NSW SCIENTIFIC COMMITTEE

Notice of Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' as a KEY THREATENING PROCESS in Schedule 3 of the Act.

A copy of the Determination, which contains the reasons for the determination, may be obtained free of charge on the Internet www.environment.nsw.gov.au, by contacting the Scientific Committee Unit, PO Box 1967 Hurstville 1481. Tel: (02) 9585 6940 or Fax (02) 9585 6606, or in person at the Department of Environment and Climate Change Information Centre, Level 14, 59-61 Goulburn Street, Sydney. Copies of the determination may also be obtained from National Parks and Wildlife Service Area Offices and Visitor Centres, subject to availability.

Professor Lesley Hughes, Chairperson

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Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' as a KEY THREATENING PROCESS in Schedule 3 of the Act. Listing of key threatening processes is provided for by Part 2 of the Act.
The Scientific Committee has found that:

1. Extensive areas of eucalypt forests are increasingly affected by a form of tree canopy dieback that can be diagnosed by the presence of over-abundant populations of psyllid insects (*Glycaspis* spp.) often with over-abundant Bell Miner birds (*Manorina melanophrys*) (Wardell-Johnson *et al*. 2006). It is one expression of a range of dieback events in Australian eucalypt forests that may or may not have common underlying causes as yet poorly understood. The presence of psyllids and Bell Miners may be secondary and tertiary consequences of the syndrome, or they may contribute directly to the process of dieback.This form of dieback is particularly prevalent in north-eastern New South Wales, but also occurs south to Victoria. Dieback is initially expressed through leaf loss from the tips of twigs and branches, and can result in defoliation of whole trees and stands (Stone *et al.* 1995). It may include cycles of defoliation and regrowth, with fluctuating abundances of Bell Miners and psyllids, but if the causal factors persist it can lead to tree-death over extensive areas. Reproductive success of eucalypts in forests subjected to this form of dieback is typically low, and recruitment of new individuals tends to be poor due to reduced seed production and reduced seedling establishment as a consequence of weed invasion. In its most severe form, dieback results in the loss of forest structure.

2. The severity of this form of dieback varies across the forested area of NSW, although its extent has not been fully investigated. The forest types most susceptible to dieback are those dominated by Dunn's White Gum (*Eucalyptus dunnii*), Sydney Blue Gum (*E. saligna*), Flooded Gum (*E. grandis*), Grey Ironbark (*E. siderophloia*), Narrow-leaved White Mahogany (*E. acmenoides*), Grey Gum (*E. punctata)* and Grey Ironbark (*E. paniculata*) (Bell Miner Associated Dieback Working Group, 2004). Other eucalypt species such as *E. moluccana, Corymbia maculata* and *C. variegata* may be affected, usually after a substantial decline in the most susceptible species. Mapping of affected areas has been most intensive in the Kyogle region where helicopter surveys indicated that almost 20% of 100,000 ha of susceptible forest types were affected by dieback attributable to this cause (State Forests of NSW, 2004). Of the affected area, approximately one third (6511 ha) has been assessed as 'severe', with 'many dead trees, severe thinning of crowns, low stocking rate of susceptible species and greatly increased mesophyllic ground story vegetation including weeds such as lantana' (State Forests of NSW, 2004). It has been estimated that 2.5 million ha of forest in New South Wales has the potential to be affected (Wardell-Johnson *et al*. 2006).

3. Most of the information on the number and range of species that are threatened by 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' comes from the Kyogle area where 39 species of threatened fauna and nine species of threatened flora occur in forests experiencing canopy dieback (Morrison *in litt.* 2007). Many of these species are dependent on habitat structure provided by eucalypt forests. For example, loss of old canopy trees reduces habitat for gliders and possums which, in turn, reduces prey availability for large forest owls. Tree death and reduced eucalypt recruitment will eventually contribute to a shortage of tree hollows for hollow-dependent fauna. 'Loss of hollow-bearing trees' is listed as Key Threatening Process under the *Threatened Species Conservation Act* 1995.

