



## Landscape Investment Plan for the Kanangra-Boyd to Wyangala Link

Securing the future of our land, water and wildlife  
between the Greater Blue Mountains and Wyangala Dam

## Purpose of this Investment Plan

The Great Eastern Ranges Initiative (GER) is a voluntary conservation effort that is bringing people and organisations together to protect, link and restore 3,600km along the Great Dividing Range and Great Escarpment extending from centralwest Victoria through the Australian Capital Territory and New South Wales to tropical far north Queensland.

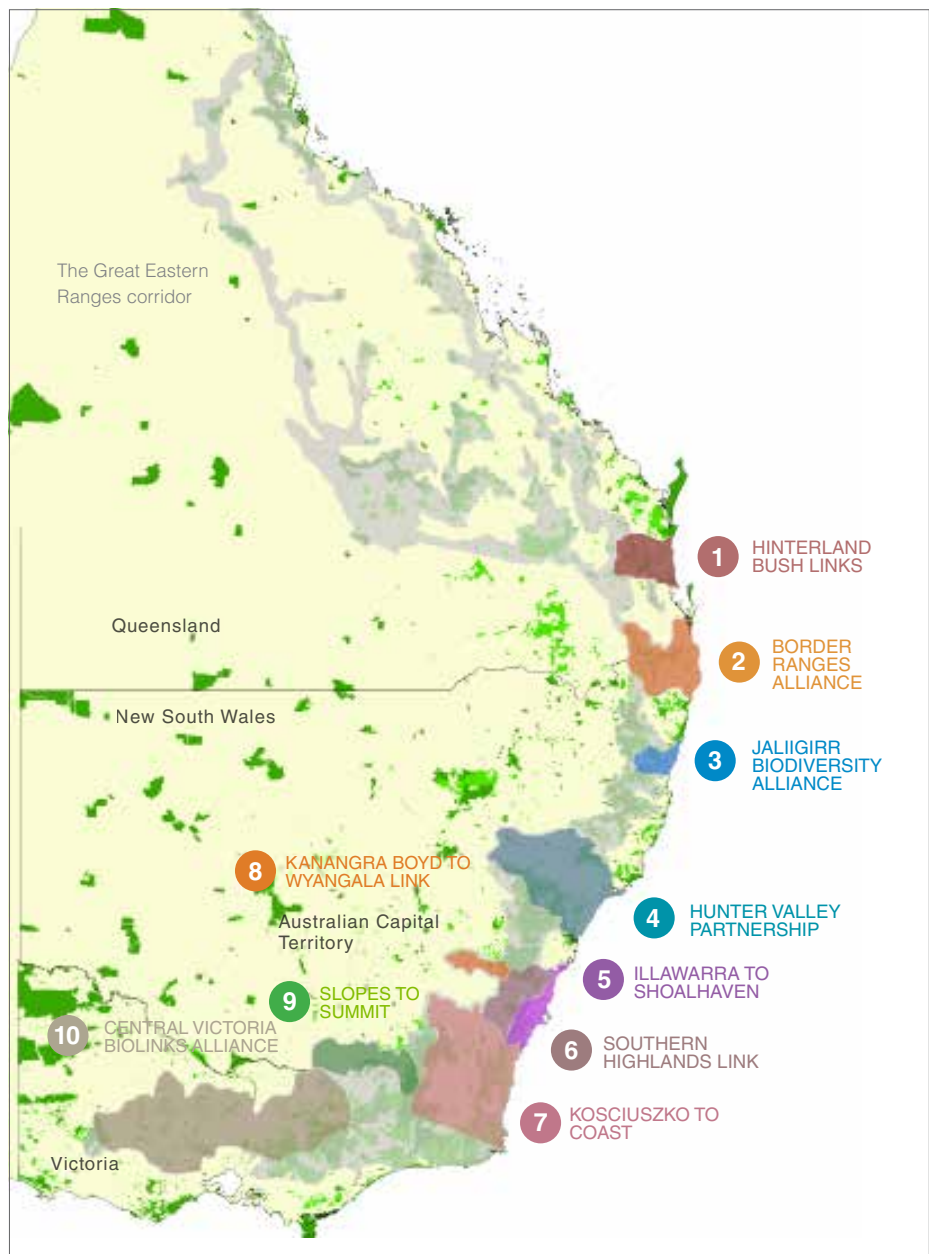
Threats posed to the connectivity, health and resilience of natural ecosystems have the potential to isolate and weaken species survival and movement in the landscape. These threats include the impacts of climate change, pests and weeds, inappropriate fire regimes, land clearing and other land use change. Compromised ecological connectivity impedes the optimal functioning of natural ecosystems and degrades conservation values.

