

Central Tablelands Natural Resource Management Plan

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing. However because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Local Land Services or the user's independent advisor.

Description of country

Wiradjuri Country

Wiradjuri Country is known as the land of the mountains, plains and the 3 rivers, the **Billa Wambool** (known as the Macquarie River), the **Billa Galari** (known as the Lachlan River) and the **Billa Murrumbidya** (known as the Murrumbidgee River).

Wiradjuri Country is one of the biggest tribal lands in NSW. It begins at the Great Dividing Range and travels as far west as Hillston and Narrandera with the southern boundary at the **Billa Mulawa**, the Murray River at Albury.

The Wiradjuri people today still have a spiritual connection to country through the ongoing practices of traditional knowledge, celebrations of song and dance, land and water management and age-old ceremonies that have been passed down through generations.

Wiradjuri country has been cared for and managed by the Wiradjuri people for thousands of years which continues both now and into the future.

Central Tablelands Local Land Services acknowledges and recognises the Wiradjuri Nation as the traditional owners and custodians of the land within the Central Tablelands region and we take this opportunity to pay respect to Elders past, present and emerging.

Ngangaanha Yindyamarra Yawali Ngurambanggu

To acknowledge, look after, respect and care for country (Wiradjuri).

Artwork telling the story of the Mudgee region – 'Place of Many Rocks'
By Kylie Tarleton



Wiradjuri dancers



Carved tree on Gara TSR

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Alignment to Regional Land Partnership Requirements

Requirement – “The NRM Plan will”:	Addressed in this plan
(i) identify and describe the 5-year Outcomes and Investment Priorities that are relevant to the region	Executive Summary (p6), Figure 2 (p7) Appendix 5 (p59)
(ii) describe stakeholder aspirations for natural resource management in the region, and where possible, how these align with the 5-year Outcomes and other relevant Australian Government priorities	Short term outcome 1 (p18), Short term outcome 2 (p20)
(iii) identify and prioritise natural resource management actions based on knowledge of: <ul style="list-style-type: none"> (A) location and condition of natural resources, including the Investment Priorities; (B) threats to, or impacts on, natural resources; (C) prioritisation methods for determining the most cost-effective management actions, including decision support and spatial mapping tools; (D) methodologies for assessing the effectiveness of management actions 	Long term outcome 1 through 5 (p26 to p45), NRM Landscape pages (p14 to p17), Appendix 4a (p57), Appendix 4b (p58),
(iv) identify how the delivery of Projects will contribute to 5-year Outcomes and Investment Priorities for the Management Unit	Executive Summary (p6), Appendix 5 (p59)
(v) identify how the Natural Resource Management Plan will be implemented with comprehensive community participation	Short term outcome 2 (p20)
(vi) identify Indigenous peoples’ land and sea management aspirations for the relevant region, including how they relate to 5-year Outcomes, and strategies to prioritise and implement them	Short term outcome 1 (p18), Long term outcome 1 (p26)
(vii) incorporate traditional ecological knowledge, where appropriate, in accordance with agreed protocols and with prior approval of the Indigenous custodians of the knowledge	Short term outcome 1 (p18), Long term outcome 1 (p26)
(viii) describe key collaborations, for example between the Service Provider, industry and/or Community groups, for delivery of 5-year Outcomes	Short term outcome 2 (p20)
(ix) identify the monitoring and reporting processes in place and how they are utilised to measure the achievements and the effectiveness of the Natural Resource Management Plan	Executive Summary (p6), Short term outcome 1 (p18), Short term outcome 2 (p20), Long term outcome 1 through 5 (p26 to p45)
x) include any other relevant content, explain how you involved the community, including the Indigenous community in the development of the new NRM Plan	Appendix 7 (p64)

Executive Summary

The primary purpose of the Central Tablelands Natural Resource Management Plan (the Plan) is to guide the strategic implementation of the Central Tablelands Local Land Services (Central Tablelands LLS) outcome of enhancing landscape ecosystem function while supporting other associated outcomes. In other words, to enable *Ngangaanha Yindyamarra Yawali Ngurambangu* (to acknowledge, look after, respect and care for country).

The document takes a Central Tablelands perspective of the major challenges, issues and opportunities in the region, setting a regional-scale and regionally focused agenda. It draws on and acknowledges the knowledge and priorities of other investors, such as the NSW and Commonwealth Governments, but remains driven by local needs. The document serves as both a natural resource management (NRM) plan and an evidence plan.

The plan was developed through desktop review, discussion and debate within the Central Tablelands NRM team and consultation with key knowledge holders, as supported by external facilitation, analysis and document drafting. The Central Tablelands NRM team have taken an active role in making decisions and determining how the region will work towards its NRM goals.

Relationship to other planning documents

At a high level, the directions of Central Tablelands LLS are guided by the Central Tablelands Local Strategic Plan 2021–2026. This NRM Plan is a functional area plan, it focuses on the NRM core services and provides supporting detail to translate the strategic directions of the Local Strategic Plan into programs and projects. The Plan is an important bridge between the high-level strategic planning and operational planning of projects, as shown in Figure 1.



Figure 1: Summary of planning: strategic to operational.

Scope of the NRM Plan

The scope of the Plan is set by the landscape management component of the Local Strategic Plan:

Landscape management: Landscape ecosystem function is enhanced, and community are informed and confident in their land management decisions and actions.

The relationships between landscape management short and long term outcomes as well as outcomes in other core service areas are shown in Figure 2.

This plan will focus on the following outcomes :

Longer-term outcomes:

- LT01 Increased used of traditional land management
- LT02 Travelling stock reserves to support community outcomes
- LT03 Improved habitat management
- LT04 Increased landscape connectivity
- LT05 Improved recovery of threatened species

Shorter-term outcomes:

- STO1 Enhanced connection of Aboriginal people to country, community and culture
- STO2 Landholders and community contribute to natural resource management

STO2 is a amalgum of 3 short term outcomes from the outcome map (Figure 2).

For each of these outcomes, a clear vision of success is used to further define the outcome and prioritisation. The use of thresholds and assumptions is applied to guide efficient and effective investments.

For each outcome, this NRM Plan:

- sets a vision of success to establish clear common understanding of intent;
- outlines the decision-making criteria applied to identify the most efficient and effective use of resources; and
- identifies the priorities for the next 10 years to provide a future view of investments.

This NRM Plan is closely aligned with the State LLS NRM Framework (see Table 1) and the Australian Government’s Regional Land Partnerships’ priorities for the Central Tablelands (see Appendix 5. Statement of alignment to State and Commonwealth priorities).

Central Tablelands LLS Outcome Map

Central Tablelands LLS is committed to delivering valued services for the productivity and sustainability of its uniquely diverse region and its people through collaborative, knowledgeable and trusted leadership, and partnership.

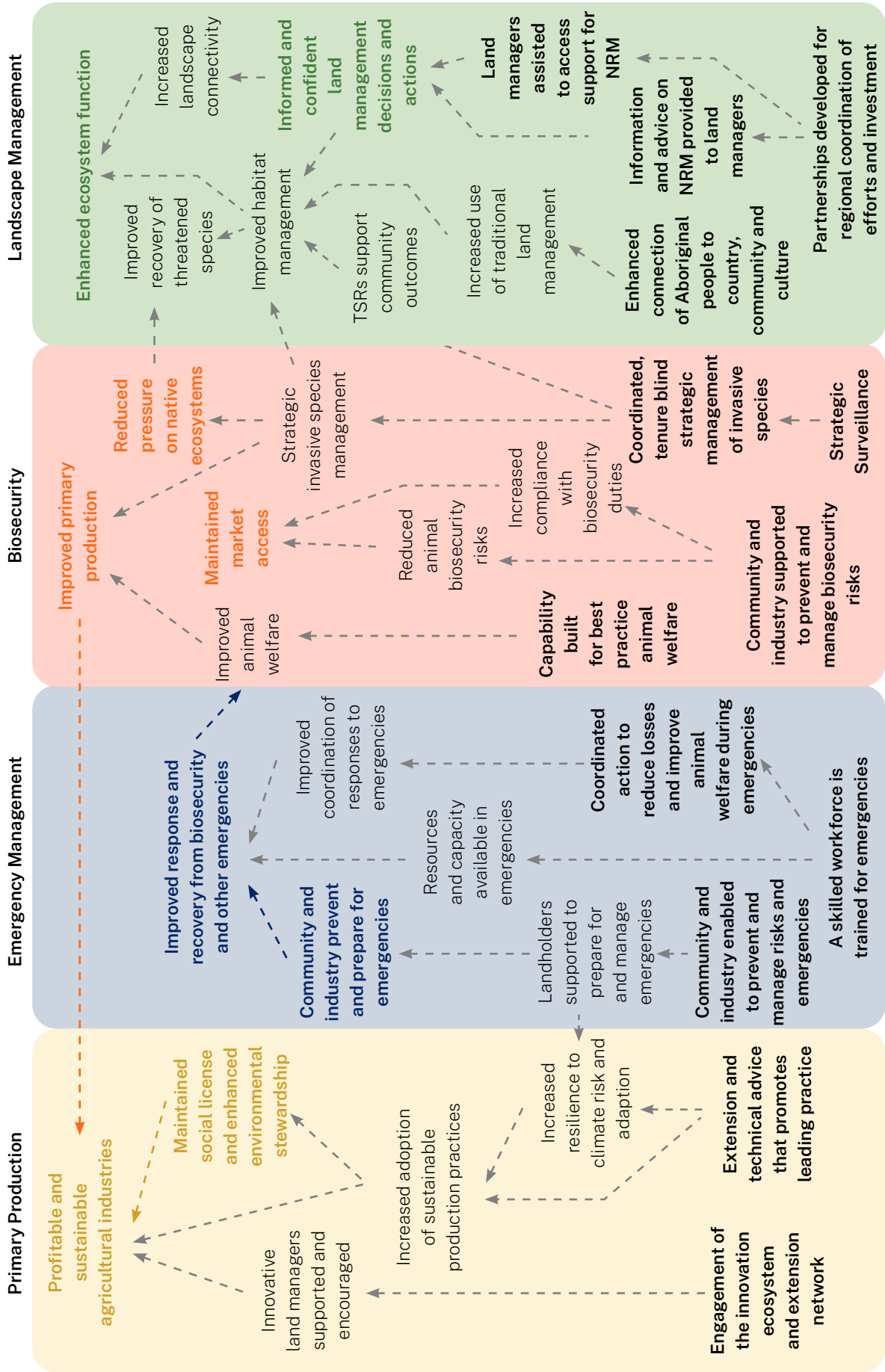


Figure 2: Central Tablelands LLS Outcome Map based on strategic outcome areas of: Primary Production, Emergency Management, Biosecurity and Landscape Management.

Prioritisation

Prioritisation of investments and actions is driven by a need to maximise impacts from the limited resources available. Prioritisation is a major theme in this plan and is applied to each outcome. The knowledge available that has informed prioritisation is briefly described, and where possible assumptions are outlined as critical foundations. The approach to prioritisation varies for each outcome, as guided by the landscape, available knowledge and other contextual factors. In some outcomes prioritisation is driven by spatial attributes of the landscape, in others prioritisation is nuanced across the NRM landscapes in response to the features of the landscape and in other outcomes prioritisation is more influenced by understanding of landholder and community motivations. However, there remains a steady aim of maximising the impact achieved.

The thinking behind the approach to prioritisation applied in this plan is summarised in Figure 3.

The first theme commonly applied to prioritise actions looks at the closely related concepts of additionality and diminishing returns. To maximise impact the additionality of investment is a critical consideration, that is; what would be achieved in the **absence** of LLS investment and what extra impact can be achieved **with** LLS investment?

For example, a site of high conservation value that is already well cared for and not subject to escalating or new threats, could be considered relatively secure under its current management. Investment by LLS will have limited additional impact.

Diminishing returns is a similar concept that looks at the extent of investment relative to the extent of impact. Diminishing returns from improving already high ecological value sites means that conservation activities will become a lesser focus to the larger relative gains possible from rehabilitation and revegetation.

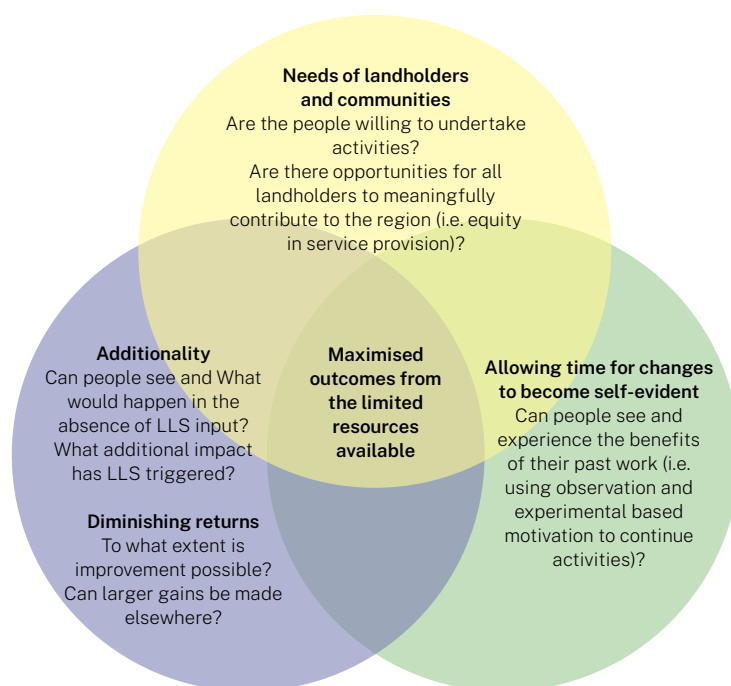


Figure 3: Prioritisation concepts applied to maximise outcomes

The second common theme to prioritisation in this plan is the needs of land managers and community members of the region. The ecological differences across the region could result in all NRM investments focused to just one or 2 NRM landscapes. However, there are willing and motivated landholders and community members across the region, and these should be encouraged and supported to improve their local environments. Opportunities for all land managers to make a meaningful contribution to biodiversity outcomes have been identified, as guided by landscape context. For example, for the outcome of increased landscape connectivity there are different standards of connectivity defined for the different landscapes. Similarly, the prioritisation of threatened species has ensured a diversity of ecosystems and spatial distribution across the region.

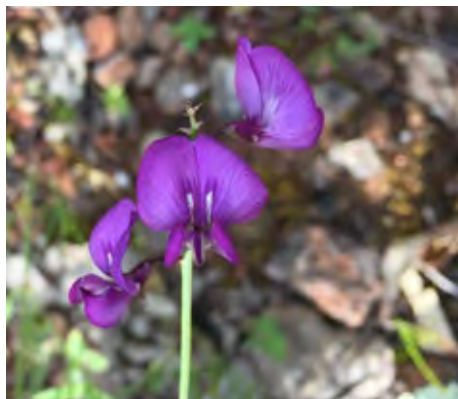
The third theme also considers the human dimensions of NRM. It is known that continuous NRM offerings can create pressures on landholders with priority after vegetation, species or other attributes on their land and result in burn-out for some. Time is also required for the results of on-ground works to become visually evident, building experience-based validation of the

efforts invested. Instead, a pulsing of NRM opportunities across the landscape, species or other priorities with a shifting of priorities over time is described for each outcome.

Partnerships and community engagement

It was clearly evident during consultation that the Central Tablelands LLS NRM team has good, constructive and healthy partnerships. In part, this is due to the calibre of the partnering organisations. The partners are effective change agents in their own right, making valuable contributions to NRM and the outcomes in this plan. By bringing together the differing technical, community engagement and project management strengths across these organisations, the effectiveness of each partner is enhanced.

There is scope to move beyond one-to-one partnerships by first acknowledging that the range of NRM service providers in the region are a network, and then working to build the strength of the network with the aim that this extends the collective reach and NRM impact achieved.

Small Purple Pea - *Swainsona recta*

Long Swamp alternate crossing

Translocating *Swainsona recta*

Central Tablelands LLS needs to play a pivotal connective role in this network of NRM service providers, facilitating connections across the network, providing a knowledge brokering service and maintaining communication with information and lesson sharing. Operationally, a coordinated network can provide; a referral service to help landholders access the most appropriate support, co-design and advise on each other's projects and delivery of joint, multi-partnered projects. The existing partnerships can be improved through a blend of formal and informal points of connection.

Critically across this network, it is important for Central Tablelands LLS to respect the strengths and position of each NRM service provider and what is available to the shared end client: the landholder.

Central Tablelands LLS also has the capacity to be flexible, applying this flexibility to limit duplication of NRM services offered will prevent competition between NRM service providers and maximise the range of services available for landholders. This is the approach taken in this plan.

The priorities for Central Tablelands LLS investments are shaped by the gap in other services available to landholders, for example projects and sites that are ineligible for Biodiversity Conservation Trust (BCT) funding.

Climate change

Delivering long-term impact from NRM investments requires careful consideration of the changing climate. To promote legacy of the outcomes, NRM actions and the short-term results achieved will need to persist under future climatic conditions. Greater legacy can be achieved if these actions also contribute to ecosystem adaptation.

The mean temperatures in the Central Tablelands are predicted to rise by 0.7°C by 2030. They are forecast to continue to rise by 2.1°C by 2070. By 2030 there will be 9 more days of temperatures above 35°C each year. Annual rainfall will remain similar but with increases in autumn and the greatest reduction occurring in spring. Visit the [AdaptNSW website](#) for more information on climate change.

This has implications for on-ground actions. Landscape connectivity will be increasingly important for enabling species to move between habitats and adapt to climate change. Higher altitude areas to the east of the region are likely to act as refugia. Increased pressure from invasive species will reduce the capacity of these habitats. The potential [increase in weed species has been modeled](#) and approximately 40 species are rated as high risk of establishment and expansion in Central Tablelands.

Strategically, the outcomes of improved habitat management and increased connectivity take on more importance in supporting the capacity of the region's biodiversity to adapt to climate change. Operationally, there will be changes required across all outcomes and embedded into project delivery processes. For example;

- High value conservation sites will need to be monitored as their risk profile changes with climate change. Seed dispersal from these sites, particularly if the site is isolated, may need to be actively supported to facilitate species movement to more amenable locations
- Revegetation species will need to consider [both current and future climates](#) for investments to promote survival and deliver legacy
- Susceptibility of existing habitat and tree species to drought can prompt current revegetation efforts to establish replacement trees before the existing trees die.
- Spring revegetation planting may need additional watering to support plant establishment and some species may establish better in autumn.

Adaptive management

The plan allows for adaptive and flexible delivery to opportunistically respond to funding available and to shift with environmental conditions. The outcomes, and priorities within, are to guide and structure adaptive management of the investment portfolio. This concept is demonstrated in Figure 4.



Box Gum Grassy Woodland

NRM Plan

Background

In 2019 a review of the NRM sections of the Central Tablelands Core Services Delivery Plan by the National Landcare Program -Regional Land Partnership (RLP) Program identified a number of opportunities for improvements. Around the same time a Natural Resources Commission (NRC) audit provided feedback that identified a greater focus on outcomes could improve the effectiveness of Central Tablelands LLS investments.

The Central Tablelands LLS Board and management have reviewed investment decision-making and the planning frameworks that support it, identifying that a more detailed functional area plan for NRM would provide a valuable way to bridge the gap between high-level strategic planning and technical prioritisation.

As a result, this NRM plan is designed to address the feedback from the RLP and NRC and respond to feedback gathered by the review of investment decision-making.



Tree and shrub planting

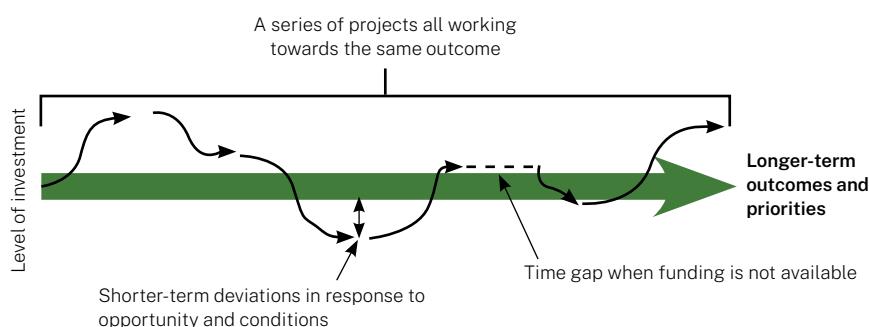


Figure 4: Adaptive management of investments, working towards longer-term outcomes



Temperate Highland Peat Swamp on Sandstone
Happy Valley Swamp – Newnes Plateau

Implementation principles

The Plan makes strategic decisions to maximise impact from investments (funding, staffing and other resources) in NRM.

The thinking that has been applied in this plan, will also need to be applied during design and implementation of projects using the following principles.

1. Identify funding opportunities that align with the priorities in the Plan to build a positive trajectory towards desired outcomes over the long-term (beyond service delivery level).
2. Prioritise investment (use of staff and funds) to service delivery with maximum potential for impact and biodiversity gains.
3. Respond to landholder and community willingness to contribute towards achieving the outcomes of the Plan.
4. Build landholder and community relationships throughout the region, working on practice changes and innovative incentives (where available) to motivate and support actions that are appropriate for the local landscape.
5. Where possible, undertake investments and actions that deliver multiple outcomes.

6. Look for opportunities to work across teams within Central Tablelands LLS for common messaging and to promote NRM activities with multiple benefits to land managers in all industries (cropping, grazing, horticulture etc).

NRM Landscapes

Across the Central Tablelands there are 18,418 holdings with a total combined area of 2.35 million hectares. Of these 14,333 are rateable (2.3 million hectares). On average landholdings (rateable and non-rateable) have 45% native vegetation cover. The region as a whole has an average native vegetation cover of 62%. However, this vegetation cover is not evenly spread, in fact there are a large number of properties with very little native vegetation and a substantial number with a lot of native vegetation. Land use varies across the region, with the eastern part having more remnant vegetation and grazing, while the western part has more cropping (as shown in Figure 5).

Central Tablelands is largely made up of 3 bioregions: Sydney Basin (east of Lithgow, the Capertee Valley and north around the Wollemi National Park), South Eastern Highlands (Oberon, Bathurst and Orange), and the NSW South Western Slopes (to the north and west of South

Eastern Highlands, including Mudgee to the north and Cowra to the west).

There are differences in the character of the northern portion of the NSW South Western Slopes around Mudgee and the western portion around Cowra. These differences are enough to warrant a distinction between these areas for the purposes of this NRM Plan, leading to the following 4 NRM landscapes (as shown in figure 6):

- Lithgow-Wollemi-Capertee
- South Eastern Highlands
- Cowra-Molong Slopes
- Mudgee Slopes.

Priorities based on NRM landscapes

The implementation of the prioritisation principles identified in this plan have been applied against each NRM landscape/bioregion to improve delivery focus at that scale.

The following pages identify for each NRM landscape:

- key assets and cultural links
- threats
- priority focus areas
- proposed activities, and
- alignment to long term outcomes.

