



A Manual for Planted Farm Forestry for the Northern Inland of New South Wales

Appendix P

Shane Andrews

Dave Carr

Helen Ward

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Appendix P. Pests and diseases of farm forestry plantings.

By Dave Carr.

Management of pests and diseases in tree crops is just as important as it is for pastures, agricultural crops and livestock. In nature trees exist in an ecological balance with other species. In these relationships, the trees are host to a wide variety of organisms, both as food and as shelter. While trees suffer some damage from pests and diseases, these organisms are kept in check by their own predators, parasites and diseases. However trees in plantations or in isolated groups in agricultural lands, are much more prone to outbreaks of pests and diseases.

Monocultures of plants in large numbers allow large numbers of pests and diseases to build up, as they provide a large food or shelter source. Allowing a diverse range of habitats to develop in and around a farm woodlot or timberbelt will increase the number of organisms present. As a result, more "enemies" of pest and disease organisms will be present, therefore minimising the damage to the trees. Good pest and disease management should aim to minimise damage rather than eliminate any damage.

Damage

Pest and disease organisms are with us most of the time. It is only when they are present in sufficient numbers and at the right (or wrong) time that they become a problem. A little bit of damage to a few trees should not present a problem. A quarter of the trees affected with scale might have you starting to worry. Half the trees with most of their foliage stripped would have you very concerned. At what stage does intervention become necessary?

The type of plantation, the money and time invested, the age of the trees and the level of damage will determine when and how you intervene. Damage should be assessed by looking at the number of trees affected, the extent of the damage to individual trees, the duration of the damage and the type of damage.

Different pests and diseases cause different types of damage, which can be put into a few broad categories:

1. Leaf eaters – may eat some or all of the leaves. Some will prefer fresh new leaves, while others will eat older leaves lower in the canopy.
2. Sap-suckers – there are a variety of insects that suck sap from trees allowing less sugars to be put into tree growth. Sap-suckers are often associated with honeydew and moulds that reduce the photosynthetic ability of leaves.
3. Root feeders – these pests will damage young roots, starving the plant of nutrients and water and facilitating the entry of soil-borne diseases.
4. Borers – these insects feed on the wood of the tree and may kill or seriously injure trees, allow the entry of other pests and diseases or cause degradation to timber from the harvested tree.
5. Galls – galls are made up of deformed tissue from leaves, twigs, roots and flowers. They can be caused by a variety of organisms.
6. Fungal diseases- can be minor blemishes on leaves or lead to serious damage to growing trees. Fungi are often responsible for timber defects such as rot and stain.
7. Other diseases- which may cause wilting, root death, canopy shedding, leaf curl or leaf blisters.
8. Leaf miners – these insects cause blistering of the leaf surface which reduces the photosynthetic efficiency of the leaf.
9. Nutrient deficiencies – while not pests or diseases, deficiencies often show similar damage symptoms such as leaf discolouration, wilting, leaf drop, stunting and deformity.

10. Macro-pests – rabbits and hares, livestock, native mammals and many birds can cause severe damage to trees.

Control

Control of pests and diseases uses three principle mechanisms:

1. Natural control – natural control measures from birds, reptiles, frogs and other insects may be sufficient to prevent pest numbers from reaching harmful levels. Enhancing the habitat for these organisms will improve the natural control possible. Chapter 12 gives some ideas on how to do this. An important measure to take is to select the right species for your farm forestry venture. Species growing outside their natural range or conditions will often be much more prone to pests and diseases than well-adapted species.
1. Physical or mechanical means – small outbreaks of pests can often be controlled by simply removing them, squashing them or hosing them off. The use of physical barriers such as collars or nets can be effective in some instances. Lures or diversionary plantings may work for some plantings. While not always effective for large-scale outbreaks, physical means are environmentally-benign and may stop pests building up in numbers or re-infesting a site after a control program.
2. Chemical means – large pest outbreaks which threaten the existence of the farm forestry planting may require chemical control. Chemical means are not always cost-effective once trees are established but are part of the toolbox of control measures available to farm foresters. Chemical measures may be organic or inorganic and can be as simple measures as soapy water or white oil. **If using formulated chemical products it is essential to read the label, use appropriate protective equipment and follow all instructions for application.** Chemicals have different effects; contact insecticides, stomach poisons, systemic poisons or biological insecticides (Phillips, 1996).

For plantations and large woodlots, most control measures used for ornamental trees are uneconomic. For these stands the development of an integrated pest management strategy (IPM) is recommended. IPM strategies involve monitoring of pest populations to determine the most timely and effective control methods. They are decision-support mechanisms that allow forest growers to make the best use of available pest control resources and can stop pest populations building up to levels where they will cause major damage (Stone, 1991). Integrated pest management is widely used in agriculture and forestry where it can be used to determine an acceptable level of damage to crops and apply insecticides sparingly to avoid the development of resistance in pest insects.

