



NATIVE VEGETATION AND BIODIVERSITY R&D PROGRAM

Science for managing native vegetation in Australian landscapes

Australians receive great value from the ecosystem services of natural systems and their varied fauna and flora, and these systems underpin much of our economic activity including agriculture and tourism. Many of the ecosystem services, such as provision of clean water and air, pollination of crops, mitigation of environmental hazards, and pest and disease control are either unvalued or undervalued.

The management of native vegetation and biodiversity continues to be a priority issue for R&D investment by Land & Water Australia because of the critical role of vegetation in:

- providing ecosystem services
- improving landscape function
- enhancing production, and
- mitigating climate change through carbon sequestration.



A major challenge for Australia is to find more efficient and effective ways to achieve our desired production and environmental outcomes so that they maximise the benefits and opportunities, and minimise the costs, for farmers, land managers and the broader community. The Native Vegetation and Biodiversity R&D Program is making an important contribution to this quest.

The program is jointly funded and managed by Land & Water Australia and CSIRO and receives advice from a collaborative partnership between a wide range of agencies with interest in native vegetation and biodiversity management.

This R&D investment is directed at informing governments at all levels and providing tools, technologies and practices to resource managers and landowners to enhance landscape health and productivity. It will do this by addressing knowledge gaps in vegetation and biodiversity issues in both the intensive and extensive landscapes of Australia.

The program is organised around six themes which have a strong focus on improved knowledge generation, application and adoption. Of these six themes, themes 1, 2 and 4 have research projects.

R&D themes

1. Understanding landscape processes and ecosystem services

- studying how landscapes work and how they generate value,
- managing landscapes and biodiversity to maintain or improve their capacity to deliver ecosystem services.

2. Managing risks and threatening processes

- identifying risks to a landscape's capacity to deliver ecosystem services and conserve biodiversity,
- identifying options to manage these risks in the most cost-effective manner.

3. Understanding ecosystem processes, condition and dynamics.

4. Informing policy and management

- informing policy using improved knowledge and understanding of both ecological systems and socio-economic drivers,
- developing landscape design and management principles to improve regional planning,
- improving the understanding and practice of landscape restoration for greater efficiency and effectiveness.

5. Enhancing national R&D capacity in native vegetation, ecosystem services and biodiversity management.

6. Effective communication and adoption.



Partners in vegetation management

Land & Water Australia has formed a partnership with a number of leading NRM organisations to better coordinate information and knowledge exchange across the spectrum of vegetation management issues. The partners include CSIRO, the Joint Venture Agroforestry Program, the Bureau of Rural Sciences, the Australian Master TreeGrower Program and Greening Australia. You can find out more about this partnership and access a range of other information about vegetation management through the **Exchange web portal** at www.greeningaustralia.org.au



or through the program website at www.lwa.gov.au/nativevegetation

Research project summaries

ABH2: Linking biodiversity benefits to management actions on conservation reserves

This project will develop a formal system for evaluating and documenting the biodiversity benefits resulting from management actions on land within the private nature conservation sector. Six Australian Bush Heritage reserves will provide research sites to test and develop appropriate indicators of biodiversity trend and to relate these to on-ground management actions. The project will also develop a tool for assessing and reporting the effectiveness of investments in biodiversity conservation. Availability and use of such reporting tools will help increase investor confidence across all nature conservation sectors.

UME73: Working with farmers to manage and restore native vegetation for ecosystem services, conservation and profit

This project will work with regional NRM and farmer groups in selected regions to exchange information, experience and ideas for better integration of native vegetation management into overall property management. It will model its approach on the successful Australian Master TreeGrower Program which has mainly focussed, to date, on integration of commercial tree production into farm systems. The project will highlight the benefits and services from native vegetation in agricultural landscapes, assist farmers to plan and implement native vegetation management, and encourage development and testing of management options.



