



Insect pests of young eucalypt plantations

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This Agriculture Notes (one in a series of five) discusses the likely causes of severe insect outbreaks in plantations and the nature of damage that occurs. This damage occurs due to insect species identified as potentially the most destructive in Victorian eucalypt plantations during the first four years after planting and prior to canopy closure.

Other notes in this insect pest series summarise the biology, symptoms and control of these destructive pests, and provide the definition of forest entomology and common technical terms associated with it.

Background

An early goal in establishing eucalypt plantations is to provide conditions that accelerate the expansion of root systems, favour rapid crown development, induce the transition from juvenile to adult foliage and cause early canopy closure. If these processes are disrupted or delayed, there is a risk of damage to trees from destructive insects, especially leaf chewers, which thrive in open-canopy conditions that allow ample space, airflow and sunlight between trees and provide insect-susceptible juvenile foliage close to the ground.

Common leaf-feeders are:

- blue gum psyllid (*Ctenarytaina eucalypti*); a sap sucking insect which causes some wilting in growing tips of young shoots, especially of hosts with waxy glaucous leaves such as *Eucalyptus globulus* (blue gum) and *E. nitens* (shining gum);
- lace and basket lerps (*Cardiaspina* spp.); a sap sucking insect beneath a fan-shaped lerp which causes necrosis on foliage of mature leaves, especially of *E. camaldulensis* (river red gum) and *E. blakelyi* (Blakely's red gum);
- sugary lerps (*Glycaspis* spp.); a sap sucking insect beneath a soft whitish conical lerp on mature foliage which produces honey-dew leading to sooty mould formation but not necrosis; *E. camaldulensis* is the principal host;

- gumtree scale (*Eriococcus coriaceus*); a sap sucking insect on leaves, branches and stems of a wide range of young eucalypts, causing necrosis and dieback but seldom tree mortality; *E. globulus* and *E. nitens* are favoured hosts;
- coreid bugs (*Amorbus* spp.); a sap sucking insect which causes wilting among young shoots of eucalypts including *E. globulus* and *E. camaldulensis*
- larvae and adults of chrysomelid leaf beetles (*Paropsis* spp. and *Chrysophtharta* spp.) causing 'brooming' of terminal branches in upper crowns, especially of *E. grandis* (flooded gum), *E. viminalis* (manna gum), *E. globulus* and *E. regnans* (mountain ash);
- larvae of the emperor gum moth (*Opodiphthera eucalypti*) causing damage to leaves throughout the crowns of many species of eucalypt;
- larvae and adults of the eucalypt weevil (*Gonipterus scutellatus*) chewing leaf blades and leaf edges respectively, especially of *E. globulus* and *E. viminalis*;
- larvae of leaf-skeletonising or leaf-grazing moths such as the gumleaf skeletonizer (*Uraba lugens*) and cup moths (*Doratifera vulnerans* and *D. oxleyi*); most favoured host is *E. camaldulensis* for the gumleaf Skeletonizer and *E. saligna* for cup moths;
- larvae of leafrollers (*Stiepsicrates macropetana*) causing damage to terminal shoots and some older leaves, particularly of *E. globulus*.

However, in recent years the following insect types have been the most destructive defoliators of young planted eucalypts in Victoria:

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- nymphs and adults of the leaf-chewing wingless grasshopper (*Phaulacridium vittatum*),
 - larvae of the leaf-chewing autumn gum moth (*Mnesampela privata*),
 - larvae of the leaf-chewing steelblue sawfly (*Perga affinis affinis*),
 - larvae of the leaf-mining leafblister Sawfly (*Phylacteophaga froggatti*),
 - adults of leaf-chewing Christmas beetles (*Anoplognathus chloropyrus*, *A. hirsutus*)
 - larvae and adults of leaf-chewing chrysomelid leaf beetles (*Paropsis porosa*, *P. atomaria*, *Chrysophtharta agricola* and *C. variicollis*), and
 - nymphs and adults of the sap-sucking brown basket lerp (*Cardiaspina fiscella*) and the redgum basket lerp (*C. retator*)
- All of these are ‘primary’ destructive agents in that they attack the foliage of vigorous, healthy trees (Table 1), in contrast to ‘secondary’ attackers that feed on the foliage, inner bark or wood of low-vigour, dying or recently killed trees.

Table 1. Summary of principal insect defoliators and features of their life cycle, host preferences and type of foliage attacked in young Victorian eucalypt plantations prior to canopy closure.

