Forest Health Bulletin

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Wind damage to high altitude eucalypts

by Karl Wotherspoon

During intensive health survey transects in high altitude or exposed compartments, it has become increasingly apparent that stem forking and other form problems are a major issue. Bud loss, flattened crowns, forks and multi-leaders increase at higher altitudes and are significantly more prevalent above 600m. In these high altitude compartments it is common to see the young growing shoot blown out, sometimes still hanging by threads of cambial tissue.

This problem is most apparent when trees are still in the juvenile phase of development and shoot tissue is relatively succulent and brittle. The immediate result of this type of damage is a small fork with two "prongs" of relatively similar size. It is not known what proportion of these forks persist over time, resulting in a tree suitable only for pulpwood. The fact that established forks tend to be more abundant in exposed/high altitude compartments suggests that a significant proportion do persist.

Fig. 1 Young fork developing as a result of wind damage

Another problem is that of crown flattening because of exposure to prevailing winds. Branches tend to bend permanently back and/or up at a high angle to the main stem and the majority of foliage ends up towards the lee side of the tree. This has an adverse impact on wood quality and may also affect pruning efficiency. Pruning time is expected to increase due to difficulties orienting shears in such a way as to avoid damage to the main stem caused by forcing them in behind high angle branches. Furthermore the pruning wound will be larger leading to an increased risk of infection by decay causing fungi.

Fig. 2: Distorted branches caused by wind exposure

Many high altitude sites are on very productive soils and these form problems can have a substantial impact on the final crop. In severe instances, what might have been a high-pruned sawlog crop could be reduced to a pulpwood crop. A number of silvicultural options are currently being investigated to address the issue.

Copper deficiency in pines

Copper deficiency is rare in Tasmania and has been found only in localised areas such as the Derwent Valley. Branch and stem twisting is the most obvious symptom and this occurs due to a reduction in lignin production once foliar levels drop below 1-2 ppm.

Fig. 3: Twisted stems caused by Copper deficiency.

The main impact of copper deficiency is a reduction in wood quality. Affected stems have wandering pith and increased wood compression, making them unsuitable for sawlogs. Twisted stems may also prove too difficult to process for pulpwood.

There are several other factors that cause similar symptoms but should not be confused with copper deficiency. Strong wind and rain can cause bending of stems, which is usually directional. High nitrogen availability can cause 'speed wobbles', while possums can cause the branches in the upper stem to bend downwards. A single strong bend in an otherwise straight branch is usually caused by a short-lived factor such as herbicide.

Applications of copper have been shown to correct severe symptoms of copper deficiency. However, it is important to conduct a foliar analysis to ensure that it is copper deficiency and not some other factor causing the symptoms.

Exotic diseases of *P. radiata* in California

by Robyn Doyle

Pitch canker and western gall rust are regarded as two of the greatest exotic threats to Australia's pine plantation estate. In Tasmania, four of the five ports that receive international ships have *Pinus radiata* plantations nearby, making this State especially vulnerable to exotic pests and diseases.

Until now we have had no expertise in the laboratory diagnosis of these diseases and have needed to rely on assistance from overseas in the event of detection in Tasmania. Our experience in the field recognition of these diseases has been limited to written descriptions and photographs. Recent experience with a suspected western gall rust incursion in 1999 (Bulletin No. 1)) and also an isolated case of suspected pitch canker in 2001 (Bulletin No. 8)) in Tasmania has shown that diagnosis offshore, even with excellent collaboration, introduces delays in obtaining positive identification.

In September 2001, I visited the United States and with funding from the Gottstein Memorial Trust Fund Award and from Forestry Tasmania, I was able to take the opportunity to observe the aerial health surveillance operations carried out by the United States Forest Service (USFS) in Colorado. I also visited some of California's plant disease experts and saw trees infected with some of the more exotic diseases that have not reached Australian shores. It brought home to me just how devastating it would

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be if pitch canker or western gall rust were to ever make it to Australasia, especially due to the speed of proliferation of pitch canker.

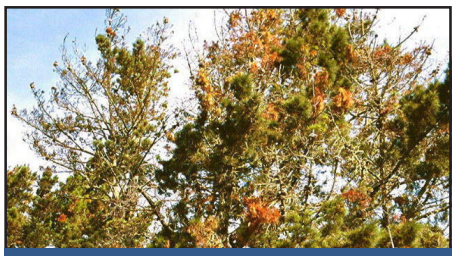

Fig. 4: Trees infected with Pitch Canker

I met Professors David Wood and Bob Gordon and Dr Det Vogler in California. Professor Wood and Professor Gordon are acknowledged experts of pitch canker disease of pines and associated insect vectors, while Dr Vogler's main interest and research has focussed on western gall rust and white pine blister rust. Professor Gordon also gave up some of his time to show me around his laboratory at UC Davis where I was able to study an isolation of *Fusarium circinatum*.

