WESTERN AUSTRALIA

PLANTATIONS

Pinus radiata

Insect Pests

Sirex

From July 2003- July 2004 no evidence of Sirex infestation was found in Western Australian pine plantations. However, although the establishment of more trap tree plots were planned for Dec 2003, this has not been completed due to salvage logging in plantations affected by the December 2003 fires near Bridgetown. (JF, FPC)

Ips grandicollis

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

Monterey Pine Aphid (Essigella californica)

The aphid is a common occurrence and widespread in pine growing areas. Damage is minimal with no tree deaths or loss of tree vigour being observed as a result of infestation. Monitoring of this species has ceased, as it is not significant enough a pest to justify the expense of monitoring and or control. All field officers are aware of this pest and any plant deaths or loss in vigour caused will be reported as an EMS incident.

Wingless Grasshopper (Phaulacridium.sp):

This is a common pest during the first year of plantation establishment. Control involves weekly monitoring and occasional control by misting with alpha cypermethrin and or baiting with Malathion infused chick starter crumble. Such control was required throughout the entire 2003 plantation area for the northern west coast region (approximately 635 ha)

Rutherglen Bug (Nysius vinitor):

It is a pest of during first year plantation establishment. Control involves weekly monitoring during the end of spring and start of summer. Misting with alpha cypermethrin is used to eradicate infestations. Such control was required throughout the entire 2002 and 2003 establishment area (approximately 1379 ha)

Diseases

No major problems reported.

Eucalyptus spp

Insect Pests

Psyllids

The blue gum psyllid is common across the plantation estate but has not been a significant pest during 2003-04. (FPC, GSP, APFL, WAPRes, Timbercorp)

Autumn gum moth

Autumn gum moth has not been a significant pest during 2003-04. 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 plantation, most late instar larvae were killed by a virus. Diversity of parasitoid wasps of AGM seems to be limited in SW WA. (FPC, GSP, APFL, WAPRes, Timbercorp)

Leaf beetles
Very minor damage from *Cadmus* and Chrysomelids was noted. (FPC, GSP, APFL, WAPRes, Timbercorp)

Eucalyptus weevil
Weevil control was carried out on approximately 12,000 with the ages varying from 2 to 4 years old. Significant damage would have resulted if this preventative spraying hadn't occurred. Defoliation appeared less severe in 2003 than in previous years. This is because (1) weevil densities are gradually decreasing in areas around Albany and (2) trees have kept producing new leaves because of a wet winter-spring season. The area of high weevil densities have been gradually moving northwest, and the current high risk area is around Manjimup. The weevil distribution is also expanding north. (FPC, GSP, APFL, WAPRes, Timbercorp)

Heteronyx spp
Heteronyx have caused light defoliation to the growing tips of older aged plantations, particularly in the North Bannister area (~20 Ha) & east of Albany (~750 Ha). The distribution and density has significantly increased in the last 24 months. Using 12 light traps in seven plantations, 41 (morpho-)species of *Heteronyx* and related scarab beetles (*Liparetrus*, ABB and allies) have been collected from December 2003 to May 2004, although some of these species may not cause damage on blue gums. Different species and the same species in different plantations show different phenology. But as a general rule, high activity levels are observed on hot nights in the coastal areas. Coastal areas east of Albany are more at risk, but *Heteronyx* beetles are found throughout the region. Damage levels due to Heteronyx beetles were much lower in 2003-04 than 2002-03, possibly due to fewer hot evenings in 2003-04. (FPC, GSP, APFL, WAPRes, Timbercorp)

African Black Beetle (Heteronychus arator)
The introduction of "socks" to 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, WAPRes, Timbercorp)

Leaf Blister Sawfly
LBS predominantly cause damage to juvenile leaves of blue gums. A high risk area is around Albany. Damage was generally limited in 2004. However, some plantations (area not available) received severe damage (>50% of canopy damaged on >25% of trees). Damage became suddenly apparent in late March/early April. (FPC, GSP, APFL, WAPRes, Timbercorp)

Spring Beetle (Liparetrus spp)
Increased knowledge of the life cycle has significantly reduced the threat of this insect. (FPC, GSP, APFL, WAPRes, Timbercorp)

Vertebrate pests

Port Lincoln (28) Parrot

Throughout the West coast region(midwest and southwest) both trapping and shooting of the Port Lincoln Ringneck had been occurring. The success between control techniques vary greatly with shooting found to be the most cost effective and easiest method. Shooting of the parrots has occurred via both contractor and FPC personnel where from the Collie region alone (inclusive of the southern west coast region) 3753 birds have been destroyed throughout 21 properties over the past 12 months. Such numbers have been reflected in the midwest region with approximately 1214 birds destroyed in the past 4 months throughout 11 properties.

Diseases

No major problems reported. Research continues on *Mycosphaerella* leaf blights and *Endothia gyrosa* and other cankers in *Eucalyptus globulus* plantations (see Research and Development).