Eucalypt, Casuarina and Acacia pests and diseases

1. Sawflies

Often known as “spitfires”, these grubs are the larval stages of sawflies. They form clusters of caterpillars on young trees in the leaves or in branch axils on the trunk. These clusters will be present during the day in winter and summer, depending on the species. They characteristically raise and lower their tails when disturbed and may “spit” their stomach contents.

Sawfly larvae are serious pests in the Northern Inland and may completely defoliate trees between 1 and 5 metres in height (Farrow, 1998). They are common on a wide range of species including *Eucalyptus viminalis*, *E. blakelyi*, *E. camaldulensis*, *E. melliodora* and *E. pauciflora*. They do not seem to affect *E. sideroxylon* and *E. microcarpa* (Farrow, 1998).

Parasites play a major role in regulating sawfly numbers while weather has the greatest effect on population numbers. Hot and dry conditions in early Spring reduce sawfly numbers as pupae dessicate in the soil and larvae cannot dig through the soil (Farrow, 1998).

Control is best achieved early in the season (Spring and Autumn for different species) Colonies should be removed and squashed or by application of a contact insecticide such as carbaryl or malathion with a wetting agent, directly to clusters of insecticides. Application of insecticides should be avoided where possible to reduce the risk of destroying populations of beneficial insects.

2. Eucalypt Leaf Beetle

Also known as Chrysomelid or Tortoise beetles, these beetles can be major pests of plantation Eucalypts. Both the larvae and the adult beetles eat leaves of trees up to 10 years of age. Larvae can completely remove all new growth while adults damage the margins of older leaves lower in the canopy (Farrow, 1998).

Larvae are pale green to yellow grubs about 1 cm long with black heads (Jones and Elliot, 1986). The adults are hemispherical beetles with a metallic colour that may be brown, yellow, black (with two red spots) or green. The beetles have numerous natural predators and parasites. Control of outbreaks is usually carried out in the early larval stages before population numbers build up. Chemical control is achieved with Carbaryl or Maldison (Phillips, 1996).

3. Christmas Beetle

One of the most noticeable eucalypt defoliators on the Northern Tablelands is the Christmas beetle (*Anoplognathus* spp). The shiny, metallic-coloured adults defoliate leaves in Summer, with different species being more predominant at different times and in different areas. The numbers of Christmas beetles present in a season depends on a number of factors including the presence and health of adjacent pastures and seasonal rainfall (Farrow, 1998).

The characteristic damage from Christmas beetles is a zig-zag pattern of leaf cuts. Trees can be totally defoliated during large outbreaks. In most years, Christmas beetles will have an effect on new plantings of Eucalypts, with up to half the growth potential of new trees lost in the season of attack. The beetles swarm in the late afternoon and fly to new trees, recognising them by their silhouette and by the volatile leaf oils.

Eucalypts are the preferred food tree, with some species more susceptible than others. On the Northern Tablelands, yellow box (*E. melliodora*), Blakely's red gum (*E. blakelyi*), white gum (*E. viminalis*), New-England peppermint (*E. nova-anglica*), Tasmanian blue gum (*E. globulus*), shining gum (*E. nitens*) and snow gum (*E. pauciflora*) are commonly heavily attacked. Other species such as stringybarks (*E. caliginosa*, *E. laevopinea*, *E. cameronii*, *E. obliqua*) are not usually attacked.

It should be presumed that Christmas beetles will attack new plantations of susceptible species established on former pasture sites. Control is difficult in large scale plantations, short of aerial spraying with maldison or carbaryl (Phillips, 1996). In small plantations, trunk injections of systemic insecticides will sometimes help. Other methods include; shaking the canopy and capturing falling beetles on a tarp spread on the ground; and placing strong lights over large drums of water to lure and drown the beetles.

Natural enemies include Thynnid wasps and tachinid flies which parasitise the larvae. These parasites depend on nectar from native shrubs (particularly *Bursaria spinosa*) and honeydew from scale insects for food (Farrow, 1998). Adult beetles are preyed upon by a wide range of predators including insects, birds and mammals, but in large outbreaks the sheer numbers of beetles makes control limited in effect. Healthy populations of predators and parasites can be encouraged by developing or protecting diverse native vegetation.

4. Scale

The predominant scale which affects eucalypts is gum tree or Eriococcid scale (*E. riococcus coriaceus* and *E. confusus*). It is a sap-sucking insect that affects predominantly young trees. The damage is two-fold: directly by removing photosynthates from the tree leading to branch dieback and indirectly by secreting honeydew, a sticky gum. The honeydew provides a medium for sooty mould to grow which covers the photosynthetic surfaces of the plant. Scale infestations are often attended by ants which protect the scale from predators in return for food from the honeydew (Farrow, 1998)

Scale appear as red or white, waxy lumps on the leaves and stems of affected plants. When squashed they exude a deep red liquid. Scale can be present at all times of the year but are more prolific in summer.

