Primary Industries Standing Committee

Forestry and Forest Products Committee

Research Priorities and Co-ordination Committee

RESEARCH WORKING GROUP 7
FOREST HEALTH

Annual Pest and Disease Status Report for Australia and New Zealand 2006-2007

December 2007

Table of contents

SOUTH AUSTRALIA

Sirex flights held in the Green Triangle during July (2007) revealed Drought has had a considerable affect on the health of forests in South Australia this year with many dead and dying trees spread across the plantation estate. Many of the deaths are associated with drought conditions. Trees are stressed and thus more susceptible to attack by insects and diseases. In some areas planting was halted due to lack of soil moisture.
Current forest health problems are likely to increase in plantations over the upcoming months unless moisture levels increase.

PLANTATIONS

Pinus radiata:

Pests

Sirex:

In the Green Triangle Region:
Sirex remains at a low level in this region. However numbers are expected to increase over the next year as trees are stressed due to drought. Surveillance flights were conducted in June with follow up ground inspection of 71 sites. Not all deaths at these sites were associated with *Sirex* attack. *Diplodia* and *Ips* also caused tree deaths.

The establishment of trap tree plots and the inoculation program has continued as has collection of billets from trap trees and naturally struck trees. *Sirex* were again very late emerging from billets collected last year and few were sent to Agriculture Victoria for infectivity testing. Parasitoids (mainly *Ibalia*) emerging from these billets were released back into the forest.

Pheromone traps were placed in several plantations for early detection of *Sirex* (in collaboration with a project being run by Forestry Tasmania) but no *Sirex* were detected.

In the Ranges Region:
The Sirex program in the Ranges Region has continued but staff changes and changes in responsibility for the program have resulted in a somewhat disjointed report this year. Sirex has been reported from 2 locations in the Mt Crawford Forest Reserve and from 2 locations in the Southern Hills. Nematodes have been found in *Sirex* from both areas. *Sirex* have also been found in dead trees at Second Valley (these were nematode –ve)

Ips:

In the Green Triangle Region:
Ips grandicollis is present in increased numbers and has caused many deaths (including death of apparently healthy trees) in several plantations in the South East this year. Drought has caused the trees to be stressed and therefore more susceptible to attack. *Ips* have caused significant deaths in some older plantations near Mount Gambier, resulting

in sanitation salvage operations in several plantations. In one plantation *Ips* attack was associated with slash left on the ground after a thinning and salvage operation following a *Diplodia* outbreak last year.

A number of bark beetles were caught in pheromone traps placed in plantations to detect *Sirex* (see above).

In the Ranges Region:
Ips remains a problem in the Northern forests. *Ips* numbers have increased in both the Ranges region and in the northern forests. This increase is associated with drought conditions.

Essigella:
In the Green Triangle Region *Essigella* damage has been widespread with most plantations sustaining some damage. Older plantations appear to be most affected but damage is evident in younger plantations also. *Essigella* has also been found in some plantations less than 10 years old but damage is not obvious. Ladybird numbers have been high this year.

In the Ranges Region *Essigella* appears to have caused little damage.

Wingless Grasshoppers:
Wingless grasshoppers have not caused significant damage this year though they have been present in some plantations.

Diseases
Many plantations in the South East Region have been affected by *Diplodia* this year with most deaths occurring in young (1998-99), unthinned plantations (however other age groups (20-30 years old) have also been affected). Some of these plantations were also affected last year but infection is more widespread this year. Deaths are scattered through the plantations with approximately 15% of trees showing symptoms in the most severely affected plantations. The majority of affected plantations have infection levels of approximately 5%.

Most disease problems are occurring in unthinned plantations but Dplodia is also affecting trees in the fuel modified zones in plantations which have been thinned.

Eucalypts:
Pests:
Sawflies (*Perga* spp.) have been present and causes defoliation in many plantations across the Green Triangle this year. Several plantations were sprayed.

Heteronyx spp and other scarabs have also caused damage.

Autumn Gum Moth and **Chrysomelid beetles** cause varying amounts of damage every year.

Drought has been a major factor in seedling survival and general health of plantations this year.

An emerging pest is known locally as the **Shothole Miner**. The species has not yet been formally identified but is similar to the Jarrah Leaf Miner (and may be either the same or a related species). Preliminary studies carried out on the distribution and incidence and severity of attack indicate that the pest is widely distributed throughout the region and is causing considerable leaf loss. Numbers appear to be increasing. Further studies are in progress.

E. globulus leaf with Shothole Miner damage

Shothole Miner larva inside leaf mine

Shothole Miner larva

Diseases: There have been no reports of significant diseases in eucalypts this year. However Mycosphaerella spp and other leaf diseases are present in most plantations to some extent all the time.

NURSERY

There have been no reports of significant pest or disease problems in nurseries this year. There have been some problems with salt levels in bore water used to irrigate pines in the nursery due to lowering water tables. Cuttings seem to be affected more than seedlings.

ENVIRONMENTAL

Drought is having a significant effect on all plantations this year. Trees are stressed and in some eucalypt plantations there has been little new growth so far this year. Dry conditions are also enhancing the risk of fire over the coming summer.

FOREST HEALTH SURVEILLANCE

Annual surveillance flights in the Green Triangle Region in June to detect forest health issues in pines have been followed up by further flights later in the year (August/September). Many symptoms showed up in these later flights that were not apparent earlier. This has resulted in increased activity in several plantations. Plantations where there were dead or dying trees were rated as:

- Areas where action may be necessary
- Areas of concern – areas which need further monitoring
- areas where there were few deaths and no further action was necessary

The main problem has been *Diplodia* infection but some plantations are also heavily infested with *Ips*. Various actions (eg thinning, sanitation salvage and operational activities) have been taken in plantations in category 1.

Diplodia infection - Springs Road, Mt Gambier Forest Reserve

RESEARCH & DEVELOPMENT

ForestrySA has been involved in several projects in the CRC for Forestry. These include projects in

- Program 1: Measuring and monitoring (ForestrySA has assisted with field work in the Greenhills (NSW) and Wattle Range (SA) areas associated with project 1.2).
- Program 3: Harvesting
- Program 4: Trees in the Landscape (assistance given to students)

ForestrySA has assisted the Industry Pest Management Group with work in the Green Triangle region.

The FWPRDC sponsored project for the biocontrol of *Essigella* is progressing. Mummies of *Essigella californica* (MPA) containing The parasitoid *D. essigellae* were collected in the US arriving in Quarantine in Australia in March 2007. Host Specificity Tests on 7 host species commenced in May 2007. The next stage is to complete host specificity testing and to seek permission to release the parasitoid. Mass rearing of parasitoid will then begin.

NEW SOUTH WALES

Pinus Plantations

Forest Health Surveillance
Softwood plantations in all Regions were surveyed from May to August 2006. Sixty State Forests or Plantations were surveyed by helicopter, with the majority having follow-up ground surveys.

The main health issues in 2006 were:

Damage from ***Diplodia pinea* (=*Sphaeropsis sapinea*) & Drought** was not as high in NSW as has been observed in previous years. Hume Region had 6,640 ha affected; the worst areas in Kangaroo Vale, Lindley, Cottway, Lynbrook, Mortons section. In Northern Region, 1,480 ha were affected, associated with drought-stress and hail damage, with Nundle and Nowendoc the worst affected areas. Low levels of damage from *Diplodia pinea* were observed in Monaro Region (1,050 ha). Damage was not as severe or widespread in Macquarie Region (3,355 ha affected), although Pennsylvania SF and Charleville Rd area (Canobolas SF) still had significant damage.

Essigella californica was again significant in 2006. In Macquarie Region, damage was widespread and severe in many forests. All State forests had some level of damage, ranging from high to extreme (e.g. Lidsdale SF), to moderate to high (e.g. Essington SF & Vittoria SF) and low to moderate (e.g. Lowes Mount SF & Jenolan SF). Damage was more severe across Macquarie Region than has been observed in previous years. Over 40,000 ha were affected. In Hume Region, damage was again significant, although not as severe as that observed in 2005. The main forests affected were Green Hills SF, Bago SF, Carabost SF, Mundaroo SF & Buccleuch SF, with over 33,500 ha affected. Ground observations in September 2006 (as part of the CRC Forestry Remote Sensing project) revealed very severe defoliation from *Essigella* in younger age classes in Green Hills SF that had not been observed during surveys in May. Such severe damage had not previously been observed in these younger age classes. In Monaro Region, *Essigella* damage was widespread throughout the Moss Vale forests but less significant in the Bombala forests. In total, only 3,100 ha were affected, the majority of this in the Moss Vale area. There was also less damage in Northern Region with ~6,780 ha affected, mostly in Nundle SF. Forests NSW & NSW DPI are involved in a national project to test biological control agents for control of *Essigella.* A parasitoid has recently been imported into Australia and is currently undergoing rigorous testing before release in 2008-2009. Significant control (reduced numbers of *Essigella* and associated damage) are hoped for 2010-2011.

***Sirex* woodwasp** was a significant pest in Hume Region in 2006, with outbreaks in two areas (Green Hills SF and Maragle SF). Up to 5% of trees in these areas were infected with sirex, which is relatively high, and the highest we have observed in NSW for at least a decade. Lower levels were observed in other areas in Hume Region. A management

plan was developed and supplied to the Region in October 2006, which included recommendations on increasing trap tree plots, inoculating naturally struck trees, and refining the trap tree and emergence-monitoring program. Very low levels of damage were observed in Macquarie Region, Northern Region and Monaro Region. No sirex was observed in the pines around the Casino-Urbenville area. In total, almost 2,500 ha of pine plantation were affected by sirex in NSW in 2006. In most instances, emergence data revealed acceptable levels of parasitism for the biological control agents (nematode and parasitic wasps). However, more work is required on the levels of parasitism of naturally struck trees to determine how effectively nematodes are disseminating into the background sirex population. Forests NSW & NSW DPI are part of an ongoing project funded by the National Sirex Coordination Committee (NSCC) investigating the levels of infectivity of nematodes in Australia. This will help elucidate whether the Kamona strain of nematode has effectively replaced the defective strain.

***Ips* bark beetles** again attacked *Sirex* trap trees in Hume Region and Northern Region, causing concern over the effectiveness of the plots to assist in the biological control program. A collaborative project, funded by the NSCC, will investigate management options to reduce the impact of *Ips* on the sirex control program during 2007-2008. There was some evidence of a build-up of *Ips* in Hume Region with trees in recently thinned compartments in Private plantations killed by bark beetles. However, there was no evidence of *Ips* damage to killed trees within the Forests NSW plantations.

***Dothistroma* needle blight** was higher in 2006 than previous years, with over 1,200 ha affected in Northern Region (Glenn Innes, Nowendoc & Nundle plantations). No control spraying was conducted. No other Region had significant levels of *Dothistroma septosporum.*

Wallaby damage was again severe in young age classes adjacent native forests in Northern Region, Monaro Region and Macquarie Region. In many instances over 50% of trees had been damaged, and in some cases this was as high as 90%. Forests NSW & NSW DPI are part of a national collaborative project investigating non-lethal methods of control for wallabies in pine plantations.

Possum damage was again lower than previous years in Monaro Region, with 1,900 ha affected.

Frost resulted in severe and widespread damage, including seedling mortality, in several forests in Macquarie Region, with 935 ha affected (Canobolas SF, Gurnang SF & Vulcan SF). Some of these areas will need to be replanted. Lower areas were affected in Monaro Region (65 ha).

Relatively low levels of **nutrient deficiency** problems were observed.

Eucalyptus Plantations

Forest Health Surveillance

In July 2006 the FHSU conducted an aerial survey of over 90 eucalypt plantations as part of the annual survey program. This included *Creiis* monitoring as well as general forest health. A ground survey of selected plantations was conducted in February 2006. However, this was of fewer plantations than previous years due to a reduction in FHSU staff. The main aim of the ground survey was to follow-up on disorders observed in the previous aerial survey, as well as visit plantations highlighted by Northern Region as having forest health issues. Health issues were discussed with the Operations Forester and Field Officers.