The Central Tablelands LLS Board and management have reviewed investment decision-making and the planning frameworks that support it, identifying that a more detailed functional area plan for NRM would provide a valuable way to bridge the gap between high-level strategic planning and technical prioritisation.

As a result, this NRM plan is designed to address the feedback from the RLP and NRC and respond to feedback gathered by the review of investment decision-making.

The NRM Plan has been informed by desktop review, discussion and debate

within the Central Tablelands LLS NRM team and consultation with key partners, supported by external facilitation, analysis and document drafting. The NRM team have taken an active role in making decisions and determining how to work towards enhanced landscape ecosystem function.

The document takes a Central Tablelands perspective of the major challenges, issues and opportunities in the region, setting a regional-scale and regionally focused agenda. It draws on and acknowledges the knowledge and priorities of other investors, such as the NSW and Commonwealth Governments, but remains driven by local needs.

There is strong alignment between this plan and the State LLS NRM Framework.

The Plan is structured according to the outcomes of the Central Tablelands LLS Outcome Map (see Figure 2). It commences with the underlying shorter-term outcomes and finishes with the higher-level, longer-term outcomes. In each outcome a common structure is used starting with a description of success for the outcome and key performance indicators. Each outcome has listed priorities for investment and an outline of the future pathway.

LLS NRM Framework objective	Alignment to Central Tablelands NRM Plan
Driving practice change through customer-centered NRM services	Prioritisation focuses on the needs of landholders and communities. See Figure 3. This is further detailed throughout the outcomes specifically <i>'STO2. Landholders and community contribute to natural resource management'</i> .
Helping land managers to get a return from NRM	There are many opportunities for landholders to get a return from NRM through developing environmental markets and stewardship opportunities through the Biodiversity Conservation Trust (BCT) and alike. Prioritisation in this plan looks to avoid duplication with the BCT and support landholders who are close to eligible to improve site condition or size so they can access the BCT (see <i>'NRM delivery agent'</i> and <i>'Increased landscape connectivity in terrestrial and aquatic dispersal corridors'</i>) The connection between NRM and production is also recognised.
Tackling the priority threats to achieving healthy resilient landscapes	This plan considers threats as part of prioritisation principles as well as the 5 long term outcomes detailed.
Supporting Aboriginal land managers to care for Country	There are 2 specific outcomes (see <i>'Enhanced connection of Aboriginal people to country, community and culture'</i> and <i>'Aboriginal communities and cultural heritage in Central Tablelands'</i>). An Aboriginal context is described for all outcomes.
Becoming a service provider of choice and trusted broker of partnerships	Both service provider and partnership broker roles are described in the outcome <i>'Landholders and community contribute to natural resource management'</i> .

Table 1: Alignment with the LLS NRM Framework

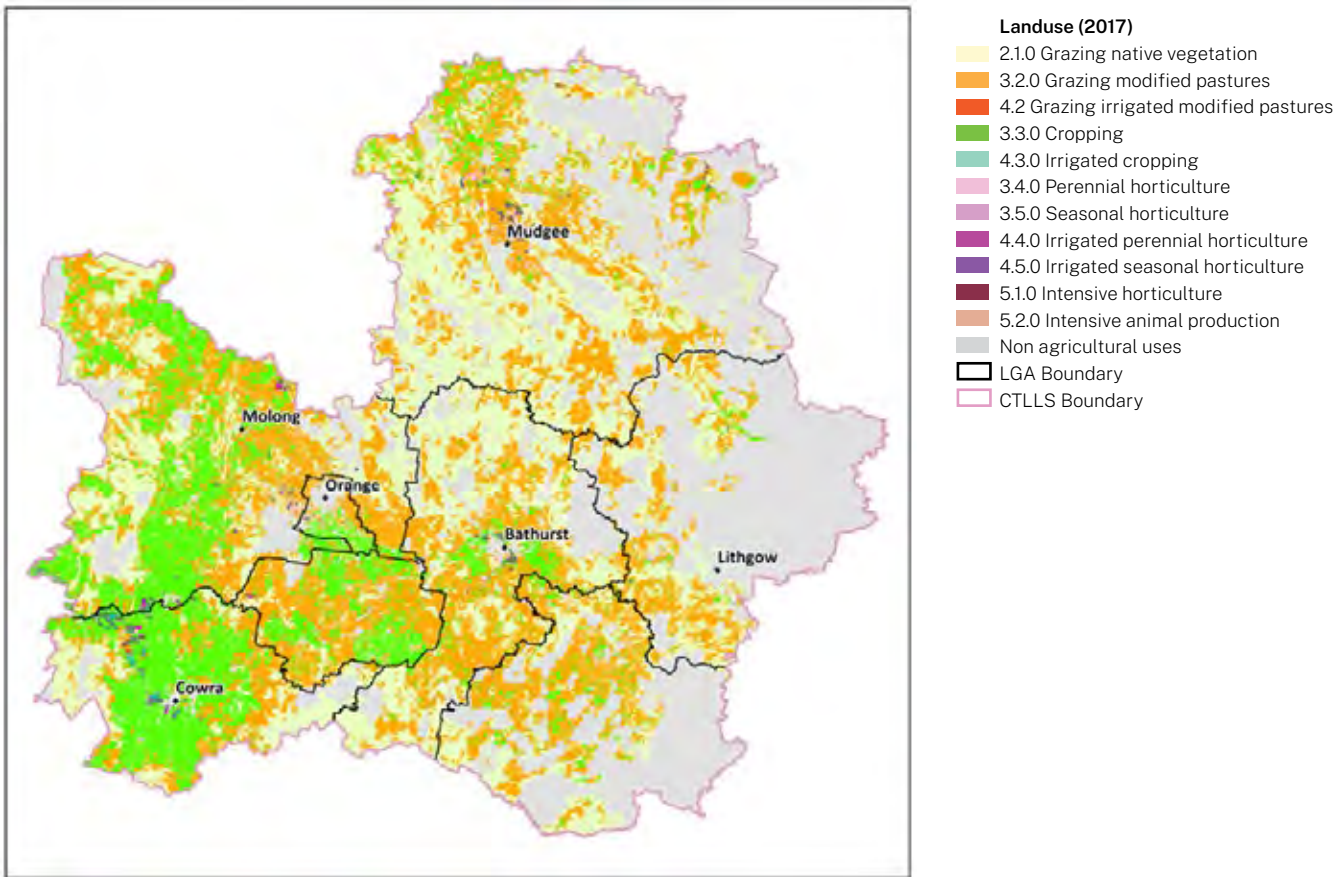


Figure 5: Landuse across the Central Tablelands



Figure 6: Central Tablelands NRM Landscapes based on bioregions

Cowra-Molong Slopes

Characteristics

Cowra-Molong Slopes is part of the western portion of the NSW South Western Slopes bioregion. It is 781,144 hectares in size and 25% of Central Tablelands. It has 40% native vegetation cover.



Key assets and cultural links

- Mandagery Cultural Area (High Sigh Ach).
- Intact TSR's with BGGW.
- Lachlan River (Billa Galari).
- Goobang, Nangar and Conimbla National Parks.

Threats

- Habitat fragmentation and reduction.
- Salinity.
- Climate change.
- Invasive species (flora and fauna).
- Soil erosion/sedimentation.
- Bush rock removal.
- Loss of hollow-bearing trees.
- Barriers to fish passage.
- Severe weather events (e.g. bushfire, flood etc).
- Cultural exclusion and/or unknown cultural heritage sites.

Priority focus areas	Proposed activities	Alignment to outcomes				
		LT01	LT02	LT03	LT04	LT05
<u>Increase condition and extent of endangered ecological communities and woodland bird habitat that benefit:</u> <ul style="list-style-type: none"> • Woodland birds including the Regent Honeyeater, Swift Parrot, Supperb Parrot, Turquoise Parrot, Brown Treecreeper etc • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland • Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia 	Protection and retention of existing remnant vegetation		X	X	X	
	Increasing patch size through revegetation		X	X		
	Habitat augmentation and re-aging		X			
	Landscape connectivity		X			X
	Invasive species (flora and fauna) control (including traditional fire burning)		X		X	
	Increase community awareness and educate land managers		X			
<u>Improve water quality and aquatic habitat within priority streams that benefit:</u> <ul style="list-style-type: none"> • Lachlan River, Little River, Bell River, Belubula River and Boree Creek systems • Native fish populations 	Weed and pest animal control			X		
	Revegetation			X		
	Removal of fish barriers			X		
	Community awareness			X		
	Erosion and sediment control/mitigation			X		
	Protection of riparian zones			X		
<u>Valuing rocky outcrops to benefit:</u> <ul style="list-style-type: none"> • Pink Tailed Worm Lizard 	Protection and retention of rocky outcrops		X			
	Increase community awareness and educate land managers		X			
	Create artificial habitat		X			
<u>Connection of community to traditional cultural values, sites and practices that benefit:</u> <ul style="list-style-type: none"> • Aboriginal community connection to country • Traditional land management valued in modern land management • Community capacity for and knowledge of cultural fire practices 	Community awareness/engagement	X				
	Education around traditional fire practices	X				
	Workshops and community days to create opportunities to access country	X				
	Facilitate initiatives to incorporate traditional practices into modern land management	X				
	Undertake cultural surveys	X				

South Eastern Highlands

Characteristics

South Eastern Highlands makes up most of the South Eastern Highlands bioregion. It is 1,419,138 hectares in size and 45% of Central Tablelands. It has 56% native vegetation cover.

Key assets and cultural links

- Greater Blue Mountains World Heritage Area (southern portion).
- Macquarie River (Wambuul).
- Borenore Caves (Woman's birthing site).
- Mount Panorama (Wahluu).
- Mount Canobolas (Goanhabula).
- Eastern flowing Wild Rivers.
- Wyndradines Grave.
- Eusdale and Windburndale nature reserves.
- Abercrombie River National Park.

Threats

- Habitat fragmentation and reduction.
- Urban encroachment/development.
- Soil Erosion/sedimentation.
- Cultural exclusion/ access to country.
- Barriers to fish passage.
- Weeds.
- Pest animals.
- Browsing/grazing.
- Disease (e.g. chytrid fungus).



Priority focus areas	Proposed activities	Alignment to outcomes				
		LT01	LT02	LT03	LT04	LT05
<u>Increase condition and extent of endangered ecological communities and other remnant vegetation that benefit;</u> <ul style="list-style-type: none"> • Koala (<i>Phascolarctos cinereus</i>) • Purple Copper Butterfly • Small Purple Pea (<i>Swainsona recta</i>) • Zieria obcordata • White Box-Yellow Box-Blakeleys Red Gum Grassy Woodlands • Upland Basalt Eucalyt Forests of the Sydney Basin region • Acacia Meiantha • Mountain Trachymene • Tarengo Leek Orchid 	Protection of existing remnants		X	X	X	
	Increasing patch size through revegetation		X	X		
	Habitat augmentation		X			
	Landscape connectivity		X			X
	Weed and pest animal control		X		X	
	Community awareness/engagement		X			
	Protection of rocky outcrops		X			
<u>Improve water quality and aquatic habitat within key streams that benefit;</u> <ul style="list-style-type: none"> • Booroolong Frog (<i>Litoria booroolongensis</i>) • Macquarie Perch • Conservation reaches including 'Upland Valley Fill systems' • Macquarie River, Abercrombie River and Turun River 	Weed and pest animal control		X			
	Revegetation		X			X
	Erosion and sediment control/mitigation		X	X		
	Removal of fish barriers		X			
	Protection of riparian zones	X	X	X		
<u>Connection of community to traditional cultural values, sites and practices that benefit;</u> <ul style="list-style-type: none"> • Aboriginal community connection to country • Traditional land management valued in modern land management • Community capacity for and knowledge of cultural fire practices 	Community awareness/engagement	X				
	Education around traditional fire practices	X				
	Workshops and community days to create opportunities to access country	X				
	Facilitate initiatives to incorporate traditional practices into modern land management	X				
<u>Protecting the Greater Blue Mountains World Heritage Area</u>	Weed control		X	X		
	Pest animal monitoring, surveillance and management		X	X		
	Community awareness/engagement	X		X		

Mudgee Slopes

Characteristics

Mudgee Slopes makes up the northern portion of the NSW South Western Slopes bioregion. It is 406,669 hectares in size and 13% of Central Tablelands. It has 75% native vegetation cover.

Key assets and cultural links

- Capertee National Park.
- The Drip.
- Dunn's Swamp.
- Munghorn Gap.

Threats

- Habitat fragmentation.
- Lack of suitable foraging habitat.
- Urban encroachment/development.
- Weeds.
- Pest animals.
- Browsing/grazing.



Priority focus areas	Proposed activities	Alignment to outcomes				
		LT01	LT02	LT03	LT04	LT05
<u>Increase condition and extent of endangered ecological communities and other remnant vegetation that benefit:</u> <ul style="list-style-type: none"> • Koala (<i>Phascolarctos cinereus</i>) • Acacia Meiantha • Regent Honeyeater • White Box-Yellow Box-Blakeleys Red Gum Grassy Woodlands • Eucalyptus alligatrix subsp alligatrix • Small Purple Pea (<i>Swainsona recta</i>) 	Protection of existing remnants		X	X		
	Increasing patch size through revegetation		X	X		
	Habitat augmentation		X			
	Landscape connectivity		X			
	Weed and pest animal control		X			X
	Community awareness/engagement		X			
<u>Improve Water Quality and aquatic habitat within priority streams that benefit:</u> <ul style="list-style-type: none"> • Cudgegong River • Cudgegong Giant Spiny Crayfish (<i>Euastacus vesper</i>) 	Weed and pest animal control			X		
	Revegetation			X		
	Erosion control		X	X		
	Protection of riparian zones including swamps/wetlands		X	X		
	Reinstatement/introduction of large woody debris			X		

Lithgow-Capertee-Wollemi

Characteristics

Lithgow-Wollemi-Capertee is part of the Sydney Basin bioregion. It is 527,785 hectares in size and 17% of Central Tablelands. It has 98% native vegetation cover.

Key assets and cultural links

- Greater Blue Mountains World Heritage Area.
- Eastern flowing Wild Rivers.
- Blackfella hands rock art.
- Gardens of Stone State Conservation Area.
- Munghorn Gap Nature Reserve.

Threats

- Habitat fragmentation.
- Long Wall mining.
- Soil erosion/sedimentation.
- Weeds.
- Pest Animals including Noisy Minors.
- Lack of suitable foraging habitat.
- Browsing/grazing.
- Suitable foraging habitat.



Priority Focus Areas	Proposed activities	Alignment to outcomes				
		LT01	LT02	LT03	LT04	LT05
<u>Increase condition and extent of endangered ecological communities and other remnant vegetation that benefit;</u> • Koala (<i>Phascolarctos cinereus</i>) • Purple Copper Butterfly • Regent Honeyeater • Upland Basalt Eucalyt Forests of the Sydney Basin region	• Protection of existing remnants		X	X		
	• Increasing patch size through revegetation		X	X		
	• Habitat augmentation		X			
	• Landscape connectivity		X			X
	• Weed and pest animal control		X			
	• Community awareness		X			
<u>Improve water quality and aquatic habitat within priority streams and swamp/wetland dependant ecosystems that benefit;</u> • Temperate Highland Peat Swamps on Sandstone • Giant Dragonfly • Blue Mountains Water skink	• Weed and pest animal control		X			
	• Revegetation		X			
	• Erosion control		X			
	• Protection of riparian zones including swamps/wetlands		X			
<u>Protecting the Greater Blue Mountains World Heritage Area</u>	• Weed control		X	X		
	• Pest animal monitoring, surveillance and Management		X	X		
	• Community awareness/engagement	X		X		

Shorter-term outcomes

STO1 Enhanced connection of Aboriginal people to country, community and culture

The vision of success for this outcome is for Aboriginal people and communities to be engaged in NRM, establishing and maintaining close connection to country. There is an improved capacity to share cultural heritage with Aboriginal and non-Aboriginal people, leading to an increased recognition of traditional practices. Access to culturally significant sites and flora, fauna and fungi is facilitated and encouraged.

Key Performance Indicators

- Number of projects undertaken to protect Aboriginal cultural heritage or traditional ecological knowledge (statewide metric).
- Participation of Aboriginal people in projects and activities.

Aboriginal communities and cultural heritage in Central Tablelands

Aboriginal culture is intrinsically tied to the landscape, and the landscapes, waterways, and ecosystems of Central Tablelands are highly valued by Aboriginal communities. 'People and ancestors, past and present, [lore] and culture, kin and identity, knowledge and learning, place and landscape, plants and animals, song and stories are parts of the whole' (Colloff 2020 pg 114).

The land and its ecosystems have been cared for by thousands of generations of Aboriginal people. It is with respect and cultural obligations to the ancestors that current generations of Aboriginal people and communities continue to care for country as a living culture, handed down from generation to generation.

Wiradjuri Country is one of the biggest tribal lands in NSW. It begins at the Great Dividing Range and travels as far west as Hillston and Narrandera with the southern boundary at the Billa Mulawa, the Murray River at Albury. The Wiradjuri people today still have a spiritual connection to country through the ongoing practices of traditional knowledge, celebrations of song and dance, land and water management and age-old ceremonies that have been passed down through the ages.

In the Central Tablelands there are cultural landscapes of significance. For example, Mt Canobolas (Gunnabula), Mt Panorama (Wahluu) and Mt Macquarie (name no longer known) are the 3 brothers that tell the creation stories of clan groups of the Wiradjuri nation. The landscape is woven with journey pathways, with traditional song lines along ridges and creeks. In the high-country ceremonial (Bora) grounds are

associated with men's business and in the low country the water sources hold special significance for women (e.g. birthing sites).

The rocky outcrops throughout Central Tablelands were used for making and maintaining stone tools, with rock grinding grooves still present today. Caves provided shelter, carved stone water bowls captured rainfall, and grain stores were built to sustain populations through the seasons. The waterways sustained Aboriginal tribes and are acknowledged strongly in dreamtime stories, creation and song and dance. The ecosystem informed the lives of Aboriginal people (e.g. when the wattle blooms the turtles are fat and it's time to hunt turtles), resulting in over 40,000 years of sustainable and adaptive living with the land.

There are approximately 7,000 Aboriginal people living in the Central Tablelands. There are 5 Local Aboriginal Lands Councils (LALC) in the Central Tablelands, with 3 of these (Orange, Bathurst and Mudgee) having all or large portions of their areas within the region.



Fire rings as part of cool burn



Member of Orange Local Aboriginal Lands Council talking to community member about cultural fire

Partnerships in Central Tablelands

There are a number of partners identified in the Central Tablelands LLS First Nations Peoples Participation Plan. The Central Tablelands LLS First Nations Peoples Participation Plan sets out how Central Tablelands LLS will work with First Nations peoples and communities in the region, including Bathurst LALC, Billa Galari Aboriginal Corporation, Cowra LALC, Mingaan Wiradjuri Aboriginal Corporation, Mudgee LALC, Orange LALC, Orange Aboriginal Elders Group, Pejar LALC and Yarrowarra Hillford Aboriginal Corporation.

In addition to these partners, there are other potential partners and sources of support in the region. These are partners that have an interest and willingness to support reconnection to country and the use of traditional land management practices and principles. Landcare and community groups, Local Government and other managers of large tracts of public land and those with corporate social responsibilities are all potential partners that can support improved access to country.

Critical foundations

Connection to country is important for Aboriginal identity and spirituality, and this is central to the issues facing Aboriginal people (Ampt et al 2018).

Aboriginal engagement in NRM and caring for country improves health and social wellbeing for Aboriginal people, including an increased self-esteem, sense of autonomy and social cohesion (Ampt et al 2018).

Improved health, including social health, of Aboriginal communities will contribute to a healthier, stronger, more cohesive and more resilient regional community in the Central Tablelands.

Landholder awareness and interest in Traditional practices is required before landholders will provide access to country.

The capacity of some community groups may be so low that significant investment may be needed to improve their potential to achieve long-term impacts. Working to support groups with some base level of capacity, with greater potential for long-term additionality (legacy), may be more efficient and effective.

Assisting and encouraging higher capacity groups to be inclusive of individuals and lower capacity groups, to form a connected supportive network will create a more sustaining broader community.

Priorities for investment

The priority for investment in this outcome is to create opportunities for Aboriginal people to get back on country and involved in traditional land management. The work undertaken in this outcome is community driven and responsive to requests for support from community groups. This ensures that Central Tablelands LLS is working with willing people with Yindamarra (respect, without rushing and bringing people along). In considering the priority of the request and ability to service the request, the following factors are considered:

- Are there commonalities with other requests and potential to coordinate into one event?
- Is the project and its desired outcomes realistic and practical?
- What is the potential sphere of influence and number of direct and indirect beneficiaries?
- What critical relationships and

past experiences can be drawn on to maximise success?

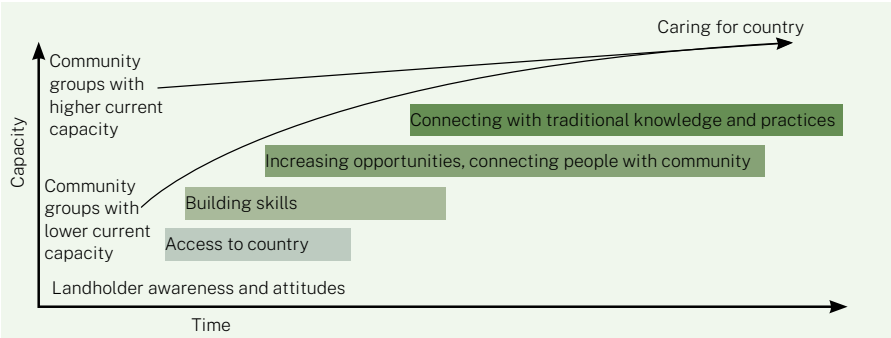
- How inclusive is the requested project?
- How strong are the cultural links e.g. is there a tangible connection such as a site of significance?
- What is the potential environmental outcome?
- Is there longevity to the outcomes e.g. building an ongoing skills base, long-term ability to continue with reduced support?
- What are the resources and capacity available from the community and collectively available within the region to support the project?

Future pathways

To increase capacity of Aboriginal community groups, improved access to country will be needed, with the current Indigenous Land Management negotiations contributing to this. With improved access to country there will be more scope for Aboriginal people and communities to take on NRM projects and build skills. Access to country and building skills is the current focus of work in this outcome.

Over time, it is expected that the focus of work in this outcome will shift to establishing and maintaining on-ground projects that create opportunities for Aboriginal participation, pride and ownership of outcomes and improved connections of Aboriginal people with community and culture. In turn, increased use of Traditional knowledge and practices by Aboriginal people and communities will result in caring for country.

Figure 7: Enhanced connection of Aboriginal people to country, community and culture over time



Shorter-term outcomes

ST02

Landholders and community contribute to natural resource management

The vision of success in this outcome is that there is increased environmental awareness, including understanding of traditional land management and climate change awareness, across all landholder types and communities leading to improved contribution to NRM. This includes the recognition that all land managers and community members have a role in NRM. There is an ongoing increase in the number of land managers engaged in NRM, with a mix of previously unengaged land managers and repeat land managers accessing advice, extension services and participating in on ground projects.

