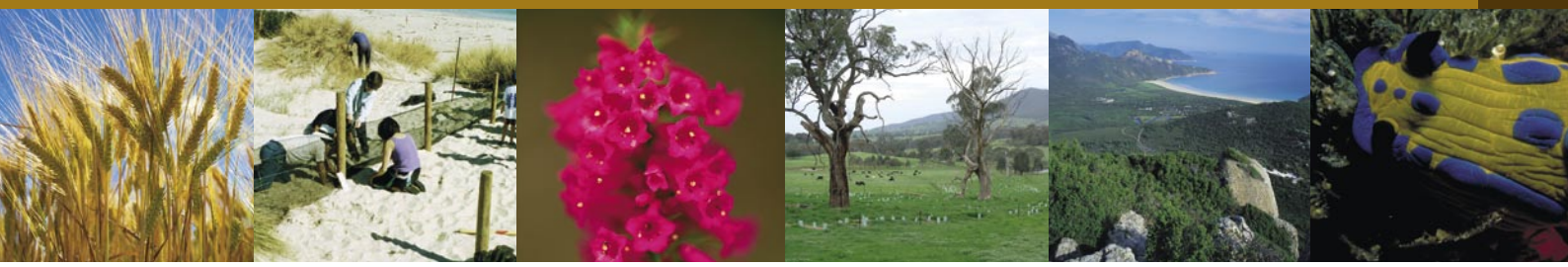


Improving ecological connectivity

This paper discusses the concept of ecological connectivity and biolink zones. Many submissions to the Consultation Paper identified the need to improve connectivity in the Victorian landscape.

The theory of connectivity conservation focuses on interventions that protect, restore and reconnect fundamental ecosystem processes across landscapes. The approach recognises that ecosystems are functionally connected and that land and water use decisions will affect broader ecosystem function in different ways depending on the type and scale of intervention, its location in the landscape, its timing and the rate at which the ecosystem responds. A strategic connectivity conservation approach to inform land and water use decisions provides an opportunity to more effectively increase the capacity of a landscape to protect biodiversity and build resilience against current and future threats.

Increased connectivity can be achieved by building a network of biolink zones incorporating existing habitats or refuges, which are linked and buffered across different land tenures in ways that maintain and improve ecosystem processes. Parks and reserves have an important role in protecting biodiversity and ecosystem services, and can form the cores of these biolink zones. Improved protection and management of remnant patches on other public and private land will also play an important part.

Biolink zones differ from traditional 'wildlife corridors' in that they incorporate a range of activities seeking to maintain and improve broader ecosystem function and resilience and are thus an important adaptation response to climate change. A biolink zone can be visualised as a 'green' and 'gold' matrix of productivity and conservation values across the landscape where connectivity between different land uses is recognised and understood. This was envisioned by the Victorian Catchment Management Council in its Catchment Condition Report 2002 and again in 2007.

Biolink zones can also link small-scale local actions to larger-scale landscape processes. Protecting, enhancing or restoring a natural asset is important in itself and these actions can also contribute to broader landscape-scale outcomes such as improved connectivity or a more resilient ecosystem.

Suggested approach

The Green Paper proposes that a biolinks strategy is developed for Victoria which identifies potential biolink zones. Areas the Green Paper identifies to focus effort in the short term to improve connectivity are:

- improve riparian vegetation as a priority, which will achieve the multiple benefits of improving river health and water quality while contributing to ecological connectivity
- identify and map areas where the natural resilience of ecosystems remains viable and concentrate regeneration efforts in these areas
- work with local government on transport corridor management issues, including identifying opportunities for using roadsides and disused licenced roads to improve connectivity
- review urban development patterns as part of the four yearly review of local government Council Plans and Municipal Strategic Statements to identify the need for strategic planning responses to better integrate opportunities for species migration.

Discussion

Large-scale land restoration projects, which can include reconnecting habitats in fragmented landscapes, are underway around the world to reverse the decline in biodiversity and to respond to the additional pressure of climate change.

High profile 'landscape link' projects underway in Australia include the Gondwanalink across Western Australia, Nature Links in South Australia, Habitat 141 in western Victoria and the Alps to Atherton project in eastern Australia. In the US, the Yellowstone to Yosemite Conservation Initiative has been working to maintain mountain ecosystems in north-west America and south-west Canada.

Community-based groups like Conservation Management Networks and Landcare Networks are major players in implementing these projects, as they increasingly take a landscape scale perspective and participate in restoration efforts at that scale.