The main forest health issues in the young eucalypt plantations in 2006-2007 were:

Creiis caused significant damage this year, with up to seven plantations with severe damage. In total, 535 ha were affected at high to extreme severity. In some cases the majority of the plantation was affected (e.g. 250 ha), while in other instances only a localised area was affected (e.g. 5 ha). No control operations were conducted (although control operations were conducted in private plantations). This was partly due to (1) affected plantations being over 2 years old and requiring aerial application and the difficulties of such operations, and (2) the long-term effectiveness of the current chemical control (dimethoate) has been below acceptable levels. Forests NSW & NSW DPI, in conjunction with the Subtropical Forest Health Alliance, is currently investigating more effective and socially-acceptable control options, including the use of targeted insecticide and fertilising to improve tree recovery after damage.

Dieback, associated with Bell miners (**Bell miner associated dieback – BMAD**) was observed for the first time during aerial surveys in two 10-year-old plantations. It was apparent that the disorder had been present and building up in these plantations for several years, with low levels of tree mortality observed. Field Officers had reported damage the previous year. Damage was observed in another plantation during ground surveys, identified by Field Officers. pproximately 45 ha were affected. This is the first instance of BMAD being a problem in the young hardwood plantations in NSW, being normally associated with dieback of mature native forest in eastern Australia. Affected areas were adjacent native forest with BMAD. Control options include reducing weed (lantana) infestation. The long-term impact and spread of BMAD in these young plantations needs to be monitored.

Similar to previous years, **Cerambycid stem borers** were a continuing problem in the older plantations, especially *E. grandis* and *Corymbia* spp. Some *Corymbia* trees were completely 'ringbarked' by borer damage.

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

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

Stem canker fungi, including *Botryosphaeria* spp., *Cryphonectria eucalypti* and *Caliciopsis* sp., are continuing to increase in incidence and severity in the older plantations. Severe damage was observed in several plantations in 2006-2007. In many cases severe damage was associated with tree stress, such as that caused by repeated defoliation events of leaf fungi (*Kirramyces* spp.). *Caliciopsis* sp. caused significant damage (cankers and dead topping) in several *E. nitens* plantations on the Dorrigo Plateau. The long-term impact of stem fungi on tree survival and wood quality is unknown. Some stem fungi in NSW eucalypt plantations are still unidentified, and require detailed taxonomic work.

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

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

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

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

<u>Information provided by private growers on health issues included:</u>

- A small amount of attack from **swarming scarabs** where intervention was required on less than 500 ha.
- **Creiis** – significant area of attack of over 2000 ha of *E. dunnii*. This was combined with wet feet and severe frosts to result in failure of approx 600 ha of *E. dunnii*
- **Chrysomelid** – not very high levels and no intervention
- **Glycaspis** psyllid was observed on *E. grandis* hybrids, but no commercial impact
- **Giant wood moth** – now seeing about 20% infestation in 2yr old *E. grandis* hybrids. Ongoing damage at about same level in grandis plantations.

- Psyllids (*Creiis lituratus* & *Cardiaspina spp.*): *E.dunnii* & *E.grandis*: Sprayed approximately total areas of 1200 ha (with dimethoate / fertilisers)

- *Quambalaria pitereka*: *C. variegata*: Nothing could be done but completely eliminating of competition such as weed control.
- Cossid moth and Cockatoos damaged: ***E.grandis*** & ***E.dunnii***: Nothing has been done with the current situation yet except no further planting of ***E.grandis*** in our current project.
- Mycosphaerella leaf disease: on ***E.nitens*** at Walcha region in NSW: Caused severe defoliation on ***E.nitens*** (? ha) and applying fertiliser on new growth
- Leafblister sawfly: on ***E.dunnii*** at Kingaroy region in QLD: Caused severe defoliation on ***E.dunnii*** (approx. 200ha) no control measure was applied but trees recovered significantly well
- Chrysomelid leaf beetles (*Chrysophtharta cloelia* & *Paropsis atomaria*): ***E.dunnii***: Sprayed approximately 400ha (with Fastac Duo) with no significant damaged but reduce tree growth.
- Nutritional issues such as boron, Copper, Phosphorus, & Manganese deficiency etc.
- Finally, there are few other potential issues that we are dealing with right now especially when trees are less than 12 months old as indicated below:
    - Chrysomelids - if become established will greatly reduce growth as at one site. Easy to control if can be timely with spraying. There are some minor species that seem to be more significant this season.
    - Weevils - Seem to short term effects on younger trees but we have a number of older plantations that growth has been restricted in spring and vigour of trees lost. Mostly in Dyraaba area. We have seen a good response from the limited spraying we have carried out.
    - Scarabs and Christmas Beetles - have caused a lot of damage in younger trees this season. Very difficult to monitor due to temperature effect on activity. Difficult to assess impact on older trees.
    - Mirids - appears to be an increasing problem but could be seasonal. Overall effect on growth is yet to be determined. Will attack a range of species.
    - Coreids - seem to be having a significant impact in low lying areas but may be a short-term effect.

TASMANIA

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

Insect Pests

Sirex wood wasp (Sirex noctilio)

Monitoring for Sirex killed trees, using traditional aerial and roadside surveys, was conducted throughout the softwood estate. Sirex killed trees were not located. In addition, kairomone charged static traps were placed in five regions across the north of the State in young Sirex free compartments. In four of these compartments Sirex females were captured in static traps. Dead suppressed trees with exit holes were found, within a 100 metre radius of the traps, in three of the four compartments. The trap tree/nematode program will be put into place in these compartments this summer if more than three killed trees are located.

Ips grandicollis and other bark beetles

Monitoring for Ips grandicollis using pheromone charged static traps has continued in P.radiata plantations and in urban/port quarantine surveillance programs. Ips continues to be absent from Tasmania.

Monterey pine aphid (Essigella californica)

Essigella pine aphid is still restricted to the south of the State. Following a short-term outbreak in late winter 2006 at Pittwater, populations are again at very low levels. Trees affected in the outbreak have restored crown density. High populations of lacewing larvae (Drepanacra binocula) seem to have impacted on outbreak population.

Pine aphid (Eulachnus thunbergii)

Not recorded from Tasmania.

Pine aphid (Pineus laevis)

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

Vertebrate Pests

Bark stripping by browsing mammals was recorded across was 536ha during 2006-2007 (Fig. 1a). The proportion of stands suffering severe damage (incidence >50%) this year was much greater than in recent years and made up 32% of the total area affected. In the worst affected plantations up to 30% of trees were missing and recent mortality a further 10%.

Dead tops caused by possum bark stripping were only mapped in 17ha in the central northeast of the state (Fig. 1b). Damage levels were variable but reached 25% in localised hot-spots. Although the area mapped as affected by possum bark stripping appears to be substantially less than the 177ha reported last year, surveillance during 2006-2007 did not

include an extensive area of plantations in southern Tasmania, where much of the damage is concentrated.

Mammal shoot browsing had caused poor stocking and severe stunting across 20ha in the central north of the state (Fig. 1c).

Diseases

Cyclaneusma needle cast/spring needle cast

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

Dothistroma needle blight

Needle blight due to Dothistroma has been a chronic problem throughout 80ha of plantation in Ringarooma Block for some years. Infection levels have been relatively stable over recent years with incidences of 40-80%. However, severe defoliation of 50-75% has previously been restricted to localised hot-spots. This season there was a higher incidence of defoliation throughout most of the affected area and severity was more consistently above 50% of the crown than in previous years (Fig. 2a & b).

Sphaeropsis shoot blight/crown wilt

Extensive (over 1000ha) and sometimes severe shoot/top death due to Sphaeropsis was observed across the south of Payanna Block in the northeast of the state (Fig. 2c). In the worst affected compartment the incidence of top death reached 50% in localised hot-spots. Severe resin bleeding was common and scattered trees had died. Less severe and more restricted damage was also recorded in a number of other blocks in the northeast including Retreat, Springfield, Gladstone and Lisle. Record low rainfall over the previous 18 months was likely to be the primary causal factor.

Other biotic agents

Phytophthora root rot, Armillaria and Hylastes were detected at very low incidence in young dead trees from Branch's Creek (32ha) and Long Hill (8ha) in the central north of the state. Other abiotic factors were also involved in causing mortality rate of around 1% with small, localised patches of up to 5% (see also "Other abiotic agents").

a

b

c

Figure 1. a – Severe bark stripping of young P. radiata. b – Severe stunting caused by browsing mammals. c – Recent bark stripping by possums in upper crown.

a

b

c

Figure 2. a & b – Severe Dothistroma defoliation in Ringarooma, northeast Tasmania. c – Extensive dead crowns caused by Sphaeropsis shoot blight/crown wilt in Payanna, northeast Tasmania.

Environmental and site related problems

Fire

Approximately 920ha of P. radiata plantation in the northeast (Saddleback, Nicholas and Scamander blocks) and central north (Branch's Creek) were affected by wildfire during the 2006-2007 fire season.

Wind

Only small pockets of wind damage, all of which were well under 1ha, were mapped in three plantation areas this season. Areas where more extensive windthrow were reported last season, primarily in the Styx Valley were not surveyed during 2006-2007.

Lightning

A single lightning strike was detected in the central north of the state and had resulted in damage to 5-6 trees.

Exotic weeds

Exotic weeds, primarily gorse but also pampas grass, were detected at a number of locations across the north of the state. The most extensively affected area was in the young plantations in Oonah block, south of Wynyard in the northwest.

Boron deficiency

Active shoot dieback as the result of severe boron deficiency was observed throughout 24ha of a plantation in the northeast. Symptoms had eased in 180ha that were reported last year.

Other abiotic agents

Ringbarking due to loose planting, root girdling and poor drainage had contributed to observed mortality rates of 1-5% in Branch's Creek and Long Hill in the state's central north.

Plantations (Eucalyptus species)

Insect Pests

Autumn gum moth (Mnesampela privata)

The outbreak of autumn gum moth detected in the northeast last season was effectively controlled and very little damage was observed in 2006-2007.

Leaf beetles

Moderate and severe Chrysomelid defoliation was mapped in 880ha of plantation this year. Some 687ha were assessed as having moderate damage while a further 193ha were assessed as severe (Fig. 3a). Beetle populations were over the control thresholds in 1486ha and of these 1018ha were sprayed. Control operations in the northeast of the state were hampered by extensive bushfires over the summer.

Weevils (Gonipteris)

Around 166ha of E. globulus in southern plantations had moderate defoliation and broom topping, which was attributed to Gonipterus.

Gum leaf skeletonizer

Uraba was widespread throughout the State this year but only 5ha of predominantly edge trees in a 3-year-old E. nitens plantation in the northeast was mapped as having severe defoliation.

Beetles (Christmas, scarab, spring, etc.)

No significant damage observed.

Sawflies

No significant damage observed.

Borers

Mortality and stem damage attributed to borers was mapped in 148ha of plantation established between 1998-2001 (Fig. 3b - d). Damage was primarily attributed to cerambycids (Coptocercus rubrides and Epithora dorsalis)) and a buprestid (Nascioides parryi) but also cossid moths (Culama sp.) and weevils (Pelororhinus transversus). Borers also contributed to mortality in a further 112ha that had suffered chronic cold air drainage, frost damage, grass competition and insect defoliation over a number of years. At its worst mortality reach 30-40% in localised hot-spots which were subsequently clearfelled in preparation for replanting.

Psyllids

No significant damage observed.

Tortricids

No significant damage observed.

