Primary Industries Standing Committee

Forestry and Forest Products Committee

Research Priorities and Co-ordination Committee

RESEARCH WORKING GROUP 7
FOREST HEALTH

Annual Pest and Disease Status Report for Australia and New Zealand 2005-2006

October 2006

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AUSTRALIA

VICTORIA

PLANTATIONS

Pinus *spp*.

Insect pests

Sirex noctilio (Sirex wood wasp)

The incidence of Sirex over summer 2005-2006 remained at low levels across the state. To date, no Kamona strain has been recovered, with the 'defective' and 'other' strain predominating in field samples. Emphasis has been placed on ensuring sufficient inoculations are done using the more effective Kamona strain nematode coupled with timely surveillance and thinning of susceptible stands. Parasitoid populations of *Ibalia* and to a lesser extent *Megarhyssa* and *Schlettererius* continue to emerge at elevated levels providing a useful secondary means of Sirex control.

Ips grandicollis (Fivespined Bark Beetle) and other bark beetle species

Ips grandicollis has remained at trace levels only with no significant outbreaks recorded. *Hylastes ater* and to a lesser extent *Hylurgus ligniperda* caused minor localized damage in private plantations located in the east of Victoria.

Essigella californica (Monterey Pine Aphid)

Monterey Pine Aphid populations continue to cause significant defoliation on a regular basis. While >15-18 year-old thinned stands of *P. radiata* have been the predominant age class to be defoliated, increasingly, defoliation of younger trees under ten years of age has been observed on a more frequent basis. While it is now over six years since the pest was first detected in Victoria, and most of this period has coincided with drier than average rainfall conditions, there has been no widespread mortality associated with the defoliation observed to date. However growth losses may be substantial.

Pathogens

No major outbreaks of disease were observed during the Forest Health Surveillance program within Hancocks Victorian Plantations during 2005/2006.

Dothistroma

Surveys have shown *Dothistroma septospora* to be at relatively low levels across the plantations although some localized hot spots with levels up to 80%defoliation have been detected in high risk areas in the north-east of the State. No spray program was conducted in the 2005/2006 season and is unlikely to be needed for the 2006-07 year.

Cyclaneusma Needle Cast

Defoliation associated with Cylaneusma was recorded in most areas of plantations in the State, with some areas exhibiting moderate defoliation levels.

Diplodia

Diplodia in association with the previous drought, is continuing to cause dead topping and death of trees in some plantations throughout the State.

Plantations (*Eucalyptus* spp.)

Insect pests

Mnesampela privata (Autumn Gum Moth)

Autumn Gum Moth has caused only minor damage in a small number of plantations throughout the state and has not been of concern over the past year.

Chrysophtharta and Paropsis *(Chrysomelid Leaf beetles)*

Leaf beetles have caused very low levels of defoliation (up to 10%) in 16 year-old stands of predominantly *E. globulus* in northern Victoria during the 2005-2006 summer with damage generally observed in the upper 50% of the tree canopy. Trace levels only of upper crown defoliation (<10%) was also observed in 10 year-old *E. globulus* plantations in Central Gippsland over the same period. In both cases, the trees required no control options to be implemented and they recovered fully by the end of summer.

Perga spp. *(Sawflies)*

Sawflies were observed causing trace levels (<10%) of defoliation only in eastern Victoria during winter 2005 with damage generally confined to individual and small clusters of trees of predominantly *E. globulus*. Defoliation was predominant in the upper 50% of tree crowns although in severe cases, lower crowns were also affected.

Phorocantha spp. ***(Longicorn Borers)***

Phorocantha acanthocera continues to occur at low levels only in eucalypt plantations in East Gippsland. Observations confirmed that *Eucalyptus saligna* and *E. viminalis* remains the preferred host tree species, with attack confined to individual trees of these species within stands. No other species of borer have been observed in any numbers at this time.

Cardiaspina spp. ***(Psyllids)***

Psyllids of the genus *Cardiaspina* (predominantly *C. retator*) has been observed causing low to moderate levels (10-30%) of defoliation to *E. camaldulensis* plantings in northern Victoria with the damage generally confined to specific areas rather than being widespread. This pattern of defoliation continues similar trends observed over the past three to four years, particularly in trees aged four years and over. Defoliation occurred predominantly in the lower crown of trees with levels up to 60% in some stands being recorded compared to levels ranging up to 15-20% in the upper crowns.

Other Pests of Eucalypts

- Low to moderate levels (10-30%) of defoliation damage were observed over summer 2005-2006 to *E. grandis* plantations in northern Victoria by the Leaf Blister sawfly (*Phylacteophaga froggatti*). Damage was generally confined to young juvenile foliage on young trees.
- Low levels of Light brown apple moth (*Epiphyas postvittana*) damage was observed on the growing tips of two year old *E. globulus* plantations in south west Victoria Victoria during late summer/early autumn 2006.
- Christmas beetles (*Anoplognathus* spp.) caused low levels only of defoliation in the upper crowns of four year old *E. globulus* plantations in Central Victoria over early summer 2005-2006.
- Low levels of Emperor gum moth (*Opodiphthera sp.)* defoliation were observed in an *E. globulus* plantation in near Mangalore in north-central. Trees subsequently made a full recovery following defoliation.

Pathogens

Mycosphaerella

Mycosphaerella defoliation in 2 year-old *Eucalyptus globulus* plantations in the Otways and South Gippsland, was the only significant disease reported within eucalypt plantations during 2005/2006. The pathogen still causes concern for growth of *E. globulus* in some areas, with plantation companies changing species to *E. nitens* in high risk sites. A trial is being established to evaluate the potential for fungicide use during the years leading up to canopy closure and change to adult foliage.

NURSERIES

Conifer species

Phytophthora cinnamomi remains a high priority for monitoring so as to reduce the further spread of disease. Research into herbicide use in nurseries showed that some herbicides can predispose pine seedlings to attack by *Phytophthora* while others can suppress disease development. Charcoal Rot and Fusarium have caused some disease issues in a nursery.

Eucalyptus species

No reports of damage due to pathogens were recorded in 2005/2006.

MANAGED NATURAL FORESTS

Insect pests

Didymuria violescens (Spurlegged Phasmatid)

Following information received in March 2005 of outbreaks in the Central Highlands of Victoria, egg surveys of 1939 and 1983 *E. regnans* regrowth were conducted to determine the numbers and viability of phasmatid eggs within the litter layer to determine their outbreak potential. These surveys found that eggs numbers and viability were at levels not expected to pose a threat to forest canopy cover in the forthcoming two year period.

Cardiaspina bilobata (Mountain ash psyllid)

An inspection was conducted of mountain ash psyllid monitoring plots in June 2006 with the survey indicating that populations are at barely detectable levels only and as a consequence, unlikely to cause significant defoliation this year. Observations made indicate general tree health to be very good at all three sites and in the surrounding forest with minimal insect/pathogen damage evident.

Cardiaspina retator **(Red gum basket lerp)**

Infestations of *E. camaldulensis* by the Red gum basket lerp *Cardiaspina retator* have continued over the 2005-06 summer, with significant defoliation for the fourth year running again observed in northern Victoria. However, the areas showing symptoms of defoliation are decreasing continuing a pattern observed over the past two years. While individual trees had died, there has been no widespread mortality associated with the defoliation despite the continuation of drier than average conditions.

Uraba lugens (Gum leaf skeletoniser)

Surveys were conducted in late 2005 responding to defoliation observed in forests in east Gippsland by *U. lugens*. Defoliation levels varied from trace levels (<10%) to moderate (20-30%) at various sites across the region. A follow-up survey in early 2006 found that in most cases, trees had substantially recovered foliage lost in feeding by the insect. A further outbreak has been detected in September 2006 which has been investigated and has shown widespread defoliation of *E. globoidea* (White stringbark) in the area between Orbost and Bairnsdale.

NATIVE PLANT COMMUNITIES

Few diseases were reported from native forest communities during 2005/2006. *Phytophthora cinnamomi*, continues to expand in areas such as the Brisbane Ranges and other heathland environments. Draft State strategy for its management has been released for comment.

It was with much sadness that we received the news that Dr Gretna Weste passed away in the last week in August 2006, just shy of her 90th Birthday. Gretna worked in the School of Botany at the University of Melbourne from 1961-82, and while retiring as Reader from the University, she continued her involvement in research with students and colleagues for another 20 years until 'retiring' to Tasmania in 2004. Her research has

helped considerably to understand the biological behaviour of *Phytophthora cinnamomi*. Our sympathies extend to her family, friends and colleagues.

MONITORING AND SURVEILLANCE

Insect pests

Lymantria dispar (Asian Gypsy Moth)

Monitoring of the ports of Melbourne, Geelong and Westernport continued for the Asian Gypsy Moth over summer 2005/06 as part of a nationwide monitoring program. Apart from native lepidopterous species being trapped, no exotic species including gypsy moths were detected during the survey.

Hylotrupes bajulus (European House Borer)

Following the original report from WA, a watching brief has been kept for any instance of this pest re-occurring in Victoria. To date, surveys for other insect pest species have not shown up evidence of active EHB as an incidental finding to these surveys. Efforts are continuing to obtain historical data on locations of previous occurrences within Victoria to act as a guide for subsequent surveys

Plantations and Native Forest Monitoring

The Forest Health Surveillance Group has been working closely with industry developing and conducting ongoing insect pest and disease surveillance programs in both softwood and hardwood plantations throughout the state to meet their varying operational and stewardship requirements. It is pleasing to note that industry as a whole has recognised the need for formalised forest health surveillance programs within their plantations and native forest remnants and on an individual company basis has either implemented programs or are in the process of developing such systems. While public lands under state government stewardship are surveyed on an ad-hoc basis in response to when outbreaks occur, a pilot surveillance program is to be developed for native forests during the next 3 years.

Chalara australis (Myrtle Wilt)

Mytle Wilt continues to cause the death of mature *Nothofagus cunninghamii* in rainforests across Victoria. Monitoring is continuing to evaluate whether gaps produced through mortality recover through seedling regeneration.

Stream monitoring for Phytophthora

An honours project assessing techniques for monitoring streams for the presence of *Phytophthora* based on those used for Sudden Oak Death in the USA and Europe, is

nearly completed. *Phytophthora gonipoidoides* and at least 2 unidentified species of *Phytophthora* were recorded. *P.ramorum* and *P. kernoviae* were not recorded. The unidentified species appear similar to that recorded from riparian streams in Europe. Their pathogenicity is unknown. *Phytophthora gonapodyides* has been recorded from Western Australia and Tasmania previously. Ways to reduce this as a pathway for potential spread through water use from streams (e.g. in fire-fighting operations etc.) needs further research.

URBAN, RURAL AND AMENITY.

Phytophthora

Phytophthora cinnamomi is causing stem cankers on plane trees (*Plantanus acerifolia*) within the City of Melbourne. A trial using phosphonate applied as a stem application using pentra-bark is to commence during 2006-7.

Canary Island Date Palms – Phoenix canariensis

Only one further Canary Island Date Palm in Melbourne was found to be infected with *Fusarium oxysporum fsp canariensis* (Fusarium Wilt) during 2005/2006. This brings to 12 palms that have been infected with the pathogen. All palms have been removed and deep buried in a quarantine tip. Surveys within the major plantings of palms in Melbourne are to continue in 2006-7.

Dieback Mornington Peninsula

A study of dieback within remnant native vegetation on the Mornington Peninsula revealed a mixture of causes including drought, *Phytophthora*, Mundulla Yellows, salt and defoliation caused by over-browsing by possums and koalas and the interaction of bell-miner/psyllids. Defoliation tended to result in invasion of the root systems of the trees by secondary fungi resulting in tree mortality. The creation of islands of native vegetation due to land sub-division for housing is the probable cause of the overpopulation coupled with lack of fire to reduce defoliator habitat and provide natural regeneration. Local government have been encouraged to undertake regeneration activities within the reserves under their control.

Mundulla Yellows

Investigations into the cause of Mundulla Yellows (MY) is continuing with a multi-disciplinary team drawn from the Department of Primary Industries and University of Melbourne through funding by Environment Australia and South Australia Department of Environment and Heritage. Monitoring plots have been set up in South Australia, Victoria, Western Australia, Tasmania and Canberra. Studies to date suggest that soil factors play a significant role in the development of the 'disease' and that it appears to be a form of induced iron chlorosis. While the symptoms could be reversed using iron chelates and iron implants, the cause/s of their development are still to be determined.

The increase of CO2 in the atmosphere and bicarbonates in the soil may be contributing to the development of the 'disease'. A trial has been established to evaluate species which may be planted back onto sites of high risk of development of MY.

Dutch Elm Disease (Information supplied by Greg Lefoe DPI, Victoria)

A draft Australian Dutch elm disease contingency plan was prepared in 2001 and provides a detailed framework for actions to prevent the introduction and establishment of DED pathogens in Australia. It also provides a compilation of technical information which would be required quickly should the disease be found here. The four main strategies included in the DED contingency plan are:

1. Exclusion of the causal fungi
2. Pre introduction measures
3. Eradication
4. Containment

The draft plan has been circulated widely, audited by Plant Health Australia, and used as a model for the management of tree pest/disease incursions in urban and peri-urban areas. The draft contingency plan also highlights key recommendations that require implementation. In Victoria the Committee for Amenity Tree Health continues to promote recommendations from the plan and seek their implementation. DED was recently categorised under the Emergency Plant Pest Response Deed.

The City of Melbourne continued to support surveys for Dutch Elm Disease in the main gardens and boulevards under their management. Symptoms found resembling DED were attributed to ringbarking of branches by possums and elm bark beetles and fruit tree

borers. The fungus could not be isolated from wood of any trees exhibiting flagging due to beetles.

Elm leaf Beetle (Information supplied by Greg Lefoe DPI, Victoria)

The elm leaf beetle is a pest of European elms, and was discovered on the Mornington Peninsula, Victoria, in 1989. Most elms planted in Australia are European species, and are susceptible to elm leaf beetle attack. The elm leaf beetle has the potential to cause severe defoliation of susceptible elms, which can weaken mature trees and reduce their aesthetic and amenity value. In the United States for example, the elm leaf beetle has become a major pest of American and European elms and is ranked as the third most important insect pest of urban forests in the western states. In severe cases the elm leaf beetle has been blamed for tree death. The elm leaf beetle is now damaging elms in metropolitan Melbourne and much of regional Victoria. Where elm leaf beetle infestations occur, control measures must be implemented to prevent serious damage. The City of Melbourne, for example, incurred costs of about $80,000.00 to monitor their elms and treat elm leaf beetle infestations during 1998/99, and invested a further $43,000.00 into research to protect its elms from elm leaf beetle and DED. Of particular concern to many tree managers and residents are the hazards associated with applying broad-spectrum insecticides to the canopies of large trees in urban areas.

Local government has therefore readily adopted the principles of integrated pest management (IPM), and research into the management of the elm leaf beetle in Australia has therefore sought to develop an IPM program by:

- developing an understanding of the pest, its ecology and distribution;
- monitoring elm leaf beetle populations to determine the level at which control measures are necessary;
- co-ordinating and applying control measures in a way that is mutually reinforcing, optimises control of the pest, is cost-effective and safe to use in an urban environment, and
- evaluating the effectiveness of control programs

Although IPM seeks to reduce chemical use, control of elm leaf beetle in Australia is still heavily reliant on insecticides.

A biological control program was initiated in Victoria in the 1990's. Two parasitoids were selected for host-specificity testing at the (then) Keith Turnbull Research Institute (now DPI Frankston). The first *Oomyzus gallerucae* (Hymenoptera: Eulophidae) was shown to be host-specific and approval to release was granted in 1990. Releases of *O. gallerucae* commenced in southern Victoria in the same year. Although parasitism of elm leaf beetle eggs was observed during the season of release, *O. gallerucae* has not been recovered from release sites during subsequent seasons.

For the second parasitoid, *Erynniopsis antennata* (Rondani) (Diptera: Tachinidae), host-specificity testing commenced in 1991. Approval to release *E. antennata* was granted in 1994. Since 1994 several attempts at rearing *E. antennata* through one generation in

sufficient numbers to enable field releases against the elm leaf beetle were unsuccessful. A strategy to increase the likelihood of successfully releasing and establishing this agent was proposed to AQIS, namely the direct release of *E. antennata* adults imported as diapaused larvae inside over-wintering hosts. In 2001 AQIS approved this strategy, agreeing to waive the requirement for rearing an entire generation in quarantine, provided the larval diapaused stage of the parasitoids life-cycle was imported, and certain hygiene and testing conditions were met. In January 2002 the first releases of *E. antennata* commenced at Birrarung Marr park, Melbourne. Altogether 199 parasitoids were released in 2002 at central Melbourne, Lilydale, and Alexandra. In 2004 a further 478 parasitoids were released at Lilydale, Frankston and Emerald. These sites are being monitored for establishment however *E. antennata* has not been recovered. Further importations are necessary to supplement the initial releases and maximise the likelihood of *E. antennata* establishing in Victoria. The City of Melbourne has therefore agreed to fund a further importation of *E. antennata* in November 2006. Greg Lefoe (DPI Victoria) will travel to UC Davis in November to collect over-wintering elm leaf beetles potentially harbouring the parasitoid. These beetles will be shipped to DPI's quarantine laboratory at Frankston, where emerging parasitoids will be collected and, upon approval, released during December 2006 and January 2007.

Morton Bay Fig Psyllid (Information supplied by Greg Lefoe DPI, Victoria)

Moreton Bay figs *Ficus macrophylla* are important landscape trees in Melbourne's parks and gardens, many having considerable historical significance as well as great amenity value. Heavy infestations of the psyllid *Mycopsylla fici* can be damaging to Moreton Bay figs. Psyllids are a pest on Moreton Bay figs for several reasons :

- They can rob figs of nutrients and other compounds.
- They are potential vectors of disease.
- Can cause early yellowing and leaf fall, in some cases causing severe defoliation.
- The sticky lerps produced by Moreton Bay fig psyllids remain on fallen leaves and are a considerable nuisance and danger to park users.

There are 568 Moreton Bay figs at 17 sites within the Melbourne City Council area, mostly in public parks. At these sites specific control measures may be necessary to protect figs from serious damage. However tree managers need to have a good understanding of pest biology, infestation levels, and threshold size of pest populations, when formulating an integrated pest management (IPM) plan. Acceptance of low-level pest density, for example, requires an understanding of action thresholds - or the level of pest density at which some form of intervention, either direct (population reduction via chemical control), or indirect (cultural control measures) must occur. Chemical, biological, and cultural control methods can then be integrated in an overall strategy to keep pests below levels that cause unacceptable damage to figs. Studies of the psyllid and its natural enemies were conducted by DPI in central Melbourne in 1997/98 and 2002/03. In 2004/05 psyllid infestation levels on Melbourne's Moreton Bay figs were measured by randomly sampling a proportion of trees within each site. Large sites were further divided into discrete management zones, each of which was sampled separately. Based on this

information, control measures were proposed to more effectively target trees where unacceptable damage is anticipated. During 2006/07 DPI will assist City of Melbourne tree contractors to implement an IPM program for the psyllid by:

(i) monitoring emergence of adults psyllids to identify the period when foliar application of registered insecticides will be most effective, and

(ii) sampling lerps before and after treatment to evaluate the effectiveness of the control program.

Armillaria

Armillaria luteobubalina was recorded causing dieback of trees and shrubs in gardens, Parks and Reserves across Melbourne and the Dandenong Ranges during 2005/06.

Cypress dieback.

Cypress aphid associated with Cypress dieback in some trees in Melbourne.

QUARANTINE

Phytophthora fallax

Phytophthora fallax was isolated for the first time in Australia in September 2006 from a routine soil sample taken from a recently burnt (Feb 2006) messmate/peppermint forest within the Kinglake State Park north-east of Melbourne. Identification was made using rDNA ITS sequence data. *P. fallax* was described earlier this year from eucalypt plantations in New Zealand, where it has been noticed to cause crown dieback, leaf spots and twig/small branch lesions in *E. regnans*, *E. fastigata*, *E. delegatensis* and *E. nitens* over the last 20 years (Dick et al 2006, Images from New Zealand, courtesy Margaret Dick). It has previously not been recorded outside of New Zealand. Parks Victoria has placed a voluntary quarantine on the area until its pest-risk status has been assessed.

Bursaphelenchus

In February 2000, ***Bursaphelenchus hunanensis*** nematodes were isolated from a dying ***Pinus halepensis*** tree in a botanical garden near the port of Melbourne. An eradication program was approved as a precautionary approach to their introduction by the then Standing Committee of Forestry (now Forests and Forest Products Committee) under the coordination and support of a National Consultative Committee established for this purpose. Extensive surveys across Melbourne over the next 4 years resulted in the removal of 39 mature pine trees that contained the nematodes. No further trees have been identified as being infected with the nematode since January 2003., and no *Monochamus* beetles (the normal vector of the nematode) were detected. The FWPRDC sponsored project at Adelaide University has been completed and is currently being written up.