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 Northcliff. *Mycosphaerella* is also found throughout the region at low levels. Also, one year old coppice growth near Albany was severely damage by *Mycosphaerella* in 2003. Coppice growth before thinning may retard air flow and create moist environments which may encourage growth of *Mycosphaerella*. (FPC, GSP, APFL, WAPRes, Timbercorp)

Weeds

Blackberry control

Following on from work that was started in the 1990's CSIRO have obtained approval for the release of 8 additional strains of blackberry rust fungus to be trialled in the SW of WA. The release of the new strains has created a unique opportunity for integrated weed management for blackberry. Effective control strategies have been developed for agricultural properties but riverbank, forest edge and plantations provide a unique challenge where infestations have been considered too difficult to tackle due to access and the sensitive environment. This project is designed to intensively study blackberry ecology and management in WA and to develop appropriate control strategies. The project will be led by CSIRO in conjunction with FPC, CALM, Ag Dept, UWA and others.

Sandalwood

Due to the difficulty and expense of controlling Kangaroo populations within Sandalwood plantations it has become standard practice not to establish Sandalwood plantations adjacent to or in close proximity to native bush reserves. This was demonstrated recently with a sharefarm north east of Brunswick Junction losing its entire Sandalwood host planting (*Acacia acuminata)* to kangaroo grazing. The area affected was 25 hectares. Some plant culling was carried out in order to reduce seedling damage but this was unsuccessful as the site adjoins State Forest and private

property. The area has since been planted with *Eucalyptus saligna* rather than re-planted to *acacia acuminata.*

MANAGED NATURAL FORESTS

Insect Pests

Jarrah leaf miner

Jarrah leaf miner is still in outbreak in some areas of the northern Jarrah forest. A small outbreak area of Jarrah leaf miner was observed on the Water Commission block east of Manjimup near Tone River last November. Janet Farr, Tom Burbidge and Allan Wills inspected this area and it was decided to inspect it again this coming November to see whether it has worsened or not. Cutout boundary surveys were not conducted over this past season. It is anticipated that the next survey will be conducted in October 2004. 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. A paper on *U. lugens* spatial distribution during the outbreak period has been published in Australian Forestry. (JF)

Defoliation Trial at Holmes Block near Dwellingup

The annual defoliation of the jarrah coppice at Holmes Block near Dwellingup was carried out last December. The project has been terminated after 15 complete annual defoliations. (T Burbidge)

Biodiversity study (Forestcheck)

The biodiversity study FORESTCHECK, has now completed its 3rd sampling season with over 900 morpho-species collected. (JF)

Diseases

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

Insect Pests

Eucalyptus wandoo
The Wandoo Response Group continues to coordinate research into the wandoo decline. University of Western Australia honours student Ryan Hooper completed a study of the role of disease factors in the decline of wandoo. Research by UWA on disease, entomological and environmental factors is ongoing. (A. Wills)

Eucalyptus gomphocephala
Research and policy development regarding the conservation of Tuarts continues under the direction of the Tuart Response Group. Cooperative scientific research involving The Department of Conservation and Land Management, Murdoch University, Edith Cowan University and Alcoa World Alumina Australia and funding by Australian Research Council's Competitive Linkage Grants Program. Edith Cowan University Masters student Todd Edwards completed a study into the distribution and severity of Tuart decline and factors associated with the decline. The study showed that the decline was largely confined to sites in Yalgorup National Park. (A. Wills).

Diseases

Thirty three sites covering a total of 195 ha were aerially sprayed with phosphite in 2004, comprising 168 ha in Stirling Range National Park and on coastal reserves near Albany (South Coast region) and 27 ha on nature reserves and in State forest south of Busselton (South West Region). Ten critically endangered, three endangered and one vulnerable species susceptible to *Phytophthora* root rot disease were treated with phosphite in the South Coast Region and one critically endangered and two endangered, susceptible, taxa near Busselton. Some sites in the Stirling Range and near Albany only received a single spray this autumn because of inclement weather during the second spraying period and these will be treated again at a later date. All sites in the Stirling range burnt in the 2000 wildfires were sprayed at only half the normal rate because the target species were still very small. The effects of the October 2000 wildfires continue to be evident in populations of several endangered plant species in the Stirling Range National Park with little regeneration of several threatened and common obligate re-seeder species. (R. Smith - CALM).

URBAN AND RURAL

Mundulla Yellows
Monitoring of the occurrence of Mundulla Yellows (MY) has continued. Symptomatic eucalypts (both planted trees and remnant native trees) have been observed in several additional locations. 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. 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. Contributions were made to the final report of the national Mundulla Yellows Task Group (2004). 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 between Mandurah and Preston Beach has suffered a decline in health. Infestation by wood boring insects is associated with the decline. Reasons for the decline are not yet clear but may include climate variability, hydrological and salinity factors, altered fire regimes, competition with understorey species and impacts by plant pathogens. An initial project intensively sampled whole trees of varying size and health, at a range of sites in Yalgorup National Park. No root pathogens were isolated, but a number of fungi were isolated from significant butt rots and stem decays. Further work is being carried out on the role of butt and root rots in the decline of tuart in yalgorup National park and Ludlow State Forest (D. Hasswell - CALM).