Success would also include knowledge sharing as a two-way street between Aboriginal communities and other landholders, with knowledge gain by both parties.

It is the aim of our efforts to ensure landholders and community are able to confidently make informed decisions and take action to restore and maintain ecosystem function for healthy and thriving landscapes. Contributions to NRM are varied, occurring with and without financial incentives and ranging from small scale contributions such as volunteering at planting days to large

scale property restoration. The success of this outcome will require a range of actions including habitat management, revegetation, weed removal, pest control, carbon management and riparian restoration.

Key Performance Indicators

- Number of opportunities for people to support LLS decision-making including number of participants (statewide metric).
- Number of community groups supported and number of participants (statewide metric).
- Number of landholders undertaking pest and weed control.
- Number of landholders undertaking habitat restoration and revegetation.
- Number of individual landholder and total hours of advisory meetings/inspections.
- Number of Aboriginal people involved in co-management.
- Data on management practices and landholder NRM objectives gained through a benchmarking survey.

- Estimate of leveraging gained through partnered organisations.
- Number of advisory positions or roles with other organisations.
- Estimated additional landholders reached through the NRM service provider network.

Landholders and community in Central Tablelands

Across Central Tablelands there are 18,427 holdings. Of these 14,333 are rateable, totaling 2.35 million hectares.

The 4,142 holdings that are not rateable account for 46,767 hectares. Figure 8 shows the number of holdings in different size categories for Central Tablelands, and each of the NRM regions. There is a consistent pattern across the regions with a primary peak in the number of holdings in the 10-40 hectares size grouping (2-10 hectares for Mudgee Slopes), a secondary, much smaller peak in the 300-500 hectares size grouping and a long tail of fewer, larger properties. Across Central Tablelands there are 65 properties over 2,000 hectares.



Giant dragonfly



Landholder workshop

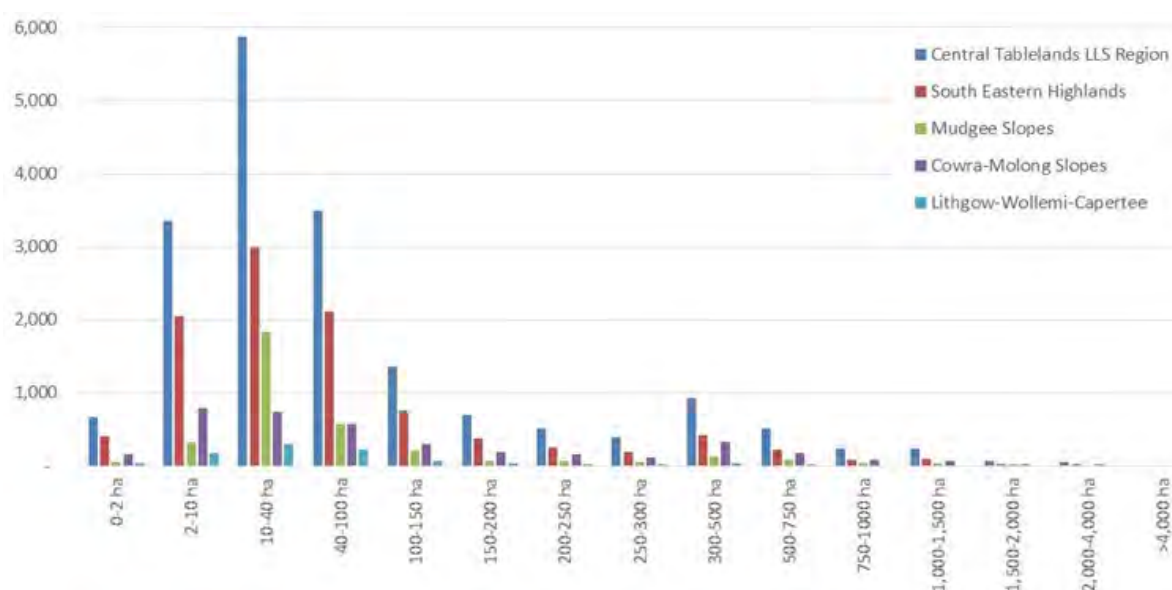


Figure 8: Number of holdings of different sizes, across the NRM landscape bioregions

This two-peak pattern is most pronounced in Mudgee Slopes with the highest percentage of properties in the 300-500 hectare category (9%), suggesting increased diversity in land ownership and uses.

Across the NRM regions, Mudgee Slopes has the highest percentage of holdings under 100 hectares (79%) and Cowra-Molong Slopes has the lowest percentage (60%). South Eastern Highlands has the greatest number of non-rateable holdings at 2,540 (30,616 hectares). The statistics for South Eastern Highlands and Mudgee Slopes reflect the high number of lifestyle properties in these locations.

The steady changeover in ownership of these properties (estimated average ownership time of 7 years) and loss of land management capacity, is a significant challenge to maintaining NRM in these regions.

There are several organised community groups in Central Tablelands that work with landholders to improve management of natural resources in the region. These include Watershed Landcare, Mid Lachlan Landcare, Central Tablelands Landcare, Lithgow and Oberon Landcare Association, Little River Landcare, Capertee Valley Landcare,

Kanangra-Boyd to Wyanagla Link Community Conservation Partnership and the Cowra Woodland Bird Group.

NRM is a collective effort, with each member of the community having a part to play. This concept is highlighted by the totem system embraced by First Nations Communities. Traditionally totems played a major role in directing NRM efforts. Totems operated at several levels (clan, family and individual) and each person had an obligation to look after their totems, adding another perspective to protection and conservation decision making. Although riparian totems were more common, overall, the number and diversity of totems created ecosystem balance.

Native Title Groups and Land Councils are also land managers in the Central Tablelands. Some of these groups are involved in negotiation on Indigenous Land Use Agreements (ILUA) on Crown Lands. The same land management duties, such as biosecurity management, applies to these lands. It is expected that to meet these duties, a culturally appropriate blend of Traditional and other management practices will be needed.

Engagement and knowledge sharing between Aboriginal land managers and non-Aboriginal land managers is a priority, with benefits across the communities involved in co-management.

Partnerships in Central Tablelands

Central Tablelands LLS has a range of existing partnerships from community focused groups through to technical experts and other public land managers. Landcare and community groups include Watershed Landcare, Lithgow and Oberon Landcare Association, Central Tablelands Landcare, Little River Landcare, Mid Lachlan Landcare, Kangara-Boyd to Wyangala Link Community Conservation Partnership, Cowra Woodland Bird Group, and Capertee Valley Landcare. Other partnering organisations include ANU, Department of Planning and Environment's (DPE) Biodiversity Conservation Unit, National Parks, Forestry Corp NSW, Environment and Waterways Alliance, Birdlife Australia and DPE Water. Environmental Trust and the Regional Land Partnerships Program are important supporters of the work undertaken.

Critical foundations

It is more efficient and effective to engage willing landholders. Awareness of NRM benefits to conservation and production will increase interest in participation.

Financial incentives are important motivations to participate for some landholders. Access to on-ground advice is also an important motivator and is highly valued by participating landholders (Moon et al 2012).

Increasing understanding of environmental conditions by increasing landholder ability to monitor habitat condition and other factors will increase landholder willingness to take action.

Time is a significant barrier to participation for productivity driven landholders (Moon et al 2012). Ongoing targeting of a community may lead to burn-out and erode willingness. Landholders may prefer to implement smaller ‘trials’ of NRM , with time to observe the benefits before making larger changes and commitments (Pannell et al 2020).

Motivations of individual landholders varies, and some level of NRM outcome can be gained from all farming enterprises and situations. Messages and

opportunities to contribute to NRM need to be tailored accordingly.

Trusted relationships between LLS and landholders will increase willingness to participate in NRM projects and activities. The relationships established through the provision of other services (e.g. disease management, pest control) can be built on by the NRM Team.

Engaging with and supporting a network of organised community groups to act as change actors will extend the reach of advisory services and key messages.

Priorities for investment

Central Tablelands prioritises the delivery of NRM investment through the provision of 3 service areas; NRM Delivery Agent, Network and Partnership Facilitator, and Landholder Advisory Services.

NRM delivery agent

Central Tablelands LLS is a NRM delivery agent for funders such as the Australian and NSW Governments. Each funder has its own funding priorities. To achieve the longer-term NRM outcomes, opportunities with the greatest alignment between funder interests and LLS outcomes are the highest priority.

The NRM delivery agent service can be extended to private and corporate investors with NRM outcomes to develop a more diverse portfolio of funders and funding priorities. Increasing the range of funders will increase the range of incentives and other support that can be made available to landholders. A gap analysis of existing funding against the NRM plan outcomes alongside a review of the objectives of potential funders will identify areas of alignment and priorities for developing partnerships with investors.

It is through its role as a NRM delivery agent that Central Tablelands LLS can make financial incentives available to landholders. These incentives are often oversubscribed with demand exceeding funds available. To maximise the total financial opportunities available for landholders, the simplest approach is to avoid duplicating or competing with other incentives such as Biodiversity Conservation Trust (BCT) grants. As other environmental markets develop, Central Tablelands LLS is well-positioned to facilitate landholder participation and avoid duplication.

Maximising impact and value will need more than just simply avoiding duplication. Incentives should be considered not only from the perspective of delivering environmental outcomes at the targeted site, but also for potential to influence and encourage others in the community to also change practices.

Incentives on a fixed cost share arrangement will exceed the willingness of some landholders; essentially some landholders would be willing to undertake the work for less funding. When these incentives are awarded to projects with the highest environmental services it then also fails to consider additionality and diminishing returns; sites that are currently in good condition with less room for improvement will rank higher than sites of moderate condition and greater potential improvement.



Figure 9: Central Tablelands Regional Landcare Network

Landcare and community groups that have worked with landholders on more limited budgets may have ideas and experience on innovative ways of maximising on-ground impact with minimal investment.

The priority actions as a NRM delivery agent are:

- Provide funding to landholders and community groups to incentivise on ground works and practice change adoption
- Provide NRM advisory services and capacity building opportunities
- Undertake a gap analysis of existing funding against the NRM outcomes and the objectives of potential funders to identify areas of alignment and priorities for developing partnerships with investors.
- Use more innovative methods to increase the impact and value for money of current funding:
 1. Adjust incentive assessment tools to prioritise projects with greatest potential for improvement or greatest threat, as opposed to current condition
 2. Investigate opportunities where landholders put forward their own project and the amount of incentive required
 3. Set a flat rate of incentive and ask landholders to propose the works they are willing to undertake for that set amount
 4. Value the willingness of the landholder to share their NRM experiences with others, with demonstration sites and field days to influence others in the community
 5. Small, flexible grants to landholders that have no previous experience of NRM projects to provide small scale experiential learning.

Network and partnership facilitator

Central Tablelands LLS is just one of several organisations and community groups providing NRM services to landholders in the region and working to improve NRM outcomes on public land. Each of these organisations and groups brings to the region differing strengths in technical fields, community engagement and project management. Working in partnership with these organisations and groups allows complementary strengths to enhance the partnership's combined effectiveness.

The most successful partnerships are a result of long-term commitment to a specific, common goal with passionate people and staff stability. These factors have allowed these partnerships to become more informal. The shift to informal, ad hoc communication also brings a risk of losing connection across the organisations, this is best managed by maintaining some formality to the relationship. This may be regular scheduled joint planning and review meetings and MoUs that require periodic check in or re-negotiation. Successful partnerships also need high-level support across organisations and in some cases such as Local Government, partnerships must first be established at Board and executive levels to pave the way for more operational level collaborations.

A primary strength of Central Tablelands LLS is that it is able to identify landscape level problems through science, monitoring and community input. It is able to bring stakeholders together and design potential solutions.

A prospectus of current, future pipeline and possible projects would allow potential partners to self-identify their fit and contributions. This will extend current partnerships and may open up new partnerships. It could also be a way of appealing to potential investors, as noted in the above section.

There is scope to move beyond one-to-one partnerships by first acknowledging that the range of NRM service providers in the region are a network, and then working to build the strength of the

network with the aim that this extends the collective reach and NRM impact achieved. Central Tablelands LLS can play a pivotal connective role in this network of NRM service providers, facilitating connections across the network, providing a knowledge brokering service and maintaining communication with information and lesson sharing. Operationally, a coordinated network can provide a referral service to help landholders access the most appropriate support, co-design and advise on each other's projects and deliver joint, multi-partnered projects. Critically across this network, it is important for Central Tablelands LLS to respect the strengths and position of each NRM service provider and what is available to the shared end client, the landholder.

The priority actions as a network and partnership facilitator are:

- Maintain existing partnerships through a blend of formal and informal arrangements, as designed to meet the needs of the partner. For some this may mean biannual planning and review meetings, while others may prefer an ongoing MoU with defined check ins
- Provide easy access to technical information by providing reports, taking on advisory roles on steering committees and projects, and applying a customer ethos to partners with prompt responses for assistance
- Allow flexibility in partnership arrangements so partners maintain project ownership in a supported culture
- Maintain Board and executive level connections between partners to demonstrate support for collaboration and provide a mechanism for resolving strategic inconsistencies
- Develop a prospectus of current, future pipeline and possible projects to give partnership talks a tangible base to build from.

- Take a leadership role in fostering the regional network of NRM service providers with:
 1. A collated list of services provided that can be used by the network to refer landholders to the best available support
 2. Contribute to project design with technical advice and facilitating access to expertise
 3. Share knowledge on monitoring results, scientific studies, regional developments and opportunities across the network
 4. Provide a coordination role in facilitating and bringing the network together.

Landholder advisory services

Providing information, advice and extension is an ongoing service that needs to be available to all land managers, community members and organisations in the region to build trusted relationships and encourage practice change. Advisory services are important as the resources available to provide financial incentives to implement on ground works are not guaranteed from funders and remain insufficient to

achieve widespread change.

Achieving widespread change will require a greater focus on providing advice and extension services to guide land managers in practice change.

Advice and extension services that Central Tablelands LLS can provide to support landholders and communities include:

- Information on NRM practices and species identification
- 1:1 support and advice to identify and plan on-farm projects, with referral to the best options for ongoing advisory and financial support
- 1:1 support and training to increase landholder and community skills in monitoring environmental condition and assets—particularly on high value sites
- Field days, short courses or workshops to build skills in environmental restoration and monitoring on specific local topics
- Events (landholder hosted talks and paddock walks) that connect land managers to each other to share experiences and allow peer learning.

- Education on best practice for NRM projects; and
- Incorporation of environmental considerations into advice, tools and resources provided by other Central Tablelands LLS services to promote decision-making that is sympathetic to environmental health.

In providing these advisory services some landholder segmentation is needed to tailor messages and topics. The willingness and capacity of landholders on small holdings to undertake NRM work differs markedly from large producers, with further differences between industry based on differing opportunity to incorporate actions into production systems (e.g. cropping versus grazing). The advisory services provided need to be driven by the landholder's needs and interests while designing on ground actions to make meaningful contribution to the NRM outcomes.

In the case of landholders on small holdings, there are many individuals to connect with and this is a resourcing challenge common across Central Tablelands LLS teams.

A coordinated, whole of Central Tablelands LLS approach is needed.



Community volunteer day



In-field fauna monitoring

Central Tablelands LLS is in a unique position to appeal to production or profit oriented landholders. The ag advisory services team and the vet team are one resource to draw on. These teams can provide advice on NRM messaging, science from a productivity perspective that supports NRM actions and insight on how to appeal to these landholders. Going further, these teams can be supported to provide consistent messaging on NRM issues. For example, the ag advisory services team regularly conduct property planning workshops and the connectivity rubric in this plan (Table 8) could be incorporated to define different standards of connectivity. Where landholders are interested in conducting revegetation, they can then be referred to support, either in Central Tablelands LLS or within the NRM service provider network. Similarly, animal health issues that are affected by water quality also relate to riparian health and can be used to generate awareness of the multiple benefits of clean stock drinking water and interest in NRM activities.

A client focused approach that builds an understanding of the individual landholder over time can be used to ensure Central Tablelands LLS provides relevant advisory services. This may be most simply developed around 1:1 site inspections. These inspections are an opportunity to identify the relevant NRM actions and interests of the landholder. Collating this information into a customer database can be used to drive a schedule of field days and other group capacity building events. Annual or even biannual revisits are an opportunity to check what actions the landholder has managed to undertake, check the condition of sites, maintain knowledge on landholder interests and build a relationship with the landholder.

Specifically, for those communities and people currently negotiating ILUA for co-management of Crown Lands, extension services will need to foster knowledge sharing on Aboriginal and non-Aboriginal land management practices. Approaches that build networks across communities and facilitate greater shared understanding among Aboriginal and

non-Aboriginal people will have multiple social and environmental benefits.

Advisory services can also be used to complement financial incentives, particularly in situations where financial incentives are not available or would provide lower value (e.g. diminishing returns) but landholder willingness remains high. For example, on high condition sites that are under stable management and not facing a change in threat, advisory services can assist landholders with monitoring conditioning and identifying opportunities from a landscape perspective to further capitalise on the high condition site (e.g. seed source, increasing connectivity, use as an awareness raising site through field walks etc).

The priority actions for the provision of landholder advisory services are:

- Coordination of services and advice across Central Tablelands LLS, including drawing on the knowledge and skills of the ag, biosecurity and vet teams to highlight production benefits from NRM activities

- Developing a joint whole of Central Tablelands LLS approach for improving land management on small holdings with one multi-pronged coordinated program to engage this landholder segment
- Providing tailored advice to landholders with annual 1:1 site inspections to identify site values, recommend potential choices/ actions and refer to other avenues of support
- Work with landholder demand by responding to common areas of interest and learning to schedule group capacity building events.

Future pathways

While the emphasis between the NRM delivery agent and landholder advisory services roles will shift over time as determined by funding and staffing availability, the role of network and partnership facilitator must be maintained throughout. This is critical to build the long-term relationships needed to underpin successful partnerships.

Levels of activity	Role	Advisory Services	Network Facilitator	NRM Delivery Agent
		Continuous region wide efforts	Long-term relationships that opportunistically ebb between networked services and partnered delivery	Opportunistic efforts when funding is available
	Information	Build awareness and understanding of need for NRM, threats, best practice NRM and species identification	Ongoing landholder and community engagement, education and technical support for practice change	
	Advice	Ongoing landholder and community engagement, education and technical support for practice change	Share technical information across the network to maintain common directions	Avoid duplication of financial opportunities available to landholders
	Regional coordination (leveraging)	Refer landholders onto support available	Maintain referral information on behalf of the network and facilitate common understanding across the network	Targeted landholder engagement, education and technical support to prepare for planned incentives
	Financial investments		Develop partnerships and regional investment opportunities for NRM outcomes	Targeted engagement in incentive projects for specific outcomes, with prioritisation to value for investment (making a difference)
	Ongoing monitoring	Periodic site inspections to maintain landholder relationships and monitor changes. Monitoring of high value sites for changes to threats		Ongoing monitoring support and advice. Help landholders to observe and experience the benefits of the works completed

Figure 10: Schematic of the different levels of activity and support provided across the roles

Longer-term outcomes

LT01 Increased use of traditional land management practices and principles

Success in this outcome would be an increase in traditional ecological knowledge, both within Aboriginal communities and by non-Aboriginal land managers and that traditional land management practices (e.g. Traditional burning) and the principles (e.g. cool burns) are incorporated into modern land management by a range of landholders and land managers. Cultural safety is respected with Aboriginal people enabled to work on country, to care for country.

The vision is for the use of traditional land management practices and principles beyond the protection of culturally significant sites, to terrestrial and aquatic resource management. Cultural practices, and the principles of cultural practices, are increasingly used to manage country by Aboriginal and non-Aboriginal people. This is supported by Local Government, Landcare communities and other stakeholders in the Central Tablelands.

Key Performance Indicators

- Number of conservation agreements (and hectares) incorporating traditional land management practices and principles.

- Current land management practices.
- Number of land managers intending to adopt traditional land management practices and principles and area of land impacted (post event feedback).

Traditional land management in Central Tablelands

Traditional land management is underpinned by a worldview that the land is intimately related to people, creating deep respect and empathy for the ecosystem and its parts. In this worldview, the land is not a natural resource to use or extract from but about leaving something behind for 7 future generations. The land is cared for by its current custodians in gratitude to the ancestors who cared for country before them. This creates an ethical relationship with the land, flora, fauna and fungi where people are secondary. In each land management decision, the question becomes 'what would this landscape like?.'

Consideration from the perspective of the ecosystem is expressed in specific practices such as cool burns that gently clear groundcover, leaving food stores in the canopy for native birds

and marsupials, and flowers and seeds unburnt and ready to germinate with green growth. These cool burns maintain woodland structures and native grasses, as opposed to hot burns that encourage growth and reproduction of more fire tolerant species such as grevilleas and other invasive native species, creating higher fuel loads and a cycle of damaging wildfires.

Incorporating sustainable thinking into land management may be as simple as letting native grasslands set seed before grazing or slashing, in this way providing what the grassland would like to survive and thrive. Similarly, revegetation becomes a consideration of where would this tree species naturally occur on this property, as opposed to where is the most convenient place for this tree?

Increased use of traditional land management involves incorporating practices and principles into routine NRM by all land managers.



Artwork telling the story of the Mudgee region – 'Nest between the Hills, Moothi' – By Kylie Tarleton



Cool mosaic burn

However, in some cases (e.g. traditional burning), practices may need to be implemented by suitably experienced people or organisations instead of individual land managers. Practices and principles, such as the use of mosaics to create habitat and life stage diversity across the landscape and the role of songlines and totems in focusing land management efforts are discussed later in this document, under the most relevant outcome.

Critical foundations

Aboriginal people have been successfully sustainably managing the Australian landscape for over 40,000 years (Colloff, 2020). Traditional land management has co-evolved with Australia's flora and fauna, with practices and principles that supports the long-term survival of natural Australian ecosystems. A return of these practices and principles will improve ecosystems and increase the sustainability and health of the landscape.

Partnerships with Aboriginal communities and non-Aboriginal landholders are critical to achieving this outcome. Landholders with a greater sense of public duty or social license pressure may be more willing and interested in forging cooperative partnerships with Aboriginal communities for land management. This includes Central Tablelands LLS in relation to the management of TSRs, Forestry Corporation of NSW and other managers of Crown Land. Other opportunities for Aboriginal people to walk on country and provide landholder site assessments from a cultural perspective may be found working through Landcare groups.

Priorities for investment

Increased use of traditional land management practices and principles by Aboriginal people and communities will require access to country by these groups. Where there is currently access to country that enables Aboriginal people and groups to undertake projects, and there is community interest and willingness, these projects are a priority. It is expected that as outcomes are achieved in the short term outcome 'Enhanced connection of

Aboriginal people to country, community and culture' there will be increasing opportunities for Aboriginal people and communities to undertake traditional land management.

This outcome is also seeking an increase in use of traditional land management practices and principles by non-Aboriginal land managers, via healthy relationships with local Aboriginal people and communities. Stable investment is needed to provide impactful training with ongoing links to opportunities for Aboriginal people to provide NRM services.