WESTERN AUSTRALIA

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PLANTATIONS

Pinus radiata

Diseases

No major problems reported.

Eucalyptus globulus

Diseases

No major problems reported. Research at Universities continues on *Mycosphaerella* leaf blights (MLB) in *Eucalyptus globulus* plantations (see Research and Development). Research has also commenced on the potential risks posed by MLB and associated pathogens in plantations to native remnants.

Phaeophleospora eppicocoides, a common pathogen causing leaf blight on eucalypts in the Eastern states and elsewhere in the world has been reported for the first time in western Australia (Sarah Jackson, Murdoch University)

MANAGED NATURAL FORESTS

Jarrah forest (*Eucalyptus marginata)*

Diseases

No new major pathological problems reported, but severe frost damage was reported at several locations (see Urban and Rural). Management and survey of *Phytophthora* 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*)

Diseases

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

Diseases

250 hectares sprayed in the South Coast Region (near Albany, in the Stirling Ranges, at Esperance), 15 hectares at Mt Lindesay, and about 50 hectares near Busselton. Targets included the critically endangered species *Banksia brownii*, *Dryandra montana* and *Andersonia axilliflora* in the Stirling Ranges, and *Lambertia echinata ssp. occidentalis* at Busselton (R. Smith, DEC)

URBAN AND RURAL

Diseases

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, and it occurs on alkaline coastal sands as well as on acid soils including laterites. 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, DEC).

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 *Peronospora-like* 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 foliar analysis has shown that tuart within Yalgorup NP have low levels of trace elements such as Zinc (H. Eslick - Murdoch University). Studies on the role of fire and competition indicate tuart seedlings growing on ashbeds exhibit greater rates of survival and growth compared to those grown off ashbeds. Canopy health of the majority of tuart has increased following a controlled burn within Yalgorup NP (R. Archibald, Murdoch University). Trunk injections of a complete nutrient formula have shown promising results in a trial established within the national park and monitored over the previous 12 months (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 a Wandoo Strategy and Action Plan 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). Evidence from recent research shows cankers are more severe on declining trees and suggests an interaction between borers and decay-fungi is causing the decline of canopies (Hooper and Sivasithamparam. Can J For. Res. 35 (2005): 2589-2602).

Rudis decline: Rudis (*E. rudis*) has shown varying degrees of symptoms of crown decline throughout its range for many years. Collaborative research between Murdoch University, Serpentine-Jarrahdale Local Council and ALCOA has been initiated to investigate the efficacy of trunk injections to reverse canopy decline. Trials include treatments of phosphite, complete nutrient and also an insecticide. A trial established in spring 2005 at Pinjarra is currently in progress. Assessments of canopy health are focusing at the canopy, branch and leaf scale and the incidence and severity of a range of insect and fungal pests. Results will be available later this year (2006) (P. Barber, Murdoch University).

Foliar and stem pathogens: 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). A study (by K. Taylor, Murdoch University) investigating the diversity of *Botryosphaeria* spp. in tuart woodlands has identified 5 new species on a range of hosts, including tuart, jarrah, acacia, quandong and banksia. These fungi are currently being described. It is

thought that one of these species may be responsible for the 'top-down' deaths of ***B. grandis*** in the Yalgorup N.P. Pathogenicity trials will commence shortly to determine whether this is the case (P. Barber, Murdoch University). An increased occurrence of 'flagging' and thinning of the crowns of ***Agonis flexuosa*** has also been noticed within Yalgorup N.P. and near the Busselton region over the past 12 months. An unknown fungus has been isolated from symptomatic tissue within the national park. Studies are underway to determine the identity and pathogenicity of this fungus (P. Barber, Murdoch University).

Frost Damage: In mid-June 2006, extensive frost damage has occurred throughout the SW of WA. Damage resulted from a combination of low temperatures and low humidity. On the coastal plain south of Perth temperatures in mid-June dropped to -3°C at Busselton and to -5°C and -6°C inland at Collie and Wandering, and record low rainfall was recorded for June throughout the SW. At Lake Clifton, in Yalgorup NP, the damage was confined to peppermint (***Agonis flexuosa***), and on the Albany Hwy at Glen Eagles and the Brookton Hwy at Dale both mature and juvenile jarrah was affected. Minor damage to marri at Mt Cooke and wandoo at Glen Eagles was also reported. Reports so far have been ***ad hoc*** and further surveillance and monitoring is necessary to determine the full extent and range of damage, but damage so far appears to be restricted to foliage and no deaths have been reported (R. Robinson and A. Wills, DEC).

Frost Damage to ***Agonis flexuosa*** (peppermint) at Lake Clifton, June 2006 (A. Wills, DEC).

Forest health surveillance and diagnosis

Dieback mapping and management

To assist the planning of roading and harvesting operations undertaken by the FPC on DEC managed lands, a total area of 24,686 ha was mapped by accredited DEC interpreters for the presence of symptoms of dieback disease, caused by *Phytophthora cinnamomi*. This included 11,969 ha of previous mapping that was rechecked for further spread. Mapping and hygiene planning was also undertaken on a further 5,970 ha for the Parks and Visitor Services, Nature Conservation and Sustainable Forest Management Services, and 3,108 ha for external requests. Mapping for external clients included assistance to determine the current extent and model predicted future spread of dieback from point infestations in the Fitzgerald River National Park (Bell Track Project), and in the implementation of phosphite application trials (M. Rayner, DEC).

A major project to undertake dieback threat assessment and risk analyses for vegetation on the South Coast continued with the SCRIPT (South Coast Regional Initiative Planning Team) natural resource management group. This work has included the collation of biological assets, strategic disease mapping, predictive modelling of future disease spread, and estimation of threat and risk categories within a target area of approximately 1.9 million ha. (M.Rayner, DEC).

In the year to June 2006, a total of 1,475 samples were processed for *Phytophthora* identification by DEC's Vegetation Health Service (VHS). DNA sequencing has led to the identification of *Phytophthora inundata* which was isolated from a sample collected beneath a dead *Xanthorrhoea preissii* in the Southern Jarrah Forest in 2005. Further work is being done to test and identify various recent and historical isolates of unidentified *Phytophthora* from a range of locations and ecosystems. A small number of other tree health and nursery problems were investigated (M.Stukely, DEC).

A Forest Health and Vitality Surveillance and Monitoring program is in the initial stages of planning. An options paper has been prepared and submitted to the DEC Sustainable Forest Management Division for consideration (R. Robinson and J. Farr, DEC).

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 3 years, 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. Several new fungal species have been found causing leaf diseases and these are currently being described. 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 have been 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. A project has been funded to test the susceptibility (in trials in Asia) of several tropical and sub-tropical eucalypt species to *P. destructans* and *C. zuluense* (T. Burgess, Murdoch University)

Study on the exchange of pathogens between native forests and bluegum plantations in Western Australia continued at Murdoch University and the new forestry CRC is studying the movement of Mycosphaerella spp. into WA and between forests and plantations. Several *Botryosphaeria* spp., endemic to WA have moved into the plantations. (T. Burgess, Murdoch University).

Kate Taylor (MU) completed an honours thesis on Botryosphaeria spp. associated with trees in healthy and declining tuart stands; identification, pathogenicity and potential role in decline. She found that *B. australis* was widespread and very pathogenic on most hosts. Several new endophytic species were also found and these are currently being described (T. Burgess, Murdoch University).

Diseases

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

Collaborative Project - Murdoch University and the Tree Pathology Cooperative Program (TPCP - Sth Africa). The project 'New and emerging pathogens threatening the biodiversity of Australia's eucalypts' continues, and concentrats on some of the major eucalypt pathogens worldwide (*Phaeophleospora* spp. *Mycosphaerella* spp., *Botryosphaeria* spp. *Cryphonectria* spp.). The aim is to determine their origin, movement and the risk they pose to Australia's eucalypts (T. Burgess, MU and M. Wingfield, TPCP).

PhD Theses in progress at Murdoch University

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

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

In 2005 a large-scale survey of the *E. globulus* 2nd rotation estate of WA was conducted to establish the incidence and likely causal agents of observed basal stem rots. Three main wood decay fungi were identified as possible causal agents of observed rots; *Trametes versicolor*, *Stereum hirsutum* and *Pycnoporus coccineus*. Additionaly, 2 commercial scale trials were set up to investigate the efficacy of a variety of fungal rot preventative treatments. In 2006 further surveys will be conducted, a pathogenicity trial will be set up, a population genetics survey of *T.versicolor* will be conducted and data from 2005 trials collated (F. Tovar, MU).

Stereum hirsutum fruiting on stump (left) and resulting basal rot in stump and coppice (right) of *E. globulus* (R. Robinson, DEC).

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

Katherine Taylor: A detailed study of *Mycosphaerella cryptica* and *Mycosphaerella nubilosa* in Western Australia, focusing on the threat to native remnants. (Supervisors: T. Burgess, G. Hardy and P. Barber, MU, C. Mohammad, Forestry CRC and A. Carnegie, SF NSW).

Diseases of Boabs

In collaboration with Mike Winfield in South Africa Murdoch University has conducted a survey of fungi associated with boab (*Adansonia gregorii*) in Western Australia that will have a matching project in South Africa. Monique Sakalidis (PhD, MU) is taking on this work as part of her thesis.

Paulownia Plantations

Diseases of *Pawlonia.* (K. Bayliss, Postdoc MU). Funded by ARC LINKAGE.

MANAGED NATURAL FORESTS

Corymbia calophylla

Diseases

PhD Theses in progress at Murdoch University

Trudy Paap. (PhD submitted 2006). Canker fungi associated with deaths of *Corymbia calophylla* (marri) (Supervisors: G. Hardy, MU, B. Shearer, CALM and J. McComb, MU). Part funded by Forest and Wood Products Scholarship.

The impact of a canker disease of *Corymbia calophylla* (marri) in the southwest of Western Australia (WA) has been increasing since it was first observed causing decline and death of this species in the 1970s. Despite increasing concern, there has been very little research into the disease. This study examined the range of fungal species associated with healthy and diseased *C. calophylla,* and the pathogenicity of isolates obtained from these surveys. DNA sequencing confirmed that *Quambalaria cyanescens* and *Q. pitereka* are present in southwest WA, with the latter associated with leaf and shoot disease. A third group isolated from cankers represented a new species of *Quambalaria.* Comparisons of disease symptoms and conidiogenesis indicate this species is synonymous with *Sporotrichum destructor,* a fungus historically implicated in the canker disease described in the 1920s on amenity planted *C. ficifolia,* and the species is formally described as *Q. coyrecup*. Pathogenicity trials show *Q. coyrecup* is capable of causing significant lesions similar to those observed in natural infections, confirming it is the fungus responsible for the current canker disease. *Endothiella eucalypti* also caused significant lesions, though these were not typical of natural infections, which together with its frequent isolation from both healthy and diseased trees suggests it is an

opportunistic pathogen. The current cause of cankers in *C. calophylla* is the same as the fungus historically implicated in the canker disease described in the 1920s on amenity planted *C. ficifolia.* At that time it was described as an endophyte doing little or no damage in *C. calophylla.* It is of immediate importance to determine the factors potentially driving this decline, and develop control and management options (T. Paap, 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, and promising levels of survival have been recorded in the critical first and second years. 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, DEC).

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

PhD Theses in progress at Murdoch University

Sarah Collins (PhD submitted 2006). 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. (Supervisors, G. Hardy, MU and B. Shearer, DEC). Funded by ARC LINKAGE.

Kathryn Smith (PhD received Sept 2006). Saprophytic ability and long-term survival of *Phytophthora cinnamomi* in rehabilitated bauxite mines and adjacent jarrah forest. (Supervisors G. Hardy, J. McComb, MU and I. Colquhoun, Alcoa World Alumina). Funded by ARC LINKAGE.

Arunodini Jayasekera (PhD submitted 2006). Mechanisms of suppression of Acacia species on *Phytophthora cinnamomi* (Supervisors: B. Shearer, DEC, J. McComb and G. Hardy, MU)

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

Michaela King . Genomic analysis of phosphite responsive genes from *Phytophthora* cinnamomi (Supervisors: G. Hardy, J. McComb, W. Reeve, P. O'Brien, MU).

Nathan Jardine. Is phosphite accumulation in the plant necessary to induce resistance? (Supervisors: P O'Brien, G. Hardy and J. McComb, MU).

Leila Eshraghi. The role of plant defense pathways in Phosphite induced protection of *Arabidopsis thaliana* from *Phytophthora cinnamomi* infection (Supervisors: P. O'Brien, G. Hardy and J. McComb, MU).

Nari Anderson. DNA based detection of *Phytophthora cinnamomi* from soil samples (Supervisors: P O'Brien, MU and I. Colquhoun, Alcoa World Aluminium).

Masters Theses in progress at Murdoch University

Mee Hua Wong. Characterization of phosphite responsive genes in *Phytophthora cinnamomi* and other *Phytophthora* species (Supervisors: P. O'Brien, G. Hardy, J. McComb, MU).

Honours projects in progress at Murdoch University

Melissa Bexley. Taxonomy, biology, ecology, pathology of *Phytophthora citricola*-like pathogen (Supervisors: K. Bayliss, G. Hardy, MU)

Shannon Dundas. Utilisation of *Phytophthora cinnamomi* infected habitats by honey possums (*Tarsipes rostratus*) in the Cape Riche area, Western Australia (Supervisors: T. Fleming, B.Wilson and G. Hardy, MU).

Chid Gilovitz. Screening *Lambertia* species for susceptibility and resistance to *Phytophthora cinnamomi* to develop a model plant system to examine resistance mechanism (Supervisors: G. Hardy, MU, B. Shearer, DEC, B. Bowen, MU).

Nicole Moore. Interaction of fire and *Phytophthora cinnamomi* on plant communities in the Stirling Range National Park, Western Australia (Supervisors: G. Hardy, B. Bowen, MU, B. Shearer, S. Barrett, DEC).

Department of Environment and Heritage funded projects at Murdoch University.

Enhancing the efficiency of phosphite with the addition/supplementation of other chemicals such as those known to be involved in resistance (Chief Investigators: G. Hardy, B. Dell, B. Bowen, P. O'Brien, M. Calver, J. McComb, Research Officer: J. Ellery).

Defence gene regulation by combined treatments with phosphite and inducers of systemic acquired resistance in the model plant *Arabidopsis thaliana* (PhD student: Patsy Stasikowski).

Does the physiological status of the plant at time of spraying affect the efficiency of phosphite? (Research Associate: D. Huberli).

Eradication of *Phytopohthora cinnamomi* from spot infections in a native plant community in Tasmania (Research Associate: W.Dunstan).

Eradication of *Phytophthora cinnamomi* from spot infections at Cape Riche, Western Australia. (Research Associate: W. Dunstan, Research Officer: N. Moore).

Department of Environment and Heritage Consultancies (MU).

A project to review current best practice approaches to the management of sites in Australia that are or could be threatened by *Phytophthora cinnamomi* (Chief Investigators: G. Hardy, E. O'Gara, B. Wilson, Scientific Advisory Group: K. McDougall, D. Cahill, T, Rudman, I. Smith, P. Gaddek, K. Vear)

Review of National Threat Abatement Plan (E. O'Gara, G. Hardy, K. Howard).

Karri forest (*Eucalyptus diversicolor*)

Diseases

Re-measurement of the impact of Armillaria root disease in the Warren Thinning Experiment, 20 years following treatment, was undertaken in 2005-06. Preliminary indications suggest that singe the last assessment (2000), there has been limited tree mortality and many bole scars have occluded (R. Robinson, DEC).

Wandoo Decline

In recent years the health of Wandoo (*Eucalyptus wandoo*) woodlands has been affected by crown decline, sometimes resulting in the death of declining trees. The Wandoo Recovery Group was established in 2003 and a Wandoo Strategy and Action Plan was developed, which included aims to support research, distribute information in the community and develop partnerships with stakeholders. Research strategies were based on two lines of research; (A) Abiotic factors (i.e. drought) and physiological response of Wandoo are impacting on its health directly; (B) Insect pests and pathogens are more

prevalent in recent years and causing severe damage to Wandoo canopies. The University of Western Australia is pursuing these lines of research. For "A" two projects are currently running: A PhD project is screeningtolerance of Wandoo seedlings from various provenances to abiotic stress factors such as drought and salinity. These provenances are also being characterized genetically (E. Dalmaris, E. Veneklaas, P. Poot, UWA and M. Byrne, DEC). Also, a field study in Julimar state forest is comparing water-use strategies of four co-occurring eucalypts including Wandoo (*E. wandoo, E. marginata, Corymbia calophylla, E. accedens*) (P. Poot and E. Veneklaas, UWA). Preliminary results indicate that Wandoo uses more water and allows its tissues to dry out further. This strategy allows the species to grow in drier soil but could be associated with severe stress when threshold soil water contents are reached after several low-rainfall years. For "B" a PhD project is focussing on the model for Wandoo decline introduced in 2003 (Hooper and Sivasithamparam 2005, Can. J. For. Res. 35: 2589–2602) that proposes an interaction between a wood boring insect (type 1) and decay-causing fungi, and specific site conditions that influence these causal relationships (R. Hooper, K. Sivasithamparam, UWA; B. Shearer, C. Crane and A. Wills, DEC). Tri-annual surveys using a crown assessment method developed by K. Whitford and A. Wills (DEC) for use in community assessment (K. Whitford, DEC), have shown April to May to be the peak period for decline symptoms (R. Hooper, UWA). Comparison of 9 locations (1 sq km each) throughout the Wandoo range has identified two locations as decline "hotspots". By using aerial trapping and branch caging we have shown the "hotspots" to have more current borer galleries and higher populations of type-1 borer, whereas recovering stands have greater mean number of old type-1 galleries. Pathogenicity trials using most frequently isolated fungal species have shown 5 isolates out of 11 to cause significant lesions on healthy Wandoo saplings (R. Hooper, UWA). Molecular work is planned to identify fungal species and elucidate functional relationships between type-1 borer and pathogenic fungal species. All results at this stage are preliminary and further work is being carried out by the research groups. Decline "hotspots" have been identified in two locations, with symptogalleriesms severe throughout autumn and type-1 borer identified as a Buprestid (Jewel) beetle is most active in these areas with close associations with two fungal species. A pathogenicity trial showed significant lesions were formed on healthy Wandoo saplings for 5 of the 16 isolates used in the trial. Molecular work is planned to identify species and investigate the nature of the relationship between the insect and fungi (R. Hooper, UWA).