Insect species	No. generations per year	Damaging part of life cycle	Primary eucalypt host species	Foliage attacked	Comments
Wingless grasshopper (<i>Phaulacridium vittatum</i>)	One	Nymphs and adults (mid-summer to early autumn)	Most spp. of eucalypt at the seedling stage	Juvenile	Attack generally confined to first year after planting during drought years
Autumn gum moth (<i>Mnesampela privata</i>)	One	Larvae (March to August)	<i>E. globulus</i> <i>E. nitens</i> <i>E. dunnii</i> <i>E. bridgesiana</i>	Juvenile	Attack ceases once trees have adult foliage
Leaf blister sawfly (<i>Phylacteophaga froggatti</i>)	Four to five	Larvae (mainly over winter in north-central Victoria)	<i>E. botryoides</i> <i>E. grandis</i> <i>E. saligna</i>	Juvenile	Attack ceases once trees have adult foliage
Steelblue sawfly (<i>Perga affinis affinis</i>)	One	Larvae (April to September)	<i>E. camaldulensis</i> <i>E. globulus</i> <i>E. occidentalis</i> <i>E. melliodora</i> <i>E. viminalis</i>	Juvenile and adult	Attack declines once trees achieve canopy closure
Christmas beetles (<i>Anoplognathus</i> spp.)	One or two	Adults (November to January)	<i>E. grandis</i> <i>E. globulus</i> <i>E. blakelyi</i> <i>E. botryoides</i> <i>E. viminalis</i>	Juvenile and adult	Generally, pre-canopy closure pest in farm areas with susceptible eucalypts
Leaf beetles (<i>Paropsis</i> spp. and <i>Chrysophtharta</i> spp.)	Two	Larvae and adults (November to March)	<i>E. viminalis</i> <i>E. grandis</i> <i>E. regnans</i> <i>E. melliodora</i> <i>E. globulus*</i> <i>E. blakelyi</i>	Juvenile and adult	Attack lessens once trees achieve canopy closure; usually a problem near forest areas
Brown basket lerp (<i>Cardiaspina fiscella</i>)	Three to five	Nymphs and adults	<i>E. botryoides</i>	Adult	Attack is concentrated adults on lower crowns
Redgum basket lerp (<i>C. retator</i>)	Three to five	Nymphs and adults	<i>E. camaldulensis</i>	Juvenile and adult	Whole crowns are susceptible

- Adult foliage only

Causes of outbreaks

The factors that may lead to sudden population explosions in even-aged eucalypt plantations prior to canopy closure, vary in different regions of the state, and are not thoroughly understood. Outbreaks on specific hosts in particular areas are therefore difficult to predict, although the following factors are important:

1. unusually long periods of warm weather, which accelerate insect life cycles and enhance survival, thus increasing population levels;
2. the degree of susceptibility to insect attack of the host species or provenances planted;
3. the nature of the native vegetation within and outside plantations, and the land uses in nearby areas (for example, grassy farmland interspersed with scattered eucalypts tends to favour large populations of scarab beetles on eucalypts; and plantations of *E. camaldulensis* and *E. globulus* established near woodland areas dominated by *E. camaldulensis* and supporting populations of the steelblue sawfly, can be targets for sawfly invasion and rapid build-up in insect populations);
4. the range and effectiveness of biological control agents present (parasitoids, predators, insectivorous fungal pathogens);
5. the leaf biochemistry (for example, a low cineole fraction in leaf oils favours defoliators such as Christmas beetles);
6. the extent of genetic diversity within and between tree species planted (a low diversity can lead to widespread devastation within plantations if few genotypes highly susceptible to insect attack have been planted); and
7. whether plantations are irrigated by sewage or fresh water, or grow in dryland areas (protracted nutrient deficiency and/or drought stress among eucalypts planted in dryland areas can be linked to increased damage, especially from 'secondary' destructive

insects such as the gumtree scale, lerps and wood borers including species of *Phoracantha*).

Various provenances of two to three-year-old *E. globulus* and of *E. grandis* growing in north-central Victoria in a plantation on grazing land intermittently irrigated with channel water, were severely to totally defoliated by autumn gum moth and leafblister sawfly despite weed control and fertiliser applications at planting and at regular intervals thereafter to accelerate tree growth. In contrast, a plantation about 30 km away of *E. globulus*, *E. grandis* and *E. camaldulensis* of the same age and irrigated regularly with sewage effluent, reached canopy closure after just two years and remained largely free of insect pests.

Insect pest management of eucalypt plantations may therefore benefit from periodic sewage-effluent irrigation or from irrigation using ground water to reduce tree stress and therefore, susceptibility to insect attack. It should be noted that regularly irrigated trees can become rapidly drought-stressed and therefore, susceptible to insect attack when irrigation is suspended or significantly reduced. Thus, irrigation schedules must ensure that trees are subjected to a constant program of either minimal or maximal irrigation throughout the rotation, or at least to the first thinning stage, to alleviate moisture stress and the potential for insect attack.

Types of crown damage

Damage from leaf-feeding insects may be confined to the upper crown causing a conspicuous 'brooming' effect (Figure 1a), or to the lower 50% of crown in the case of autumn gum moth chewing on juvenile foliage of *E. globulus* (Figure 1b). If attack continues, trees can be completely stripped of foliage which, if repeated in successive years, can lead to tree mortality (Figure 1c).



Figure 1. Typical patterns of defoliation in young eucalypt plantations: a) the 'brooming' effect in the upper crown, b) lower crown defoliation and, c) severe damage leading to total defoliation.

In eucalypt trials defoliated by autumn gum moth and leafblister sawfly during autumn and winter, trees had usually regenerated their upper-crown foliage completely by mid to late spring. However, severe defoliation and the destruction of the terminal shoots affects height and lateral growth. To quantify these effects, trials have been established examining the effects of different levels of artificial defoliation on the major eucalypt species. When completed, they should assist in more accurately determining the impact of defoliation on tree growth.

Acknowledgments

This Agriculture Note is a revision of Forest Service Research and Development Note No. 24 'Insect pests of young eucalypt plantations' (1993), and has been updated with relevant new information.

Further Reading

For more information on forest entomology, the following references are recommended reading:

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Organisations and contacts

Private Forestry Web site:

www.nre.vic.gov.au/forestry/private.htm

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