

**The new Australia Felix –
ten key steps to conserving Australia's temperate eucalypt woodlands**

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Major Mitchell's 'Australia Felix' or 'Fortunate Land', Hans Heysen's majestic landscapes of red gums and merinos, Dorothea McKellar's land of sweeping plains. These typify Australia's temperate eucalypt woodlands, the open park-like country with scattered trees over productive grasslands, abundant wildflowers and low shrubs that offered the answer to early European Australia's search for grazing and cropping lands. But this very productivity has resulted in temperate eucalypt woodlands becoming some of the most threatened ecological communities in Australia. Few pristine woodlands remain. Clearing, fertilization, grazing and cultivation have led to dramatic losses of woodland biodiversity and to the collapse of ecological and hydrological processes, resulting in the decline of remnant trees, salinization, erosion and acidification of productive land, and widespread weed invasion.

The plight of this country is disheartening, but scientists, policy-makers and land managers are converging on a vision: putting the pieces back together to create healthy, vibrant and viable woodland landscapes and rural communities. The target for sustainability is 40% remnant and restored native vegetation, 30% perennial production systems and 30% annual or intensive cropping systems (McIntyre et al. 2002). Storehouses of woodland biodiversity still remain in some of the most unlikely places, such as old cemeteries set aside for never-to-be-realised towns, the iconic Travelling Stock Routes of the drought-stricken graziers and drovers, and water reserves capturing water from granite outcrops in the WA wheatbelt (Fig. 1). These 'jewels in the crown' of remaining woodlands can provide the building blocks for restoring the 40% native vegetation that many scientists believe would provide viable habitat for much of the woodland flora and fauna and heal landscape-scale problems such as salinity, erosion and fragmentation. Production systems based around deep-rooted perennial pastures or trees like the valuable native Sandalwood would add to sustainability of landscape processes and provide further resources for wildlife, while providing sustainable incomes for rural communities. Together, these restored landscapes will be more resilient to a changing climate.

Achieving this vision will not be easy: in this article we describe the ten most important things we believe are needed to work towards it, as summarized in Box 1.

Box 1. Summary of ten key steps to conserving temperate eucalypt woodlands.

1. Put a final end to woodland clearing.
2. Secure conservation of the historic travelling stock route network.
3. Protect the Great Western Woodlands.
4. Achieve 40% revegetation in selected landscapes NOW.
5. Restore functioning ecological communities instead of simply fencing stagnating remnants or planting lines of trees.
6. Support achievement of 30% perennial production systems through research and policy initiatives.
7. Achieve a representative set of diverse, weed-free woodlands.
8. Find better ways of dealing with the pervasive threat of feral predators.
9. Initiate or reinstate fire regimes that encourage woodland regeneration.
10. Coordinate and support the vision through a national system of management networks and stewardship schemes.

Put a final end to woodland clearing

It's sometimes hard to believe, but we are still clearing woodlands, pressing further and further into drier country. Not the least under threat are the iconic Coolibah woodlands – c.20% of these have been cleared since 1985 (Cox et al. 2001). Additionally, the collective woodland resource provided by the many scattered small remnants and paddock trees across cleared districts suffers ongoing 'death by a thousand cuts' through widening of roads, making way for irrigation systems, collection of firewood and so on

(Gibbons & Boak 2002). Progress has been made in the last decade, with many states introducing clearing controls and threatened ecological community legislation, but there's no excuse for any further loss. We must not continue the mistakes of the past; our first key step towards woodland conservation should be to ensure that large-scale clearing ends and small-scale clearing is minimized and adequately offset in all Australian states.

Secure conservation of the historic travelling stock route network

A great legacy of the droving days, the travelling stock route and reserve networks conserve considerable tracts of temperate eucalypt woodland that would otherwise have been cleared and ploughed. These state-managed public lands support a range of woodland plants, and are especially important for their grand woodland trees and the habitat corridors they create across landscapes (Prober & Thiele 2005). Woodland trees can take over a hundred years to develop the hollows needed to provide homes for declining woodland fauna such as the squirrel glider (Vesk et al. 2008). But times are changing and livestock are transported by truck in preference to walking these routes these days. Hence stock reserves and routes are threatened by sell-off and leasing for intensive production management. A second key step for woodlands would thus be to design and establish a new funding model to secure the conservation of the travelling stock route and reserve networks and maintain this rich resource.