No single approach to connectivity will accommodate all Victorian species. Our significant and diverse biodiversity means different actions will benefit different species. Instead, the adopted biolink approach needs to consider the functional characteristics of ecosystems and different land uses to inform interventions in the landscape (see Figure 1).

Figure 1: Functional considerations for biodiversity conservation interventions in the landscape

The following diagram illustrates the range of factors that influence how species experience the landscape. The characteristics of remnants provide both opportunities and risks for individual plants and animals, and these interact with the characteristics of the landscape to influence the vigour of populations and ultimately the conservation of species. These interactions occur within a current land use and climate envelope and changes to either or both of these in the future can impact on all of these factors and the relative risks, trends and opportunities need to be considered from each perspective when identifying options for improved connectivity.

Improving connectivity does not mean revegetating large-scale "corridors" of land, although this could be an aim for some areas of Victoria over the longer term. Initially, providing better managed 'stepping stones' such as existing remnants in the landscape can improve connectivity (which will help some bird species) or protecting and rehabilitating important habitat areas such as the banks of rivers and streams (for aquatic and terrestrial biodiversity). Further, enlargement of these "stepping stones" through restoration, buffering and connection of these to similar or different habitat types would provide a diversity of habitat across the landscape, promoting recolonisation and movement of biota and the space to self adjust to climate change.

Identifying a biolink zone approach could provide a strategic framework to unify many activities that currently operate independently of each other. In some cases, we don't necessarily need to do new things. Instead, on-ground work needs to be approached more strategically and informed by the best available science to quantify the relative benefit (or dis-benefit) of these proposed works on overall ecosystem function. This will ensure that an action in one area (such as replanting) isn't undermined by lack of action (such as pest management) in a related area.

Many existing actions, cumulatively, can improve the resilience of ecosystems and support the construction of biolink zones. Examples include:

- managing, protecting and rehabilitating important habitats, such as riparian areas, roadsides and areas on private land that provide important ecological connections, such as stepping stones, corridors and stop-overs
- improving links between small, fragmented areas such as patches of remnant vegetation
- improving links between large, protected areas
- improving connections within landscapes such as coastal hinterland and estuaries
- restoring connections between wetlands, floodplains and rivers and streams and protecting and restoring hydro-ecological systems
- removing threats and providing protection for threatened species habitat and populations
- buffering protected areas and ecologically-connecting isolated reserves and habitat
- coordinating weed and pest animal control across land tenures
- planning at ecological and evolutionary scales (spatial and temporal), such as that occurring in the Alps-to-Atherton project but connecting this to 'real-world' decision-making which typically occurs at a much smaller scales (eg. paddocks, parts of reserves) and progressively over time.

There is good potential for natural regeneration in areas of native pasture[1], and as agricultural landscapes evolve and change we need to identify opportunities for better integrating conservation as a land use with production.

Characteristics of the remnant patches

type, size, shape, configuration of remnant vegetation

measures of current vegetation condition or habitat suitability for different species

incoming threats: biological (e.g. pest plants & animals) and physical (e.g. salinity, exposure)

competitive dynamics between individuals and species with respect to opportunities to occupy habitats and reproduce successfully

Characteristics of the landscape

permeability of the landscape - how well can different species use and/or move through the matrix?

re-establishment potential - given the land use history & prevailing condition, what changes are feasible?

re-establishment options: a enlarge existing patch

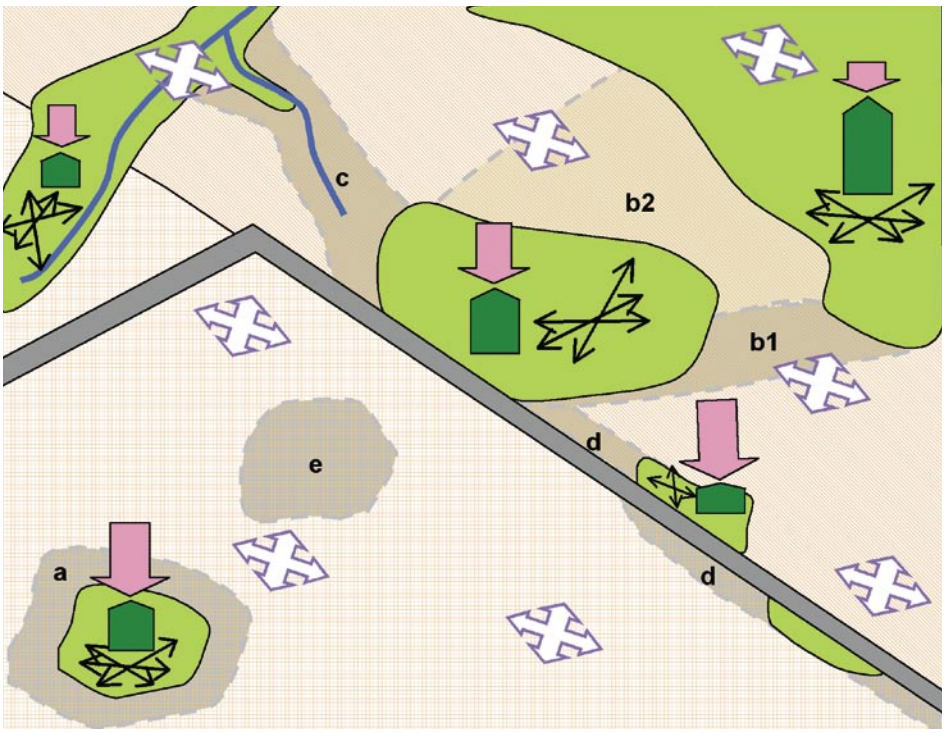
b1 strong connection between similar types