Research project summaries

TRC14: Defining successional patterns and biodiversity values of Top End eucalypt forests

This project will improve the management of open eucalypt forests in the Top End of northern Australia by describing their conservation values in relation to forest age and history. It will describe the biodiversity values of "mature" eucalypt forests, with specific reference to hollow formation and other attributes that may be useful in definition of "old-growth", and measure the relationship between biodiversity value and age of regrowth. The latter will inform the process for assessing applications to clear regrowth, while the former will show whether "old-growth" is a useful categorisation for these tropical eucalypt forests, whether it can be operationally defined, and whether this can then assist clearing assessments and other management strategies.

TRC6: Working with indigenous communities to manage fire in tropical woodlands for improved ecological, economic and social outcomes

This project will build on recent success in engaging with indigenous communities to improve fire management of northern Australian tropical woodlands through payment for environmental services (carbon offsets). It will identify the most effective ways to engage with aboriginal communities, reduce uncertainty about the influence of fire management on greenhouse gas emissions and carbon sink strength (especially at regional scales), improve cost-effectiveness of aerial ignition, and provide assessments of fuel curing at large scales. Models and decision tools will inform fire management planning and operations by predicting fire spread and landscape impacts.

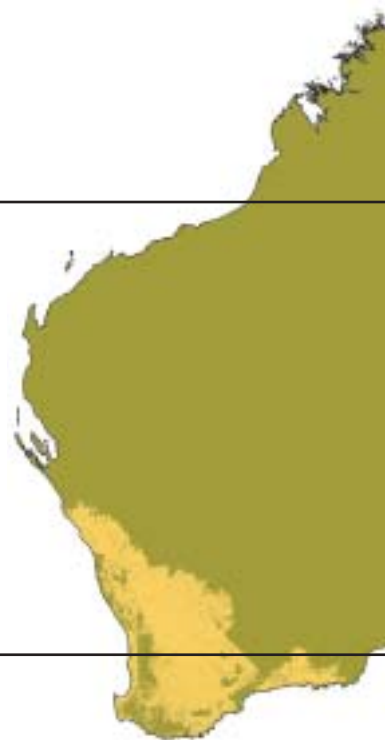


TRC7: Designing agricultural landscapes in the monsoon tropics to maintain biodiversity and ecosystem services

This project will improve understanding of relationships between vegetation pattern and quality of ecosystem services in the Daly River region. Initially, the project will take advantage of existing regional variation in patterns of land clearing and ages of remnants to determine likely responses to further clearing in new locations. Insights from this stage will be used to design new approaches to land clearing that show promise for maintaining ecosystem function while also meeting the production needs of landowners. Subsequent changes in biodiversity and vegetation condition within both the designed and pre-existing landscape configurations will be monitored. The project will inform an adaptive management framework established by government and regional landholders to direct development in the region.

CSE44: Assessing biodiversity outcomes from waterpoint management in the arid rangelands

This project will define the desired outcomes for landscape condition from waterpoint management in arid rangelands, and identify the appropriate measures for assessing these outcomes, from field studies on cattle properties in the stony plains country of South Australia. Here, a permit system for waterpoints trades off livestock grazing and biodiversity conservation and there is understandable pressure to show that waterpoint intervention is having the desired community benefits. The influence of regulated waterpoint management on soil condition, soil seedbanks, biodiversity and total grazing pressure will be assessed in the study, which will also employ analysis of real-time satellite imagery. The study will therefore deal with the reality of assessing short-term impacts of waterpoint management on biodiversity in an arid environment, and derive recommendations on how government agencies can best assess future waterpoint management.