GER presents an opportunity to reduce the risk of wildlife and their habitats not being able to withstand and adapt to the increasing pressures placed upon them. At a landscape scale, private and public landholder and community involvement and support is fundamental to addressing this challenge across all land tenures and to achieve long-term outcomes.

This plan focuses on the Kanangra-Boyd to Wyangala Link, a major natural connection between the sandstone forests of the Greater Blue Mountains and Wyangala Dam which is used by countless species on their daily, seasonal and annual migrations.

This area contains an extraordinarily diverse range of species and habitats and is rich in culture and heritage. At the same time the K2W Link is under threat from increasing numbers of feral animals and weeds and has the potential for continued loss of landscape health.

This plan was developed by partner organisations involved in the Kanangra-Boyd to Wyangala Link project, with funding assistance from the Australian Government





## Biological importance of the Kanangra-Boyd to Wyangala Link

The K2W Link is a natural landscape corridor following the line of the Abercrombie River, formed by the Casuarinas lining its banks, the Eucalypt forests on the surrounding hills, and the grassy box woodlands that connect them. Its location, natural values and cultural significance make it an integral part of the vision of the Great Eastern Ranges Initiative.

Covering an area of 319,200 hectares, the K2W Link comprises a biologically rich landscape that supports a diversity of natural processes. The area is significant in the context of the wider Great Eastern Ranges Initiative for a number of reasons:

**It's diverse** - The west-east transition from temperate woodland to moist forest combines with riparian habitats and limestone ecosystems forming the Abercrombie and Wombeyan caves. This creates a complex mosaic of habitats, supporting over 2,400 species of native plants, animals, fish and invertebrates.

**It forms a natural highway** - The K2W Link provides an important east-west connection between the main range and a major node in the 'western woodlands way' around Copperhania Nature Reserve and the Wyangala State Recreation Area. It supports altitudinal and latitudinal seasonal migrants, nomadic movement patterns and seasonal dispersal of juveniles

Figure 1. Status of native vegetation formations in the K2W Link

Formation Type	Original Extent (ha)	Current Extent (ha)	Proportion Remaining
Rainforests	246	245	99.59%
Wet sclerophyll forests (Shrubby subformation)	199	159	79.90%
Wet sclerophyll forests (Grassy subformation)	31622	26584	84.07%
Grassy woodlands	103035	45968	44.61%
Dry sclerophyll forests (Shrub/grass subformation)	38373	24946	65.01%
Dry sclerophyll forests (Shrubby subformation)	137885	110850	80.39%
Heathlands	272	272	100.00%
Freshwater wetlands	431	320	74.25%
Forested wetlands	6089	5045	82.85%

Source: Drielsma et al. In Prep



**It serves as a drought refuge** - Satellite imagery indicates that the K2W Link remains consistently wetter than surrounding areas throughout the year. This means that it contains many core areas of habitat where animals and birds can seek shelter and food during periods of lower rainfall or drought.

**It contains significant natural connections** - The basis for the K2W Link is provided by several significant areas of extant native vegetation. These constitute the major 'building blocks' for improving connectivity and resilience of ecosystems in the K2W. The network of public protected areas and native vegetation on private land provides the core of a network of habitats that support local biodiversity values and landscape connections on a larger scale. This in turn supports ecological processes such as seasonal dispersal or migration of native species and long-term adaptation of ecosystems.

A series of workshops and focused discussion sessions with project partners in late 2012 and early 2013 identified eight major assets in the K2W Link. These, along with assets nested within them, the systems they comprise, and the ecological processes they support, will form the focus for conservation investment in the K2W Link.