b2 weaker connection between similar types

c connection to a different type of habitat

d connection via public road reserve

e new 'stepping stone'



1. Dorrough, J. and Moxham, C. (2005) *Eucalypt establishment in agricultural landscapes and implications for landscape-scale restoration*. Biological Conservation, Volume 123, Issue 1, pp 55-66

Future directions on biolink zones should be guided by:

The best available science – a dynamic strategy enables the best available science to be incorporated and applied as it becomes available. Models can help deal with uncertainty and inform decision-making.

High priority natural assets and risk management – estimates of climate change and the impacts on biodiversity and ecosystems in Victoria are uncertain. A resilient landscape requires identification of high priority assets and important ecological processes, and the management of threats to these assets and the ecosystem services they provide.

Systematic decision-making – a 50-year biolink strategy means intervention decisions will be progressively made. Applying the best available science to understand the benefits of these decisions as well as understanding landholder values, aspirations and the costs of intervention will inform which actions and opportunities are best and when they should occur.

Protect, enhance, restore – protecting existing habitat and improving its management is generally less expensive than re-establishing habitats and provides more certain outcomes. In many cases, facilitating natural regeneration by removing threats may be a better approach than active revegetation. Large intact areas, such as tracts of public land, are more likely to be in better condition, so managing these areas to reduce the impact of current and future threats and then buffering and reconnecting these areas to other important habitat across public and private land is a priority.

Value for money – highly degraded landscapes can be considered as part of a biolink zone but value-for-money must be factored in. Models can help determine the quality of habitat and resilience and identify areas with little chance of recovery to ensure targeted investment to areas where greatest potential of success exists. Public investment decisions need to based on the ecosystem outcomes being achieved and the cost of undertaking the required action. As with any investment decisions, the benefits of investing in a particular area should outweigh the costs.

Synergies and trade-offs – the synergies or trade-offs of different intervention options need to be made explicit so the community is clear on the consequences of decisions. Where possible, interventions should achieve multiple environmental benefits, such as improved water quality, habitat and carbon sequestration, and avoid negatives consequences such as excessive water consumption.

Community engagement – active participation of people can make a big difference to community understanding of the role of biolinks in achieving biodiversity outcomes, and should be considered at the earliest stages of planning.

Connection to regional strategies and the planning system – biolink zones should be linked to regional strategies as well as the strategic planning system so our institutions can align their activities and work more collaboratively.

While it may be physically possible to reconnect the landscape, the decision about the extent to which it occurs is a social one. As a community, we need to decide our objectives and how change should occur as well as the private and public resources we want to dedicate to achieving them.

Restoring the land and improving connectivity does not mean eliminating agriculture from landscapes. Sustainable, productive farms are an integral part of Victoria. There are many ways farmers can help minimise the barriers to ecosystem connectivity that human settlement and land use have created. This can allow ecosystems and species to respond to climate and environmental change, and give species the opportunity adapt.

Creating biolink zones requires work at a landscape scale as well as a local scale. It means using metrics to identify the best value-for-money activity at a point in time, and working across a 50-year time period. Priority assets need identifying and investment targeted to them while flexibility is retained that recognises all biodiversity gains are a positive and that public investment decisions will be informed by public benefit/cost.

Working at multiple scales and across multiple objectives means we will not 'put all our eggs in the one basket' and all Victoria's native species will have the best chance of adapting to climate change.

Improving connectivity in the landscape is a long-term endeavour. It requires taking advantage of opportunities when they arise and ensuring appropriate incentives for environmental outcomes including conservation are available.

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