WESTERN AUSTRALIA - PESTS

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PLANTATIONS

Pinus radiata

***Sirex*:** 52 trap tree plots (for *Sirex noctillio*) were installed throughout the Forest Product Commission's mature estate during the summer of 05/06. Although this did not constitute all plantations, the distribution did focus on those areas of higher risk (Swan cell). (M. Lobb, FPC)

Live "Steely-blue wood wasps" (*Sirex juvencus*) were detected in dunnage from Germany in April 2006**.** The initial detection was a Post Quarantine Detection at Laminex Dardanup in Bunbury, Western Australia. The consignment consisted of 9 containers and 4 flat racks of dryer components. All components were on skids, pallets and crates. The crates and pallets were ISPM 15 approved with stamps intact. The truck driver noticed live wasps on the outside of one of the skids upon delivery and collected three specimens. He handed them to the transport company manager who phoned the broker. The broker contacted AQIS. Adult wasps were found on the outside of a skid upon delivery. The first of the two containers had been unpacked and wood packaging was stored in the Laminex yard. Adult wasps could have emerged from this packaging and after examination by AQIS, *Sirex* emergence holes were found. After the broker contacted AQIS Breach management, AQIS officers in Bunbury went to the premise and collected the three wasps that had been caught by the truck driver. Upon consultation with the senior entomologist, all wood packaging was contained by being placed into a container and returned to Fremantle for fumigation. This consisted of two containers and one crate. The rest of the consignment was held in Fremantle for fumigation prior to release to importer. No further action was required by AQIS. (I Dumbrell, FPC)

Thrips: The first known occurrence of thrips (*Heliothrips haemorrhoidalis*) in a thinned *Pinus radiata* plantation in WA was recorded in March 2006. Incursion at this stage is restricted to the understorey "wilding" population with no noticeable effect on the mature trees. The affected area is approximately 3 ha and spreading slowly. (I Dumbrell, FPC)

***Ips grandicollis*:** No reports on high numbers have been received for this past year. (JF)

Monterey Pine Aphid *(Essigella californica)*

Although Essigella is present it is still not a real problem in WA. Ian Dumbrell (FPC) is the WA representative on the Essigella biocontrol project steering committee. (I Dumbrell, FPC)

Pinus radiata & Pinus Pinaster

European House Borer *(Hylotrupes bajulus)*: Surveillance of every gazetted road between Geraldton and Esperance, inland to the 400mm isohyet, occurred again from April – August 2006 as part of the annual delimiting surveillance. No further finds were made outside of the broader Perth metropolitan area. Within the metropolitan area our number of confirmed sites has grown to 104, with no increase to the existing 4 government owned plantations, 1 private plantation and the FPC seed orchard at Rottnest. Increased understanding of the biology of the EHB has resulted in an increase in the intensity of tree destruction activities by the EHB response on private properties. Regulations have now been enacted (Agricultural and Related Resources Protection (European House Borer) Regulations 2006) which place restrictions on the movement of pinewood, of certain types within certain geographical and seasonal constraints. These have resulted in modification of some of the FPC's harvesting activities. A number of research activities have been undertaken into the EHB, such as DNA profiling, acoustic detection, pheromone trapping and efficacy of insecticidal timber preservatives. (J. Lette, FPC)

Pinus Pinaster

Wingless Grasshopper (*Phaulacridium.sp*): During November 2005 to January 2006 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 (approximately 605ha misted and baited). (D. McMillan, FPC)

Rutherglen Bug (Nysius vinitor): October to late December Midwest plantations misted approx 605ha in conjunction with wingless grasshopper control. (D. McMillan, FPC)

Port Lincoln (28) Parrot: Trapping and shooting has taken place in the Midwest Plantation areas over the last 12 months on 9 properties.(also see below) (D. McMillan, FPC)

Eucalypt plantations

Leaf Blister Sawfly: Leaf blister sawfly has been noted on stress exposed *E saligna*. (G. Hodgson, FPC)

"Spring" Beetle (*Liparetrus jenkinsi*): Spring beetle features as a significant problem in establishment of *E saligna*, *E cladocalyx*, and *E maculata* plantations. Attacks predominate in late September/October. (G. Hodgson, FPC)

Kangaroos: There is a significant Kangaroo issue on several plantation/farm sites. DEC accredited/Licensed shooters are engaged to assist with controlling numbers. (Generally all Kangaroos taken are for Consumer or Petfood use). The major impact is on the Eucalypt/Acacia establishment sites across the Boyup Brook /West Arthur Shires. (G. Hodgson, FPC)

Port Lincoln (28) Parrot:
Parrot Control (Trapping/Shooting) has occurred in the Moodiarup and Katanning area for the last 2 years(since April 2004). Damage is occurring in Eucalypt, Pinaster and Acacia establishment sites. It is expected to have a significant control program in place as new plantations are established. A coordinated program for parrot control was set up in 2006 across 6-7 properties from Quinndanning to Dinninup this year. Trapping is under Permit with DEC. (G. Hodgson, FPC;)

Eucalyptus globulus (Mamouru Matsuki)

Psyllids: The blue gum psyllid is common across the plantation estate but has never caused damage. (FPC, GSP, APFL, WAPRes, Timbercorp)

Autumn gum moth: Due to dry and mild May and June 2006, the mortality of larvae caused by virus was limited. Therefore, a number of two & three year old plantations have been affected (CDI > 50% in some spots). (GSP, APFL, WAPRes, Timbercorp)

Leaf beetles: Although *Cadmus* and *Chrysophtharta* (This genus is now subsumed into *Paropsisterna*: Reid, in press) 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. In March 2006, *Cadmus excrementarius* caused damage in an one year old plantation. This is the first incidence of damage by this species in young plantations in at least five years. Densities of larvae of "Chrysophtharta" variicollis were higher than usual (but still not consistently high enough to trigger spraying) in parts of some plantations between Albany and Porongurup NP. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Eucalyptus weevil: At the time of the annual population assessment of eucalyptus weevil in late September to early October, the weevil population levels were generally lower than previous years, and only a modest numbers of plantations were treated. The distribution range of this species has now expanded to the northern and western limits of blue gum growing areas. In areas where the weevil has recently colonised, damage levels tended to be higher than areas where the weevil populations have been around for a number of years. We think that natural enemies are tracking the expansion of weevil distribution range. 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:** At least one plantation near Boyup Brook suffered damage suspected to be caused by larvae of *H. elongatus* (ITC).

Adult *Heteronyx* beetles are now considered to be one of the most significant defoliating insects in blue gum plantations in SW WA (especially from Esperance to Rocky Gully/Frankland area). Currently, there is no effective management tool for *Heteronyx* beetles because: (1) it is difficult to predict when and where the swarming might occur; (2) these beetles are nocturnal; (3) defoliate tree tops (often 10+ m above ground); and (4) repeated spraying is necessary.

Only a small number of plantations were defoliated by *Heteronyx* beetles in 2005-06 in areas between Albany and Bunbury. This is possibly due to low population numbers in the previous season. A number of plantations near Esperance experienced defoliation in tree tops by *H. proxima*. There was also some damage near Albany. Twelve light traps were deployed in blue gum plantations from Esperance to Bridgetown from December 05 to May 06. Over 30 species of *Heteronyx* and related scarabs were recorded, and roughly one-half of those species were undescribed species. (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 been reduced to minimum. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Leaf Blister Sawfly: Severe defoliation by this species was recorded from plantations east of Albany and near Augusta. There was moderate damage by LBS around Esperance (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Wingless Grasshopper: Wingless grasshoppers caused damage in P2005 plantations from Bremer Bay to Esperance. (GSP, ITC)

***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 2005-06 than in the previous season. Seedlings seem to be infected in nursery. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

"Spring" Beetle (*Liparetrus jenkinsi*): Damage by this species was recorded from P2005 plantations near Esperance and east of Albany. There was no swarming of this species near Manjimup and Boyup Brook. Spring of 2005 was the first time without swarming in these areas since blue gum planting started. (FPC, GSP, APFL, ITC, WAPRes, Timbercorp)

Garden Weevil (*Phlyctinus callosus*)?: Seedlings were ringbarked or grazed on the main stem (from the top of the mesh sock upwards) in a number of plantations. The damage in one plantation W of Demark was concentrated in a wet area with peaty soil and rushes. Nearly 100% of seedlings were damaged over about 4ha. There was no direct observation of the insect, and thus, identify of the insect is still to be ascertained.

Frost damage: SW WA experience unusually severe cold snap in winter of 2006. Some plantations less than three years old (new plantings and coppice) from Albany to Collie suffered severe damage on tree tops. Frost was so severe near Collie, canopy of native trees along creeks turned brown. (mm)

Other Eucalyptus species not native to WA
Cardiaspina fiscella is still found on *E. grandis* and *E. robusta* in parts of Albany. The distribution range of this species appear to be spreading within Albany, and this year it was found on *E. saligna* north of Tenterden (about 70km N of Albany). I would like to see this species eradicated from WA before spreading too widely. (mm)

There were some outbreaks of LBS on *C. maculate* in FPC infinitree projects. At least one plantation was misted. I guess that you already have more precise info from FPC. (mm)

Sandalwood (*Santalum spicatum*)

Rutherglen Bug: FPC is finding significant Rutherglen Bug attacks on newly established Sandalwood seedlings. This is providing new challenges in taking Sandalwood into the pastoral areas in the intermediate/low rainfall zones of the Southwest. (G. Hodgson, FPC))

MANAGED NATURAL FORESTS

Eucalyptus marginata

Jarrah leaf miner: No information

***Uraba lugens*:** Populations of gum leaf skeletonizer (*U. lugens*) remain low in the southern Jarrah forest. (JF)

Biodiversity study (Forestcheck): The biodiversity study FORESTCHECK, has now completed its 5th sampling season with over 1500 morpho-species collected. (JF)

NATIVE PLANT COMMUNITIES

***Eucalyptus wandoo*:** No information**.**

***Corymbia callophylla*:** No information

NATIONAL REPORT FORMAT 2006FOR WESTERN AUSTRALIA

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Autumn gum moth								x			NA	0	***E. globulus***
Leaf blister sawfly					x	x					NA	0	*E. globulus*
"Spring" beetles (scarabs)					x			x			NA		*E. globulus*
Weevils (defoliating)					x					x	NA		*E. globulus*
Heteronyx (establishment)	x					x					NA	0	*E. globulus*
Heteronyx (post-establishment)					x					x	NA		*E. globulus*
Wingless grasshopper				x			x				NA	605	*E. globulus*
Psyllids	Nil					Nil					nill	0	*E. globulus*
Creis periculosa											Nil (not specifically	Nil	*Eucalyptus rudis*

											inspected)		
Jarrah leaf miner											Nil (not specifically inspected)	Nil	*Eucalyptus marginata*
Gum leaf skeletonizer	Nil										Nil (not specifically inspected)		*Eucalyptus marginata*
Bark beetles (*Ips*)	NA										Nil (not specifically inspected)		***Pinus radiata***
Monterey Pine aphid	Nil										Nil (not specifically inspected)		***Pinus radiata***

TASMANIA

Plantations *(Exotic pines /* Pinus *species especially* P. radiata*)*

Insect Pests

Sirex wood wasp (*Sirex noctilio*)

Sirex populations remain at low levels in all Tasmanian plantations. Adults from six plantations were sent to PIRVic for quality assurance testing of nematode strains. Nematode introductions have not been required for the past two seasons.

Static trapping , targeting *Sirex*, has shown that most plantations over the age of seven have *Sirex* females present. However populations are very low and attacking only suppressed trees, not trap trees.

The integration of static trap monitoring into the trap tree program will result in considerable cost savings by reducing the number of trap trees required.

***Ips grandicollis* and other bark beetles**

Ips pheromone trapping was conducted in three unthinned plantations during January/February 2006. *Ips* has not been recorded from Tasmania.

Hylastes ater and *Hylurgus ligniperda* are common species throughout the *Pinus* estate. *Hylastes ater* has been found in malaise trap collections in Myrtle/Sassafras oldgrowth forests in southern Tasmania. The nearest *Pinus* planting's are approximately 17 kilometres east of the detection site at Warra.

Monterey pine aphid (*Essigella californica*)

With one exception there has been little evidence of obvious damage that could be attributed to *Esigella* across pine plantations surveyed this year. *Essigella* is widespread in the south of the State but to date not recorded in northern Tasmania.

During late summer in 2006 *Essigella* adults were collected in static panel traps near *P. radiata* plantings at Hobart Airport. In June several mature trees exhibited yellowing of second year needles. These trees were sampled using a beating tray and very large numbers of early nymphal stages were collected with a few adults. By August these trees

were showing defoliation levels of up to 60% (Fig. 1). High populations were restricted to individual trees and only older, dominant trees appeared to be affected. There was also a considerable number of lacewing larvae (*Drepanacra binocula*) feeding avidly on the nymphs and sampling in late August showed much reduced nymphal numbers.

Figure 1. Defiloation caused by *Esigella* in Pittwater, southern Tasmania.

Pine aphid (*Eulachnus thunbergii*)

Not recorded from Tasmania.

Pine aphid (*Pineus laevis*)

Has widespread distribution in Tasmania but seldom causes commercial damage. Mainly present on young roadside wildlings.

Vertebrate Pests

Bark stripping of young trees, primarily by wallabies, was recorded across 620ha (Fig. 2a). Damage incidence was typically below 50% although it got as high as 80% in localised hot-spots. Mortality was generally well below 1% with the exception of around 70ha in the south of the state where it reached 40%.

Bark stripping in the mid to upper crown by possums was detected across 177ha this year, all of which was in the central north of the state or the Derwent valley, in regions with a history of chronic possum damage. Incidence was usually in the vicinity of 10% rising to 40% in some cases. Top death was usually below 5%.

Shoot browsing of young trees was recorded in 39ha of which 28ha was being replanted at the time of surveillance.

Diseases

***Cyclaneusma* needle cast/spring needle cast**

This remains the most significant disease in radiata pine in the state, affecting all high, wet (>400 metres and > 1200 mm rainfall) plantation areas. Management strategies remain the same as reported previously and include the use of resistant genotypes and appropriate silvicultural regimes.

***Dothistroma* needle blight**

As in recent years the only area significantly affected by *Dothistroma* is in Ringarooma block in the northeast (Fig. 2b). About 80ha had varying levels of defoliation within the moderate – severe range. Damage was not sufficiently extensive to warrant spraying.

***Sphaeropsis* shoot blight/crown wilt**

Sphaeropsis damage was far less prevalent this season. Around 75ha in the northeast of the state was affected (Fig. 2c).

ENVIRONMENTAL AND SITE RELATED PROBLEMS

WIND

Wind damage affected approximately 180ha of pine plantation. The most extensive area of wind damage was around 80ha in the Styx block (central south) where damage incidence ranged between 5-25%. Locally severe patches of damage with up to 90% of the stems being either blown over or snapped (Fig. 2d) were seen in the northeast.

LIGHTNING

Several discrete patches of lightning damage were observed, mainly in the central north of the state. Damage was generally restricted to < 10 trees.

POOR DRAINAGE

Poor drainage resulting in a 50-80% reduction in stocking affected 14 ha of plantation in Branch's Creek (central north)

BORON DEFICIENCY

Symptoms of boron deficiency persisted across a single region of 210ha in northeastern Tasmania where shoot death was widespread at an incidence of 1-5%, with localised hot-spots of up to 10%. Maweena soils on Silurian – Devonian sandstone were prevalent throughout this area.

a

b

c

d

Figure 2. **a** - Dead tops and mortality due to ringbarking by browsing mammals. **b** - *Dothistroma* infection (Ringarooma Block). **c** - Dead top caused by *Sphaeropsis* (northeast Tasmania). **d** - Wind damage (northeast Tasmania).

Plantations (*Eucalyptus* species)

INSECT PESTS

Autumn gum moth (*Mnesampela privata*)

An autumn gum moth outbreak affecting about 540ha was detected in the northeast of the state (Fig. 3a). Monitoring recorded high larval populations that were likely to cause severe defoliation if allowed to develop prompted a decision to spray all affected plantations.

Leaf beetles

Leaf beetle populations this season were comparable with last year. Above-threshold populations were recorded in 6695ha of which 3589ha were sprayed. Late-season damage from feeding by chrysomelid adults was limited this year with severe damage being restricted to around 10ha.

Weevils (*Gonipteris*)

Gonipterus was reported in 334ha of plantation with over-threshold defoliator (*Gonipterus* and *Chrysophtharta*) populations of which 275ha were sprayed. About 60ha of *E. globulus* plantation sustained moderate damage (Fig. 3c).

Gum leaf skeletonizer

No significant damage was recorded this year.

Sawflies

Sawfly larvae were detected in only one compartment in northern Tasmania where they were causing only minimal damage in a very limited area (Fig. 3b).

Borers

Borer attack (including cossid moths - *Culama* sp., transverse weevils - *Pelororhinus transversus*, cerambycids - *Coptocercus rubrides* and buprestids - *Nascioides parryi*) in a drought stressed plantation in central northern Tasmania as resulted in poor wood quality and a number of trees have sprouted epicormics (Fig. 3d).

Shoot borers (*Orthorhinus* sp.) were detected in one compartment in the south of the state. They were widespread but at the time of surveillance had caused little obvious damage (Fig. 3e).

a

b

c

d

e

f

g

Figure 3. **a** - Autumn gum moth damage on *E. nitens*. **b -** Sawfly larvae (*Lophyrotoma interrupta*) on *E. nitens*. **c** - *Gonipterus* larva and shoot damage. **d** - Epicormic development following borer attack. **f** - *Cardiaspina* lerps. **g -** Larvae of a Tortricid shoot webber and feeding damage.

PSYLLIDS

Moderate damage due to *Hyalinaspis* was recorded in approximately 100ha of *E. nitens* plantation in the south of the state. A small patch of approximately 2ha of *E. nitens* in the Styx/Plenty region of central southernTasmania had moderate damage by *Cardiaspina squamula* (Fig. 3f).

TORTRICIDS

Bud damage caused by the Tortricid shoot webber *Epiphyas* sp. was observed at an incidence of 80% of the trees in a single compartment in the south of the state (Fig. 3g).

EUROPEAN WASPS

Control of European wasps (*Vespula germanica*) has been necessary in several southern plantations prior to pruning operations. Baiting is conducted one week before operations commence at sites where high wasp populations have been noticed during pre-pruning surveys. Areas of up to 50 hectares can be treated and populations markedly reduced enabling operations to proceed without workers being distracted by wasps.

VERTEBRATE PESTS

Damage by browsing mammals was reported in 446ha of mainly *E. nitens* plantation, the majority of which was assessed as severe (>50% of trees severely stunted or missing). Stunting (262ha) and highly variable growth (116ha) were the main consequences and 55ha had a high incidence of missing trees. Damage was considered potentially severe enough in around 89ha to warrant replanting.

Diseases

***Mycosphaerella* leaf disease**

Dry conditions throughout much of the state resulted in a quiet season for *Mycosphaerella* leaf disease with only 23ha, mostly in the south of the state, suffering only moderate damage.

***Botryosphaeria* top death**

An extended drought period in the northeast was associated with top death in 1-2 year-old *E. nitens* plantations due to *Botryosphaeria ribis* (Fig. 4a). About 27ha was affected at

incidences ranging between 10-40%. The result was a significant proportion of trees becoming stunted and developing rounded crowns.

Endothia stem canker

Stem cankers in *E. nitens* due to *Endothia gyrosa* (Fig. 4b) was associated with localised mortality following thinning in stand at Roses Tier in the northeastern highlands. It is thought that drought conditions immediately after thinning induced water stress that triggered infection. A number of affected trees were sprouting epicormics.

Phytophthora root rot

Mortality of 1- to 2-year-old *E. nitens* due to root rot caused by *Phytophthora cinnamomi* (Fig. 4c) affected 313 ha in the northeast and northwest. The incidence of mortality was generally <1% but there were occasionally small hot-spots where up to 20% of the trees had died.

Armillaria root rot

Mortality due to *Armillaria* was detected in three small patches of between 0.1 – 0.7 ha (<15 trees in each patch) in the north of the state (Fig. 4d).

a

b

c

d

Figure 4. **a** - *Botryosphaeria* top death (northeastern Tasmania). **b** - *Endothia gyrosa* stem canker. **c** - Blight of *E. nitens* due to root rot by *Phytophthora cinnamomi*. **d** - Mycelial fan of an *Armillaria* infection of *E. nitens.*

ENVIRONMENTAL AND SITE-RELATED PROBLEMS

WEEDS

Around 187 ha were affected by weeds causing a number of problems including stunting / variability, missing trees and potential access problems. Grass competition caused stunting and foliar discolouration of 60ha in the central north of the state, while thistles were associated with stunting in over 17ha in the central south and 25ha in the northeastern high country. Silver wattle and other woody weeds, often including Macquarie vine, were a problem in 64ha; primarily the northeast.

HERBICIDE DAMAGE

The use of the herbicide Clomac at the recommended rate to control silver wattle (2000g/ha) was associated with symptoms of weeping (Fig. 5a) and microphylly. Ongoing monitoring will determine whether or not affected trees recover.

COPPER DEFICIENCY

Around 167ha were affected by stunting, microphylly and branch distortion thought to be due to copper deficiency on infertile soils (Fig. 5b). Symptoms were seen throughout the state but the most extensive area affected was in the northwest. The application of copper fertiliser is generally effective in remediating symptoms.

Wind

Wind damage resulting in windthrow affected 117ha. Most damage was in a recently thinned compartment where the incidence was generally <1% but there were isolated hot-spots in which around 5% of trees were affected.

OTHER ABIOTIC DAMAGE

Other abiotic factors (poor drainage, poor site preparation/no cultivation, exposure, steep and/or rocky slopes) had caused or contributed to performance or health issues across 267ha. The main result was stunted or variable performance but exposure caused shoot death in around 26ha and severe leaf scorch in 74ha (Fig. 5c).

a

b

c

Figure 5. a - Prostate growth habit in *E. nitens* attributed to copper deficiency. **b -** Severe weeping of *E. nitens* attributed to Clomac. **c -** Leaf scorch caused by cold exposuere.

Managed natural forests

Pests

Uraba lugens is a species that has cyclic outbreaks in the mature peppermint forests in north eastern Tasmania. There have been signs of increased defoliation activity at several east coast sites indicating a population up-turn. The cycles are of approximately seven years duration and result in gradual branch death in mature trees and total defoliation of young seedlings in the spring. The impact is often exacerbated in spring with feeding by *Gonipterus* weevils on expanding leaf buds.

Diseases

Mycosphaerella leaf disease

High, late-summer rainfall in southern Tasmania triggered an epidemic of leaf and shoot infection by *Mycosphaerella cryptica* in young *Eucalyptus obliqua* regeneration.

Phytophthora cinnamomi

Forestry Tasmania and the Forest Practices Authority have been developing an improved way through the Forest Practices System / Forest Health Surveillance of identifying and managing susceptible plant communities from the risk of accidental introduction of *P. cinnamomi*. Quarry certifications (as *P. cinnamomi* free) are now being included in the annual FHS program on State forest.