With a few trees, scale can be controlled by the application of grease bands to the base of the trunk, which prevent ants climbing the tree to attend to the scale. The scale are then easy prey for birds and other predators. Hosing or spraying with soapy water is reported to have some effect on scale as well (French, 1990). Spraying with white oil or other oil sprays has the effect of smothering the scale insects. It is most effective when applied in early spring before the scale develops the hard waxy coatings. Oil sprays will however also kill many insect predators. Similarly, spraying with contact insecticides such as maldison or carbaryl, will only be effective in early stages and will have the effect of destroying predator populations.

5. Psyllids, lerps and galls

There are several species of lerps and psyllids that affect Eucalypts in Australia. They are all insect pests with sap-sucking habit, with some causing a retardation of growth. They rarely cause the death of trees.

Bluegum psyllid (*Ctenarytaina eucalypti*) infests the branch tips of *E. globulus* and other trees with glaucous juvenile foliage (including *E. nitens* and *E. nova-anglica*). The psyllid is not a problem worthy of control in forestry plantations, but has a severe effect on Eucalypts grown for their foliage (Farrow, 1998). Control is usually achieved by natural enemies. Chemical control with a systemic insecticide such as dimethoate may be necessary for foliage crops but insecticides should be used sparingly to preserve populations of natural enemies.

Other lerps and psyllids include yellow-box lerp, pimple psyllids, sugary lerps and spotted-gum psyllid. They are usually seen as small bumps or sugary secretions on the surface of the leaf. These insects rarely cause significant problems in plantation trees and are kept in check by natural enemies (Phillips, 1996).

The sugary coatings of some lerps were collected by Aboriginal people as ‘manna’ for food.

6. Emperor Gum Moth

The emperor gum moth is a large pinkish-brown moth with two large eye-spots on the wings. The larvae feed on eucalypt foliage and will eat leaves back to the midrib. They rarely cause major damage to trees and are easily controlled by natural predators and parasites. In small numbers they can be picked off and squashed. The larvae are green caterpillars up to 75mm long (Jones and Elliot, 1986; Farrow, 1998).

Other leaf-eating caterpillars include Loopers, case-moths, Lasiocampid and Anthelid larvae, light-brown apple moth and Lewins bag-shelter moth. These are mostly minor pests readily controlled by healthy populations of natural enemies (Farrow, 1986).

7. Cup Moth

Also known as Chinese junks, the larvae of this moth are short fat bluish-green with colourful body markings in pink, black or yellow. The “cup” is the pupal shelter built onto twigs that resembles the cup of a single eucalypt fruit.

The larvae cause damage in outbreaks when they can completely defoliate trees. However these outbreaks are rarely sustained and the trees should recover well. Natural control is by a virus which affects the caterpillar, sometimes wiping out whole populations (Phillips, 1996).

Control is rarely necessary, however Dipel (asuspension of a parasitic bacteria) can be applied.

8. Autumn Gum Moth

The caterpillars of this moth are small, green caterpillars with two distinctive yellow spots. They damage eucalypts by both skeletonising and defoliating leaves. They are a major problem in the Northern Inland, where they can cause the death of young trees in the 3 years following planting. Their effect is particularly devastating on trees that have been defoliated by summer leaf feeders such as Christmas beetles. Most damage is done by the later larval stages, so it is important to apply any controls early.

Autumn gum moths are attacked by numerous predators such as birds and scorpion flies and parasitised by black wasps and flies (Phillips, 1996). Chemical control may be necessary in young trees, using maldison or carbaryl at the recommended rate. Chemicals must be applied late in the day when the caterpillars are active.

9. Tree-hoppers.

Treehoppers are sap-sucking bugs which are found on the stems of young eucalypts. They can cause damage by weakening the growth of young branches. They are rarely a serious enough problem to warrant control as natural enemies keep their numbers down. Ants are often associated with treehoppers as they feed on their sugary secretions in return for protection from predators.

10. Leaf-blister sawfly

This small sawfly has small grubs that causes papery blisters on the surface of leaves. It is a problem on *E. camaldulensis*, *E. nichollii* and *E. tereticornis* where it causes major damage. This damage is unsightly and also sets back the growth of trees. Chemical control by dimethoate is effective in garden settings but is difficult on a forestry scale. Leaf-blister sawfly numbers are usually kept in check by parasitic wasps (Jones and Elliot, 1986).

11. Gum-leaf skeletoniser

The larvae of a small moth, the gum-leaf skeletoniser can cause severe damage to forest and plantation species in large outbreaks. The larvae are small very hairy caterpillars with distinctive “headdresses”, made from the head capsules retained when they moult.

