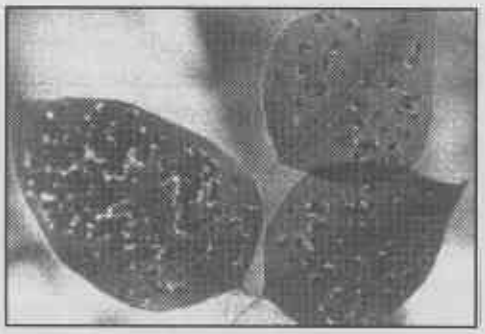
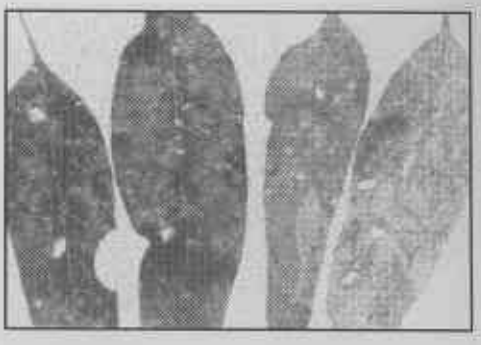
RESEARCH



Perthida sp Blotch Mines

FLOODED GUM DIEBACK

by
Vanessa Yeomans



Psyllid infestation

At the request of the Leschenault Catchment Coordinating Group and as part of her studies at UWA, Vanessa Yeomans studied E. rudis dieback along the Preston River. Her findings and recommendations are given below.

As many of you will be aware flooded gum (*Eucalyptus rudis*) throughout the southwest of Western Australia has been identified as exhibiting extensive and progressive dieback. Insect attack has been implicated in most cases of flooded gum dieback. However insect attack is thought to be symptom of tree stress. With plant stress nitrogen content and insect abundance increases. Causal factors can be a combination of climatic changes, salinity and other hydrological changes, nutrification, pathogens, fire, competition with exotic species and other land use practices. The decline of eucalypts is significant not only due to the prominence within Australia, but due to the resources, heritage and ecological functions they provide. Tree cover is important for the control of soil erosion and dryland salting. Riparian eucalypts are also important for flood control and bank stabilisation. Riparian eucalypts provide an increased number of food sources, tree hollows and a dense leaf litter giving them great ecological importance. Therefore the decline of *E. rudis* can not be ignored.

The condition of *E. rudis* along the Preston River, Donnybrook, has generated substantial concern within the local community, with the flooded gum leafminer *Perthida* sp thought to be responsible for canopy cover decline. A second insect thought to be in outbreak along the Preston River is a lerp insect or psyllid, *Creiis periculosa.* It has developing nymphal stages, which suck the phloem beneath lerps (sugary casings). Psyllid infestation causes leaf necrosis and premature leaf drop.

Gregarious gall beetles are also known to attack *E. rudis.* The adults are leaf chewing winged beetles whilst the larvae create large irregular stem galls which can cause senescence of entire branches.

As part of an honours project in the Botany Department at the University of Western Australia, I sought to identify variation in *E. rudis* canopy cover along the Preston River, how it may have changed with time and if there were any correlations with types of leaf damage, foliar quality, soil profile, soil nutrients and species richness. The study region was a 30km stretch of the Preston River, 234km south of Perth, beginning 7 kms upstream from the Donnybrook-Boyup Brook turnoff. Six sites were chosen for accessibility and with subjective measurements of crown cover, to represent the observable range of tree conditions at each site. Three sites were located downstream of the Glen Mervyn Dam and three sites upstream.

My conclusions were:

- % Canopy cover was found to differ significantly across sites, higher in plots upstream of the Glen Mervyn Dam.
- Leaf chew was correlated significantly with the change in canopy cover and lerp insects were in higher abundance on defoliated trees.
- The severely defoliated tree had lower % tannin content. Leaf N increased with defoliation in a glass house experiment.
- Soil P_i and the proportion of the vegetation was that exotic could be used as indicators of environmental disturbance.
- The Glen Mervyn Dam was found to be the distinguishing landuse practice between severely defoliated and less defoliated sites.
- An examination of tree rings and water – use efficiency revealed that tree health has declined over the last decade and rainfall did not seem to be a factor.

Further Research and Recommendations

Insect Monitoring. Since the principal type of leaf damage encountered was related to leaf chewing insects, it is necessary to identify the composition of this functional group to identify their predators and nutritional requirements in order to determine possible preventative or control

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measures. In this investigation psyllids were also found to infest the most severely defoliated site. However numbers recorded in this study are not as high as has been recorded for other *E. rudis* populations. It must be considered that leaf damage due to particular insect groups will depend on the time of the year and the results of this study may differ with the seasons (leaf necrosis due to psyllid infestation may increase later in the year).

Restoration of Preston River Riparian Ecology. Once predators of particular insect pests have been identified, the appropriate understorey shrubs should be replanted to encourage natural predators to return to help prevent insect outbreaks in the future. This study suggests that the Glen Mervyn Dam has had a negative impact on the health of *E. rudis*, whether this inference can be substantiated requires further investigation. Increased runoff into the river due to land clearing has led to a deepened river channel along with a faster flowing more erratic river flow. The river no longer floods out onto the old river flood plains. Drying out of the riparian zone may have led to tree stress and subsequent insect damage. Flood is an essential part of riparian ecology, for example redistribution of nutrients, control of insect pests and regeneration of vegetation. An experimental study into the effects of water regime on tree growth and foliar quality is suggested as a possible means to investigate the influence of catchment clearing and dam construction on riparian vegetation. There is also a multitude of other land use practices (chemicals etc.), which due to the brevity of this study were not examined for their possible contributions to tree stress. These practices would require further investigation. Due to the widespread nature of *E. rudis* dieback it is difficult to pinpoint any causal landuse practices, as not all instances of dieback are in the same situation. More broadscale environmental changes should be considered, such as length of the growing season, temperature fluctuations etc. It must also be remembered that insect outbreaks can simply spread from the initial point of occurrence.

Tree Resistance. In this study and elsewhere throughout the southwest, healthy trees can be found amongst defoliated trees so the possibility remains that trees with the ability to produce abundant anti-herbivore compounds or those with other resistance mechanisms may be identified and used for replanting. It is important to retain the genealogy of the different *E. rudis* populations, so one strategy may instead be to plant resistant clones amongst those susceptible in 'hot-spots' of tree stress so that insect outbreaks do not become so severe.

Comparative studies.

Investigations into *E. rudis* decline along other rivers or in other catchments may identify causal factors which could then be compared to the history of decline along the Preston River to obtain a greater understanding of the casual factors leading to tree stress and/or insect outbreaks. A concerted effort is certainly needed to address the widespread occurrence and severity of *E. rudis* dieback.

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