Threatened species recorded within the dieback-affected area surrounding Kyogle include the following:

Animals
Coeranoscincus reticulates (Three-toed Snake-tooth Skink)
Hoplocephalus stephensii (Stephens' Banded Snake)
Mixophyes fleayi (Fleay's Barred Frog)
Calyptorhynchus lathami (Glossy Black-cockatoo)
Climacteris picumnus victoriae (Brown Treecreeper (eastern subsp.))
Coracina lineate (Barred Cuckoo-shrike)
Cyclopsitta diophthalma coxeni (Double-eyed Fig-Parrot)
Dasyornis brachypterus (Eastern Bristlebird)
Menura alberti (Albert's Lyrebird)
Monarcha leucotis (White-eared Monarch)
Ninox connivens (Barking Owl)
Ninox strenua (Powerful Owl)
Podargus ocellatus (Marbled Frogmouth)
Ptilinopus magnificus (Wompoo Fruit-dove)
Ptilinopus regina (Rose-crowned Fruit-dove)
Ptilinopus superbus (Superb Fruit-dove)
Turnix melanogaster (Black-breasted Button-quail)
Tyto novaehollandiae (Masked Owl)
Tyto tenebricosa (Sooty Owl)
Petaurus australis (Yellow-bellied Glider)
Petaurus norfolcensis (Squirrel Glider)
Phascolarctos cinereus (Koala)
Aepyprymnus rufescens (Rufous Bettong)
Macropus dorsalis (Black-striped Wallaby)
Potorous tridactylus (Long-nosed Potoroo)
Thylogale stigmatica (Red-legged Pademelon)
Planigale maculate (Common Planigale)
Phascogale tapoatafa (Brush-tailed Phascogale)
Pseudomys gracilicaudatus (Eastern Chestnut Mouse)
Pseudomys oralis (Hastings River Mouse)
Falsistrellus tasmaniensis (Eastern False Pipistrelle)
Kerivoula papuensis (Golden-tipped Bat)
Miniopterus australis (Little Bentwing-bat)
Miniopterus schreibersii (Eastern Bentwing-bat)
Myotis adversus (Large-footed Myotis)
Nyctophilus bifax (Eastern Long-eared Bat)
Pteropus poliocephalus (Grey-headed Flying-fox)
Scoteanax rueppellii (Greater Broad-nosed Bat)

Plants

Callitris baileyi (Bailey's Cypress Pine)
Clematis fawcettii (Northern Clematis)
Monotaxis macrophylla (Large-leafed Monotaxis)
Owenia cepiodora (Onion Cedar)
Plectranthus alloplectus (Narrow-leaved Plectranthus)
Rhynchosia acuminatissima (Pointed Trefoil)
Senna acclinis (Rainforest Cassia)
Sophora fraseri (Brush Sophora)
Wahlenbergia scopulicola (Rock-face Bluebell)

Threatened species from forests in other parts of NSW may also be adversely affected by this Key Threatening Process.

'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' is identified as a threat to White Gum Moist Forest in the NSW North Coast Bioregion which is listed as an Endangered Ecological Community under the *Threatened Species Conservation Act* 1995. It is considered to be a significant threat to remnants of the Blue Gum High Forest Ecological Community (C Stone *in litt.* 2006, A Jones *in litt.* 2007), which is listed as Critically Endangered under the *Threatened Species Conservation Act* 1995. It is also considered as a threat to Grey Box (*Eucalyptus moluccana*) Grey Gum (*Eucalyptus propinqua/Eucalyptus punctata*) wet sclerophyll forest in the NSW North Coast Bioregion.

In addition, the Regent Honeyeater (*Xanthomyza phrygia*) and Swift Parrot (*Lathamus discolour*) migrate to northern New South Wales in response to flowering of eucalypts such as Swamp Mahogany (*Eucalyptus robusta)*, White Box (*E. albens*), Grey Box (*E. moluccana*) and Spotted Gums (*Corymbia maculata*) and (*C*. *variegata*). These bird species, listed as Endangered under the Threatened Species Conservation Act, could potentially be affected by declining habitat quality associated with dieback (J Morrison *in litt.* 2007).

4. Broad-scale canopy dieback associated with psyllids and Bell Miners usually occurs in disturbed landscapes, and involves interactions between habitat fragmentation, logging, nutrient enrichment, altered fire regimes and weed-invasion (Wardell-Johnson *et al.* 2006). At present, no single cause explains this form of dieback, and it appears that 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' cannot be arrested by controlling a single factor. Over-abundant psyllid populations and Bell Miner colonies tend to be initiated in sites with high soil moisture and suitable tree species where tree canopy cover has been reduced by 35 – 65 % and which contain a dense understorey, often of *Lantana camara* (C Stone *in litt.*). Such conditions arise as a consequence of landscape-level disturbance of forest ecosystems. 'Invasion, establishment and spread of *Lantana* (*Lantana camara* L*. sens. lat*)' is listed as a Key Threatening Process under the *Threatened Species Conservation Act* 1995.

