Standing Council on Primary Industries
Forestry and Forest Products Committee
Research Priorities and Coordination Committee
and
Plant Health Committee

RESEARCH WORKING GROUP 7
FOREST HEALTH

Annual Pest, Disease & Quarantine Status Report for Australia and New Zealand 2010/2011

October 2011

Table of Contents

Key issue and threats

New South Wales

Myrtle rust: the impact of myrtle rust (*Puccinia psidii*) in forests and plantations is currently unknown, but it is already impacting on a range of rainforest species in native forests. Monitoring of myrtle rust in native forest stands and plantations continues.

Spotted gum canker: the full extent and impact of spotted gum canker is not known, and is currently being determined. In some plantations a large proportion of trees are affected, resulting in significant volume losses.

Sirex wood wasp continues to be a threat in softwood plantations.

Queensland

Myrtle rust: After initial detection in Queensland in December 2010, Myrtle rust rapidly spread throughout regions of south east Queensland impacting on a wide range of species. The disease has had significant impact on the nursery industry (in excess of $9 million), urban and peri urban areas, revegetation sites and native forests. The disease has not as yet been identified in plantation hardwoods. However, glasshouse screening would suggest that there is susceptibility within the key Queensland hardwood species.

The Sirex wood wasp (*Sirex noctilio*) threat to pine plantations in southeast Queensland continues to increase, with numbers of trapped wasps and detected struck trees increasing in the Stanthorpe area following the initial detection in February 2009.

Victoria

Softwood Plantations

An issue emerged during the 2010-11 season concerning the impacts of Dothistroma Needle Blight. Above average rainfall in 2010-11 allowed the development of a Dothistroma outbreak that has not been seen since the early 1990's. This increase in pathogen levels has been brought on by the wet and mild spring, summer and autumn of 2010-11, which had a significant change in environmental conditions compared to the past 15 years of surveys. Average levels of current infection increased in some localised areas above the economic threshold.

Hardwood Plantations

Mycophaerella's, Allographina and Kiramyceses caused significant damage in localised areas around the State. The level of damage increased significantly from the previous year due to a warm and wet spring, summer and autumn in the Gippsland and Otways districts. Reports of damage were also confirmed from south west Victoria in 2 year old *Eucalyptus globulus* where the pathogen was generally in low levels.

Kirramyces eucalpti caused significant discolouration and defoliation of *Eucalyptus nitens* plantations in both the Otways and Gippsland Regions. This is the first time the pathogen has been identified as a significant threat to plantations in Victoria. Both

juvenile and adult foliage was affected. If environmental conditions remain wet and warm, the development of this pathogen will continue and may spread to other areas where *E.nitens* is grown.

Tasmania

South Australia

No new or emerging pest or disease issues recorded in South Australia in 2011.

Introduction of Myrtle Rust (*Puccinia psidii*) from eastern states remains a threat.

Western Australia

An outbreak of gumleaf skeletonizer (GLS) was first observed in the summer season of 2009-10 but escalated substantially in the summer of 2010-11. The last major outbreak was in the period 1982-92. Severe defoliation has occurred on 250,000 ha, with > 350,000 ha experiencing severe to moderate defoliation. The mean larval density was measured in December as 824 larvae kg^{-1} dry weight of leaf, nearly twice the past peak outbreak level in 1986-87. Some areas of forest experienced nearly 100% defoliation.

Record low rainfalls over the past three years, coupled with prolonged high temperatures have resulted in widespread tree deaths in southwest WA. Assessments conducted indicate that the underlying contributory factors to tree deaths in plantations and native forests are the prolonged absence of rain and the associated fall in water tables. There has been a significant decline in soil moisture in the root zone to such an extent that tree survival has been compromised. No amount of rainfall in the current season will ameliorate the impact on the plantation timber currently affected. Mortality in the coastal plantations continued through winter and current estimates indicate approx 75% loss of plantations of *Pinus pinaster* immediately north of Perth. For water tables to stabilise and recover, several years of above average rainfall is required. In the immediate future, rainfall trends suggest this outcome is unlikely. Mortality in the native forest areas occurred in overstorey (jarrah/marri) and midstorey (*Banksia grandis/Allocasuarina*) in noticeable patches. All size and age classes of trees are affected. Most canopies died very quickly (within 5-7 days), losing their shoots and leaves within a month. Wood boring beetle and bark beetle populations responded strongly to the drought-induced collapse of jarrah and marri in the Northern Jarrah Forest by quickly colonizing damaged stems (83% of marri, 84% of jarrah).

In June/July 2010 large portions of the northern jarrah forest experienced extreme low temperatures (-4 to -6º C) resulting in rapid foliage and shoot mortality in marri and jarrah. Damage was restricted to drainage lines, which likely acted as cold-air sinks.

New Zealand

In indigenous forests collar rot of *Agathis australis* (kauri) associated with *Phytophthora* taxon Agathis continues to be a major concern.

The primary cause of growth loss in the major plantation species *Pinus radiata* is the suite of foliage diseases recorded in New Zealand.

SUMMARY

New South Wales

In hardwood plantations, overall health status generally remained static. Damage from cardiaspina and creiis psyllids was slightly higher than last year, but restricted to several plantations. Damage from herbivorous insects was also restricted to a few plantations, and there were only small areas of damage from leaf and shoot fungi. The area affected by bell-miner associated dieback (BMAD) and stem borers remained static. A new emerging canker disease in spotted gum (*Corymbia*) plantations has recently been detected, with significant damage (including tree death) in several plantations.

In softwood plantations, overall, plantation health was generally good in 2010, with few major issues: sirex woodwasp continues to cause tree mortality in several areas in Hume and Macquarie Regions; damage from essigella pine aphid was significantly lower in all Regions; tree mortality associated with drought was relatively restricted to localised areas in Macquarie Region; hail damaged a localised area in Macquarie Region; wind damage occurred in several areas in Hume and Macquarie regions; dothistroma needle blight, however, was significant and widespread in Northern Region (Walcha plantations). Management intervention included chemical control of dothistroma needle blight, biological control for sirex wood wasp and salvage logging of wind-throw.

Queensland

Surveys of Teak (*Tectona grandis*), red mahogany (*Eucalyptus pellita*) and sandalwood (*Santalum album*) in the tropics have continued to identify a number of significant pests and diseases.

For teak, an emerging problem has been Pink Disease (*Erythricium salmonicolor*) causing severe cankers at a number of sites in far north Queensland. Clonal differences were noted in susceptibility, but more intensive assessments of clonal trials are needed. The two major insect problems associated with teak plantings were the teak defoliator, *Hyblaea puera* and teak skeletoniser, *Paliga damastesalis*.

For red mahogany, bacterial wilt continues to cause morality on poorly drained sites and two leaf blights (*Pilidiella* and *Cylindrocladium*) were identified causing defoliation of older age foliage. Gum tree scale, paropsine beetles, cup moths, scarabs and borers were considered the highest potential insect pest risks to *E. pellita* plantation productivity. In February 2011 the majority of *E. pellita* plantings in north Queensland were severely damaged by cyclone Yasi and are not being replanted.

In sandalwood plantings in far north Queensland and Kununurra, W.A., sandalwood itself has had far fewer significant pest and pathogen issues than its host plants. In contrast,

host trees have tended to have a greater prevalence of generalist pests that occur in surrounding crops, such as aphids and mealybugs. Other issues affecting host plant health may be related to irrigation, nutrition and the complex interactions generated by demands of the parasitic relationship of sandalwood on its hosts.

Sirex wood wasp numbers have continued to increase in the Stanthorpe region of southeast Queensland following from its initial detection in the region in February 2009. It has not yet been detected outside this region, but has expanded its range within the region from the point of the initial detection.

A widespread outbreak of the gum leaf skeletoniser (*Uraba lugens)* was observed in southeast Queensland from August – October 2010, particularly in remnant narrow-leaved ironbarks (*Eucalyptus crebra*) in the South Burnett and Lockyer Valley*,* but also on a range of other remnant eucalypt species including *Corymbia tessellaris* (Moreton Bay Ash), *E. tereticornis* (Forest Red Gum), and in a plantation of *C. citriodora* ssp. *variegata* (Spotted Gum).

Victoria

Sirex noctilio has remained at relatively low levels across the State, except for isolated softwood plantations in North East Victoria, which have shown elevated levels of damage.

Monterey Pine Aphid populations in 2010–11 decreased for the first time since surveys began in 2001. The average levels of defoliation across the State ranged from 0 to 30% with trace levels of discolouration (active aphid infestation) observed. The biological control agent, *Diaeretus essigellae,* continues to be released across Victoria and its efficacy in controlling aphid populations is being assessed.

Ips grandicollis was not observed as a significant pest of Radiata pine plantations in 2010–11. Only two small areas in North East and Otways were seen to be affected.

Dothistroma levels across Victoria increased to levels not seen since the early 1990's. This increase in infection places some areas of the State at risk of a potential significant outbreak.

Cyclaneusma needle cast was observed throughout Victoria in 2010–11, however, damage recorded was at trace to low levels.

Damage from Diplodia was generally confined to either individual trees or small groups of trees that generally had been affected by other environmental stresses such as water logging.

Insect pests of eucalypt plantations such as Autumn Gum Moth, chrysomelid leaf beetles, longicorn borers and psyllids have generally tended to cause only minor localised damage in a small number of plantations.

Perga dorsalis (steel-blue sawfly) continued to cause significant damage in both plantations and native forests in the west and south of the State.

Mycosphaerella leaf disease was found in all eucalypt plantations. Overall, levels have increased from low to severe in some locations due to a warm and wet 2010-11.

Kirramyces eucalpti caused significant discolouration and defoliation of *Eucalyptus nitens* plantations in both the Otways and Gippsland Regions. This is the first time the pathogen has been identified as a significant pathogen to plantations in Victoria.

Increased *Phytophthora cinnamomi* damage was observed across native forest, eucalypt and Radiata pine plantations in Victoria. For the first time in 15 years, environmental conditions were conducive to development because of the late summer and early autumn rains.

Chalara australis (Myrtle Wilt) continued to cause some deaths of mature *Nothofagus cunninghamii* in rainforests and along roadsides where small outbreaks of the pathogen were observed. These outbreaks were associated with disturbance from roadside maintenance.

Department of Primary Industries (DPI) has been working closely with industry to develop and conduct ongoing surveillance programs in forest plantations throughout the State to meet their varying operational and stewardship requirements.

Monitoring of ports within Victoria were undertaken for the national Asian Gypsy Moth program. The City of Melbourne commissioned DPI to undertake Dutch Elm Disease surveys in parkland under their management.

Targeted surveys for *Cryphonectria parasitica* (Chestnut blight) were undertaken by DPI as part of the National Chestnut Blight Eradication Program. Surveys were carried out on known eucalypt hosts and within and around all known infected properties in North East Victoria. Chesnut blight was not isolated from any samples collected from eucalypts however *Holocryphia eucalypti* was identified as the cause of stem cankers on both eucalypt and chestnut trees.

Tasmania

Browsing mammal damage, particularly bark stripping by wallabies, remains the most significant health problem affecting the *P. radiata* estate although the area suffering moderate / severe damage was lower than previous years. Higher than usual rainfall in northeastern Tasmania during the 2009-10 growing season resulted in an increase in the area of the *P. radiata* estate suffering moderate / severe defoliation from *Dothistroma*. None of the *Sirex* populations detected during the year were sufficiently high to require management. The State remains free of *Ips grandicollis*, while *Essigella californica* remains confined to the south of the State where it is causing little damage. Windthrow remains the main abiotic damage suffered in the *P.radiata* estate.

Above average rainfall fell across northern Tasmania during the 2010-11 growing season resulting in widespread moderate / severe defoliation following epidemics of fungal leaf diseases: *Kirramyces eucalypti* and *Teratosphaeria* spp. were the main pathogens involved. Leaf beetle populations were at comparable levels to previous seasons: one third of the nearly 29,000 ha monitored supported above-threshold populations, with almost 5,500 ha being sprayed, mostly with α-cypermethrin. *Paropsisterna bimaculata* was the dominant species. The newly-described species, *P. selmani*, was present in many northern plantations.

Static trapping at Tasmania's five major ports only detected native species or known established exotic species.

There was a strong research focus on understanding the performance and benefits provided by the leaf beetle IPM. The IPM had a benefit – cost ratio of 1.78:1 in 2009-10 and performed optimally in 3-6 year-old plantations. Declining performance of the IPM in older plantations was mainly due to false negatives (monitoring failed to detect above-threshold populations). In addition, most of the severe end-of-season defoliation occurred in older plantations that were not managed for leaf beetles. Altitude and proximity to Poa grasslands were significantly associated with differences in the proportion of plantations with above-threshold populations. A site-hazard rating based on these two factors has been used to stratify the plantation estate into low, medium and high leaf beetle risk. Based on this research the leaf beetle IPM will move to risk-based targeting of areas to manage for leaf beetles in 2011-12.

South Australia

In general the health of the forest has improved this year with good rains after several years of drought.

Sirex remains at a low level in all regions. Annual surveillance and inoculations continued in all pine growing areas.

Ips grandicollis remains active in the Mid North plantations of Wirrabara and Bundaleer but with increase thinning and pre-commercial thinning, the health of these plantations is also improving. Areas that were damaged by a windstorm in 2010 have been salvaged and the residue managed to minimise impact of Ips.

Aphid numbers have generally been low throughout South Australia in 2011. Releases of the biocontrol agent, *Diaeretus essigellae*, have continued and several "mummies" have been recovered. Monitoring is continuing.

Continuing changes in ownership and loss of personel have resulted in limited information being available on the health of plantations, particularly eucalypt plantations. There continues to be damage (particularly in young plantations) caused by a number of established pests such as Autumn Gum Moth, Christmas beetles (*Anoplagnathus* spp.),

Cup Moths and Eucalypt Weevil (*Gonipterus scutellatus*) which require spraying of affected areas. Shothole miner (*Perthida* sp.) is now widespread.

Western Australia

A significant outbreak of gumleaf skeletonizer (GLS) was first observed in the summer season of 2009-10 but escalated substantially in the summer of 2010-11. Severe defoliation has occurred on 250,000 ha, with > 350,000 ha experiencing severe to moderate defoliation. Total defoliation of some *E. saligna* and *E. botryoides* plantations were also observed. These plantations were isolated from the main outbreak.

Record low rainfalls over the past three years, coupled with prolonged high temperatures have resulted in widespread tree deaths in southwest WA. Mortality in the coastal plantations continued through winter and current estimates indicate approximately 75% loss of plantations of *Pinus pinaster* immediately north of Perth. Mortality in the native forest areas occurred in over-storey (jarrah/marri) and mid-storey (*Banksia grandis/Allocasuarina*) in noticeable patches. All size and age classes of trees are affected. Most canopies died very quickly (within 5-7 days), losing their shoots and leaves within a month. Wood boring beetle and bark beetle populations responded strongly to the drought-induced collapse of jarrah and marri in the northern jarrah forest by quickly colonizing damaged stems (83% of marri, 84% of jarrah).

There is no formalised plantation estate-wide surveillance and monitoring program for pests and diseases in Western Australian plantations (although one is currently being developed by the IPMG). Plantation managers do however frequently visit (at least monthly) plantations less than 3 years old to monitor growth and general health. Thereafter plantations are visited once a year. Reports and records of pests and diseases are often ad-hoc, occur after the main damage has occurred and data are frequently not data-based or easily accessible for historical reference.

In pine plantations the drought has had the most significant impact. Of note were the very high numbers of bark beetles caught in static (*Sirex*) traps north of Perth that preceded the overt symptoms of drought, and significant areas of mortality in *P. radiata* plantations caused by *Sphearopsis sapinea* following summer hailstorms. The European house borer (EHB) incursion transitioned from “containment and eradication” to “management”.

In *Eucalyptus globulus* plantations, pest and disease levels reported over 2010-2011 were moderate. Insect damage levels seemed to be exacerbated by prolonged drought conditions. *Liparetrus* beetles, the chrysomelid *Paropsisterna m-fuscum* (yellow belly) and wingless grasshoppers caused most damage to seedlings and young plantings. *Heteronyx* beetles, eucalypt weevils (*Gonipterus* spp.) and chrysomelids (*Paropsisterna variicolis*) continue to be the most frequently reported insect pests in >3 year-old plantations.

In native forest, dieback in jarrah forest caused by *Phytophthora cinnamomi* and tree decline in tuart and wandoo woodland continues to command attention. Soil and plant samples tested to confirm the presence of *P. cinnamomi* have identified new *Phytophthora* taxa. In addition to *Phytophthora multivora*, a further eight new species

isolated from WA natural ecosystems have now been described: *P. elongata, P. thermophila, P. gibbosa, P. gregata, P. litoralis, P. arenaria, P. constricta* and *P. fluvialis.* Pathogenicity has so far been tested and confirmed on native plants for *P. multivora*, *P. elongata, P. arenaria* and *P. constricta*. Several additional new WA taxa await formal description. New records for WA of *Phytophthora* taxa known elsewhere have included: *P. inundata*, *P. niederhauserii*, *P*. taxon asparagi, *P*. taxon personii, *P*. taxon PgChlamydo, *P*. taxon rosacearum-like, *P*. taxon salixsoil and *P*. taxon humicola-like. Most of the newly-described Phytophthoras (and some of those yet to be described) have been associated with multiple species of dying native plants in WA natural ecosystems.

New Zealand

The levels of Dothistroma needle blight of *Pinus radiata* were higher in 2010-11 than in the previous two years but still well below those recorded in the years 2000-2008. The severity of Cyclaneusma needle-cast increased slightly but not significantly from low levels experienced over the past few years. Physiological needle blight has affected parts of Northland, and red needle cast (previously referred to as atypical *Cyclaneusma*) is at relatively high levels in some stands in the central North Island and Nelson.

There has been no further northward extension to the range of *Neonectria fuckeliana* which remains restricted to the lower half of the South Island. Management regimes to control Nectria flute canker have resulted in a significant reduction in the number of trees affected.

Armillaria root disease, caused primarily by *Armillaria novae-zelandiae*, remains widespread in many *Pinus radiata* plantations throughout much of the country**.**

Small patches of mortality in some young *P. radiata* plantations in the northern South Island were associated with *Phytophthora cactorum* infection.

The eucalypt tortoise beetle *Paropsis charybdis* (Chrysomelidae) continues to be a major pest, particularly in *Eucalyptus nitens* plantations.

Uraba lugens (Nolidae), the gum leaf skeletoniser, is widespread in the greater Auckland region, and is present in the northern part of the North Island. In the last year it was found in Nelson, the first record from the South Island. It has not been reported as a concern in commercial plantations. The biological control agent (*Cotesia urabae* (Braconidae)) has been imported from Tasmania and is established in Auckland.

Ophiostoma novo-ulmi, causal agent of Dutch elm disease, remains confined to the greater Auckland region. Very high numbers of beetles were trapped in three locations during the 2010-11 control program and extensive focussed searches were required before the source of these high beetle numbers were found – all were dead wood on the ground or firewood stacks. Three elm trees positive for Dutch elm disease were found and removed.

State Annual Reports

New South Wales

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FOREST HEALTH SURVEILLANCE PROGRAM

The annual forest health surveillance program was interrupted in 2010 due to the incursion of the exotic disease myrtle rust[1] and the Forest Health Survey Unit (FHSU) conducting much of the surveillance during the early part of the emergency response[2]. Aerial surveys were also delayed due to the Forests NSW helicopter requiring a major service mid-year. Aerial surveys were conducted over the majority of the pine estate in Macquarie (mid-August), Northern (late-August), Hume and Monaro (late-October) Regions, and a portion of the hardwood estate in Northern Region (late-August). Reduced but targeted ground surveys were conducted in all softwoods Regions in 2010, often in conjunction with the aerial survey, with ground surveys of hardwood plantations occurring in late-2010 and early-2011. A separate aerial survey for wind damage was conducted in Macquarie Region in late-February to assist with identifying areas to salvage following severe storms.

Each Region was provided with a debrief immediately following the aerial and ground surveys, either verbally or via email, highlighting the main issues and indicating any likely management options. Forest Health Survey Reports were provided generally within 1 month of the survey, detailing the key issues observed and recommending management options where appropriate. GIS maps (or shapefiles) of key health issues were supplied, including maps for control of Dothistroma needle blight, wind damage and risk maps for Sirex wood wasp to assist in location of trap tree plots for the biological control program. *Ad hoc* discussions were held with regional staff throughout the year relating to specific issues, including the Sirex biological control program, Dothistroma needle blight control and myrtle rust.

SOFTWOOD PLANTATIONS

Overall, plantation health was generally good in 2010, with few major issues: Sirex wood wasp continues to cause tree mortality in several areas in Hume and Macquarie Regions; damage from Essigella pine aphid was significantly lower in all Regions; tree mortality associated with drought was relatively restricted to localised areas in Macquarie Region; hail damaged a localised area in Macquarie Region; wind damage occurred in several areas in Hume and Macquarie regions; Dothistroma needle blight, however, was significant and widespread in Northern Region (Walcha plantations). Management

1 Carnegie *et al.* (2010) *Uredo rangelii,* a taxon in the guava rust complex, newly recorded on Myrtaceae in Australia. *Australasian Plant Pathology* **39**:463-466.

2 Carnegie AJ, Cooper K (2011) Emergency response to the incursion of an exotic myrtaceous rust. *Australasian Plant Pathology* **40**: 346-359.

intervention included chemical control of Dothistroma needle blight, biological control for Sirex wood wasp and salvage logging of wind-throw.