The caterpillars defoliate leaves back to the midrib. Damage is usually minor, but in periods of major outbreak, the caterpillars can severely retard tree growth or kill trees. Many natural predators including the predatory shield bug, keep numbers in check. Chemical control, when necessary, is by application of maldison with a wetting agent. Control is most effective when applied in the early stages (Phillips, 1986).

12. Longicorn beetles and other borers.

There are several types of wood-feeding beetles that have an effect on plantation and forest species. They affect most species including pines and eucalypts. Longicorn beetles and Bulls-eye borer are two common species occurring in the Northern Inland.

The larvae of the beetles cause the damage. In the case of the longicorn beetle, the larvae tunnels into the wood leaving damage to the timber and increasing access for fungal and bacterial infection. The Bulls-eye borer burrows out a “bulls-eye” shaped tunnel in the wood of young trees, causing timber downgrade and allowing the entry of fungus.

Both borers are difficult to detect and have no satisfactory means of chemical control. However, they are more common in stressed trees, so keeping the trees healthy through timely thinning and good silviculture will help. Trees are often attacked by cockatoos that tear open the bark and wood to extract the grubs. However, this method of “control” often leaves more damage than by the grub alone! Badly affected trees should be removed to reduce the population of the grubs.

13. Galls

Galls are swellings of plant tissue caused by some external agent. This may be insects (wasps, flies, mites etc), bacteria or fungi (Phillips, 1996). Galls can affect stems, leaves, flowers, fruit, roots and other plants tissue. The damage is often unsightly but usually not severe enough to have a major effect on tree growth. However, some wattles can be badly affected by galls, to the point where trees are killed.

Control is usually achieved by parasitic wasps. Galls can be cut and burnt, but chemical control is not effective. An excellent summary of the numerous types of galls and the plants they affect is given in Jones and Elliot, 1986.

14. Fungal diseases

Several fungal diseases affect the leaves of Eucalypts, including *Pseudocercospora eucalyptorum* on *E. nitens*, sooty mould on a range of species and *Mycosphaerella spp* (Crinkle-leaf disease). The leaves of infected trees may be blotchy, patchy or dirty. The effect of the fungus will depend on the level of infestation, and will result in some reduction in growth. This can range from minor to severe (Phillips, 1986).

Fungal infestation is heavily dependent on weather conditions. Control is generally not warranted or practical in plantations. Sooty mould is usually controlled by the control of the honeydew-producing species associated with it (see “Scale insects”).

Other fungal diseases can cause wood rot, leaf-spotting or root rot. A particularly severe fungus is *Phytopthora* root rot which can kill whole trees or stands of trees.

Pine pests and diseases

1. Sap-suckers

The most common sap-sucking pest of pine is the pine aphid, a small brown aphid about 1mm long. It can cause needle and shoot death and is indicated by the presence of white woolly material at the base of the pine needles. Pine aphids are particularly associated with sick or stressed trees (Elliot and deLittle, undated).

Control is usually not warranted as this pest does not cause large scale damage.

2. Leaf-eaters

Pine loopers (*Chlenias spp*) are native caterpillars that have adapted to include leaves of *Pinus radiata* in their diet. It is a small green caterpillar with yellow, black and white stripes and red spots (Elliot and deLittle, undated).

They rarely occur in sufficient numbers to be a problem, but under certain weather and seasonal conditions have been known to cause severe defoliation of pine plantations. Control is not usually needed.

3. Sirex wood wasp and other wood feeders.

Sirex wood wasp is a serious economic pest of radiata pine in Australia. It was accidentally introduced to Australia and has spread to many pine growing areas, including the Northern Tablelands. Pine growers are very watchful for outbreaks and take immediate action to stop large outbreaks occurring. When outbreaks of the wasp are detected, affected trees are felled and destroyed to stop the population of the wasp building up.

The adult wasp is a small metallic blue wasp with no waist. It ranges in length from 10-40mm. The wasp lays its eggs in the trunk of pine trees by inserting an ovipositor through the bark. The wasp also inserts mucilage and fungus into the egg-laying hole. The mucilage causes the major problem by blocking movement of water and nutrients to the foliage. This causes the leaves and branches to die. The fungus causes wood decay allowing the larvae to burrow into the softened wood.

The effect on the leaves is referred to as Sirex wilt and can affect part or the whole tree. Resin beads on the trunk and the presence of sirex wilt indicate the possible presence of the sirex wood wasp.

Growing pine on high quality sites and practicing good silviculture, particularly thinning, is the best way to prevent sirex infestation. Removal of infested trees keeps populations to manageable levels. Keeping trees growing strongly, through the application of fertiliser, also helps prevent sirex infestation.

If you suspect you have sirex wasp symptoms, contact NSW State Forests softwood division in Walcha for advice.

Pests and diseases references

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