European Wasps

The European wasp Vespula germanica was of considerable nuisance value in many plantation and regeneration sites across Tasmania. Very large numbers of wasps in late summer resulted in several baiting operations, within southern coupes, to enable pruning operations to be conducted. Baiting was also conducted at the forestry tourist sites at Tahune and Dismal Swamp.

Figure 3. a – Severe defoliation by chrysomelids. b – Mortality and branch dieback caused by word boring insects. c – Buprestid & d weevil larvae associated with mortality in an E. globulus plantation in northeast Tasmania.

Vertebrate Pests

Damage attributed to browsing mammals affected 379ha this season. Stunting (166ha), highly variable growth (130ha) and poor stocking (84ha) were the main consequences.

Brushtail possum damage including defoliation, branch breakage and bark stripping was recorded over 19ha. The most significant consequence was top death due to bark stripping in the upper crown that occurred across 14ha at an incidence of up to 30-40% in localised hot-spots (Fig. 4a).

Diseases

Mycosphaerella leaf disease

Significant defoliation due to Mycosphaerella was only recorded in the south of the state where around 32ha of E. globulus were severely affected.

Botryosphaeria top death

The level of infection in E. nitens observed in the northeast of the state last season had dropped right off this year and little damage was evident.

Cryphonectria stem canker

C. eucalypti (syn. Endothia gyrosa) was commonly associated with borer damage (reported previously).

Phytophthora root rot

Mortality caused by Phytophthora was mapped in 285ha of plantation established in 2005 or 2006 (Fig. 4b). Of this 117ha were assessed as having an incidence of >1% but in localised hot-spots reached 30%. The worst affected areas were low rainfall regions in the northeast of the state such as Retreat, Lefroy, Jetsonville and Payanna Blocks and on the poorer soils in Holder Block in the northwest.

Armillaria root rot

The only detection of mortality due to Armillaria was for scattered mortality in a small patch (0.4ha) of 10-years-old E. nitens in the northeast.

a b

Figure 4. a – Crown damage caused by possums in a 2003 E. nitens plantation. b – Mortality caused by Phytophthora in a 2005 E. nitens plantation.

Environmental and site-related problems

Wind

Moderate (1-2%) or severe (>2%) wind damage was recorded in 25ha of E. nitens from the 2004 age class in Goulds Country in the northeast of the state. However, lower incidence (<1%) windthrow and stem lean was observed across a much larger area of plantation in Goulds Country established between 2003-2005. Damage followed severe westerly storm events, while the granite soils were wet, and was exacerbated by poor root development.

Drought/desiccation

Record drought in northern Tasmania this year resulted in 293ha of 2006 plantation suffering severe desiccation in the period following planting. The majority of the affected areas required replanting (Fig. 5a).

Copper deficiency

Symptoms associated with copper deficiency on poor soils, such as microphylly, stunting and branch distortion, were mapped on 269ha (Fig. 5b). These were primarily observed in plantations established in 2005 (89ha) and 2006 (155ha) with the largest component of the latter being 107ha in Bass District, particularly Tomahawk, Retreat and Goulds Country Blocks.

Weeds

Weed competition had caused stunted performance across 52ha and had contributed to poor stocking across a further 6ha.

Herbicide damage

Stem malformation ("weepy leader syndrom") linked to the use of the herbicide Clomac was mapped on 141ha. Weepy leader syndrome was reported for 73ha of plantation established in 2005-2006. Areas for which weepy leader syndrome was reported last season had fully recovered apical dominance. However, deformities such as big branches, forking and kinking severe enough to cause pruning problems persisted across at least 68ha (Fig. 5c). These deformities tended to occur at around 1.5-2m up the stem, the approximate height of crown weeping last season.

Other abiotic damage

Other abiotic factors (poor site preparation/no cultivation, poor drainage, frost, exposure, wind, fire, steep slopes) had caused or contributed to performance or health issues across a cumulative area of around 250ha (Fig. 5d).

a

b

c

d

Figure 5. a – Mortality caused by desiccation in a 2006 E. nitens plantation. b – Microphylly and stem deformities associated with copper deficiency. c – Stem defects associated with 'weepy leader' syndrome the previous season. d Severe scorch caused by frost/cold in a 2007 E. nitens plantation in northeast Tasmania.

Managed natural forests (Eucalyptus species)

Pests
Localised patches of moderate-severe defoliation by Uraba lugens occurred throughout the State this year.

Diseases
No significant disease problems were reported during the past year.

Environmental and site-related problems
Extensive areas of predominantly high altitude forests and woodlands remain in chronic poor health with symptoms of severe dieback. Past drought events, grazing of mature trees by possums and seedlings by livestock have all contributed to the problem.

Nurseries

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
A large number of inquiries from the public about control of European wasps were received during the year. Several southern councils reported destroying more than 100 nests during the year as a result of public requests.

A survey was conducted for the Elm Leaf Beetle, Pyrrhalta luteola, in Launceston. Following detection in 2003 and subsequent control using Bacillus thringiensis there has been no further evidence of the presence of this pest.

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

A previously unreported crown rot disease was detected for the first time in Xanthorrhoea spp. in northeastern Tasmania. Fusarium aff. babinda was consistently isolated from the edge of advancing lesions and on one specimen of a flower spike fruiting bodies had formed within lesions (Figure 6). Aetiology has not been established but it appears as though infections establishing in the flower spike might be one important entry point. Affected Xanthorrhoea communities had been burnt a year earlier and widespread flowering the following spring coincided with a significant rainfall event.

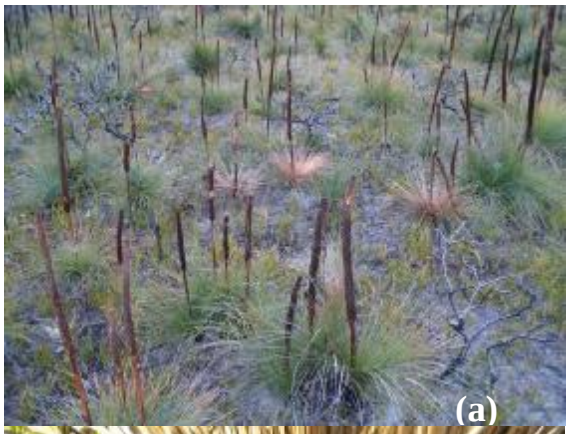


Figure 6. Fusarium crown rot of Xanthorrhoea. (a) affected plants are scattered through a densely stocked Xanthorrhoea community; (b) Fusarium babinda fruiting within a lesion on a flower spike; (c) lesion extending from the apical meristem downwards into trunk.

Quarantine

Trapping for a number of exotic woodborer insect species, of importance to forestry, was conducted within the Urban Surveillance program in association with Quarantine Tasmania. Two unidentified scolytid species were found among the 11,250 beetles collected during the 2005/2006 monitoring. A number of uncommon native species were captured and placed in the Tasmanian Forest Insect Collection. Exotics, established in mainland Australia but absent from Tasmania, Arhopalus rusticus, Ips grandicollis, Scolytus multistriatus and Hylotrupes bajulus, were targeted but not detected.

A pine needle rust tentatively identified as Coleosporium tussilaginea was detected on Campanula takesimana in a nursery in southern Tasmania. All affected plant material was removed and destroyed and a trace-back was conducted. Surveys of radiata pines (mature trees and roadside wildlings) around the nursery failed to detect any symptoms.

Research and development

Continued research (through CRC for Forestry) to develop alternative ways of managing chrysomelid leaf beetles, particularly late season feeding by adults. Established trap tree plantings of E. regnans and E. delegatensis in ten E. nitens plantations for future proof-of-concept trials. Established LD_{95} dose of imidacloprid for P. bimaculata adults feeding on treated foliage. This has enable a target concentration of imidacloprid within leaf tissue to be set, which will in future allow greater use of leaf tissue analysis rather than bioassay to monitor treatments, particularly duration of effective dose within treated trees.

Conducted static trap surveys for wood boring insects within mid-rotation eucalypt plantations sampled along a rainfall gradient. Significantly higher populations were detected in plantations within the <1000mm rainfall zone compared with plantations receiving 1000-1500mm or >1500mm rainfall. Ground surveys have been done to measure the incidence of borer damage within the sampled plantations. Awaiting the results of analysis to compare static trap catches with level of borer damage in plantations.

A major field trial (through CRC for Forestry) to screen elite seedlots of E. globulus for resistance to Mycospharella leaf disease has been established on four sites and across two planting years. A recent epidemic has developed on all four sites although infection is currently only sufficiently severe to justify assessment on two of the sites.

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

Eucalyptus spp.

Pest	Area with moderate damage (Ha)					Area with severe damage (Ha)					Area inspected (ha)	Area treated (ha)	Hosts
	<10	10-100	100-500	500-1000	>1000	<10	10-100	100-500	500-1000	>1000			
Browsing mammals			**ü**				**ü**				49013	Not yet available	*E. nitens* & *globulus.*
Autumn gum moth											49013		
Christmas beetle											49013		
Paropsines				**ü**				**ü**			49013	1018	*E. nitens*
Gum leaf skeletoniser						**ü**					49013		
Sawfly											49013		
Leaf blister sawfly											49013		
Spring beetles (scarabs)											49013		
Jarrah leaf miner											49013		
Phasmatids											49013		
Weevils (defoliating)			**ü**								49013		*E. globulus*
Psyllids											49013		
Phoracanthines											49013		
Wood moths											49013		
Wood borers - cerambycids								**ü**			49013		
Wood borers – buprestids								**ü**			49013		
Wingless grasshopper											49013		
Mycosphaerella spp.							**ü**				49013		*E. globulus*
Aulographina eucalypti											49013		
Armillaria spp.						**ü**					49013		*E. nitens*
Phytophthora spp.		**ü**					**ü**				49013		*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			**ü**					**ü**			52700	Not yet available	*P. rad*
Bark beetles (*Ips, Hylastes*)											52700		*P. rad*
Sirex wood wasp											52700		*P. rad*
Monterey pine aphid											52700		*P. rad*
Wingless grasshopper											52700		*P. rad*
Armillaria spp.	**ü**										52700		*P. rad*
Phytophthora spp.	**ü**					**ü**					52700		*P. rad*
Dothistroma septosporum	**ü**						**ü**				52700		*P. rad*
Spring needle cast / *Cyclaneusma*					**ü**					**ü**	52700		*P. rad*
Sphaeropsis sapinea					**ü**				**ü**		52700		*P. rad*

WESTERN AUSTRALIA

DISEASES (2007)

Richard Robinson **(Compiler)**
Science Division
Department of Environment and Conservation (DEC)
Brain Street
Manjimup, WA 6258

Plantations

Pinus radiata

Diseases
No major problems reported.

Eucalyptus globulus

Diseases

No major problems reported. Research at Universities continues on *Mycosphaerella* leaf blights in *Eucalyptus globulus* plantations, 13 species have now been found associated with E. globulus (see Research and Development). One species, *kirramcyes epicoccoides*, not previously known in WA has been found on young *E. diversicolor* near Manjimup and young *E. rudis* near Perth. Research has also commenced on the potential risks posed by MLB and associated pathogens in plantations to native remnants.

Neofusicoccum eucalypti was found for the first time associated with sever cankers on a plantation near Albany. This pathogen has not been found before in WA, even during extensive surveys of plantations, it is endemic to eastern Australia and is highly pathogenic.

Managed natural forests

Jarrah forest (*Eucalyptus marginata)*
Diseases
No new major pathological problems reported, but severe frost damage was reported at several locations (see Urban and Rural). Management and survey of *Phytophthora* root disease in jarrah (*Eucalyptus marginata*) forests continues to command attention (see Forest Health Surveillance and Diagnosis, and Research and Development).