Figure 2. The Kanangra-Boyd to Wyangala Link Landscape Corridor

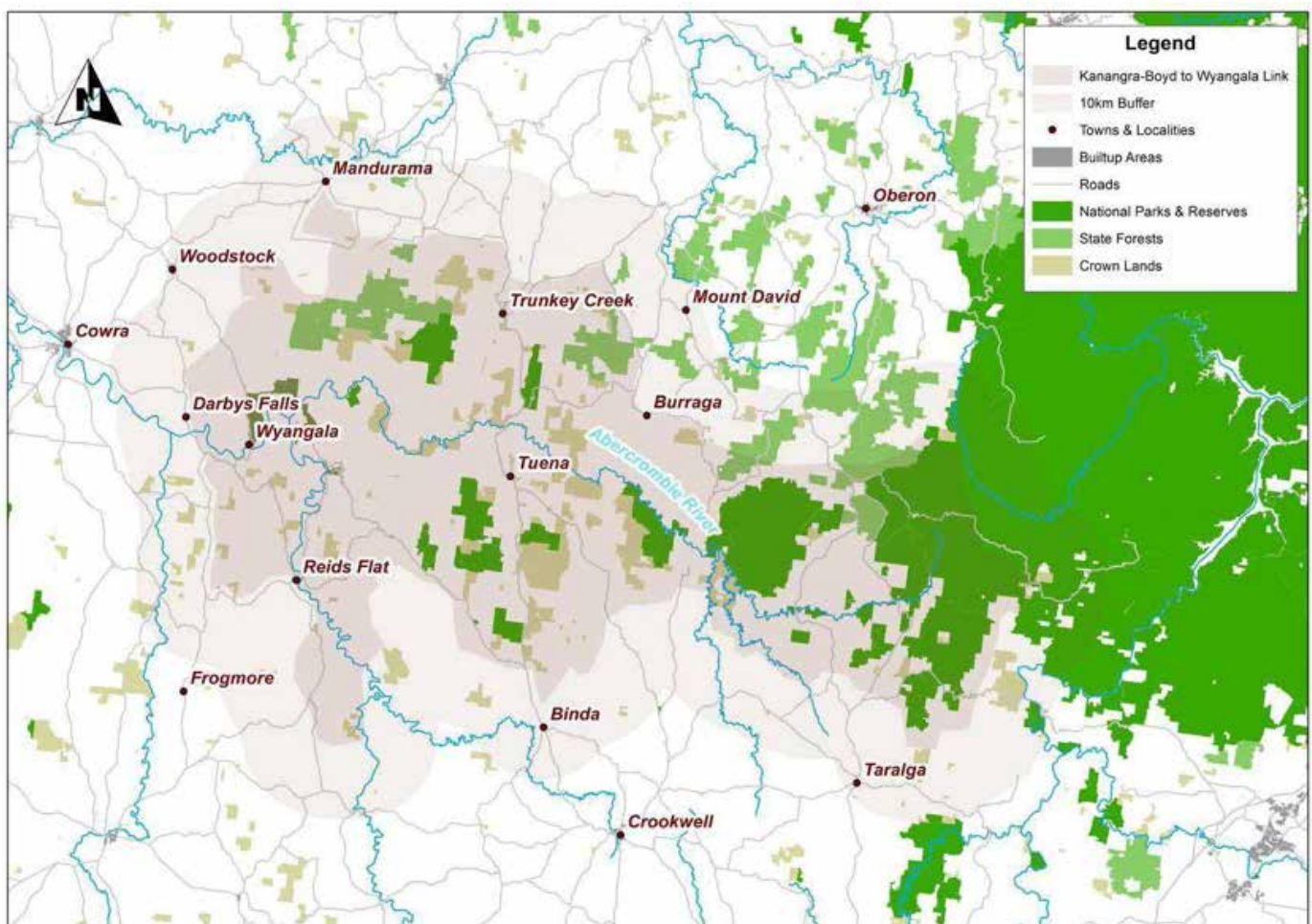


Figure 3. Threatened species in and around the K2W Link

	Common Name	Scientific Name	Status
Birds	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V,P,3
	Scarlet Robin	<i>Petroica boodang</i>	V,P
	Flame Robin	<i>Petroica phoenicea</i>	V,P
	Powerful Owl	<i>Ninox strenua</i>	V,P,3
	Varied Sittella	<i>Daphoenositta chrysoptera</i>	V,P
	Brown Treecreeper	<i>Climacteris picumnus victoriae</i>	V,P
	Diamond Firetail	<i>Stagonopleura guttata</i>	V,P
	Hooded Robin	<i>Melanodryas cucullata cucullata</i>	V,P
	Little Lorikeet	<i>Glossopsitta pusilla</i>	V,P
	Turquoise Parrot	<i>Neophema pulchella</i>	V,P,3
	Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V,P,2
	Regent Honeyeater	<i>Anthochaera phrygia</i>	E4A,P
	Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>	V,P
	Little Eagle	<i>Hieraaetus morphnoides</i>	V,P
	Speckled Warbler	<i>Chthonicola sagittata</i>	V,P
	Freckled Duck	<i>Stictonetta naevosa</i>	V,P
	Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V,P
	Masked Owl	<i>Tyto novaehollandiae</i>	V,P,3
	Painted Honeyeater	<i>Grantiella picta</i>	V,P
	Superb Parrot	<i>Polytelis swainsonii</i>	V,P,3
Mammals	Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V,P
	Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V,P
	Yellow-bellied Glider	<i>Petaurus australis</i>	V,P
	Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E1,P
	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V,P
	Koala	<i>Phascolarctos cinereus</i>	V,P
	Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V,P
	Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V,P
	Squirrel Glider	<i>Petaurus norfolcensis</i>	V,P
	Tasmanian Bettong	<i>Bettongia gaimardi</i>	E4,P
	Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V,P
	Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V,P
Little Bentwing-bat	<i>Miniopterus australis</i>	V,P	
Reptiles and frogs	Booroolong Frog	<i>Litoria booroolongensis</i>	E1,P
	Stuttering Frog	<i>Mixophyes balbus</i>	E1,P,2
	Rosenberg's Goanna	<i>Varanus rosenbergi</i>	V,P
Insects	Giant Dragonfly	<i>Petalura gigantea</i>	E1
	-	<i>Bossiaea fragrans</i>	E4A,P
Plants	Cabbage Kunzea	<i>Kunzea cabbagei</i>	V,P
	Buttercup Doubletail	<i>Diuris aequalis</i>	E1,P,2
	Black Gum	<i>Eucalyptus aggregata</i>	V,P
	Dense Cord-rush	<i>Baloskion longipes</i>	V,P
	Yass Daisy	<i>Ammobium craspedioides</i>	V,P
	Aromatic Peppergrass	<i>Lepidium hyssopifolium</i>	E1,P
Klaphake's Sedge	<i>Carex klaphakei</i>	E1,P	



## What we want to conserve and manage

Three planning workshops were undertaken at the Oberon office of Parks and Wildlife on the 16th August 2012, the 18th December 2012, and on the 25th March 2013. These initial workshops were attended by project delivery partners comprising staff from partner organisations, representatives from a range of community groups and interested researchers. The planning process made use of an approach based on The Nature Conservancy's "Conservation by Design" process ([www.nature.org/about-us/howwework/cbd/](http://www.nature.org/about-us/howwework/cbd/)) to identify seven major conservation assets characteristic of the K2W Link. Each includes "nested assets" and has different characteristic or desired future states that will be considered in future management strategies.