Sirex wood wasp

Sirex continues to cause tree mortality in certain areas in Hume Region. The outbreak in Green Hills North, in the Monterey Road area, has continued to spread north into unthinned stands, with significant mortality (5–10%) in a range of compartments in the 1996–1997 age classes. In compartments where wildlings are an issue in this area, high levels of sirex attack occurred, as sirex is able to build up in these small, sub-dominant trees. However, areas south of this that have in previous years had high levels of sirex damage have now seen a crash in the sirex population due to a combination of a concerted campaign to introduce the biological control agent (nematode) as well as thinning operations (which reduce tree stress and removes wildlings). This illustrates how a major pest can be effectively managed to reduce significant losses, with surveillance detecting the outbreak and then the biological control program in combination with silvicultural operations controlling the pest. A small private plantation adjacent Blowering State Forest (SF) had high levels of sirex attack, and an increase in the biological control program in Blowering SF will help control this outbreak as well as reduce the damage to adjacent Forests NSW stands. Elsewhere in Hume Region low levels of damage from sirex were observed, including areas in Carabost SF, Blowering SF, Buccleuch SF and Mannus SF.

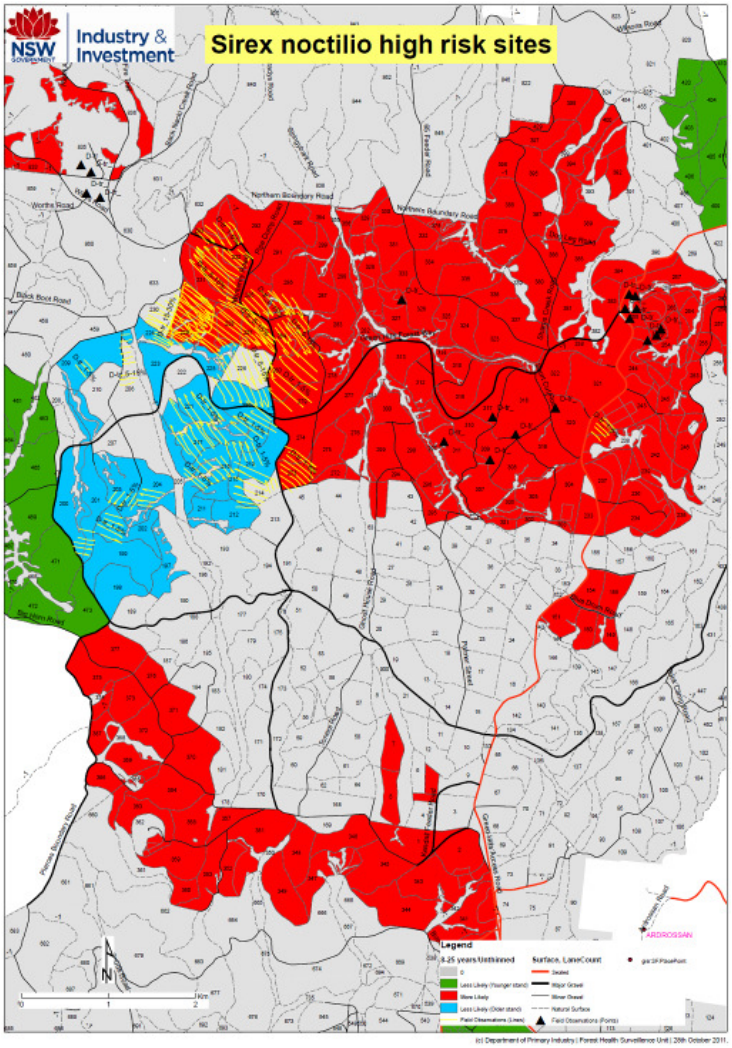
In Macquarie Region, a localised outbreak of sirex was observed in Canobolas SF (1998–1999 age classes), with moderate levels of attack. Many of the attacked trees were suppressed wildlings, but co-dominant trees were also attacked and killed. Elsewhere in Macquarie Region, low levels of sirex attack were observed in several compartments in Sunny Corner SF.

Sirex was not an issue in Northern or Monaro Regions, with small levels of attack observed in Croft Knoll and Oak Range, respectively. Interestingly, we observed old Sirex attack in *Pinus patula* wildlings in Mt Mitchell SF, which is a new host for Sirex in Australia.

The reportable area (for social, environmental and economic performance) affected by sirex in Forests NSW estate was 530 ha, which was slightly more than for 2009–10.

In all areas where we observed sirex activity we targeted these compartments with trap tree plots, with increased trap tree plots in areas with increased activity (e.g. Green Hills North, Canobolas SF, Mannus SF). The FHSU also developed sirex risk maps, based on susceptibility of age classes (generally 8-20 years old) and silviculture (unthinned stands), to further assist Regions in prioritising location of trap tree plots. Selection of areas for location of trap tree plots is optimised by utilising the sirex risk maps (i.e. identifying susceptible stands) and taking into account current sirex activity (i.e. sirex attack observed during forest health surveys) and the effectiveness of the biological

control program determined from results of the trap tree plot emergence data[3]. This system allows for a reduction in overall number of trap tree plots that need to be established, reducing costs, without increasing the risk of sirex outbreaks.



Sirex risk map for Green Hills SF (north), showing high risk sites and aerial observations (hatched lines = >1% incidence; triangles = single trees).

In recent years we have utilised panel traps with pheromone lures (in place of trap trees) to detect sirex in the southern-pine (*Pinus taeda, P. elliottii, P. elliottii* x *caribaea* hybrids) growing areas of Northern Region (in plantations around Casino and Urbenville). These traps have proved effective for early detection of sirex, detecting the movement of sirex into Queensland in 2009 To date, the traps have not caught sirex in this area, providing further evidence that the pest is not established in north-east NSW.

3 Carnegie AJ, Bashford D (2012) Sirex woodwasp in Australia: current management strategies, research and emerging issues. *In:* B. Slippers et al. (eds) *The sirex woodwasp and its fungal symbionts: research and management of a worldwide invasive pest* (Springer).

To monitor the effectiveness of the biological control program, a selection of billets from trap trees are placed into drums and parasitism levels of the wasps that emerge are determined (i.e. the proportion of wasps with nematodes) and the numbers of parasitoid wasps (*Ibalia leucospoides* and *Megarhyssa nortoni*) that emerge are collated Results from the 2009–10 emergence season (which is relevant for the 2010 surveys) indicate good parasitism (~90%) of inoculated trap trees in Southern Hume and in Macquarie Region, but poor results from Northern Hume, with very few wasps emerging from billets placed in drums, indicating issues with trap tree establishment. Very few wasps emerged from the monitoring of billets from Northern region, and no trap trees were established in Monaro region for monitoring in 2009–10. Of the parasitoid wasps used for biological control, good numbers of *Ibalia* were reported (emerged) but low numbers of *Megarhyssa.* There was not enough data from naturally struck trees to report trends here.

Ips bark beetles (*Ips grandicollis*) are a continuing concern to the sirex biological control program, with beetles attacking trap trees in all regions in NSW. Research funded by the Australian Research Council (ARC) and the National Sirex Co-ordinating Committee (NSCC), with industry support, is examining the impact and management options of this issue.

Essigella pine aphid

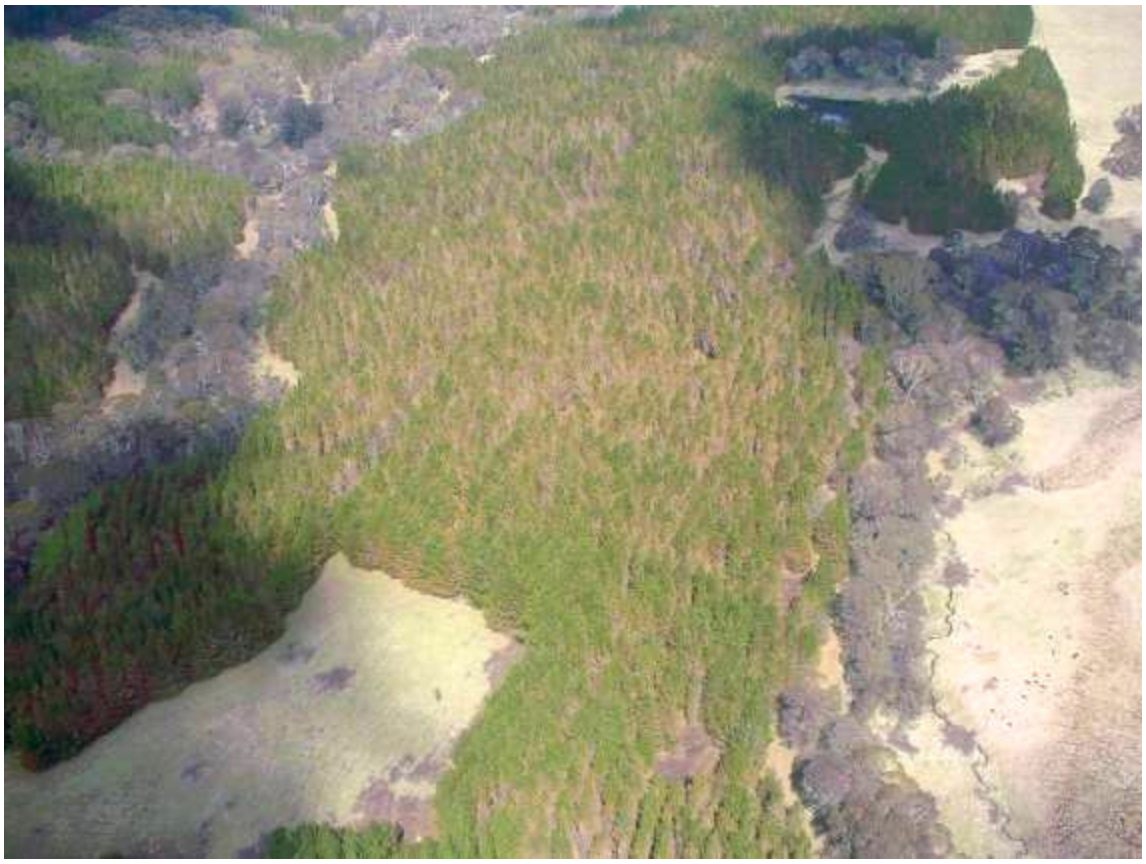
The monterey pine aphid, *Essigella californica*, has caused widespread and severe damage in NSW in most years since it was first detected in Australia in 1998. Damage from essigella this year, however, was significantly lower than in previous years in all Regions in NSW. This is most likely due to good rainfall across the pine-growing areas of NSW. Moderate levels of needle chlorosis and defoliation were observed in several areas in Buccleuch SF in Hume Region, with low levels elsewhere (e.g. Green Hills SF, Bago SF, Carabost SF and Mundaroo SF). In Macquarie Region, only low levels were observed (e.g. Essington SF, Sunny Corner SF and Vulcan SF). However, "grey-topping" (defoliated tops from previous year's essigella damage) was evident in large areas of Essington SF, which has experienced severe and repeated damage since essigella first arrived. Essigella was not an issue in Monaro or Northern Regions.

In 2005, a project was commissioned by the forest industry (including the majority of pine growers) to import a biological control agent for essigella, the parasitoid *Diaeretus essigellae*[4]. Following extensive testing once the parasitoid arrived in Australia (2007), releases of the parasitoid began in late 2009. Releases have been made in Macquarie, Hume and Northern Regions to date, with more planned for these and Monaro Region this year. Follow-up monitoring at release sites reveals that only low levels of establishment have occurred. Releases and monitoring will continue for another 12-14 months. The reportable area of essigella damage in Forests NSW pine plantations was 18,161 ha, which was significantly lower than for 2009–10 (42,600 ha).

4 Kimber et al (2010) *Diaeretus essigellae,* a biological control for Monterey pine aphid, *Essigella californica*: host-specificity testing and historical context. *Australian Journal of Entomology* **49**I377-387.

Dothistroma needle blight

Dothistroma needle blight caused severe damage in Northern Region's tablelands plantations in 2010 (Walcha plantations), with severe and widespread damage in Riamukka SF and Nowendoc SF, and lower levels and more localised damage in Hanging Rock SF and Nundle SF. In Hanging Rock SF, younger age classes (2005 and 2008) were significantly affected. Only low levels of damage were observed in Mt Mitchell SF; however, thin crowns indicated severe damage in previous years. Dothistroma needle blight was also observed in localised areas (gullies) in Hume Region (e.g. Mannus SF, Maragle SF, Green Hills SF, Bago SF) and Monaro Region (e.g. Coolangubra SF, Nalbaugh SF). In both Northern Region and Hume Region, *Pinus ponderosa* plantings (most >80 years old) were severely affected. Maps of affected areas were supplied to Northern Region for aerial spraying operations, with approx. 1,800 ha sprayed in November 2010. The reportable area of dothistroma needle blight in Forests NSW pine plantations was 2,026 ha, which was similar to 2009–10.



Dothistroma needle blight in Pinus radiata on the NSW northern tablelands.

Drought-associated tree mortality

Tree mortality associated with drought and water stress on low quality sites (e.g. rocky ridge tops) was significantly lower in 2010. In Macquarie Region, moderate levels (5–15%) were observed in Pennsylvania SF, with lower levels (1–5%) observed in Canobolas SF, Macquarie Woods SF and Mount David SF. In Hume Region, low levels (1–5%) of tree mortality associated with drought or water stress was observed in the northern sections of Buccleuch SF and the northern sections of Carabost SF.

The reportable area of drought-related damage in Forests NSW pine plantations was 2,541 ha, which was significantly lower than for 2009–10 (8,000 ha).

Wind damage

Storms caused wind damage (wind-throw) in Hume, Macquarie and Monaro Regions (in total 2,294 ha). In Hume, damage tended to be more severe in gullies and in recently thinned stands, with most areas relatively small, and the number of trees felled being variable (from 5% up to 75%). The most severely affected areas, where salvage was recommended, included stands in Carabost SF, Blowering SF and Bago SF. In Macquarie, a separate aerial survey was conducted in February 2011 to map wind damage. Much of the damage was concentrated adjacent areas that had recently been or were in the process of being harvested, or in recently thinned stands. The most severely affected areas included stands in Mullions Range SF, Canobolas SF and Sunny Corner SF, where salvage was recommended. Only small areas of wind damage were observed in Monaro region, including in Coolangubra SF and Bondi SF. Salvage was recommended in Coolangubra SF. For Hume and Macquarie Regions, GIS shape-files were provided of affected areas to assist in prioritising salvage operations.

Wind damage in Pinus radiata in Hume Region.

Hail damage
Hail caused extensive damage (mostly dead topping) in Jenolan SF in Macquarie Region. Dead topping will result in multi-leaders if the stand is grown-on and downgrade due to blue stain. Maps of the affected area were supplied to the region to assist in salvage operations. Elsewhere in Macquarie only low levels of hail damage were observed, such as in Sunny Corner SF. Hail damage was also observed in small areas in Monaro and Northern Regions.

HARDWOOD PLANTATIONS

In hardwood plantations, overall health status generally remained static. Damage from cardiaspina and creiis psyllids was slightly higher than last year, but restricted to several plantations. Damage from herbivorous insects was also restricted to a few plantations, and there were only small areas of damage from leaf and shoot fungi. The area affected by bell-miner associated dieback (BMAD) and stem borers remained static. A new emerging canker disease in spotted gum (*Corymbia*) plantations has recently been detected, with significant damage (including tree death) in several plantations. Area figures reported below are mainly calculated from aerial survey observations and are "reportable" levels[5] (e.g., severity of foliage damage >25%; incidence of stem borers >5%). No disorders required management intervention.

Psyllids
Damage from *Cardiaspina* spp. and *Creiis lituratus*, in *E. grandis* and *E. dunnii,* respectively, was slightly greater this year compared to last year, with ~160 ha affected by cardiaspina psyllids and ~170 ha by creiis psyllids. The main areas affected were around Mallanganee for creiis and Kyogle for cardiaspina. In both instances, severe infection has subsequently resulted in dieback of affected trees. Some of the areas affected by cardiaspina are also affected by BMAD. No control was conducted for either pest.

Damage from cardisapina psyllids was also observed in the older (>25 year old) plantations around Coffs Harbour. These are not systematically surveyed to be able to provide accurate area figures, but the majority of plantations had moderate to high levels of damage. Cardiaspina damage was also observed in native stands of *E. grandis.*

Herbivorous insects
There were relatively few plantations with reportable levels of foliar damage by herbivorous insects, where obvious and severe damage was observed during the aerial survey, with ~300 ha affected. This damage tended to be a combination of Christmas beetles (*Anoplognathus* spp.) and chrysomelid leaf beetles (*Paropsis* spp. and *Paropsisterna* spp.) and especially to *E. dunnii*. Herbivorous insects have become less of an issues as the plantations have aged.

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5 Stone, C., Wardlaw, T., Floyd, R., Carnegie, A. J., R. Wylie, R. and de Little, D. (2003). Harmonisation of Methodologies for the Assessment and Reporting of Forest Health in Australia – A Starting Point. *Australian Forestry* **66**, 233-246.

Leaf and shoot fungi
There were few plantations with reportable levels of damage from leaf and shoot fungi, with less than 50 ha affected. The main agents of leaf damage were Kirramyces leaf disease (especially in *E. grandis* x *camaldulensis*) and Quambalaria shoot blight. Foliar fungi have become less of an issue as the plantations have aged.

Bell-miner associated dieback (BMAD)
Damage associated with BMAD was again restricted to a small number of plantations, and in *E. grandis* and *E. saligna* adjacent native forest areas with BMAD.

Stem borers
Damage from stem borers (longicorns beetles and cossid moths) has remained relatively static. The main agents of damage in NSW are *Phoracantha acanthocera* (bulls-eye borer) and *P. solida* (two-hole borer), especially on *E. grandis* and its hybrids*, E. saligna,* and *Corymbia* spp. for *P. solida*, and the giant wood moth (*Endoxyla cinereus*) on a range of species including *E. grandis, E. dunnii* and *E. saligna.* In recent years we have seen an increase in trees affected by the ringbarking longicorn (*P. mastersi*), mainly in older *Corymbia* spp. plantations, and currently at low levels (1%). Damage from the ringbarking longicorns results in tree mortality.

Winter bronzing bug
Approximately 400 ha of *Corymbia* spp. were affected by winter bronzing bug (*Thamastocoris* sp.). This is an increase on previous years, with several new plantations observed with damage. The main area affected continues to be plantations west of Casino, but we also observed damage in the Wauchope area this year. Damage includes chlorosis and premature defoliation.

Spotted gum canker
A new disease has emerged on spotted gum in recent years associated with *Caliciopsis pleomorpha.* Disease begins on branches, which eventually die, and progresses to the upper stem then the whole tree, and can result in tree mortality when severe. A small number of plantations have high levels of damage (>50% incidence), with many having only small levels of damage (<5%). The most severe areas are in far-north NSW. Research is being conducted on the impact, biology and management of the disease.

Spotted gum canker in Corymbia plantations.

BIOSECURITY

Myrtle rust: a new disease with devastating potential

In April 2010 a myrtaceous rust was detected by a cut-flower grower on the Central Coast of NSW[1]. It was subsequently identified as *Uredo rangelii,* a member of the eucalyptus/guava rust (*Puccinia psidii*) complex, and determined to be an Exotic Plant Pest (it is now generally accepted that the exotic rust in Australia is *Puccinia psidii* sensu lato). Eucalyptus rust is recognised as a significant threat to Australia's native Myrtaceae and has been listed as a key biosecurity threat in several industry and national biosecurity plans. The exotic rust in Australia (myrtle rust) is regarded as a strain of eucalyptus rust.

An emergency response was established to determine whether it was technically feasible to eradicate myrtle rust[2]. The emergency response included surveys of a large number of nurseries, residential gardens and bush-land sites, tracing plant movements to and from nurseries, destruction of diseased material, and quarantine zones established in Local Government Areas and on infected premises as well as restrictions on inter-state plant movements. However, by December 2010 the rust had been detected on a large number of properties (nurseries and private gardens), had spread to native bush and been identified on a large number of hosts. It was determined that myrtle rust was now established in Australia and the emergency response was called off. Government and industry bodies are now in the process of working towards a transition to management phase. Myrtle rust is likely to impact on a range of industries reliant on Myrtaceae (including forestry, native cut-flower, tea tree, oil production) as well as the native environment.

Myrtle rust is now considered established along the east coast from south of Sydney to Central Queensland, including two World/National Heritage-listed National Parks, and has been found on over 110 plant species in 30 genera during surveys. The rust is currently most active and damaging in subtropical NSW and Queensland. Severe impact has been observed in several rainforest species, such as *Rhodamnia rubescens* (brush turpentine) and *Rhodomyrtus psidioides* (native guava), native stands of *Melaleuca quinquenervia* (broad leafed paperbark) and some amenity species (e.g. *Syzygium jambos,* rose apple). The number of host species affected and the level of damage and impact is expected to increase.

Current research and research proposals are investigating the epidemiology and impact in the native environment, identifying resistance in a range of Myrtaceae, taxonomic questions and control options. Myrtle rust is here to stay, so we need to "learn to live with it" and manage it to reduce the potential impact on native flora and fauna.

Myrtle rust on a range of hosts: Melaleuca quinquenervia, Syzygium anisatum, Rhodamnia rubescens, Eucalyptus agglomerata, Syzygium jambos.