Karri forest (*Eucalyptus diversicolor*)

Diseases

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

Nurseries

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

Native plant communities

Diseases

Aerial application of phosphite at sites of biodiversity significance infected with *Phytophthora cinnamomi* within the Stirling Range National Park (230 ha), Albany Coastal (73 ha), Bell Track in the Fitzgerald River National Park (377 ha), Cape Le Grand National Park, Esperance (31ha), Mt Lindesay National Park (15 ha) and the Busselton Ironstone Threatened Ecological Community (TEC) has been completed. Targets included a number of associations of Montane-mallee-heath and Montane-mallee-thicket TEC and the critically endangered *Banksia brownii*, *Dryandra montana*, *Dryandra anatona*, *Lambertia fairellii* and *Andersonia axilliflora* in the Stirling Ranges and *Lambertia echinata* subsp. *echinata* in Esperance. New target sites are currently being considered for inclusion into the 2008 Phosphite Spraying Program. Monitoring of occurrences and survivorship of individual species and rate of spread of Phytophthora Dieback at target sites has continued. Sampling to confirm disease status and species susceptibility within sites also continues (N. Moore, DEC).

Dryandra anatona communities on sites infested with *P. cinnamomi* in the Stirling Range National Park. Dead plants on an unsprayed site (*left*) and healthy plants on a site sprayed with phosphite (*right*) (photos in Feb 2007 by S. Barrett and N. Moore, DEC).

DEC Phytophthora Research Project

Funded through the State Government's Biodiversity Conservation Initiative a research project was commenced in late 2006 into the epidemiology and control of ***Phytophthora cinnamomi*** on the south coast of WA. The project is investigating the seasonal disease dynamics of ***P. cinnamomi*** including the mechanisms to disease centre extension and survival. Further the project is also investigating the use of phosphite basal stem application to prevent disease centre expansion and its effect on the epidemiology of the pathogen (C. Dunne, DEC).

Urban and rural

A Woodland Decline Symposium was held at Mandurah in November 2006. About 260 delegates from government, industry and community groups attended. Results of recent research on Tuart (*Eucalyptus gomphacephala*), Wandoo (*E. wandoo*), rudis (*E. rudis*) and marri (*Corymbia calophylla*) were presented as well as presentations and commentary on future directions and management implications.

Diseases

Mundulla Yellows: Monitoring of the occurrence and symptom development of Mundulla Yellows (MY) in WA has continued. Symptomatic eucalypts (both planted trees and remnant native trees) have been observed in several additional locations. Spread of symptoms within affected sites appears generally to be slow. The observed distribution of MY symptoms in the south of the state is from north of Geraldton to Esperance, and it occurs on alkaline coastal sands as well as on acid soils including laterites. As in South Australia, MY 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 it 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. DEC was an Industry Partner in a three-year ARC Linkage project at The University of Adelaide, "A comparative study of the distribution and spread of potential molecular markers for Mundulla Yellows disease", which was completed in March 2007. (M.Stukely, DEC).

Tuart Decline: In recent years, tuart (*Eucalyptus gomphocephala*) woodland within Yalgorup National Park, south of Mandurah has suffered a severe decline in health. Research carried out by The Tuart Health Research Group (THRG) has shown from surveys of tuart across the range, that the major decline syndrome is confined to Yalgorup N.P. These sites show a high correlation with higher rainfall, finer and shallower soils, higher groundwater alkalinity and salinity, and a greater rate of groundwater salinity increase (T. Edwards - Edith Cowan University). Critical water potentials for loss of xylem function were rarely breached in any size class or location within YNP over the past 20 months (P. Drake - Edith Cowan University). A *Phtophthora citricola*-like sp. has been recently isolated from a number of declining sites with the Yalgorup region. Further work is being conducted to determine the pathogenicity of these isolates and to characterise them (P. Scott, Murdoch University). There have been fewer mycorrhizal pads associated with fine roots of declining trees c.f. healthy trees and foliar analysis has shown that tuart within Yalgorup NP have low levels of trace elements such as Zinc (H. Eslick - Murdoch University). Studies on the role of fire and competition indicate tuart seedlings growing on ashbeds exhibit greater rates of survival and growth compared to those grown off ashbeds. Canopy health of the majority of tuart has increased following a controlled burn within Yalgorup NP (R. Archibald, Murdoch University). Trunk injections of a complete nutrient formula, zinc and phosphite either alone or in combination have shown promising results in a two trials established within the Yalgorup region and monitored over the previous 24 months (P. Barber, Murdoch University).

Wandoo Decline: In recent years the health of Wandoo (*Eucalyptus wandoo*) woodlands has been affected by crown decline, sometimes resulting in the death of declining trees. The Wandoo Recovery Group was established in 2003 and a Wandoo Strategy and Action Plan was developed, which included aims to support research, distribute information in the community and develop partnerships with stakeholders. Research strategy aims to increase the understanding of the relationships between climate, tree physiology and putative pests and pathogens associated with the decline. A number of projects, funded by The Australian Research Council, DEC, the Cooperative Research Centre for Plant-based Management of Dryland Salinity and UWA, focus on mapping canopy condition, tree physiology and ecology and pathology. Recent findings indicate that (1) wandoo decline occurs throughout most of its range and is not explained by a single factor, (2) wandoo trees continue to transpire when soils dry out, but other species such as jarrah and marri reduce transpiration rates under the same conditions, (3) tolerance levels to drought and salinity vary among wandoo populations from different locations, (4) wood boring insects and fungal pathogens are constantly associated with branch death and (5) crown assessment surveys suggest April to May is the peak time for decline symptoms. Future research will address links between environmental stress and susceptibility to pests and diseases (Wandoo Recovery Group Bulletin No. 4, March 2007).

Wandoo tree showing symptoms of crown decline and recovery photographed in June1999 (*left*), May 2001 (*centre*) and May 2007 (*right*) (photos by A. Wills, DEC).

Rudis decline: Rudis (*E. rudis*) has shown varying degrees of symptoms of crown decline throughout its range for many years. Collaborative research between Murdoch University, Serpentine-Jarrahdale Local Council and ALCOA has been initiated to investigate the efficacy of trunk injections to reverse canopy decline. Trials include treatments of phosphite, complete nutrient and also an insecticide. A trial established in

spring 2005 at Pinjarra is currently in progress. Assessments of crown health are focusing at the crown, branch and leaf scale and the incidence and severity of a range of insect and fungal pests. Results indicate that stem injection with phosphite or a systemic insecticide induce an increase in crown health when compared to control and nutrient treatments (P. Barber, Murdoch University).

Forest health surveillance and diagnosis

Dieback mapping and management

To assist the planning of roading and harvesting operations undertaken by the FPC on DEC managed lands, a total area of 21,233 ha was mapped by accredited DEC interpreters for the presence of symptoms of dieback disease, caused by *Phytophthora cinnamomi*. This included 6,710 ha of previous mapping that was rechecked for further spread. Mapping and hygiene planning was also undertaken on a further 4,462 ha for the Parks and Visitor Services, Nature Conservation and Sustainable Forest Management Services, and 2,615 ha for external requests. Mapping for external clients included assistance to review the current extent and model predicted future spread of dieback from point infestations in the Fitzgerald River National Park (Bell Track Project), and in the implementation of phosphite application trials. New projects including engineering solutions were initiated to attempt to control the spread and immanent spilling of the infection into the next larger catchment (G. Strelein, DEC).

A major project to undertake dieback threat assessment and risk analyses for vegetation on the South West was extended with the South Coast Natural Resource Management group. This work has included the collation of biological assets, strategic disease mapping, predictive modelling of future disease spread, and estimation of threat and risk categories within a target area of approximately 0.6 million ha, and commenced in the Northern Agricultural Catchment Council and South West Catchment Council NRM zones. (G. Strelein, DEC).

In the year to 30th June 2007, a total of 1,693 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), Murdoch University, on various recent and historical isolates of unidentified *Phytophthora* in the DEC culture collection, from a range of WA locations and ecosystems. This has led to the identification of *Phytophthora inundata* which was associated with dying *Banksia littoralis* in 1984 and with a dead *Xanthorrhoea preissii* in the Southern Jarrah Forest in 2005. *Phytophthora gonapodyides* has also been identified. At least seven new and undescribed *Phytophthora* taxa have been distinguished, based on their ITS rDNA sequences. Several of them are indistinguishable, on morphological characters, from known locally-occurring species such as *P. citricola*, *P. cryptogea*, or *P. megasperma*. A PhD project commenced in April 2007 at Murdoch University to further investigate and describe these new Phytophthoras, and to test their pathogenicity. A small number of other tree health and nursery problems were investigated (M.Stukely, DEC).

Plantations

Eucalyptus globulus

Forest health surveillance

Several projects at Murdoch University are focusing on eucalypt plantation health and risks to biodiversity of native forests in Australia. In the past 3 years, surveys have been conducted in collaboration with State departments and private forestry companies in eucalypt plantations in QLD and NT. The surveys provide a framework for a database on disease already present in Australia. Several new fungal species have been found causing leaf diseases and these are currently being described. A database of exotic eucalypt diseases and their proximity to Australia and the risk they pose to Australia's forests and industry is being compiled. A number of diseases are of particular interest, *Kirramcyes destructans, Kirramyces zuluensis* and *Chrysoporthe cubensis*. Molecular markers have been developed for *K. destructans* and are already in existence for *K. zuluensis* and *C. cubensis* (through collaboration with the Forestry and Agriculture Biotechnology institute in South Africa). These markers will be used to determine the origin, diversity and movement of potentially destructive eucalypt diseases. The population of *K. destructans* in Asia was found to be genetically uniform providing evidence for a founder effect in Asia. Australia was thought to be the most likely origin and surveys in northern Australia have now found *K. destructans* in two locations, Derby Western Australi and Melville Island in the Northern Territory. A project has been funded to test the susceptibility (in trials in Asia) of several tropical and sub-tropical eucalypt species to *K. destructans* and *K. zuluensis.* These trials have been established in Thailand, Vietnam and China and will be rated by the end of 2007. A matching trial will be established on Melville Island in 2008 (T. Burgess, Murdoch University)

Study on the exchange of pathogens between native forests and bluegum plantations in Western Australia continued at Murdoch University and the new forestry CRC is studying the movement of *Mycosphaerella* spp. into WA and between forests and plantations. The focus of this project will be the two main pathogens. *M. nubilosa* and *M. cryptica* (student Kate Taylor). Kate is currently designing molecular markers for *M. cryptica.* The number of Mycosphaerella spp. associated with bluegum plantations has increased from 4 species in 1995 to 13 in 2006 (Sarah Jackson).

Several *Neofusicoccum* spp. (*N. australe, N. macroclavatum*), endemic to WA, have moved into the plantations and *N. eucalyptorum*, endemic to eastern Australia has recently been found in a plantation (T. Burgess, Murdoch University).

Kate Taylor (MU) completed an honours thesis on *Botryosphaeria* spp. associated with trees in healthy and declining tuart stands; identification, pathogenicity and potential role in decline. She found that *N. australe* was widespread and very pathogenic on most

hosts. Several new endophytic species were also found and these are currently being described (T. Burgess, Murdoch University).

Diseases

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

PhD Theses in progress at Murdoch University

Fransisco (Paco) Tovar: The cause of basal stem rot in second rotation *Eucalyptus globulus* plantations (Supervisors: T. Burgess, G. Hardy, MU and R. Robinson, DEC). 2006-2007 saw the completion of a large-scale survey of 2nd rotation *E. globulus* coppice plantations. The survey was conducted to establish the incidence and likely causal agents of stump rots observed in such plantations. Six main wood decay fungi have been identified as possible causal agents of observed rots on stumps; *Trametes versicolor*, *Stereum hirsutum, Sterum illudens, Pycnoporus coccineus* and 2 as yet unidentified polypores species termed 'species A' and 'species B'. An inoculation trial on *E.globulus* coppice shoots will be set up this spring 2007 in order to determine the capacity of the above mentioned fungi to move from the stump into the new coppice shoots and cause further rot during the rotation. A stump treatment trial set up in 2005 will end in December 2007. Preliminary data already indicates that none of the anti-fungal preventative treatments were effective. An experiment investigating effect of harvest season on subsequent fungal colonisation was set up in spring 2006 and will continue until summer of 2008. Further surveys of both 1st and 2nd rotation plantations will be conducted in 2007-2008 to ascertain if there is an increase in levels of rot through the rotations (F. Tovar, MU).