Increasing use of traditional land management practices requires an understanding of traditional land management by all Central Tablelands LLS staff and incorporation of traditional land management practices and principles in the other outcomes in this plan. As a result, the priorities for increased use of traditional land management practices and principles by non-Aboriginal land managers go hand in hand with the species and ecosystems targeted, spatial prioritisation and land manager audiences focused on in the other outcomes, as conceptually shown in Figure 11.

Future pathway

There is currently limited access to country and opportunities for Aboriginal people to contribute directly to caring for country. As a result, the current focus of work in this outcome is to support those few groups with access, and to develop connections across all NRM projects to increase the use of traditional land management practices and principles.

This means establishing relationships between traditional land management and the other outcomes in this plan, as shown in Figure 11. It is expected that these relationships will develop over time with acknowledgment of the contribution of traditional land management in NRM evolving into incorporation of practices and principles into the design and implementation of NRM projects.

The second step or phase is to facilitate partnerships with land managers that already have an interest in improving social outcomes through their environmental management. This includes Central Tablelands LLS management of TSRs, Forestry Corporation of NSW and managers of Crown Land.

As acceptance of traditional land management practices and principles increases across all land managers, opportunities for Aboriginal people to walk on country, read country and provide cultural advice on caring for country are expected to develop. Opportunities for Aboriginal people to walk on country and provide landscape assessments from a cultural perspective on private lands may be found working through Landcare groups, as these groups have an established role in fostering social and environmental change in regional communities.



Eucalypt blossoms

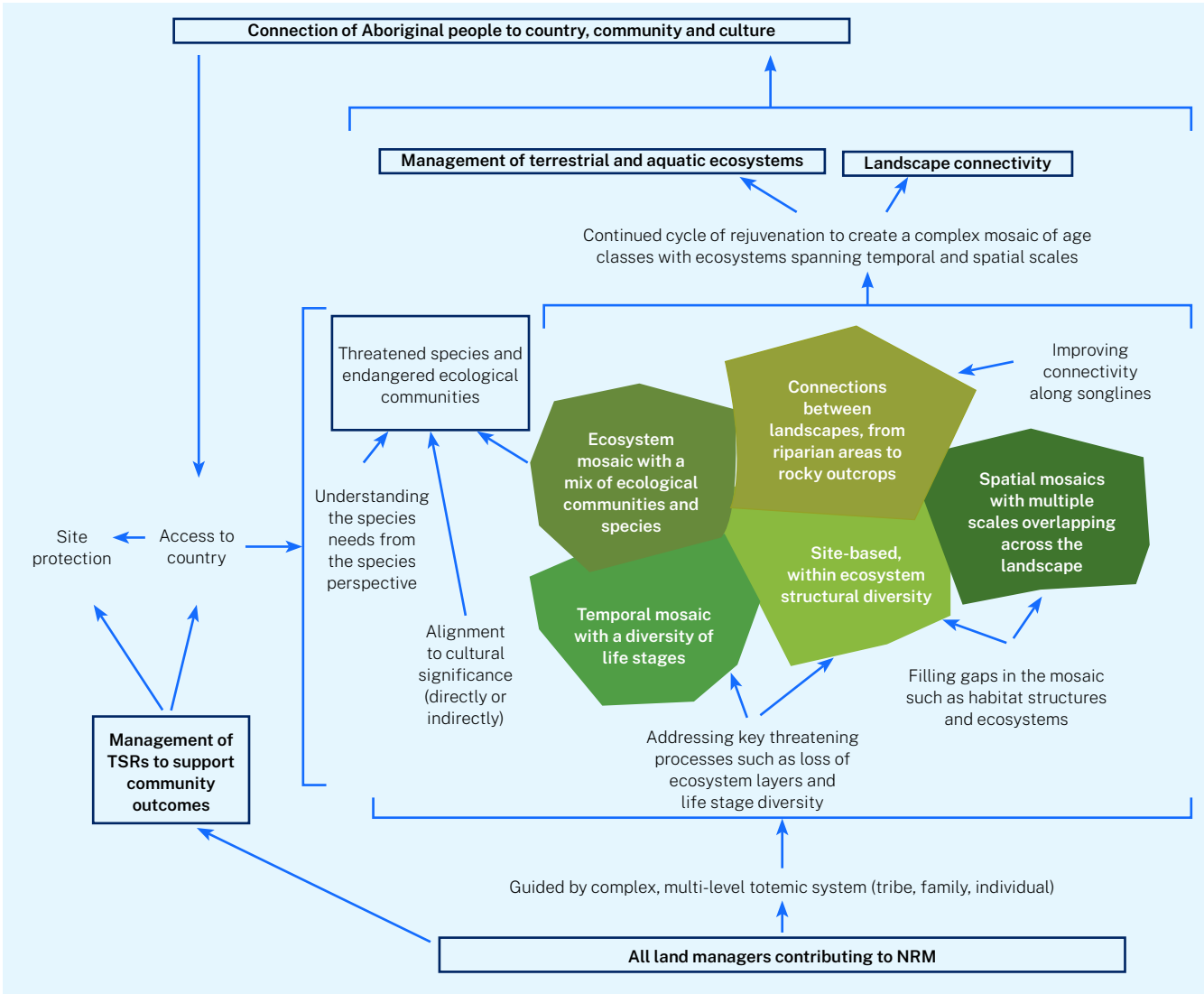


Figure 11: Relationship between traditional land management practices and principles to the other outcomes in this plan

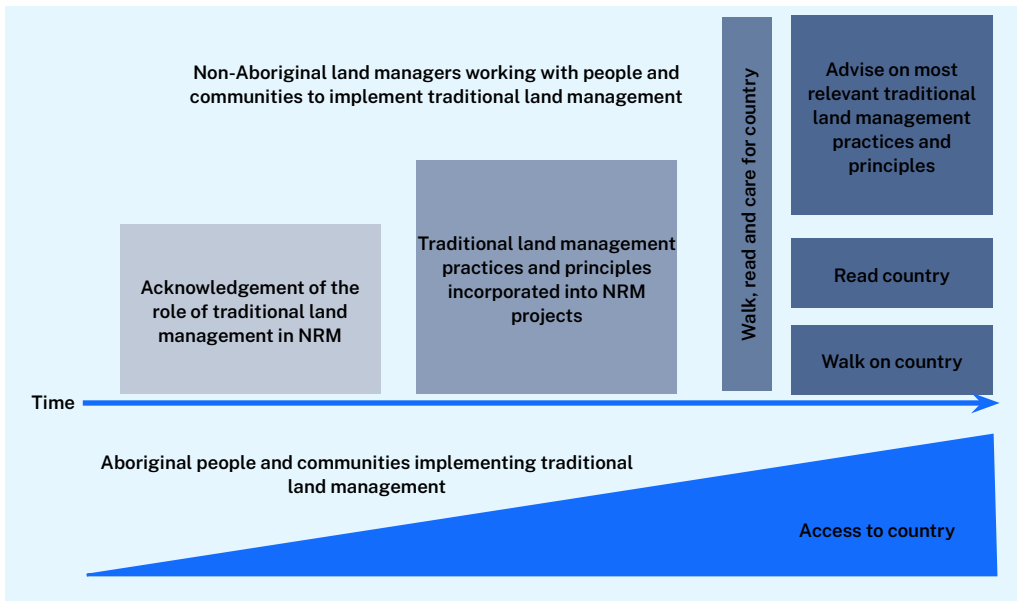


Figure 12: Increasing use of traditional land management practices and principles over time

Longer-term outcomes

LT02 Improved recovery of threatened species and threatened ecological communities

This outcome aims to improve the status of threatened species and threatened ecological communities. For some species or communities, a realistic level of improvement is a slowed rate of decline, whereas for others, stabilisation or recovery may be an achievable objective. Reduced decline and stabilisation are considered improvements to the recovery of the species, along a pathway to increased populations. The targeted level of improvement is determined by the expected ability to control or influence threatening processes and risks posed by other factors. Recovery efforts may be challenged by unfavourable seasonal conditions, changes to habitat outside of Central Tablelands (especially for migratory species) and disturbances such as bushfire. The outcome is aiming for long term improvements at a local scale within the Central Tablelands (10 years).

Key Performance Indicators

- Area (ha) of threatened species, populations or ecological communities enhanced, rehabilitated or protected (statewide metric)
- Number of stakeholder partnerships, number of projects supported and funds invested (statewide metric)
- Outcome monitoring data, in conjunction with DPE and research institutes. This may use indicator species.

Threatened species in the Central Tablelands

A total of 173 threatened species (FM Act & BC Act) have been found within the region, comprising of 6 critically endangered species, 54 endangered species and 113 species listed as vulnerable. There are 5 federally listed Threatened Ecological Communities (EPBC Act). Saving our Species has classified these species as site-managed, iconic, landscape-managed, data-deficient, partnership and keep watch species.

A few of these threatened species may also be species of cultural significance, however it is more common that these threatened species co-exist with culturally significant species (e.g. yam daisy is not endangered but co-exists with several species of endangered orchids) or are found in more culturally favoured habitats (e.g. native grasslands with kangaroo grass, native leek). A holistic, ecosystem approach to threatened species management may address Aboriginal cultural heritage needs.

Improving the populations of threatened species and communities by addressing key threatening processes will deliver co-benefits to biodiversity and the environment more generally, for example, land clearing and inappropriate fire regimes. The key threatening processes relevant to Central Tablelands (appendix

1) have been grouped into 6 themes, highlighting the main challenges facing biodiversity.

- Loss of habitat (e.g. removal of dead wood and dead trees)
- Predation by introduced pest animals (e.g. cats, foxes, Plague Minnow).
- Competition by pest species (e.g. goats, deer, Noisy Miners).
- Ecological changes (e.g. high frequency fires, alteration to natural flow regimes and climate change).
- Weed invasion (e.g. exotic perennial grasses, exotic vines and scramblers).
- Disease (e.g. Psittacine circoviral [beak and feather] disease).

Key threatening process for aquatic species in Central Tablelands include:

- Degradation of native riparian vegetation along NSW water courses
- Introduction of fish to waters within a river catchment outside their natural range
- Removal of large woody debris from NSW rivers and streams.

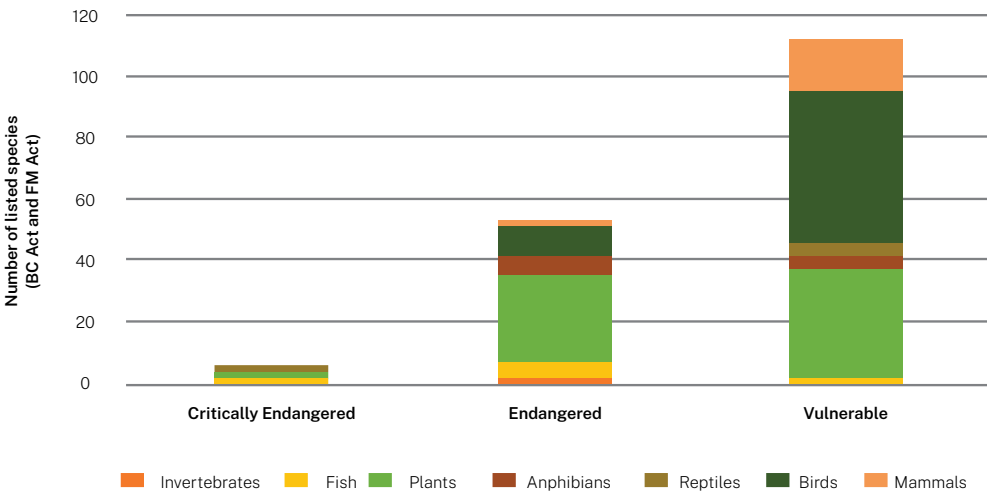


Figure 13: Number and taxon of threatened species known or predicted to occur in the Central Tablelands

The 6 themes of threatening processes are all expressions of an ecological imbalance. For example, predation is problematic when the extent of it causes the decline or loss of another species. Traditional land management may offer an alternative perspective and response to these threats. An Aboriginal land management perspective to bush regeneration is to manage for the desired ecosystem, as opposed to targeting specific threats. For example, rather than focusing on eliminating feral cats, management would instead seek to create the habitat conditions that supports native wildlife. Feral cat control may still feature within a program of actions, as necessary to manage the impacts of feral cats within a balanced ecosystem, but feral cat control is no longer the objective.

Aboriginal communities have identified a loss of balance within the environment, with a lack of rejuvenation. Healthy country has an abundance of resources to sustain native animals and tribal populations with rejuvenation in a continuous cycle that creates a complex mosaic of ecosystem stages across scales with diversity in lifecycles, species and habitat. Some habitat types, and components, such as grasslands and forb layers in woodlands have become rare and this is also threatening the ecosystem balance needed for healthy country.

Critical foundations

There are 2 main assumptions underpinning investments in threatened species. First, it is assumed that if the threatening processes are addressed, there will be recovery of the species. Second it is assumed, or hoped, that reduced decline or stabilisation of species will buy time for other, more effective solutions to appear. The frailty of these assumptions means that critical review of investments is needed so efforts that are not successful can be redressed, and potentially, investments shifted to other species or outcomes that do respond.

Most threatening processes are widespread and making a difference on a large scale is difficult and costly.

Threat elimination is rarely possible, either due to the uncontrollable nature of the threat, confounding factors, or cost of action so instead conservation efforts tend to focus on threat mitigation or management.

There are cumulative threatening processes that compound the impact of each individual threat (Tulloch et al 2018).

Not all species will be negatively impacted by threatened processes and those species that benefit may become problems themselves as a part of ecological imbalance (Tulloch et al 2018). Management of multiple threats may be the most effective and efficient approach.

Managing ecosystems, as opposed to each threat, is a more effective approach to threatened species recovery. This is a more holistic approach that enhances and restores landscapes for multiple species, not just the focal threatened species.

Protection of habitat from threats may be cheaper than restoration, but may also lack additionality to NRM outcomes (Possingham 2015). Similarly, habitat that is already in good condition due to current land management represents lesser change in behaviour and lesser environmental gain (Race & Curtis 2009).

Protection of habitat still requires management to ensure an ongoing cycle of rejuvenation to ensure mixed ages classes. It does not create new habitat, but reduces the threat of ongoing habitat loss. Actions that actively seek to counter threats, such as creating new habitat or replacing instream woody habitat, may provide greater benefits (Possingham 2015). Persistence of species and communities will require recruitment of young within a healthy population covering a range of life stages. For fauna, it will also require a range in life stages of feed plants and other habitat structures for the species' needs to be met now and into the future. A temporal dimension needs to be included in the assessment of species needs with actions identified that promote ongoing species diversity and habitat balance.

Investors are increasingly looking to outcome monitoring. For threatened species investments, this work can be costly and requires expert assistance. In Central Tablelands, Australian National University and DPE have been conducting outcome monitoring.

Climate change will increase disturbances, such as drought and fires. These disturbances will exacerbate threatened species vulnerability. Larger populations and multiple populations may go some way to buffering the impact of these stochastic events.

Priorities for investment

Threatened species prioritisation has been done in collaboration with the Biodiversity Conservation Unit of DPE North-West Branch. This work created a list of 151 species (66 plants, 47 birds, 13 mammals, 10 amphibians, 6 reptiles, 6 marsupials, 2 invertebrates and one crustacean). Of which there were 62 categorised as landscape management, 55 site management, 19 data deficient, 12 keep watch species and 3 iconic species).

Central Tablelands LLS prioritises investment in threatened species or communities based on the following factors:

- regional relevance or is uniquely found in the region
- enough foundational knowledge on the threats and recovery requirements of the species
- co-benefits to other species or broader NRM outcomes
- existing or potential partnerships
- existing programs or projects to build on, particularly if these have been successful
- willing landholders and communities
- cultural significance
- a connection to or is found on private land
- threats that can reasonably be addressed by Central Tablelands LLS
- NSW and Commonwealth Government program investment priorities.



Blue Mountains Water Skink



Regent Honeyeater –Capertee Valley



Macquarie Perch – Retreat River

Where there is flexibility, the above prioritisation principles may be applied to select the most appropriate investment from a Central Tablelands perspective.

In working with Saving our Species, there are strengths that Central Tablelands LLS can contribute:

- in coordinating and delivering conservation projects, particularly where these span multiple landholders and land tenures
- directing landholders to support and services available through Saving our Species
- connecting researchers with willing landholders and communities, including Aboriginal communities and
- facilitating more people to get involved in projects.

Future pathway

When advice and extension services provided to target other outcomes in this plan identify some relevance to threatened species and communities, threatened species and communities information and management considerations will be incorporated.

The main investment in threatened species and communities by Central Tablelands LLS will only occur when external funding is available.

Partnerships with ANU and DPE’s Biodiversity Conservation Unit will remain important for robust outcome monitoring. Scheduled biannual meetings with DPE to share plans for the coming financial year (e.g. April) and check in on current progress (e.g. September, or prior to spring monitoring) would add a formal, structured element to the informal relationship. This would ensure work alignment and create space for additional partnership opportunities to be identified.

Several of the Landcare groups in the region have identified priority species to draw attention to relevant issues and focus local efforts around a common goal. Reviewing the needs of these species to the outcomes and priorities in this plan will help determine alignment. Central Tablelands LLS needs to keep these species front of mind when seeking external funding and develop partnered bids that can build on the base of awareness established by these groups. Where the species identified by Landcare groups are not prioritised by external funders, commonalities in habitat or threat can be used to develop complementary investments.

Landholders are also an important partner in this outcome. Threatened species and communities work is a long-term commitment. Landholder monitoring can be used to change hearts and minds and provide an ongoing point of connection for engagement in future works as opportunities arise.

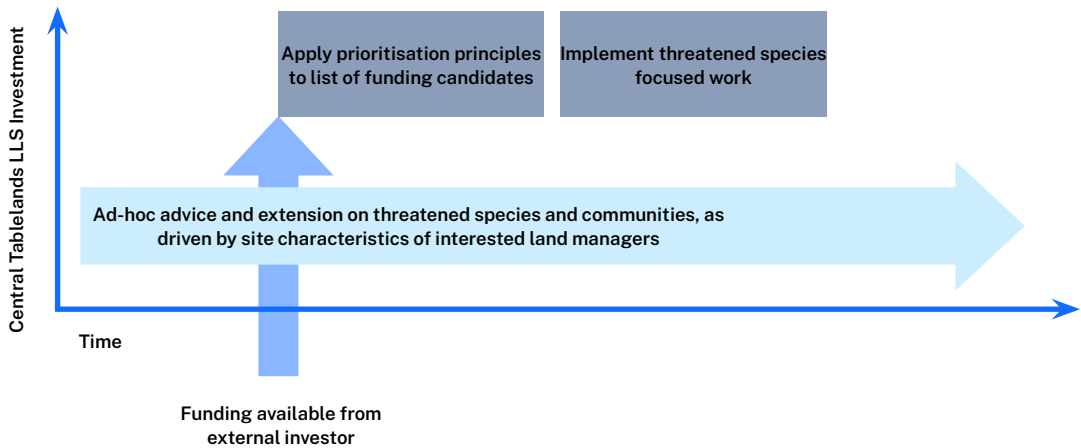


Figure 14: Schematic of shifting priorities over time

Longer-term outcomes

LT03 Improved management of terrestrial and aquatic natural resources

In this outcome the condition and functioning of terrestrial and aquatic ecosystems is improved with increased diversity in habitat types and age structures. Remnant native vegetation has reduced impacts of pests and weeds and increased regeneration of native pastures and native plant diversity, providing habitat for an increasing population and diversity of native fauna. Aquatic ecosystems have increased native plants and macroinvertebrate populations, providing habitat and food for native fish, amphibians and waterbirds.

Key Performance Indicators

- Number of agreements and area (ha) of native vegetation enhanced, rehabilitated or protected (statewide metric).
- Stream length (km) river/estuary enhanced, rehabilitated or projected (statewide metric).
- Area (ha) of wetlands enhanced, rehabilitated or protected (statewide metric).
- Benchmarking survey to identify number of landholders undertaking condition improvement.
- Condition assessment before and after conservation agreements.

Terrestrial and aquatic natural resources in the Central Tablelands

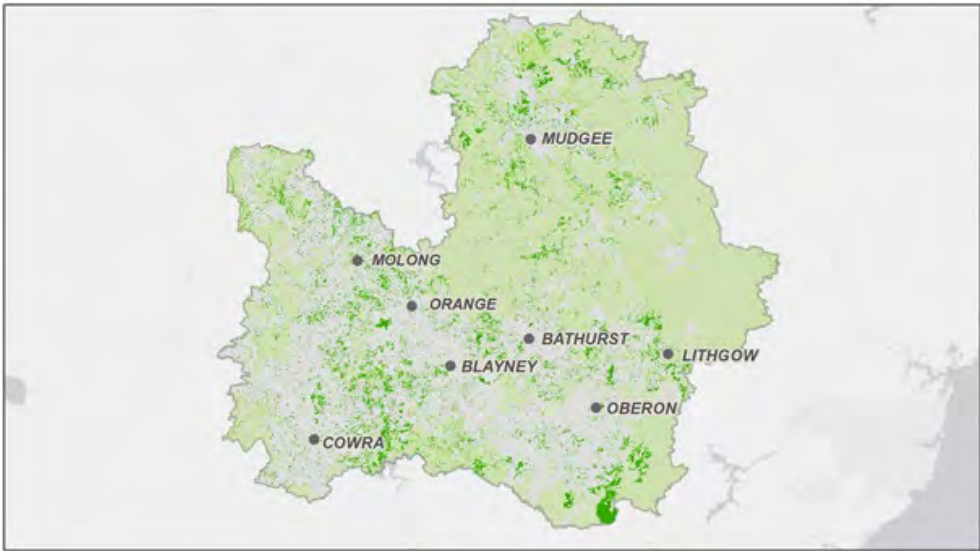
The terrestrial and aquatic natural resources of Central Tablelands have been altered through agricultural production with approximately 38% of the region’s native vegetation cleared and a high proportion stream length regulated (flows are controlled). In this context, the importance of protecting a particular habitat type, river style or Plant Community Types (PCTs) is relative to how much still remains. For example, traditionally both grasslands and woodlands held cultural significance, but the rarity of native grasslands in today’s landscape increases their current day significance.

Terrestrial natural resources

The terrestrial natural resources are more than the threatened species and endangered ecological communities previously highlighted. All terrestrial habitat is important, not just habitat for threatened species and communities. Across the region there is 1,930,520 hectares of remnant native vegetation with 36% of this being over 50% cleared PCTs. There are also important ecosystems that are valued due to their rarity and/or the diversity of flora and fauna that are supported. These ecosystems include:

- Native grasslands, rocky outcrops (see <https://www.sustainablefarms.org.au/node/212>) and songlines
- PCTs that are over-cleared (over 80% cleared for South Eastern Highlands, Mudgee Slopes and Cowra-Molong Slopes, and over 50% cleared in Lithgow-Capertee-Wollemi totaling 275,187 hectares or 14% of remnant vegetation)
- PCTs that buffer conservation areas (public or private lands) or terrestrial remnant vegetation greater than or equal to 50 hectares and
- Threatened ecological communities

Within each of these habitat types, there is also a loss in diversity in life stages. Culturally, a sick landscape is dominated by one cohort of vegetation or species, with other life stages missing. The loss of tree hollows from the landscape is symptomatic of imbalance and a missing cohort of vegetation. Instead, healthy landscapes are multi-dimensional mosaics with fresh new growth and rejuvenating flora and fauna (temporal dimension to the ecosystem), alongside mature structures at both site and landscape scales (spatial dimension with mosaics within mosaics), with a range of habitat types spanning across microclimates (ridges, gullies, flats and waterways).