Queensland

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[2] Forestry Plantations Queensland

SOFTWOOD PLANTATIONS

SOUTHERN PINE PLANTATIONS (*Pinus* species)

Sirex wood wasp (*Sirex noctilio*)

Forestry Plantations Queensland (FPQ) detected Sirex for the first time in Queensland on 10th February 2009 within an abandoned private *Pinus radiata* plantation near Stanthorpe in the southern border "Granite Belt" region. FPQ subsequently expanded its trapping effort yet failed to detect any further Sirex. During the following flight season (2009/2010), Sirex static panel trapping using attractant lures was again instigated throughout FPQ's Passchendaele estate (near Stanthorpe), Gambubal (north-east of Warwick) and Pechey and Geham (north of Toowoomba). Trapping was also extended to the coastal plantations at Beerburrum and Fraser Coast. In February 2010 the first Sirex within FPQ plantations was detected at Passchendaele, some 20 kilometres from the previous year's initial detection. A total of 44 females were intercepted in traps from February to March 2010, using a total of 51 traps. The trap tree plots that were established to facilitate the introduction of the bio-control nematode *Beddingia siricidicola* failed to attract Sirex "strike" as these trees died prior to Sirex emergence. A number of suspected wild struck trees were identified, felled and inoculated with billets collected to ascertain possible Sirex emergences the following season.

Very large Sirex emerging in Queensland: 30 mm male & 37 mm

It was predicted that Sirex would "appear" in numbers during the 3rd flight season (2010/11), however this was not detected with only 9 females intercepted in static traps at Passchendaele. In addition, no Sirex were detected outside of the Passchendaele estate. Throughout the 2010/11 flight season the extreme wet weather probably reduced trap intercepts as it is known that Sirex resist flying during heavy rain. Unfortunately, the extreme weather,

Sirex emergence holes surrounded by *Ips* and *Hylastes* galleries

combined with staff disruptions, contributed to a much reduced trapping effort compared to 2009/10 making comparisons between trapping seasons problematic.

Even though low Sirex numbers were intercepted during 2010/11, it was clear that Sirex populations were building since 13 individuals (3 females and 10 males) emerged from just a few billets collected the previous season. Harvesting contractors also occasionally found stems riddled with emergence holes. In one instance (Passchendaele, October 2010) a 300mm DBH 36 year old "suppressed" tree was found to contain hundreds of emergence holes.

The early emergence holes were puzzling as they did not fit with the 'normal' December to March emergence season. Later observations suggest that Sirex are indeed emerging earlier and/or there may be two separate emergence events, one in early spring and the other during summer. The 2010/11 flight season was more constricted spanning from late January to the first week of April 2011.

Trap tree plot establishment occurred throughout the 2010/11 flight season with 2 plots per month (from October 2010), in each of the five logging areas at Passchendaele. This continued to January 2011 with a total of 20 plots established. Trap tree plot assessment at the conclusion of the flight season indicated partial success. There was obvious strike in some plots but none in others where trees had died quicker than anticipated, with rapid *Ips* invasion likely deterring Sirex strike. Successful trap trees were linked directly to methods used to establish them viz quantity of herbicide used, application of herbicide and positioning of application. Struck plots were inoculated in May 2011 at a rate of 1 million nematodes per 10 tree plot. Wild struck or suspected struck trees were also inoculated. Billets from all inoculated stems were stored within the Sirex emergence facility at Passchendaele for monitoring during the 2011/12 flight season. In order to boost Sirex control efforts, parasitic wasps (*Ibalia* and some *Megarhyssa*) were also released throughout the flight season (supplied by NSW counterpart Angus Carnegie).

Scolytid beetles

- On 21st March 2010, tropical cyclone Ului crossed the coast near Proserpine and damaged approximately half of the 460 ha of mature *Pinus caribaea* var. *hondurensis* (PCH) plantation at nearby Cathu State Forest (SF). *Araucaria* plantations (hoop pine) on the leeward side of the range were relatively unaffected. Damage to plantation PCH was similar to that experienced in March 2006 when tropical cyclone Larry affected north Queensland plantations at Ingham-Cardwell on the coast and on the Atherton Tablelands west of Cairns. Salvage operations (for log export through the Port of Mackay) commenced in early August 2010 and was completed in late 2011.

Multiple *Xyleborus perforans* galleries on cyclone Ului damaged timber

Pinhole borers (Ambrosia beetles) quickly infested timber that had been blown

over by the cyclone or otherwise damaged/stressed by it. Due to the difficulty in collecting these beetles for identification directly from logs, insect trapping using static panel traps and attractant lures, as undertaken following cyclone Larry, was again undertaken within both Cathu SF and the log storage facilities.

Generally, Ambrosia beetles and pinhole borers attack unseasoned timber in injured or diseased areas of living trees, green logs or newly sawn timber. Bark beetles can be primary attackers and killers of living trees, although most are associated with stressed or unhealthy trees. Ambrosia beetles belong to two subfamilies: the Platypodinae and Scolytinae. The Ambrosia beetles infesting the Mackay logs were identified as belonging within the Scolytinae with the only species present being *Xyleborus perforans*. Within the Scolytinae subfamily *Xyleborus* and *Xyleborinus* are the most important wood-boring genera in Australia. Scolytinae are notorious in that a number of important species have been successfully moved and established as exotics around the world.

Scolytids predominately *Truncaudum agnatum* boring into log ends of cyclone Yasi damaged timber

During the later stages of the salvage operation blue stain and decay fungi were also evident, primarily in logs that had been in extended contact with the ground.

- On 2nd February 2011 severe tropical cyclone Yasi crossed the north Queensland coast near Mission Beach causing extensive damage to FPQ's 10,800 hectare softwood plantation estate near Ingham and Cardwell. Some months later (when if finally stopped raining and ground conditions improved!) salvage logging commenced, initially via log exports through the Port of Townsville. Pinhole borers again quickly infested cyclone damaged timber with static panel traps used to intercept specimens for identification and monitoring purposes.

  Traps were positioned within the various plantations where salvage operations were being undertaken as well as at log storage facilities. It was suggested that Platypodids such as *Austroplatypus incompertus* would be the prominent pinhole borer as they attack high moisture content trees as soon as they are damaged or felled, unlike Scolytids which like a lower water content. This did not prove to be the case with only Scolytids being intercepted.

  Static insect trapping undertaken within the Southern pine plantations during 2004/2005 found that *Xyleborus perforans* was the most prolific beetle species intercepted in traps in terms of distribution and total numbers. Following cyclone Larry in 2006 trapping intercepts from the Ingham region demonstrated that

Xyleborus affinis was then the dominant species (rather than *X. perforans*); although *X. perforans* was the only Scolytid present within the Mackay region following cyclone Ului in 2010.

Interestingly following Yasi in 2011 the Scolytid *Truncaudum agnatum* (*Cyclorhipidion*), was by far the most prolific. It has been suggested that *X. affinis* populations may increase in response to the availability of damaged or stressed trees following cyclones. *Truncaudum agnatum* certainly demonstrated an ability to quickly colonise high moisture content logs from trees that were damaged during Yasi. It remains unknown why there has been shifts in species dominance in north Queensland.

- The exotic bark beetle *Ips grandicollis* was detected in south-east Queensland in 1982 and then spread steadily north, being found at Byfield *Pinus* plantations north-east of Rockhampton in 1994. An industry self-imposed *Ips* Quarantine line near Marlborough (north of Rockhampton) restricted further *Ips* migration until 2006 when it was detected in north Queensland. *Ips* first detection in north Queensland was by AQIS at the Townsville Port facility and then in FPQ surveillance traps at Cathu, Abergowrie and Cardwell State Forests. Subsequent trapping over the years in north Queensland has only intercepted a few individual *Ips* with trapping following cyclone Yasi yielding only a single individual.

Static insect trapping undertaken in log stacks following salvage

Throughout the early-mid stage of Yasi salvage operations ground surveys of cyclone felled logs found no evidence of any bark beetle activity, whereas in south east Queensland *Ips grandicollis* would have been the prominent Scolytid immediately following damage. The reason why *Ips grandicollis* is still apparently only a minor background Scolytid is open to interpretation. Predatory clerids were commonly intercepted in static traps although in low numbers.

Ips grandicollis is an introduced species, and it is likely that *Truncaudum agnatum* and *Xyleborus perforans* have been too, though perhaps at a much earlier date. *Xyleborus* and *Truncaudum* carry "Ambrosia" fungi which are quite distinct and grow differently within the wood to the blue-staining fungi that *Ips grandicollis* also carries

Numbers of the bark beetle *Hylastes ater* on log ends of felled & inoculated Sirex trap trees

symbiotically. Due to the absence of any obvious *Ips* log infestations in north Queensland, all blue stain within logs will likely be caused by species of Ophiostomoid fungi other than *Ophiostoma ips*.

- From Rockhampton south *Ips grandicollis* is by far the most prominent Scolytid following tree damage or stress of any kind. Following wildfires, during drought or on sites that quickly dry due to shallow soils, *Ips* typically infest the upper tree stems causing dieback with further lower stem infestation leading to tree death. As *Ips* and the Sirex wood wasp are both attracted to stressed trees, beneficial inhibitory competition may restrict further Sirex spread from south east Queensland.

  Interestingly in September 2011 *Hylastes ater* were found in large numbers under the bark on log ends of felled and inoculated Sirex trap trees within Passchendaele SF. These logs had been in direct ground contact for five months with the beetles restricted to approximately 1.5 m of the butt end of the log. *Ips* was also present having infested the entire length of the logs.

Monterey Pine Aphid
(*Essigella californica)*

The exotic Monterey Pine Aphid had been associated with extensive defoliation and growth losses in *Pinus radiata* plantations in south-eastern Australia since it was first detected in 1998. Needle cast within FPQ estates varies greatly with needle cast not easily linked to the presence of high populations of this aphid. The most common indicator as to the presence of large numbers of these aphids is when foliage becomes noticeably covered in black mould fungi. These moulds feed on the aphid honeydew exudates which drips and accumulates to a greater extent on lower foliage. *Essigella* can now be found on *Pinus* throughout coastal Queensland as well as in inland and NSW border regions. *Essigella* numbers are commonly far greater on *Pinus taeda* although this aphid has been found on all *Pinus* species, including *Pinus* hybrids.


Parasitoid wasp release technique

In order to introduce some controls to *Essigella* populations FPQ, together with growers from several other States, is a co-investor in the FWPA project "Introduction of the wasp *Diaeretus essigellae* for the biocontrol of pine aphid *Essigella californica* in Australia". During the reporting period, SARDI Entomology continued to supply partners with further releases of the parasitoid *D. essigellae.* FPQ received a number of additional bio-control releases as *Essigella* continued to be more abundant during periods when they were low to absent in southern States. These releases were undertaken within Passchendaele and Beerburrum State Forests in south east Queensland. Ground surveys

for the successful establishment of *Diaeretus* is ongoing with evidence to date that established (in the form of mummified *Essigella*) is minimal. This is not surprising as observations of parasitoid dissemination from release bags has been that *Diaeretus* fly or are blown well away from the release sites. It may be many years before *Diaeretus* builds to easily detectable levels. The black mould associated with high levels of *Essigella* has not been observed for some time.

Within south east Queensland the introduced exotic pine tree aphids *E. californica* and *Eulachnus thunbergi* were commonly found inhabiting the same foliage with *Eulachnus* initially far more numerous. *Eulachnus* advanced to north Queensland some years prior to the detection of *Essigella,* but since had virtually disappeared from catch assessments throughout the State. Recent surveys have found that *Eulachnus* have again started to appear near Passchendaele.

Needle Blight (Dothistroma)

The fungus Dothistroma *(Mycosphaerella pini)* regularly causes needle cast in a small isolated mountainous plantation of *Pinus radiata* at Gambubal SF, near the border with NSW. Severe needle cast is spasmodic over time and generally is always associated with lower temperatures and continued leaf wetness combined with the canopies of young trees being intertwined with under-canopy weeds. In the past, silvicultural tending (removal of weeds, lower branches and perhaps thinning) has been the primary control response, with copper-based fungicides generally not favoured.

Widespread *P. radiata* canopy discolouration/loss, Gambubal SF

In March 2011 severe needle browning followed by scattered tree deaths was reported within a number of compartments of young *P. radiata* within Gambubal SF. Needle cast followed with disease incidence and severity increasing through to June of 2011. Red banding on needles progressed to complete needle discolouration (red/brown), and was most severe on trees on the upper portion of west-facing slopes. Canopy discolouration always progressed up the canopy from within a high weed count below. *Dothistroma* was suspected as the cause as summer rains and temperatures were supportive, although the full expression of the symptoms was many months earlier than typical for the region (normally July-August).

Vertebrates (Animal damage)

Damage by animals such as pigs, deer and rats is spasmodic over time and often linked to drought and or silvicultural practises which fail to remove attractive inter-row herbage. In the upper Brisbane Valley at areas such as Esk SF and trial plots at Benarkin SF deer have caused extensive damage to young *Pinus* in the form of widespread leader removal. Even though damage can be extensive full plant recovery often exceeds expectations, although leader dieback often occurs and results in the development of a new poorly formed alternative.

Deer induced leader death (*Pinus*) and production of new malformed stem

ARAUCARIA PLANTATIONS
(*Araucaria cunninghamii)*

Beetle defoliation

During summer 2008/09 and again in 2009/10 beetles emerged on mass from retained clear-fall *Araucaria* (hoop) harvesting residues in the Mary Valley (Gympie region) through to Bulburin near Monto, central Queensland. These beetles primarily defoliated only the margins of adjacent young plantation *Araucaria*.

Losses were minimal with the majority of defoliated trees recovering. Twelve insects were found causing this defoliation, most being specific to *Araucaria* with only two being generalist host grazers. No additional defoliation has occurred since these two climate-linked events that consisted of a long drought followed by extended rain and high humidity. *Araucaria* tends to recover well even when virtually ring-barked following hail, so it was not surprising that the majority of plants recovered over time.

Army worm defoliation

In late March 2010 caterpillars defoliated large areas of young *Araucaria* throughout the Burnett Region in SEQ, as well as at Jimna SF within the Conondale Ranges. Trees to clear-fall age were attacked with the most severe damage being to trees up to 3 years old, with newly planted trees reduced to “twigs”. Prior to consuming the foliage and succulent stems of the *Araucaria* the caterpillars completely defoliated virtually every weed species

within the plantation. After 2-3 weeks the caterpillars, identified as *Tiracola plagiata,* pupated on mass and have not been observed in large numbers since. Observations of collected *T. plagiata* pupae placed within insectaries showed an initial burst of adult moths, followed by a predominance of the parasitoid wasp *Lissopimpla excelsa.*

Rat damage (*Rattus tunneyi* var. *culmorum*)

Pale Field Rat damage primarily to the roots of young 2-4 year old *Araucaria* has again become problematic within a number of plantation regions. Rats can cause severe tree damage, including tree death, through extensive excavation around the root system and girdling of both the roots and stems. Trees not killed are often left leaning with reduced growth.

The first major recorded outbreak occurred at Imbil in 1935 followed by widespread outbreaks in 1951-58, and then 1963- 75, as is not unusual to have 20-30 years between outbreaks. Outbreaks have not occurred when rainfall is below average but once rat damage occurs it persists for a further year or more. The late 2010 outbreak is believed to be the "re-colonisation" phase and that during the subsequent year (2011) the "exploration" phase will follow.

This species of native rat favour disturbed areas with plenty of herbage, moist, partially shady and high soil nutrient content. Plantations become an ideal environment that encourages their population growth and maintenance. Breeding capacity often exceeds carrying capacity during winter causing the rats to resort to eating *Araucaria* roots. As well, most of the plant species that naturally occur in their normal feeding zones (along creek margins in open flats) also occur within the plantations. Breeding season varies from November to April peaking in February-March. Most damage occurs through winter to early spring. A range of controls including dozer inter-row tending are used to modify plantation habitats, making them less attractive to rats. However, when populations exceed threshold values, baiting (under permit) with 1080 is considered.

Old rat damage and tunnelling beneath young *Araucaria*

HARDWOOD PLANTATIONS
Eucalyptus and *Corymbia* Plantations

Disease

In April 2010 a Myrtaceous Rust fungus given the misleading common name of "Myrtle Rust" and taxonomic name of *Uredo rangelii* was detected in a commercial Nursery on the NSW central coast. In late December the same year this rust was detected in Queensland and has subsequently spread and established throughout the south east corner. Detections at nearly all major coastal centres to Cairns continue with most linked to infested plant movements through commercial nurseries. It is now generally agreed that Myrtle Rust is indeed *Puccinia psidii* s.l., a fungus that is closely related to Eucalypt/Guava rusts.

Numbers of confirmed naturally infected hosts continue to increase with DAFF (ex DEEDI) laboratory studies demonstrating that this rust can infect virtually all Myrtaceae under the right conditions and with suitable inoculum loads. Most of FPQ's plantation species have also been shown to be susceptible under these laboratory conditions, although to date no detections have been reported within the hardwood plantations. Surveys within FPQ's commercial nursery at Toolara found Myrtle Rust on surrounding amenity *Melaleuca leucadendra* although none has been found on any hardwood seedlings held at the time and prior. Surveys also established that Myrtle Rust was easily detectable throughout the Fraser Coast region being found on *Melaleuca quinquenervia.* Myrtle Rust has also been detected throughout thick *Melaleuca quinquenervia* stands within the Beerburrum plantation estate as well as on a few understory *Lophostemon suaveolens* within.

Geoff Pegg DEEDI surveying Myrtle Rust detected on young regrowth in *Melaleuca quinquenervia* stands throughout Fraser Coast region

FPQ's hardwood plant needs are being sourced from external nurseries with stock no longer grown or held over within the Toolara nursery facility. Through participation on the Myrtle Rust Advisory Committee, FPQ are keeping a watching brief on efforts to delineate the extent of the rust, its distribution, control and especially its relationship to other Eucalypt/Guava rusts.

***Eucalyptus pellita* – north Queensland**

- **Leaf blight** – Both *Pilidiella* (previously known as *Coniella*) and *Cylindrocladium* leaf blights were identified with plantations. However, the impact of these fungi was restricted to the older foliage and not likely to be impacting on growth at this point in time. There is a need to monitor for changes during the wet season.
- Shoot and leaf blight – A high incidence of shoot and leaf blight was detected within a single plantation at Flynn Rd south of Babinda. The causal agent has yet to be identified.
- **Bacterial wilt –** Bacterial wilt continues to be an issue within plantation areas where drainage is poor. Tree deaths should decline as plantations age. However, site selection or use of other less susceptible species in areas where drainage is poor may reduce the impact of the disease.
- **Minor pathogens** – *Teratosphaeria epicoccoides* was found to be widespread and identified causing minor damage on old foliage and restricted to the lower canopy. This disease is not regularly associated with severe defoliation although there have been some reports of significant defoliation following floods and in relation to site stress issues.
- Black mildew (*Meliola* sp.) was identified from most sites with varying degrees of severity. However, even at the sites where the disease is more prominent the impact is minimal and does not warrant control. The fungus can be found on both stems and leaves and could be associated with premature senescence of lower canopy foliage.

Black Mildew on leaves and stems

Leaf blight caused by *Pilidiella* (*Coniella*) sp.

Purple coloured lesions associated with infection by *Teratosphaeria* (*Kirramyces*)

Foliage diseases on *Eucalyptus pellita* in north Queensland

The majority of *E. pellita* plantings in north Queensland were severely damaged by cyclone Yasi and maintenance of plantations has discontinued.

Pests
About a dozen *Eucalyptus pellita* sites, trials and plantations were surveyed in Far North Queensland, November 15-18, 2010 for insect pests and pathogens. Sites ranged from relatively pest free, to having substantial defoliation. At some sites, broom-topping had occurred to several trees, although the causal agent was no longer present.

Broom-topping on *Eucalyptus pellita*.

Overall, >25 insect species from about 17 families in 5 orders were collected on *E. pellita* in these surveys. Most were of minor importance. Sawflies, a common eucalypt pest group, were notably absent in these surveys, although they are recorded as pests of *E. pellita* in these regions.
Gum tree scale, **paropsine beetles**, **cup moths**, **scarabs** and **borers** are considered the highest potential risks to plantation productivity at this time.

Defoliators including the chrysomelid beetles *Cryptocephalus* sp., *Geloptera miracula, Paropsisterna* nr *amoena, Paropsis variolosa, Paropsisterna sexpustulata, Paropsisterna* sp, several weevils, geometrid larvae, *Doratifera vulnerans* (cup moth), and various grasshoppers, katydids and scarabs were collected. **Sapsuckers** including coreids, spittlebugs, psyllids, leafhoppers and the gumtree scale *Eriococcus coriaceus,* **stem borers** (Cerambycidae), and various **gallformers** were also collected.

Natural enemies were also abundant within sites. Predators including **ladybirds** and their larvae, **robber flies**, **spiders**, **shield bugs** and **assassin bugs** were observed during surveys, and several species of **parasitic wasps and flies** were reared from samples in the laboratory. Some entomopathogenic fungi were also found.

Teak plantings – North Queensland

Disease

Stem canker

Stem canker symptoms have recently been identified within trials and commercial plantings of teak in areas of north Queensland. Symptoms include the presence of swelling on branches and the main stem, cracking and splitting of bark (Figure 1 & 2), sunken regions and death of stem or branch as a result of girdling (ring-barking).

During November surveys Pink Disease, *Erythricium salmonicolor* was identified causing severe cankers at a number of sites in north Queensland including Mena Creek and Abergowrie. Differences in susceptibility between clones were noted and rating of the trial sites was suggested. The disease was also observed on plantings of African mahogany.