Collapsed bluegum coppice (*left*) and *Pycnoporuc coccineus* fruiting on a treated stump (*right*) (F Tovar, MU).

Vera Andjic: The movement of *Kirramcyes destructans* throughout Asia, a potential threat to Australia's forests and plantations (Supervisors: T. Burgess and G. Hardy, MU and M.Wingfield, TPCP).

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

Diseases of Boabs

In collaboration with Mike Winfield in South Africa Murdoch University has conducted a survey of fungi associated with boab (*Adansonia gregorii*) in Western Australia that will have a matching project in South Africa. Monique Sakalidis (PhD, MU) is taking on this work as part of her thesis. Seven new species in the Botryosphaeriaceae have been identified. *Lasiodiplodia* sp. nov, *Dothiorella* sp. nov, *Botryosphaeria* sp. nov and *Pseudofusicoccum* sp. nov (3 species). The most commonoly isolates species was Lasiodiplodia theobromae. A pathogenicity test has shown that this species is highly pathogenic to boabs.

Managed natural forests

Jarrah forest (Eucalyptus marginata)

Diseases

Dieback-resistant jarrah (*Eucalyptus marginata*): Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have been written up. Trials of site preparation procedures for re-establishment of jarrah in dieback "graveyard" sites, especially on the "black gravels", commenced in 2003 with further trials established in 2004, and very promising levels of survival have been recorded in the critical first and second years. Final planting of a production seed orchard of dieback resistant jarrah clones at the Forests Products Commission's Plant Propagation Centre near Manjimup has been deferred pending the availability of clones. The first seed crops from the clonal seed orchards established from the late 1990s has been harvested. (M.Stukely, DEC).

VICTORIA

PLANTATIONS

Pinus *spp.*

Insect pests

Sirex noctilio (Sirex wood wasp)

The incidence of Sirex over summer 2006-2007 remained at low levels across the state. Emphasis remains on ensuring sufficient inoculations are done using the more effective Kamona strain nematode coupled with timely surveillance and thinning of susceptible stands. Parasitoid populations of Ibalia and to a letter extent Megarhyssa and Schlettererius continue to emerge at elevated levels providing a useful secondary means of Sirex control. Recently a review of biocontrol efficacy in Victoria over the past 36 years has been completed with a view to publishing results in an international journal.

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

Ips grandicollis populations were expected to increase due to significant fires throughout Victoria over the summer of 2006-07 where some softwood stands were burnt. However only trace levels of the beetles were recorded in these stands and thus the impact of *Ips grandicollis* within pine plantations in Victoria has remained at relatively low levels. with significant damage only observed in isolated areas of northeast Victoria where the bark beetle was considered as a primary contributor to mortality of trees subject to drought. This damage was observed over a wide range of age classes from nine to 30 years old. *Hylastes ater* and to a lesser extent *Hylurgus ligniperda* caused trace damage in private plantations located in central Victoria.

Isolated pockets of damage caused by *Ips grandicolis* in pine plantations in northeast Victoria in 2006-07.

Essigella californica (Monterey Pine Aphid)

Monterey Pine Aphid has been identified in all districts across the Victoria. Monterey Pine Aphid populations continue to cause significant defoliation, particularly in the north-east part of the state although stands in the southern areas have also recorded significant localised damage. While thinned *P. radiata* plantations older than 15 years of age have been the predominant age class to be defoliated, increasingly, defoliation of younger trees under ten years of age has been observed on a more frequent basis. Although it is now over seven years since the pest was first detected, there has been no widespread mortality associated with the defoliation observed to date.

Pathogens

Dothistroma

Surveys have shown *Dothistroma septospora* to be at relatively low levels across the plantations although some localized hot spots with levels up to 80%defoliation have been detected in high risk areas in the north-east of the State. No spray program was conducted in the 2006/2007 as disease levels across the plantations lie below the economic threshold for which management actions would be normally considered.

Dothistroma damage in isolated pockets of north-east Victoria in 2006/07.

Cyclaneusma Needle Cast

Defoliation associated with *Cylaneusma* was recorded in most areas of plantations in the State, with some areas exhibiting moderate defoliation levels. As the pathogen was only found in older needles, little impact on growth of trees is expected.

Diplodia

Damage from *Diplodia* was observed across Victoria during the 2007 survey. *Diplodia* in association with the drought, is continuing to cause dead topping and death of trees. Damage ranged from trace levels to severe where 90% of a plantation in Gippsland was affected by a hailstorm.

Damage caused by *Diplodia* in pine plantations in South Gippsland Victoria in 2006/07.

Plantations (*Eucalyptus* spp.)

Insect pests

***Mnesampela privata* (Autumn Gum Moth)**

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

Chrysophtharta and Paropsis (Chrysomelid Leaf beetles)

Defoliation due to chrysomelids within plantations, was observed across all age classes of *E. globulus* or *E. nitens* , with no preference shown between either eucalypt host species. Damage levels ranged from low to moderate in the 1-5 age-classes, low to high in the 6-10 age-classes, moderate in the 11-15 age-classes, and low to high in the 16-20 age-classes. The lower crowns were generally more affected than upper crowns with moderate to high levels of defoliation.

Perga spp. (Sawflies)

Sawflies were observed causing trace levels of defoliation only in trees in Gippsland and north central Victoria and were not considered a problem over the past year.

Phorocantha spp. (Longicorn Borers)

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

Cardiaspina spp. (Psyllids)

Psyllids of the genus *Cardiaspina* (predominantly *C. retator*) has been observed causing trace levels of defoliation to *E. camaldulensis* plantings in northern Victoria with the damage generally confined to specific locations rather than being widespread. This pattern of defoliation continues similar trends observed over the past three to four years, particularly in trees aged four years and over.

Anoplognathus spp. (Christmas beetles)

Christmas beetle defoliation was most predominant in age classes >6 years on *E. globulus* and to a lesser extent *E. nitens*. Defoliation varied from low in the upper crown to high in the lower crowns of some locations. Defoliation was generally higher in the lower crowns.

Other Pests of eucalypts

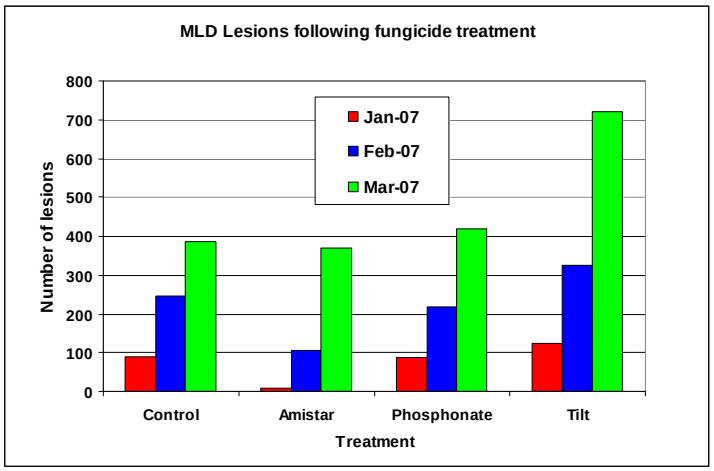
Low levels of defoliation damage were observed over late spring and early summer to *E. grandis* plantations in northern Victoria by the Leaf Blister sawfly (*Phylacteophaga froggatti*). Damage was generally confined to young juvenile foliage on young trees.

Low levels of Light brown apple moth (*Epiphyas postvittana*) damage was observed on the growing tips of recently established *E. globulus* plantations near Ballarat during late summer/early autumn 2007.

Pathogens

Mycosphaerella

Defoliation due to *Mycosphaerella* in 2 year-old *Eucalyptus globulus* plantations continued to be of some concern in the Otway Ranges and South Gippsland, although not to the extent of the 2005-06 season due to the drought. A fungicide trial established in the Otway Ranges was inconclusive due to the non-conducive conditions for disease development. However a glasshouse trial showed promise for the use of Amistar as a potential fungicide for control possibly applied in the nursery prior to planting, and prior to canopy closure.



Amistar gave up to 3 months control of Mycosphaerella (treatment December 2006) in a glasshouse trial
(Pham Thi Hoa *et al* 2007 Australasian Plant Pathology Society Conference 2007).

NURSERIES

Conifer species

Phytophthora cinnamomi remains a high priority to reduce the further spread of the pathogen and close future pathways for spread of new *Phytophthora* species should they enter the nursery industry.

Eucalyptus species

No reports of damage due to pathogens were recorded in 2006/2007.

MANAGED NATURAL FORESTS

Insect pests

Didymuria violescens (Spurlegged Phasmatid)

Following the severe fires experienced this last summer and four years previously in areas of ash forest susceptible to outbreaks, most of the forest litter which provides habitat suitable for egg survival and development has been removed. As a consequence, it is anticipated that apart from smaller unburnt areas that may harbour residual populations, large-scale outbreaks are unlikely to occur into the foreseeable future.

Cardiaspina bilobata (Mountain ash psyllid)

An inspection was conducted of mountain ash psyllid monitoring plots in April 2007 with the survey indicating that populations are at barely detectable levels only and as a consequence, unlikely to cause significant defoliation in the coming year. Observations made indicate that despite the drought, general tree health to be very good at all sites and in the surrounding forest with minimal insect/pathogen damage evident.

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

Infestations of *E. camaldulensis* by the Red gum basket lerp *Cardiaspina retator* have continued over the 2006-07 summer in northern Victoria, although at a reduced level compared with that observed in previous years. The impact of the drought and associated tree stress my also account for some of the symptoms of poor tree heath observed as much as the past and present effects of insect-related defoliation.

Bag Shelter Moth (*Panacela* sp.?)

Significant outbreaks of the Bag shelter moth (*Panacela* sp. – species to be confirmed) were reported in a wide area across northern Victoria from Horsham to Albury/Wodonga in autumn 2007. Both mature and young trees in native stands and roadside plantings covering a variety of species were affected with extensive defoliation occurring in many cases. No remedial action was undertaken. Based on past outbreak experience, such events are usually short-lived and disappear by the following summer.

Uraba lugens (Gum leaf skeletoniser)

The incidence of defoliation, predominantly in *E. camaldulensis* has declined substantially over that observed the past 2-3 years. As with the *Cardiaspina*, the ongoing impacts of drought and associated water deficit may account for more of the symptoms of low foliage levels and poor tree health observed in some trees rather than the defoliating effects of the insects themselves.

Pathogens

Few diseases were reported from managed natural forests during 2006/2007.

NATIVE PLANT COMMUNITIES

The drought has continued to result in a reduction in disease reports from native forest communities during 2006/2007. However the drought has in itself resulted in the mortality of trees and understorey particularly on drought prone landscapes.

MONITORING AND SURVEILLANCE

Insect pests

Lymantria dispar (Asian Gypsy Moth)

Monitoring of the ports of Melbourne, Geelong and Westernport continued for the Asian Gypsy Moth over summer 2006/07 as part of a nationwide monitoring program. Apart from native lepidopterous species being trapped, no exotic species including gypsy moths were detected during the survey.

Plantations and Native Forest Monitoring

The Forest Health Surveillance Group has continued to work with industry to develop and conduct ongoing insect pest and disease surveillance programs in both softwood and hardwood plantations throughout the state, to meet their varying operational and stewardship requirements. Pilot studies have also commenced in public lands under state government stewardship to develop surveillance programs that both detect insect outbreaks in their early phase of development and to meet requirements under their State of The Forests and Montreal Sustainability reporting criteria. Further work is also underway with the department of Primary Industries to develop monitoring programs suitable for application in small eucalypt plantation holdings to meet certification requirements and to treat potential outbreaks in their early phase of development.

