

Background on Monaro Dieback



Photo by L. van Dyke

Tree dieback across the Monaro is degrading the environment and economy of one of Australia's most treasured and iconic regions. The affected area spans more than 2000 km² (the size of the ACT, Ross and Brack 2015). Notably, almost all dead trees belong to one species, *Eucalyptus viminalis*, otherwise known as the Ribbon or Manna gum. These gums are favoured by koalas (Moore and Foley 2000) and honeyeater birds which rely heavily on 'manna', the sugary substance exuded from leaves following insect attack, for food (Paton 1980).

Eucalyptus weevils (*Gonipterus scutellatis*, Mapondera et al. 2012) also favour Ribbon gums. Most *E. viminalis* on the Monaro show signs of leaf damage by this and other native insects. Snow gums (*E. pauciflora*), Candlebark gums (*E. rubida*), and Black Sallee (*E. stellulata*) – the main companion species to *E. viminalis* in this region (Costin 1954) – are likewise chronically under weevil attack but are not dying. Thus insect damage, although capable of causing death in eucalypts of many species (Ohmart and Edwards 1991), does not fully explain Monaro dieback.

In the only scientific study on Monaro dieback to date, it was concluded that the long drought at the turn of the millennium led to levels of water stress which, coupled with defoliation by weevils, caused irreversible damage to mature Ribbon gums (Ross and Brack 2015). Water stress followed by insect attack is a common feature of dieback in other *Eucalyptus* species (Landsberg and Wylie 1988) of which there have been many since Australia was colonised by Europeans (Howitt 1891; Ellis 1964; Pook et al. 1966; Mackay et al. 1984; Ross and Brack 2015). This is thought to be because water stress leads to loss of foliage in the crown of the tree which, in turn, stimulates growth of new leaves that are more attractive to insects due to their higher nitrogen levels (White 1969; Landsberg and Wylie 1983). Insect populations then explode, leading to damage of even more trees and, through this positive feedback loop, widespread tree death.

An alternative view is that Monaro dieback is a consequence of the lack of regular 'cool burning' practised by Aborigines when the land was in their custody (Jurskis 2016). Fire burning practices are generally agreed to be essential to health of eucalypt forests which have evolved under this management system over many millennia (Gill 1975; Jurskis 2005; Jurskis 2016). Burning causes changes in the physical, chemical and biological properties of soils, including availability of nutrients such as nitrogen, carbon and phosphorous (Neary et al. 1999; Knicker 2007), and of fungal populations that associate with Eucalypts which can affect their growth (Malajczuk et al. 1982; Warcup 1991; Horton et al. 2013). Changes in farming practices following European settlement such as pasture improvement which elevates nitrogen and phosphorus, livestock grazing which affects soil aeration and moisture penetration, and removal of ground litter which affects soil organic matter and seedling survival, are also implicated in Eucalypt dieback. Interactions between these factors are complex, however, and thus difficult to assign as proximate causes of Monaro dieback.

A third hypothesis is that reductions in tree density due to land clearing for agriculture has left the Ribbon gum genetically isolated. Like most *Eucalyptus* species, *E. viminalis* likes to outcross (Griffin et al. 1988) thus maintaining high genetic diversity (Moran 1992). It is possible that trees remaining in fragments of native forest on the hilltops of the Monaro has forced higher rates of inbreeding than are healthy (Broadhurst et al. 2008), or even to lack of mating altogether. However, such an explanation would depend on the species' dispersal range (Young et al. 1996) and this is unknown for *E. viminalis*. Scenarios in which low biodiversity on the periphery of fragmented ecosystems leads to self-reinforcing 'extinction vortices' have been blamed for the wide-scale degradation of ecosystems across the length of the Great Dividing Range (Mackey et al. 2010).

Thus the aetiology of Monaro dieback is complex. Moreover, clues from the past challenge our modern view of its causes. For example, Howitt (1891) reports a large-scale dieback of *E. viminalis* in the Omeo region as far back as the 1860's, a time when the impact of agricultural clearing would have been low. This raises the

question as to whether dieback, especially in a species that is particularly vulnerable to water and insect stress, is part of a natural cycle of species flux within the Eucalyptus forests of Australia's environmentally harsh sub-alpine areas. A second lesson from the past that gives pause for thought is that, in the Monaro, dense stands of trees only became common when fire burning had stopped: under Aboriginal care, trees were much more sparsely distributed (Howitt 1891). Thus it may be that *E. viminalis* is suffering from over-forestation rather than under-forestation.

Whatever the cause, Monaro dieback is an urgent problem that seems likely to eliminate the Ribbon gum from the Monaro region within the next few decades. If this happens, the habitat of native birds, insects and animals that *E. viminalis* sustains will be destroyed and a key pillar of the Monaro's unique and valuable flora will be lost. The Upper Snowy Landcare Network is tackling this problem by taking a two-pronged approach that merges pragmatism with science. First, they are kick-starting the process of vegetation restoration in the worst-affected dieback areas, meanwhile collecting badly needed information on the most effective planting methods to do so. Their overall goal is to motivate large numbers of landholders to copy their example and thereby address the problem at a regional scale. Second, through a partnership with Greening Australia and CSIRO under a 10-year Bush Connect Grant, they are working closely with scientists to establish the best source of *E. viminalis* seedstock for replanting on the Monaro. By working with Southeast Local Land Services, Landcare, the Snowy Monaro Regional Council, community groups and researchers, Upper Snowy Landcare Network hopes to make significant inroads into reversing the unsettling phenomenon of Monaro dieback.

References

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