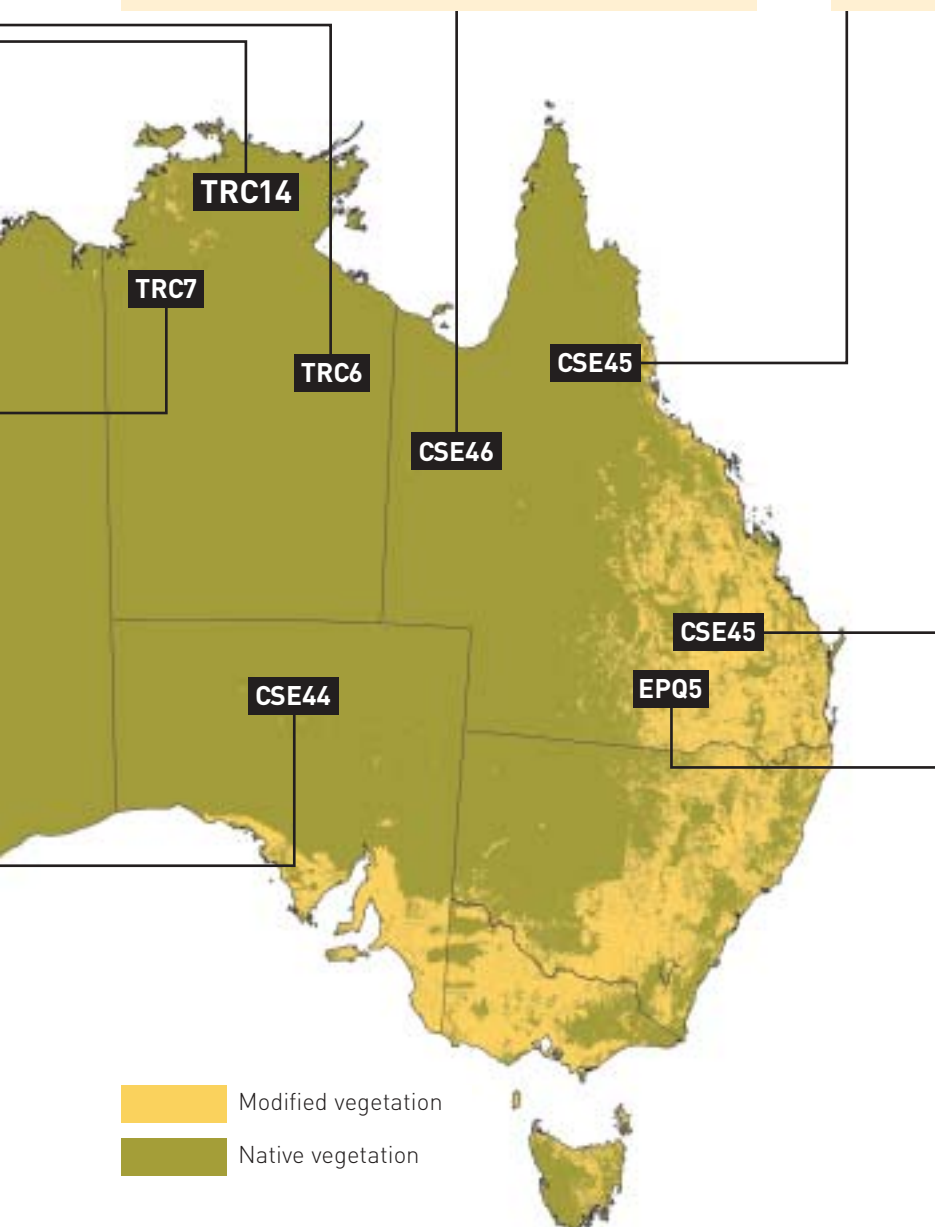


CSE46: Using spatial variation in climate and vegetation growth to improve rangeland management

This project will develop analytical tools to assist cattle producers in northern Australia decide where additional grazing properties or sources of agistment might be best located to help minimise the impacts of climate variability. This will help avoid some of the current problems associated with declining native vegetation condition during drought. It will quantify patterns in rainfall and forage growth that are not coincident in time or rate (i.e., patterns of 'asynchronicity') within and across regions, using time series satellite data. Results will be mapped on a GIS decision tool to help locate temporal patterns of resource asynchronicity that could benefit a pastoral enterprise.

CSE45: Achieving coordinated landscape scale outcomes with auction mechanisms

This project will apply recent advances in auction theory to develop principles for auction design that are capable of delivering efficient, coordinated outcomes across landscapes. While the need for more coordinated management at the landscape scale is widely acknowledged, existing market-based instruments and other policy mechanisms do not achieve the necessary level of engagement and coordination of actions amongst landholders. The project will further develop 'combinatorial' auction mechanisms, identify auction design principles that maximise landholder participation, and produce software that simulates the auction environment for hands-on learning.