Chalara australis (Myrtle Wilt)

Mytle Wilt continues to cause some deaths of mature *Nothofagus cunninghamii* in rainforests across Victoria although at low levels.

Stream monitoring for Phytophthora

A project assessing techniques for monitoring streams for the presence of *Phytophthora* was continued in 2007 in streams around Melbourne using a variety of baits, and water filtration. *Phytophthora* species were isolated from all streams tested, bait types and filters used in the study. Species isolated in June 2006, included *Phytophthora gonapodyides*, *P. citricola*, *P.* taxon *Pgchlamydo*, *P.* taxon from Clade 8 and an unknown *P.* taxon from an unknown clade. Species isolated in March 2007 included, *Phytophthora cinnamomi*, *P. citricola*, *P. cryptogea*, *P.* taxon from Clade 2 related closely to *P. citrophthora*, *P.* taxon from Clade 8 related closely to *P. cryptogea* and an unknown *P.* taxon from an unknown clade. Species isolated varied with season, baits and method used. *Phytophthora* species of current quarantine concern (*P.ramorum* and *P. kernoviae*) were not recorded.

The method provides an ability to relatively simply monitor catchments for the presence of *Phytophthora* species and should be considered to be adopted nationally to determine the presence of *Phytophthora* species in Australia and provide an early warning for the introduction of new species.

Baiting streams for *Phytophthora* in Victoria in 2006/07.

URBAN, RURAL AND AMENITY.

Canary Island Date Palms – Phoenix canariensis

Surveys within the major plantings of palms in Melbourne were carried out 2006-7. Two Canary Island Date Palms in Melbourne were found to be infected with *Fusarium oxysporum fsp canariensis* (Fusarium Wilt) during 2006/2007. This brings to 14 palms that have been infected with the pathogen. All palms have been removed and deep buried in a quarantine tip.

Mundulla Yellows

Investigations into the cause of Mundulla Yellows (MY) have been completed. This study that involved a multi-disciplinary team drawn from the Department of Primary Industries and University of Melbourne was funded by Environment Australia and South Australia Department of Environment and Heritage. The research concluded that soil factors play a significant role in the development of the 'disease' and that it is a form of physiologically induced iron chlorosis that could be reversed using iron chelates and iron implants. However the underlying physiological basis for symptom development is still to be determined and requires further research. The increase of CO2 in the atmosphere and bicarbonates in the soil may be contributing to the development of the 'disease'. A trial established to evaluate species which may be planted back onto sites of high risk of development of MY continues.

Dutch Elm Disease

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

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

Armillaria

Armillaria luteobubalina was recorded causing dieback of trees and shrubs in gardens, Parks and Reserves across Melbourne and the Dandenong Ranges during 2006/07.

QUARANTINE

Phytophthora fallax

A soil and disease survey was carried out in summer and autumn 2006/07 of the area within the Kinglake State Park north-east of Melbourne where the first isolation in Australia of *Phytophthora fallax* was made in September 2006 . The pathogen had previously not been recorded outside of New Zealand. No symptoms of disease were observed and no further isolations made from soil. Information provided by New Zealand pathologist Margaret Dick, was that symptom development occurred in winter and thus surveys should be concentrated then. Seedling trap plants have been planted underneath the mature trees in the Kinglake National Park to monitor for symptom development. Investigations continue, and novel baiting techniques using rain-gauges containing baits to pick up potential aerial dispersal spores are being evaluated.

In July 2007, DPI diagnostic lab isolated *P.fallax* from a soil sample from dry sclerophyll native vegetation on the Mornington Peninsula. Again further testing to reisolate the pathogen has failed. Investigations are continuing.

QUEENSLAND

PLANTATIONS

Eucalyptus *species*

Insect pests

Insect pests recorded in Queensland plantations and trial plantations in 2006/07.

Tree species	Agent	Common Name	Severity
C. citriodora ssp. variegata	*Liparetrus* sp.	Swarming scarabs	**Severe**
C. citriodora ssp. variegata	*Gastrimargus musicus*	Grasshopper	**Severe**
C. citriodora ssp. variegata	*Rhombacus* & *Acalox* spp.	Erinose mite	**Moderate**
C. citriodora ssp. variegata	*Eriococcus coriaceous*	Scale	**Moderate**
C. citriodora ssp. variegata	*Eucalyptolyma* sp.	spottedgum psyllid	**Minor**
C. citriodora ssp. variegata	*Phoracantha solida*	Two-hole borer	**Minor**
Corymbia hybrid	*Liparetrus* sp.	Swarming scarabs	**Severe**
E. cloeziana	*Paropsis atomaria*	Eucalyptus tortoise beetle	**Severe**
E. cloeziana	*Kahaono* sp.	Tent leafhopper	**Moderate**
E. dunnii	*Endoxyla cinerea*	Giant wood moth	**Severe**
E. dunnii	*Oxyops/Gonipterus* spp.	Eucalyptus weevils	**Severe**
E. dunnii	*Creiis* sp.	Creiis psyllid	**Minor**
E. dunnii	*Phylacteophaga* sp.	Leafblister sawfly	**Severe**
E. dunnii	*Paropsisterna* (=Chrysophtharta) *cloelia*	Leaf beetle	**Severe**
E. dunnii	Species not known	Swarming scarabs	**Moderate**
E. grandis	*Endoxyla cinerea*	Giant wood moth	**Severe**
E. grandis x *E. camaldulensis*	*Endoxyla cinerea*	Giant wood moth	**Severe**
E. grandis x *E. camaldulensis*	*Kirramyces* spp	Leaf spots	**Severe**
E. grandis x *E. camaldulensis*	*Phylacteophaga* sp.	Leafblister sawfly	**Severe**
E. grandis x *E. camaldulensis*	*Paropsis atomaria*	Eucalyptus tortoise beetle	**Severe**
E. longirostrata	*Liparetrus* sp.	Swarming scarabs	**Severe**
E. longirostrata	*Eurymela* or *Eurymeloides* sp.	Leafhoppers	**Moderate**

Psyllids
A small area of attack by *Creiis* sp. on *E. dunnii* (approx. 15 ha) was observed near Beaudesert. The affected plantation recovered well, though population movement within the plantation has seen renewed attack in another part of the same plantation.

Leaf Beetles
Paropsis atomaria: severe damage (mean CDI of 40%) to *E. cloeziana* was observed in central Queensland around Miriam Vale in an eight year old plantation.

Significant chrysomelid attack (species not confirmed, but likely to have been *P. cloelia*) was observed during the October 2006 period in Miriam Vale region with over 400 ha of *E. dunnii* sprayed. Defoliation in excess of CDI 40% was observed. A second wave of attack was observed in these plantations in March/April 2007.

Swarming Scarabs
Attack noted in December 2006 in 2 *E. dunnii* plantations in the Miriam Vale area with CDI up to 20% in parts of the affected plantations.

Erinose mite
Moderate levels of damage by these mites continued to be found in young *C. citriodora ssp. variegata* plantations in the south Burnett region. Damage by this mite has decreased in recent years, perhaps in relation to the severe drought conditions experienced in the region, with a commensurate lack of new flush vegetation to feed on.

Plate galler
No damage by *Ophelimus* sp. plate galler to *E. argophloia* plantations was recorded in 2006/07. Incidence of this pest has decreased since it was first found outbreaking in 2002.

Weevils
The weevils (*Oxyops* and *Gonipterus* spp.) were observed in high numbers in some *E. dunnii* plantations in southern Queensland and appear to have been increasing in numbers in recent years. Approximately 1000 ha were sprayed to control weevils in the Miriam Vale area.

Sawflies
No damage recorded.

Leaf blister sawfly
Severe damage by *Phylacteophaga* sp. was widely observed in the South Burnett, mainly in *E. dunnii* plantations. More than 200 ha of plantations were affected, but no control measures undertaken and trees have recovered well. Severe damage to *E. grandis* x *E. camaldulensis* plantations in central Queensland.

Grasshoppers
With the dry conditions a range of grasshopper species continued to cause chewing damage to young trees, particularly to *C. citriodora ssp. variegata*. A number of species were observed in the most badly affected plantation, with *Gastrimargus musicus* the most common.

Christmas Beetles
No damage recorded.

Stem borers
Giant wood moth (*Endoxyla cinerea*) and two-hole borer (*Phoracantha solida*) continue to be the key stem borers affecting eucalypt plantations in Queensland, particularly in plantations of *E. grandis* x *E. camaldulensis*, *E. grandis* and *E dunnii*.

Estimated levels of attack by *E. cinerea* of greater than 20% of trees in *E. dunnii* and *E. grandis* plantations in the Miriam Vale area were observed, with similar levels in *E. grandis* x *E. camaldulensis*. Attack was particularly prevalent from age 2 to 3.

***Thaumastocoris* sp. bug**
No damage was recorded by this bug during 2006-07

Flea beetles (*Chaetocnema spp.*)
No damage was recorded during 2006-07.

Gum Tree Scale
Several *C. citriodora ssp. variegata* plantations in the south Burnett suffered moderate to severe patch damage by *Eriococcus coriaceous*. This is the first time severe infestations of more than isolated trees have been observed for this host in Queensland plantations.

Fungal Pathogens

Quambalaria shoot blight
Quambalaria shoot blight (*Quambalaria* pitereka) remains the main pathogen associated with establishment problems in spotted gum (*C. citriodora ssp. variegata*) plantations. However, the extended dry conditions have seen a fall in the incidence and severity.

Kirramyces leaf blight
Kirramyces leaf blight is continuing to be an issue within *Eucalyptus* plantations. There is however, uncertainty over the species that is associated with the majority of defoliation in the central Queensland region. Previously it was identified as *K. eucalypti* but DNA analysis has indicated that this is not the case. A name is yet to be determined.

Research & Development

Quambalaria shoot blight

- Variability in the *Q. pitereka* population was previously identified when examining the ITS region of isolates collected in subtropical and tropical regions. Examination of the haplotypes from the perspective virulence shows variability.

- *Q. pitereka* has been identified from stem cankers on woody branches. This is the likely long term survival mechanism of the pathogen. Glasshouse tests indicate that infection of the stems does not occur in the absence of wounds. Hail damage to young stems and branches, observed in Grafton, appears to be a method of entry for *Q. pitereka*.

Pest management in* Corymbia *plantations
A Subtropical Forest Health Alliance (SFHA) supported project led by DPI&F was successful in attracting Queensland Department of State Development and industry funding from Forestry Plantations Queensland, Forest Enterprises Australia and

Integrated Tree Cropping. The project is worth $570,000 over three years and will focus on minimizing the risk that pests and diseases pose to the developing *Corymbia* hardwoods industry in Queensland through assessment and screening of germplasm for resistance/tolerance to the key pests and diseases of the *Corymbia* complex, and developing management methods for these based on improved knowledge of pest biology and ecology.

Hardwoods Pest & Disease Field Guide

The SFHA was instrumental in developing a FWPRDC project to revise and republish Angus Carnegie's 2002 "Field guide to pests and diseases of eucalypts in New South Wales". The revision will incorporate new and emerging pests as well as a guide to common nutritional deficiencies and biosecurity threats to hardwood plantations in the subtropics. In addition, a series of management response protocols will be published for the use of SFHA member operational staff. Upgrading of the information in the CRC for Forestry's online Pest database is also included in the outcomes of this project. The revised guide is expected to be published early in 2008.