Environmental and site-related problems

The FHS team undertook a study to develop a way of rapidly monitoring the condition of wildlife habitat strips in high-risk areas (eg. road-crossings). Generally strips were found to be in good condition but pine wildlings were identified as a significant problem in habitat strips through pine plantations on drier sites. Further surveys will be done this year to better measure the extent of this problem.

NURSERIES

CONIFER SPECIES

There have not been any significant insect problems in the forestry nurseries.

Phytophthora cinnamomi was accidentally introduced into an open-rooted *Pinus radiata* nursery several years ago. The application of granular Ridomil followed by sowing to pasture, which was maintained for 3 years, appears to have eliminated the pathogen from the soil (a sandy soil).

EUCALYPTUS SPECIES

There have not been any significant insect or disease problems in the forestry nurseries.

URBAN AND RURAL

Pests

Control of European Wasp (*Vespula germanica)* has become a routine necessity at the forest tourism ventures, managed by Forestry Tasmania, which attract many thousands of visitors a year, especially in the summer months. The use of insecticide laced baits has proved an effective control technique.

Sawflies (*Perga affinis*) continue to be a major contributor to defoliation of amenity roadside and agricultural windbreak plantings.

A survey of Elm trees in Launceston failed to find adults or larvae of the Elm Leaf Beetle (*Pyrrhalta luteola*) following insecticide (Btt) applications last year.

Flower galling of *Acacia melanoxylon*, an important plantation species in Tasmania, was observed on a number of trees in rural situations. The galls are formed by the cecidomyiid fly, *Dasineura furcata* **sp.n..** This is a new record for Tasmania. Galling has not been detected in *A. melanoxylon* plantations.

DISEASES

Mundulla Yellows continues to develop on urban trees in the Hobart area. *E. sideroxylon* remains the most severely affected species.

QUARANTINE

Lymantria dispar (Asian Gypsy Moth)

Quarantine Tasmania now conducts monitoring for Asian Gypsy Moth. All international ports and airports are monitored during the summer months. All results have been negative to date.

Urban Surveillance at port sites.

This project is managed by Quarantine Tasmania with input from Forestry Tasmania.

The first season of urban monitoring using static trapping was completed in May 2006. Sets of panel and funnel traps were established within a 2 km radius of international cargo entry ports including Hobart Airport. Wood borer Coleoptera were the primary target and lure combinations were utilised to attract new exotic species (eg *Monochamus* spp.) as well as exotics established in mainland Australia (eg *Scolytus multistriatus*). A total of twenty-nine woodborer species were detected including several non-Tasmanian scolytid species.

RESEARCH AND DEVELOPMENT

MYCOSPHAERELLA LEAF DISEASE

A large trial replicated across two sites and two planting years is being established to screen Tasmanian *E. globulus* deployment populations for resistance to *Mycosphaerella nubilosa*. Research has shown that the growth impacts to *E. globulus* from a single severe epidemic of MLD are ephemeral and likely to result in little loss in productivity over the length of a rotation. An uncertainty preventing the resumption of planting *E. globulus* on high MLD risk sites is the likelihood of severe epidemics in consecutive years. This will be investigated by ensis through a retrospective analysis of the weather patterns during previous epidemics combined with epidemiological data to identify weather patterns associated with epidemics to enable calculations of the risk such patterns occurring in consecutive years.

CHRYSOMELID LEAF BEETLES

A review of best prospects for advancing the management of chrysomelid leaf beetles, particularly late-season feeding by adults, rated attract-and-kill highly. This is being progressed initially through the establishment of field trials to test lethal trap trees (attractive *E. regnans* / *E. nitens* deployed at low density and made lethal by the application of systemic nicotinamide insecticides).

STATIC TRAPPING TO DETECT STRESSED MID-ROTATION EUCALYPT PLANTATIONS

Several recent detections of outbreaks of wood borers and epidemics of stem cankers in recently thinned eucalypt plantations suggest an emerging problem of stress-induced susceptibility in mid-rotation plantations. An ACIAR-funded investigation is planned this year to test the usefulness of static trapping for wood-boring insects to detect plantations with elevated populations as a potential early warning of developing stress.

Browsing mammals

A major research initiative is underway to develop an integrated management strategy to protect young plantations and regenerating native forests from browsing damage. Forestry Tasmania research has focussed on the development of: (i) better ways of predicting browsing risk and monitoring damage, (ii) an improved box trap for the humane capture of brush-tail possums and pademelons; (iii) combining repellents / diversionary feed and shooting; and (iv) nursery treatments to reduce palatability. UTas research (ARC Linkages) is focussing on: (i) developing ways to rapidly screen *E. nitens* and *E. globulus* deployment populations to identify genotypes with high levels of secondary compounds (FPCs) and how resistant genotypes with high levels of FPCs should be deployed; (ii) understanding seasonal sugar physiology of radiata pine and determining whether site-related stresses elevate sugar levels rendering plants attractive to bark stripping by wallabies. The new CRC for Forestry will be bringing together the browsing research outcomes from Forestry Tasmania and UTas into an integrated browsing management strategy, which will be tested and refined through a series of demonstration sites.

TABULAR SUMMARY OF THE ACTIVITY OF THE MAIN PESTS AND DISEASES OF *EUCALYPTUS* AND *PINUS* PLANTATIONS IN TASMANIA

***Eucalyptus* spp.**

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Autumn gum moth											44,576	540	**E. nit**
Christmas beetle													
Paropsines			**ü**			**ü**					44,576	3589	**E. nit &**
Gum leaf skeletoniser											44,576		
Sawfly													
Leaf blister sawfly													
Spring beetles (scarabs)													
Jarrah leaf miner													
Phasmatids													
Weevils (defoliating)		**ü**									44,576	275	**E. nit &**
Psyllids		**ü**									44,576		E. nit &
Phoracanthines													
Wood moths													
Wingless grasshopper													
Browsing mammals		**ü**						**ü**			44,576		E. nit &
Mycosphaerella spp.		**ü**									44,576		**E. glo**
Auloographina eucalypti													
Cylindrocladium spp.													

Quambalaria pitereka													
Armillaria spp.						**ü**					44,576		**E. nit**
Phytophthora spp.			**ü**				**ü**				44,576		*E. nit*

***Pinus* spp.**

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (Ha)	Area treated (Ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Bark beetles (*Ips, Hylastes*)											78,000		**P. rad**
Sirex wood wasp											78,000		*P. rad*
Monterey pine aphid						**ü**					78,000		*P. rad*
Wingless grasshopper													*P. rad*
Armillaria spp.											78,000		*P. rad*
Phytophthora spp.											78,000		*P. rad*
Dothistroma septosporum		**ü**					**ü**				78,000		*P. rad*
Spring needle cast / *Cyclaneusma*					**ü**					**ü**	78,000		*P. rad*
Sphaeropsis sapinea		**ü**									78,000		*P. rad*

QUEENSLAND

PLANTATIONS

Eucalyptus *species*

Insect pests

Insect pests recorded in Queensland plantations and trial plantations in 2005/06.

Agent	Common Name	Host species	Severity
Amorbus sp.	Clown bug	*E. longirostrata*	**Moderate**
Cardiaspina albicollaris	Basket lerp	*E. moluccana*	**Severe**
		E. argophloia (natural hybrid?)	**Severe**
Chaetocnema sp.	Flea beetles	*E. biturbinata*	**Severe**
Chaetocnema sp.	Flea beetles	*E. dunnii*	**Severe**
Eucalyptolyma sp.	Spotted gum psyllid	*Corymbia citriodora* ssp. *variegata*	**Minor**
Paropsis atomaria	Leaf beetle	*E. cloeziana*	**Severe**
Paropsis atomaria	Leaf beetles	*Corymbia citriodora* ssp. *variegata*	**Minor**
Perga sp.	Sawflies	*Corymbia citriodora* ssp. *variegata*	**Moderate**
Phaulacridium vittatum *Austracris guttulosa*	Wingless Grasshopper Spur-throated locust	*Corymbia citriodora* ssp. *variegata*	**Minor**
Phaulacridium	Wingless	*E. argophloia*	**Severe**

vittatum	Grasshopper		
Austracris guttulosa	Spur-throated locust		
Phaulacridium vittatum,	Wingless Grasshopper	*Corymbia* hybrid	**Severe**
Austracris guttulosa	Spur-throated locust		
Phylacteophaga sp.	Leaf blister sawfly	*E. globulus x E. camaldulensis*	**Moderate**
Phylacteophaga sp.	Leaf blister sawfly	*E. grandis*	**Minor**
Phylacteophaga sp.	Leaf blister sawfly	*E. grandis* x *E. camaldulensis*	**Moderate**
Phylacteophaga sp.	Leaf blister sawfly	*E. propinqua*	**Moderate**
Rhombacus sp.	Erinose mite	*Corymbia citriodora* ssp. *variegata*	**Severe**
Thaumastocoris sp.	Winter bronzing bug	*Corymbia citriodora* ssp. *variegata*	**Moderate**

Psyllids

Creiis sp. damage was not observed in plantations in 2005/06 in Queensland. Its current distribution appears to be restricted to the area around Beaudesert in SE Queensland.

Severe damage by *Cardiaspina albicollaris* was observed on *E. moluccana* trees and a putative *E. argophloia* hybrid in a trial plantation at Millmerran in March 2006.

Leaf Beetles

Widespread moderate defoliation by *Paropsis atomaria* was restricted to a two-year old plantation of *E. cloeziana* on the Binjour plateau, with moderate damage also being observed in a two-year old plantation near Gympie. *Chrysophtharta cloelia* caused moderate to severe defoliation in *E. grandis* x *E. camaldulensis* plantations in the Miriam Vale area near Gladstone.

Swarming Scarabs

Little scarab activity was seen again in plantations this year.

Erinose mite

Incidence and severity of erinose mite (*Rhombacus* sp.) damage was less severe than in previous years, with no severe damage observed this year in any of the approximately 40 spotted gum (*Corymbia citriodora* ssp. *variegata*, CCV) plantations of ages ranging from one to seven years old in SEQ that were surveyed quarterly.

Plate galler

No damage by *Ophelimus* sp. plate galler was recorded in 2005/06.

Weevils

No damage by weevils was recorded in 2005/06

Gum leaf skeletoniser

Has not been recorded causing damage to plantations in Queensland.

Sawflies

Moderate damage by *Perga* sp. was noted in a single two-year old plantation of *Corymbia citriodora* ssp. *variegata* in the Binjour plateau area in March 2006.

Leaf blister sawfly

Severe damage by *Phylacteophaga* sp. was recorded a trial plantation at Millmerran (Darling Downs region) in March 2006 on *E. globulus* x *E. camaldulensis*, *E. grandis* and *E. grandis* x *E. camaldulensis*.

Wingless grasshopper & Spur-throated locust

Severe damage caused by *Phaulacridium vittatum* (wingless grasshopper) and *Austracris guttulosa* (spur-throated locust) was recorded in a 9-month old plantation of *Corymbia citriodora* ssp. *variegata, Corymbia* hybrid and *E. argophloia* on the Binjour plateau. Feeding by *A. guttulosa* on stems of the *Corymbia* hybrid was particularly severe, causing stem breakage of approximately 80% of these trees (see photos below), while *P. vittatum* caused severe bark stripping and stem dieback on *Corymbia citriodora* ssp. *variegata* and *E. argophloia*.

Phaulacridium vittatum feeding on stem of *E. argophloia.*

Bark stripping and stem breakage on *Corymbia* hybrid caused by *Austracris guttulosa.*

Christmas Beetles

No damage recorded

Stem borers

Giant wood moth (*Endoxyla cinerea*) and two-hole borer (*Phoracantha solida*) continue to be the key stem borers affecting eucalypt plantations in Queensland, particularly in plantations of *E. grandis* x *E. camaldulensis*, *E. grandis* and *E dunnii*. Bulls-eye borer (*P. acanthocera*) was recorded causing scattered damage in a seven-year old trial plantation of *E. grandis* at Tumoulin on the Atherton tablelands in Far North Queensland.

An emerging stem borer issue in SE & FNQ is the cossid moth *Culama australis*, which although not a primary pest species, is often associated with attack by *E. cinerea* and *P. solida.* Gregarious feeding by its larvae in the cambium greatly enlarges the area of stem damaged, often girdling younger trees.

Thaumastocoris sp. bug

This bug continued to cause moderate patchy damage in the single six-year old plantation in the Burnett where it had been recorded causing severe damage in 03/04 and 04/05.

The related species *T. australis*, a pest of street trees in Sydney, continues to be of major concern in South Africa where it was first recorded near Pretoria in 2003 (Jacobs and Neser 2005). It has now also been found in Argentina (Noack and Coviella 2006)

Flea beetles (Chaetocnema spp.*)*

Severe damage was recorded to the lower foliage of *E. dunnii* and *E. biturbinata* in a trial plantation at Millmerran in southwest Queensland.

Diseases

Wollemi Pine

Water stress, in the form of water logging, has been identified as the main contributing factor in *Fusicoccum* causing deaths in Wollemi cuttings and branch and stem cankers in more established trees. Reduction of humidity levels and frequency of watering has decreased disease incidence within cuttings. However, overcrowding of established plants is resulting in elevated levels of stem and branch cankers and tree deaths during the warmer months.

Hardwoods

Quambalaria shoot blight (QSB) has been recorded in the majority of plantations in Queensland. Severe damage has occurred in plantations in the Beaudesert area with 100% of the trees affected.

Quambalaria eucalypti has been identified in both NSW and Queensland occurring on a range of hosts including *E. grandis*, *E. dunnii*, *E. longirostrata*, *Eucalyptus* sp. and G x C hybrids.

Quambalaria cyanescens has been identified from woody stems and branches of spotted gum, both in plantation and native stands. The fungus appears to be causing only superficial lesions on the trees.

Phaeophleospora spp. (soon to be reverted back to *Kirramyces*) have been identified as the major causal agent in defoliation of G x C hybrids in Southern Queensland plantations and northern trial plantings. A new species of *Phaeophleospora* has been

identified from north Queensland and has been named *Kirramyces viscida* Andjic, Barber, Burgess sp. nov. This fungus caused severe defoliation of G x C trees in trial plantings. It was also detected on *E. grandis* but has foliage damage is significantly less.

Phaeophleospora eucalypti was found to be the main causal agent of severe defoliation in G x C planting in the Miriam Vale region.

A new species of *Ceratocystis* has been identified in association with *Phorocantha* damage on *E. grandis* trees in north Queensland. The fungus has been provided with the provisional name *Ceratocystis atrox prov. nom.*

RESEARCH AND DEVELOPMENT

Hardwoods

- The second year's research program of the Queensland University of Technology ARC Linkage project "Enhancing natural enemy mortality of chrysomelids in young eucalypt plantations through habitat manipulation" concentrated on laboratory studies of the biology of *Neopolycystus* sp., an egg parasitoid of *Paropsis atomaria*. In association with this project, DPI&F continued fortnightly sampling of a two-year old *E. cloeziana* plantation near Gympie from October 2005 to May 2006 to assess the population phenology in relation to CDI, foliage phenology and egg parasitism by *Neopolycystus* sp. Related research funded by DPI-Forestry on tritrophic interactions between the host-tree (*E. cloeziana*), herbivore (*P. atomaria*) and parasitoid (*Neopolycystus*) failed to identify specific wasp parasitoid attraction cues from beetle-damaged plants, although much more work needs to be done.
- Extensive quarterly surveys of the incidence and severity of erinose mite damage in SEQ were carried out by DPI&F Horticulture & Forestry Science with the assistance of DPI-Forestry in over approximately 40 spotted gum (*Corymbia citriodora* ssp. *variegata*) plantations. Data from this year's surveys are being added to that from two previous years to evaluate risk factors for this key pest.
- DPI&F Horticulture & Forestry Science purchased a state-of-the art GC-EAD (Gas Chromatogram – Electro-Antennographic Detector) system in November 2005 to aid in chemical ecology research into key hardwoods pests such as the giant wood moth, chrysomelid beetles and their egg parasitoids and the cedar tip moth (*Hypsipyla robusta*).
- The Subtropical Forest Health Alliance (SFHA) agreement was signed off by nine grower and R&D provider members in December 2005. The members are: Integrated Tree Cropping, Forest Plantations Queensland (formerly DPI-Forestry), Forest Enterprises Australia, DPI - Forests NSW, Ensis, Southern Cross University, Queensland University of Technology, NSW DPI Resources Research and

Queensland DPI&F. The first meeting, held in February/March 2006, identified priority areas for forest health R&D in the region over the next 12 months.

- Both *Q. pitereka* and *Q. eucalypti* have been identified from spotted gum. However, *Q. pitereka* is the primary causal agent of leaf and shoot blight. Considerable variation exists within the *Q. pitereka* population within the ITS region. Variability is both at a regional and local level and suggests the presence of a sexual stage within the fungal lifecycle. Infection occurs through natural openings on leaves of ages and immature stems. The fungus initially grows intercellularly and rapidly colonises the leaf and stem tissue. The host appears to attempt to wall off infection. However, it is unclear as to what host processes are initiated. The lifecycle can be completed within 14 days with sporulation occurring when conidiophores rupture through the stomata on the upper and lower leaf surfaces and directly through the epidermis of the stem. Disease impact studies indicate that *Q. pitereka* infection significantly reduces tree growth rate in addition to affecting tree form. Inoculation studies have indicated a trend of reduced disease impact for optimum Boron and Calcium levels.

- Cedar tip moth (*Hypsipyla robusta*)

  The effectiveness of two sex-pheromone formulations in attracting male moths was tested at Imbil in December 2005 and January/February 2006. Moth numbers at the site were unusually low and the second round of trapping attracted no moths. The first round in December attracted moths to both pheromone blends.

A new three-year ACIAR red cedar project "Domestication of Meliaceae spp. in SE Asia and in Australia, particularly management of the problem of *Hypsipyla robusta* attack" is now underway. This new project is focussed on genetic material identified in the previous project as having superior tolerance to moth attack.

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ForestryPlantationsQueensland

Formerly trading as DPI Forestry

Forest health surveys within Forestry Plantations Queensland exotic *Pinus* and native *Araucaria* plantation estate and nurseries

Report for RWG7 20 October 2006

Michael Ramsden

Introduction

Pest and disease surveys within our exotic (*Pinus*) and native (*Araucaria*) plantation estate, and associated production nurseries were contracted for the 2005/2006 period to the Department of Primary Industries and Fisheries (Qld), Forest Technologies Program. Staff from DPI&F Plant Science and Grow Help also participated in surveys, identifications and reporting. Forest health surveys within the exotic plantation estate and their production nurseries had not been undertaken by the Department of Primary Industries and Fisheries since the 2003/2004 financial year although a static insect trapping project was undertaken during this period within the exotic plantations at Beerburrum, Maryborough, Ingham and Cardwell.

Initiation and completion of the surveys was undertaken within a very tight timeframe (5 months). Reduced time allocations resulted in the non-inclusion of surveys within a number of major plantation areas and a reduction to actual survey time allocations within nominated forests. Objectives of the surveys was to maintain and enhance the productivity of the Government owned exotic plantation estate and nurseries by undertaking regular surveys aimed at detecting, identifying and monitoring potential and emerging pests and diseases. Regular reports were presented on plantation health, biotic impacts following destructive events, new pest / disease incursions intercepted by associate agencies and emerging potential external biotic threats.

Contracted surveys were undertaken within the Fraser Coast Management Area (Maryborough region), Byfield (Rockhampton region) and Kuranda State Forests (Atherton region) with Beerburrum and Toolara production nurseries having biannual surveys. Additional surveys ware undertaken within Gadgarra and Danbulla State Forests (Atherton region-principally planted to *Araucaria cunninghamii*); following specific technical advice requests to investigate pests within cyclone Larry damaged stands. A further three surveys were undertaken in the Atherton / Ingham regions following the discovery of what appeared to be bark beetle damage to logs in Kuranda and Danbulla State Forests and beetle damage in log stacks and cyclone Larry windthrow trees in Abergowie State Forest .

Only incidental targeted insect static trapping work was undertaken within specific areas of the plantation during the 2005/2006 period although sorting, identification and reporting on a previous winter and summer 2004/2005 trapping project was completed.

Survey methodology

Where aerial survey data is available this is used to select a sub-set for ground examination. The less beneficial but still utilised vehicle surveys are generally restricted to travelling between inspection sites. Identified disorder sites are inspected on foot utilising a variety of methods to assess stand health and identify causal agent/s.

Early 2004 a complementary addition to the annual ground surveys was the establishment of a static insect-trapping program within the *Pinus* estate. Dick Bashford from Forestry Tasmania developed this urban / plantation trap design and surveillance system. In Queensland this trapping program, which complements the general forest health surveys, was set up within the Beerburrum, Maryborough, Ingham and Cardwell management areas. Forestry Plantations Queensland staff were trained in the maintenance and collection of specimens from the traps.