USQ12: Understanding factors affecting bird diversity in sub-tropical woodlands

This project will increase understanding of bird ecology in subtropical woodlands of central Queensland through studies of adjacent areas under management for either conservation or grazing. It will determine the interactions among fire history, grazing history and habitat structure for abundance of both small passerine bird assemblages and an aggressive avian competitor, the noisy miner. Emphasis will be given to impacts on threatened and declining bird species, especially granivores and ground-foragers. This will help develop land management guidelines for conservation areas and grazing properties within the brigalow belt bioregion of Queensland.

EPQ5: Measuring the biodiversity values and ecosystem services of regrowth vegetation in modified landscapes

This project will quantify the role of regrowth vegetation in maintaining biodiversity values, soil condition, ecological processes and net primary production of landscapes in mulga woodlands of western Queensland. In these landscapes regrowth can provide a cost-effective solution to targeted revegetation, but information on the functionality of different ages and areas of regrowth is lacking. The results will inform policy, planning and management of these ecosystems, especially with respect to restoring habitat, mitigating salinity risk, and improving soil condition.

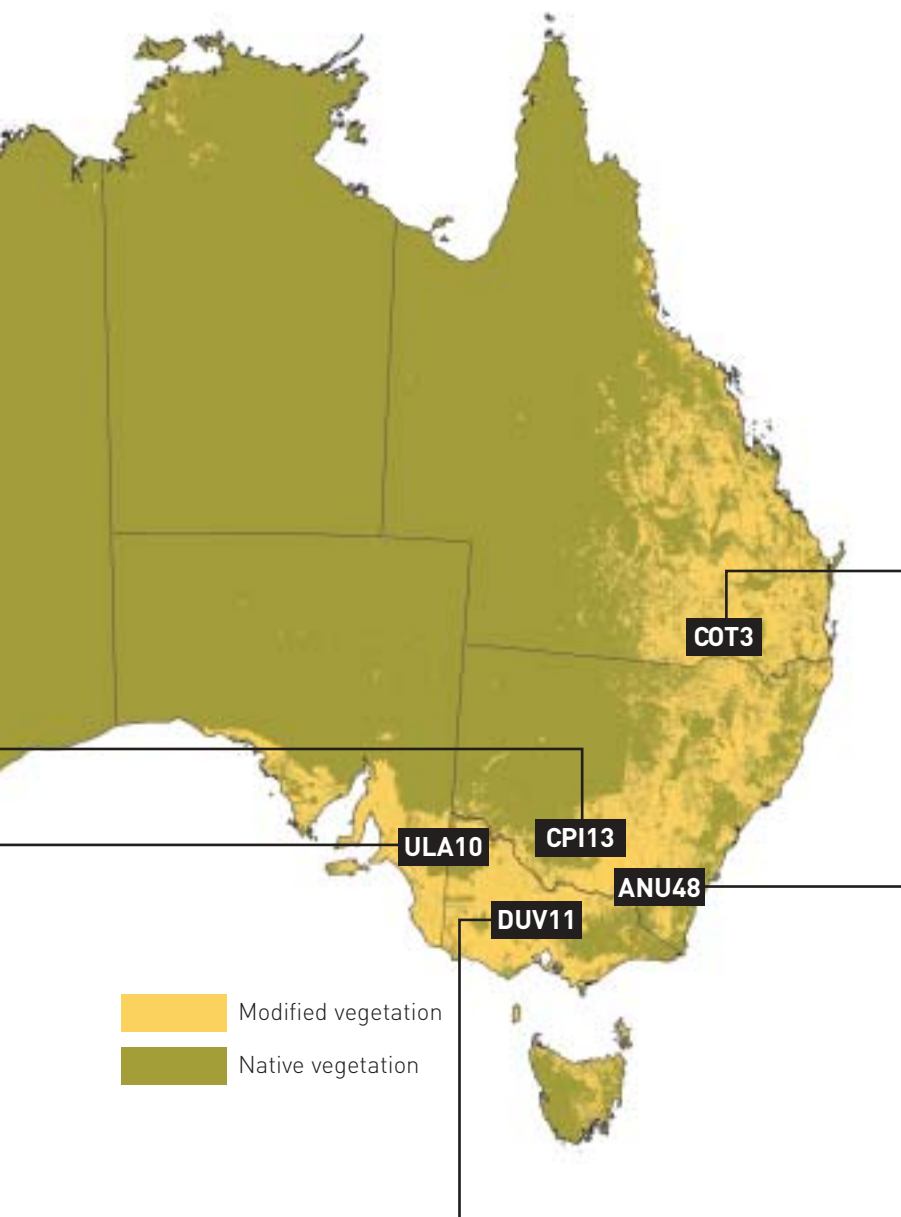


CPI13: Understanding genetic constraints to vegetation persistence in fragmented landscapes

This project will improve understanding of the genetic and demographic constraints to persistence of plant populations in remnant vegetation patches through field studies in two environments: the mallee woodland of central-west New South Wales and the kwongan heathlands and shrublands of south-west Western Australia. It will assess the importance of gene flow and seed dispersal among populations for determining local species persistence, and how this is affected by landscape configuration. This will permit development of “landscape leverage” maps that quantify the influence of different patches on local ecological and genetic dynamics which, in turn, will assist landscape design.

ULA10: Determining appropriate fire mosaics for biodiversity conservation in mallee ecosystems

This project will identify the fire mosaics that improve persistence and status of flora and fauna in the eucalypt mallee habitats of the semi-arid Murray Mallee region of south-eastern Australia. Fire is a major natural process that shapes mallee ecosystems. While there is consensus that conservation is best achieved by managing landscapes to maintain ‘fire mosaics’, there is little knowledge of which mosaics are best. The project will study the response of a broad range of taxonomic groups to various fire regimes using an innovative, landscape-level approach at sites across three states (VIC, SA, NSW). A GIS modelling tool will incorporate project findings for the benefit of future fire planning by land management agencies in each state.



COT3: Capturing the pest control services of native vegetation

