest Health Surveillance and Diagnosis, and Research and Development).

Karri forest (Eucalyptus diversicolor)

No new major pathological problems reported. Management of *Armillaria* root disease in karri (*Eucalyptus diversicolor*) continues to command attention.

NURSERIES

No major problems have been reported in either hardwood or conifer seedlings in nurseries.

NATIVE PLANT COMMUNITIES

Eucalyptus wandoo

The Wandoo Response Group continues to coordinate research into the wandoo decline. In 2005 a public forum and a scientific workshop were held to set future directions for research responses to Wandoo decline. Research by UWA on disease, entomological and environmental factors is ongoing. (A. Wills)

Corymbia callophylla

Lerps of what looked to be *Cardiaspina fiscella* were found on *C. callophylla* near one of the rubbish dumps near Albany. The species will be confirmed in early October 2005 by G. Taylor of Adelaide University (he is currently on leave). This may prove to be a new host record. *Cardiaspina fiscella* was first found in WA in Albany during November 2001 on *E. robusta*, and subsequently found to be widely distributed on eastern states eucalypts in the state's southwest. (M. Matsuki, JF)

Thirty three sites covering a total of 485 ha (the highest total since the inception of the program) were aerially sprayed with phosphite in 2005, comprising 225 ha in Fitzgerald River National Park, 175 ha in Stirling Range National Park and on coastal reserves near Albany and 85 ha on nature reserves and in State forest south of Busselton. Monitoring of individuals and populations of threatened flora, and positions of *Phytophthora* 'fronts' continues to show beneficial effects of the application of phosphite. The nine-year study of average rate of spread of a *Phytophthora* front in *Banksia* woodland near Albany shows that phosphite application reduced the average ROS by more than 65% over the period (R. Smith, CALM).

URBAN AND RURAL

Mundulla Yellows

Monitoring of the occurrence and symptom development of Mundulla Yellows (MY) in WA has continued. Symptomatic eucalypts (both planted trees and remnant native trees) have been observed in several additional locations. Spread of symptoms within affected sites appears generally to be slow. The observed distribution of MY symptoms in the south of the state is from north of Geraldton to Esperance. Tests of foliar samples from symptomatic trees for "MY-RNAs" (by D.Hanold, The University of Adelaide) all gave positive results. Nutrient analysis of soil and foliar samples from MY-affected and nearby asymptomatic eucalypts at various locations has been completed. As in South Australia, MY is only seen in vegetation in disturbed sites or modified landscapes such as road verges and medians, parks and gardens, and in parkland or paddock remnant stands. Symptoms have not been observed within undisturbed native forest or woodland stands in WA. CALM is an Industry Partner in a three-year ARC Linkage project at The University of Adelaide, "A comparative study of the distribution and spread of potential molecular markers for Mundulla Yellows disease." (M.Stukely, CALM).

Tuart decline

In recent years, tuart (*Eucalyptus gomphocephala*) woodland within Yalgorup National Park, south of Mandurah has suffered a severe decline in health. Research carried out by The Tuart Health Research Group (THRG) has shown from surveys of tuart across the range, that the major decline syndrome is confined to Yalgorup N.P. These sites show a high correlation with higher rainfall, finer and shallower soils, higher groundwater alkalinity and salinity, and a greater rate of groundwater salinity increase (T. Edwards - Edith Cowan University). Critical water potentials for loss of

xylem function were rarely breached in any size class or location within YNP over the past 20 months (P. Drake - Edith Cowan University). Fine feeder root necrosis has been observed on trees showing decline and a number of Phtophthora and Pythium spp. have been isolated from these roots (P. Scott, Murdoch University). There have been fewer mycorrhizal pads associated with fine roots of declining trees c.f. healthy trees and tuart showing symptoms of severe decline in YNP have different foliar nutrient profiles than trees growing outside YNP that are in good health (N. Moore - Murdoch University). Preliminary studies on the role of fire and competition indicate tuart seedlings growing on ashbeds exhibit greater rates of survival compared to those grown off ashbeds and Agonis flexuosa (W.A. Peppermint) is not alleopathic to tuart and does not significantly alter the growth of tuart seedlings due to competition (R. Archibald, Murdoch University). All results at this stage are preliminary and further work is being carried out by the research group (P. Barber, Murdoch University).

Wandoo Decline

In recent years the health of Wandoo (*Eucalyptus wandoo*) woodland has been affected by crown decline, sometimes resulting in the death of declining trees. The Wandoo Recovery Group was established in 2003, and recently a Wandoo Strategy and Action Plan was developed. Insects and fungal pathogens are associated with the decline, but rainfall deficit, salinity, waterlogging, altered fire regimes and agricultural practices are also thought to be contributing to the decline. Government and community based action is underway to map the extent of decline, and monitor trends in the health and condition of wandoo forests (Wandoo Recovery Group, Bulletin No.2, March 2005).