Hazard site surveillance

A trapping program in Brisbane for the early detection of targeted forest invasive species has completed its first year of operation. Five different lure types are being used in panel traps *viz.* ipsenol, ipsdienol, exo-brevicomin, frontalin and ά-pinene + ethanol. In total 67 species and 5757 individuals of wood boring beetles have been trapped and identified during the program to date. Scolytines are the most abundant taxa making up 82.6% of the catch. No new exotics have been trapped but 19 of the species and 60% of all specimens caught are exotics that are already established in Australia.

NEW ZEALAND 2006/2007

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

1. Plantations:

PINUS RADIATA:

Pests:

No insect problems of any note were recorded in *Pinus radiata* plantations. The Monterey pine aphid, ***Essigella californica*** (Aphididae), has been associated with severe upper crown yellowing and premature needle cast in *P. radiata* forests in Australia, however it has not been associated with any major damage in New Zealand. Ensis has been monitoring *E. californica* population numbers at two sites: a warmer, dry forest in Canterbury and a central North Island forest, to examine the interaction between climate and *E. californica* numbers and the effect of the aphid on tree growth. Trees were injected with a systemic insecticide, to remove aphids during summer and autumn when aphid numbers peak, to enable comparisons in tree growth and health to be made with un-injected trees. Low aphid numbers have been recorded at both sites over the two sampling years (2005-2006 and 2006-2007). Consistently higher numbers of aphids were recorded in Canterbury in both years, however, these were very low in comparison to numbers recorded in Australia.

Diseases:

Dothistroma needle blight

Dothistroma needle blight was less severe in 2006, and carrying over into early 2007, than in previous years. The standout year remains 2002, where the number of records of severity over 25% is significantly higher than other years. This was a result of high rainfall in the 2001/02 summer. The number of records where severity was greater than 25%, decreased in 2006 (figure 1).

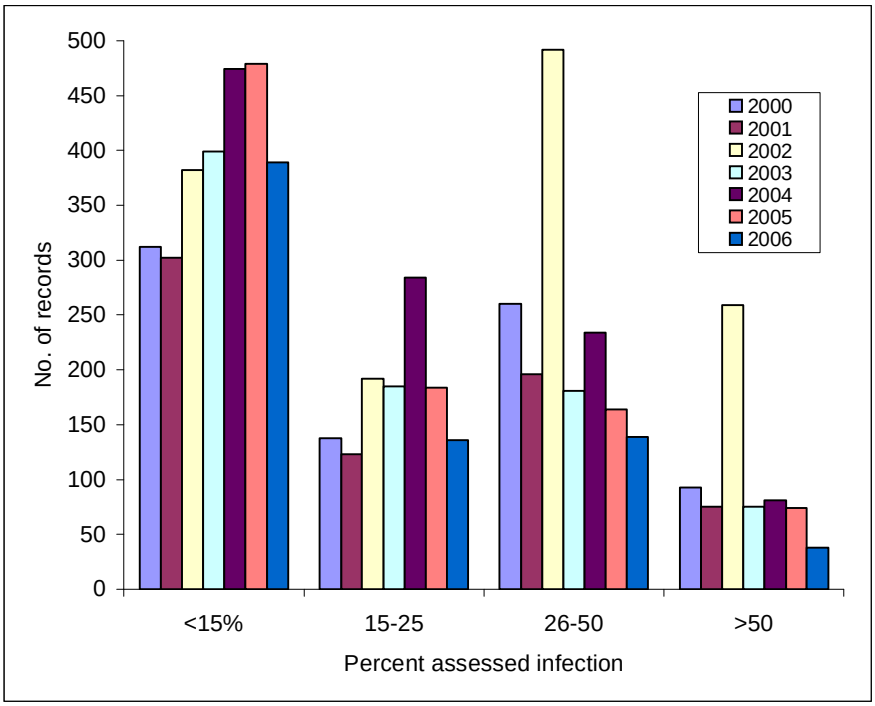


Figure 1 - Forest Health Database records of Dothistroma needle-blight during the period 2000-2006

At 134,742 ha the aerial spray programme in the North Island for 2006-2007 was greater than the previous season when an area of 121,196 ha was sprayed (figures provided by the Dothistroma Control Committee). The 2002-2003 spray programme was the largest ever undertaken at 182,290 (figure 2). The area sprayed is a separate, but less refined indicator of the annual impact and extent of Dothistroma needle blight throughout the whole country, since it may be influenced by other forces driving company activities (for example: budget constraints, changes in silvicultural practices, increasing area of at-risk age classes due to greater planting in the 1990s). Changes in practice were responsible for the increase in sprayed area over the past two years. For some companies the threshold level for spraying is now 10-15%, compared with 25% previously.

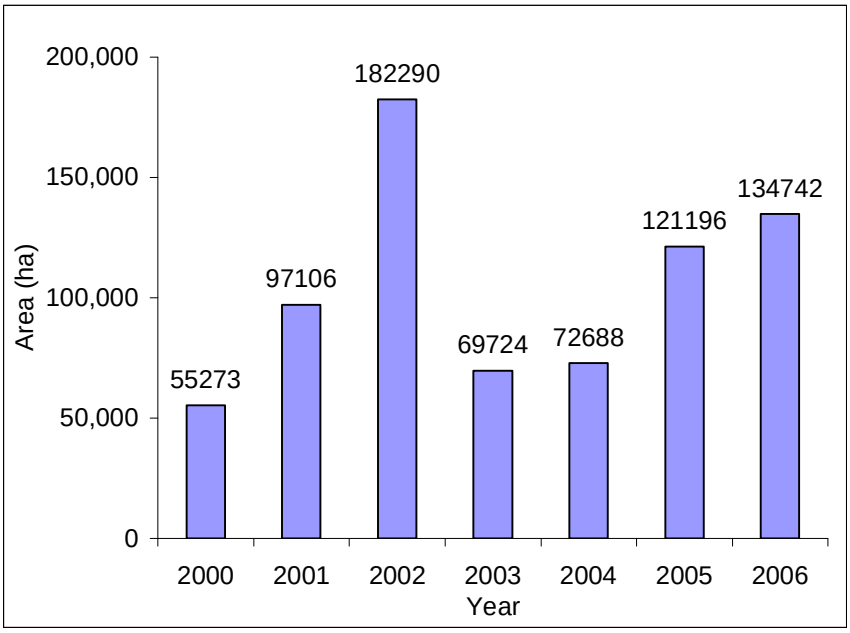


Figure 2 – Area sprayed annually for Dothistroma control in the North Island

Cyclaneusma needle cast

Based on Forest Health database records, the severity of Cyclaneusma needle-cast was again low, as it was in previous seasons (figure 3). In 2005-06 there was a minor increase in disease incidence demonstrated by a small increase in the number of records in the 26-50% and over 50% disease severity categories. This year, disease severity is at normal levels. Forest Health database records provide a crude estimate of disease severity, because less than one fifth of records in the database are collected during the peak Cyclaneusma needle-cast expression period of September/October/November. The main infection period is summer for *Dothistroma* and autumn for *Cyclaneusma*.

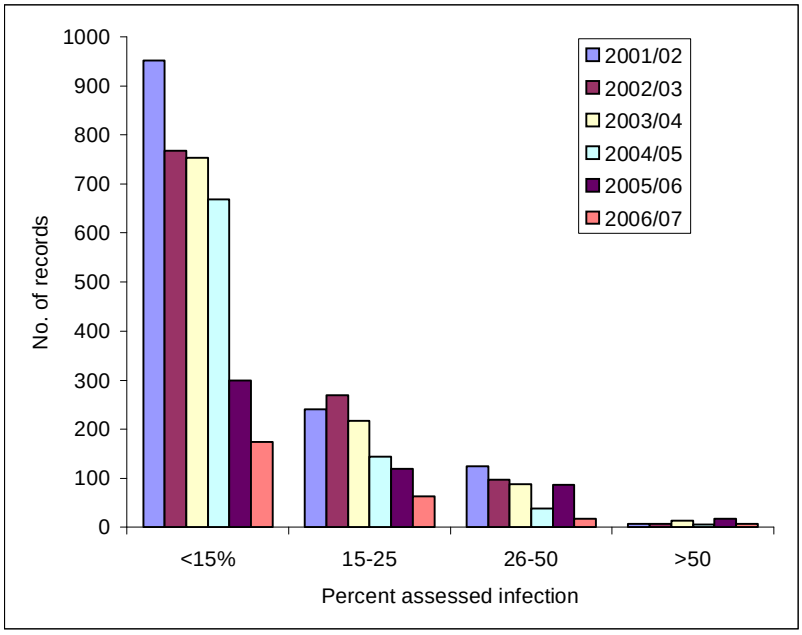


Figure 3 - Forest Health Database records of *Cyclaneusma minus* for 2000/01-2006/07

Physiological needle blight *and atypical Cyclaneusma needle cast*

Very few reports of the physiological needle blight were made in 2006-07. Regions commonly affected in the past, such as East Cape of the North Island and Northland were unaffected. However, in August and September 2006, reports were received of an outbreak of needle cast in a major central North Island forest. *Pinus radiata* along roadsides showed browning to greyish decaying foliage on lower half of the crown. The tops of the crowns remained green (figure 4). Disease incidence was extremely high, unlike that caused by typical Cyclaneusma needle-cast.

Figure 4 - Needle cast symptoms on trees along road side

Other trees showed needle yellowing and readily detached needles typical of Cyclaneusma needle-cast (Fig. 5). Needles on those trees remained rigid and did not wilt.

Figure 5. Cyclaneusma needle-cast symptom of yellow needles on a lower branch.

On some trees the bottom crown under the Cyclaneusma affected middle section had brown to greyish foliage that appeared to be in an advanced stage of death and the dead needles could NOT be dislodged by shaking (Fig. 6). The needles could be heard detaching from the branch as they were ripped off it. These symptoms were described as typical of physiological needle blight (PNB). Trees showing those symptoms were very much in the minority.

Figure 6. Drooping needles typical of PNB-type symptom on an ex-skid site.

Based on observations that affected foliage on most trees detached readily and did not wilt, it was concluded that *Cyclaneusma* was the predominant cause of the needle cast disease. PNB, if present, usually appeared at the bottom of the crown and Cyclaneusma needle-cast was often present on the same tree. The affected area was re-inspected in February 2007 and the lower crown on the majority of affected trees was bare. The needle cast had not spread to the remainder of the crown.

Nectria fuckeliana

There has been an extension northwards of the range of *N. fuckeliana*, the most recent record was made on Banks Peninsula (east of Christchurch). *Nectria fuckeliana* therefore still remains confined to the lower half of the South Island. The fungus is spreading northwards slowly.

Studies on the effect of silviculture and environment on disease development are continuing. Stem fluting was more common after second lift pruning operations than first lift. The level of infection is decreased when pruning operations are carried out in winter. Inoculation studies have demonstrated that there is considerable variability in individual tree response. Molecular and isolation studies have shown that *N. fuckeliana* can be isolated from asymptomatic unpruned trees as frequently as from asymptomatic pruned trees. This result also supports the observations on the variable response from inoculation work. It is speculated that bark cracks in the branch crotches may be another entry point for the fungus.

Trial work showed that spread of the fungus via nursery stock was extremely unlikely. We have shown that there is some relationship between spore release and rainfall, but over some periods there was considerable variation, suggesting that some other factors such as temperature or ice melt are playing a role.