The trapping system incorporated the use of intercept panel and Lindgren 12-funnel traps (wet type) using ethanol and alpha-pinene lures respectively, at each of five different plantation sites within the above mentioned management areas. These traps and lures were designed to act as generalist attractants for known and previously undetected economic pest species. Target captures were Scolytids, Buprestids, Cerambycids, Anobiids, Curculionids and Sirex (no Sirex intercepted). This trapping system is now being rotated throughout the plantation estate and is being used for targeted monitoring of insect damage and activity e.g. in areas of north Queensland affected by cyclone Larry.

Nursery inspections

Toolara

The objective of regular nursery inspections is to ensure that nursery stock remains healthy, maintenance of nursery productivity and prevention of pests and diseases escaping into the environment. During the inspections general nursery hygiene was also documented as nursery hygiene is integral to the maintenance of a healthy and productive plantation estate. Both production nurseries (Beerburrum & Toolara) maintained excellent hygiene standards.

Inspections involve a general overview of seedlings, cuttings and tubbed / potted plants. Individual plants and especially groups or trays of plants displaying abnormal growth or colour are examined and samples selected for follow-up laboratory analysis. Particular attention was given to examining soil for the presence of pathogens within potting heaps, soil beds, seed trays, potted soil and any area where water was observed to persist on the ground.

The on-going monitoring undertaken during these nursery inspections is more important and more rigorous than for most other accreditation nursery schemes in Queensland. As per previous surveys, both the Beerburrum and Toolara production nurseries were monitored for major root rot pathogens, in particular to determine presence or absence of a prime disease indicator, *Phytophthora* species.

Pythium was isolated from above ground tube-stock at Toolara, even though grown on open sun benches in conditions of very high nursery hygiene. The presence of a *Pythium* species was of interest; particularly as past lupin baiting tests from forestry nursery tube-stock have not revealed the presence of any *Pythium*.

Although the *Pythium* detected was pathogenic to lupin seedlings, something that is not normally encountered based on past "lupin bait monitoring", it may be of no significance to *Pinus* as a root rot pathogen and may be merely present as a saprophyte. The presence of *Pythium* at Toolara continues to be monitored, in particular to ensure there is no development of disease symptoms.

A batch of *Melaleuca* maintained in an area external to the main Quarantine portion of the nursery was found to be affected by a foliage blight, which tended to occur in patches. *Rhizoctonia* was consistently isolated from affected plant areas. *Rhizoctonia* is a commonly occurring fungus causing damping-off in seedlings, root rot and crown rot diseases in certain plants. It also commonly causes foliage blight particularly in tightly packed foliage in nursery plants. Past inspections have recorded this fungus causing foliage blight in ferns, *Callistemon* and recently *Araucaria cunninghamii* seedlings. Fungicidal control measures coupled with modified nursery practices controlled outbreaks.

In several areas of the nursery potted plants displayed poor top growth and chlorosis. Mycelial cords were found to have enveloped the potting mix of these plants plugging the base of the tubes, inhibiting water infiltration and drainage. Fungi such as *Lophodermium* and *Pestalotiopsis* were frequently identified on dead *Pinus* needles. The genus Lophodermium, although common as a saprophyte on dead needles, has been recorded as a pathogen on *Pinus* overseas.

Toolara nursery was found to be reasonably free of insects. There were scattered detections of first instars of scale insect crawlers, but no significant scale build-up. Weeds surrounding the cutting hedge beds were inspected for the presence of Nysius bugs and Ragweed, as they were found to be a problem during the 2003/2004 surveys. Neither seemed to be a problem this inspection period and as in the past, bugs moved in and out of *Pinus* patches, prodding foliage, and causing some spotting. There were no insect related problems identified within hybrid hedge plants.

Beerburrum

Beerburrum nursery experienced large losses and decline within a specific batch of *Araucaria cunninghamii,* where losses commenced following dibbling in 2004 with a *Fusarium* sp. a consistent isolate. Lester Burgess's group in Sydney confirmed that the *Fusarium* isolated was not *F. circinatum*, cause of Pine Pitch Canker. This batch tended to maintain poor health and experience high mortality counts through to field planting in 2006. *Lasiodiplodia theobromae* was found to be fruiting within prominent black sunken lesions on the majority of the unhealthy plants maintained at the nursery. This fungus was not regarded as the primary cause of plant decline as the batch concerned was exposed to slightly different management regimes that may have resulted in reduced plant vigour. Losses continued following field planting of remaining healthy stock. Investigations found that losses paralleled low site rainfall indices with excellent growth at sites not drought affected. Heat girdling to the lower stems was a common observation in the field.

Rhizoctonia sp. continues to persistently cause scattered clumped losses within young tightly packed *A. cunninghamii* maintained under shade. Development of *Rhizoctonia* usually corresponds with periods of high rainfall and humidity. Modified nursery regimes and sporadic use of fungicides have maintained control of this fungus. *Colletotrichum* was also found to be causing terminal crook in *Pinus* on open sun benches.

***Rhizoctonia* in tightly packed beds of *Araucaria cunninghamii* seedlings (Beerburrum nursery)**

Incidence of insects was low throughout this nursery. Clumps of ladybird beetles (Coccinellidae- mostly regarded as predators) were noted, and this could note the presence of aphids or mites etc. Laboratory examinations ascertained that *Collembula* (Springtails- prob. family Sminthuridae) were also present.

The presence of Ladybird beetles can indicate the presence of their food source (aphids, mites, scale insects) or simply a resting site or congregation site. *Collembula* may well represent a food source for the Ladybirds. The brownish black, scale insect-like small lumps found on the foliage of the *Pinus* and *Wollemi were* Springtail faecal deposits.

Plantation surveys

Byfield

The survey of selected areas within Byfield State Forest was undertaken during a period of extended rain. No exotic or potentially threatening organism was detected. A number of large log stacks were retained in the field for extended periods, encouraging establishment and development of insects and fungi. *Ips grandicollis* were well established within the majority of logs within these stacks as was fungal staining. The fungal decay organism (*Schizophyllum*) was found to be fruiting on a number of stems within the stacks. This particular fungus is an early coloniser and is followed by more destructive decay fungi. More recently felled stacks had also developed severe blue-stain with rain assisting development. Feller-buncher's de-bark stems in patches and also loosens bark around such areas. These areas are prime sites for the establishment of surface moulds that then penetrate into the stem causing stain. A stack of *Araucaria cunninghamii* logs was also blue-stain affected with fresh insect activity along entirety of some logs. The insects are likely to be *Xyleborus* spp. based on bore hole symmetry, white

frass and lack of stain around bore holes.

Following felling termites *Coptotermes* sp. (Isoptera: Rhinotermitidae) were found to have hollowed out a number of healthy green canopied standing mature *Pinus* (pipe 6m+ up stem). Hollowing of *Pinus* stems is infrequently reported but a recent discussion with contractors has established that this is quite common. Within Byfield State Forest arboreal termite nests (*Nasutitermes walkeri* & *Microcerotermes* sp.) are a common observation on young to mature *Pinus* stems. These termites are also possibly associated with some of the stem damage observed. Future surveys will carry out more detailed investigations into any association between stem damage and arboreal termite activity. In the Pacific there are some very destructive termites i.e. *Neotermes* sp. (ring-ant termite), which cause widespread shelling of stems. Continued surveys of termite activity assist in ensuring that exotic species such as *Neotermes* sp. do not become inadvertently established. The termite *Heterotermes* sp. (Isoptera: Rhinotermitidae) was active on the peripheral of stems in the clonal seed orchard.

Phytophthora was isolated from soil and roots within a patch of dead young *Pinus*. This compartment was apparently replanted due to past losses from *Phytophthora*. This area has a high water table that would assist the development of *Phytophthora,* although the dead trees did not appear to have root rot with the stems dying leader downwards. Interestingly in the early development of new first rotation areas previously planted to Pineapples, *Phytophthora* caused large losses within a number of the lower lying areas, but presently these areas appear to support healthy stands of trees. At Passchendaele State Forest (Warwick area), *Phytophthora* causes scattered losses to *Pinus radiata* during the early establishment phase but then appears to have little out-wood affect.

Drought appears to be affecting a number of the larger more mature un-thinned stands within Byfield State Forest. Large dieback areas were identified within 10 compartments of one logging area. The observed mortality and dieback had been occurring for quite some time due to the absence of needles on dead trees. The observed mortality and decline appeared similar to dieback reported within *Pinus elliottii* stands in 2003. Previous investigations established that the bark beetle *Ips grandicollis* and its associated blue-stain fungus *Ophiostoma ips*, were establishing within the canopy of declining trees leading to tree mortality

Ips grandicollis are well established but not north of Byfield State Forest (Rockhampton). Several small areas within this estate were exposed to hot canopy fire scorch, something that usually precipitates infestation by *I. grandicollis,* if lower or upper cambium stem damage is sustained. In the areas exposed to hot basal fires no *Ips* were detected at the time of the inspection. In areas planted to un-thinned mature *Pinus elliottii, Ips* were well established in upper canopy stems with associated blue-staining of the timber. The presence of bark beetles certainly is playing an important role in the decline of stressed stands within Byfield State Forest.

North Queensland

Three months prior to the surveys the majority of the plantation estate (*Pinus* & *Araucaria*), from Ingham north had been damaged to varying degrees by cyclone Larry. Damage sustained to younger trees resulted in broken and twisted branches, sheared stems, leader loss, bruised / ripped and spiked foliage, windthrow and severe leans. Mature *Pinus* and *Araucaria* predominately sheared off a few meters above ground level, lost their upper leader and branches, and lost majority of their foliage. Damage such as windthrow and severe leans also affected large areas within the estate.

Stem damage & foliage loss in mature *Araucaria* Atherton

Following cyclone Larry survey evidence suggests that a range of insects built up within areas of the plantation estate, possibly due to the almost complete destruction of surrounding native forests (especially loss of foliage). Within young *Araucaria* plantations the endemic Painted Apple Moth *Teia anartoide* was a common detection. This moth can build up dramatically in numbers but is closely followed by parasites and parasitoides which cause populations to fall away.

Large Case Moth's Metura *elongates* were common on foliage, as were large numbers of the Golden Mealy Bug *Nipaecoccus aurilanatus.* This particular bug has caused several localised infestations within Forestry Plantations Queensland nursery shade-houses. The most common insect present on young *Araucaria* was the Hoop Pine Weevil *Leptopius horridus.* The level of damage to foliage and limbs suggested that prior to the surveys there was a much larger population of this insect present. At the time of the inspection weevil numbers per tree ranged up to five.

Throughout the plantation of young *Araucaria*, trees were declining with browning upper canopy and overall foliage. Examination of roots found root coiling was common with remaining roots being torn off due to the severe whipping sustained during cyclone Larry. No *Phytophthora* was isolated from the soil in these areas.

Hoop Pine Weevil *Leptopius horridus* on young *Araucaria* post cyclone Larry north Queensland

Whipping and insect damage to young *Araucaria*

In second rotation *Araucaria cunninghamii* the root and stem rot pathogen *Phellinus noxius* had caused scattered mortality with continuation of disease evident in most areas. Trees with snapped

upper stems were re-shooting although future retention is unlikely due to entry of decay and blue-stain, and inability of wounds to heal (large uneven breakage points / tears). Examination of young *Araucaria* again showed that cyclone Larry induced whipping had stripped roots of bark allowing fungi to establish. Evidence suggested that many of these trees will die in the months following the surveys.

Young *Araucaria* upper stem breakage

Within a recently planted second rotation *Pinus* plantation large numbers of plants displayed needle browning and foliage loss (lower half of canopy), with scattered mortality from lower areas to upper slopes. All of north Queensland had been exposed to sustained rainfall and within this particular area pooling was common especially in inter-rows. Water-logging may have played a part in the observed disorders although *Phytophthora cinnamomi* was isolated from soil and roots in these plants from lower to upper slope areas.

Within an adjacent older second rotation *Pinus* compartment severe whipping had resulted in a majority of the trees retaining a degree of lean. On subsequent surveys many of the trees which were more prostrate were dying or had died.

Phytophthora in newly planted Pinus Kuran

Root examination revealed that many of the lateral roots had torn off during cyclone Larry, with *P. cinnamomi* again being isolated.

In *Pinus* log-stacks at Kuranda there appeared to be bark beetle damage. This was of concern as *Ips grandicollis* has been restricted to the Byfield area south, and had not been recorded in north Queensland. Galleries under the bark looked smaller than is generally typical of *Ips* and was thought to be possibly associated with *Cyrtogenius brevior*.

***Ips* like under bark damage in log stacks north Queensland**

Further surveys established that under bark damage was present in all *Pinus* plantations within the Atherton and Kuranda areas. Static traps were established using Ips-dienol and Alpha-pinene & ethonal lures in order to ascertain whilch beetles were responsible for the damage. A range of beetles were intercepted although *Ips* was not.

Cossoninae weevils were noted within the *Ips*-like tunnels, but are not normally known to cause this sort of damage and as such are thought to be secondary. The Cossoninae include several genera of which only a few species have some biological notes. References in the literature make note that some species of Cossoninae do tunnel under bark and as such the Cossoninae may have to be considered as primary tunnelers.

A species of pinhole borer (*Xyleborus* sp. nr. *celsus* Eichhoff), taken from lures in Kuranda did not match any species held in the DPI&F Forestry Collection (QFIC) containing Queensland & PNG species. The most common detection within log-stacks and windthrow timber was the Pine Bark Weevil *Aesiotes notabilis*. Larvae of this weevil were prolific especially on the ends of salvaged logs.

Log stacks and windthrow stems in the Ingham area were severely affected by beetle damage. Static traps were erected to lure beetles for identification. The pin-hole borer *Xyleborus affinis* was identified as the most dominant scolytid, rather than *X. perforens*. Anthribidae (family within the superfamily Curculionoidea - the weevil complex) were common but may be a vagrant. Two scolytids intercepted *Eccoptopterus spinosus* (Olivier) & *Euwallacea destruens* (Blandford), were regarded as a problem on our Brisbane wharves many years ago when logs came from New Britain. Again no *Ips* intercepted within the erected traps.

Insects trapped within log stacks Ingham management area, July 2006

Scolytidae (pinhole borers) –
Eccoptopterus spinosus (Olivier)
Euwallacea destruens (Blandford)
Xyleborus affinis Eichhoff
Xyleborus perforans (Wollaston)
Xyleborinus artestriatus (Eichhoff)
Xylosandrus solidus (Eichhoff)

Anthribidae (anthribids - Curculionoidea)
Curculionidae (weevils)

Scolytidae –
Eccoptopterus spinosus (Olivier)
Euwallacea destruens (Blandford)
Xyleborus affinis Eichhoff
Xyleborus similis (Ferrari)
Hypothenemus prob. seriatus Eichhoff
Cyrtogenius ?brevior (Eggers)
(Xyleborus) Cyclorhipidion agnatum (Eggers)

Anthribidae
Curculionidae (weevils)

Maryborough

No specific pest or disease problems were identified within the Maryborough management area although a number of additional specific inspections and surveys were undertaken following feedback from processing mills. Inspections were undertaken of standing and fallen timber within two logging areas previously affected by a severe wind-storm, due to reports of advanced decay, blue-stain and checking in logs entering processing. Field and laboratory inspections of trees and timber from source areas indicated that the checks and associated decay developed post harvest.

It was possible blue-stain fungi such as *Sphaeropsis sapinea* and *Ophiostoma ips* did initiate in the field within log stacks if left for a considerable period. The brown cubical rot in the industry samples supplied would have taken many months to develop and this was supported by field and laboratory evidence as no advanced rot was detected in stems examined.

Surface moulds were common on log stack stem ends and on areas of the stem debarked by the feller-buncher. Staining was shown to penetrate deep into the log beneath the surface areas affected. The presence of the *Aesiotes notabilis, I. grandicollis* and numerous species of ambrosia in some log stacks indicated long periods of field storage. Compression wood in wind-whipped trees was obvious and may lead to problems during processing.

A number of corporate holdings in the Maryborough management area were within the Sugarcane Smut *Ustilago scitaminea* Pest Quarantine Area. As a number of these holdings either farmed cane previously or retained remnant cane, Forestry Plantations Queensland initiated protocols to limit vehicular and personnel access, established wash-down facilities, arranged for inspections of equipment by plant health Inspectors before machinery movements were initiated.

Static insect trapping

Winter and summer static traps captures taken during 2004/2005 were sorted, collated and identified.

A total of 420 trap samples were collected from three management areas (Beerburrum, Maryborough & Ingham), July 2004 and January 2005. 139 (33%) of these samples were sorted and the material identified. In total 38 species and over 13,000 individual insects were identified during the course of the study. The majority of these are pinhole borers (Scolytinae) or auger beetles (Bostrichidae). The only non-beetle species collected have been the two pine aphid species, *Essigella californica* and *Eulachnus thunbergii.*

The diversity of insect species trapped was lowest in Beerburrum and highest in Ingham in terms of total species collected and number of unique species. Funnel traps baited with both ethanol and alpha-pinene lures were more effective than intercept traps baited with

ethanol lures only, trapping a greater number of species and individuals. Across the three districts, a greater number of insect species was trapped from compartments that had been recently thinned with stumps and thinnings on site. Fewer insect species were collected from compartments that had been cleared and contained no standing trees.

List of insect species collected from winter and summer catches in each of the three management areas during the static trapping program in Queensland.

Family Species	WINTER			SUMMER		
	Beerburrum	Fraser Coast	Ingham	Beerburrum	Fraser Coast	Ingham
Scolytinae						
Xylosandrus solidus (Eichhoff)						
Xyleborus similis (Ferrari)						
Xyleborus perforans (Wollaston)						
Xyleborus nr. *eximius* Schedl						
Xyleborus nr *sundaensis* Eggers						
Xyleborus ipidia Schedl						
Xyleborus ferrugineus Fabricius						
Xyleborus affinis Eichhoff						
Xyleborinus saxeseni (Ratzeburg)						
Xyleborinus artestriatus (Eichhoff)						
Ips grandicollis (Eichhoff)						
Hypothenumus melasomus (Lea)						
Hypothenemus nr *seriatus* Eichhoff						
Hypothenemus eruditus						
Hypothenemus birmanus (Eichhoff)						
Hylurgus ligniperda (Fabricius)						
Gen. et sp.? nr. *Eidophelus hornus* Schedl						
Cyrtogenius brevior (Eggers)						
Cyclorhipidion agnatus (Eggers)						
Ambrosiodmus compressus (Lea)						
Amasa truncatus (Erichson)						
Platypodidae						
Crossotarsus subpellucidus Lea						
Crossotarsus kuntzeni (Schedl)						
Hemiptera						
Eulachnus thunbergii Wilson						
Essigella californica (Essig)						
Curculionidae						
Mitrastethus australiae Lea						
Eutyrhinus meditabundus Fab.						
Cleridae						
Stigmatium linealba Chevrolat						
Cerambycidae						
Temnosternus planiusculus White						
Cacodacnus planicollis (Blackburn)						
Bostrichidae						

Xylopsocus gibbicollis (Macleay)						
Anobiidae						
Ernobius mollis (Linn.)						

SOUTH AUSTRALIA

PLANTATIONS

Pinus radiata:

Pests

Sirex:

In the Green Triangle Region:

Sirex remains at a low level in this region. Surveillance flights were conducted in July and from these 21 sites had follow up ground inspection. Of these only 6 were associated with *Sirex* attack. The establishment of trap tree plots and the inoculation program has continued. *Sirex* were very late emerging from billets this year and numbers were down on previous years. Several live *Sirex* were sent to Agriculture Victoria for infectivity testing. Parasitoids (mainly *Ibalia*) emerging from billets were released back into the forest. Some trap tree plots were accidentally clear felled by the Operations Section but steps have been taken to ensure this does not occur in future.

In the Ranges Region:

Sirex is still present in all forest districts in the Ranges region and although no emergences were recorded in Northern Forests, reliable reports were received of *Sirex* at both Wirrabara and Old Kersbrook.

The majority of *Sirex* emerged from several locations at Second Valley. Nematodes were recorded in *Sirex* at several sites but at others no *Sirex* were nematode positive.

Very few *Sirex* were found in Trap Tree plots from Kuitpo, and nearly all were nematode positive.

Last year large numbers of *Sirex* emerged from Mt Hayfield from the Trap Tree Plots. However only 4 emerged this year (none were nematode positive).

Sirex Barrier Breach:

No further evidence has been seen of *Sirex* around the barrier breach at Port Adelaide in 2005. Monitoring is continuing this summer.

IPS:

In the Green Triangle Region:

Ips grandicollis caused scattered deaths in a 2002 plantation at Comaum in the South East. This plantation is opposite an area which was clear felled last summer (2005-06) and there is a lot of slash on the site.

In the Ranges Region:

Ips continues to be a major problem in the Northern forests. Conditions (hot and very dry) have been ideal for a build up of numbers in Bundaleer and Wirrabara forests.

At Mt Crawford, *Ips* is present at moderate levels. Deaths have occurred in several scattered areas.