### Threats to the K2W Link

Despite the area's existing values and strengths, our analysis highlighted a number of weaknesses and gaps in connectivity along the length of the K2W Link. Projections of future land use change in these areas show the potential for continued loss of existing connections. Targeted efforts in these areas is needed to secure and maintain functional connectivity, while continued management of core habitat areas seeks to maintain the resilience across the wider corridor. Threats to values include:

1. **Past habitat loss** - Loss of woodlands associated with agricultural development has been widespread since the region was settled by Europeans in the early 19th century. This is particularly notable on valley floors and fertile flats associated with watercourses; the more rugged terrain associated with ridgelines and outcrops (associated with the 'poorer land capability classes' – Figure X) remain less disturbed and are at greater threat from broader landscape scale processes.
2. **Species population decline** - Recent decades have witnessed a decline in the number of woodland species as a result of past clearing, loss of habitat elsewhere in the range of mobile species, ongoing erosion of habitat through loss of mature paddock trees and coarse woody debris, change in groundcover species composition, etc.).
3. **Habitat fragmentation** – Loss of woodlands has, in many areas, resulted in lost or reduced connectivity between forested ridges. Roads, infrastructure corridors (rail, power, etc.) further exacerbate reduced movement options across the region. The resulting loss of broader landscape permeability is significant both within the valley, and across the wider great eastern ranges corridor.
4. **Introduced species** – The region supports 45 recorded introduced species (Figure 7). Exotic plants now comprise a significant proportion of the flora recorded in the region, with species associated with agriculture most prevalent. A number of native fauna are recognised as being under increasing pressure from introduced predators.
5. **Total grazing pressure** - combined grazing pressure exerted by all stock – domestic and wild, native and feral – has contributed to changes in the structure and composition of native vegetation across the landscape. Direct impacts include soil erosion, fouled water supplies and weed invasion. Indirect impacts are through the loss of potential productivity, biodiversity, and the ecosystem services provided by native flora and fauna.
6. **Changed fire regimes** – Changed fire regimes resulting in more intense burns and at times when native species are more susceptible to burning, has the potential to significantly impact biodiversity (i.e. habitat) values, landscape connectivity and the persistence of soil nutrients and carbon.