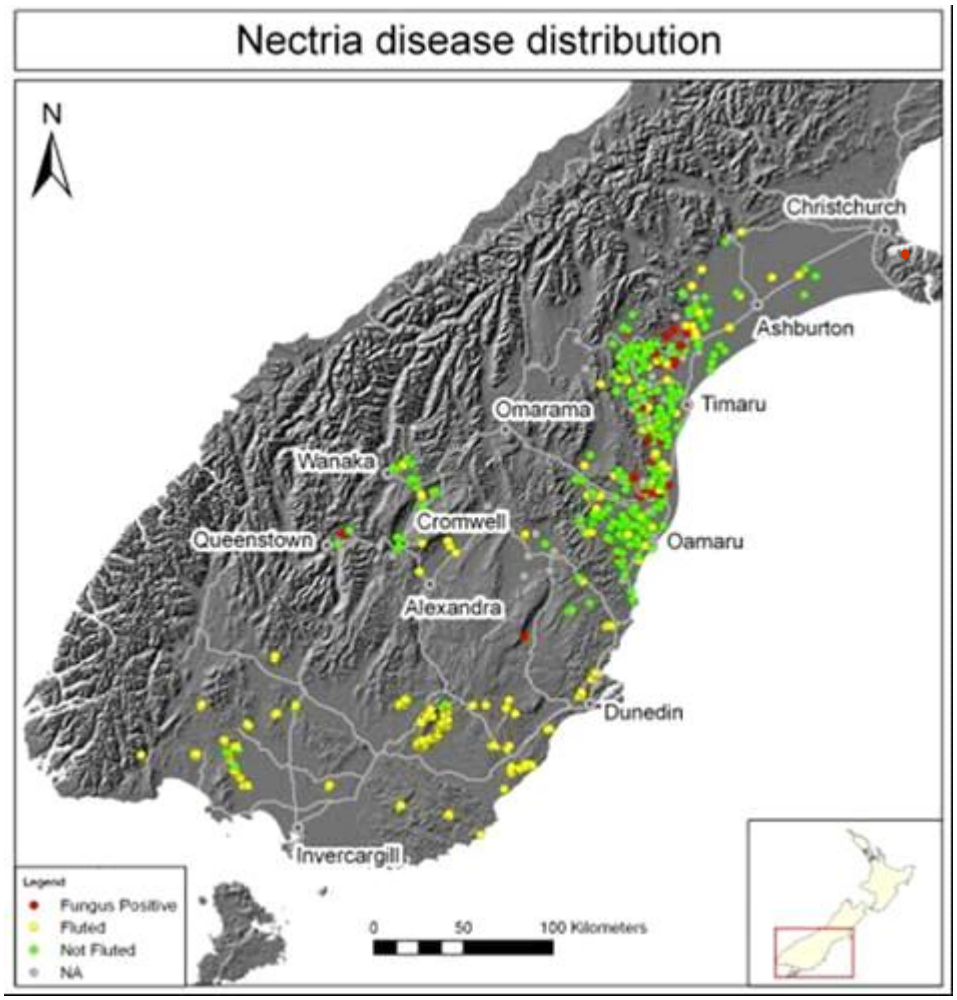


Figure 7. Known distribution of *Nectria fuckeliana*.

Armillaria root disease

Armillaria root disease, caused primarily by *Armillaria novae-zelandiae*, remains widespread in many pine plantations throughout much of the country. In second or third rotation stands mortality of young trees is less common. However, chronic, non-lethal infection of older trees can still lead to significant increment loss. In a series of inoculation screening studies, all *Pinus radiata* clones tested were susceptible to two isolates of *A. novae-zelandiae*. However mortality appeared below average among a small number of clones, suggesting they might be suitable for planting on infested sites. Further testing is underway. A volumetric spore trap is being used in a study to investigate directly the ability of basidiospores of *A. novae-zelandiae* to invade forest plantations. Results so far demonstrate that although a high proportion of spores remain within the indigenous forest, others escape beyond the stand edge and are potentially free to disperse more widely.

Phytophthora inundata
Phytophthora inundata, which was previously not known to be present in New Zealand, was isolated from soil collected from beneath a stand of *Pinus radiata* with root disease and lower stem cankers. Some trees have died. Overseas *P. inundata* has been demonstrated to be an aggressive pathogen of olive plants and moderately pathogenic to *Fagus* and *Castanea*, particularly after flooding. Pathogenicity tests have not been carried out with *P. radiata.*

Trimmatostroma abietis
The fungus associated with "black band", a needle disease of sporadic occurrence which has been recorded in New Zealand since the 1960's, has been identified as the recently described *Trimmatostroma abietis.* In Europe, *T. abietis* has been isolated from needles of *Abies* and *Pinus* spp. and also a variety of non-living substrates.

NURSERIES

Root rot caused by *Phytophthora cinnamomi* was the most common serious nursery disease. Terminal crook disease, caused by *Colletotrichum acutatum* f. sp. *pinea* was recorded at a low level in several North Island nurseries.

DOUGLAS FIR (PSEUDOTSUGA MENZIESII):

Diseases:

Phaeocryptopus gaeumannii (Swiss needle cast disease)
Swiss needle cast disease (*Phaeocryptopus gaeumannii*) was again recorded throughout New Zealand and remains the most significant disease of Douglas fir. Preliminary results of a collaborative project to relate severity of infection with site and climate will shortly be published. A further survey is planned this coming spring and all data will be used to derive a model to provide short and long term disease risk predictions.

EUCALYPTUS SPP.:

Pests:

Nambouria xanthops (Pteromalidae) which was first found in New Zealand in 1999 and is widespread throughout much of northern half of the North Island and in mid

Canterbury has been recorded from Northland and Hawke's Bay for the first time. The distinctive leaf galls are quite common on *Eucalyptus cinerea* and *E. nicholii*.

The eucalypt tortoise beetle ***Paropsis charybdis*** (Chrysomelidae) continues to be a major pest. The egg parasitoid *Enoggera nassaui* (Pteromalidae appears to effectively reduce the pest population in early summer however high rates of hyperparasitism by its obligate hyperparasitoid, *Baeoanusia albifunicle* (Encyrtidae) render the control agent ineffective against the bulk of the late summer generation A second primary parasitoid of *P. charybdis*, *Neopolycystus insectifurax* (Pteromalidae) is able to compensate to some extent for the decline in *E. nassaui*. Both *N. insectifurax* and *B. albifunicle* are still thought to be restricted to the upper half of the North Island.

Work is currently underway to assess the distribution of the hyperparasitoid to provide more information on its potential impact on *E. nassaui* and the control of *P. charybdis.*

Petri dish assays were conducted to determine the physiological host ranges of *E. nassaui* and *N. insectifurax* in New Zealand. Eggs of all four paropsine beetles currently established here (*P. charybdis*, *D. semipunctata*, *Trachymela sloanei*, *T. catenata*) were accepted for oviposition by both parasitoid species. Both parasitoid species also successfully completed development in all four host species although percent parasitism, successful development and the sex ratio of offspring varied considerably between species.

Uraba lugens (Nolidae), the eucalypt leaf skeletoniser, although eradicated from the Bay of Plenty in 2001 is now very widespread in the greater Auckland region. It has been detected as far as Warkworth to the north, and at Meremere in the Waikato region to the south of Auckland. An individual has also been caught in a pheromone trap at Katikati, about 28 km north of Mount Maunganui. No range extensions were found during pheromone trapping conducted in April 2007, although trapping covered Waikato, Bay of Plenty, Coromandel and Northland.

Uraba lugens has also been recorded on a number of other Northern Hemisphere tree species, such as *Betula pendula, Quercus* spp., *Liquidamber styraciflua, Fraxinus excelsior, Fagus sylvatica,* and *Populus* sp. It is not yet known what effect *U. lugens* will have on these trees, as this pest has not been recorded from Northern Hemisphere species in its native Australia.

Research into biological control of *U. lugens* is ongoing. Of four candidate parasitoid species imported for testing two species, Cotesia urabae and Dolichogenidea eucalypti , remain, and these were the focus of biological control research in 2006/07.

Funding has been secured to complete host range testing, and support the research through to the release of a biological control agent.

Abundance of *U. lugens* has been high over the 2007 winter generation in Auckland. Public inquiries have increased and defoliation has occurred in some areas, particularly on *Lophestemon*. Further research is underway into stem injection techniques. Training of a pest management contractor is underway to enable the public to access control methods for *U. lugens* for amenity trees.

Diseases:

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

Sarcostroma mahinapuense
This branch canker-causing fungus was again recorded from *E. nitens* in Mahinapua Forest (South Island). *Sarcostroma mahinapuense* was also isolated from a group of recently dead *Eucalyptus* sp. in the North Island though it is not thought that it played an important role in the mortality.

CYPRESSES:

Diseases:

Cypress canker (*Seiridium *spp.)
Cypress canker, caused by two species of *Seiridium* continued to cause damage in many cypress stands throughout the country, particularly *Cupressus macrocarpa*. Research on this disease will be presented at a forthcoming joint Farm Forestry Cypress Action Group/Ensis workshop on cypresses.

Stigmina thujina
Defoliation and dieback of *Chamaecyparis lawsoniana* caused by *Stigmina thujina* was recorded in two South Island locations.

2. Biosecurity:

POST-BORDER (ERADICATION):

Dutch elm disease:

The eradication campaign for Dutch elm disease (DED) continued in Auckland with the aim of controlling the effect of the disease within the current controlled area and to slow or to prevent the spread of the disease. The programme was intended to provide a 'holding pattern' while long-term prospects for managing DED are explored. Two targeted surveys were carried out, with the second survey in particular concentrating on high risk suburbs. The first disease detection survey was carried out from 4 December 2006 to 12 January 2007 and the second survey ran from 7 February to 21 March 2007. A total of 3 diseased elms from 3 locations were found. All three of the locations were new. A targeted beetle trapping programme was undertaken, initially with 30 traps increasing to 36 by season end. Of the 772 beetles trapped, 1 (0.13%) carried *Ophiostopma novo-ulmi*. The infective beetle was trapped in West Auckland. The future of the programme will be determined in late 2007.

POST-BORDER (NEW RECORDS):

In February 2007 *Discula betulina* was found associated with leaf spots on *Betula pendula* in Christchurch. Overseas this fungus has been shown to be pathogenic to *B. pendula* seedlings when stems were inoculated. It was found in the course of high risk site surveillance.

SURVEILLANCE

A revised forest health surveillance system

The Forest Owners' Association were awarded a Sustainable Farming Fund grant to design and implement a long term forest health condition monitoring scheme. The scheme will collect data that will link to productivity data collected from permanent sample plots. Data will also be used for Forest Stewardship Council (FSC) certification purposes and will link with a carbon monitoring system being developed and run independently. Funding is spread over 3 years, after which it is hoped that an integrated scheme would have been implemented and any residual monitoring requirements identified and incorporated.

3. BIOLOGICAL CONTROL OF *BUDDLEJA DAVIDII*

The buddleia leaf weevil (*Cleopus japonicus*), a biological control agent for the weed buddleia (*Buddleja davidii*), was first released in New Zealand in spring 2006. Five field release sites have been established in commercial forests in the North Island. These were

selected to maximise the climatic range the weevil might encounter in areas with buddleia in New Zealand. A total of 1000 weevils were released at each site from October 2006 to January 2007 and sites have been closely monitored to determine weevil survival, dispersal and life history at each site.

Weevils and their characteristic feeding damage has been easy to find, with larvae found more than 100 metres from the release area at one site prior to winter. Weevils and larvae have been found at all sites following winter, the first larvae appearing in late August at the warmest, coastal site. Early signs are that cleopus is doing well at all sites, with a number of generations recorded.

Feeding damage to buddleia plants within the central release area is considerable, with cleopus feeding on both new and old foliage. It is hoped that the buddleia leaf weevil will help to reduce the costs associated with chemical control and growth losses to crop trees and also provide some control in natural areas where access is difficult.

In addition to these field trials, the buddleia leaf weevil was released in a small trial with both native and non-native New Zealand plant species planted alongside buddleia. The results of this trial support previous host-specificity testing in the laboratory which showed *Cleopus* to be very host-specific, only feeding on two exotic weeds -*Verbascum virgatum* and *Scrophularia auriculata*. No feeding was recorded on the native species tested in this trial.

RECENT PUBLICATIONS AND WEBSITE FEATURES:

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

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