This project will quantify the benefit of native vegetation remnants for pest control in cotton and grain systems in southern Queensland. It will help answer frequently asked questions by farmers: why should I maintain or create areas of native vegetation, how can it benefit me, how do I know it will not add to pest problems? Field studies will improve understanding of the contribution that native vegetation makes to populations of both beneficial insects and pest insects, show whether a high native remnant: arable land ratio results in greater pest suppression, and reveal the spatial scales at which remnant areas contribute to pest control.

ANU48: Harvesting general principles from research to improve the effectiveness and uptake of conservation strategies and actions

This project will apply new methods of data analysis and synthesis of information to identify general patterns of biodiversity response across a range of studies including five landscape experiments, established for up to 23 years, in south-east Australia. Data on bird, reptile and mammal abundance from forest, woodland, and heathland sites will test general theories underpinning conservation strategies including: (1) the importance of vegetation structure as a surrogate for species richness, (2) the impact of disturbance on species richness, (3) functional redundancy, (4) the utility of species-abundance curves, and (5) concepts of connectivity and heterogeneity. Outputs will underpin more effective landscape design and the associated investment in conservation of biodiversity.

DUV11: Improving landscape design guidelines by considering temporal trends in species richness and population sizes

This project will improve knowledge about the levels of native vegetation cover required to sustain biodiversity in farming landscapes by accounting for temporal trends in species populations. It will build on earlier field work in northern Victoria that took a 'snapshot' of faunal biodiversity in contrasting landscapes. This work suggested that 30% or more vegetation cover was required within a region to maintain most bird species. However, such snapshots of biodiversity imply or assume 'stable' populations whereas populations of some species may still be responding (declining or increasing) to the changed landscape. Resampling these landscapes will provide estimates of rates of change in species richness and population sizes for woodland-dependent birds in relation to landscape attributes. This will, in turn, improve the set of design principles (extent, placement and configuration of native vegetation) for landscape restoration.





The outcomes from research in the Native Vegetation and Biodiversity program will be communicated through targeted workshops, presentations and through online resources. Knowledge synthesised from the program will be of relevance to policy makers, state agency and regional natural resource planners and land managers .

For more information on individual projects and the Native Vegetation and Biodiversity R&D program, view the program website at

www.lwa.gov.au/nativevegetation

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