Native vegetation - above cleared threshold

Native vegetation

Figure 15: Map of over cleared Plant Community Types (PCTs) (80% for South Eastern Highlands, Mudgee Slopes and Cowra-Molong Slopes, and over 50% cleared in Lithgow-Capertee-Wollemi)

Management to improve the condition of terrestrial and aquatic natural resources needs to look across all of these dimensions to create sustaining diversity.

Recreating diverse mosaics requires both a site-based approach and a wider landscape view. On a site scale, system changes such as soil type, vegetation type, aspect and microclimate dictate land management units or mosaics ranging in size from a few square meters to hectares. The health of these mosaics is based on the diversity within the mosaic and how the mosaic relates to other surrounding mosaics in the landscape. Successfully caring for country requires all land managers to take part in managing finer-scale mosaics, to collectively create a larger scale mosaic of diversity.

Aquatic natural resources

There are 2 critical aspects to the health of aquatic ecosystems – structure and function (or hydrology).

1. Structure

River Styles is an evolving framework which provides a physical description and explanation of river forms and processes. This framework can be used to predict future river behaviour and how it has adjusted over time. The River Styles framework helps develop methods for setting geomorphic priorities based on a stream's recovery potential (a measure of a stream's ability to improve its condition). As such highest priority is given to Conservation reaches which are generally rare or fragile river reaches in good condition. Identifying and eliminating potential threats to Conservation reaches is also a main priority as protection is more cost-effective than trying to rehabilitate degraded streams. Further priorities are then characterised by the stream's recovery potential.

River Styles considers the geomorphic structure of a stretch of stream. This is an inactive dataset (the geomorphology doesn't change over time). However, vegetation and other habitat features are also important structural features that contribute to condition and ecosystem

function. At a more localised scale, site based structural diversity in native riparian vegetation needs to include sedges (weaving plants), forbs and semi-aquatic plants alongside trees and shrubs. These lower canopy species are often missing from riparian revegetation efforts, particularly when stabilising banks in incised gullies.

Detailed habitat mapping is being completed by DPI Fisheries. The field-based inspection used in habitat mapping is considered a better, more reliable source of insight on the condition of aquatic habitat than River Styles. At a reach scale where habitat mapping data is available, and the objective is to extend or connect intact aquatic habitat that is in good condition, this should be used preferentially to River Styles. Future habitat mapping is reliant on funding from Central Tablelands LLS. There are 8 high priority streams for habitat mapping identified.

2. Function

The capture and storage of stream and river flows for consumption and irrigation impacts on stream hydrology (duration and seasonal timing of flows of different magnitudes), with implications to the growth and maintenance of instream and riparian vegetation, breeding cues for aquatic species and overall health of the aquatic food web. In those stretches of stream and river where natural hydrological cues remain or are less impacted, there is greater potential for ecosystem restoration. Riparian and in-stream works can provide the structural requirements, with the hydrology providing the ecological cues and processes.

Lengths of stream with less altered hydrology have been identified in recent risk assessments undertaken by DPI for water sources within the Murray-Darling Basin (as summarised in Appendix 3. Aquatic and riparian data). In Central Tablelands it is common for zero flow periods and base flows to be impacted by changed hydrology. In regulated reaches, changes to fresh and high flows are also common. A priority status has been determined for each water source, based on the number of flow components

at either low or high risk, with the results provided in Appendix 3. Aquatic and riparian data.

Critical foundations

Shifting the condition of habitat from poor to fair can require substantial investment and this may limit the number of sites that can be addressed. Improving a moderate or fair condition site is more achievable. The highest gain in biodiversity occurs at lower levels of vegetation cover (Cunningham et al 2007) and rehabilitation can provide greater biodiversity gains than conservation (Possingham et al 2015). In these situations, the investment has greater additional biodiversity benefits, compared to protection of an already high-value site.

It is important to ensure high ecological value sites remain in good condition. Changes to these sites (e.g. property transfer, drought) can increase risk of losing the contribution these sites make to the landscape and services provided (e.g. seed nursery sites). Management of high value sites can be supported by providing a service of ongoing monitoring and advice.

In over-cleared landscapes all remnant vegetation provides a valuable role in maintaining ecosystem function and biodiversity. The patch size needed for species survival is species dependent. The Brown Treecreeper has a territory of between 4-6 hectares while the Squirrel Glider will breed in patches between 10-20 hectares.

Maintaining and improving the condition of remnant vegetation is needed to protect older structures (nesting trees) within the landscape. Patches that currently do not have hollows and other mature features should be protected through to maturity to minimise the future hollow bottleneck.

Altered flow regimes is a major threat to aquatic biodiversity but, where this is due to water regulation (i.e. below major water infrastructure) directly changing flow regimes is out of scope for Central Tablelands LLS.

In these regulated areas, stream stretches with less altered flow regimes are ideal candidates for protection or restoration as these stretches can provide the structure and function (hydrology) required for healthy aquatic ecosystems. At a site scale, erosion and sediment control may require site-scale changes to hydrology.

In unregulated areas, changes to stream hydrology may be required to restore rare upland swamps and wetlands. Installation of leaky weirs and other remediation works in these ecosystems are a high priority for investment. Retention of water in these ecosystems will be increasingly important in a changed climate.

In aquatic and riparian areas, the cost of restoration work is often prohibitive. The concept of diminishing returns is not applied. Instead, the priority is to protect and enhance areas that are in good condition, and then work to extend these areas and link with other areas of good condition

There are production and environmental implications from stock access to riverbanks. Cattle defecate 25% of the time when drinking, with 1kg of phosphorus from manure resulting in up to 500 kg of algal growth (Fitch et al. 2003). From a production perspective, cattle will avoid drinking water that

is contaminated with faeces (0.05mg/g water) when given an alternative clean water source. In the absence of choice, water consumption is reduced at concentrations above 2.5mg/g water and feed consumption is reduced at concentrations above 5mg/g water (Schütz 2012). Weight gains around 20% have been reported for cattle with access to clean water (Schütz 2012).

Conservation areas (e.g. National Parks, TSRs) provide important habitat with ongoing management for biodiversity outcomes. Improving the condition of remnants on private land that adjoin or are close to these conservation areas will effectively extend this high condition habitat further into the surrounding landscape and create a pest animal and weed buffer.

Site condition assessment, such as the habitat mapping by DPI Fisheries provides a sound evidence base for prioritising the protection and enhancement of riparian works. Ongoing partnership with DPI Fisheries can continue to complete habitat mapping, before shifting focus to monitoring and reporting the impacts of investments. Investments to access technical expertise that increases the cost-effectiveness of actions will increase the on-ground impacts that can be achieved with limited funding.



Figure 16: River Styles recovery potential

NRM Landscape	Minimum patch size	Landscape context	Vegetation rarity	
Lithgow-Capertee-Wollemi	2ha	Adjoining larger patches >50 ha or conservation areas	Threatened Ecological Communities	Over 50% cleared PCT
South Eastern Highlands	2ha			Over 80% cleared PCT
Cowra-Molong Slopes	1ha			Over 80% cleared PCT
Mudgee Slopes	1ha			Over 80% cleared PCT

Table 2: Criteria to guide priorities for terrestrial habitat investment in each NRM Landscape

Biodiversity adaptation to climate change will require healthy riparian and aquatic ecosystems that are connected to terrestrial habitat.

Priorities for investment

Prioritisation for investment in condition improvement is guided by current condition and recovery potential. While this can be guided by datasets such as the DPI Fisheries Habitat Mapping and Risk Assessments, final assessment will need to be site based.

Terrestrial

The criteria applied to guide prioritisation of terrestrial habitats for Central Tablelands LLS investment vary in each NRM Landscape, as summarised in Table 2. It is not expected that an individual landholder will meet all these criteria, rather the criteria serve as a guide to the ranking of potential investments. There are also other considerations such as potential risk to the remnant, ability to control influencers of condition from the immediately surrounding landscape and local rarity that may need to be factored in on a case-by-case basis.

In addition to these criteria, landholders with remnants greater than 20 hectares are potentially eligible for funding and support through the BCT.

- Landholders with habitat patches greater than 20 hectares in good condition should be referred to the BCT for support.
- Landholders with greater than 20 hectares in poor to moderate condition should be provided with technical support to improve condition, to work towards eligibility to BCT. In some cases, where there are other co-benefits for priority threatened species or increasing landscape connectivity, financial support may be warranted.

Enthusiastic landholders with remnants that do not meet the criteria below (e.g. minimum patch size), should be supported with technical advice with the longer-term objective of reaching the criteria in future years.

Aquatic

Prioritisation for aquatic habitat is guided by DPI Fisheries Habitat Mapping, DPI Water Sharing Plan Risk Assessments (see Appendix 3. Aquatic and riparian data for further details) and River Styles strategic reaches. These 3 items each provide a different perspective to riparian and aquatic prioritisation and collectively cover habitat values, hydrology and geomorphology. Final investment decisions will need to be determined by a site assessment (habitat mapping) with consideration to the potential to address threats and influence the riparian condition. Across these data sources, riparian priorities are generally to first protect and enhance,

Data source	Low priority	Medium priority	High priority
Habitat condition	Poorer health	Moderate health	Short section of moderate health within stretch of better health
		Short section of poorer health within stretch of better or moderate health	Section of poorer or moderate health immediately upstream from a section of better health that is being impacted by the upstream section
Risk assessment	Highly impacted: More than 50% of flow components at high risk	Medium impact	Less impacted: More than 50% of flow components at low risk
River Styles	Moderate recovery potential	Rapid and high recovery reaches	Strategic

Table 3: Combination of data sources used to determine riparian priorities

second link areas of good habitat and third improve the condition of other areas. Rare riparian features such as upland swamps and wetlands are an overarching priority to restore sponges and filters for their broader ecosystem functions.

Future pathway

The priorities in this outcome have been determined for terrestrial and aquatic ecosystems separately. The simplest approach would be to seek willing landholders with areas that match the priorities shown and encourage those with the highest potential for biodiversity gains.

Technical experts with an appreciation of local contexts, such as ANU, are able to assist Central Tablelands LLS in further identifying priorities and options for improving terrestrial habitat management. Operationalising the approach to prioritisation in this plan (e.g. additionality and diminishing returns) will require changes to current site assessment and project prioritisation tools (e.g. the Environmental Services Ratio). ANU has the skills to assist with this task.

Central Tablelands LLS is positioned well to engage land managers on multiple issues. Landscape level management of threatened species includes improved connectivity between habitats and access to drought refugia including aquatic ecosystems. Working across teams in Central Tablelands LLS will help identify and convey to landholders the multiple benefits of NRM, such as improved animal health and productivity from clean drinking water and shade.

Education from a production perspective (and supporting incentives where possible) that address the barriers to change will encourage more landholders to improve NRM. Consistent messaging across Central Tablelands LLS teams (e.g. Ag Advisory Services and Vet Teams) can provide opportunistic awareness raising in non-priority areas.

An alternative approach or additional level of targeting could be to further prioritise investment based on lowest risk of project failure. This can take into account local seasonal conditions. For example, riparian areas may be more accessible in drier times, and terrestrial revegetation is more likely to be successful in wetter times.

The Central Tablelands region spans the heads of several catchments. Investments to improve aquatic and riparian condition in these areas will deliver downstream benefits. Partnerships with other LLS's are needed for landholders to be connected with catchment scale riparian outcomes.



Capertee River



Valley fill system

Longer-term outcomes

LT04 Management of TSRs to support community outcomes

This outcome recognises that management of TSRs needs to deliver a mix of economic, environmental and social outcomes for a range of stakeholders. There is a balance between revenue raising and maintaining the ecological and cultural values of the reserves. TSR management ensures these reserves provide broader landscape benefits (e.g. habitat connectivity, contribute to pest and weed control).

Key Performance Indicators

- Revenue raised from TSRs (statewide metric)
- Area (ha) of TSRs actively managed (statewide metric)
- Number of regional TSR plans developed (statewide metric)
- Number of permits issued for TSRs and total stock number by class (statewide metric)
- Number and hectares of TSRs assessed for cultural significance
- Number and hectares of TSRs with Aboriginal co-management arrangements
- Percentage of high conservation value TSRs under conservation agreements (number and hectare)
-

TSRs in Central Tablelands

Across Central Tablelands there are 402 TSRs with a combined total area of 3,311 hectares (TSR Plan 2020), however, spatial analysis has identified 413 TSRs with a combined total area of only 2023 hectares (see Table 4).

The fragmentation and size of these TSRs can be limiting to their commercial use through grazing permits and other land management agreements. It can also be limiting to the ecological functions that the TSR can provide. For example, the small average size of TSRs in South Eastern Highlands suggests that most TSRs in this NRM Landscape will need to be located in close proximity with other remnant vegetation to meet the 6hectares patch requirement for Brown Treecreepers, as further discussed in the outcome ‘Increased landscape connectivity in terrestrial and aquatic dispersal corridors.’ From a habitat and connectivity perspective, the local context of each TSR is critical.

Each TSR has been assigned a category largely based on current use, consistent with the State Plan of Management. In the categories of TSRs, Aboriginal cultural values are recognised however there have only been a handful of TSRs that have been surveyed.

The presence of cultural values remains largely unknown with sites remaining unprotected. Desktop analysis of historical data and literature cross referenced to spatial vegetation data has already been successfully trialled as a method to identify potential sites. Ideally all TSRs, including leased out TSRS, would be surveyed for cultural values with the results registered on AIHMS and ongoing protection of sites with Aboriginal community input on appropriate management. Currently there are no co-managed TSRs in Central Tablelands. There have only been 3 Aboriginal cultural heritage projects on TSRs since 2014.

The categories assigned to each TSR also considers conservation values. 2,829 hectares of TSRs managed by LLS in Central Tablelands have also been assessed for conservation value. Of these, 212 or 53% of the TSRs (1,365 hectares or 45% by land area) have been rated as high conservation value, with a further 19% of medium value (1,192 hectares or 39%). There is an additional 634 hectares of high or medium conservation value TSRs in Central Tablelands that is not managed by LLS.



Warree Creek TSR

NRM Landscape	No. of TSRs	Area (ha)	Average size (ha)
Lithgow-Capertee-Wollemi	24	194.0	8.1
South Eastern Highlands	195	674.4	3.5
Cowra Molong Slopes	143	709.1	5.0
Mudgee Slopes	51	444.9	8.7
Central Tablelands	413	2022.5	4.9

Table 4: Number and area of TSRs in each NRM Landscape, based on spatial analysis

Critical foundations

Linear stretches of habitat require fauna to travel further to satisfy their needs. TSRs co-located with other remnants within a network of habitat have greater potential, if condition is appropriate. TSRs that adjoin or are close to other native vegetation may have greater habitat potential and species diversity.

Grazing can be managed to improve biodiversity values, and site-based assessment is needed to apply decision trees such as that in Lunt et al 2007.

Management in line with 'Travelling Stock Reserves Best environmental management practice: Toolkit for travelling stock reserves' will deliver community outcomes

Less resourcing is required to maintain high condition TSRs compared to the investment needed to improve poor condition TSRs.

It is assumed that the different uses of TSRs are compatible, and also compatible with desired outcomes.

TSRs are an important habitat resource for biodiversity adaptation to climate change, providing refuge and connectivity through the landscape.

Priorities for investment

Funding to manage and maintain the TSRs mainly comes from issuing permits, with a longer-term management objective of cost neutrality, however this NRM plan has clear goal of enhancing ecosystem function. The financial objective may at times be at odds with the desire to maintain and protect ecological and cultural values of the reserves. The financial objective assumes that financially viable levels of stock grazing will protect cultural and conservation values. However, it is possible that some TSRs have very high cultural and conservation values that can only be protected with a lesser intensity or frequency of grazing.

The conflict between the management objective of cost neutrality and conservation is exacerbated by the restriction on permit uses. Permits are issued for grazing, with cultural use and conservation values structurally excluded.

Category	Total ha	% of area
1. TSRs that are only used for travelling stock or emergency management and biosecurity purposes. These sites have no other important uses or values.	83.54	2.52%
2. TSRs that are used for travelling stock, emergency management or biosecurity purposes, but they are also important and used for other reasons, e.g. biodiversity conservation, First Nations Peoples' cultural heritage or recreational purposes.	2767.26	83.57%
3. TSRs that are rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation, First Nations Peoples' heritage or recreation. These TSRs are not Stock Watering Places.	395.82	11.95%
4. TSRs, in the Western Division only, that are rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation or First Nations Peoples' heritage. These TSRs are Stock Watering Places.	NA	NA
5. TSRs that are no longer used or valued for any of the above reasons.	64.67	1.96%
Total	3311.29	100%



Remnant vegetation

Table 5: Total hectares of each category of TSRs

Under the current arrangements there are only 2 options to balance financial neutrality with conservation: a) grazing permits subsidise maintaining cultural and conservation values or b) other revenue streams are used to support cultural and conservation values. The forecast TSR permit revenue for 2020-21 is \$95,300. It is clear that other revenue streams are urgently needed to support the sustainable use of TSRs that maintains and protects cultural and conservation values.

A more strategic approach to TSR management is needed to ensure the multiple benefits and values of TSRs are being maximised. Currently there are 634 hectares of TSRs that are not managed by Central Tablelands LLS with unknown results (e.g. how are these TSRs delivering multiple values and public good outcomes?) and a discrepancy of 1,288 hectares between data sources on TSRs in Central Tablelands. At a basic accounting level, these issues need to be addressed to improve public confidence in the management of TSRs. A stocktake that considers all TSR values, including Aboriginal cultural heritage and threatened species and communities is a first step. Acknowledgement of these non-monetised values within a framework for TSR management will go some way in addressing the structural imbalance driven by the state goal of cost-neutrality.

The priority for the conservation of high conservation value TSRs, in the context of Central Tablelands’ landscape and the other desired outcomes in this plan is guided by the criterion in ‘Improved management of terrestrial and aquatic natural resources’ and ‘Increased landscape connectivity in terrestrial and aquatic dispersal corridors’, as summarised in Table 6.

In keeping with the financial objectives, it is imperative that partnerships and funding opportunities are identified for the management of sites that meet the criteria in Table 6, with these partnerships and funding opportunities aimed at reducing the financial driver for issuing grazing permits on these sites.

In addition, it is known that culturally significant sites occur on TSRs,

however there has been no systematic assessment of TSRs in the region. Funding opportunities are needed to support the systematic survey of all TSRs for cultural significance and implement plans to protect. At the least, overtime, cultural assessment of all TSRs is desired and at a minimum any on-ground works that involves ground disturbance or tree removal should trigger assessment. Negotiations with Land Councils for co-management of culturally sensitive sites may open up opportunities to gain access to resources, such as willing volunteers, that can make a valuable contribution to TSR management.

Lastly, it remains unknown which sites are the highest earning sites, and the conservation value of those sites. Further analysis is required to identify high earning TSRs that meet the criteria in Table 6 and determine the investment needed to balance both objectives. This analysis and works on these sites are critical for the long-term financial and conservation management of TSRs in the region.

With respect to ongoing management, the Annual Business Plan identifies the priorities for surveillance for priority weeds and new incursions based on the following high-risk sites and pathways:

- Stock holding areas, e.g. yards or paddocks on TSRs
- Areas within TSRs containing rivers and streams (permanent and non-permanent)
- TSRs rated as high conservation value
- TSRs containing known high risk and priority weeds, or those with a high weed burden
- Priority pest animals in the Central Tablelands Regional Strategic Pest Animal Management Plan 2018-2023.

In addition, at all sites, cultural heritage assessments should be done prior to construction of minor and major infrastructure and this will help provide a step-wise approach to cultural heritage inspection of all TSRs.

Future pathway

The future pathway, as schematically shown in Figure 18, is a steady progression towards a smaller portfolio of TSRs managed solely by Central Tablelands LLS, using Central Tablelands LLS revenue. The early emphasis is on finding opportunities for funding and other support to assist with management, with different options explored for high earning, high biodiversity and high cultural value sites.

TSRs are an opportunity for improved partnerships with Aboriginal communities to increase access to country and enable Aboriginal land management. External funders with both environmental and Aboriginal cultural heritage objectives are likely to be supportive of such initiatives.