Western gall rust (WGR) is caused by a rust fungus *Endocronartium harknessii*. The infection period is 3-4 months with spores produced from late January to the end of May when the soft newly expanding tissue is present. Spores are windborne and may travel hundreds of miles to infect other pines. Moist conditions promote spore release and infection. In California, there is a mass infection along the coast where sea mists occur. It is gradually moving inland. In the wild, WGR thins out the stands.

Fig. 5: galls observed on the coast at Año Nuevo in a wild stand of *P radiata*.

Infected tissue will begin to show symptoms within two years. The galls enlarge and release spores annually, which can re-infect pines. Consequently, no alternate hosts are involved in this rust's life cycle. The fungus moves into the wood and causes excessive growth of the plant's cells. The gall disrupts the sap flow, and eventually, they girdle and kill the branch or the trunk, which happens quickly with seedlings. However, the fungus and the tree may survive for 200 years. The disease may also damage the tree by producing enough branch galls to diminish the tree's growth, or by weakening the trunk and predisposing it to breakage.

Fig. 6: Large hip canker caused by western gall rust

Pitch canker, a disease of pines caused by the fungus *Fusarium circinatum* was first discovered in California in 1986. There is no cure or preventative treatment for pitch canker, and it is spread by insect vectors and also by airborne spores. It can be found in or on seed, and it also survives for a long period of time in the soil where it acts as a typical root-infecting pathogen. Humans are the biggest cause of the spread of the pathogen.

The disease appears in the top third of the crown, which is the most vigorous part of the tree, and then generally a bole canker forms, although you can get a stem canker without tip dieback. Honey-coloured soaked sapwood is a key feature of pitch canker-affected branches. In very young pines, a canker may form down near ground level. Root collar death when not associated with insects is probably soil-borne. The fungus can be soil-borne for a very long time.

Pityophthorus twig beetles are thought to be important in the establishment of the disease given that they preferentially colonise small branches and these are always first to show symptoms (Gordon, *et al*, 2002). The beetles prefer the yellow shoots just below the soft new green shoot growth. The beetles leave the shoots before flagging occurs. Beetles are not found in mature or young cones.

Fig 7: resin stain caused by pitch canker

While there are many insects in California that are thought to be vectors of pitch canker, there are only two in Australia that are considered likely to spread the fungus if it was ever to reach Australia. They are *Ips grandicollis* (not in Tasmania) and *Hylastes ater*. In South Africa, where pitch canker has been introduced, it appears to be confined to nurseries. This is thought to be due to the absence of insects likely to act as vectors or wounding agents and it may be the same in the event of a disease incursion in Australia. The symptoms of pitch canker death of young seedlings are not distinctive and could be attributed to damping-off.

Being able to study these diseases in the field will considerably improve my ability to promptly recognise them if they were ever to find their way to Tasmania. This trip has also enabled me to form important links with international Forest Health Surveillance teams. This knowledge and the contacts will prove valuable to Tasmania, with its rapidly expanding plantation forestry. It is vitally important that any that do find their way to our shores are quickly identified and dealt with appropriately.

Forest Health Surveillance Update

Aerial surveys of the Norske Skog estate were conducted in November, followed by ground and roadside surveys. No major problems were observed, apart from the detection of *Endothia gyrosa* infection in a Eucalypt compartment near Dover.

What to look out for in summer

With the wetter-than-usual conditions this year there is expected to be an increase in infection of eucalypt leaves by *Mycosphaerella Spp.* (Bulletin No. 2). Chrysomelid leaf beetles (Bulletin No. 2) and *Uraba* skeletoniser (Bulletin No. 4) are also expected to have increased populations this summer.

References

Doyle, R.E. (2002) A Brief Look at Aerial Sketchmapping, Pine Pitch Canker and Western Gall Rust in the USA. Technical Report No. 11/2002. Forestry Tasmania

Will, G. (1985) FRI Bulletin No. 97 *Nutrient Deficiencies and Fertiliser Use in New Zealand Exotic Forests*. Forest Research Institute, NZ Forest Service, Rotorua.

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