Protect the Great Western Woodlands

The world's largest and most diverse example of temperate eucalypt woodland lies east of the Rabbit Proof Fence in Western Australia's south-west. Too dry for cropping, with

no readily-accessible underground water to support rangeland livestock grazing, these woodlands escaped early European impacts, but are now threatened by road construction, mining, logging and altered fire regimes, and require legislative protection (Watson et al. 2008). Not only are they the greatest surviving example of temperate eucalypt woodlands, these remote woodlands are an immense carbon store and provide a model for understanding how woodland ecosystems work at landscape scales, providing a unique resource for informing how we might restore and manage woodlands in degraded areas. This key step, protecting the Great Western Woodlands, provides a unique opportunity to invert the conservation paradigm – from one of conserving biodiversity within a landscape dominated by human use to one of allowing limited human disturbance within an intact conservation landscape.

Achieve 40% revegetation in selected landscapes NOW

Ecological evidence indicates that c.40% representative native vegetation cover is desirable for maintaining biodiversity and supporting healthy woodland landscapes (McIntyre et al. 2002; Radford et al. 2005). While it is a long road to achieving this across all woodland landscapes, an important step towards this goal would be to achieve it in selected landscapes, now. There is a variety of innovative funding models to facilitate this process. These include the increasingly ambitious goals of Natural Resource Management councils; the purchase and conservation management of woodland properties by philanthropic organizations; and capitalizing on the carbon storage values of revegetation through carbon credit schemes. A revolving fund proposed by Greening Australia to purchase, transform and on-sell groups of farms as sustainable conservation-

production systems also provides a potential new mechanism for achieving transformation of degraded woodland landscapes. Additionally, a new era of broad-scale revegetation programs, linking biodiversity across regions, has already begun. These programs, such as *Gondwanalink* in Western Australia, aim to help native plants and animals adapt to a changing climate. Integration of these efforts with catchment scale 40:30:30 targets will enhance the likelihood of lasting outcomes for woodland biodiversity under climate change.

Restore functioning ecological communities

In our efforts to reach our target of 40% native vegetation, more creative approaches are needed to achieve the restoration of diverse ecological communities that support key natural processes such as regeneration and nutrient cycling and are likely to be more resilient to climate change. Putting a fence around a degraded woodland remnant or planting lines of trees can provide some conservation outcomes (Spooner & Briggs 2008), but in many cases more substantial intervention is needed (Vesk & McNally 2006). This can include altering soil conditions, providing fallen timber for fauna habitat, dealing with weeds and reintroducing species no longer present in the seed store (Yates & Hobbs 2000; Prober & Thiele 2005; Vesk & McNally 2006; Standish et al. 2008). This does not mean that all revegetation needs to restore all woodland plants and animals, rather some intensive revegetation and restoration efforts might target high native plant diversity, others high habitat quality for woodland birds, with other areas of simpler revegetation targeting restoration of landscape processes and connectivity. Some of these

we already know how to achieve, others require further scientific and technological advances.

Support achievement of 30% perennial production systems

Many wheatbelt farms that once supported woodlands are now planted almost entirely to shallow-rooted annual crops and pastures. The absence of deep-rooted perennials has led to widespread soil erosion, and caused saline groundwater to rise, killing native vegetation, crops and pastures alike. To maintain ecological processes at the landscape scale, an upper limit of 30% intensive annual landuses is commonly recommended (McIntyre et al. 2002). To fill the gap between 30% annual crops and 40% native vegetation, new policy and research initiatives are needed to promote 30% perennial production systems in degraded woodland landscapes. Not only will these support landscape processes, they can augment resources for native species, and help restore viable farm incomes. A wide range of perennial production options is available, including forage shrubs, oil mallees, sandalwood, tree crops and plantation forestry. In addition, carbon sequestration is likely to become an important management goal that will drive increases in woody perennial systems. Some woodland regions already support large areas of perennial native pasture and scattered woodland trees, and maintaining these under low intensity grazing and minimal fertilization will similarly promote woodland biodiversity and help achieve the 30% target (Dorrough et al. 2006).

Achieve a representative set of diverse, weed-free woodlands

Invasion by exotic plant species poses one of the greatest threats to temperate eucalypt woodlands (ASEC 2001). Weeds that have invaded woodland ecosystems are an ongoing and difficult challenge. However, our understanding of conditions that promote their persistence and spread is increasing (e.g. Prober & Lunt 2008). We cannot expect to control all weeds in all woodlands, but an important step for woodlands would be to limit their spread and achieve representative sets of weed-free woodlands. In addition we need to avoid the introduction of new invasive species. For example, in our search for new perennial production systems, indigenous species should be utilized in preference to exotics.