Figure 4. Conservation assets and their future desired condition

Target assets	Description	Future status and condition desired
<b>Woodlands and Grassy Ecosystems</b> Gliding Possums Regent honeyeater White Box-Yellow Box Blakely's Red Gum EEC Natural Temperate Grassland EEC	The 'connecting' fabric of the region; habitat for woodland and grassland dependent species (plants and animals), including nectar source for honeyeaters and other groups travelling over large distances	Larger woodland remnants and populations of fruiting mistletoe Restoration and return of species to larger (>200 ha) woodland remnants Are the basis for a productive landscape with grazed woodlands and grasslands supporting productive soils with good soil carbon, healthy farm enterprise and a 'connected' landscape
<b>Large intact forest areas</b> Greater Glider Tablelands Basalt Forest EEC Abercrombie River Gorge country	Minimum viable habitat for species requiring large areas of forest and woodland as home range, (often species with long-lived individuals and long generation times)	Intact woodland-dry forest complexes with plentiful prey (in turn indicative of good habitat)
<b>Karst</b> Cave-dependent Bats Abercrombie Caves	Limestone caves and karst-dependent species; rocky outcrops and surrounding vegetation in core areas	Integrity of habitat (caves, hollow-bearing trees) and abundance of flying insects in adjacent woodlands and farmland
<b>Abercrombie River corridor and tributaries</b> Arboreal Mammals Stuttering Frog Boorolong Frog Macquarie Perch	Natural linkages running through and connecting the major protected area parcels. Key source of water and supports the more productive nectar-producing trees in the landscape; stepping stones across fertile flats; connectivity within the wider landscape, especially with slopes and higher elevation forests	Targeted revegetation of the riparian corridor and fringing forests to support maintenance of water quality and bank stability, control of serrated tussock and strengthened connectivity Collaborative cross-tenure management of deer and goat movements in/through the riparian corridor
<b>Altitudinal links (east-west and hills-to-creeklines)</b> Hooded robin Gang gang cockatoo	Areas of forest and woodland on gradients between higher elevation forests on slopes and woodlands on foot-slopes and flats	Connectivity (including absence of predators and competitors) along linkages between higher altitudes and creeks/valley bottoms
<b>Travelling stock reserves, roadsides and paddock trees</b> Turquoise parrot	Scattered native vegetation providing the ecological 'infrastructure' for grazing management (and potentially woodland restoration) on farmland; minor changes in grazing management over multiple properties in key landscapes can improve the likely resilience and 'semi naturalness' of the landscape matrix	Presence of abundant native grasses throughout the wider landscape
<b>Culturally Rich Natural Areas</b>	Healthy habitats contributing to maintenance of Country	Application of traditional knowledge leading to a shift in perspectives about fire management from asset protection to habitat management



## What is our Objective?

The Great Eastern Ranges Initiative has a broad vision:

*“People working together to protect, restore and connect healthy habitats from western Victoria through NSW and ACT to far north Queensland”*

To ensure effective implementation, GER is structured to deliver four objectives. The primary objective relates to the ‘on-ground’ outcome that will be achieved in relation to connecting landscapes and ecosystems. It is supported by three complementary objectives relating to partnership activities (i.e. coordinating efforts within the GER), communications (i.e. communicating with the wider community to increase awareness, support and active participation) and application of knowledge (i.e. understanding the ecological conditions and changes in the GER corridor that will in turn influence management).