Symptoms of stem cankers on teak (Malaysian clone) resulting in (a) sunken lesions and (b) swelling and splitting of the bark

Other disease issues identified from planting of teak were minor and included the rust fungus *Olivea tectonae* (Teak rust). Teak leaf rust, caused by *Olivea tectonae* was found in Australia near Darwin in an irrigated commercial planting in June 2006. Within a month it had also been detected in northern Western Australia and northern Queensland. It can now be found in all areas where teak is planted in Queensland.

Teak rust in combination with a teak skeletoniser causing damage to planting at Lakeland Downs, North Queensland

Insect pests

The two major insect problems associated with teak plantings were the teak defoliator, *Hyblaea puera* and skeletoniser, *Paliga damastesalis*. Both of these species are significant pests of teak plantations overseas (Nair 2007), but only the former has been mentioned as a likely threat to teak in northern Australia.

Teak defoliator (*Hyblaea puera*) (Lepidoptera: Hyblaeidae)

Teak defoliator was present at sites near Innisfail, Mena Ck and sites in the far north at Cooktown (Mt Ray) and Lakeland Downs. At Innisfail and Mena Ck it was the only main insect present, while both defoliator and skeletoniser were present at Lakeland Downs. The very young age at which trees are being attacked is unusual compared with overseas plantings, where trees are most severely infested from about 11 years of age.

Teak defoliator larva

Teak skeletoniser (*Paliga damastesalis*[1]) (Lepidoptera: Crambidae)

Identification The teak skeletoniser *Eutectona machoeralis* (Lepidoptera: Pyralidae) was listed by Griffiths *et al*. (2004) as an exotic species representing a potential threat to teak in northern Australia. Although this species is noted as being represented in Australia in the British Museum of Natural History card index, no Australian material has been located: the record "is…possibly based on a misidentification of *E. celatalis* (Walker, 1859) or even of *Paliga damastesalis* (Walker, 1859)" (Neilson *et al.* 1996). *Eutetectona* is considered a junior synonym of *Paliga* (Neilson *et al.* 1996, Intachat 1989).

Paliga damastesalis is listed in the Checklist of Australian Lepidoptera (Neilson *et al.* 1996), but Nair (2007) reported that despite its distribution being recorded as far as Australia, no primary record had been traced. McDonald *et al*. (2010) reported *P. damastesalis* from teak plantations at Kununurra last year, but no larvae survived to enable positive identification. There are six *P. damastesalis* specimens in the Australian National Insect Collection (ANIC) with collection records from Kuranda (three specimens) and one each from Eungella, Howard Springs and Weipa; the latter two records list teak as the host plant (T. Edwards, pers. comm. 05 August 2011). The Kuranda specimens were collected in the early 1900s and suggest that this is probably an endemic species in Australia (T. Edwards, pers. comm. 05 August 2011). *Paliga damastesalis* is also recorded from Malaysia, Indonesia, Sumatra, Papua New Guinea and some parts of India (Intachat 1989, Nair 2007), while the teak skeletoniser in India, Myanmar and Thailand is *E. machoeralis* (Intachat 1989). The correct identity of these two species of "teak skeletoniser" throughout their range needs to be established because of potential differences in their biologies confounding control and management options.

Two adults were reared from six larvae collected on this trip. They have been preserved and are awaiting confirmation of their identification.

Skeletonising damage on teak

Skeletonising damage was widespread at Lakeland Downs, and common at Mt Ray. Six skeletonising larvae were collected, of which two pupated and emerged as moths, and are awaiting identification. No parasitoids emerged from any of these skeletoniser specimens. In Australia, hosts other than teak are unknown.

Late instar larva (L) and adults (R) of teak skeletonizer

Sandalwood – *Santalum album*

Three plantation surveys were undertaken by the DEEDI forest health team between June 2010 and July 2011. These surveys targeted plantations at Lakeland Downs, Qld. and Kununurra, W.A. From these surveys we are beginning to gain a better understanding of the key pests and pathogens of importance to Indian sandalwood plantations in the tropics.

In general, sandalwood has had fewer significant pest and pathogen issues than its host plants. In contrast, host trees have tended to have a greater prevalence of generalist pests that occur in surrounding crops, such as aphids and mealybugs. Other issues affecting host plant health may be related to irrigation, nutrition and the complex interactions generated by demands of the parasitic relationship of sandalwood on its hosts. Briefly, the range of issues for each species has included.

Alternanthera nana – defoliating looper caterpillars.
Cathormion umbellatum – Crusader bugs leaf-tiers, eriophyoid mites, scale insects
Dalbergia latifolia – anthracnose, leaf blight
Santalum album – Stem canker, lucerne leaf roller, lygaeid bugs, leaf beetles, plant hoppers, lymantriid moths & borers (stored product only)
Sesbania Formosa – Anthracnose (?), aphids, mealy bugs, hairy caterpillars, grasshoppers, red shouldered leaf beetles, Pyralid moths, a stem borer, Xyloryctid wood moth, pinhole borers.

NATIVE FOREST

Gum leaf skeletoniser – *Uraba lugens*

There was a widespread outbreak of the gum leaf skeletoniser (*Uraba lugens)* in southeast Queensland from August – October 2010, particularly in remnant narrow-leaved ironbarks *Eucalyptus crebra* in the South Burnett and Lockyer Valley, but also on a range of other remnant eucalypt species including *Corymbia tessellaris* (Moreton Bay Ash) and *E. tereticornis* (Forest Red Gum), and in a plantation of *C. citriodora* ssp. *variegata* (Spotted Gum). Larvae that were collected from two sites and reared out to adult showed very low rates of parasitism (1.5 % overall), although other mortality causes (possibly disease) were more common (25% mortality of larvae).

A web page (http://www.dpi.qld.gov.au/26_18820.htm) was established to meet demand from the public for information on the outbreak.

Defoliation of remnant small-leaved ironbarks and other eucalypt spp. in southeast Queensland.

RESEARCH

Semiochemistry R&D

Cerambycid pheromones

Cerambycid beetles are among the most important forestry pests worldwide, damaging and killing trees in natural and urban forests, plantations, and orchards, as well as degrading timber and wooden structures. This research will identify compounds attractive to the beetles, improving Queensland preparedness for the early detection of these exotic pests and/or providing control of existing pest populations. The work is being carried out in collaboration with Prof J. Millar, University of California, Riverside. We trapped at three sites in South-east Queensland for nine weeks over the 2010 - 2011 summer period. The sites represented a large remnant vegetation patch on farmland near Gympie, as well as an agricultural / woodland edge near Boonah, and an urban re-growth patch within suburban Brisbane. Eight pheromone lures were tested. In total we caught 160 individuals from 31 species in 16 tribes across 3 subfamilies. 3-hydroxy-2-hexanone was the most effective lure, a known cerambycid attractant while a different suite of beetles were attracted to other compounds, such as 2R*,3R*-octanediol. There were differences between sites with respect to abundance and diversity of the beetles trapped. Further work is currently underway to focus in on the two most effective lures, and see the effect of plant odours on their trapping success.

Chrysomelid leaf beetles

Leaf beetles are key defoliators of young eucalypt plantations in Queensland. Current management is through the use of insecticides, which is not sustainable long-term. Using attractant lures to bring beetles to lethal trap trees on the periphery of plantations offers a potentially clean and green solution. Preliminary studies on the volatile profiles of *Corymbia* hosts (pure taxa and commercial hybrids) have been completed and this profiling will now be extended to the field preferred hosts *Eucalyptus cloeziana* and *E. pilularis*.

Wood moths (*Culama* and *Endoxyla*)

The giant wood moth is a significant pest of eucalypt plantations grown for solid timber production in Queensland. Developing tools based on its sex pheromone may be the only viable option for its management in susceptible stands. To determine its sex pheromone blend, billets containing moth pupae were sourced from a plantation in N-NSW in mid December 2009 and again in December 2010 and solvent extracts taken from the ovipositors of calling females after emergence. Using GC-MS we isolated and identified a long-chain acetate compound from these extractions which, based on other known cossid pheromones, is a strong candidate to have pheromonal activity. Male antennal response to another known cossid pheromone was demonstrated in the laboratory using EAD. Further field and laboratory testing of these compounds will be carried out during the next moth emergence season.

Red cedar shoot borer (*Hypsipyla robusta*)
Cedar shoot borer is the primary reason that the valuable red cedar tree cannot be grown successfully on a commercial scale in Queensland. Understanding the chemoecology of this species provides opportunities to manage this important pest. DEEDI has been investigating the cues used by female moths to locate their host tree and male moths to locate the females. The development of a multi-sex lure provides potential to trap and remove adult moths from the wild population improving tree growth and form. EAD screening and behavioural trials have enabled initial field testing of some prospective compound blends

Hardwood Plantation Research

***Paropsis atomaria* dispersal and modelling**

We are in the second year of data collection of adult and larval counts in a *Corymbia citriodora* subsp. *variegata* (CCV) plantation in south east Queensland. The monthly survey suggests a movement into the plantation in spring of the first year of sampling and has found the presence of overwintering adults in the plantation foliage from June-August. The data will be modelled in DYMEX, once surveys are completed, to fill in the knowledge gaps on the contribution of immigration and overwintering adults to population dynamics over more than one year. We have also been in discussions with the University of the Sunshine Coast to improve precision of DYMEX model predictions using model fit optimization processes.

Stem defect risk modelling

Phoracantha solida and *Culama* sp. attack on 7 year-old *Corymbia citriodora* ssp. *variegata* (Woondum provenance)

This project began in November 2010 and has initially focussed on acquiring and cleaning up forest health surveillance data, gathering landscape data for Queensland and NSW from satellite imagery, and developing optimum field protocols to both accurately measure borer damage and define the causal agents.

We have also carried out analysis of cerambycid beetles and cossid moth incidence in Queensland and NSW from existing survey and trial data.

Initial results indicate that *E. grandis*, *E. grandis* x *E. camaldulensis*, *E. grandis* x *E. tereticornis* and *E. longirostrata* are predicted to be most susceptible to cerambycids and cossids, with cossids also showing preference for *E. tereticornis* and *E. dunnii*. While CCV showed low susceptibility to cerambycid attack in the young trials in Queensland, the NSW data suggest that average incidence increases with age in CCV. We found that borer incidence was very low in both *E. argophloia* and *E. cloeziana*. Different environmental predictors were associated with cerambycid and cossid incidence in Queensland. The percentage of trees affected by cerambycids appears to be more site-driven than cossid incidence.

BIOSECURITY

Myrtle rust

Myrtle rust, *Puccinia psidii*, was detected for the first time in Queensland in December 2010, just prior to the 2011 floods that impacted on the State's south east. The first detections were restricted to retail and production nurseries and limited to only a couple of host species, mainly *Gossia inophloia*. The sexual state of *Puccinia psidii* was identified from the first sample collected. By the end of February 2011 detections had been made in peri urban and urban environments and native bushland in and around the Gold Coast, Brisbane and the Sunshine Coast. As of October 2011, spread of the disease had extended west to include Toowoomba and north to Bundaberg with the host range in Queensland alone close to 100 species.

In June 2011, a CRC PB funded project commenced to investigate epidemiology and impact of *Puccinia psidii* in Queensland and New South Wales. Several study sites have been established monitoring changes in disease levels and impact of infection over time. Species of greatest concern and of environmental significant include *Rhodamnia* species and *Melaleuca quinquenervia*. A number of rare and endangered species have also been identified as being highly susceptible including *Gossia gonoclada* and *Rhodamnia angustifolia*. A full host list and preliminary susceptibility rating are available on the Biosecurity Queensland website (http://www.dpi.qld.gov.au/4790_19788.htm).

Impact of *Puccinia psidii* infection over time on *Rhodamnia angustifolia*, a rare and endangered plant species.

Infection on fruit of *Rhodamnia sessiliflora* and flower spike of *Melaleuca leucadendron*.

Research into characterising the susceptibility of key Queensland hardwood species to Myrtle rust commenced in September 2011. Spotted gum species were the first tested, with *Eucalyptus argophloia* and *E. cloeziana* to be tested in 2012.

Victoria

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FOREST HEALTH SURVEILLANCE

In Victoria, DPI is contracted to undertake forest health surveillance for private plantation companies (predominantly to monitor established pest populations), the Commonwealth Government (Asian Gypsy Moth program around high risk sites) and the City of Melbourne (surveillance of amenity trees for Dutch elm disease). These programs are also supported by a passive surveillance program whereby pest and pathogen reports from small forest growers, farm forestry and concerned general public enquiries are followed up.

In 2010-11 forest health surveillance in Victoria for forest plantations was carried out using aerial surveillance backed up by permanent health monitoring plots. For the first time since formal surveys commenced in 2001 these aerial surveys were performed across the entire State enhancing the coverage provided by the health surveillance monitoring program.

CLIMATE

In 2010–11, the ending of the 15-year drought in Victoria by a strong La Nina event resulted in above average rainfall across the State and flooding in some areas. This dramatic change in environmental conditions caused pest and pathogen complexes to change their incidence and severity.

PLANTATIONS

Pinus radiata

Insect pests

***Sirex noctilio* (Sirex wood wasp)**

The incidence of Sirex over the 2010-11 summer remained at relatively low levels across the State. Some isolated areas in North East Victoria showed elevated levels of damage. This damage was observed in previous years and remedial action such as thinning and nematode inoculation (Kamona strain nematode) in areas not yet thinned, brought the levels of Sirex down to acceptable levels. In addition, the parasitoid wasp *Ibalia* continue to provide a useful secondary means of Sirex control.
Parasitic nematodes were recovered from all pine growing regions of Victoria. *Megarhyssa* and *Schlettererius* were also recovered across the State, albeit at low levels.

Above average rainfall across the State in the previous two years assisted in reducing tree moisture stress and subsequent susceptibility to Sirex attack.

***Essigella californica* (Monterey Pine Aphid)**
Monterey Pine Aphid populations in 2010-11 decreased across the state for the first time since surveys began in 2001. The average levels of defoliation ranged from trace to moderate, with trace levels of discolouration (active aphid infestation) observed.

Defoliation levels caused from previous aphid damage remained at high to severe levels in the North East of the State, with up to 70% defoliation recorded in some stands. The defoliation is most probably due to the lag in foliage replacement and timing of assessment.

Over the past few years, discolouration and defoliation has increasingly been observed in trees less than ten years of age. However, damage to these younger age-classes was significantly reduced in 2010–11. This decline can generally be attributed to milder and wetter weather conditions which are known to reduce aphid populations. Aphid abundance will take several years to be fully reflected in retained foliage levels.

The biological control agent (*Diaeretus essigellae*) is continuing to be released across Victoria and its efficacy in controlling aphid populations is being assessed. The success of the release will not be completely determined until favourable environmental conditions for increased aphid population occur.

***Ips grandicollis* (Five-spined Bark Beetle) and other bark beetle species**
Ips grandicollis was not observed as a significant pest of Radiata pine plantations in 2010-11 with only two small areas in North East and Otways affected.

Some seedlings in the Otways showed stem girdling symptoms caused by *I. grandicollis.* This attack was attributed to a large amount of debris left in the windrows after harvesting. *Ips grandicollis* was also identified in trap trees established for the Sirex biological control program in North East Victoria. The lower recording of *I. grandicolis* is attributed to the good rainfall in 2010-2011 and a resultant lack of moisture stress, which is known to facilitate insect attack.

Pathogens

***Dothistrom septosporum* (Dothistroma needle blight)**
Dothristroma needle blight disease increased to levels not seen since the early 1990's. This was brought on by the wet and mild 2010-11 season. Current infection (discolouration), increased to moderate levels across Victoria. There were some isolated pockets of severe infection recorded in the North East of the State, with some sites showing levels of infection at or above the economic threshold in Autumn 2011.

***Cyclaneusma minus* (Cyclaneusma needle cast)**
Cyclaneusma needle cast was observed throughout Victoria in 2010 - 11. The damage recorded across the State was at trace to low levels, with some discolouration present. As

the pathogen generally only affects older needles, and is primarily located in lower crowns, little impact on growth of trees is expected.

***Diplodia pinea* (Diplodia dieback)**
Damage from Diplodia in 2010-11 was generally confined to the North East and South West of the State in un-thinned stands. However, the damage was minor in comparison to previous years due to a reduction in moisture stress from above average rainfall. Damage was generally confined to either individual trees or small groups of trees around areas that were affected by other environmental stresses, such as water-logging.

***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 was not of concern over the past year.

***Chrysophtharta and Paropsis* (Chrysomelid Leaf beetles) and Anoplognathus spp. (Christmas beetles)**
Christmas beetles and Chrysomelid leaf beetles caused defoliation levels ranging from trace to severe in individual plantations of *E. globulus* and *E. nitens* across the State. Damage was observed across all age-classes with no tree species preference observed. Defoliation was confined to individual trees or small isolated clusters of trees. No mortality was observed with the defoliation.

***Perga* spp. (Sawflies)**
Sawflies in 2010-11 caused damage within native forest and eucalypt plantations in South West Victoria and Gippsland districts. Damage was generally confined to localised areas of *E. globulus*. Defoliation generally occurred in the upper 50% of tree crowns, although some trees were entirely defoliated.

***Phorocantha spp.* (Longicorn Borers)**
Phorocantha acanthocera (Bullseye borer) continued to occur at very low levels in *E. globulus* plantations in Gippsland. This pest has remained at low levels over many years despite the increasing age of plantation trees in the region.

***Cardiaspina spp.* (Psyllids)**
Cardiaspina retator was observed causing significant discolouration in Sydney Blue Gum (*Eucalyptus saligna*) plantations in Gippsland. In North Central Victoria, low levels (approximately 10-20%) of defoliation were observed on *E. camaldulensis* plantings along roadsides and individual paddock trees. The defoliation caused by the psyllid tended to be sporadic over a wide area rather than confined to specific locations.

Other Pests of eucalypts

- Low levels of Gumtree scale (*Erioccus*) were observed in *E. globulus* plantations and urban environments across Victoria, where it caused significant branch dieback to individual trees.
- Low levels of defoliation caused by Leaf Blister sawfly (*Phylacteophaga froggatti*) were again observed over late spring and early summer to *E. grandis* plantations in northern Victoria. It was also widely found in *E. globulus* plantations in Gippsland and Otway Ranges. Damage was generally confined to foliage on juvenile trees.

Pathogens

Mycosphaerella

Mycosphaerella leaf disease was identified as widespread across eucalypt plantations in Victoria. Overall, levels increased significantly from previous surveys due to a warm and wet 2010–11 in the Gippsland, South West Victoria and Otways districts. Damage ranged from low to severe levels in both the upper and lower crowns and there is a risk that it may impact directly on tree growth.

Kirramyces eucalpti

Kirramyces eucalpti caused significant discolouration and defoliation of *Eucalyptus nitens* plantations in both the Otways and Gippsland Regions. The outbreak covers an area greater than 65ha and is entirely defoliating trees aged from 4 to 11 years of age. This is the first time the pathogen has been identified as a significant threat to plantations in Victoria. Both juvenile and adult foliage was affected and if environmental conditions remain wet and warm, the development of the pathogen will continue and may spread to natural strands of *E.nitens*.

NURSERIES

Pinus radiata

Increased *Phytophthora cinnamomi* (PC) disease was observed in new plantings of Radiata pine within the North East Victoria and Central districts during early 2010/11. Above average summer and autumn rains have produced environmental conditions conducive to disease development.

Management and awareness of PC remains a high priority for the nursery industry to minimise further spread of the disease and reduce the likelihood of new *Phytophthora* species incursions.

Reports of root strangulation decreased in comparison to the 2009–10 season. The increased uptake of a new tray design has helped to reduce root coiling.

Eucalyptus species

No reports of damage due to pathogens were recorded in 2010/2011.

MANAGED NATURAL FORESTS

Insect pests

***Uraba lugens* (Gum leaf skeletoniser) and *Doratifera* spp. (Cup moth)**

While there were no formal surveys undertaken to evaluate the recovery of trees from *U. lugens* defoliation in East Gippsland, observations provided by local Department of Sustainability and Environment (DSE) staff suggest an increase in foliage cover after above average summer rainfall in 2010-11.

Pathogens

Leaf pathogens such as *Mycophaerella's, Allographina and Kiramyceses* were the key species identified causing significant damage in localised areas of the State in 2010/11.

NATIVE PLANT COMMUNITIES

Phytophthora cinnamomi

Management of *Phytophthora cinnamomi* (PC) continues to be a focus for DSE. State wide modelling of PC risk and impact is being evaluated to help prioritise forest management activities. Reports of PC damage in native communities increased over the 2010-11 year, due to above average summer and autumn rainfall producing environmental conditions conducive to disease development. New areas of infection have been recorded in the Otway Ranges and other parks across the State.

Chalara australis (Myrtle Wilt)

Mytle Wilt continues to cause some deaths of mature *Nothofagus cunninghamii* in rainforests across Victoria and small outbreaks of the pathogen in the central highlands were observed along roadsides. These outbreaks are associated with disturbance caused by road maintenance.

MONITORING AND SURVEILLANCE

Plantations and Native Forest Monitoring

DPI worked closely with the plantation industry to develop ongoing surveillance programs throughout the State to meet their varying operational and stewardship requirements.

BIOSECURITY

Insect pests

***Lymantria dispar* (Asian Gypsy Moth)**

Monitoring of 57 trap sites for Asian Gypsy Moth (AGM) around the ports of Melbourne, Geelong and Westernport was undertaken in summer 2010/11 as part of the national program. The replacement of delta traps with bucket traps showed an increase in native lepidopterous species being trapped. However, no exotic species, including AGM, were detected during the survey.