Find better ways of dealing with the pervasive threat of feral predators

Many native marsupials that once roamed temperate eucalypt woodlands, such as numbats, bettongs and woylies, have been predated to near-extinction by foxes and cats. (Lunt & Bennett 2000). Some species now survive only in purpose-built exclosures or on offshore islands. Loss of these species has probably impacted dramatically on woodland ecosystem processes; for example many played an important role in soil processes through their habit of digging for food (Martin 2003). Targeted use of toxic baits for fox control has allowed populations of native marsupials to increase greatly in parts of southwestern Australia; however, population numbers have recently declined again, possibly due to disease and/or cat predation. Clearly there is an ongoing need to find better ways of dealing with the pervasive threat of feral predators to conserve woodland fauna and re-establish associated ecosystem processes.

Initiate or reinstate fire regimes that encourage woodland regeneration

Compared with other vegetation types in Australia, relatively little is known about impacts of fire in many temperate woodlands (Hobbs 2002). While it is recognized that fire and other types of disturbance are needed to promote regeneration and plant diversity in some woodlands (e.g. Knox & Clarke 2006), few woodland remnants are actively managed using fire. On the other hand, fire in fragmented and degraded woodlands may also cause weed invasion and further degradation (Standish et al. 2008). Another important step for woodland conservation is thus the reinstatement of effective fire management, through an integrated approach that considers not only historical fire regimes but also accounts for other factors that may now prevent woodland regeneration and restoration. Targeted studies in intact woodlands such as the Great Western Woodlands, as well as in degraded woodland remnants, are needed to inform these decisions.

Coordinate and support the vision at the national level

Finally, we emphasize that making a real difference in temperate eucalypt woodlands will only be achieved through coordination and support of individual efforts. Every woodland remnant and every on-ground action to restore woodland landscapes contributes to the 40:30:30 vision. Some new 'off-reserve' conservation models, such as Conservation Management Networks, Natural Resource Management councils and the box-gum woodland stewardship program, have already been established to help coordinate and support the plethora of on-ground actions being undertaken. These programs require ongoing development and integration, to support landholders at the local level and ensure

we achieve the best possible outcomes from the collective effort at bioregional and national scales (e.g. Fitzsimons & Wescott 2005).

Conclusions

Prevention is better, and much cheaper, than cure. The first three steps we have recommended for conservation of temperate eucalypt woodlands are about avoiding further damage. Not only are these the most cost-effective options, they also offer outcomes that may be otherwise unattainable. Their implementation simply requires policy will. No matter how well we do, revegetation and restoration efforts will rarely achieve the integrity, diversity and condition of the best undisturbed woodlands, so conservation of remaining woodlands must be given the highest priority.

Six steps focus on repair and restoration of sites and landscapes. Revegetation of 40% of the landscape is a mammoth task, but 20 years of effort through Landcare, Greening Australia and the Natural Heritage Trust has already begun to make a difference. This task requires considerable advancements in knowledge and methodology to achieve restoration of self-sustaining, diverse woodland communities. Ongoing efforts would thus benefit from a learn-by-doing approach with appropriate scientific input. As well, the considerable adjustment required in rural communities and farming systems means that achieving the 40:30:30 goal is a long-term view. Dealing with feral animals and weeds too, are difficult tasks that will not be completely solved without novel technologies. We

can be heartened by some existing successes though, such as improved rabbit control through calici-virus and effective fox control programs in Western Australia.

While an enormous task remains ahead, we are optimistic that the outlook for woodlands in 20 years can be better than it is today. The final step we have recommended helps us to pick up the pieces of the woodland puzzle, and place them into a framework that ensures optimal landscape configurations for habitat connectivity, adequate representation of all aspects of woodland biodiversity, due consideration of climate change issues and support to the many individual land managers involved, be they farmers, park rangers, local council workers or the like. Progress has already been made in the past two decades towards many of the steps we have described. Achieving them will bring us a long way towards the new Australia Felix.

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Figure 1: A diverse remnant of York Gum (*Eucalyptus loxophleba*) woodland in the Western Australian wheatbelt. Typical of other important remnants in this region, the remnant escaped clearing and cultivation because it was set aside as a water reserve early in the history of settlement.



(Alternative Figure 1: The Great Western Woodlands forms the largest remaining tract of temperate eucalypt woodland, occurring as a mosaic with heathland and mallee over an area of 16 million hectares.)