*Figure 5. Goals of the Great Eastern Ranges Initiative*

<p><b>Goal 1 - Connect landscapes and habitats</b> – Improve the connectivity, condition and resilience of landscapes and habitats, and achieve an associated halt to further decline and loss of species</p>
<p><b>Goal 2 - Link people and nature</b> - Increase the number of people working together in locally organised and managed regional partnerships to improve the connectedness and resilience of landscapes</p>
<p><b>Goal 3 - Communicate effectively</b> – Increase the awareness and effectiveness of conservation efforts through transfer of knowledge and insights between regional partnerships</p>
<p><b>Goal 4 - Apply knowledge</b> – Improve our understanding of species, ecosystems and local landscapes in the context of the wider GER, and their requirements for long term health</p>

## Aims for Investment in the K2W Link

K2W will work with landholders and Landcare, staff from the Lachlan CMA, local government, National Parks & Wildlife Service and other land management authorities to:

1. Support voluntary management of remnant native habitats by local landholders, parks staff and others;
2. Encourage collaborative control of pests and weeds across property boundaries to improve the condition and corridor value of habitat linkages;
3. Restore lost habitat connections through assistance and support for voluntary revegetation;
4. Support reconnection with country through sharing of Aboriginal traditional knowledge and development of new joint ventures; and
5. Provide opportunities for community involvement in field days, replanting events, and wildlife surveys.





## What Will We Do?

### **Strategy 1 - Protect and manage existing natural and cultural heritage values and the most important habitat remnants and revegetation sites**

- Deliver community engagement activities to stimulate interest in available conservation mechanisms.
- Negotiate new landholder agreements to ensure security of remnants and revegetation sites.

### **Strategy 2 - Plant stands of mixed native species to supplement natural regeneration and buffer the most important habitat remnants from surrounding pressures**

- Run property planning workshops to promote access to property information and develop tools delivered through the Atlas of Living Australia.
- Promote natural regeneration through whole of paddock restoration and grazing management assistance incentives.
- Deliver funds to plant mixed species stands to supplement natural regeneration.

### **Strategy 3 - Promote broader community involvement in the K2W Link**

- Involve Aboriginal traditional owners in joint ventures and knowledge sharing on Country.
- Develop and distribute information on opportunities for landholder involvement in K2W and to raise awareness of connectivity conservation.
- Encourage local school children to experience and learn more about the area and get involved in some of K2W's projects
- Increase community engagement through citizen science, field days, information sessions and other events.

### **Strategy 4 - Manage threats to biodiversity**

- Coordinate cross-tenure fire and invasive species management involving national parks staff, local government, Lachlan CMA and the community.
- Develop staged plans for fire risk management, threat monitoring and invasive species management to accompany revegetation and conservation agreements.
- Deliver landholder workshops and establish sites to promote grazing management in weed control
- Provide chemicals, baits, contractors and coordination to assist with invasive species control

### **Strategy 5 - Monitor outcomes**

- Expand existing CMA and public land monitoring to measure planting success, condition of remnant areas on conservation agreements, and distribution and abundance of invasive species
- Map activities and investments, and report on improvement in habitat condition and connectivity
- Track the changing conditions of the K2W Link through research, monitoring and citizen science.