Pathogens

Ophiostoma novo-ulmi (Dutch Elm Disease)

Surveys commissioned by the City of Melbourne for Dutch Elm Disease (DED) were completed across the main gardens and boulevards under their management. Symptoms resembling DED were attributed to ringbarking of branches by possums, elm bark beetles and fruit tree borers. The DED fungus was not identified from samples of wood collected from trees exhibiting flagging due to beetle activity. Elm Leaf Beetle damage was the lowest level observed in the past 5 years.

Holocryphia eucalypti (Eucalyptus Canker)

Targeted surveys for *Cryphonectria parasitica* (chestnut blight) were undertaken by DPI as part of the National Chestnut Blight Eradication Program. Surveys were carried out on known eucalypt hosts and within and around all known infected properties in North East Victoria. Chesnut blight was not isolated from any samples collected from eucalypts however *Holocryphia eucalypti* was identified as causing stem cankers on many of the surrounding eucalypt trees.

Holocryphia eucalypti was also identified on many chestnut trees causing branch cankers.

All infections were associated with a physical scar or pruning wound and did not appear to cause any significant decline in tree health.

Tasmania

Plantations *(Exotic pines* / Pinus *species especially* P. radiata, *surveillance season mid to late 2010)*

Insect Pests

Sirex wood wasp (*Sirex noctilio*)

Standard aerial and roadside health surveillance of the softwood plantation estate in the north of the State detected *Sirex* activity and mortality in the Retreat block. Ongoing *Sirex* control operations are underway in this area.

Kairomone charged static traps were placed in four blocks between January and March. A small number were caught in Long Hill and Saddleback but numbers were not high enough to require nematode introduction. *Sirex* females were captured in Long Hill and one *Ibalia leucospoides* adult was captured in Saddleback.

Trapping for a number of exotic bark beetle species, of importance to softwood forestry, was conducted between December and April. With these static traps, the parasitoid wasp *Ibalia leucospoides* was also captured, six in Devonport and one in Hobart.

Ips grandicollis

Monitoring for *Ips grandicollis,* using ipsenol and ipsdienol pheromone charged static traps, has continued in *P. radiata* plantations. *Ips* continues to be absent from Tasmania.

Monterey pine aphid (*Essigella californica*)

There remained little evidence of *Essigella* damage across the north of the State and no damage symptoms were observed in the south.

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

Damage, through bark stripping, by browsing mammals was the most prominent problem by area across the plantation. The area affected by mammal bark stripping this season was 434 ha. This was well down from the previous two years with 813 ha in 2009-10 and 693 ha in 2008-09. Severe damage (>50% trees affected) was found in 134.6 ha which is 31% of the total area affected. This proportion was similar to that seen over the last few years.

The blocks most affected were Saddleback in the northeast and Oonah in the central northwest, however there was a marked decrease in the level of activity in these blocks since last year (Fig.1). This was also the case in a number of other blocks including Scamander in the east and Branch's Creek and Castra in the central north. In fact the only block in which an increase was observed was Sideling but this was restricted to a single coupe.

Figure 1. Bark stripping and ringbarking in young *P. radiata* seedlings in the northwest of the state.

The area of young plantation affected by mammal shoot browsing had dropped to 183 ha this season down from 229 ha in 2009-2010. The majority of this area (111 ha) is associated with reduced stocking caused by mammal damage last season in a coupe in Payanna. However, 33 ha of newly planted seedlings was heavily browsed by wallabies and deer in Ben Nevis block. Trees had recovered well in Saddleback and little fresh

damage was observed. Reduced stocking and current damage were observed in a coupe in Sidling (Fig.2). There was still some activity and reduced stocking in Smith Plains which persists from last year.

Figure 2. Mortality and patchy stocking caused by mammal browsing in the northeast of Tasmania.

At 66 ha the area of dead tops caused by possum bark-stripping in the mid-upper crown was very similar to last season (62 ha). Oldina continued to be the area of greatest activity although much of the observed symptoms appeared to reflect old damage and there was only scattered fresh damage

Diseases

Cyclaneusma needle cast/spring needle cast

This remains the most significant disease of radiata pine in Tasmania, 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

Dothistroma infection and spring needle cast were more prevalent, and more severe, this season than in the past few years. As is usually the case Ringarooma was the block primarily affected with some 87 ha suffering moderate or severe needle dicolouration/defoliation (Fig.3). Smaller areas of damage were detected in Payanna and Springfield. Very much above average temperatures and above average rainfall between March and August are likely to have created locally ideal conditions for fungal diseases. Early indications are that the wet summer of 2010-2011 has lead to a further increase in infection levels into 2011.

Figure 3. Currently infected trees with *Dothistroma* and Spring needle cast in Payanna and Ringarooma, northeast Tasmania.

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

Top death caused by *Sphaeropsis* was well down on the 171 ha observed last season with continued good rainfall across the north of Tasmania. Only 30 ha were significantly affected this year most of which was in the Bass District (Fig.4). Damage tended to be restricted to areas with shallow or rocky soil such as knolls and ridges.

Figure 4: Localised dead tops caused by *Sphaeropsis* in Retreat in the northeast.

Drought & *Phytophthora*

Good rainfall across the north of Tasmania again this year meant there was minimal evidence of drought or *Phytophthora* mortality.

Environmental and site related problems

Fire

An area of 8.6 ha of fire damage was observed in Nicholas and Wilmot blocks. There was no evidence of subsequent *Sirex* attack.

Wind

Around 92ha of windthrow were mapped this year, the most substantial contiguous area being in Payanna Block (Fig.5). Further damage was seen in Oonah after the severe damage detected last year. Lower incidence damage was ongoing in Oldina Block.

Figure 5. Windthrow detected during aerial surveillance in Payanna

Lightning damage

No lightning damage was detected this year.

Exotic weeds

The only exotic weeds reported this season were the persistent infestations of gorse (*Ulex europaeus)* in Oonah in the northwest, particularly along Chatwins Rd.

Boron deficiency

Symptoms associated with boron deficiency such as low apical dominance, shoot dieback and fused or short needles, persisted at low incidence throughout Payanna Block (Fig.6). Although symptoms were still apparent they appeared somewhat less severe than last year.

Figure 6. Shoot dieback and short, fused needles in Payanna

Frost/cold

No frost or cold damage was detected in *P. radiata* plantations this year.

*Plantations (*Eucalyptus *species, surveillance season early to mid 2011)*

Insect Pests

Autumn gum moth (*Mnesampela privata*)

No significant outbreaks of autumn gum moth (AGM) were detected this year.

Leaf beetles (primarily *Paropsisterna bimaculata and P. agricola)*

In 2010/11 the monitoring program covered 28,912 hectares of plantations between 3 and 13 years old in state forest. Approximately 33% of this monitored area experienced a beetle population high enough to potentially cause significant foliar damage. As seen in previous years, the northeast of the State had the greatest area over threshold as well as the highest beetle populations. Most of the area over the threshold was sprayed (5,262 ha) with the broad spectrum insecticide α-cypermethrin, with a small area sprayed with the BFA registered product Entrust® (208 ha). However, 1,313 ha (13%) was not sprayed

after subsequent re-monitoring observing a natural drop in the population following heavy rain and/or strong wind events, or by the activity of the leaf beetle's natural predators.

Chrysomelid defoliation severe enough to cause an impact on growth was detected in 3,384 ha. Of this 2,595 ha was assessed as moderate and 789 ha as severe. However, damage assessment this year was confounded by fungal damage and defoliation in many areas. Over 64% the damage (1,949 ha) was recorded in plantations older than 6 years.

The chrysomelid *Paropsisterna selmani* is being observed in increasing numbers in the north of the State. For the first time a population was recorded to be high enough to potentially cause economic loss and was controlled.

Eucalyptus weevils (*Gonipterus spp.*)

No significant *Gonipterus* damage was detected this season.

Gum leaf skeletoniser

Chronic defoliations by the gum leaf skeletoniser *Uraba lugens* continued this year in areas previously mapped. Damage remains limited and only extends a short distance in to the plantations. However, these stressed trees are often stunted and mortality caused by borer infestation following consecutive defoliation events is common.

Beetles (Christmas, scarab, spring, etc.)

No significant damage was observed on State Forest this season.

Sawflies

No significant damage was observed on State Forest this season.

Borers

Ongoing good rainfall has seen very little borer related mortality across the north of the State except where it was associated with chronic *Uraba* damage. Significant mortality was detected in a late rotation *E. nitens* stand in southern Tasmania. The primary causal agent was suspected to be *Culama australis* which had caused extensive galleries extending in to the heartwood in the affected trees that were examined (Fig. 6). Given the age of the stand the site was likely to have been under a degree of environmental stress following well below average rainfall in autumn/winter 2010.

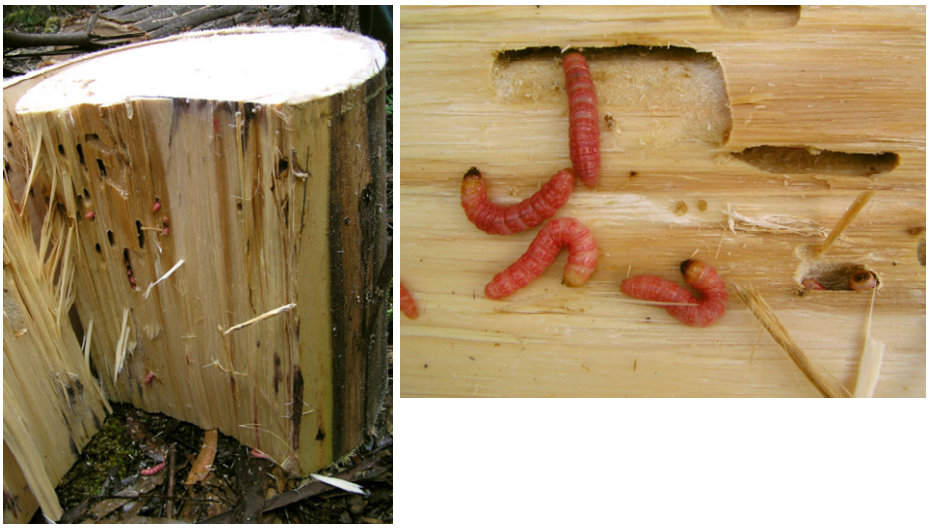

Figure 6. *Culama* galleries extending into heartwood 12m up an *E. nitens* stem (left) and *Culama* larvae (above).

Psyllids

No significant damage was observed on State Forest this season.

Tortricids

No significant damage was observed on State Forest this season.

European Wasps

Management to reduce populations at operational sites or tourism facilities was not required during the past year.

Vertebrate Pests

Intensive pre - and post-plant management of browser populations coupled with the use of seedling stockings was largely effective in preventing significant browsing damage. Significant damage, attributed solely to browsing mammals, on State Forest covered by health surveillance was detected in only 7ha this season.

Diseases

Mycosphaerella *and other leaf diseases*

Wet summer/autumn conditions across much of the north of the State provided ideal conditions for the flourishing of fungal leaf pathogens and this year saw further significant damage primarily to *E. nitens* plantations. The main pathogens were *Kirramyces eucalypti* and *Teratosphaeria* spp. (syn. *Mycosphaerella*) which together caused significant defoliation across nearly 2,000 ha. Damage could be from the bottom up, causing early branch death, or top-down, causing severe broom-topping, in young plantations. *K. eucalypti* was a particular problem in *E. nitens* plantations established between 2006 and 2008 where it caused defoliation across nearly 850 ha. In the worst cases defoliation levels were in the vicinity of 80% of the crown (Fig. 7). In mid-rotation coupes fungal damage was often confounded by chrysomelid defoliation so it was difficult to accurately ascribe damage levels to specific causal agents. Nevertheless the combination had caused very poorly foliated crowns in a number of regions.

Botryosphaeria *top death*

No substantial damage was observed on State Forest this season.

Cryphonectria *stem canker*

Little *Cryphonectria. eucalypti* (syn. *Endothia gyrosa*) was observed this year.

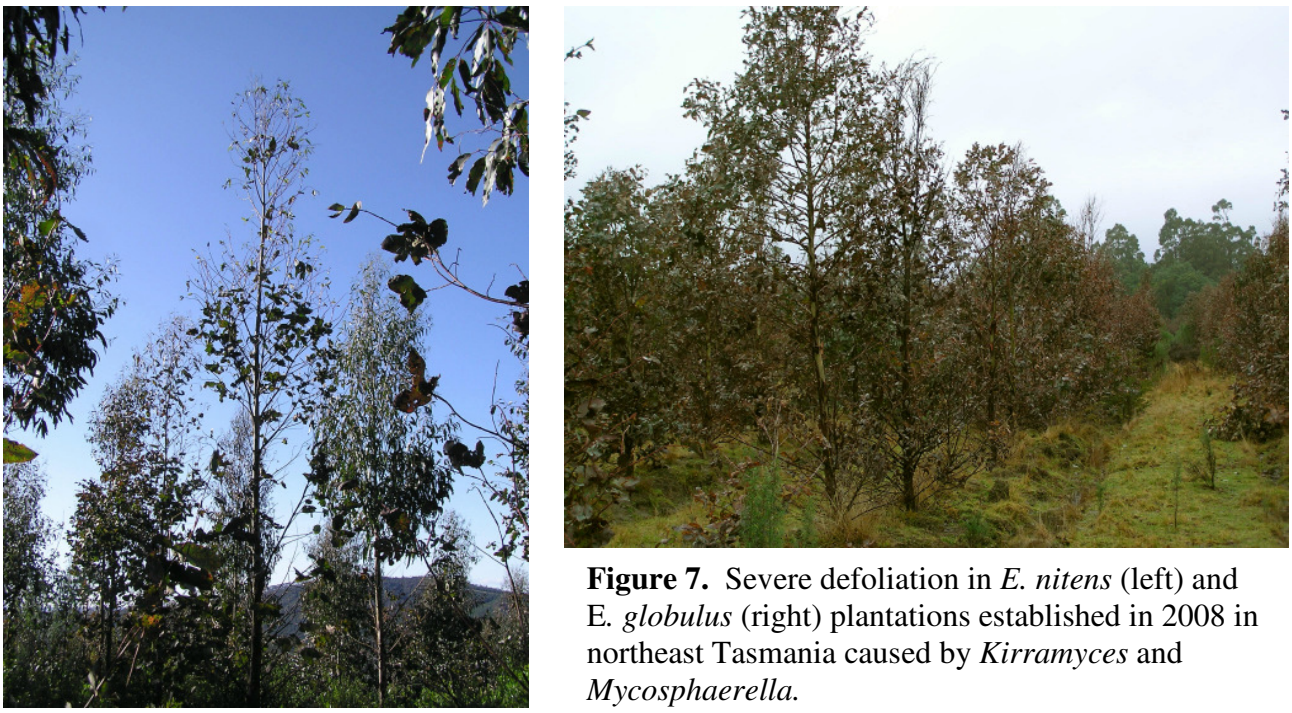

Figure 7. Severe defoliation in *E. nitens* (left) and E. *globulus* (right) plantations established in 2008 in northeast Tasmania caused by *Kirramyces* and *Mycosphaerella.*

Phytophthora *root rot*

Significant mortality (>1%) caused by *Phytophthora* was recorded in 28 ha this season in a single plantation in the northeast of the State.

Armillaria *root rot*

No instances of significant *Armillaria* mortality were detected this year.

Environmental and site-related problems

Windthrow

Ongoing windthrow was recorded in a single plantation covering around 39 ha.

Drought/desiccation

No mortality caused directly by drought effects was observed this year.

Cold/exposure

Exposure, wind and cold were thought to have been a major contributing cause of shoot death and the development of thin crowns across an area of at least 790 ha (Fig. 8). This type of damage is often compounded by chrysomelid defoliation and this season possibly fungal infection as well. The bulk of this area was in plantations at an elevation above 500m.

Figure 8. Thin crowns developing in mid-rotation, high elevation plantations in northeast Tasmania.

Frost

Frost damage consisting primarily of foliar scorch affected around 60 ha, mostly in 2009 plantation in the Florentine valley on the State's south.

Waterlogging

Small, localised areas around drainage lines were suffering symptoms such as stunted performance and foliar discolouration in a number of young plantations; the total area mapped was <10 ha.

Copper deficiency

Limited new plantings in vulnerable areas saw no new copper deficiency symptoms reported this season.

Weeds

Grass was contributing to stunted performance and foliar discolouration across 157 ha of 2009 plantation (Fig. 9) and cutting grass (*Gahnia grandis*) was contributing to similar symptoms on another 69 ha. Over-topping woody weeds were also having a growth impact on 50 ha of 2008 plantation.

Scattered instances of the exotic, invasive weeds gorse (*Ulex europaeus*) were detected in various locations. Thick California (*Cirsium avense*) thistle had caused failure of seedlings to establish in a small section of one plantation.

Figure 9. Grass competition contributing to premature leaf senescence and foliar discolouration in a 2009 *E. nitens* plantation

Soil fertility

Symptoms associated primarily with nutrient limited soils were recorded in 1,394 ha of eucalypt plantations. Consequences included reduced (686 ha) or variable growth (300 ha), early branch death (202 ha), foliar discolouration (108 ha) and thin crowns (98 ha).

Multiple causes

Problems are placed in this category when there is a suite of factors contributing to particular symptoms and it is difficult to tease out primary causal factors. This year over 3,000 ha were determined as having health issues due to multiple causes. This will include some of the area already mentioned in previous sections (*eg.* cold/exposure, fungal infection, limited soil nutrients) but refer to different symptoms caused more by the interaction of multiple factors (*eg.* early branch death due to an interaction of poor soil, elevation and fungal infection as opposed to defoliation caused primarily by fungal infection). The main symptoms were early branch death (999 ha), stunting (605 ha), variable performance (413 ha), thin crowns (367 ha), foliar discolouration (386 ha). The substantial increase in area of early branch death (Fig. 10), foliar discolouration and thin crowns this year was largely due to the influence of *Kirramyces* and *Mycosphaerella* infection. Extensive fungal infection had greatly exacerbated the early lifting of the green crown and early branch death that occurs on nutrient limited soils. The cause of stunting and variability most commonly included a combination of poor, rocky or

shallow soils; steep slopes, elevation, restricted drainage and weed/grass competition. Thin crowns were generally caused by a combination of insect defoliation, fungal infection, cold/exposure and nutrient limitation. Other interacting factors influencing foliar discolouration were nutrient limitation, elevation/exposure, restricted drainage and grass competition.

Figure 10. Early lifting of the green crown and development of dead branches above the first pruning lift due to a combination of

*Managed natural forests (*Eucalyptus *species)*

Pests

There were no reports of significant pest outbreaks during the past year.

Diseases

A crown rot disease of *Xanthorrhoea* spp. associated with *Fusarium* aff. *babinda* is widespread at a low incidence in healthlands and heathy dry forests throughout the northeast of the State. With the exception of a localised epidemic several years ago in the Waterhouse State Reserve the mortality-rate from the disease is low.

Mortality of naturally-regenerated blackwood (*Acacia melanoxylon*) due to Armillaria root rot (likely *A. leteobubalina*) was reported last year from a research trial at Togari (Circular Head area). More extensive surveys of trial areas found the disease was quite

limited in its distribution.

Mortality associated with Armillaria root rot continues to be very active at the Tahune Airwalk. Celery-top pine (*Phyllocladus aspleniifolius*) has suffered the great majority of the recent mortality (Figure 11).

Figure 11. Dead and dying celery-top pine adjacent to the Tahune Airwalk.

Nurseries and Seed orchards

Conifer species

There were no reports of significant pest or disease problems of conifers in production nurseries during the past year.

Eucalyptus species

There were no reports of significant pest or disease problems of eucalypt seedlings in production nurseries during the past year.

Urban and rural

Pests

No pest outbreaks were reported.

Diseases

No diseases were reported.

Quarantine

Trapping for a number of exotic bark beetle species, of importance to softwood forestry, was conducted again this season between December and April. The National Indicator Species Program (NISP) is funded through the DAFF/OCPPO National Urban Surveillance program and was conducted in conjunction with DPIPWE.

Static intercept panel and funnel traps baited with pinene and ethanol lures were set up in five urban ports around Tasmania including, Burnie, Devonport, Bell Bay, Hobart and Pittwater (Hobart Airport). All bark beetle species were extracted from the samples with a total catch of 1,920 woodborers from all traps and sites. All of the 42 species captured were either established exotic or native woodborer species. None of the target pest species were detected.

Research and development

Research was dominated by studies examining the management of the eucalyptus leaf beetle (*Paropsisterna bimaculata*).

A CRC Forestry project testing "proof of concept" of lethal trap trees completed a second season of operational evaluation this year. A further six *E. nitens* plantations in which 200-tree blocks of *E. regnans* or *E. delegatensis* trap trees were established 2-3 years earlier were treated by stem injection with imidacloprid in mid spring. Treatment coincided with the *E. nitens* plantations transitioning to adult foliage and all six plantations were in areas that supported over-threshold populations of *P. bimaculata* the previous season. Monitoring of beetle populations in the six plantations recorded a range of population sizes varying from well above economic injury threshold to virtually absent. Sticky trap monitoring found that the treated trap trees attracted *P. bimaculata* to all five plantations where this species dominated. Plots of lethal trap trees reduced beetle populations in and around their perimeter and provided a small but significant reduction in the subsequent defoliation of *E. nitens* immediately adjoining the plots. However this effect only extended 50 metres into the *E. nitens* plantation beyond the trap tree plots. The small measured effect size suggests an attract-and-kill approach to managing leaf beetles is unlikely to be viable.