In the Southern forests of Kuitpo and Second Valley, *Ips* is present in increasing numbers.

Essigella:

In the Green Triangle Region *Essigella* has again caused considerable damage. Damage has been widespread with defoliation being most severe in marginal areas. Given the very dry conditions and the mild winter temperatures, it is expected that damage will again be severe this coming season.

In the Ranges Region *Essigella* numbers have been low and have caused negligible damage. Again high numbers of ladybirds have been recorded.

Wingless Grasshoppers:

Wingless grasshoppers have caused significant damage in patches in some newly established plantations this year.

DISEASES

There have been several plantations in the South East Region affected by *Sphaeropsis* (*Diplodia*) this year with most damage being in young (1998-99), unthinned plantations. The deaths were scattered through some plantations and it was estimated that approximately 5% of trees in these have been affected. Most of the affected trees are the better grown trees, not the suppressed trees. Some trees appear to have been infected for at least 12 months. There was no evidence of disease in nearby thinned plantations.

Sphaeropsis outbreak in Bowd's 1998 plantation, South East Region

One thinned plantation has also been affected by *Sphaeropsis* this year. In this plantation the affected trees also had large numbers of *Ips grandicollis*. The plantation is next to a recently clearfelled area and it is thought that as a result of this operation *Ips* numbers built up in slash and *Ips* came in as a secondary incursion. At this stage only a few scattered trees are affected. There is no evidence of *Sirex*.

Such outbreaks of *Sphaeropsis* have occurred regularly in the Green Triangle Region. The last major episode was in 2000. The affected plantation is approaching first thinning and the trees are well grown and given the dry season, would be competing other for moisture and nutrients. This could explain why some of the better trees in the plantation are affected.

Some older plantations in the South East have been severely affected by *Cyclaneusma* this year. In particular in 1966-69 plantations that have also been affected by *Essigella*. There was no evidence of infection earlier in the year (July) but since then approximately 40-50% trees have developed symptoms. Some trees are now showing new growth on the tips of the branches.

Tower Ridge 1966 Plantation. *Essigella* damage and *Cyclaneusma* infection

Eucalypts:

Pests:

Autumn Gum Moth and Chrysomelid beetles cause varying amounts of damage every year in plantations throughout the South East Region.

This year sawflies (*Perga* sp.) have been present in very large numbers across the region and many plantations have been sprayed.

Also causing damage are *Cadmus* and *Heteronyx* beetles and weevils (*Gonipterus scutellatus*).

Diseases: ***There have been no reports of significant diseases in eucalypts this year.***

NURSERY

There have been no reports of pest or disease problems in nurseries this year.

ENVIRONMENTAL

No significant fire events occurred this year.

DIEBACK

The "Phytophthora Management Guidelines" 2nd edition, produced by the Phytophthora Technical Group, is now available on the following website. http://www.environment.sa.gov.au/biodiversity/pdfs/pc_management_guidelines.pdf

FOREST HEALTH SURVEILLANCE

Flights to detect *Sirex* (and other forest health issues) continue to be carried out each year in the Green Triangle Region. Surveillance of ForestrySA pine forests in the Ranges Region in future will also be done by air.

RESEARCH & DEVELOPMENT

ForestrySA is now a member of the CRC for Forestry and is involved in a number of projects involving forest health issues. ForestrySA has also become a member of the Industry Pest Management Group based in Western Australia and will be assisting with work in the Green Triangle region.

The FWPRDC sponsored project for the biocontrol of *Essigella* is progressing. The application by the South Australian Research and Development Institute (SARDI) to

import a parasitoid wasp, for control of *Essigella*, has been approved and collaborators in California are engaged in collecting aphids and mummies.

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NEW SOUTH WALES

Plantations

Pinus *spp.*

Insect Pests

Sirex noctilio (Sirex wood wasp)

During 2005, *Sirex* woodwasp was caused very low levels of damage in Macquarie Region (Kinross, Essington, Canobolas and Lowes Mount), Northern Region (Nundle) and Monaro Region (Wog Wog). However, up to 2% mortality was observed in several areas in Hume Region, including Black Andrew, Carabost and Hopeton Park. This is a concern as levels of *Sirex* can increase rapidly once tree-mortality rates reach 1-3%. Bark beetles attacked *Sirex* trap trees in Hume Region and Northern Region, causing concern over the effectiveness of the plots to assist in the biological control program (see below). The FHSU is working on a collaborative project with Forestry Tasmania and Queensland DPI&F, funded by the National Sirex Coordination Committee, investigating the use of insect lures in traps to detect *Sirex* in new areas (such as Northern Region and south-east Queensland).

Ips grandicollis (Fivespined bark beetle) and other bark beetles

Ips grandicolis has increased in Hume Region and Northern Region, due most likely to increased logging operations and resultant slash left on the ground. In Hume, *Ips* infested a pruning and thinning research trial at Nanangro. A high proportion of trap trees in Hume Region (50%) and Northern Region (Casino Operational Area: 50-100%) were attacked by *Ips grandicolis* in 2005. *Ips* is attracted to stressed trees like *Sirex,* and these bark beetles carry a fungus (*Ophiostoma ips*) that may outcompete the sirex fungus. Trap trees infested with *Ips* may render them useless to act as a means of inoculating *Sirex* with the biological control agent (nematode).

Hylastes ater, another bark beetle, was observed attacking a small patch of replant in Buccleuch State Forest in Hume Region, causing mortality of seedlings. Hume Region has developed a surveillance and monitoring program for this establishment pest.

Essigella californica (Monterey pine aphid)

Essigella californica caused major damage in 2005, resulting in needle chlorosis and defoliation. Again, older age classes were the worst affected. Hume Region had over 35,500 ha affected to varying levels of severity, with Green Hills (Figure 1), Buccleuch, Carabost, Bago and Mundaroo the worst affected. In Macquarie Region, almost 25,000 ha were affected, in all forests, with Essington, Mt David, Sunny Corner, Lidsdale, Vittoria and Vulcan the worst affected. It was estimated that this defoliation resulted in

approx. $1.8 Million in lost wood production in Hume Region and over $1.3 Million in lost wood production in Macquarie Region. In Northern Region, moderate to high levels of defoliation were observed in older age classes, in *Pinus radiata, P. elliottii* and *P. taeda,* in Whiporie, Barcoongere, Mt Mitchell, Hanging Rock, Clouds Creek and Eden Creek. Mostly low levels of damage from *Essigella* were observed in Monaro Region, with moderate to high levels in several localised areas.

Diseases

Dothistroma septosporum (Dothistroma needle blight & cast)

Dothistroma needle blight was again lower this year than previous years, with only 450 ha affected in Northern Region (Riamukka, Nowendoc, Armidale and Crofst Knoll). No other Region had significant levels of *Dothistroma septosporum.*

Armillaria novaezelandiae

Mortality from *Armillaria* was still a continuing problem at Acacia Plateau (Northern).

***Diplodia pinea* (= *Sphaeropsis sapinea*)**

Diplodia pinea (=*Sphaeropsis sapinea*) damage affected over 1,500 ha in 2005, mostly related to drought-stress and hail damage. Hume Region had almost 1000 ha affected; the worst areas in Kangaroo Vale, Lindley, Cotway, Lunbrook, Black Andrew and Nanangro. In Northern Region, 250 ha were affected, associated with drought-stress and hail damage, with Hanging Rock, Nundle and Acacia Plateau the most severely damaged. Low levels of damage from *Diplodia pinea* were observed in Macquarie Region (e.g., Warrengon, Essington, Pennsyvania and Canobolas) and Monaro (Wog Wog, Pericoe and Nalbaugh). Damage from *Diplodia pinea* was lower than in previous years in all Regions.

Environmental (drought, frost, fire, nutrient, weeds, etc.)

Wind damage

Wind had caused damage to recently thinned stands in Macquarie Region, resulting in 5% of retained trees being blown over, and also to young stands, resulting in bent stems as affected trees recover. The long-term affect of this damage (compression wood in lower 1m or so) is unknown.

Frost damage

Frost damage resulted in scattered mortality in Macquarie Region (Canobolas, Vittoria).

Herbicide damage

Herbicide damage was observed in several patches of older trees in Macquarie Region, associated with control spraying for serrated tussock.

Vertebrate pests

Possum

Possum damage was again lower than previous years in Monaro Region.

Wallaby

Wallaby damage was again severe in young age classes adjacent native forests in Northern Region, Monaro Region and Macquarie Region. In many instances over 50% of trees had been damaged, and in some cases this was as high as 90%.

Eucalyptus *species*

Insect Pests

Psyllids (Cardiaspina, Ctenarytaina, Creiis)

Creiis was not as significant this year, with only one plantation with severe damage. No control operations were conducted (although control operations were conducted in private plantations). Very low numbers of *Creiis* were observed in many plantations. Plantations that sustained severe damage in 2005 were surveyed again in 2006, with many trees showing poor recovery, resulting in dead topping and mortality. *Cardiaspina* spp. psyllids were observed at low to moderate levels in only one plantation this year, which is a significant decrease from last year. *Glycaspis* sp. psyllids were observed causing low to moderate levels of damage in several *E. dunnii* plantations during the aerial survey.

Leaf beetles

Chrysomelid leaf beetles, Christmas beetles, *Amorbus* bugs and flea beetles were observed only at trace to low levels this year.

Stem borers

Cossid stem borers were also a continuing problem in older plantations, with *E. grandis* the most susceptible, but stressed *E. dunnii* (e.g after *Creiis* damage) also sustaining high levels of damage from cossids. Cockatoos had caused further damage by feeding on cossid larvae and damaging the stem of trees. Stem fungi, including stain and white rot, were observed associated with this damage. The long-term impact of these fungi on wood quality is unknown. Cerambycid stem borers were a continuing problem in the

older plantations, especially *E. grandis* and *Corymbia* spp. Some *Corymbia* trees were completely 'ringbarked' by borer damage.

Diseases

Corymbia shoot blight (Quambalaria pitereka)

Quambalaria shoot blight (caused by *Quambalaria pitereka*) was more common this year due to good rainfall preceding the surveys. In most cases only low to moderate levels of damage were observed, but some plantations also sustained high to severe damage. Several older plantations had continued damage from RSB with up to 25% of trees stunted and bushy.

Quambalaria eucalypti was observed for the first time in *E. dunnii* at several plantations, and is the first record on *E. dunnii* in Australia. It was associated with small leaf spots and infection of insect damage (e.g. from weevils), and also minor twig cankers.

Stem cankers

Stem canker fungi, including *Botryosphaeria* spp., *Cryphonectria eucalypti* and *Caliciopsis* sp., are continuing to increase in incidence and severity in the older plantations. Severe damage was observed in several plantations. In many cases severe damage appeared to be associated with tree stress, but this needs to be further researched. The long-term impact of stem fungi on tree survival and wood quality is unknown. Some stem fungi in NSW eucalypt plantations are still unidentified, and require detailed taxonomic work.

Phaeophleospora spp.

Continued severe defoliation of *E. nitens* in Nash's block near Dorrigo was again observed. Trees had 95% defoliation, caused mostly by *Phaeophleospora eucalypti* (same genus as the 'red tide' fungus), and this has resulted in dead-topping of some trees.

A leaf spot fungus that was recently identified as new from previous surveys, *Kirramyces corymbiae*, was observed more common this year in *Corymbia* plantations than previous years, although not at significant levels.

Mycosphaerella leaf disease

Mycosphaerella nubilosa was very damaging in *E. globulus* trial plantings, similar to previous years. This species was widespread but not damaging on *E. dunnii.*

Pilidiella eucalyptorum (= Coniella fragariae)

Pilidiella eucalyptorum (= *Coniella fragariae*) was more common this year, on *E. dunnii*, but still only at low to moderate levels.

Mistletoe

Mistletoes were observed in approx. 50 plantations, mostly affecting *Corymbia* spp. Levels of mistletoe were alarmingly high (65%) in several *C. variegata* plantations, and at lower levels in up to 15% of spotted gum plantations. The impact of mistletoe in young plantations has recently been quantified (see *Publications* below), with up to 13% loss in yield at age nine.

Bunchy top

A disorder known in Queensland as Bunchy top (where trees have increased foliage growth on several branches in the upper crown) was observed in *Corymbia* spp. in several plantations. The impact of this disorder is unknown, but is increasing in incidence.

Managed natural forests

Native forest dieback is a continuing problem in coastal NSW. Aerial surveys in northern NSW were conducted in March 2004 with 20,000 ha identified with some level of dieback.

Nurseries

No significant pest or disease problems reported.

Urban and rural

Thaumastocoris australicus continues to cause significant damage to street trees (*Eucalyptus nicholii* and *Eucalyptus scoparia*) in Sydney, with greater than 50% foliar damage and dieback. A second undescribed species of *Thaumastocoris* has also been found on *Corymbia maculata* and *Corymbia citriodora* again on Sydney urban trees.

Quarantine

ENSIS - FOREST BIOSECURITY AND PROTECTION

Excerpts from Annual Science Report 2006 edited by Margaret Richardson

Biosecurity

Pre-Border

- Eucalyptus rust fungus
- Pitch canker
- Western Gall rust
- Quarantine treatments

Post-Border

- Quarantine and diagnostic services
- Incursion response - painted apple moth
- New organism identified - *Phytophthora kernoviae*

Forest insect pest and disease management

- Gumleaf skeletoniser
- Dothistroma
- Cyclaneusma
- Armillaria
- Nectria
- Physiological needle blight
- Swiss needle cast
- Septoria leaf blight
- Heart rot and root rot in acacia
- Mycosphaerella infection of *Eucalyptus nitens* and *E. globules*

Ecosystem Health and Function

- Forest health and monitoring
- Ecosystem resistance to pests

- Biodiversity

Pre-Border Biosecurity

Eucalyptus rust fungus

Funded by ACIAR and DAFF

Eucalyptus rust fungus is a serious disease caused by *Puccinia psidii*. Originating in South and Central America, this disease has the potential to significantly damage Australasian ecosystems and eucalypt plantations. Although Australia and New Zealand are currently free of the rust, its recent arrival in Hawaii has heightened awareness of the risk it poses.

Over the past year, Ensis pathologists in Australia have presented seminars to government agencies and forestry companies who are concerned about preventing the entry of this disease. Scientists have developed sensitive PCR-based detection protocols for *P. psidii*, which can be used to rapidly detect the pathogen. These protocols have been applied quarantine situations to identify infected material. Technical guidelines for a disease incursion contingency plan have been drafted and are under review.

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Pitch canker link to nitrogen under investigation

Greenhouse trials were established offshore to investigate the influence of foliar nitrogen on pitch canker disease severity, caused by the fungus *Fusarium circinatum.* Previous evidence has suggested that the disease is more severe on sites with high nitrogen content. Results from these trials will be used to predict the likely impact of this disease in New Zealand.

In addition, a variety of countries that have pitch canker were visited. Field observations and data obtained from these countries will be used to evaluate the risk and potential behaviour of this pathogen, should it be introduced into New Zealand.

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Western gall rust

Western gall rust (*Peridermium harknessii*) considered to be a serious threat to *Pinus radiata* plantations were to arrive in New Zealand or Australia. A risk-analysis study has indicated that the likelihood of western gall rust establishing in the Southern Hemisphere is minimal. Major factors include the low probability of importation of infected seedlings, unlikely spore transport in the atmosphere across the tropics, and the fact that the seasons in the Northern and Southern Hemispheres are out of phase.

Despite the low risk, all necessary steps are in place to prevent establishment. Live *P. radiata* seedlings are currently prohibited from being imported, legally closing the major pathway through which the disease could become established. In the unlikely event that the disease should arrive, DNA-based identification methods have been developed to enable detection of the pathogen before spores are produced.

To further address the risk to New Zealand, the North American distribution of the pathogen was compiled from published records and personal observations. The distribution data was then used with a CLIMEX model to undertake a regional climate matching exercise. Results indicated that the Central North Island, Nelson and Otago are the regions of New Zealand with the closest climatic match with areas of North America where western gall rust is found.

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Improving quarantine treatments

The formation of a stakeholder group aimed at protecting forestry exports represents a major step towards phasing out the use of methyl bromide at New Zealand ports. Known as STIMBR (Stakeholders in Methyl Bromide Reduction), the purpose of this initiative is to develop and promote a research strategy to provide alternative treatments and ultimately save money for the sector.

Members of STIMBR include forest industry and fumigant company stakeholders, two research providers (Ensis and Crop & Food Research) and several government departments: the Ministry of Agriculture and Forestry and Biosecurity New Zealand; the Ministries for the Environment; of Economic Development; Health; Foreign Affairs and Trade; the Department of Labour and the Environmental Risk Management Authority (ERMA New Zealand). The formation of STIMBR will enable delivery of the research strategy by ensuring the projects are adequately funded, and by providing a governance role. While STIMBR has been initiated in New Zealand, a process is now under way to engage with interested parties in Australia.

This research endorsed by STIMBR has been divided into three main categories, offering short and long term solutions:

- **Alternative fumigants** – Before new fumigants can be used for phytosanitary treatments, new data are required on their environmental impacts and toxicity against specific insects and fungi. Promising alternatives for methyl bromide currently under investigation include:
  - Phosphine, which can be used for single treatment fumigation of export logs inside the hold of ships;
  - Sulfuryl fluoride, which has been found to be effective against a wider range of insects and diseases than previously thought, and;
  - Ethanedinitrile, which is currently being researched by CSIRO Entomology.

- **Non-fumigant treatments** – Alternative technologies are under development such as heat treatment of shipping containers, light trapping of insects on wood processing sites, and pheromone attractants or repellents.

- **Ecological approach** – The need for fumigation with methyl bromide or other products can be substantially reduced in the long term by implementing an ecological risk assessment and quality assurance programme based on new knowledge of pest species, their distribution, life cycles, and contamination pathways. The risk assessments, combined with a quality assurance programme that verifies the origin and history of logs or sawn timber, will ensure treatments are only applied when and to the degree needed.

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Post-Border Biosecurity

Lessons from painted apple moth

Earlier this year, New Zealand's Ministry of Agriculture and Forestry (MAF) declared that painted apple moth (PAM) had successfully been eradicated in the Auckland area. Biosecurity Minister Hon Jim Anderton acknowledged that groundbreaking scientific advances were achieved during the course of the eradication programme, which will contribute significantly to future biosecurity response capabilities.

To capture this experience for future incursions, Ensis FBP has pulled all their data from the PAM operation into a decision-making framework which forms the basis of a new

modelling system called PAMDX. It integrates key factors that determine variability in spray efficacy with a model of insect population dynamics. As such PAMDX is a powerful tool for optimising decisions on the rates, timing and frequency of spray applications.

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New organism identified

Two isolates of the fungal species, *Phytophthora kernoviae,* have been confirmed in New Zealand through DNA sequencing. One was found in a Northland cherimoya (custard apple) orchard, and the other was identified in a soil sample from Trounson Kauri Park. Although its impact in New Zealand is still unknown, *Phytophthora* is closely related to serious plant diseases in Europe.

Phytophthora kernoviae is an unwanted organism under New Zealand's Biosecurity Act. This particular organism is an invasive pathogen that causes bleeding stem lesions and foliage dieback on some species of trees. At this stage the origin of the fungus is unknown and no links have been established to imported material.

Ensis Forest Biosecurity and Protection pathologists are collaborating with Landcare Research and HortResearch on a Ministry of Forestry (MAF) funded project that is studying the genus *Phytophthora* in New Zealand.

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Insect pests

Gumleaf skeletoniser

Funded by Biosecurity NZ

Gumleaf skeletoniser (*Uraba lugens*) is an Australian insect that causes damage mainly to gum (Eucalyptus) trees by eating the foliage. The pest is established in the greater Auckland region and is now spreading to other parts of the country. A major focus for Ensis this year has been the development of tools and dissemination of information to assist forest managers, landowners and regional authorities faced with on-going pest management. Information on gum leaf skeletoniser distribution, impact and management is now available through a guide booklet, information sheets and web pages on www.biosecurity.govt.nz

To explore long term management options, Ensis scientists have identified and imported potential biological control agents from Tasmania and South Australia for further testing. Research is now focused on two parasitic wasps, *Cotesia urabae* and *Dolichogenidea eucalypti*, both of which exclusively attack gumleaf skeletoniser caterpillars, laying their eggs inside the host. These wasps are now being reared in quarantine so host testing can be carried out. Continued research will receive funding contributions from the New Zealand Farm Forestry Association.

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Diseases

Modelling Diseases

Ensis scientists are developing CLIMEX models for Dothistroma and Mycosphaerella that will provide a better understanding of how temperature and rainfall affect disease distribution.