Priority	Criteria to be applied to high value TSRs
Very high	10 hectares or greater in Lithgow-Capertee-Wollemi and Mudgee Slopes 6 hectares or greater in South Eastern Highlands and Cowra-Molong Slopes OR adjoining other remnant vegetation to form a habitat patch of the above minimum sizes
High	Minimum patch size of 2ha in Lithgow-Capertee-Wollemi and South Eastern Highlands Minimum patch size of 1ha in Cowra-Molong Slopes and Mudgee Slopes With threatened ecological communities and/or overcleared PCTs (over 80% cleared, or over 50% cleared in Lithgow-Capertee-Wollemi) present

Table 6: Priorities for high conservation value TSRs

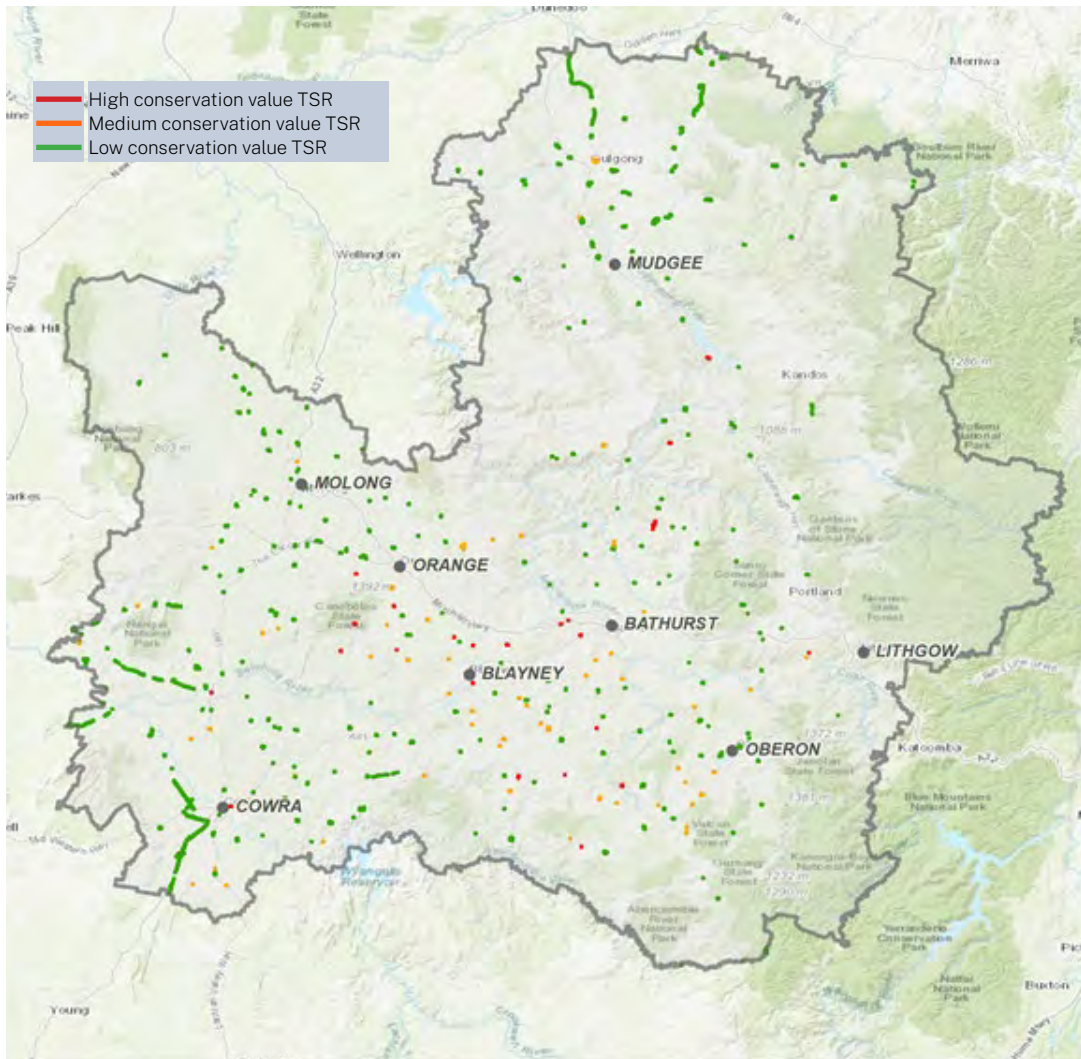


Figure 17: Spatial distribution of high, medium and low conservation value TSRs

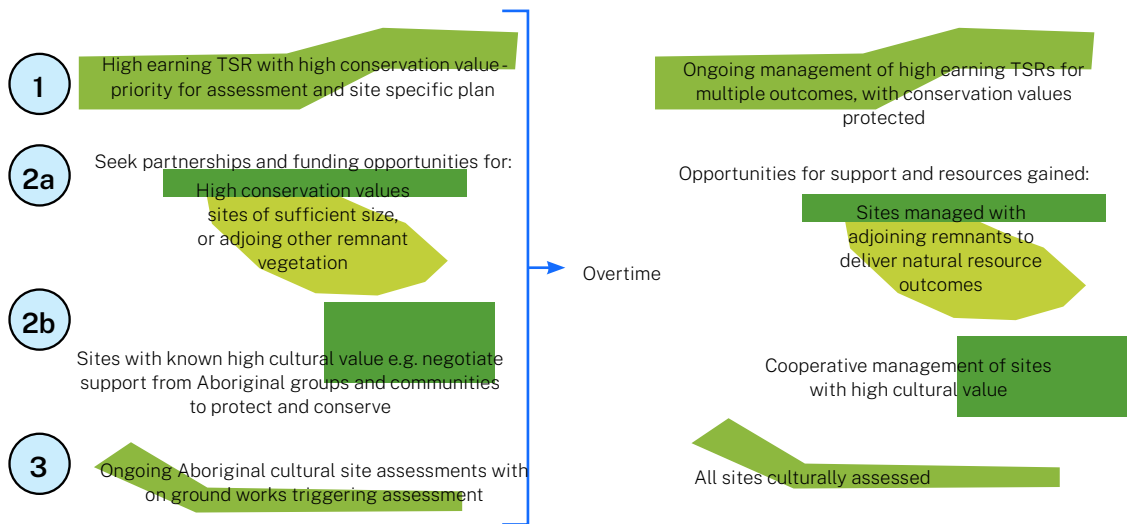


Figure 18: Schematic of TSR prioritisation

Longer-term outcomes

LT05 Increased landscape connectivity in terrestrial and aquatic dispersal corridors

Increasing landscape connectivity is critical for climate change adaptation. Connections are needed at both large scales and across localised climate gradients. Connectivity improvement is not limited to large scale corridors, such as the Great Eastern Ranges (GER). Instead, the focus is on functional connectivity for a range of different species at a local scale, tailored to the surrounding landscape. The resulting range of connectivity levels and styles allows for the needs of willing landholders and their farming enterprises, enabling wide participation from across the community. It also maintains perspective of the broader environment, with desired outcomes relative to the extent of clearing.

Key Performance Indicators

- Area (ha) of native revegetation (statewide metric)
- Number and area (ha) of notifications (SLM) (statewide metric)
- Number and area (ha) of certificates issued (SLM) (statewide metric)
- Area (ha) of native revegetation in each NRM landscape
- Number and area (ha) of notifications (SLM) in each NRM landscape
- Number and area (ha) of notifications (SLM) in each NRM landscape

- Area (ha) of native revegetation to each level of connectivity described in Table 7
- Number of landholders undertaking revegetation

Landscape connectivity and dispersal corridors in the Central Tablelands

In the east of Central Tablelands, in the Lithgow-Capertee-Wollemi NRM Landscape there remains large areas of connected remnant vegetation, with significant areas protected in National Parks. These existing large-scale corridors are of immense value to biodiversity, including threatened species. This large-scale connectivity is of a songline scale. Songlines explain a roadmap allowing Aboriginal communities and people to pass through resource rich areas and survive a multi-week journey to attend important ceremony, such as initiations and burials. A regional example of a songline connects Wellington, Eugowra and Bathurst, through Orange, to initiation on Mt Canobolas.

Areas of remnant connectivity are scattered throughout the region, as shown in Figure 19. In each of these areas there is at least 75% coverage of native vegetation. Life stage diversity within these large-scale dispersal corridors is needed to recreate a sustainable mosaic of ecosystems, operating in temporal (mixed age class) and spatial dimensions.

For larger continuous remnants, areas of rejuvenation are needed within the patch.

The Great Eastern Ranges (GER) is a large-scale connectivity corridor aiming to improve connectivity through a stretch of fragmented larger remnants in the south of Central Tablelands. Substantial effort and resources with long-term commitment will be required to establish this large-scale corridor. The Kanangra-Boyd to Wyangala Link runs from east of Oberon towards Cowra and is actively supported by the Kanangra-Boyd to Wyangala Link Community Conservation Partnership. [A species focus is being used to attract interest.](#)

Figure 19 highlights large areas of the region that are neglected by a focus on large-scale connectivity corridors. In these areas, isolated patches of remnant vegetation are extremely valuable to the survival of local species and native ecosystems and through a mix of remnants, linear continuous strips of vegetation, stepping stone patches of woody vegetation and scattered trees functional connectivity can occur. For example, in the Cowra-Molong Slopes (the most over-cleared landscape in Central Tablelands) there is only 40% of remnant vegetation, with 183,933 patches or 316,339 hectares of remnant vegetation. In these over-cleared landscapes, revegetation that increases patch size and local scale functional connectivity may also provide landscape restoration benefits, such as erosion control.



Grass trees



Corridor plantings



Fish River

There is a total of 1,930,520 hectares of remnant vegetation in Central Tablelands and 87% of this remnant vegetation is in patches of 200 hectares or greater. These large areas can act as reserves of biodiversity, with less disturbed ecosystems and potential for abundant food and habitat for native wildlife. However, there also remains large areas with scattered unconnected small patches of remnant vegetation. Fragmentation of remnant vegetation and the size of remaining patches of vegetation vary in each NRM landscape, as shown in Table 7.

- Lithgow Capertee Wollemi has significantly more remnant vegetation in larger patches, compared to the other landscapes.
- South Eastern Highlands has the greatest percentage of small patches of 0-2 hectares and the least percentage of patches of 2-6 ha. There may be opportunities to connect 0-2 hectares patches and form larger patches.
- Mudgee Slopes and Cowra-Molong Slopes are both characterised by lighter shading and lower mean connectivity scores in Figure 19. The details in Table 7

show a much larger area of remnant vegetation in the 0-2 hectares size category in Cowra-Molong Slopes, and this may be reflective of the larger size of the landscape.

Realistically, revegetation efforts can have greater impact on increasing the size of smaller patches of vegetation. A mosaic is needed across these smaller patches of vegetation. Life stage diversity may need to be created by patches of different stages of rejuvenation, as opposed to life stage diversity within each patch.

Revegetation from an Aboriginal perspective is about looking at the landscape and identifying the parts that are now missing from the ecological mosaic. These missing parts could be species, functions or structures. NRM to support a species requires a holistic view of that species needs now and into the future (taking into account climate change) to re-create the conditions (food, nesting sites, water, protection from predators) that will provide those needs.

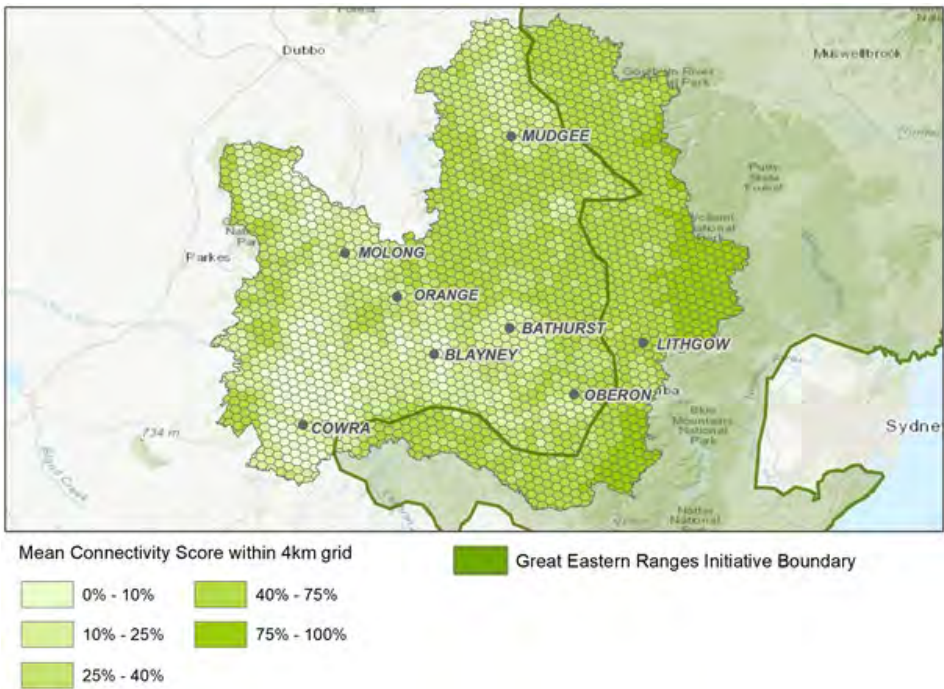


Figure 19: Remnant vegetation, showing existing connectivity and the GER

NRM Landscape	0-2 ha	2-6 ha	6-10 ha	10-20 ha	20-50 ha	50-200 ha	>200 ha
Lithgow Capertee Wollemi	71%	11%	5%	13%			
	534 ha	607 ha	745 ha	1,219 ha	2,342 ha	5,471 ha	482,686 ha
South Eastern Highlands	86%	7%	3%	4%			
	17,708 ha	11,657 ha	10,229 ha	10,777 ha	19,630 ha	38,449 ha	667,838 ha
Mudgee Slopes	78%	10%	4%	8%			
	1,790 ha	1,600 ha	1,259 ha	1,827 ha	3,430 ha	10,613 ha	283,773 ha
Cowra-Molong Slopes	80%	10%	4%	6%			
	8,069 ha	7,032 ha	7,001 ha	8,022 ha	11,875 ha	16,577 ha	252,847 ha

Table 7: Percentage of patches (irrespective of PCT) and total hectares in each size category

Functional gaps may include cool burns that trigger rejuvenation and life stage diversity. Structurally, there is an increasing recognition of the need for shade in the landscape to manage temperatures and create the soil temperature and other conditions for native grasses to establish. This shade is created through canopies. In this way, revegetation is driven by what is needed ecologically, within a broader perspective of the landscape, as opposed to resolving a specific issue. Issues are resolved in the course of building a healthier, sustainable overall ecosystem.

Critical foundations

Squirrel gliders require less than 15m gap between canopies to move through a landscape (van der Ree & Gilmore, 2004). This size gap will also enable movement of the majority of small woodland birds, mammals and reptiles.

In a single night, a squirrel glider can move up to 2km, with home ranges typically between 0.7 to 12 hectares (Korodaj et al 2014).

A 35m buffer around habitat patches is needed for squirrel gliders.

90% of woodland bird species can move between paddock trees spaced no more than 100m apart.

Brown Treecreepers have a territory size of 3-6ha, will move between scattered trees 80m apart and foray up to 1km. These configurations are acceptable for other woodland bird species (Doerr et al 2011).

Woodland birds are an appropriate surrogate for other vertebrates in a farming landscape (Ikin et al).

Bird species diversity declines with declining percentage of remnant native vegetation. The steepest drop (i.e. a threshold) occurs at around 10% native vegetation cover (Radford et al 2005). Other commonly regarded vegetation thresholds are at 30% and 60% vegetation cover (see McIntyre 2000).

The highest relative gains in the diversity of bird species occur with increasing vegetation cover from 5 to 10%

(Cunningham et al 2014). Revegetation in areas of extremely low native vegetation cover (3-5%) can have significant benefits.

Increasing habitat area alone may not be sufficient to arrest species decline. Investment in this outcome should also include habitat management requirements (Ford et al 2009).

In times of drought, revegetation success may be limited. In conditions that are unfavourable for plant establishment, a switch to remnant protection will help species persist.

Priorities for investment

This outcome is flexibly applied to enable a wide range of landholders to contribute. In some situations, a landholder may be interested in creating stepping stones and paddock trees across their property, while in others a landholder may be willing to create a band of continuous vegetation. All of these contributions are valuable, particularly in over-cleared landscapes such as the Cowra-Molong NRM Landscape. The following rubric provided in Table 8 provides a standardised way of looking at each contribution, as tailored to the extent of remnant vegetation in each NRM Landscape and guided by the science on habitat and dispersal requirements. In designing this rubric,

- the ultimate level of ‘ideal’ is species focused and is designed to provide the landscape connectivity required by a focal species selected based on the potential created by existing remnants;
- ‘excellent’ is designed to work in with willing landholders that are balancing social, economic and environmental outcomes;
- ‘good’ is designed to work at an above average level of connectivity for the landscape; and
- ‘fair’ is designed to bring up the average conditions in the landscape.

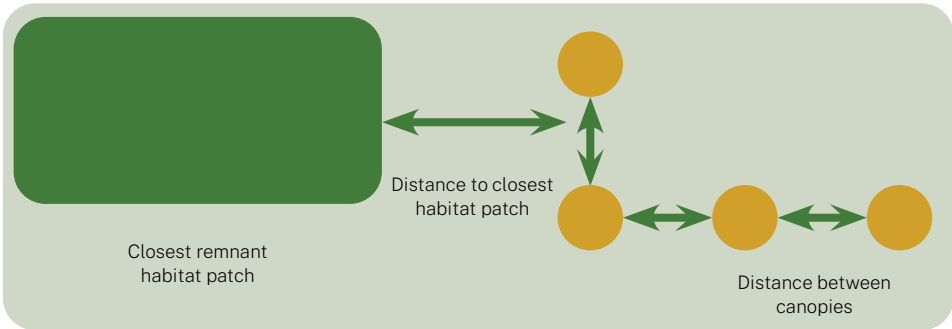


Figure 20: Schematic of terms used to define levels of connectivity in the rubric

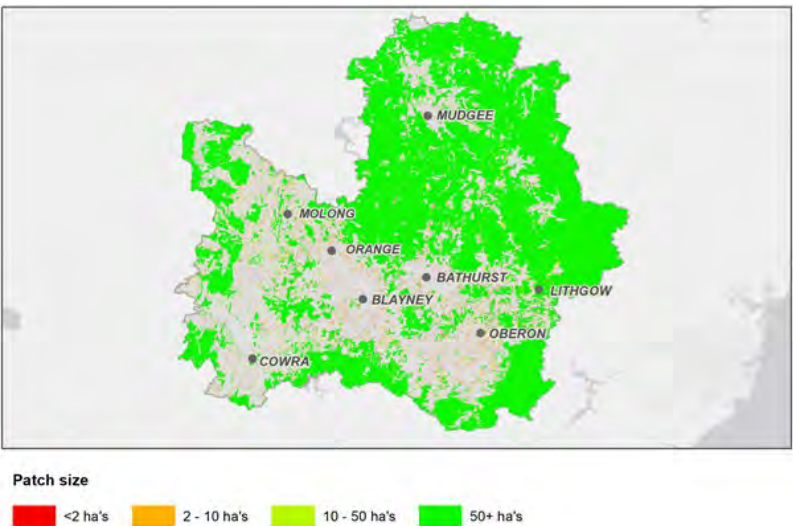


Figure 21: Distribution of habitat patches above across the region

NRM Landscape	Requirement	Fair	Good	Excellent	Ideal
Lithgow-Capertee-Wollemi and Mudgee Slopes	Maximum distance between canopies	100 m apart trees (based on threshold for movement of Brown Treecreeper)		Trees that are no more than 80m apart (based on mean movement of Brown Treecreeper, based on canopy size of a mature tree of 30m, this is a 50m canopy gap)	15m or less between canopies based on squirrel glider needs (also sufficient for the majority of small woodland birds, mammals and reptiles)
	Minimum size of the closest remnant habitat patch	1ha or greater	At least one patch of 2ha or greater	6ha or greater (based on Brown Treecreeper requirements) or a combination of remnant patches within a 500m radius of 6ha or greater	10ha or greater (Squirrel glider will breed in patches of 10-20ha and can have home ranges between 0.7 and 12 ha)
	Maximum distance to closest remnant habitat patch	Distance between habitat patches of 1.5km or less (based on Brown Treecreeper requirements)	Distance between habitat patches of 1km or less (other woodland bird species)	Distance between habitat patches of 500m or less	15m or less between canopies based on squirrel glider needs (also sufficient for the majority of small woodland birds, mammals and reptiles)
South Eastern Highlands and Cowra Molong Slopes	Maximum distance between canopies	Increases to farm scale native vegetation cover for those farms with between 5 and 10% cover (Radford et al 2005). See Figure 23.	Revegetation to create or increase patch size to 2ha or greater	100 m apart trees (based on threshold for movement of Brown Treecreeper)	Trees that are no more than 80m apart (based on mean movement of Brown Treecreeper, based on canopy size of a mature tree of 30m, this is a 50m canopy gap)
	Minimum habitat patch size			At least one patch of 2ha or greater	6ha or greater (based on Brown Treecreeper requirements)
	Maximum distance to habitat patch			Distance between habitat patches of 1.5km or less (based on Brown Treecreeper requirements)	Distance between habitat patches of 1km or less (based on Brown Treecreeper requirements)

Table 8: NRM Landscape tailored rubric for landscape connectivity (standards to strive towards for on-ground works)

The guidance provided in Table 8 will be used in information and extension services, encouraging landholders to strive to higher levels of the rubric. On-ground incentives will be driven by willing landholders, with the rubric offering a potential structure for differential cost-share arrangements. The priorities for investment are:

- Opportunities to increase patch size for patches between 2 and 50 hectares (over 50 hectares to be referred to the BCT), as guided by the minimum patch size in Table 8 and opportunities increase patch size to reach BCT minimum requirements
- Revegetation that increases blockiness of existing habitat patches (to reduce edge effects, and length of home ranges), as guided by the minimum patch size in Table 8
- Opportunities to increase connectivity between patches:
 1. As guided by the rubric in Table 8, this could involve establishment of patches or scattered trees. The rubric sets a higher standard in more connected landscapes.

Other considerations that may be applied on an individual case by case basis includes proximity to water or riparian areas, security of existing habitat patches and habitat condition.

Adaptive management of investments in this outcome will be required to:

- meet minimum requirements set by funding bodies (only where those requirements exceed the rubric); and
- adjust the rubric with new scientific knowledge on species dispersal requirements.

It may also be possible to respond to short-term conditions by targeting investments to NRM Land in favourable conditions for plant establishment.

This outcome has been designed to work in with other Central Tablelands LLS investments.

For example:

- landholders willing to contribute to this outcome may be identified through other services offered by Central Tablelands LLS, such as whole farm planning led by the Ag Services team;
- in years where NRM incentives are heavily targeted to one or 2 NRM Landscapes, investments in this outcome can be used to target other areas of the regions, ensuring opportunities are available to landholders across the region; and
- it may be possible to build on achievements in other NRM outcomes and investments, for example where targeted threatened species work has generated community interest and improved habitat condition.

Future pathways

It is expected that the flexibility offered in this outcome will allow contributions by willing landholders from across the region. Priorities in this outcome may be nuanced over time to suit investor requirements, to balance out the distribution of other NRM investments across Central Tablelands or to leverage off achievements in other NRM outcomes and investments.

Partnerships with other connectivity projects will remain an ongoing opportunity for increasing landholder awareness and bringing resources into the region. Of particular note is the Great Eastern Ranges Initiative and the Kanangra-Boyd to Wyangala Link Community Conservation Partnership. Landcare groups in the region have also undertaken projects to improve

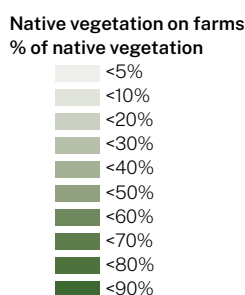


Figure 22: Percentage of native vegetation on each landholding

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Appendix 1. Key Threatening Processes

Listed terrestrial key threatening processes relevant to the Central Tablelands (*Biodiversity Conservation Act 2016*)

- Clearing of native vegetation
- Human-caused Climate Change
- Competition and grazing by the feral European rabbit
- Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)
- Herbivory and environmental degradation caused by feral deer
- Predation by the European red fox
- Predation by feral cats
- Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)
- Predation by the Plague Minnow (*Gambusia holbrooki*)
- Competition from feral honeybees
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
- Bushrock removal
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Ecological consequences of high frequency fires
- Loss of hollow-bearing trees
- Alternation of habitat following subsidence due to longwall mining
- Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations
- Invasion and establishment of exotic vines and scramblers
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. lat)
- Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*
- Removal of dead wood and dead trees

Listed terrestrial key threatening processes relevant to the Central Tablelands (*Environment Protection and Biodiversity Conservation Act 1999*)

- Land clearance
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases
- Competition and land degradation by rabbits
- Competition and land degradation by unmanaged goats
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)
- Predation by European red fox
- Predation by feral cats
- Predation, habitat degradation, competition and disease transmission by feral pigs
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Novel biota and their impact on biodiversity
- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species

Listed aquatic key threatening process relevant to the Central Tablelands (*Fisheries Management Act 1994*)

- Degradation of native riparian vegetation along NSW water courses
- Hook and line fishing in areas important for the survival of threatened fish species
- Human-caused climate change
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes in rivers and streams
- Introduction of fish to waters within a river catchment outside their natural range
- Removal of large woody debris from NSW rivers and streams

Appendix 2. Threatened species prioritisation

Threatened species prioritisation has been done by Central Tablelands with the Biodiversity Conservation Unit of DPE North West Branch. This work created a list of 151 species (66 plants, 47 birds, 13 mammals, 10 amphibians, 6 reptiles, 6 marsupials, 2 invertebrates and one crustacean). Of which there were 62 categorised as landscape management, 55 site management, 19 data deficient, 12 keep watch species and 3 iconic species).