A detailed evaluation of the performance and financial outcomes from the leaf beetle IPM was completed during the year. Performance of the IPM peaked in 3-6 year-old plantations, the span of age classes that the IPM was originally developed for, and steadily declined in older plantations. False negatives due to a failure of monitoring to correctly detect above-threshold populations were the main reason for the declining

performance of the IPM in older plantations. Overall the IPM yielded a benefit – cost ratio of 1.76 : 1. The great majority of that benefit accrued in 5-9 year-old plantations. The net benefit of the IPM would nearly double if refinements to the IPM were successful in preventing defoliation from all above-threshold leaf beetle populations. Refinements to the method for monitoring leaf beetle populations are being introduced in 2011-12 in an attempt to improve the performance of the IPM in older plantations.

Analysis of the relationships between leaf beetle populations and environmental / landscape factors found that populations varied significantly with altitude and proximity to *Poa* grassland. A simple three-class hazard-rating based on these two factors usefully stratifies the plantation estate. Compared with low-hazard sites, plantations in high-hazard areas had: (i) 2-7 times higher proportion of monitoring events detecting above-threshold leaf beetle populations; (ii) five times greater proportion of plantations experiencing above-threshold populations over consecutive years; and, (iii) seven times greater prevalence of severe defoliation. On the basis of these findings, Forestry Tasmania will switch to a risk-based targeting of plantations to include in the leaf beetle IPM in 2011-12.

The impact on growth of severe leaf beetle defoliation in mid-rotation *E. nitens* plantations is being evaluated as part of a CRC Forestry project to validate CABALA HEALTH. Plots were established in six 10-12 year-old *E. nitens* plantations in winter 2010 to enable defoliation and growth during the subsequent growing season to be measured. Growth declined with increasing defoliation and virtually ceased beyond 60% defoliation. The most severely-affected plantation, which had chronically thin crowns (>70% leaf area loss), suffered a 93% reduction in growth for the 2010-11 season.

The potential for *Phytophthora cinnamomi* to cause chronic growth reduction in *E. nitens* that survive the initial wave of disease during establishment is being examined. Paired-plots have been established and measured in *E. nitens* plantations known to be infected with *P. cinnamomi*. Each plot-pair samples an area of high productivity and an area of low productivity (based on LIDAR-derived productivity mapping). The association of *P. cinnamomi* with plots of low productivity is being tested.

Further screening of *E. globulus* progeny for resistance to Mycosphaerella leaf disease (MLD) was done in a common garden trial at Goulds Country, northeastern Tasmania – the fifth in a series of common garden trials screening for MLD resistance that have been established through the CRC for Forestry. The trial experienced severe MLD during an epidemic that developed following the wet summer-autumn of 2011. Disease assessments made after the 2011 epidemic coupled with future growth measurements will enable progeny to be ranked on their tolerance to MLD as well as the more usual trait - resistance to MLD.

Tabular summary of the activity of the main pests and disease 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**			
Browsing mammals						✔					2037 (<3yo)		*E. nitens & globulus*
Autumn gum moth											22000		
Christmas beetle											22000		
Paropsines					✔				✔		28912	5470	*E. nitens & globulus*
Gum leaf skeletoniser	✔					✔					22000		*E. nitens*
Sawfly											22000		
Leaf blister sawfly											22000		
Spring beetles (scarabs)											22000		
Jarrah leaf miner											22000		
Phasmatids											22000		
Weevils (defoliating)											22000		
Phoracanthines											22000		
Wood moths							✔				22000		
Wood borers - cerambycids							✔				22000		
Wood borers – buprestids											22000		
Wingless grasshopper											22000		
Mycosphaerella spp.				✔				✔			22000		*E. globulus*
Kirramyces eucalypti			✔					✔			22000		*E. nitens*
Armillaria spp.											22000		
Phytophthora spp.		✔									22000		*E. nitens*

***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			
Browsing mammals			✓						✓		46000		*P. rad*
Bark beetles (*Ips, Hylastes*)											46000		*P. rad*
Sirex wood wasp	✓										46000		*P. rad*
Monterey pine aphid											46000		*P. rad*
Wingless grasshopper											46000		*P. rad*
Armillaria spp.											46000		*P. rad*
Phytophthora spp.											46000		*P. rad*
Dothistroma septosporum		✓					✓				46000		*P. rad*
Spring needle cast / *Cyclaneusma*					✓					✓	46000		*P. rad*
Sphaeropsis sapinea		✓				✓					46000		*P. rad*

South Australia

Dr Charlma Phillips (Principal Forest Health Scientist, ForestrySA)

PLANTATIONS

This report summarises forest health issues in pine and eucalypt plantations in South Australia in 2011. Information on the health of Pine plantations was supplied by ForestrySA, Gunns Forest Products and Green Triangle Forest Products. Information on the health of Eucalypt plantations was supplied by ForestrySA, Gunns Forest Products and P F Olsen (Aust) Pty Ltd.

In general plantations in South Australia were very healthy in 2011. Good rains after several years of drought have improved the health of the trees and reduced the impact of insect pests and diseases.

Pinus radiata

Annual aerial surveys of plantations in the Green Triangle, Ranges and Mid-North forests were conducted in June/July 2011. These surveys were followed by ground inspections where necessary to determine/verify the cause of any problems. Very few dead/dying or unhealthy trees were recorded. Most records were of single trees or small patches of dead trees as a result of lightning strikes (often followed by attack by Ips and/or Sirex). Some deaths were attributable to site/soil conditions, mostly water-logging caused by record rainfall and mild conditions over summer.

Insect pests

***Sirex noctilio* (Sirex wood wasp)**

Sirex remains at a low level in all areas. A few scattered trees in the South East Region, identified by aerial observation, have been attacked, mainly as a result of lightning strikes. All companies set up trap tree plots, carry out annual surveillance and inoculate nematodes.

Figure 1: Sirex larva dissected to show parasitic wasp larva inside

***Ips grandicollis* (Fivespined bark beetle)**
Ips continues to be active in the Mount Lofty Ranges and Mid North plantations of Wirrabara and Bundaleer (approx. 150 km north of Adelaide). However over the last year increased thinning and pre-commercial thinning operations, together with changes in management of residue, have improved the health of plantations in these areas. Salvage of windthrow areas removed potential breeding sites for Ips though there was an increase in Ips population numbers prior to this. In the Green Triangle, *Ips* is present but there were no reports of damage in 2011.

***Essigella californica* (Monterey pine aphid)**
Aphid numbers have generally been low again this year. Damage is regarded as being slight to average in all areas. Releases of the biocontrol agent, *Diaeretus essigellae*, have continued even when aphid numbers were very low. Release sites have been monitored and a few "mummies" found at two sites.

Figure 2: Essigella californica "mummy". First one found in the Green Triangle in 2011.

***Chlenias spp.* (Pine Looper)**
No major damage by *Chlenias* spp. has been recorded this year. A plantation at Noolook in the Green Triangle that was damaged last year by this species had a small population of larvae again this year but these caused no significant damage. A viral disease killed many larvae last year. It is thought that this contributed to reduced population numbers in 2011.

Diseases
Cyclaneusma minus again affected a small number of trees in younger plantation in the Green Triangle. There were no reports of damage by *Diplodia* or other diseases in 2011.

Eucalyptus spp.

Insect Pests
In general, there were no widespread major pest or disease issues in the Green Triangle in 2011. Autumn Gum Moth (*Mnesampela privata*) and Eucalyptus Weevil (*Gonipterus scutellatus*) caused significant localised damage in some young plantations in the eastern part of the Green Triangle (in Victoria) and approximately 800 ha altogether were sprayed.
Many plantations in the SA side of the Green Triangle are now 4 years old or more and are thus less vulnerable to insect damage at economically significant levels.

Diseases
Mycosphaerella was widespread on adult foliage in some areas, especially in coppice. This was possibly due to wet conditions over summer in those areas.

NURSERIES
No reports of forest health issues in 2011.

Western Australia

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PLANTATIONS
Pinus radiata *and* P. pinaster

Insect pests

***Sirex* spp.**
The Forest Products Commission (FPC) in Western Australia conducts an annual monitoring program throughout its estate. Monitoring in WA is now done using static (panel) traps, which are effective in detecting very low numbers of Sirex. The traps are erected in pairs in open areas of plantations that would likely be used as flight paths for the wasp. Last year they were deployed in plantations from Perth to Esperance, as well as Albany town site and a Bunbury sawmill. No Sirex wood wasps (*Sirex noctillio*) were detected in any of the traps in the 2010-11 flight season.

Bark Beetles
Bark beetle distribution and abundance were monitored in conjunction with the Sirex trapping program; numbers were generally low and not causing problems however large numbers were detected in one trap in a plantation north of Perth. This and other plantations were subject to severe drought conditions in 2010-11 resulting in extensive mortality. Build up in bark beetle numbers may have been an indication of increased tree stress levels prior to symptoms becoming apparent.

Five-spined Bark Beetle *(Ips grandicollis)*
Ips were found in all plantation areas over the length of the trapping season, but were not detected in the Albany town site traps. Numbers were highest in the west coastal plantations of Gnangara, McLarty and Myalup as well as the pine mill near Bunbury.

Golden Haired Bark Beetle (*Hylurgus ligniperda*)
Hylurgus distribution and abundance around the Bunbury area was monitored in conjunction with the Sirex trapping program, but numbers were low and not causing problems.

Monterey Pine Aphid *(Essigella californica)*
Although *Essigella* is present it is still not regarded as a problem in WA. Ian Dumbrell (DAFWA) is the WA representative on the *Essigella* biocontrol project steering committee. There have been four releases in winter 2011 of the control agent *Diaeretus essigellae*. Follow up monitoring is yet to be conducted to see if the wasp has become established.

European House Borer (*Hylotrupes bajulus*)
As of September 2010, European house borer (EHB) has been confirmed at 178 sites across 50 suburbs. This includes 11 plantations and 167 urban sites. EHB infestations have been confined to the greater Perth Metropolitan area, except for one confirmed find in Albany.
Of the confirmed sites:

- 164 were in dead, dry pine in the environment, such as logs, branch stubs, stumps and dead wood inclusions.
- 2 were in furniture.

- 6 were in structural and milled timber (2 of these in houses – Albany and Brigadoon).
- 6 were in trap poles (pinewood logs placed to measure existing population densities, and later for verification of eradication from target areas)

Eradication activities will undergo a transition to ongoing management in 2011.
The Department of Agriculture and Food is undertaking consultation with stakeholders to discuss the transition impact and future management strategies. Most importantly, the transition will require increased support from industry, government and communities in carrying out EHB surveillance, and embracing future containment.

Throughout 2011, the EHB Response Program will focus on:
- Extension and improvement of current EHB training for pest controllers.
- Development of a national communication strategy for EHB education and awareness.
- Continued State communication activities to ensure uptake of risk minimisation strategies.
- Development of interstate quarantine regulations for the movement of EHB host materials from Western Australia.

Wingless Grasshopper (*Phaulacridium* sp.)
No unusual activity

Rutherglen Bug (*Nysius vinitor*)
No unusual activity

'Spring' beetle (*Liparetrus jenkinsi*
No unusual activity

Pathogens

Hail damage from summer thunderstorms south of Busselton in *P. radiata* and north of Perth in *P. pinaster* resulted in significant areas infected with *Sphearopsis sapinea* which lead to large numbers of tree deaths. Rapid decline of hail damaged trees was due to multiple infection points.

Abiotic Factors

Drought

Record low rainfalls over the past three years, coupled with prolonged high temperatures have resulted in widespread tree deaths in south-west WA. This has had a significant impact on forestry production, biodiversity, and visual amenity. Additionally, the large scale deterioration of both plantation and native forests has increased the State's bushfire risk for the coming fire season. Forecasts indicate rainfall over the 2011 spring period will be 'average' however this will provide little benefit as the impacts of the dry seasons are expected to continue through the upcoming summer.

Although south-west WA has experienced a reduction in rainfall over an extended period, the past three years have seen unprecedented weather conditions that have led to the extensive losses of plantation pine and widespread impacts across the northern jarrah forest. Assessments conducted indicate that the underlying contributory factors to tree deaths in plantations and native forests are the prolonged absence of rain and the associated fall in water tables. There has been a significant decline in soil moisture in the root zone to such an extent that tree survival has been compromised. No amount of rainfall in the current season will ameliorate the impact on the plantation timber currently affected. For water tables to stabilise and recover, several years of above average rainfall is required. In the immediate future, rainfall trends suggest this outcome is unlikely.

Eucalyptus globulus

Notes on WA plantation health data

Data presented herein has been compiled from reports provided to the industry pest management group (IPMG) by industry partners. It is of a general nature and reflects the lack of formal plantation health data collection. It is likely to be an underestimation as some data lacked integrity and not all companies were able to provide data (F. Tovar, IPMG).

WA Regional Summary

Pest and disease levels reported over 2010-11 were moderate. Insect damage levels seemed to be exacerbated by prolonged drought conditions. Many trees failed to recover from spring defoliation of crown tops, displaying generally poor crowns up until the resumption of autumn rains (March-April). Plantations displaying signs of moisture stress and pest induced defoliation included those in areas east of Albany (including Esperance), the southwest coast (Augusta to Bunbury), and the southwest interior (Collie, Boddington, Bridgetown, Boyup Brook and Rocky gully). That is, most growing areas.

Liparetrus beetles, the chrysomelid *Paropsisterna m-fuscum* (yellow belly) and wingless grasshoppers caused most damage to seedlings and young plantings. *Heteronyx* beetles, eucalypt weevils (*Gonipterus* spp.) and chrysomelids (*Paropsisterna variicolis*) continue to be the most frequently reported insect pests in >3 year-old plantations.

The prolonged summer drought conditions and lack of available food also saw large plantation areas affected by "28 parrots" (*Banardius zonarius*) in search of alternative food sources. Snapped crown-tops and bark stripping being commonly observed as the parrots fed on sap.

As was the case last year, it is estimated that 25,000 ha of the WA estate were inspected frequently by foresters, comprising mostly 1- 3 year old plantations. Of these around 8,500 ha were found to have significant problems due to biotic and abiotic problems, with 80 ha having to be replanted and 6,620 ha being treated or managed in some way. The remainder were left untreated (F. Tovar, IPMG).

Insect pests

African Black Beetle: 20 ha east of Albany was severely affected and had to be replanted, with seedlings protected by netting ("socks").

***Catasarcus* sp.:** Approximately 200 ha of plantation were damaged by *Catasarcus* species. Damage was observed on the lower foliage of trees greater than 3 years old. It was found in small areas within plantations in Collie, Boddington, Boyup Brook, Mt Barker and east of Albany.

Eucalyptus weevil *(Gonipterus* spp.): Low levels of damaged were observed throughout the estate. Drought conditions over the summer (and previously low rainfall) meant that many trees did not recover from spring damage. Moderate to severe damage, totalling some 780 ha, was reported in south-western interior areas, (Donnybrook, Bridgetown, Pemberton and Rocky Gully) and north and east of Albany (Mt Barker, Wellstead).

Eucalypt leaf beetles (Chrysomelidae): *Paropsisterna m-fuscum* was observed causing low levels of damage to seedlings throughout the WA estate. A total of 240 ha were reported as damaged, significant damage warranting spray actions occurred over 100 ha in Augusta/Margaret River and a further 40 ha around Boyup Brook. Some 70 ha of older plantations (>3 years) spread from Albany to Denmark were damaged by *Paropsisterna variicolis*.

***Heteronyx* spp:** These beetles continue to cause repeated damage to the tops of trees in young to mid rotation plantations from January to March. Plantations affected are east of Albany from Cheyne Beach to Wellstead and Esperance. Due to the large areas affected, a lack of manpower

and a lack of effective control options, formal surveys for this pest are not currently conducted. It is estimated that around 3,000-5,000 ha are affected yearly.

Spring Beetle (*Liparetrus jenkinsi*): Greater vigilance from foresters has led to fewer incidences of seedling damage by this species when compared to years past. In total 250 ha were damaged in Mt Barker, Rocky Gully, Manjimup and Boyup Brook. Around 30 ha had to be replanted, the remainder were effectively controlled and recovered from damage.

Wingless Grasshopper: Approximately 170 ha of plantations were reported as suffering Wingless grasshopper damage, mostly in plantation areas next to crops. Area affected included Augusta, Mt Barker, Rocky Gully and sandy coastal areas from Denmark to Wellstead.

Vertebrate pests

Birds: Due to drought conditions and lack of available feed large numbers of Port Lincoln parrots (commonly termed 28s) were observed in plantations. Areas north of Mt Barker and West to Busselton were especially affected with up to 3,200 ha showing signs of moderate to severe damage.

Unusually, Mountain ducks (*Tadorna tadornoides*) have been reported ripping seedlings out of the ground, with 2 ha having to be replanted near Augusta.

Rabbits: Browsing damage to seedlings by rabbits was reported east of Albany. Approximately 30 ha were affected with 10 ha having to be replanted.

Pathogens

***Teratosphaeria spp.* (formerly *Mycosphaerella*):** Though observed throughout the WA estate, plantations in the Denbarker and Mount Barker areas and along the Great Southern Coast (Wellstead to Walpole) are most affected. A total of 870 ha of affected plantations were reported a slight increase from last year.

Abiotic factors

Drought: Drought stressed plantations were observed in all areas of the WA estate. Approximately 150 ha in Mt Barker and Rocky Gully were unambiguously affected by drought with severe symptoms and deaths occurring. It should be noted however that many areas reported as having severe pest damage symptoms were also likely to be suffering drought stress but were not reported as such.

Nutrient Deficiencies: The number of first and second rotation plantations suffering nutrient deficiencies increased significantly. Close to 2,700 Ha of plantation were reported as showing signs of nutrient deficiency mostly of copper (Cu), boron (B) or zinc (Zn). Significant deficiencies were reported in interior areas (Bridgetown, Boyup Brook and Collie) and the sandy plains around Augusta.

Table 1. Area of *E. globulu*s plantation estate monitored and area affected by pests and pathogens in Western Australia in 2010-11*.

PESTS*	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			
African Black Beetle (*Heteronychus arator*)							X					20	*E. globulus*
Catasarcus sp.			X									-	
Eucalypt weevil (*Gonipterus scutellatus)*				X					X			120	*E. globulus*
Heteronyx spp.					X					X		-	*E. globulus*
Chrysomelid beetles			X									100	*E. globulus*
"Spring" beetles (*Liparetrus* spp.)			X				X					130	*E. globulus*
Wingless grasshopper (*Phaulacridium vittatum*)			X									170	*E. globulus*
28 Parrots (*Banardius zonarius*)				X					X			3200	*E. globulus,*
Rabbits		X					X					10	*E. globulus*
PATHOGEN													
Teratosphaeria spp.				X			X					220	*E. globulus*
Abiotic													
Nutrient deficiencies (Copper, Boron, Zn)					X							2650	*E. globulus*
Drought								X				-	*E. globulus*
									TOTALS		**25,000**	**6,620**	

** Data contained in the above table is of a general nature and reflects the lack of a formal pest and pathogen data collection process. It is likely to be an underestimation as a number of companies were unable to collect the necessary data.*

† Area inspected was roughly calculated from the known area of plantings from 2009- 2011 (1-3 years old), as plantations in this age group are known to be frequently inspected. Additionally older plantations that were reported as having damage were also counted. Again this is likely an underestimation

‡ Area Treated was taken to mean that some control or management action had taken place, including replanting (F. Tovar IPMG)

Other *Eucalypus* spp. (*E. cadocalyx, E. maculata* and *E. saligna*)
Insect pests
Leaf blister sawfly (*Phylacteophaga froggatti*)
Leaf blister sawfly has decimated (stress exposed) plantations of *E saligna* and *E. botryoides* in some inland areas. Gum Leaf Skeletoniser (*Uraba lugens*) was also found on *E. rudis* within the plantation boundary. *E. cladocalyx* and *Santalum spicatum* in the same plantation were not affected by these pests.

'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. 2010 spring season was not an unusual season.

Sandalwood (*Santalum spicatum*) plantations
No major insect or fungal problems reported.

Managed natural forests

Jarrah forest (*Eucalyptus marginata)*
Insect pests

Jarrah leaf miner (*Perthida glyphopa*) (JLM)
Surveys for jarrah leaf miner (JLM) in October and November 2009 showed that there was northwards spread of JLM outbreak into northern regions of Jarrah forest, but severe browning due to JLM was recorded in the Albany hinterland. A survey of the cutout boundary will be repeated in October & November 2011 (A. Wills, & J. Farr DEC).

Gum leaf skeletonizer (*Uraba lugens*)
An outbreak of gumleaf skeletonizer (GLS) was first observed in Dec-March 2009-10. In the summer season of 2010-2011 population monitoring included a road drive-by survey; branch clipping of 61 sites throughout the jarrah forest including 45 sites originally determined in the 1982-92 outbreak; aerial observation and mapping; trial of the New Zealand pheromone lure system in an outbreak situation. Severe defoliation occurred on 250,000 ha, with > 350,000 ha experiencing severe to moderate defoliation. The mean larval density was measured in December as 824 larvae kg^{-1} dry weight of leaf which was equivalent to a January population of 275 larvae kg^{-1} dry weight of leaf (adjusted for appropriate survival rates), nearly twice the past peak outbreak level in 1986-87. Some areas of forest experienced nearly 100% defoliation. The New Zealand pheromone lure system was successful and will be used in 2011-12 to determine GLS flight periods and develop a more efficient population monitoring system for future outbreaks (a paper will be published in Australian Journal of Forestry in 2011 on the pheromone trial). In addition remote sensing and GIS applications will be investigated to further investigate spatial patterns as related to vegetation, soils, fire history and land management regimes (J. Farr, DEC).