A worldwide survey of Dothistroma shows that the disease occurs over a very broad environmental range. This distribution would help to explain why New Zealand is so severely impact by the disease, given that it falls directly in the middle of the climatic range. (Show map from Mike)

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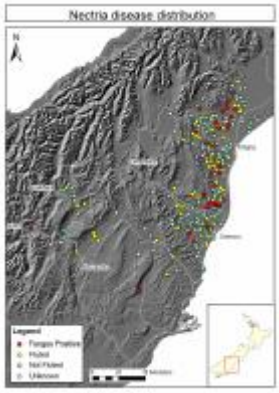
Nectria

Research into Nectria has yielded further information that allows forest managers to reduce the impact of this disease. Ongoing delimiting surveys involving over 280 forest owners have determined the distribution of the disease. The current known infected area is shown on the map above. These surveys are now being expanded to determine the limit of spread.



What do we know so far?

- Inoculums are present all year round so infection is possible at all times
- A cluster of fruit bodies probably remains active for many months
- Moisture is required for spore release and probably dispersal. Rain dispersed fungi generally result in patchy distribution and spread of the disease is slow.
- *N. fuckeliana* grows best at warm temperatures, but can probably grow to some extent year-round in NZ
- Infected radiata pine shows active resistance response. Study of early disease development is in progress.

Silvicultural trials were progressed to learn more about how pruning can be managed to reduce the risk of infection. The goals of this study are to determine the effect of time on pruning, to test efficacy of fungicide application and to determine how long the stubs remain susceptible to infection.

The pruned stub trial revealed that fluting is more common after winter treatment. Fluting was more common in pruned treatments (2.6% of stubs after winter pruning), but flutes were also present on unpruned trees (1.8% of stubs). The incidence of fluting was high immediately after second lift pruning (14.9% of stubs compared with 2.6% on first lift). A strong correlation was found between stub size and risk of infection. Fluting was rarely associated with stubs smaller than 30 mm diameter.

Immediate fungicide application reduced, but did not eliminate fluting, and the cost-effectiveness of this treatment is still unclear. Delayed fungicide application was found to be ineffective.

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Physiological needle blight

Physiological needle blight (PNB) is a disorder that usually affects radiata pine trees 15 years or older. Sporadic outbreaks in a number of locations have caused alarm over the years, particularly in Northland, East Cape, and Westland. Pathologists started research on PNB in earnest in 2002 and early findings prompted them to conclude that the primary cause of the disorder is not fungal, although fungi may contribute to death of needles already stressed by environmental factors.

Research in 2005-06 focussed on physiological factors and was undertaken by a plant physiologist sub-contracted from HortResearch and Ensis pathologists. Results of field experiments in Northland, East Cape and Waikato showed that water loss is greater in 16-year-old needles than 6-year-old needles, and resistance to water flow was higher in branches of older trees than in branches of younger trees. These results support the hypothesis that PNB is a result of water stress caused by specific environmental conditions and age-related changes in tree physiology. Further work will be carried out in 2006-07 to gather data that will help to confirm or reject this theory.

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Swiss needle cast

Swiss needle cast disease, caused by *Phaeocryptopus gaeumannii* is native and relatively innocuous in northwestern North America. However, since 1996 disease severity has been increasing in Douglas-fir plantations in western Oregon, associated with growth losses of 20–50%. Researchers there have developed a model to predict disease severity based on mean daily winter temperatures and spring moisture, which accounts for 77% and 78% of the variation in one- and two-year-old needles, respectively.

A collaborative project is now underway between Dr. Jeff K. Stone, Oregon State University, and Ensis FBP, to develop a similar model for New Zealand. Once the distribution of the disease in this country is explained using climatic variables, a predictive model can be developed to identify regions where Douglas-fir can be grown with least risk from the disease and where stands will be healthier and more productive.

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Avoiding septoria leaf blight

Septoria leaf blight, caused by the leaf-infecting fungus *Phaeophleospora eucalypti*, in association with *Mycosphaerella cryptica*, became prevalent in parts of New

Zealand when large areas of *Eucalyptus nitens* were planted as a fast-growing source of fibre for the pulp and paper industry. Results from genetic field trials determined that many families of *E. nitens* from Victoria are very susceptible to the disease, and that it may be better to plant an alternative species on disease-prone sites. Although *E.*

nitens from New South Wales was found to be more resistant, it grew more slowly, and is not a suitable substitute.

A recent survey of young plantations in the Bay of Plenty and central North Island regions revealed that the disease is most serious along a zone within 20 km of the coast, where future planting of this species should be avoided. Rainfall is adequate for infection over the whole survey region, and the disease appears to be enhanced by the warmer average temperatures that occur in the coastal zone.

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Heart rot and Root rot in Acacia

Project funded by the Australian Centre for International Agricultural research (ACIAR)

Ensis scientists associated with the University of Tasmania in Hobart have completed a large project investigating heart rot and root rot in plantation hardwoods of Indonesia and southeast Australia. Underlying this project is the need to increase the sustainability of plantation forests in Indonesia through better disease management, and thereby reduce pressure on native forest resources.

As a result of this study, around 200 new fungal isolates have been sequenced using molecular techniques developed during the project. The new sequence database provides a valuable supplement to the publicly available databases. This expanded resource increases the likelihood of identifying fungi, particularly those isolated from rotted roots, wood or symptom-less wood, without needing to locate a fruitbody.

An assessment of root rot in Central Java revealed that the disease has undergone a linear increase over a three year period. This result demonstrates the need for preventative and early disease management to avoid massive tree and hence economic loss. The results indicate that the root rot disease in the studied area is likely to have spread via sexual spore production.

The results of the three-year ACIAR project were communicated to the government, industry and the research community through a workshop run in Indonesia on 7-9th February 2006. Entitled "Heart rot and root rot in Acacia plantations: a synthesis of research progress", the workshop provided an excellent forum for discussions regarding the impact and management of heart rot and root rot in Acacia plantations. The event attracted 50 people with representation from 11 Indonesia companies that are involved with forest industries based on planted tropical acacias. Proceedings of the conference have been published in English and Indoensian.

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Mycosphaerella infection of *Eucalyptus nitens* and *E. globulus*

Funded by the Australian Research Council (ARC) and Forest and Wood Products Research and Development Corporation (FWPRDC)

Mycosphaerella leaf disease (MLD) causes defoliation of *Eucalyptus nitens* and *E. globules* plantations in Australia. Ensis scientists participated in two projects to understand the risk, impact on productivity and control of this disease. The major tool developed in these projects was a decision support system that could predict the effects of biotic damage on productivity.

There are few silvicultural options available to managers to minimise the effects of MLD on growth. Resistance to Mycosphaerella is highly heritable, meaning that deployment of resistant genotypes is a management option in the long term. Spraying with fungicides was found to be operationally and economically unfeasible.

Reducing relative humidity within a plantation, through applying weed control, may reduce levels of infection, because leaf wetness is known to influence infection. Fertilisation, particularly with nitrogen, was found to be the silvicultural option with the most potential for minimising effects of MLD on plantation eucalypts in the short term.

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Extending the worldwide network

Ensis FBP was awarded two OECD Fellowships, enabling an exchange of scientists between New Zealand and the UK. These Fellowships will help Ensis researchers to forge closer links with their counterparts in the UK and represents an important step in the relationship-building process with Forest Research in Britain.

With forest health and biosecurity issues becoming increasingly global in nature, pests that arrive on our doorstep are often well known elsewhere. For example, the recent discovery of *Phytophthora kernoviae* in Northland, a new fungus known to damage a number of tree and shrub species in the United Kingdom, illustrates the value of closer research ties as scientists seek to understand the disease.

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Ecosystem Health and Function

While Ensis FBP provides applied solutions to immediate issues, they also recognise that forest health must be viewed at a macro level. By taking a "big picture" view of forest ecosystems, scientists can understand the factors that determine resistance and resilience to pest impacts.

Forest health and monitoring in New Zealand

The New Zealand Forest Owners Association (FOA) is looking to modify their surveillance system to provide improved information on both forest health condition and pest status. The system is also intended to be capable of detecting new pest organisms.

To support this development, Ensis has embarked on a modelling project to assess the cost and efficacy of various sampling strategies. Enhanced predictive models have been developed for Dothistroma and Cyclaneusma as a test case. These model simulations are being used to define the most practical, cost-effective survey strategies for coincidentally estimating disease levels over time, and identifying the presence of new pests. This information can potentially be used to improve the FOA surveillance strategy.

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Eucalypt health assessment in Australia

Funded by the ARC and FWPRDC

As part of the study on Mycosphaerella leaf disease (MLD) in Australia, Ensis FBP contributed visual standards to the Crown Damage Index (CDI). The CDI is a system used by some sectors of the plantation forestry industry in Australia to assess forest health.

This study also confirmed that a spatially explicit method for assessing forest health can be achieved through remote sensing. Studies determined that Mycosphaerella damage could be detected by changes in patterns of leaf reflectance. It was possible to differentiate between four severity classes.

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Ecosystem resistance to pests

Rotorua scientist, Nod Kay was awarded an OECD Fellowship that enabled him to spend seven weeks in the UK. The Ensis FBP entomologist used this opportunity to further his ground-breaking research into why island plant species are less palatable to insects than continental species. His aim is to understand what chemical mechanisms are used by certain plant species to protect themselves from insect attack.

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Ensis scientist puts spotlight on fungi

Funded by FRST

Ensis pathologist, Dr Peter Gadgil, has completed the first comprehensive reference book on fungi that live in New Zealand's forests. Entitled "Fungi on Trees and Shrubs in New Zealand" this volume forms part of an international reference collection, published by the University of Hong Kong.

The book is a major achievement that represents a significant contribution to the knowledge of New Zealand species. Works such as this provide a valuable means of capturing the knowledge held by experienced forest health specialists.

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NEW ZEALAND

Collated and summarised by J. Bain, L. Bulman, M. Dick and D. Jones (Ensis) from data and information from the Forest Health Database, *Forest Health News* (Ensis), the Forest Health Reference Laboratory Diagnostic Services, and other Forest Biosecurity and Protection staff (L. Berndt, P. Crane, J. Gardner, I. Hood, T. Murray, T. Ramsfield, and M. Watson).

1. PLANTATIONS:

PINUS RADIATA:

Pests:

No insect problems of any note were recorded in *P. radiata* plantations. The status of *Essigella californica* (Aphididae) in NZ is still equivocal. Trials that were established over the summer of 2005-06 yielded no useful information because the numbers of aphids were so low.

Diseases:

Dothistroma needle blight

Records of Dothistroma needle blight confirmed a slight reduction in disease severity in 2005, compared with the level reported for 2004. The total number of records, and those where severity was greater than 15%, decreased in 2005 (figure 1).

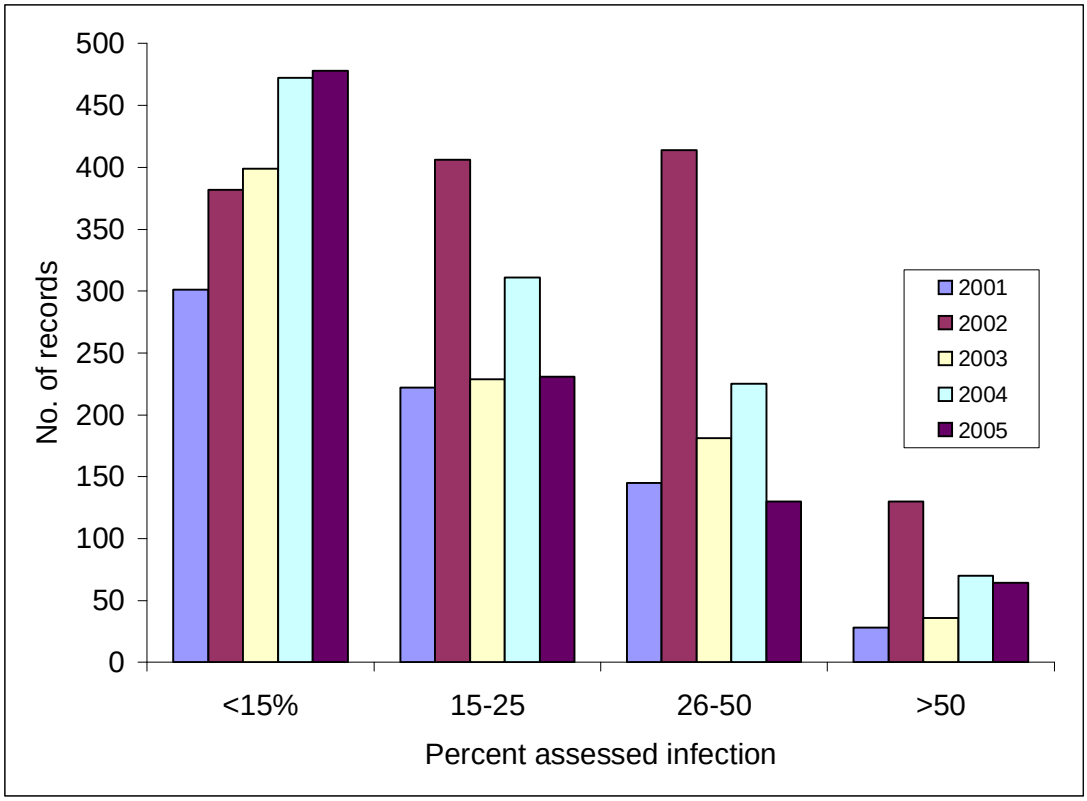

Figure 1 - Forest Health Database records of *Dothistroma pini*
during the period 2001-2005

The aerial spray programme in the North Island for 2005-2006 was 116,369 ha (figures provided by the Dothistroma Control Committee). This is a significant increase on the area sprayed in 2004-05 (72,688 ha). The increase in sprayed area does not relate to an increase in disease, but can be explained by a change in policy by several major forest owners who decided to lower the sprayable disease level from the usual 20-25% to 15%. The area sprayed is a separate, but less refined indicator of the annual impact and extent of Dothistroma needle blight throughout the whole country, since it may be influenced by other forces driving company activities for example: budget constraints or changes in silvicultural or operational practices (as seen this year).

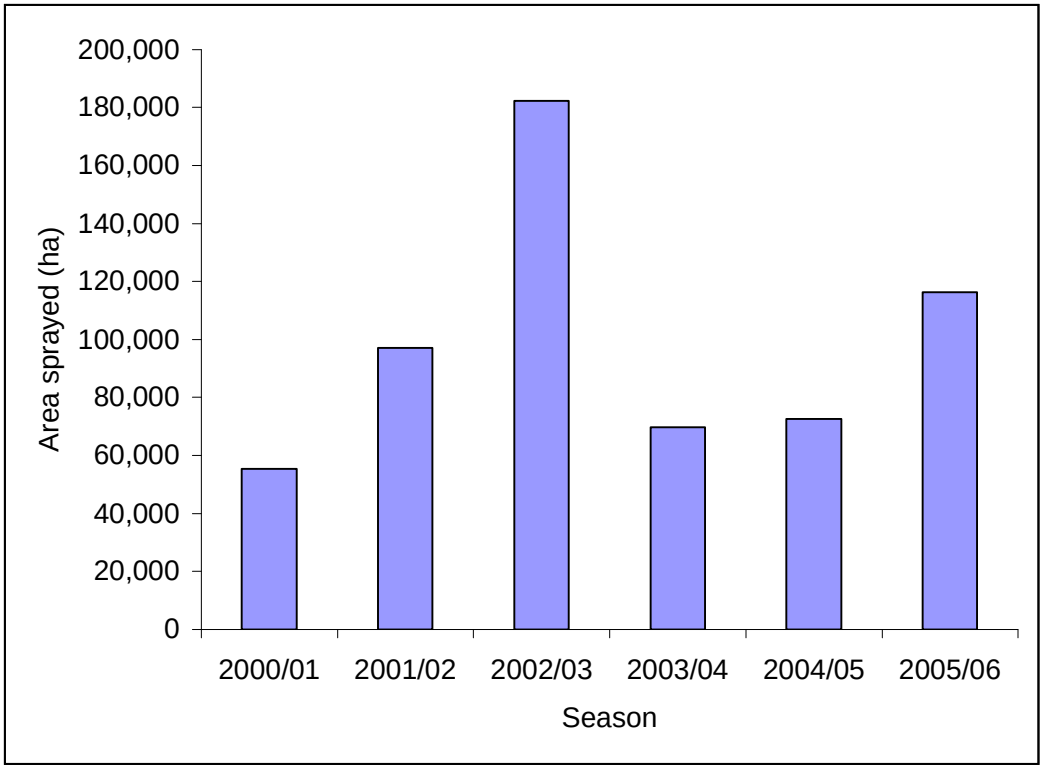

Figure 2 – Area sprayed annually for Dothistroma control in the North Island

Cyclaneusma needle cast

Based on Forest Health database records, the severity of Cyclaneusma needle-cast was again low, as it was in previous seasons (figure 3). Also, the number of Cyclaneusma records in 2005/06 was half that of previous years. These data must be viewed with caution, because only 20% of records in the database were collected during the peak Cyclaneusma needle-cast expression period of September/October/November. However, field observations by Ensis pathologists in the central North Island and East Cape confirmed that disease levels were low.

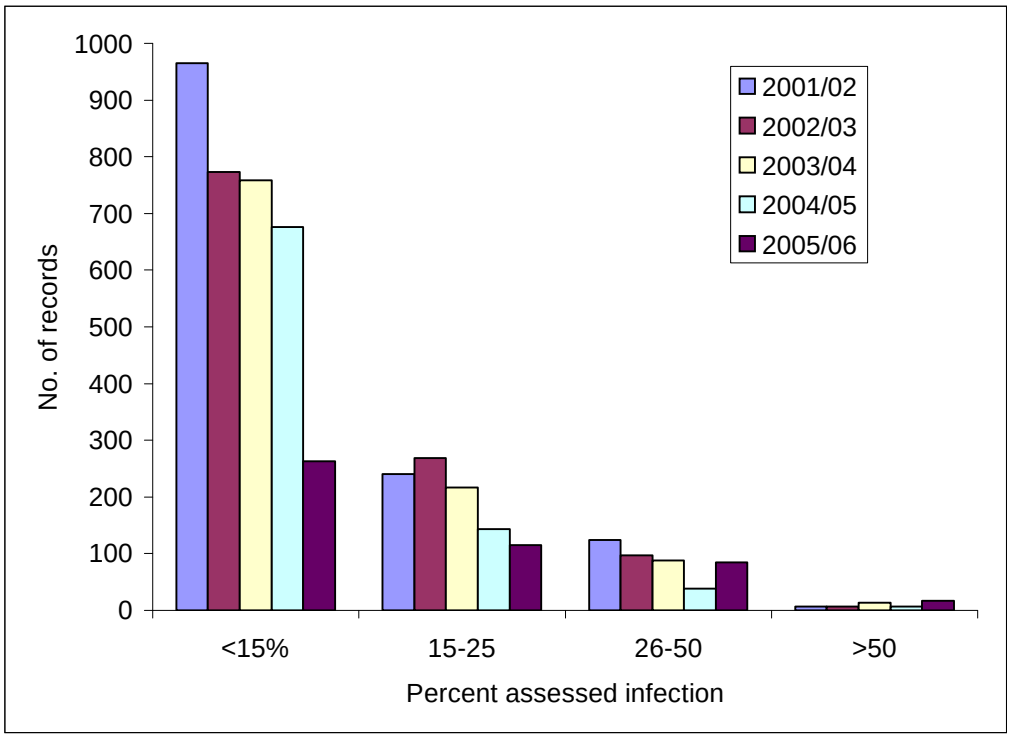

Figure 3 - Forest Health Database records of *Cyclaneusma minus* during 2001/02-2005/06

Physiological needle blight

Physiological needle blight was reported from many forests on the East Cape in 2005-06. Widespread and severe disease was noted within a 100 km line that ran north-south . Not all forests within that area were affected, and within forests disease was often patchy. No pattern or obvious association could be determined from an aerial survey conducted on 31 October 2005. It was not reported from Northland and isolated events were recorded in localised areas of individual stands in the occasional forest in Auckland, Bay of Plenty, Taupo, and Wellington. Research continued on elucidating potential physiological causes. This involved taking water potential measurements and investigating water flow resistance in young and old trees. A joint research effort has been initiated with Bioforest SA in Chile, where similar problems are occurring.

Figure 4 – PNB at East Cape 10 km north of Gisborne. Photo taken on 31 October 2005 from a Cessna 172 on a wet day.

Nectria fuckeliana

There was almost no expansion of the range of *Nectria fuckeliana*, the most recent record was made at Orari Gorge Station, WSW of Ashburton. *Nectria fuckeliana* remains confined to the lower half of the South Island. Studies on the effect of silviculture, stub treatment, and environment on disease development are continuing and a second lift pruning has been included in the treatments under evaluation. Infection percentage is higher after second lift pruning than first lift. The level of infection is decreased when pruning operations are carried out in winter. Inoculations of *Pseudotsuga menziesii*, *Cupressus macrocarpa*, *Sequoia sempervirens* and *Pinus ponderosa* have demonstrated that these species show lower susceptibility than *P. radiata*.