The following prioritisation principles seek to bring forward activities and investments that are more likely to be successful and make a difference to the targeted species or community.

The species list of 151 (Table 11) has been used as a starting point for a refined list of priorities. 10 species and TECs found in Central Tablelands with published SOS plans have been added to the list.

The list of prioritised species and communities requires a need to have priorities that address State and Federal funding opportunities, geographically spread around the region, a mix of taxon and a mix of habitat issues that can be highlighted to landholders and community, to raise overall ecosystem

understanding. Investment and action on species that will have other co-benefiting species, such as occurs with TECs, provides greater value for investment with broader benefits. For this reason, all TECs in Central Tablelands LLS are a priority and 2 groupings of species based on similar habitat requirements have been made for woodland birds and swamp/wetland dependent species. For these groupings, either the grouping can be used to promote the investment opportunity to landholders and community, or an iconic species could be used to attract attention.

As funding requirements and eligible species change, eligible species could be first compared against the list of prioritised species to find common threats or habitats. This will enable Central Tablelands LLS to continue to build on past work, with ongoing investments over a longer timeframe that can be consistently used to make a difference to the trajectory of the prioritised species at a local scale. In the absence of commonality, the Prioritisation Principles can be applied to the eligible species to identify those that most align with Central Tablelands LLS's definition of good investment.

Prioritisation principle	Questions	Rationale
Regional relevance	Is the species or ecological community unique to Central Tablelands? Can the threats be controlled or influenced by changes in Central Tablelands alone?	Ability to influence
Foundational knowledge	Is there enough knowledge on the species or ecological communities needs and the threats to its survival to inform actions? Is there support from a recovery team or other experts?	Potential effectiveness
Co-benefits	Are there co-benefits to other species, communities or broader NRM outcomes?	Multiple values from investment
Partnerships	Are there past or current organisational partnerships	Access to resources/leveraging
Existing programs	Are there existing programs or projects (led by other organisations) that Central Tablelands LLS can support and add to?	Potential efficiencies or additionality
Landholder and community willingness	Are there existing relationships with landholders in the area?	Ability to engage
Cultural significance	Are these landholders interested in and willing to undertake or continue works ? What is the potential to build relationships with the relevant landholders? Are there community groups with an interest in the species or ecological community? Are the opportunities for landholders and communities to contribute?	Cultural significance
Land tenure	Is the species or community of Aboriginal cultural significance?	Delivering services to ratepayers
Past success	Are there Aboriginal communities interested in contributing Traditional Ecological Knowledge or participating in species or ecological community recovery? Does the species co-exist with culturally significant species?	Potential effectiveness
Risk	Is the species or ecological community found on private land?	Likelihood of success
	Does Central Tablelands LLS have positive past experience in making a difference for the species or ecological community that can be extended? What threats cannot be influenced by Central Tablelands LLS? Can the delivery risks be managed?	

Table 9: Threatened species and endangered ecological communities prioritisation principles

Priority species or community	Regional relevance	Foundational knowledge	Co-benefits	Partnerships	Existing programs	Willingness	Cultural significance	Land tenure	Past success	Risk	Central Tablelands LLS status/comment
Temperate Highland Peat Swamps on Sandstone	M	H	H	H	Y	H	H	Mixed	H	L	Multiple benefits
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	M	H	H	H	Y	H		Mixed	H	L	Multiple benefits to Woodlands birds and a range of other Threatened Species
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	M	H	H	H	N	M		Mixed	L	L	
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	H	H	M	L	Y	M		Mixed	M	L	Predominately only in the Central Tablelands region
Woodland birds	L	H	H	H	Y	H	M	Mixed	H	M	Risk of burnout with Regent Honeyeater. Other species also found in Regent Honeyeater plantings.
Swamp/wetland dependent	M	H	H	~	N	~	H	Mixed	~	L	Predominantly in east of region
Small Purple-pea	H	H	H	H	Y	H	M	Mixed	H	L	Good success with current project
Purple Copper Butterfly	H	H	H	H	Y	H		Mixed	H	L	
Booroolong Frog	M	H	H	H	Y	M	H	Mixed	H	L	Limited to east of region
Superb parrot	L	H	H	H	Y	H	H	Mixed	H	L	South-western part of region
Pink-tailed Legless Lizard	L	M	H	H	N	M		Mixed	~	L	Requires rocky outcrops, habitat
Koala	L	H	M	H	Y	H		Mixed	M	M	Mainly east of region, iconic
Squirrel Glider	L	M	H	M	Y	H		Mixed	H	M	Hollow dependent
Southern Pygmy Perch	H	H	H	M	N	M		Mixed	M	M	
Eucalyptus alligatrix subsp alligatrix	H	H	~	H	Y	M		Mixed	M	L	DPE monitoring system in place
Zieria obcordata	H	H	~	H	Y	M		Mixed		L	DPE and community interest
Mountain Trachymene	H	H	~	H	H	~		~	~	L	
Eastern Pygmy Possum	M	L	~	H	H	M		Public	~	M	Community group interest
Tarengo Leek Orchid	L	H	H	H	Y	H		Public	M	M	8 years of monitoring data
Macquarie Perch	M	M	H	M	N	M		Mixed	M	M	
Acacia meiantha	H	H	L	H	Y	H		Mixed	M	M	Species found wholly within our region.
Cudgong Giant Spiny Crayfish	H	L	M	H	Y	M		Mixed	M	M	Species currently found wholly within our region

Table 10: Prioritised threatened species and ecological communities

Note: Woodland birds include Regent Honeyeater, Bush Stone-curlew, Gang-gang cockatoo, Speckled Warbler, Brown Treecreeper, Varied Sittella, Little Lorikeet, Painted Honeyeater, Little Eagle, Swift Parrot, Square-tailed Kite, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Barking Owl, Grey-crowned Babbler, Diamond Firetail

Note: Swamp/wetland dependent include Australasian Bittern, Klaphake's Sedge, Black Gum, Blue Mountains Water skink, Giant Dragonfly, Red-crowned Toadlet

Key: ~ = unknown or untested, Y = yes, N = no, H = high, M = medium, L=low

Scientific name	Common name	TSC Act status	EPBC Act status	Taxon	Management category
<i>Acacia ausfeldii</i>	Ausfeld's Wattle	Vulnerable	not listed	Plant	Site
<i>Acacia bynoeana</i>	Bynoe's Wattle	Endangered	Vulnerable	Plant	Data deficient
<i>Acacia clunies-rossiae</i>	Kanangra Wattle	Vulnerable	not listed	Plant	Keep watch
<i>Acacia flocktoniae</i>	Flockton Wattle	Vulnerable	Vulnerable	Plant	Site
<i>Acacia meiantha</i>	Acacia meiantha	Endangered	Endangered	Plant	Site
<i>Aepyprymnus rufescens</i>	Rufous Bettong	Vulnerable	not listed	Marsupial	Landscape
<i>Anseranas semipalmata</i>	Magpie Goose	Vulnerable	not listed	Bird	Landscape
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	Bird	Site
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	Vulnerable	Vulnerable	Reptile	Landscape
<i>Asterolasia buxifolia</i>	Asterolasia buxifolia	Endangered	not listed	Plant	Site
<i>Baeckea kandos</i>	Baeckea kandos	Endangered	Endangered	Plant	Site
<i>Baloskion longipes</i>	Dense Cord-rush	Vulnerable	Vulnerable	Plant	Site
<i>Boronia deanei</i>	Deane's Boronia	Vulnerable	Vulnerable	Plant	Site
<i>Bossiaea fragrans</i>	Bossiaea fragrans	Critically Endangered	Critically Endangered	Plant	Site
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	Endangered	Bird	Landscape
<i>Burhinus grallarius</i>	Bush Stone-curlew	Endangered	not listed	Bird	Landscape
<i>Caesia parviflora var. minor</i>	Small Pale Grass-lily	Endangered	not listed	Plant	Data deficient
<i>Calidris ferruginea</i>	Curlew Sandpiper	Endangered	Critically Endangered	Bird	Landscape
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Vulnerable	not listed	Plant	Data deficient
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	not listed	Bird	Landscape
<i>Calotis glandulosa</i>	Mauve Burr-daisy	Vulnerable	Vulnerable	Plant	Site
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	Vulnerable	not listed	Bird	Site
<i>Carex klaphakei</i>	Klaphake's Sedge	Endangered	not listed	Plant	Site
<i>Carterornis leucotis</i>	White-eared Monarch	Vulnerable	not listed	Bird	Landscape
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Vulnerable	not listed	Marsupial	Landscape
<i>Certhionyx variegatus</i>	Pied Honeyeater	Vulnerable	not listed	Bird	Landscape
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	Mammal	Data deficient
<i>Chthonicola sagittata</i>	Speckled Warbler	Vulnerable	not listed	Bird	Landscape
<i>Circus assimilis</i>	Spotted Harrier	Vulnerable	not listed	Bird	Landscape
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Vulnerable	not listed	Bird	Landscape
<i>Commersonia rosea</i>	Commersonia rosea	Endangered	Endangered	Plant	Site
<i>Crinia sloanei</i>	Sloane's Froglet	Vulnerable	Endangered	Amphibian	Data deficient
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Vulnerable	not listed	Bird	Landscape
<i>Darwinia peduncularis</i>	Darwinia peduncularis	Vulnerable	not listed	Plant	Site
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Vulnerable	Endangered	Marsupial	Landscape
<i>Dasyurus viverrinus</i>	Eastern Quoll	Endangered	Endangered	Marsupial	Data deficient
<i>Derwentia blakelyi</i>	Derwentia blakelyi	Vulnerable	not listed	Plant	Site

Scientific name	Common name	TSC Act status	EPBC Act status	Taxon	Management category
<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Vulnerable	Plant	Data deficient
<i>Dillwynia tenuifolia</i>		Vulnerable	not listed	Plant	Keep watch
<i>Diuris aequalis</i>	Buttercup Doubletail	Endangered	Vulnerable	Plant	Site
<i>Diuris tricolor</i>	Pine Donkey Orchid	Vulnerable	not listed	Plant	Keep watch
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Endangered	not listed	Bird	Landscape
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable	not listed	Bird	Landscape
<i>Euastacus vesper</i>	Cudgegong Giant Spiny Crayfish	not listed/ *Critically Endangered	not listed/ *Critically Endangered	Crustation	Data deficient
<i>Eucalyptus aggregata</i>	Black Gum	Vulnerable	Vulnerable	Plant	Site
<i>Eucalyptus alligatrix subsp. alligatrix</i>		Vulnerable	Vulnerable	Plant	Data deficient
<i>Eucalyptus cannonii</i>	Capertee Stringybark	Vulnerable	not listed	Plant	Site
<i>Eucalyptus canobolensis</i>	Silver-Leaf Candlebark	Vulnerable	Endangered	Plant	Site
<i>Eucalyptus corticosa</i>	Creswick Apple Box	Vulnerable	not listed	Plant	Data deficient
<i>Eucalyptus macarthurii</i>	Camden Woollybutt	Endangered	Endangered	Plant	Site
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	Vulnerable	Vulnerable	Plant	Site
<i>Eucalyptus robertsonii subsp. hemisphaerica</i>	Robertson's Peppermint	Vulnerable	Vulnerable	Plant	Data
<i>Eulamprus leuraensis</i>	Blue Mountains Water skink	Endangered	Endangered	Reptile	Landscape
<i>Euphrasia arguta</i>		Critically Endangered	Critically Endangered	Plant	Site
<i>Euphrasia scabra</i>	Rough Eyebright	Endangered	not listed	Plant	Site
<i>Falco hypoleucos</i>	Grey Falcon	Endangered	not listed	Bird	Data deficient
<i>Falco subniger</i>	Black Falcon	Vulnerable	not listed	Bird	Landscape
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	not listed	Mammal	Landscape
<i>Genoplesium superbum</i>	Superb Midge Orchid	Endangered	not listed	Plant	Site
<i>Glossopsitta pusilla</i>	Little Lorikeet	Vulnerable	not listed	Bird	Landscape
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	Endangered	not listed	Plant	Keep watch
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable	Vulnerable	Bird	Landscape
<i>Grevillea divaricata</i>		Endangered	not listed	Plant	Data deficient
<i>Grevillea evansiana</i>	Evans Grevillea	Vulnerable	Vulnerable	Plant	Keep watch
<i>Grevillea obtusiflora</i>	Grevillea obtusiflora	Endangered	Endangered	Plant	Site
<i>Hakea dohertyi</i>	Kowmung Hakea	Endangered	Endangered	Plant	Site
<i>Haloragodendron lucasii</i>		Endangered	Endangered	Plant	Site
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	Vulnerable	not listed	Bird	Landscape
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable	Amphibian	Landscape
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable	not listed	Bird	Landscape
<i>Homoranthus darwinioides</i>	Fairy Bells	Vulnerable	Vulnerable	Plant	Keep watch
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	Endangered	Vulnerable	Reptile	Site

Scientific name	Common name	TSC Act status	EPBC Act status	Taxon	Management category
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Vulnerable	not listed	Reptile	Landscape
<i>Ixobrychus flavicollis</i>	Black Bittern	Vulnerable	not listed	Bird	Landscape
<i>Kunzea cabbagei</i>	Cabbage Kunzea	Vulnerable	Vulnerable	Plant	Site
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically Endangered	Bird	Landscape
<i>Leionema sympetalum</i>	Rylstone Bell	Vulnerable	Vulnerable	Plant	Keep watch
<i>Leipoa ocellata</i>	Malleefowl	Endangered	Vulnerable	Bird	Iconic species
<i>Leucopogon fletcheri subsp. fletcheri</i>		Endangered	not listed	Plant	Site
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	Amphibian	Data deficient
<i>Litoria booroolongensis</i>	Booroolong Frog	Endangered	Endangered	Amphibian	Site
<i>Litoria castanea</i>	Yellow-spotted Tree frog	Critically Endangered	Endangered	Amphibian	Site
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	Vulnerable	Vulnerable	Amphibian	Landscape
<i>Litoria raniformis</i>	Southern Bell Frog	Endangered	Vulnerable	Amphibian	Site
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	Vulnerable	not listed	Bird	Landscape
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	not listed	Bird	Landscape
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Vulnerable	Vulnerable	Plant	Site
<i>Melanodryas cucullate cucullata</i>	Hooded Robin (south-eastern form)	Vulnerable	not listed	Bird	Landscape
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	not listed	Bird	Landscape
<i>Miniopterus australis</i>	Little Bentwing-bat	Vulnerable	not listed	Mammal	Site
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	not listed	Mammal	Site
<i>Mixophyes balbus</i>	Stuttering Frog	Endangered	Vulnerable	Amphibian	Landscape
<i>Mixophyes iteratus</i>	Giant Barred Frog	Endangered	Endangered	Amphibian	Landscape
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Vulnerable	not listed	Mammal	Data deficient
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	not listed	Mammal	Landscape
<i>Neophema pulchella</i>	Turquoise Parrot	Vulnerable	not listed	Bird	Landscape
<i>Ninox connivens</i>	Barking Owl	Vulnerable	not listed	Bird	Landscape
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	not listed	Bird	Landscape
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	Vulnerable	Vulnerable	Mammal	Landscape
<i>Olearia cordata</i>	Olearia cordata	Vulnerable	Vulnerable	Plant	Site
<i>Oxyura australis</i>	Blue-billed Duck	Vulnerable	not listed	Bird	Landscape
<i>Ozothamnus tessellatus</i>		Vulnerable	Vulnerable	Plant	Data deficient
<i>Pachycephala inornata</i>	Gilbert's Whistler	Vulnerable	not listed	Bird	Landscape
<i>Paralucia spinifera</i>	Bathurst Copper Butterfly	Endangered	Vulnerable	Invertebrate	Site

Scientific name	Common name	TSC Act status	EPBC Act status	Taxon	Management category
<i>Pedionomus torquatus</i>	Plains-wanderer	Endangered	Critically Endangered	Bird	Site
<i>Persoonia acerosa</i>	Needle Geebung	Vulnerable	Vulnerable	Plant	Site
<i>Persoonia hindii</i>	Persoonia hindii	Endangered	not listed	Plant	Site
<i>Persoonia hirsuta</i>	Hairy Geebung	Endangered	Endangered	Plant	Site
<i>Persoonia marginata</i>	Clandulla Geebung	Vulnerable	Vulnerable	Plant	Site
<i>Petalura gigantea</i>	Giant Dragonfly	Endangered	not listed	Invertebrate	Landscape
<i>Petaurus australis</i>	Yellow-bellied Glider	Vulnerable	not listed	Mammal	Landscape
<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	not listed	Mammal	Landscape
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Endangered	Vulnerable	Marsupial	Iconic species
<i>Petroica boodang</i>	Scarlet Robin	Vulnerable	not listed	Bird	Landscape
<i>Petroica phoenicea</i>	Flame Robin	Vulnerable	not listed	Bird	Landscape
<i>Petroica rodinogaster</i>	Pink Robin	Vulnerable	not listed	Bird	Landscape
<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	Vulnerable	not listed	Bird	Site
<i>Phascolarctos cinereus</i>	Koala	Endangered**	Endangered **	Marsupial	Iconic species
<i>Phebalium bifidum</i>	Phebalium bifidum	Endangered	not listed	Plant	Site
<i>Polytelis swainsonii</i>	Superb Parrot	Vulnerable	Vulnerable	Bird	Landscape
<i>Pomaderris brunnea</i>	Brown Pomaderris	Endangered	Vulnerable	Plant	Site
<i>Pomaderris queenslandica</i>	Scant Pomaderris	Endangered	not listed	Plant	Keep watch
<i>Pomaderris sericea</i>	Silky Pomaderris	Endangered	Vulnerable	Plant	Data deficient
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Vulnerable	not listed	Bird	Landscape
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	Endangered	Endangered	Plant	Site
<i>Prostanthera cryptandroides subsp. cryptandroides</i>	Wollemi Mint-bush	Vulnerable	Vulnerable	Plant	Keep watch
<i>Prostanthera discolor</i>		Vulnerable	Vulnerable	Plant	Data deficient
<i>Prostanthera stricta</i>	Mount Vincent Mint-bush	Vulnerable	Vulnerable	Plant	Site
<i>Pseudophryne australis</i>	Red-crowned Toadlet	Vulnerable	not listed	Amphibian	Landscape
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	Mammal	Landscape
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Vulnerable	not listed	Bird	Landscape
<i>Pultenaea glabra</i>	Smooth Bush-Pea	Vulnerable	Vulnerable	Plant	Site
<i>Pultenaea sp. Genowlan Point</i>	Pultenaea sp. Genowlan Point	Critically Endangered	Critically Endangered	Plant	Site
<i>Pultenaea sp. Olinda</i>		Endangered	not listed	Plant	Data deficient
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered	Endangered	Bird	Landscape
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Vulnerable	not listed	Mammal	Landscape
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable	not listed	Mammal	Landscape
<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable	not listed	Bird	Landscape
<i>Stictonetta naevosa</i>	Freckled Duck	Vulnerable	not listed	Bird	Landscape

Scientific name	Common name	TSC Act status	EPBC Act status	Taxon	Management category
<i>Suta flagellum</i>	Little Whip Snake	Vulnerable	not listed	Reptile	Data deficient
<i>Swainsona recta</i>	Small Purple-pea	Endangered	Endangered	Plant	Site
<i>Swainsona sericea</i>	Silky Swainson-pea	Vulnerable	not listed	Plant	Keep watch
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	Plant	Keep watch
<i>Trachymene scapigera</i>	Mountain Trachymene	Endangered	Endangered	Plant	Site
<i>Tylophora linearis</i>		Vulnerable	Endangered	Plant	Keep watch
<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	not listed	Bird	Landscape
<i>Tyto tenebricosa</i>	Sooty Owl	Vulnerable	not listed	Bird	Landscape
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	Vulnerable	not listed	Reptile	Landscape
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Vulnerable	not listed	Mammal	Landscape
<i>Zieria obcordata</i>	Zieria obcordata	Endangered	Endangered	Plant	Site
<i>Calidris ferruginea</i>	Curlew Sandpiper	Endangered	Critically Endangered	Bird	Landscape

Table 11: Threatened species list

**Pending current listing assessment

Appendix 3. Aquatic and riparian data

In the following table, the risk of insufficient water for the environment is rated as low, medium or high based on the extent of variation from natural conditions.

It does not consider if the required ecological cues or functional processes (e.g. velocity to conserve cobble beds) are still likely to occur within the variation from natural. E.g. the number and duration of small freshes may have decreased substantially but if the required flow (timing, duration, size of flow) for spawning is still occurring, then the ecological impact may be less than that suggested.

There are 2 parts to the information presented, as outlined in the key. The first part is an assessment of the extent of variation, as indicated by L, M or H and the second part is the direction of that change (increase or decrease).