Foliar pathogens

A new species of *Mycosphaerella* has been isolated from tuart and is currently being described. It is associated with minor spots on the foliage and does not appear to be widespread. Post-fire regenerating tuart has been severely defoliated by *M. cryptica* in Yalgorup National Park, Ludlow State Forest and Yanchep National Park and has contributed to tree deaths in Yalgorup National Park. Trials monitoring the incidence and severity of *M. cryptica* and insect pests on regenerating seedlings of *E. gomphocephala* have been in progress over the last 12 months. These are being combined with growth data and soil characteristics (P. Barber, Murdoch University).

FOREST HEALTH SURVEILLANCE AND DIAGNOSIS

Dieback mapping and management

In the period July 2003 to June 2004, CALM Forest Management Branch mapped the presence of *Phytophthora cinnamomi* disease symptoms and defined protectable areas on 22,600 ha of native forest. Approximately 13,200 ha of previously mapped forest was rechecked. Numerous development projects on CALM managed land were assessed for dieback hygiene planning. A variety of disease mapping and inspections were carried out for other government agencies and private companies or individuals. Prescriptions for planning of silvicultural operations were modified based on considerations of *P. cinnamomi* impact on vegetation complexes. These complexes

were mapped out in proposed harvest areas and harvesting activities were modified where dieback impact was expected to be high. Training programs were delivered for both Disease Detection and Hygiene Management. Strategic disease interpretation was carried out for risk assessments of biodiversity assets and community values (see Native Plant Communities) (G. Strelein, CALM).

Between 1st July 2004 and 30th June 2005, a total of 1,250 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). A small number of other tree health and nursery problems were investigated. (M.Stukely, CALM).

QUARANTINE

European House Borer (Hylotrupes bajulus)

This beetle is regarded as one of the worlds' most destructive pests of seasoned pine. In January 2004 EHB larvae were found emerging from a feature beam in a private house in the Perth Hills suburb of Parkerville. This prompted the formation of the State Pest Control Head Quarters (EHB Working Group). Surveillance has resulted in the location of infestations in four of the Forest Products Commission's (FPC's) plantations: Gnangara, Helena, Greystones and Peel, plus a seed orchard at Rottnest Island. Surveillance of over 100,000 hectares of plantation estate and urban areas (below the 26th parallel) has been conducted twice over approximately the past twelve months, indicating the incursion is contained to the greater Perth Metropolitan Area. Since detection two flight seasons have occurred. Concurrent containment activities are being conducted in urban and plantation environments including chipping and burning of infested material, and removal of susceptible material in buffer zones around infested sites. A strategic plan for the long-term hygiene of plantations, encompassing management, and hopefully eradication from affected plantations is in the process of being developed and implemented. (FPC)

RESEARCH AND DEVELOPMENT

Plantations

Eucalyptus globulus

Forest health surveillance

Several projects at Murdoch University are focusing on eucalypt plantation health and risks to biodiversity of native forests in Australia. In the past 12 months surveys have been conducted in collaboration with State departments and private forestry companies in eucalypt plantations in QLD and NT. The surveys provide a framework for a database on disease already present in Australia. A database of exotic eucalypt diseases and their proximity to Australia and the risk they pose to Australia's forests and industry is being compiled. A number of diseases are of particular interest, Phaeophleospora destructans, Coniothyrium zuluense and Cryphonectria cubensis. Molecular markers are currently being developed for P. destructans and are already in existence for C. zuluense and C. cubensis (through collaboration with the Forestry and Agriculture Biotechnology institute in South Africa). These markers will be used to

determine the origin, diversity and movement of potentially destructive eucalypt diseases

The IPMG (Industry Pest Management Group) jointly funded by the forestry CRC and bluegum plantation companies is now administered through Murdoch University. The group employs an insect ecologist Dr Mamoru Matsuki, who primarily focuses on major pest problems. However, he is constantly in the plantation estate and is vigilant for any changes or observations of new diseases

We are also focussing on the exchange of pathogens between native forests and bluegum plantations in Western Australia. We have shown that some Botryosphaeria spp.,endemicto WA have moved into the plantations. In the new forestry CRC we will be studying the movement of Mycosphaerella spp. into WA and between forests and plantations (T. Burgess, Murdoch University).

Diseases

Work under the following grants is in progress at Murdoch University.

Collaborative Project - Murdoch University and the Tree Pathology Cooperative Program (Sth Africa)

'New and emerging pathogens threatening the biodiversity of Australia's eucalypts'. This project is concentrating on some of the major eucalypt pathogens worldwide, (Phaeophleospora spp. Mycosphaerella spp., Botryosphaeria spp. Cryphonectria spp.) with the aim of determining their origin, movement and the risk they pose to Australia's eucalypts. (T. Burgess, MU, M. Wingfield, TPCP).

PhD Theses in progress at Murdoch University

Taxonomy and biology of Mycosphaerella species found on E. globulus. (Sarah Jackson; supervisors, G. Hardy and B. Dell, MU)

The cause of basal stem rot in second rotation Eucalyptus globulus plantations (Francisco (Paco) Tovar, Supervisors T. Burgess, G. Hardy, MU and R. Robinson, CALM).

Vera Andjic The movement of Phaeophleospora destructans throughout Asia, a potential threat to Australias forests and plantations (supervisors T. Burgess, G. Hardy and M.Wingfield).