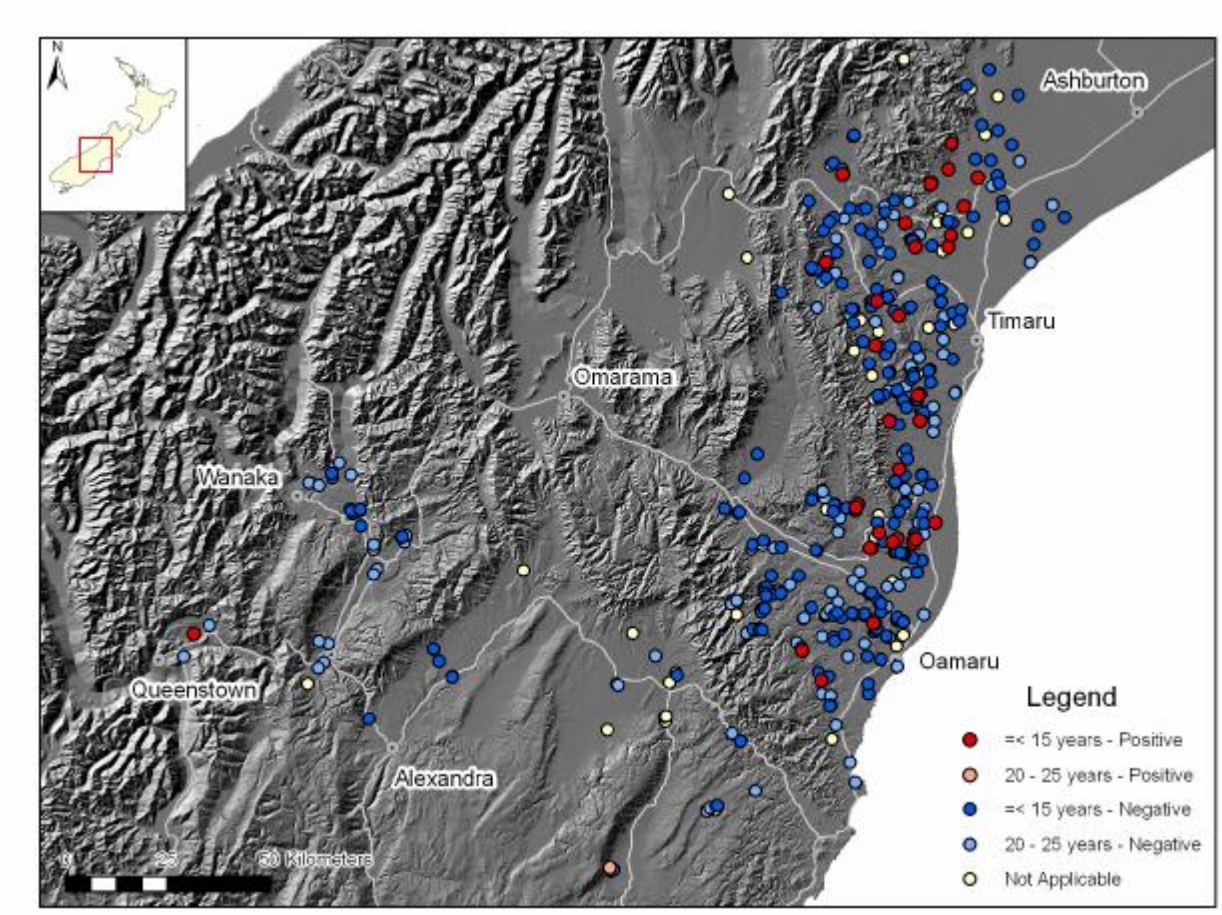

Figure 5 – Distribution of *Nectria fuckeliana* as determined by a delimiting survey of plantations in the northern part of the infected zone

Armillaria root disease

Armillaria root disease, caused primarily by *A. novae-zelandiae*, remains widespread in many pine plantations throughout much of the country. In second or third rotation stands mortality of young trees is less common. However, chronic, non-lethal infection of older trees can still lead to significant increment loss.

Phytophthora cinnamomi

Losses of newly established plants in the central North Island have been related to root infection by *Phytophthora cinnamomi*. There is a strong clonal association.

NURSERIES

Root rot caused by *Phytophthora cinnamomi* was the most common serious nursery disease. Onion thrips (*Thrips tabaci*) continues to be a problem in a few nurseries causing stunted plants with multiple leaders. Terminal crook disease, caused by *Colletotrichum acutatum* f. sp. *pineum*

was recorded at a low level in several North Island nurseries.

DOUGLAS FIR (PSEUDOTSUGA MENZIESII):

Diseases:

Phaeocryptopus gaeumannii (Swiss needle cast disease)

Swiss needle cast disease (*Phaeocryptopus gaeumannii*) was again recorded throughout New Zealand and remains the most significant disease of Douglas fir. Pathogen distribution and disease severity were surveyed in 16 plantations during the year with an index of infection calculated as the product of the average proportion of occluded stomata (severity) and the average proportion of needles infected (incidence). North Island plantations have markedly higher disease levels than those in the South Island. A model will be derived from this data and will be used to provide short and long term disease risk predictions.

EUCALYPTUS SPP.:

Pests:

Creiis lituratus (Psyllidae) which was first found in New Zealand in June 2002 in Auckland has now spread southwards into the Waikato region. Recorded hosts in New Zealand are *Eucalyptus botryoides, E. grandis, E. major* and *E. saligna.*

Nambouria xanthops (Pteromalidae) which was first found in New Zealand in 1999 and is widespread throughout much of northern half of the North Island was found in mid Canterbury in May 2006. This is the first record from the South Island. The distinctive leaf galls are quite common on *Eucalyptus cinerea* and *E. nicholii.*

Enoggera nassaui (Pteromalidae) is an egg parasitoid that was introduced into New Zealand in the late1980s and again in 2000 for the biological control of the eucalypt tortoise beetle *Paropsis charybdis* (Chrysomelidae). In 2001 its obligate hyperparasitoid, *Baeoanusia albifunicle* (Encyrtidae), was detected in New Zealand along with a second primary parasitoid of *P. charybdis, Neopolycystus insectifurax* (Pteromalidae). The attack rates of all three parasitoids on *P. charybdis* were monitored from 2001 to 2005 in the

Bay of Plenty. *E. nassaui* still appears to effectively reduce the pest population in early summer however high rates of hyperparasitism render the control agent ineffective against the bulk of the late summer generation. Most remaining eggs however, were parasitised by *N. insectifurax* suggesting that, where present, it is able to compensate to some extent for the decline in *E. nassaui*. Both *N. insectifurax* and *B. albifunicle* are thought to be restricted to the upper half of the North Island.

The high rate of hyperparasitism on *E. nassaui* in the Bay of Plenty was again apparent in the summer of 2005-06 although formal monitoring of parasitism rates has ceased. An increase in the *P. charybdis* population last year forced many forest managers to apply chemical pesticide to control the pest, and may signify a gradual reduction in *E. nassaui* as a result of hyperparasitism. Work currently underway to assess the biology, ecology and distribution of the hyperparasitoid is expected to provide more information on its potential impact on *E. nassaui* and the control of *P. charybdis*. Behavioural analysis of *E. nassaui* and *N. insectifurax* oviposition characteristics are also being conducted to assess and improve the predictability of parasitoid host range testing methods.

Uraba lugens (Nolidae) was first found in New Zealand in 1992 at Mount Maunganui, and then again in Auckland in 2001. Although it is thought to have been eradicated from Mt Maunganui, the Auckland population was judged too widely dispersed for eradication to be feasible. Monitoring of the population, and research into the management of the pest, has continued over the past five years under the auspices of the MAF. Results of this work have been reported previously, and include the phenology, potential distribution, preferences for native and economically important tree species, and chemical control methods of *U. lugens* in New Zealand. *Uraba lugens* is now very widespread in the greater Auckland region, having been detected as far as Warkworth to the north, and Meremere to the south of the region. An individual has also recently been caught in a pheromone trap at Katikati, about 28 km north of Mount Maunganui.

In Janaury 2006 *U. lugens* was found feeding on *Betula pendula* (silver birch) in Auckland. Many trees were very heavily skeletonised and in many instances there were no *Eucalyptus* spp. nearby and *Uraba* egg masses were found on *Betula* leaves.

Two new parasitoid species (*Ecthromorpha intricatoria* (Ichneumonidae) and *Dibrachys* sp. (Pteromalidae)) have been found attacking *U. lugens* although the potential impact of these species on *U. lugens*, or on potential biological control agents, is yet to be determined.

Research into biocontrol of *U. lugens* is ongoing. Four candidate parasitoid species (*Cotesia urabae*, *Dolichogenidea eucalypti* (Braconidae), *Euplectrus* sp. (Eulophidae) and *Eriborus* sp. (Ichneumonidae)) were given approval in 2004 to be imported into containment. Parasitoids were first imported during the summer of 2004-05, although

strong colonies were not established due to high hyperparasitism rates and difficulties with rearing. Preliminary host range testing of the parasitoids against potentially vulnerable species in New Zealand was started in the 2004-05 season. *Euplectrus* sp. was eliminated from the list of candidates to test for the 2005-06 year due to the presence of one of its hyperparasitoids (*Pediobius* sp.(Eulophidae)) in New Zealand. The main objective for the 2005-06 research season was to focus on the remaining three parasitoid species, reduce the problem of hyperparasitoids in the shipments, and establish vigorous laboratory colonies so host range testing could be conducted. Shipments of the three parasitoid species (*Cotesia urabae, Dolichogenidea eucalypti* and *Eriborus* sp.) were received between November 2005 and February 2006. The numbers of *Eriborus* sp. were very low, as this species proved difficult to obtain in the field in Australia. The numbers of *C. urabae* and *D. eucalypti* were good, however, and hyperparasitoids were not a significant problem. The rearing technique was refined with some success for both of these species, although only *D. eucalypti* was reared through three generations. With further work rearing problems should be minimised. No host range testing was conducted due to the continued rearing difficulties and insufficient numbers of females produced.

Diseases:

***Phaeophleospora* and *Mycosphaerella* leaf disease**

Phaeophleospora eucalypti and Mycosphaerella leaf blotch (primarily due to *M. cryptica* continue to be the cause of the most serious foliage disease in *Eucalyptus* plantations. Disease levels, along with the depredations of foliar-feeding insects have been the primary reasons for poor growth rates of *E. nitens* in the central North Island.

CYPRESSES:

Diseases:

Cypress canker (*Seiridium* spp.)

Cypress canker, caused by two species of *Seiridium* continued to cause damage in many cypress stands throughout the country, particularly *Cupressus macrocarpa.* Data from the inoculation programme which is attempting to identify, and eventually utilize, genetic resistance in commercial stock is still to be analysed.

2. BIOSECURITY:

POST-BORDER (ERADICATION):

Dutch elm disease:

The eradication campaign for Dutch elm disease continued in Auckland, and was coordinated and funded by MAF supported by the local city councils. One full survey and one targeted survey were carried out in the 2005/06 season, with the second survey restricted to high risk suburbs. A total of 7 infected trees at 5 addresses were found. While most were within the infected area there was a continuation of the expansion of the area to the south-west, as noted last year. All infected trees were found as a result of the disease detection surveys. A targeted pheromone trapping programme for *Scolytus multistriatus* was carried out this season, initially with 23 traps increasing to 31 by season end. As at 20 May 2006 1,542 beetles had been caught, of which 32 (2.1%) from traps in 4 different locations were carrying *O. novo-ulmi*. It should be noted that 31 of the 32 beetles were trapped within a small area in the North Shore, and an infected elm found in that area during the second survey had plentiful beetle emergence holes and larvae present that were carrying *O. novo-ulmi*. Thus, the relatively high percentage of contaminated beetles caught during the year was likely inflated due to this one elm.

For further information see:

http://www.biosecurity.govt.nz/pest-and-disease-response/pests-and-diseases-watchlist/dutch-elm-disease

Fall webworm:

A fall webworm "web" (*Hyphantria cunea* (Arctiidae)) containing 15 caterpillars was found in Mt Wellington, Auckland in March 2003. Five large scale ground surveys found no more insects but in 2005 six male moths were caught in pheromone traps. The moths were trapped in February (2), March, April and June. In March 2006 Biosecurity New Zealand announced that fall webworm has been eradicated. For further information see:

http://www.maf.govt.nz/biosecurity/pests-diseases/forests/fall-webworm/index.htm. (but note that this site makes no mention of the eradication announcement).

Painted apple moth:

The painted apple moth (*Teia anartoides* (Lymantriidae)) which was first found in Auckland in May 1999 has been declared eradicated from New Zealand. This announcement from Biosecurity New Zealand was made in March 2006. The trapping programme still continues and since March at least two moths have been trapped in Auckland but these are thought to represent new incursions. For further details see:

http://www.biosecurity.govt.nz/pest-and-disease-response/pests-and-diseases-watchlist/painted-apple-moth

BIOLOGICAL CONTROL OF *BUDDLEJA DAVIDII*

Buddleja davidii is a serious, invasive forest weed particulary in the central North Island. In December 2005 the Environmental Risk Management Authority (ERMA) approved the field release of *Cleopus japonicus* (Curculionidae) for its control. *C. japonicus* was imported from China several years ago and has been the subject of extensive host testing in the Ensis quarantine facility. The first releases are planned for September 2006. An extensive monitoring programme will measure the success and rate of spread the weevils.

POST-BORDER (NEW RECORDS):

The following organisms were recorded as new to New Zealand.

Phytophthora kernoviae

During a review of the genus *Phytophthora* in New Zealand, in which curated isolates were examined using both morphological and molecular techniques, two isolates were determined to be the newly described (2005) species *Phytophthora kernoviae.* One isolate was from soil and the other from custard apple (*Annona cherimoya*). Both locations are in the far north of New Zealand. *Phytophthora kernoviae* is a serious pathogen of *Fagus sylvatica, Quercus robur, Q. ilex* and *Liriodendron tulipifera* in Cornwall, England. It causes large cankers on the stem which kill the trees if the stem is girdled.

Biosecurity New Zealand (BNZ) was immediately notified of the identification by Landcare Research and has since begun an incursion investigation and has established a technical advisory group to provide expert advice for incursion management. BNZ is currently working under the assumption that *P. kernoviae* is an exotic pathogen that has recently arrived in New Zealand. As the mode of action of *P. kernoviae* is similar to *P. ramorum*, there was a strong response from some international trading partners following the notification issued by BNZ.

The potential impact of *P. kernoviae* in New Zealand remains uncertain. Further study of this organism, including its host range and geographic distribution in New Zealand are in progress.

Fusarium oxysporum f.sp. ? on *Albizia julibrissen* (Chinese silk tree). In April 2005 wilting and dying *A. julibrissen* trees were reported from two locations in Auckland. Dark staining observed with the growth rings in the stem was characteristic of a vascular wilt disease. Wilt of *Albizia* spp caused by *Fusarium oxysporum* f. sp. *perniciosum* is well documented in the USA, where it is referred to as "mimosa wilt". It has also been recorded in Greece, Japan, Argentina, Puerto Rico, and in parts of the former USSR. In the USA it is regarded as an extremely serious disease of *A. julibrissen,* with little chance of survival for most infected trees. Death of the tree usually occurs within a year. The fungus has been identified by morphological and DNA analyses. The *F. oxysporum* complex contains about 150 formae speciales associated with specific hosts. Based on the host association these isolates from *A. julibrissen* would be classified as *F. oxysporum* f. sp. *perniciosum* but when the DNA sequence data were analysed *F. o.* f. sp. *perniciosum* was not the closest match. The Ministry of Agriculture and Forestry has funded Landcare Research to carry out research aimed at resolving formae speciales identifications within this complex.

Emplesis bifoveata (Curculionidae) on *Syzygium paniculatum* at Auckland. This weevil is native to Queensland and New South Wales. The first, but unpublished, record from New Zealand is 1999 (Peter Maddison, pers. comm.).

Coryneum umbonatum on *Quercus robur* in mid Canterbury. Fruiting bodies of this fungus were found on dead branches and twigs but there was no evidence of active dieback. *Coryneum umbonatum* is extremely common on *Quercus* spp. in the United Kingdom, Europe and the United States and has also been recorded from *Castanea* spp. It is regarded as a saprophyte.

Phomopsis abdita on *Melia azedarach* from Bay of Plenty. This species has been recorded from Cuba, India and France on this host but there is apparently no information on how much damage it causes. In this instance severe crown dieback was noted and the fungus was associated with both cankers and dieback. *Phompsis* spp. are recognised as pathogenic to varying degrees.

Stengosporium pyriforme on *Acer pseudoplatanus* from Bay of Plenty. This fungus has been reported from eastern North America and Europe on species of *Acer, Betula, Fagus* and *Tilia.* In eastern North America it is confined to *Acer* spp. It is found on bark as well as dead twigs and branches and is considered to be saprophytic.

Puccinia cygnorum on *Astartea fascicularis* from Hawke's Bay. In 1991 a species of *Puccinia* was found on freshly collected stems of *Kunzea ericifolia* (native to the south-west of Western Australia) that had been exported to New Zealand as part of the trade in material for cut flower arrangements. The material was rejected by MAF Quarantine

because fungi were found on the stems during routine inspection. Subsequently Australian plant pathologists found infected plants in Perth, West Australia and described the new species *Puccinia cygnorum* in 1994. It was reported that about 5% of the *K. ericifolia* shrubs were infected and that on most plants infection was light. Dieback followed girdling of the current season's growth. No other hosts of *P. cygnorum* have been reported. During a routine high risk site survey of the Napier Botanic Gardens dieback of twigs of two plants (identified in the field as closely related to *Leptospermum*) was observed. These are thought to be the only plants of *A. fascicularis* in the gardens. This host is extremely uncommon in New Zealand; however *K. ericifolia* is planted widely. The possible susceptibility of closely related indigenous *Leptospermum* and *Kunzea* is of concern.

Mycosphaerella effigurata (**tentative identification**) on *Fraxinus angustifolia* in Hamilton, Waikato. The fungus found could be the anamorphic state of *M. effigurata* but the identification is uncertain in the absence of the teleomorph. The anamorph has been called *Marssonina fraxini* but the current status of the name is uncertain. *M. effigurata* causes a moderately important leaf-spot disease of *Fraxinus* spp. in North America.

Phyllosticta abietis on *Cedrus atlantica* in Gisborne. *Phyllosticta abietis* was described as a new species in 1989. It was previously reported as *Phyllosticta* sp. associated with needle blight of *Abies grandis* in the USA. There are very few reports of the fungus or disease associated with it. Distribution is now reported to include Canada and the host list to include *Pseudotsuga menziesii*. Most *Phyllosticta* spp. are understood to be foliar pathogens but the effects of *P. abietis* in North America appear to be minor.

An undescribed species of *Puccinia* causing leaf pustules, dieback and witches broom was found on *Olearia lineata* and O. *solandri* It is speculated that it may be a previously unrecognised native species. The rust is known only from a confined area within the city of Christchurch. Inoculations have shown that the rust fungi *Caeoma peltatum* on *Phyllocladus* spp. and *Uredo fuchsiae* on *Fuchsia* spp., both endemic to New Zealand, are anamorphs of a single species. Uredinial and telial states formed on *Fuchsia excorticata* after inoculation with aeciospores from *Phyllocladus trichomanoides*. The rust closely resembles species in the family Mikronegeriaceae, and is named as a new species of *Mikronegeria* (in press). Two species of *Mikronegeria* are known from South America on *Nothofagus* with alternate stages on *Araucaria* and *Austrocedrus.*

SURVEILLANCE

Forest condition monitoring

A revised forest health surveillance system

The New Zealand Forest Owners' Association (NZFOA) instigated a new forest health surveillance scheme on 1 July 2005, with the intent of providing data on forest health status while still maintaining some degree of pest detection capability. The new scheme involved assessing viewpoint plots (a stand-wide assessment of predefined disorders primarily affecting crown condition, with the aid of binoculars) and temporary health plots (transect-based plotting systems used to assess current pest status and for new pest detection). A series of high risk forest surveillance plots were established in areas where the risk of exotic introductions is considered to be high (about 30 over the country). Intensive pest detection surveys will be carried out at these sites. After the first year of operation the scheme could be judged a moderate success operationally. Health status reports were accurate and delivered to forest owners on time, by and large. In the absence of a control, it is difficult to judge how the pest detection component of the system performed. One new to New Zealand organism was found at a high risk forest site (a nematode on *Coprosma repens*), but to be fair the site was Mt Victoria in Wellington so it could be considered an urban high risk site too. A total of 13 new location or new host associations were made during forest surveys, a significant increase on the 5 records made during the previous year.

RECENT PUBLICATIONS AND WEBSITE FEATURES:

The monthly Ensis publication *Forest Health News* can be viewed on line. See:

www.foresthealth.co.nz.

To subscribe to this newsletter electronically, contact john.bain@ensisjv.com