U. lugens defoliation at Easter forest block February 2011 (*left*) and Aerial photograph showing large scale defoliation February 2011 (*right*).

Cerambycid woodborers (*Phoracantha semipunctata*)
Beetle populations responded strongly to the drought-induced collapse of jarrah and marri in the Northern Jarrah Forest by quickly colonizing damaged stems (83% of marri, 84% of jarrah). Destructive sampling of trees exhibiting differing symptomologies confirmed beetles are largely acting as secondary invaders, with minimal damage observed in neighbouring trees maintaining green canopies. A negative relationship was found between woodborer damage in the sapwood and sapwood moisture content. Despite their roles as secondary invaders, consumption of cambial tissues is significant with an average 68% of marri tissue and 33% of jarrah stem tissue consumed in drought-affected trees. Predation may limit the potential for resprouting, particularly in marri. Whole stem dissections of six marri stems resulted in 7, 26, 35, 36, 45, and 108 living larvae per square meter of surface area. Population and damage monitoring of the population is expected to continue. (G. Matusick, MU)

Pathogens

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

Abiotic factors

Frost

In June/July 2010 large portions of the northern jarrah forest experienced extreme low temperatures (-4 to -6º C) resulting in rapid foliage and shoot mortality marri and jarrah. Damage was restricted to drainage lines, which likely acted as cold-air sinks. Twelve plots (40m fixed-radius)(6 damaged/6 undamaged) were installed in Wandoo National Park (Talbot Brook) to collect baseline damage and track recovery. The hardest hit areas were those pockets of jarrah/marri surrounding Darken Swamp. Trees of all size classes were affected though variation was high on each site. Some marri trees experienced 100% defoliation and shoot loss (47% average), while jarrah was slightly less affected (23% foliage damage). Marri leaves discoloured, dried, and died very quickly. Affected jarrah foliage first turned purple, then eventually died in spring. Most marri trees with complete defoliation reflushed large portions of their crowns. Most affected jarrah trees simply shed their shoots, with minimal evidence of reqprouting. Wandoo was not affected. Research is continuing to determine low temperature tissue thresholds. Preliminary data suggests exponentially more cell damage occurs between -4 and -6 degrees Celsius (G.Matusick, Murdoch University).

Frost affected patch in April 2010 (*left*) and an affected jarrah tree in December 2010 (*right*)

Drought

Unprecedented drought-induced deaths in the northern jarrah forest (NJF) observed starting late February 2011. Most damage occurred along the Darling Scarp from northern Perth to Pinjarra and in the western forest. Mortality occurred in overstorey (jarrah/marri) and midstorey (*Banksia grandis/Allocasuarina*) in noticeable patches. An aerial survey of approximately 9% of the NJF resulted in an estimate of 1.6% of the area

severely affected with an additional 5% showing strong crown chlorosis in late May. The rate of progression seemingly slowed through June, however some sites continued to lose canopies through late July. All size and age classes of trees are affected. Most canopies died very quickly (within 5-7 days), losing their shoots and leaves within a month. Drought and more specifically mass conduction failure is thought to be the main cause of death in jarrah and marri due to rapid drying of the inner bark and sapwood. Also, an estimated 50% of the damaged sites were located on notably shallow soils, as evidence by their proximity to granite rock outcrops. Damaged areas were larger and more severe in the Northern section of the forest near Jarrahdale, with smaller, less severe areas to the south (Dwellingup). By late July some jarrah stems not damaged by woodborers were re-hydrated to breast height, while marri stem tissue continues to dry and die. Research is very active on this disturbance event at the moment and will likely continue indefinitely (G.Matusick, Murdoch University).

Canopy mortality centres near Dale (*left*) and strongly chlorotic canopies surrounding mortality centre (*right*). Photos taken May 2011.


Jarrah crown collapse and leaf shed near Dale. Photo taken July 2011.

Karri forest (*Eucalyptus diversicolor*)
Insect pests
No major pest problems reported.

Pathogens
No new major disease problems were reported. Management and survey of *Armillaria* root disease in karri forests continues to command attention.

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

Native plant communities

***Phytophthora* in natural ecosystems**
Previously large-scale aerial photography has been used to map the extent of Phytophthora dieback disease in native forests in the south-west of Western Australia, whereas currently most mapping is undertaken with intensive field survey. Validation of the observations involves routine testing of soil and root samples for the presence of *Phytophthora cinnamomi.* In addition to *P. cinnamomi*, six morpho-species had been identified using this technique: *P. citricola, P. megasperma, P. cryptogea, P. drechsleri, P. nicotianae* and *P. boehmeriae.* In recent years many new *Phytophthora* species have been described world-wide, often with similar morphology to existing species; thus, as

many of the isolates collected in Western Australia have been difficult to identify based on morphology, molecular identification of some of the morpho-species is required. Based on amplification of the internal transcribed spacer (ITS) region of the rDNA, sequence data of over 560 isolates (both recent and historical) have now been compared to that of existing species and undescribed taxa. This work is continuing.

In addition to *Phytophthora multivora*, a further eight new species isolated from WA natural ecosystems have now been described: *P. elongata, P. thermophila, P. gibbosa, P. gregata, P. litoralis, P. arenaria, P. constricta* and *P. fluvialis.* Pathogenicity has so far been tested and confirmed on native plants for *P. multivora*, *P. elongata, P. arenaria* and *P. constricta*. Several additional new WA taxa await formal description.

New records for WA of *Phytophthora* taxa known elsewhere have included: *P. inundata*, *P. niederhauserii*, *P*. taxon asparagi, *P*. taxon personii, *P*. taxon PgChlamydo, *P*. taxon rosacearum-like, *P*. taxon salixsoil and *P*. taxon humicola-like.

A number of unique hybrid Phytophthoras, with significant genetic diversity, have been identified from WA natural and plantation ecosystems: some from soil associated with dead plants, and also many from waterways. Investigations of the hybrids and their origins are progressing. The presence of these hybrids (all recovered from routine soil, root and water samples being tested for *Phytophthora*) shows that they are sufficiently stable and resilient to survive in the harsh WA environment. Also, it raises the possibility of hybrids with significant pathogenic capability arising in the field at any time from interactions between compatible *Phytophthora* species. Movement of infested soil and/or plant material between sites will clearly facilitate these interactions, and should be minimised.

Most of the newly-described Phytophthoras (and some of those yet to be described) have been associated with multiple species of dying native plants in WA natural ecosystems, with DEC isolations from indicator plants dating back to the 1980s. Some Phytophthoras are active in a broader range of site conditions than those favouring *P. cinnamomi* (e.g. *P. multivora* in limestone soils). Some species (e.g. *P. arenaria* and *P. constricta*) are believed to be endemic in WA. Most of the new taxa have been associated with dying *Banksia* spp. while *P. elongata*, *P. multivora* and *P. thermophila* have also been isolated from dying *Eucalyptus marginata* (jarrah). *Phytophthora multivora* is pathogenic to bark and cambium of *E. gomphocephala* and *E. marginata* and is believed to be involved in the decline syndrome of both eucalypt species within the tuart woodland. *P. elongata* has also been isolated from dying *Corymbia calophylla* in mining rehabilitation sites. Some taxa appear to have limited distribution, while others like *P. multivora* are widespread.

Land managers are being encouraged to apply the precautionary principle in dealing with all of these soil-borne *Phytophthora* species with the aim of minimising their spread, while management and policy documents are now being updated to include the other *Phytophthora* species in the definition of Phytophthora dieback.
The previously recorded presence in WA natural ecosystems of some *Phytophthora* species other than *P. cinnamomi* (*P. cryptogea, P. nicotianae, P. megasperma, P. boehmeriae*) has been confirmed by DNA sequencing of stored isolates; however, *P. citricola* and *P. drechsleri* (previously believed to be present) are not present among the

isolates tested to date. (T. Burgess, G. Hardy, D. White, A Rea, Murdoch University; J. Webster, J. Ciampini, M. Stukely, DEC).

DEC - Phytophthora Research Projects

Over the past year a number of small to medium scale experiments into the control of *P. cinnamomi* have been conducted by DEC Science Division staff. This has included investigations into the ability of geotextiles to filter *P. cinnamomi* inoculum, the suppressive effect of fire retardants on the infection cycle of *P. cinnamomi* and the use of high intensity phosphite application (HIPA) (i.e. basal stem application) in Jarrah and *Banksia grandis*. In brief, the geotextiles were able to contain *P. cinnamomi* zoospores under neutral hydrologic pressure, fire retardants (Angus ForExpan-S, Phos-Check WD-881) suppress the growth and infective ability of *P. cinnamomi* at their recommended rates for use in bushfire control and HIPA did not provide adequate phosphite tissue concentrations in Jarrah to control of *P. cinnamomi*. Further experiments into the efficacy of fumigants to sterilise *P. cinnamomi* infested soil and an assessment of the effectiveness of current DEC hygiene procedures will be conducted during 2011-2012 (C. Dunne, P. Scott, R, Thavornkanlapachai, DEC).

State NRM - Phytophthora Containment and Eradication Research

In late 2009 a State NRM grant was received to undertake a number of Phytophthora dieback management initiatives. Included in this project were attempts at management scale containment and eradication of *Phytophthora cinnamomi* infestations within the Fitzgerald River and Cape Arid National Parks. To date a <0.5 ha infestation at Cape Arid National Park has been eradicated and a 1 ha infestation within the Fitzgerald River National Park has been contained. The containment and eradication programs used an integrated management approach utilizing catchment hydrological modeling, runoff diversion, root impervious membranes, geotextiles to prevent inoculum movement in overland flows, host destruction including herbicide treatment, fungicide treatment using phosphite, fumigation and perimeter fencing to prevent animal vectoring. Further treatments and monitoring will be undertaken over the current financial year. (C. Dunne, R. Hartley, P. Scott, DEC; B. Dunstan, T. Paap, N. Williams, G. Hardy, Murdoch University).

State NRM - Correlations of plant canker pathogen impacts in Proteaceae with climate and optimizing the canker control management strategy for the south coast of Western Australia.

Currently two declared rare flora, *Banksia verticillata and Lambertia orbifolia ssp. orbifolia* are being severely impacted by canker disease and concern was raised that this may be caused by emerging pathogens in a changing climate. Studies funded by state NRM in 2010 have been conducted on the impact of aerial canker on *Banksia* decline, resulting in the identification of a number of associated fungal species which included *Neofusicoccum australe, N. macroclavatum, Cryptodiaporthe melanocraespeda* and a new genus within the Cryphonectriaceae currently being described (proposed *Cirrhiluteous shearii*).

Transects established in 2010 to monitor the health and survival of three keystone *Banksia* species of the south coast (*Banksia baxteri*, *B. coccinea*, and the rare granite banksia, *B. verticillata*) have identified an increase in canker incidence and forecast a further increase within these Proteaceous spp. in the future climate change scenarios projected for south Western Australia. Increasing canker impact in *B. baxteri* has been significantly correlated with increases in daily humidity, maximum and mean temperatures. For *B. coccinea* positive correlations with minimum temperatures and evaporation have been found.

Ranking of effectiveness of the fungicides tebuconazole (Tebuconazole®), fenarimol (Rubigan®), thiabendazole (Tecto®) and prochloraz (Sportak®) showed that prochloraz was most effective in containing lesions of *Neofusicoccum* and *Cryptodiaporthe* while fenarimol most effective against the putative *Cirrhiluteous* pathogen. (C. Crane, S. Barrett, B. Shearer, C. Dunn, DEC).

Urban and rural

Pathogens and Declines

Norfolk Pines

Recently the health of Norfolk pines in the Perth urban area has declined. There is a lot of dieback of all but the current year's needles and many young trees die. There are often visible cankers on the stems and branches. *Neofusicoccum parvum* is routinely isolated from these cankers and its pathogenicity proven. This is interesting and *N. parvum*, while common elsewhere in Australia, has not been isolated previously in Western Australia even though there have been extensive surveys in natural ecosystems (H. Golzar, T. Burgess, MU). Results from this project have been published – see Golzar H, Burgess TI (2011) *Neofusicoccum parvum,* a causal agent associated with cankers and decline of Norfolk Island pine in Australia. Australasian Plant Pathology 40: 484-489

Pathogens of boabs

Surveys for fungi associated with boab (*Adansonia gregorii*) are underway in both South Africa and Western Australia. In this study, seven new species of the Botryosphaeriaceae are described from baobab (*Adansonia gibbosa*) and surrounding endemic tree species growing in the Kimberley region of northwestern Australia. Members of the Botryosphaeriaceae were predominant endophytes isolated from apparently healthy sapwood and bark of endemic trees; others were isolated from dying branches. Phylogenetic analyses of ITS and EF1-α sequence data revealed seven new species: *Dothiorella longicollis*, *Fusicoccum ramosum Lasiodiplodia margaritacea*, *Neoscytalidium novaehollandiae*, *Pseudofusicoccum adansoniae*, *P. ardesiacum* and *P. kimberleyense*. The most commonly isolates species was *Lasiodiplodia theobromae*. A pathogenicity test has shown that this species is highly pathogenic to boabs Many of the new species found on Boabs have also been found causing cankers on mangoes in the Ord Region Irrigation Area (Monique Sakalidis, T. Burgess, G. Hardy, Murdoch University; M. Wingfield, Tree Pathology Cooperative Program (TPCP) South Africa).

Results from this project have been published – see Sakalidis ML, Hardy GESJ, Burgess TI (2011a) Endophytes and potential pathogens of the baobab species *Adansonia gregorii*; a focus on the Botryosphaeriaceae Fungal Ecology 4: 1-14 and Sakalidis ML, Ray JD, Lanoiselet V, Hardy GESJ, Burgess TI (2011b) Pathogenic Botryosphaeriaceae associated with *Mangifera indica* in the Kimberley Region of Western Australia. European Journal of Forest Pathology 130: 379-391.

***Tetratosphaeria* on marri**

Several new *Teratosphaeria* species were described from marri. *Corymbia* species are generally not severely affected by *Teratosphaeria* (formally *Mycosphaerella*) leaf diseases and few fungal leaf pathogens have been described from *C. calophylla*. Two new species of *Teratosphaeria* from *C. calophylla*, *Teratosphaeria calophylla sp. nov* and *T. rubidae sp. nov* have been described. In addition, a new epitype was designated for *T. australiensis*. *Tetratosphaeria callophylla* causes a leaf blight which can be severe, but to date its distribution appears to be limited to Kings Park (T. Burgess, Murdoch University). The results of this project have been published – see Taylor K, Andjic V, Barber PA, Hardy GESJ, Burgess TI (2011) New species of *Teratosphaeria* associated with leaf diseases on *Corymbia calophylla* (marri). Mycological Progress: DOI: 10.1007/s11557-11011-10738-11551.

Peppermint dieback

Agonis flexuosa, commonly known as the Western Australian peppermint, is a tree native to the south-west of Western Australia, and severe dieback symptoms have been recently observed in some areas. A species of fungus was believed to be the causal agent. For this project, fungi were collected, isolated, identified and tested for pathogenicity to determine the causal agent of the decline of *A. flexuosa* in natural ecosystems in Western Australia. Fungi were isolated from symptomatic and asymptomatic material collected from *A. flexuosa*, cultured, and then identified using molecular taxonomy, microscopy and vegetative compatibility trials. Pathogenicity trials using *A. flexuosa* seedlings were carried out to prove Koch's Postulate. All isolates caused lesions in the seedlings, and there is no significant difference between lesions caused by isolates from symptomatic and asymptomatic material. This suggests that the causal agent could be an endophytic fungus which has become a pathogen (N. Dakin, BioGENIUS student, T. Burgess, D. White, G. Hardy, Murdoch University). A student on the diversity of Neofusicoccum australe suggests that this latent pathogen is endemic to Western Australia. Its involvement in the decline of the peppermint must be associated with host stress (N. Dakin, BioGENIUS student, M. Sakalidis, T. Burgess, D. White, G. Hardy, Murdoch University). Results from this project have been published – see Sakalidis ML, Hardy GESJ, Burgess TI (2011a) Class III endophytes, clandestine movement amongst hosts and habitats and their potential for disease; a focus on *Neofusicoccum australe*. Australasian Plant Pathlogy 40: 510-521 and Dakin N, White D, Hardy GESJ, Burgess TI (2010) The opportunistic pathogen, *Neofusicoccum australe*, is responsible for crown dieback of peppermint (*Agonis flexuosa*) in Western Australia. Australasian Plant Pathlogy 39: 202-206.

Mundulla Yellows

Monitoring the occurrence and symptom development of Mundulla Yellows (MY) in WA continues. Symptomatic eucalypts (both planted trees and remnant native trees) have been recorded and monitored in several additional locations. Spread of symptoms within affected sites appears generally to be slow, and diseased and apparently-healthy trees can grow alongside each other. 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 inland on acid soils including laterites. As in South Australia, MY in WA 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 where symptomatic trees can be several hundred metres from, and sometimes upslope from, any road. Symptoms have not been observed within undisturbed native forest or woodland stands in WA. Collaboration is continuing in the investigation of the cause(s) of MY with D.Hanold and J.Randles from the University of Adelaide. (M.Stukely, DEC).

Forest health surveillance and diagnosis

Dieback mapping and management

Mapping the presence of symptoms of the plant disease caused by *P. cinnamomi* was carried out by accredited interpreters to determine areas suitable for protection. Hygiene requirements were specified for activities likely to result in the movement of soil (and as a consequence, *P. cinnamomi*) on lands managed by DEC. A total area of 14,395 ha was mapped to assist the planning of roading and timber harvesting operations undertaken by the FPC, while FPC also arranged significant areas of mapping by private contractors. This included 4988 ha of previous mapping that was checked for further spread. Mapping and hygiene planning were undertaken on a further 1,147 ha for the Parks and Visitor Services, Nature Conservation Service and Sustainable Forest Management Service of DEC, and 1,777 ha for external parties. Training programs were carried out in disease mapping and hygiene management (G.Strelein, DEC).

In the year to 30th June 2011, a total of 1,936 samples were tested for the presence of *Phytophthora* by DEC's Vegetation Health Service (VHS). These samples were associated with verification of dieback mapping for the above projects, as well as external requests. DNA sequencing has been carried out at the Centre for *Phytophthora* Science and Management (CPSM), at Murdoch University, on various recent and historical isolates of *Phytophthora* in the DEC culture collection, from a range of WA locations and ecosystems. This has led to the discovery of an unexpectedly large number of new *Phytophthora* taxa (nine of which have now been formally described), as well as new records for WA of several *Phytophthora* taxa known from elsewhere, and also a swarm of *Phytophthora* hybrids (see details under *Phytophthora* in natural ecosystems). While the pathogenicity of many of the new taxa is still to be fully investigated, the precautionary principle should be applied by managers to ensure that the spread of all of these soil-borne Phytophthoras to new areas is minimised. Hygiene practices should be applied in the same way as for *P. cinnamomi*. (M. Stukely, DEC).

Forest health monitoring

An automated annual monitoring program is continuing to be developed to identify changes in satellite reflectance information over time and correlate this with known or past causes of changes in forest health and vigour. This information is then used to classify the changes, with levels of confidence, to causal factors. Those with unknown or low levels of confidence or changes in magnitude are then targeted for further investigation including field checks to confirm causes and recalibrate the annual data updates. The system includes spatial modeling algorithms to incorporate both known datasets (harvesting, fire, mining) and surrogate datasets (landform, soils, vegetation) that can be correlated with possible causes and inform the decisions on causes that as yet have no spatial history to guide classification (G. Strelein, DEC).

Research and Development

General

Western Australian State Centre of Excellence for Climate Change, Woodland and Forest Health.

This new Centre was approved for funding in late 2008 is made up of four programs: Climate Change, Woodland and Forest Declines; Decline Ecology; Restoring Biodiversity Values; and Policies and Action for Woodland and Forest Restoration. Murdoch University together with the University of Western Australia and the Department of Environment and Conservation are the primary proponents, with cash and in-kind support from 27 agencies, non-government agencies and industry and collaboration with Universities and agencies in eastern Australia and overseas. Six Post-Doctoral fellows and a Manager have been appointed within the centre. The focus of this centre will initially be the decline of tuart and wandoo, however, student projects under the centre have been initiated investigating the decline of other iconic WA species including *E. marginata, Corymbia calophylla, E. rudis, Agonis flexuosa and C. ficifolia.* Further information about the Centre can be found at www.treehealth.murdoch.edu.au (G. Hardy, Murdoch University).

New Zealand

Collated and summarised by J. Bain, L. Bulman, M. Dick, and I. Hood from data and information from the Forest Health Database, *Forest Health News* (Scion), and the Forest Health Reference Laboratory.

1. Plantations:

PINUS RADIATA:

Pests:

No insect problems of any note were recorded in *Pinus radiata* plantations.

Diseases:

Dothistroma needle blight

Last year we predicted that the spray program to control Dothistroma needle blight would be about 50,000 ha. A total of 57,525 ha were sprayed throughout the North Island during the 2010-11 summer with 52,853 ha sprayed once and 4,617 ha sprayed twice. We anticipate a spray program of over 65,000 ha during the 2011-12 season, an increase from the previous season. The Chair of the Dothistroma Control Committee suggested there are a number of reasons why Dothistroma needle blight is less of a problem now compared with 5 to 10 years ago:

- Widespread drought a couple of summers ago resulting in reduced inoculum.
- Lower treatment thresholds implemented by some of the larger forest owners in recent years that has further depressed inoculum levels. Some companies are spraying when average disease levels reach 10%.
- Significant reduction in new planting in recent years and the movement of older plantings into the reduced risk older age class.
- Conversion of significant areas of forest in the central North Island to pasture, on sites that have traditionally required treatment. This activity has now eased due to the requirements of the Emission Trading Scheme (ETS).
- Reduced harvesting in recent years resulting in less re-stocking and hence fewer stands in the susceptible age class. This reduction in harvest level has reversed in the past two years and as a result there has been an increased level of restocking which will lead to more trees in the susceptible age classes.