Paulownia Plantations

ARC Linkage. Diseases of Pawlonia. (Kirsty Bayliss, Postdoc MU)

Honours Theses

Botryosphaeria spp. associated with trees in healthy and declining tuart stands; identification, pathogenicity and potential role in decline (Kate Taylor, supervisors T. Burgess and P. Barber, MU).

Managed natural forests

Corymbia calophylla

Diseases

G. Hardy, MU, Bryan Shearer, CALM and Jen McComb, MU). Part funded by Forest and Wood Products Scholarship.

A severe canker disease has been associated with decline and dieback in Corymbia calophylla (marri) across their natural range in the south west of Western Australia for several years and this project has investigated the severity, extent and possible causes of the disease. Initial surveys found cankers present on marri at all examined sites, with lesions occurring on trunks, branches and twigs of trees of all age classes. There were significantly more cankered trees at remnant sites (roadside or paddock trees) than in state forest (47.3% and 16.1% respectively, $p<0.05$). Cankers had led to tree death at a number of sites. Subsequent revisits to the sites monitored lesion expansion and tree decline. Over the period of the study lesions were observed expanding, trees continued to decline, and a number died. Isolation from healthy and cankered marri have found a total of 39 fungal species, the most common being endophytes and secondary or opportunistic pathogens including Endothiella eucalypti, Favostroma cryptica, Cytospora eucalypticola, Alternaria sp. and Cladosporium herbarum. A potential primary pathogen, Quambalaria sp. was also isolated. We are currently working to determine whether the WA isolates represent a species complex, along with their relationships to eastern Australian and South African species. Ultimately we wish to determine whether Quambalaria sp. is endemic to marri in the southwest, and if so, why it has become such a serious pathogen in recent years (T. Papp – MU).

Honours

Biology of Quambalaria on C. calophylla and C. ficifolia. (Julie Ellery, Supervisors; G. Hardy, J. McComb and T. Papp, MU)

Jarrah forest (Eucalyptus marginata)

Diseases

Dieback-resistant jarrah (Eucalyptus marginata): Field trials of jarrah clones selected for resistance to Phytophthora cinnamomi are being written up. Trials of site preparation procedures for re-establishment of jarrah in dieback "graveyard" sites commenced in 2003 with further trials established in 2004. Final planting of a production seed orchard of dieback resistant jarrah clones at the Forests Products

Commission's Plant Propagation Centre near Manjimup has been deferred pending the availability of clones. (M.Stukely, CALM).

Work under the following grants is in progress at Murdoch University.

SPIRT Large. 2000-2003 at $300,000 (Industry partners CALM, Alcoa, Worsley Alumina, CSIRO). Will Phytophthora cinnamomi become resistant to the fungicide phosphite? Its implications. (This study examines plant and fungal interactions at a genetic level). (Investigators: Giles Hardy-MU, Inez Tommerup-CSIRO, Phil O'Brien, MU, Bryan Shearer, CALM, Ian Colquhoun, Alcoa World Alumina, and Mark Dobrowolski, Postdoctoral Fellow).

Linkage ARC Large. Industry Partners Alcoa World Alumina, Worsley Alumina and Department of Conservation and Land Management. The ability of the fungicide phosphite to stop the autonomous spread of Phytophthora cinnamomi in the Eucalyptus marginata forest. Post-doctoral fellow: Bill Dunstan (Investigators: G. Hardy, B. Dell, M. Calver, J. McComb, MU I. Colquhoun, Alcoa World Alumina and B. Shearer, CALM)

PhD Theses in progress at Murdoch University

Long term survival of Phytophthora cinnamomi in rehabilitated bauxite mines and adjacent Eucalyptus marginata forest. This project is looking at chlamydospore dormancy and saprophytic growth. (Sarah Collins; Supervisors, G. Hardy, MU and B. Shearer, CALM). Funded by ARC LINKAGE

Saprophytic ability and long-term survival of Phytophthora cinnamomi in rehabilitated bauxite mines and adjacent jarrah forest. (Kathryn Smith; Supervisors G. Hardy, J. McComb, MU and I. Colquhoun, Alcoa World Alumina). Funded by ARC LINKAGE

The impact of Phytophthora cinnamomi on different mammal guilds in the Darling Range of Western Australia. (Rodney Armistead; Supervisors M. Garkaklis (CALM) and G. Hardy, MU).

Mechanisms of suppression of Acacia species on Phytophthora cinnamomi (Arunodini Jayasekera; supervisors B. Shearer, CALM, J. McComb and G. Hardy, MU)

Karri forest (Eucalyptus diversicolor)

<u>Diseases</u>

In 2004-05 approximately 210 ha of high quality karri forest was thinned in Warren forest block, 105 ha were surveyed for Armillaria root disease and resulting in stump removal for disease control being undertaken in 88 ha (M. Dybala, FPC).

Analysis of a karri regrowth thinning experiment infested with Armillaria lutebubalina has shown that 15 years after thinning, the growth of infected trees was not significantly different from that of healthy trees but in the treatment thinned to 200 sph mortality was 3 times higher than in the corresponding trees in the unthinned plots and up to 50% of the total gain in volume was lost to defect (R. Robinson, CALM).