Foliar pathogens

A number of foliar pathogens were isolated and recorded for the first time on *Eucalyptus gomphocephala* in Western Australia. They included *Mycosphaerella cryptica, M. grandis*, *Pachysacca samuelii*, and *Fairmaniella leprosa.* With the exception of *M. cryptica* they are causing minor damage to foliage. 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 are currently underway to monitor levels of *M. cryptica* on *E. gomphocephala* pre and post-fire (P. Barber – Murdoch University).

Cape Lilac (White Cedar)

The White Cedar Moth (*Leptocneria reducta*) outbreak has not appeared this year, as there have been no reports from concerned members of the general public. This may be due to it not being observed as much, or it not being as much a nuisance, as it was in previous years (T Burbidge).

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 almost 16,900 ha of native forest. Approximately 17,300 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 (G. Strelein - CALM).

Between July 2003 and April 2004, a total of 1,251 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).

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT FOREST INSECT COLLECTION

The databasing of the CALM Terrestrial Invertebrate Collection (BugBase) has been completed and is now available via CALM's website at www.naturebase.net/bugbase and is linked to the WAISS, Department of Agriculture's website and also the main State and Commonwealth insect collection websites. It contains over 17, 000 specimens collected from not only the WA forests, and the plantations of blue gums and oil mallees but also from the Stirling Range and various nature reserves in the wheatbelt (T Burbidge).

INSECT INCURSIONS

European House Borer

A single female European House Borer was found on 19 January 2004 emerging from a 200 mm x 240 mm beam of *P. pinaster* timber in a house in the Perth suburb of Parkerville. Since then an incursion has been confirmed and the Generic Incursion Management Plan has been initiated.

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 NSW and QLD. The surveys will provide a framework for a database on disease already present in Australia. Preliminary surveys of eucalypt plantations in Indonesia (Northern Sumatra and West Papua), Thailand, China and Vietnam have also been undertaken. This was made possible through local collaboration and through Murdoch's association with FABI (Forestry and Agricultural Biotechnology Institute) in South Africa. 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 (courtesy of FABI) are already in existence for *C. zuluense* and *C. cubensis*. These markers will be used to determine the origin, diversity and movement of potentially destructive eucalypt diseases (T. Burgess – Murdoch University).

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

SPIRT Large. 2000-2003 at $200, 000 (Industry Partner-Integrated Treecropping). *Mycosphaerella* leaf blights and other pathogens in *Eucalyptus globulus* plantations and interactions with tree nutrient status. (A/Prof. Bernie Dell, MU, Dr. Giles Hardy, MU and Postdoctoral Fellow Dr. Heike Neumister-Kemp).

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
Canker diseases in *Eucalyptus globulus*. (Tania Jackson; Supervisors, G. Hardy and B. Dell, MU).

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

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

Honours Theses
Infection processes of *Alternaria* leaf blights in Paulownia plantations in Western Australia. (Catherin Pleysier, Supervisors T. Burgess and G. Hardy, MU)

Managed natural forests
Corymbia calophylla
Diseases
Canker fungi associated with deaths of *Corymbia calophylla* (marri) (Trudy Paap; Supervisors: G. Hardy, MU, Bryan Shearer, CALM and Jen McComb, MU). Part funded by Forest and Wood Products Scholarship.

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*): Planting of a production seed orchard of dieback resistant jarrah clones continued at the Forests Products Commission's Plant Propagation Centre near Manjimup. Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have continued. Trials of site preparation procedures for re-establishment of jarrah in dieback "graveyard" sites commenced in 2003 and further trials are being established in 2004. (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, Postdoctoral Fellow Mark Dobrowolski).

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, Jen 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 and G. Hardy, MU).

Mechanisms of suppression of Acacia species on Pc Arunodini Jayasekera BS JMcC GH

Karri forest (*Eucalyptus diversicolor*)

Diseases

Stump pulling for the control of Armillaria root disease in regrowth karri was initiated in 2003/4. Following first thinning in karri regrowth, stumps were pulled in approx. 300 ha of karri regrowth on high quality sites. The total area of thinning was 800 ha (A. Seymour, FPC).

Native plant communities

Diseases

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

PhD Theses in progress

The biology, ecology, pathology and genetics of *Puccinia boroniae* (Boronia rust) of in *Boronia megastigma, B. heterophylla, B. clavata* and hybrids. (Susanna Driessen APAI; Supervisors Giles Hardy and Phil O'Brien, MU) Funded by ARC LINKAGE

Interactions between potential fungal and insect pathogens associated with the decline of Tuart (*E. gomphacephala*) in Western Australia. (Martin Landolt; Supervisors M. Calver and G. Hardy, MU).