5. Changed soil nutrient availability from altered fire regimes and fertilisers, and environmental stresses such as drought and water-logging can result in increased amino acid concentrations in leaves, increasing foliar quality for psyllids (Wardell-Johnson *et al.* 2006), although this is not a necessary condition for over-abundant psyllid populations (Stone and Simpson 2006). It has also been argued that long-term nitrogen accumulation in soils creates a poor root environment for eucalypts that can have a direct impact on tree health and increase susceptibility to pathogens (Turner *et al*. in litt. January 2008). A reduction in the frequency of low-intensity fires is believed to be an important cause of accumulation of soil nitrogen (Jurskis 2005a,b; Turner *et al*. in litt. January 2008). Increased light intensity associated with canopy reduction promotes the growth of the expanding foliage preferred by psyllids as well as understorey growth which is also influenced by altered fire regimes. Increased understorey growth, particularly of the invasive weed *Lantana camara*, suppresses eucalypt regeneration and provides enhanced shelter and safer nest sites for Bell Miners. The combined effect of a rich food resource and abundant shelter provides circumstances in which Bell Miner populations can become over-abundant. The positive interaction between bell miners and psyllids results in a superabundance of both species. Habitat fragmentation may also limit the opportunities for Bell Miner colonies to shift to new areas before the stage at which trees are unable to recover (Loyn *et al.* 1983, Clarke and Schedvin, 1999), contributing to forest decline. However, there have also been recent reports of 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' occurring in apparently undisturbed environments (P Meek *in litt.*). These observations require further investigation.

6. Psyllids and Bell Miners are both native fauna that naturally occur in moderate abundance in localised areas. Psyllids are sap-sucking insects that secrete a sugary shield (lerp) which provides them with some degree of protection from small predators and parasites. Psyllids and their lerps provide a rich food resource for leaf-gleaning birds, particularly small insectivores and nectarivores, and form a substantial component of their diets (Woinarski *et al.* 1989). Bell Miners are large native honeyeaters that live colonially and breed cooperatively with groups sometimes consisting of over 200 individuals in an area of several hectares (Clarke and Schedvin 1999). Bell Miners also consume psyllids and their lerps, but they may 'farm' them, possibly selecting large lerps and preferentially feeding on the lerps rather than consuming the insect itself (Loyn *et al*. 1983). Evidence of selectively avoiding the psyllid itself is currently inconclusive (Poiani 1993), and could simply be because Bell Miners may be attracted to sites with high numbers of psyllids. Situations have also been documented in which bell miners have occupied a new site without a pre-existing psyllid infestation (Dare *et al.* 2007). Irrespective of the mechanism, psyllid abundances and Bell Miner abundances are positively correlated (Loyn 1995; Stone and Simpson 2006).

7. Bell Miners exhibit high levels of inter-specific aggression and are extremely effective at excluding other species of birds from their territories (Clarke and Schedvin, 1999). When released from predation pressure by small birds through aggressive exclusion by Bell Miners, psyllid populations are able to increase to the extent that they lead to substantial canopy damage (Stone and Simpson 2006). In natural situations, these outbreaks are small scale. Bell Miner colonies tend to be relatively small, and colonies tend to move when the canopy is heavily defoliated (Clarke and Schedvin 1999). Consequently, Bell Miners may not always be evident at locations affected by this Key Threatening Process.

8. Due to the complex interaction between factors that have been altered as a consequence of landscape-level disturbance, there is at present no obvious means of arresting the threat presented by 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners'. Moreover, expert opinion varies considerably as to which factors are causes of dieback and which factors are effects. Broad-scale research and adaptive management are required to understand how to best manage this threatening process, to prevent its expansion throughout forests of eastern New South Wales.

'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' is eligible to be listed as a Key Threatening Process as, in the opinion of the Scientific Committee:

(a) it adversely affects threatened species, populations or ecological communities, or
(b) could cause species, populations or ecological communities that are not threatened to become threatened.

Professor Lesley Hughes
Chairperson
Scientific Committee

Proposed Gazettal date: 31/10/08
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