The increased deployment in high hazard areas of controlled pollinated stock with higher resistance to Dothistroma needle blight has no doubt contributed to lower disease levels. Disease levels were assessed during routine forest health surveillance activities. Mean severity increased to 29% over 2010-11, compared with 27% over 2009-10, 24% the season before that. A total of 4,483 records of biotic or abiotic disorders were made this

year. Dothistroma needle blight made up 11% records, compared with only 7% the year before. These data are useful to demonstrate gross trends and should not be viewed as true means because there is no requirement to record low disease levels or absence of disease.

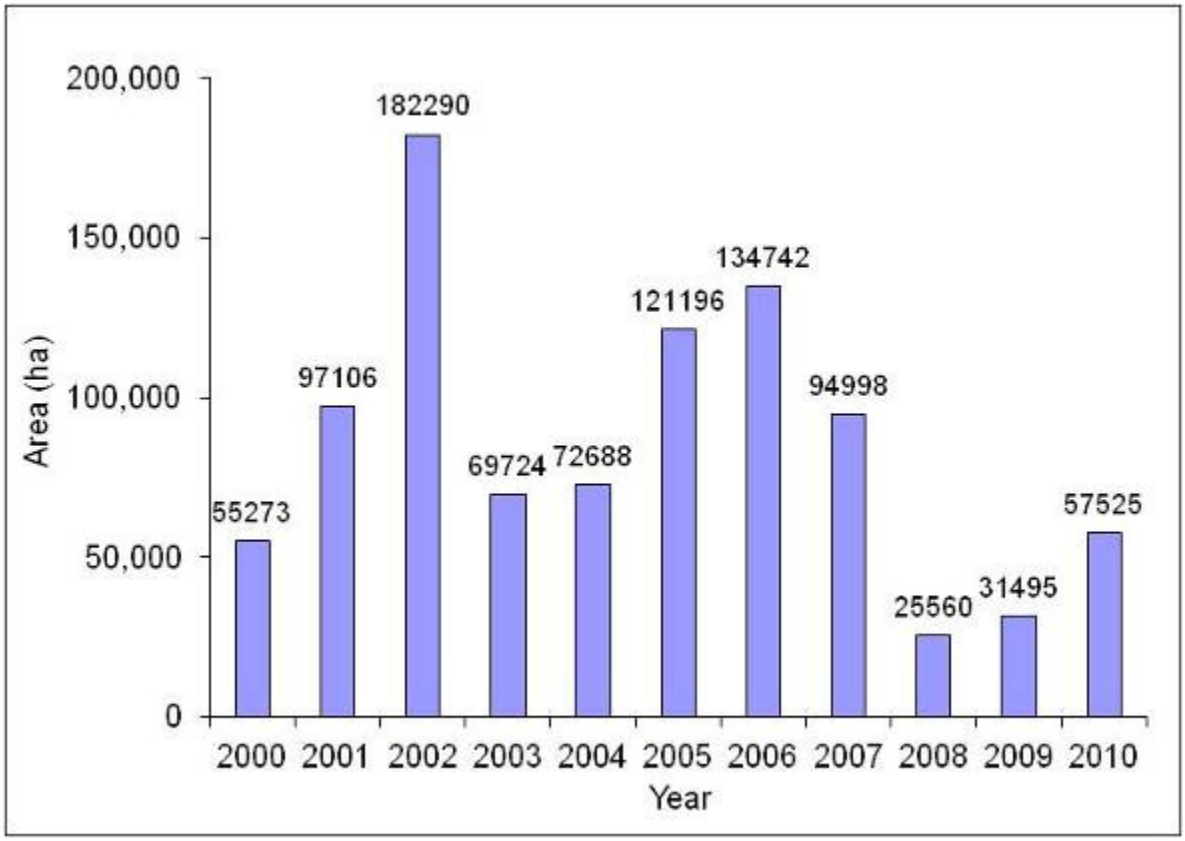

Figure 1 – Area sprayed annually for Dothistroma control in the North Island

Cyclaneusma needle cast

Based on observations, the severity of Cyclaneusma needle-cast increased slightly but not significantly from low levels experienced over the past few years. There were 311 reports of Cyclaneusma needle cast in the forest health database (7% of the total number of disorder records). Disease severity averaged 29% of the crown diseased on affected trees. This compares with an average severity of 48% during the previous year from 172 reports.

Physiological needle blight and red needle cast

As in the previous year, a few reports of the physiological needle blight (PNB) were received in early spring. Most reports were from two regions on the East Cape of the North Island and from a number of very small locations in the central North Island. Parts of Northland were affected, the first reports since 2008. Forest owners in many parts of the North Island and in Nelson have reported relatively high levels of red needle cast (formerly atypical Cyclaneusma needle cast) in some stands.

Neonectria fuckeliana

There is evidence to suggest that the management regimes to control Nectria flute canker have resulted in a significant reduction in the number of trees affected. A research plan is being prepared to quantify the effect of avoiding winter pruning and reducing pruned branch stub size.

There has been no further northward extension to the range of *Neonectria fuckeliana* which remains restricted to the lower half of the South Island (Figure 2). The fungus has not been found in Nelson, Westland, or anywhere in the North Island where surveys have been carried out. Intensive monitoring in mid-Canterbury and Bank Peninsula revealed an increase in the number of sites on Banks Peninsula where *N. fuckeliana* was recorded (Figure 3). Of the 11 sites examined on Banks Peninsula, in 2010 *N. fuckeliana* was successfully isolated from trees at seven sites compared with three in 2009. In 2011, *N. fuckeliana* was successfully isolated from six sites, but of those two were new. Both isolations and incidence of fluting varied and no trend was established when comparing 2009, 2010 and 2011 results.

Fluting typical of Nectria flute canker was not recorded and the fungus was not recovered from the three 100-tree plots established on the Canterbury plains (Figure 3). However, in August 2010 Scion field crews found Nectria flute canker in one forest in the foothills of the Canterbury plains. The discovery was confirmed by isolating *N. fuckeliana* from samples.

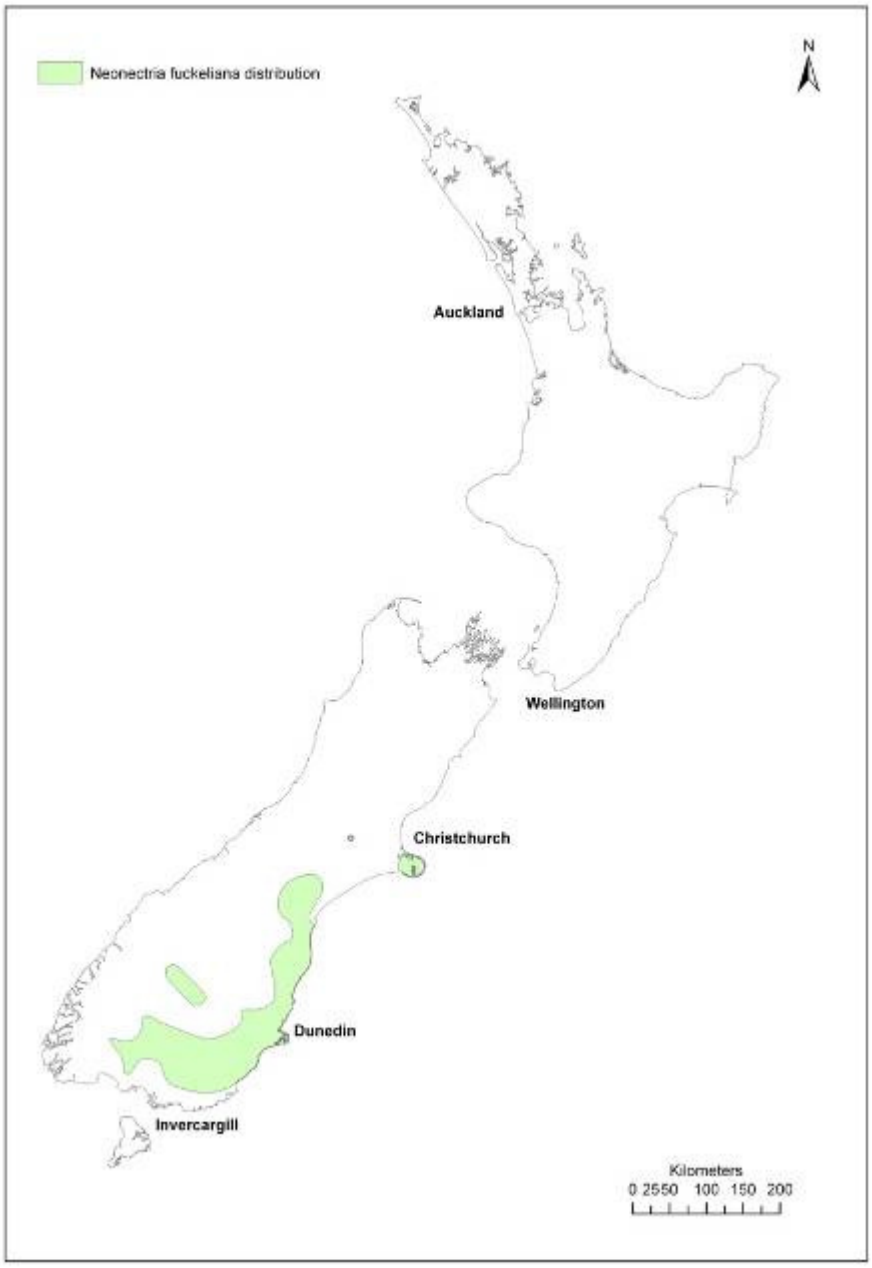

Figure 2 - Known distribution of *N. fuckeliana* in November 2011

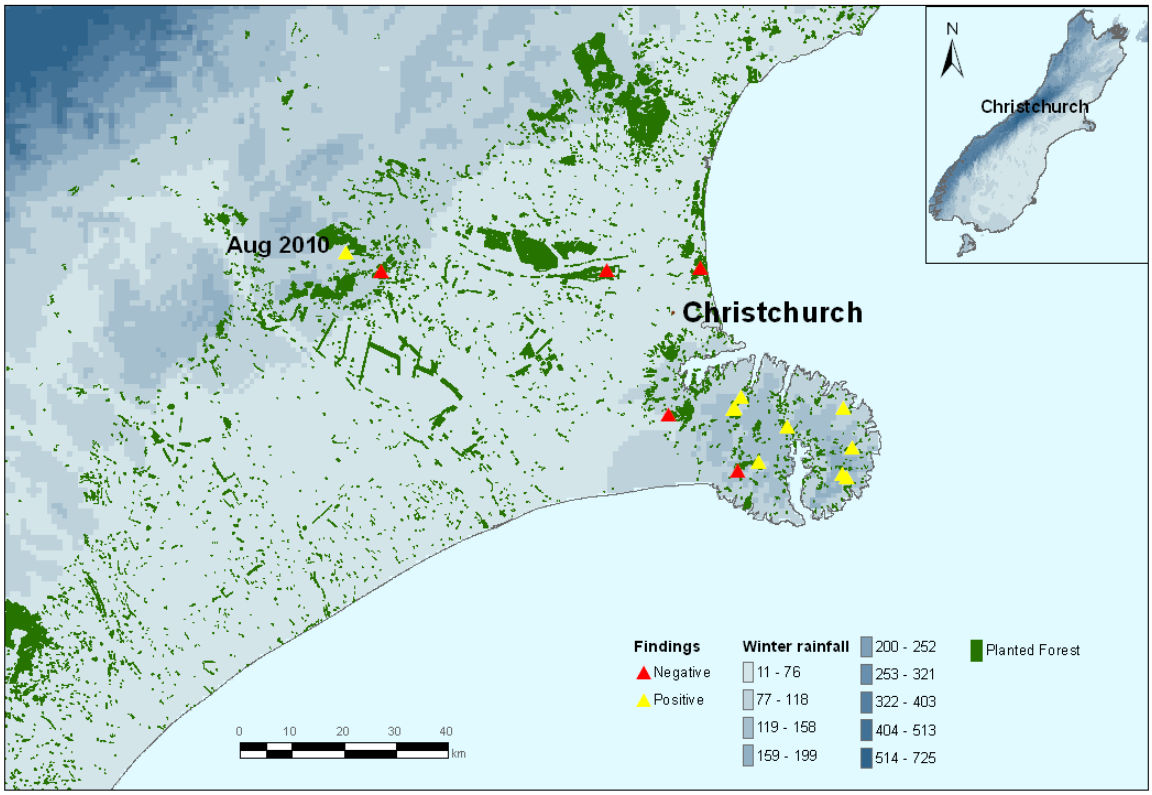

Figure 3 - Known distribution of *N. fuckeliana* in Canterbury as at November 2011

Armillaria root disease

Armillaria root disease, caused primarily by Armillaria novae-zelandiae *remains widespread but scattered in impact in many* P. radiata *plantations throughout much of the country.*

Phytophthora cactorum

Small patches of mortality in some plantations in the northern South Island were associated with *Phytophthora cactorum* infection. Severe resinosis at the root collar and lower stem occurred and the symptoms were very similar to those caused by *Armillaria* infection. Trees from one to six years old were affected but the overall incidence was very low. There was no sign of *Armillaria*, or of the other known causes of basal resinosus and *P. radiata* mortality, i.e. *Gloeopeniophorella sacrata*, *Junghuhnia vincta* or *Rosellinia*. *Phytophthora cactorum* has been associated with *P. radiata* root rot, lesions and mortality previously.

DOUGLAS FIR (PSEUDOTSUGA MENZIESII):

Diseases:

***Phaeocryptopus gaeumannii* (Swiss needle cast disease)**

Swiss needle cast disease (*Phaeocryptopus gaeumannii*) remains the most significant disease of Douglas fir throughout New Zealand.

EUCALYPTUS SPP.:

Pests:

***Uraba lugens* (gum leaf skeletoniser)**

Uraba lugens (Nolidae), the gum leaf skeletoniser, is widespread in the greater Auckland region, as far north as Warkworth, and also in the Waikato region, at Mt Maunganui in the Bay of Plenty, and in the Coromandel. In the last year it has been found in Hawke's Bay and Nelson. The latter is the first record from the South Island. It has not yet been reported as a concern in commercial plantations, and is causing significant damage only on amenity trees in the Auckland region. A biological control agent (*Cotesia urabae* (Braconidae)) has been imported from Tasmania and was released in Auckland. It has apparently established there. Its spread will be monitored.

Diseases:

Kirramyces *and* Mycosphaerella *leaf disease*

Low levels of foliage disease associated with the fungi *Kirramyces eucalypti, Fairmaniella leprosa*, and *Mycosphaerella cryptica* were recorded.

CYPRESSES:

Diseases:

*Cypress canker (*Seiridium *spp.)*

Cypress canker, caused by two species of *Seiridium* continues to cause damage in many cypress stands throughout the country, particularly *Cupressus macrocarpa*.

2. Indigenous Forests

Phytophthora *taxon Agathis*

In phase 1 of a survey to delimit the distribution of *Phytophthora* taxon Agathis (PTA) which is associated with stem cankers, dieback and mortality of kauri (*Agathis australis*) samples were collected from approximately 30 forests. The pathogen was found in six new sites. Aerial surveys are being used for detecting kauri dieback sites for subsequent ground truthing.

***Trichosurus vulpecula* (possum)**

Major damage to indigenous forests by the Australian brushtail possum (*Trichosurus vulpecula*) continues to occur throughout much of the country. Favoured food species are tall canopy species such as tawa (*Beilschmiedia tawa*), northern and southern rātā (*Metrosideros robusta* and *M. umbellata*), kohekohe (*Dysoxylum spectabile*), kāmahi (*Weinmannia racemosa*) and *odocarpus cunninghamii* (Hall's tōtara). Many other species are browsed to a lesser extent.

3 . Biosecurity:

POST-BORDER (ERADICATION):

Dutch elm disease:

The pathogen, *Ophiostoma novo-ulmi,* remains confined to the greater Auckland region.
The 2010-11 control program consisted of one disease detection survey of 5,200 trees followed by re-survey of ~1,300 trees over the summer and a trapping program for

Scolytus multistriatus in high risk areas to determine sources of infection or large amounts of breeding material. Very high numbers of beetles were trapped in three locations and extensive focussed searches were required before the source of these high beetle numbers were found – all were dead wood on the ground or firewood stacks. A total of 65 traps were deployed and they trapped 10,259 beetles, of which 149 were positive for the presence of *O. novo-ulmi*. This was a very large increase from the 1,449 beetles trapped in the previous season, of which only five were contaminated by *O. novo-ulmi*. Three elm trees positive for Dutch elm disease were found and removed.

The importance of surveying more than once during a season was demonstrated when a healthy tree surveyed early in season produced beetles later in the season.

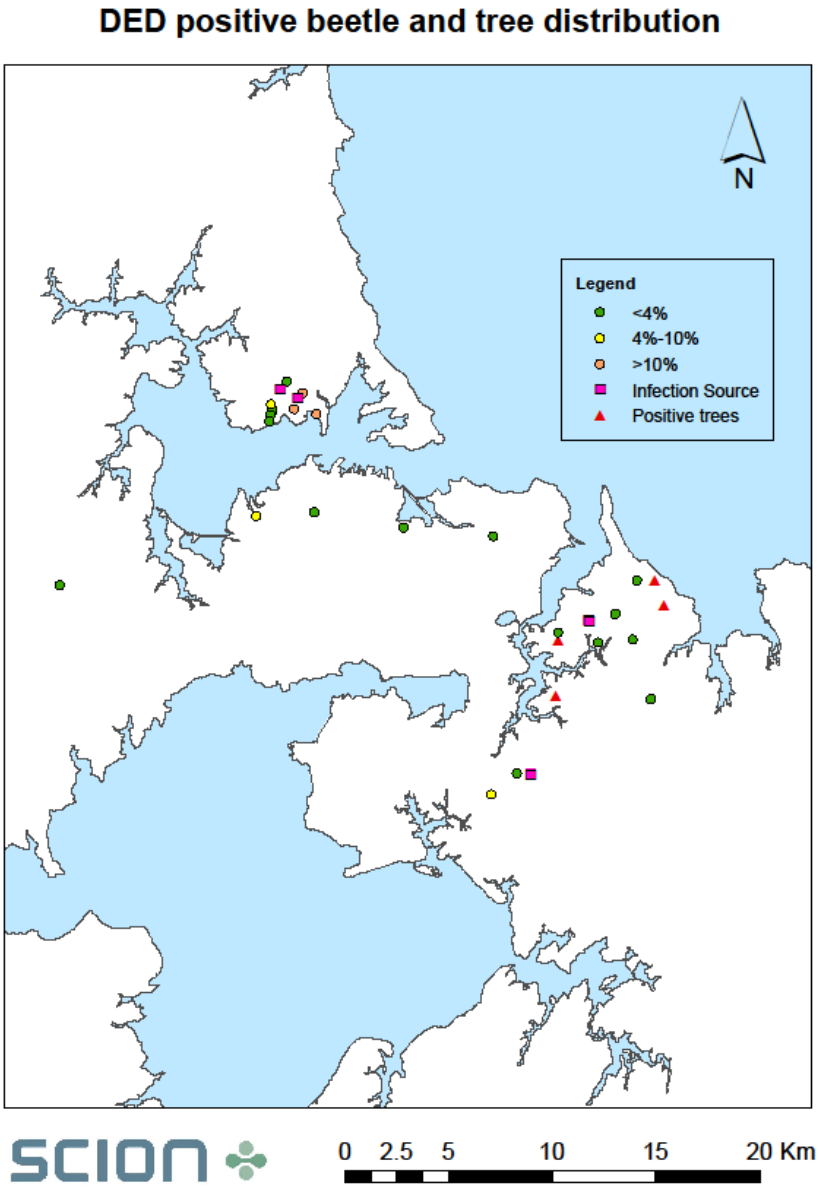

Figure 3 - Locations of diseased trees and infective beetles 2010-11

POST-BORDER (NEW RECORDS):

The following new record was validated, investigated and reported in 2010-11.

- *Stigmina platani*. This fungus forms striking dark spore masses on the leaves of *Platanus* x *acerifolia* but associated leaf spots are small and seem to be of minor significance.

4. BIOLOGICAL CONTROL

Buddleja davidii

The buddleia leaf weevil, *Cleopus japonicus* (Curculionidae), a biological control agent for the weed buddleia (*Buddleja davidii*), was first released in New Zealand in spring 2006. The weevil is spreading faster than initial observations indicated and has been up to 50 km away from some of the release sites. In some localities, particularly the Bay of Plenty, defoliation of buddleia over large areas is very noticeable.

Completely defoliated buddleia in Whakarewarewa Forest

Uraba lugens

See *Uraba lugens* under *Eucalyptus* spp. above.

RECENT PUBLICATIONS AND WEBSITE FEATURES:

The monthly Scion publication *Forest Health News* can be viewed on line. See: http://www.scionresearch.com/general/science-publications/science-publications/science-newsletters/forest-health-newsletter

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