Little River

Assessment of extent of variation		Direction of the variation		
L = Low	< 20% departure from near-natural condition	- = a reduction from near natural	0 = no change from near-natural condition	+ = an increase from near-natural
M = Medium	20-50% departure from near-natural			
H = High	>50% departure from near-natural condition			

Table 12: Key to reading Table 13

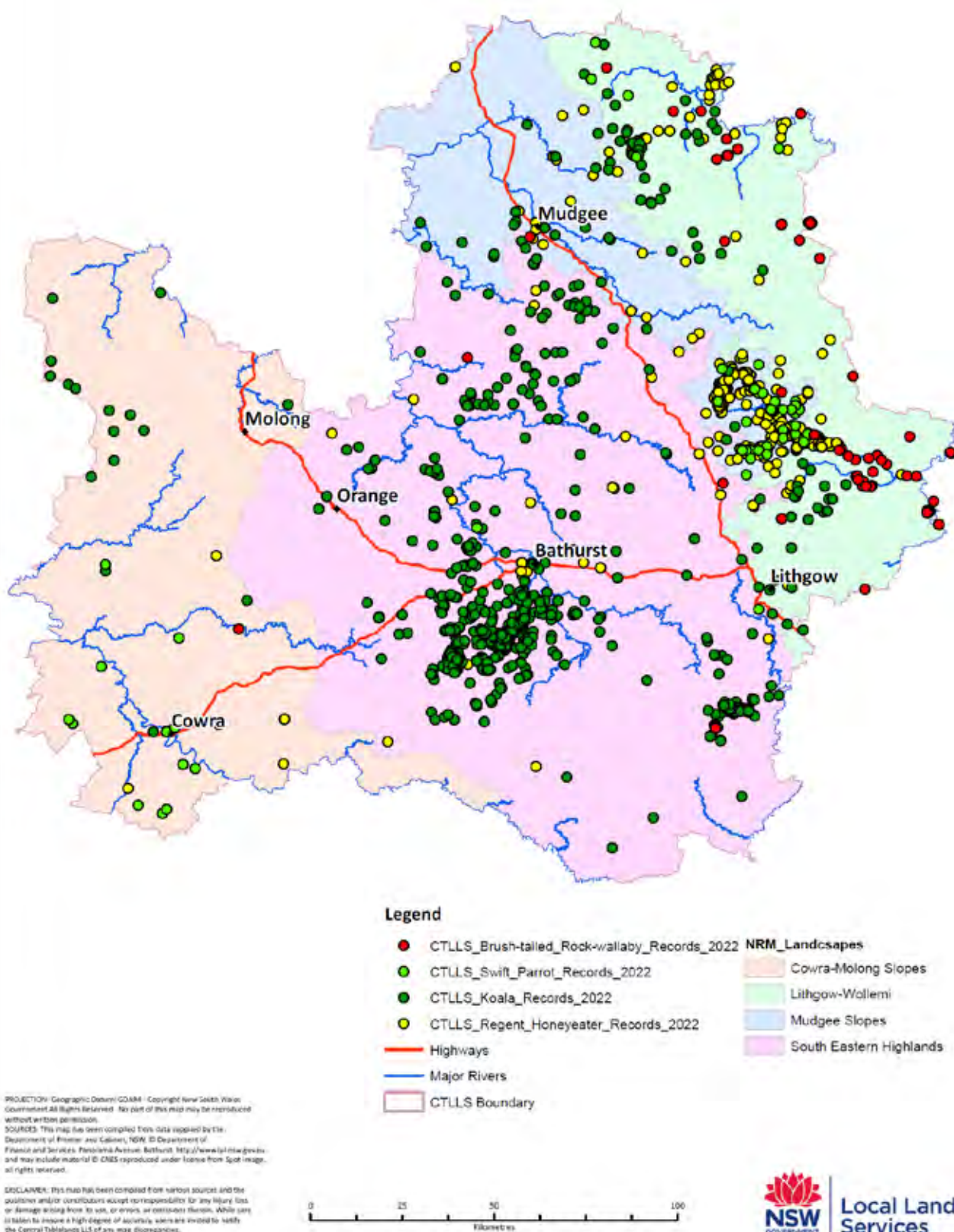
Water source	Zero flow periods	Base flows	Fresh flows	High flows (overbank) (annual recurrence interval)			Priority status in this NRM plan		
				1.5 years	2.5 years	5 years	Low priority (more than 50% of flow components at high risk)	Medium priority	High priority (more than 50% of flow components at low risk)
Unregulated river reaches									
Bell River	H+	H-	L-	L0	L0	L0			X
Burrundong Dam Storage Tributaries	H+	H-	L-	L0	L0	L0			X
Campbells River	H+	H-	L-	L0	L0	L0			X
Cooyal Wialdra Creek System	H+	H-	H-	L-	L-	L-		X	
Fish River	H-	M-	H-	H-	M-	M-		X	
Goolma Creek	L0	L0	L0	L0	L0	L0			X
Lawson's Creek	H+	H-	L-	L0	L0	L0			X
Little River	M+	H-	L-	L0	L0	L0			X
Lower Talbragar River	H+	H-	L-	L0	L0	L0			X
Macquarie River above Burrundong	H+	H-	L-	L-	L-	L-			X
Molong Creek and tributaries	H+	H-	M-	L-	L-	L-		X	
Piambong Creek	H+	H-	L-	L0	L0	L0			X
Pipeclay Creek	H+	H-	L-	L-	L0	L0			X
Queen Charlottes Vale Creek/ Evans Plains Creek	H+	H-	L-	L-	L-	L0			X
Summerhill Creek	H+	H-	M-	L0	L0	L0		X	
Turon/Crudine	H+	M-	L-	L0	L0	L0			X
Upper Bogan catchment	H+	H-	H-	M-	M-	M-		X	
Upper Cudgegong River above Windamere	H+	H-	M-	M-	M-	M-		X	
Upper Talbragar/Goolaburra-Gundy River	H+	M-	L-	L0	L0	L0			X
Wambalong Whylandra System	L+	L0	L0	L0	L0	L0			X
Winburndale Rivulet	H+	H-	L-	L-	L0	L0			X
Castlereagh River Binnaway-Gilgandra	H+	H-	L-	L0	L0	L0			X
Castlereagh River above Binnaway	L0	M-	L-	L0	L0	L0			X
Castlereagh River below Coonamble	H+	H-	L-	L-	L-	L-			X
Regulated river reaches									
Cudgegong River at Rocky Water Hole	H+	H+	H+	H-	H-	H-	X		
Cudgegong River at Yamble Bridge	H+	H+	M-	M-	L-	L-		X	

Table 13: Macquarie-Castlereagh risk assessment results (DPI 2018)

Water source	Zero flow periods	Base flows	Fresh flows	High flows (overbank) (annual recurrence interval)			Priority status in this NRM plan		
				1.5 years	2.5 years	5 years	Low priority (more than 50% of flow components at high risk)	Medium priority	High priority (more than 50% of flow components at low risk)
Unregulated river reaches									
Abercrombie R above Wyangala **	L+	L-	L-	L0	L0	L0			X
Belubula R above Carcoar Dam	H+	H-	L-	L0	L0	L0			X
Belubula Tributaries below Carcoar Dam	H+	H-	H-	L0	L0	L0		X	
Boorowa River and Hovells Creek	H+	H-	L-	L0	L0	L0			X
Crowther Creek	M+	H-	L-	L0	L0	L0			X
Goobang and Billabong Creeks	H+	H-	L-	L-	L0	L0			X
Goonigal and Kangaroo Creek	M+	H-	H-	L0	L0	L0		X	
Lake Forbes and Back Yamma Creek	L+	L-	L0	L0	L0	L0			X
Mandagery Creek **	L+	H-	M-	L-	L-	L0			X
Tyagong Creek	M+	H-	L-	L0	L0	L0			X
Waugoola Creek	H+	H-	L-	L0	L0	L0			X
Regulated river reaches									
Lachlan @ Wyangala Dam	H-	H+	H+	H-	H-	M-	X		
Belubula River @ Carcoar	M-	H-	H+	H-	H-	H-	X		
Belubula River @ Helensholme	H+	M+	M+	L-	L-	L-		X	
** A Cease to Pump (CtP) was included in the modelling scenario									

Table 14: Lachlan risk assessment results (DPI 2018)

Appendix 4a. Central Tablelands priority threatened species distribution –aligning to Australian Government Threatened Species Strategy



Appendix 4b. Central Tablelands priority endangered ecological communities distribution



Legend

♦ CT LLS Offices

— Highways

CT_EECs

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands

Temperate Highland Peat Swamps on Sandstone

Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

NRM_Landscapes

Cowra-Molong Slopes

Lithgow-Wollemi

Mudgee Slopes

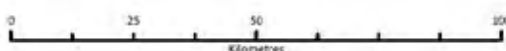
South Eastern Highlands

CTLLS Boundary

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Local Land Services

Appendix 5. Alignment to state and commonwealth priorities

National Landcare Program Phase 2 : 2018-19 to 2022-23	
Regional land partnerships	
5-year outcomes	Central Tablelands LLS outcome
By 2023, there is restoration of, and reduction in threats to, the ecological character of Ramsar sites, through the implementation of priority actions	No Ramsar sites in the region
By 2023, the trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species is stabilised or improved	Reduced decline, stabilisation or recovery of threatened species
By 2023, invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions	Impacts of disease, weeds and pests on agricultural and ecological systems are minimised. Improved management of key threatening processes
By 2023, the implementation of priority actions is leading to an improvement in the condition of EPBC Act listed threatened ecological communities	Reduced decline, stabilisation or recovery of threatened species
By 2023, there is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation	Landholders and community contribute to NRM
By 2023, there is an increase in the capacity of agriculture systems to adapt to significant changes in climate and market demands for information on provenance and sustainable production	Landholders can manage healthy, functioning landscapes for agricultural production (see Ag Plan)

Table 15: Alignment to state and commonwealth priorities

National Landcare Program Phase 2 : 2018-19 to 2022-23		
Regional land partnership priorities	Alignment to NRM Plan	Current Central Tablelands LLS investment delivery
Threatened species strategy species		
Australasian Bittern (Bird) <i>Botaurus poiciloptilus</i>	Rare occurrence in Central Tablelands. Lack of foundational knowledge (no National Recovery Plan or Saving Our Species strategy).	No current investment
Fairy Bells (Plant) <i>Homoranthus darwinioides</i>	A NSW keep watch species. Only potentially found in Lithgow LGA based on predicted distribution. Lack of foundational knowledge (no National Recovery Plan or Saving Our Species strategy).	No current investment
Malleefowl (Bird) <i>Leipoa ocellata</i>	Unlikely to be found in Central Tablelands	No current investment
Regent Honeyeater (Bird) <i>Anthochaera phrygia</i>	Included in Woodland Birds priority group (See Table 10).	RLP Woodland Birds on Farm Project
Small Purple-pea (Plant) <i>Swainsona recta</i>	Listed as priority (See Table 10)	RLP Searching for Swainsona Project
Swift parrot (bird) <i>Lathamus discolor</i>	Included in Woodland Birds priority group (See Table 10)	RLP Woodland Birds on Farm Project
Threatened ecological community		
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	All threatened ecological communities are listed as priority (See Table 10)	No current investment
Natural Temperate Grassland of the South Eastern Highlands		No current investment
Temperate Highland Peat Swamps on Sandstone		NSW SoS Swamped by Threats Project. RLP Pest Mitigation and Habitat Projection Phase 1-2, Bushfire Recovery Phase 3 Project
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion		RLP Bushfire Recovery Phase 3 Project
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		RLP Driving Corridor Connectivity Project
Threatened Ecological Community		
The Greater Blue Mountains area	Within the Lithgow-Capertee-Wollemi and South Eastern Highlands NRM regions	RLP Living on the Edge Project. RLP Pest Mitigation and Habitat Projection Phase 1-2, Bushfire Recovery Phase 3 Project

National Landcare Program Phase 2 : 2018-19 to 2022-23		
Regional land partnership priorities	Alignment to NRM Plan	Current Central Tablelands LLS investment delivery
Soil priorities		
Hillslope erosion	Addressed in Ag Plan. See outcome ‘Increased adoption of sustainable production practices’	Addressed in all Central Tablelands LLS Ag delivery (Federal and NSW investment)
Acidification		
Soil carbon		
General Priorities		
Native vegetation and biodiversity	Addressed in all outcomes	Addressed in all CTLLS NRM delivery (Federal and NSW investment)
Supporting agriculture systems to adapt to change	Addressed in Ag Plan. See outcome ‘Improved resilience to climate risk and adaptation’	RLP FARM project
Future priorities will be considered and implemented following the method and approaches detailed in this NRM plan. The connection between process and approach allows this NRM plan extended currency.		

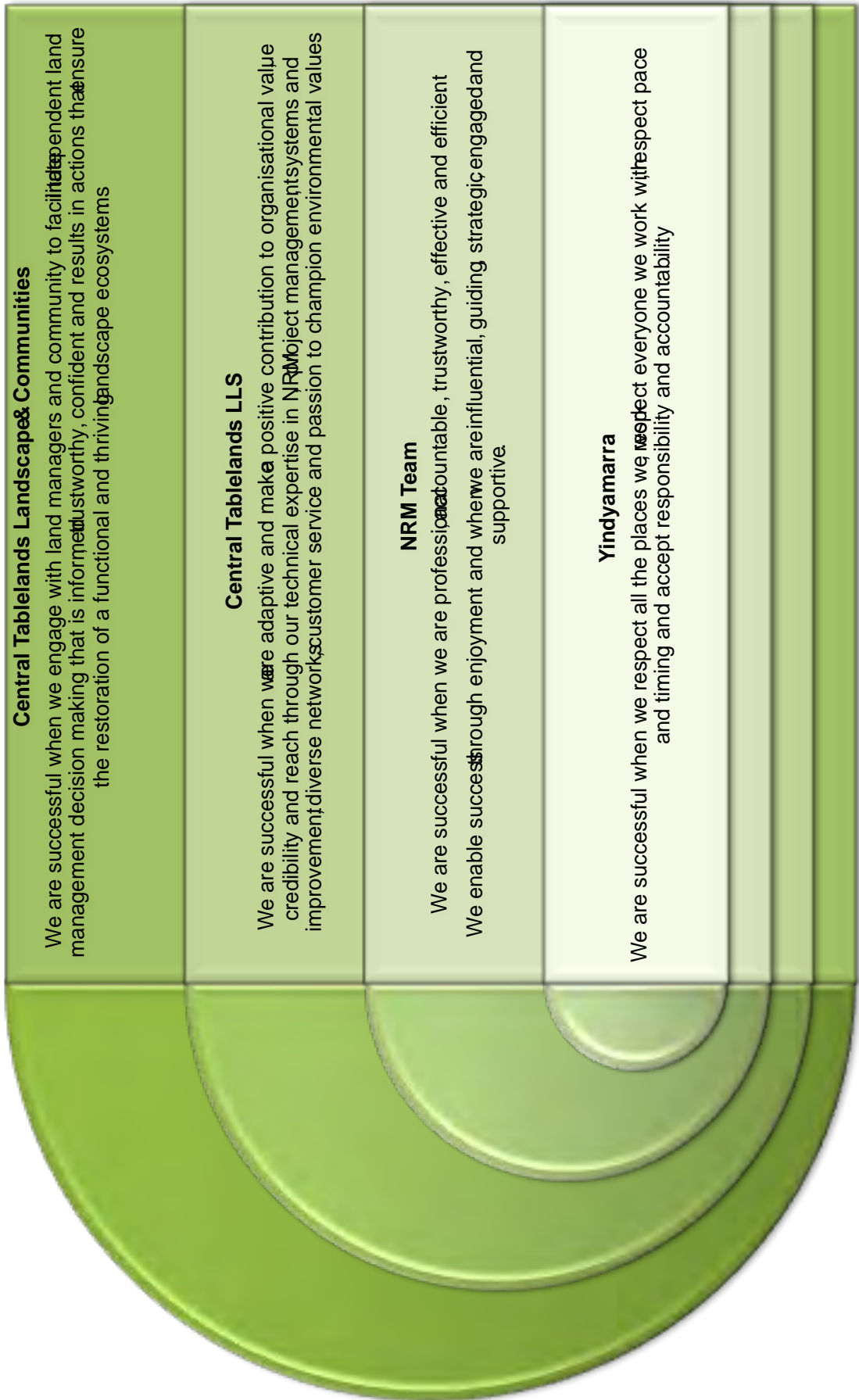
Table 16: Regional land partnership priorities for Central Tablelands

Appendix 6. NRM team success pathways and KPIs

Success	Central Tablelands landscape and communities	Central Tablelands LLS	NRM team
	We are successful when we engage with land managers and community to facilitate land management decision making that is informed, confident and results in actions that ensure the restoration of a functional and thriving landscapes ecosystem.	We are successful when we make a positive contribution to organisational value, credibility and reach through our technical expertise in NRM, culture of good Governance, systems and improvement, diverse networks, customer service and passion to champion environmental values.	<p>We are successful when we are professional, accountable, trustworthy, deliver on commitments, effective and efficient.</p> <p>We enable success when we are influential, guiding, strategic and supportive.</p>
Pathways for outcomes	<p>Yindyamarra We are successful when we respect all the places we work, respect everyone we work with, respect pace and timing, accept accountability and responsibility.</p> <div> <div>Building partnerships and maintaining positive relationships with landholders, communities, partners, peers and colleagues</div> <div>Fostering management change for NRM improvement</div> <div>Communities seeking our technical information and advice</div> <div>Communities primed to, and delivering really good outcomes</div> <div>Supporting the organisation to secure outcomes and demonstrate value</div> <div>Analysing data and reporting to support planning and decision making and innovation</div> </div> <p style="text-align: center;">NRM extension</p> <div> <div>Capacity</div> <div>Good communication and resources</div> <div>Collaboration and co-design</div> <div>Leadership</div> <div>Effectiveness</div> </div>		
KPIs	<ul style="list-style-type: none"> Number of groups or partnerships supported Number of opportunities created for participation and engagement Number of 1:1s or landholders satisfied 	<ul style="list-style-type: none"> Number of decision support tools, or resources developed Uptake of decision support tools, or resources Uptake of projects Number landholders adopting best practice (Lag indicator measured infrequently) 	<ul style="list-style-type: none"> Number of staff referring new clients for NRM advice
Assumptions or dependencies	<ul style="list-style-type: none"> Proactive v's reactive engagement with the community – expectation needs to be set and managed. Reactive service delivery may not necessarily be addressing the highest risk or effective pathway. NRM extension service to work ahead of and aligned with investor projects to enhance project participation and high quality outcomes. 	<ul style="list-style-type: none"> Review current staff roles and decide to have either dedicated extension officers or prioritise the current resourcing/staff. Work to educate the community that LLS is not just a source of incentive funding for NRM projects and promote the value of our advice and information. Projects are a catalyst for extension and vice versa. Current advice and information is offered on the following: erosion, plant identification, revegetation, riparian, threatened species, vegetation/habitat in response to ad-hoc inquiries. Practice change monitoring would be ideal to demonstrate the value of an extension service. 	<ul style="list-style-type: none"> Align staff extension expertise with skill and passion. Extension requires provision of appropriate tools to landholders for them to undertake projects without being reliant on funding grants. Ideally extension develops a relationship with a client that allows co-design of projects and opportunity to constructively negotiate either incentive offers and/or other non-monetary incentives for well thought out highly effective projects offering multiple outcomes.

Table 17: NRM Team Success Pathways and KPIs

Natural Resource Management Team Success Statement



Appendix 7. Community and stakeholder consultation

Consultation included representatives from regional Landcare groups, Aboriginal community organisations and other community groups involved in NRM, State agencies and other organisations currently partnered in the delivery of NRM in Central Tablelands. The consultation was an opportunity for stakeholders to gain clarification on the plan, provide feedback and discuss partnership opportunities and needs. Consultation took the form of a semi-structured phone conversation covering the broad questions of:

1. Do you have any questions about the plan? Or are there parts of the plan that I can clarify?
2. What do you think of the plan?
3. Are there any red flags here from your perspective? What do you suggest to resolve?
4. What can be improved?
5. How does the draft NRM plan align with your organization's thinking and direction?
6. Are there opportunities to work together on the outcomes and priorities?
7. Looking forward, what does CTLLS need to do for this partnership?

The following provides a summary of the feedback received and discussions. Specific technical detail feedback and partnership opportunities have not been included in this summary, but conveyed to CTLLS separately.

Overall feedback

All except one person had positive overall feedback with comments on how comprehensive, sensible it is, with the outcomes addressed well. Comments included 'Its pretty cool. Better than expected' and 'really liked it, a good amount of detail.' The one person who had overall negative feedback said 'I just don't get it'; that it's a complicated

document and questioned the target audience. Once clarified that it is to direct CTLLS work and a separate public facing document may be developed, the response changed to 'the content is great and if its for internal use that's fine.'

It's clear where the document fits in existing planning structures. Consistency with the statewide NRM plan will be key to forging across LLS partnerships. The state NRM plan will need to be put into a local context like this with landscape scale thinking.

Aboriginal cultural heritage

The most commonly noted point of feedback was the integration of Aboriginal cultural heritage (ACH) throughout the plan (as opposed to a tack on at the end). The level of detail was considered impressive - 'It's a fundamental shift and nice to see this generational change. Don't know how it will translate given lack of capacity but it's a good step. I think it's the first time integration like this has been attempted'. This was seen as very positive step to building awareness and recognition, and in alignment with future funder directions.

The integration of ACH also frequently raised concerns on CTLLS capacity in this area and expectation management.

NRM landscapes

NRM landscapes were received positively, as making sense and ensuring not just one area gets all the attention. Greater clarity on the projects and services available in each landscape would help Landcare groups understand what's actually available in each area.

Key improvements

Climate change is missing and needs to be addressed throughout.

Additional work on understanding landholder segmentation (e.g. smaller and lifestyle block owners) and methods to target would enhance delivery, including coordinated delivery across CTLLS and the network of NRM service providers.

Organisational fit

Scoping out the fit of CTLLS in regard to other available programs such as BCT is a smart way to go, but it can go further with other programs such as Land for Wildlife also available. Getting shared clarity of different NRM service providers (community groups and organisations) in the region and the services available will help the collective network work together to refer landholders to the most appropriate support.

Prioritisation

The approach to prioritisation was supported with particular appreciation of the approach to work with willing landholders and acknowledgement of trade-offs (e.g. TSR). The adaptive management was also highly regarded.

Investments

The next steps will need to look at how this plan translates to projects and actions. E.g. How does the plan relate to current NLP projects that have 3 years still to go? How will existing delivery change? Where are the gaps in current delivery?

Communication/language

The language of the document is too technical and assumes the same depth of knowledge across all readers. Document will need a common language put over it before/if a simplified version goes out to landholders.

Partnerships

The majority of people interviewed spoke highly of the partnership and relationships already in place. The successful partnerships are where:

- Long-term commitment has meant relationships have developed over time, becoming more informal
- Consistent and reliable responses to enquires from the partner and help is always available
- Staff dedication and commitment on both sides to a common goal
- Flexibility and freedom in the partnership, with CTLLS allowing the partner some self-direction over activities. E.g. a MoU with an approval process prior to expenditure means ongoing dialogue and negotiation is needed and this ensures a working level of connection is maintained between the organisations.
- Staffing stability.

Conversely, where partnerships were not working well there had been Central Tablelands LLS staff turnover, enquiries had been left unanswered and connection at the leadership level of the organisations was also absent (indicating no leadership support for the partnership).

Partnership next steps

The NRM plan was regarded as a great first step in opening up and clarifying Central Tablelands LLS directions. Central Tablelands LLS can identify landscape level problems and design potential solutions. This knowledge and skill can be used to help potential partners identify areas to contribute to. Greater awareness of current Central Tablelands LLS programs (across all of Central Tablelands LLS) and the expertise and information available will help community groups and organisations identify potential points of contribution.

Some formalisation of the network of NRM service providers would help all contributors to refer landholder enquiries appropriately, extending the respective reach of each group. There were also specific approaches outlined for larger organisations including biannual planning and reporting workshops and co-design of larger projects.

The next step was commonly seen as a sit down conversation to work up potential projects and activities.

- For some larger organisations, a list of current and pipeline projects to discuss and identify opportunities for collaboration or co-investment.
- Regular discussions on current and possible future priorities will further some partnerships.
- Contribution through steering committees can enhance knowledge sharing.
- Reports such as the habitat mapping should be presented to relevant potential partners to coordinate actions.
- Partnerships with flexibility such as an MOU on desired outcomes with seed funding that is used on an 'as proposed-as approved basis' will ensure ongoing conversations and negotiations that can develop long-term relationships.
- Technical knowledge holders can assist with project design and project implementation processes (e.g. ESR).



Temperate Highland Peat Swamp on Sandstone

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