## Where are the priority areas for investment?

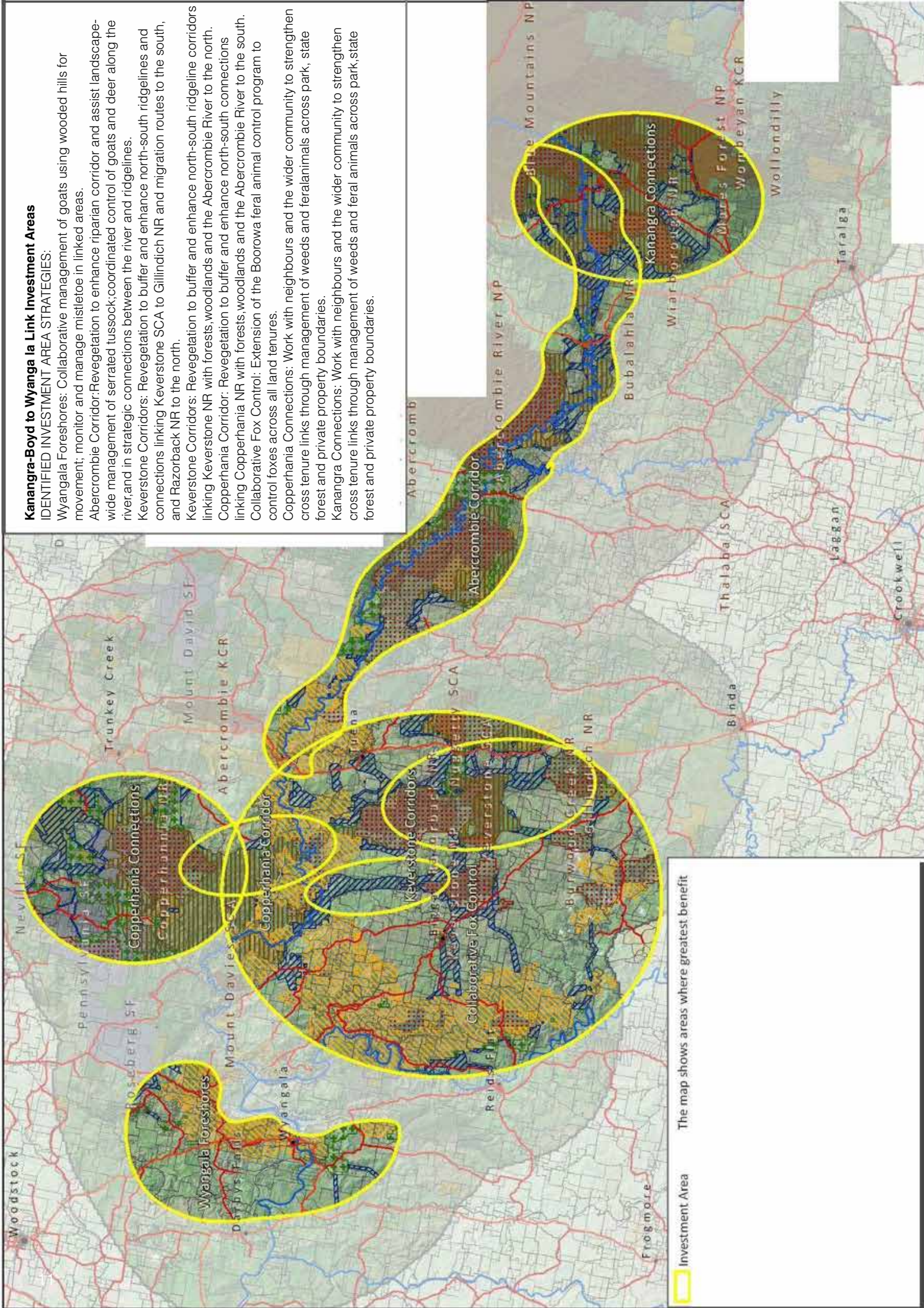
<b>K2W Link Investment Areas</b>	
1 Kanangra Connections	<ul style="list-style-type: none"> <li>• Work with neighbours and the wider community to strengthen cross tenure links through management of weeds and feral animals across park, State forest and private property boundaries</li> </ul>
2 Abercrombie River Corridor	<ul style="list-style-type: none"> <li>• Revegetation to enhance riparian corridor and assist landscape-wide management of serrated tussock, blackberry</li> <li>• Coordinated control of goats and deer, dogs and pigs, along the river, and in strategic connections between the river and ridgelines</li> <li>• Track goats and deer to identify movement pathways and key control locations</li> </ul>
3. Keverstone Corridors	<ul style="list-style-type: none"> <li>• Revegetation to buffer and enhance a north-south ridgelines and connections linking the 'Cookwell Reserves (Keverstone, Gillindich, Wianbatt, Razorback)</li> <li>• Revegetation to buffer and enhance a north-south ridgeline corridor linking Keverstone NR with forests, woodlands and the to the north</li> </ul>
4 Copperhania Corridor	<ul style="list-style-type: none"> <li>• Revegetation to buffer and enhance a north-south connections linking Copperhania NR with forests, woodlands and the to the south</li> </ul>
5 Wyangala Foreshores	<ul style="list-style-type: none"> <li>• Collaborative management of goats using wooded hills for movement</li> <li>• Monitor and manage mistletoe in linked areas</li> </ul>
6 Bigga District	<ul style="list-style-type: none"> <li>• Extension of the Boorowa feral animal control program to control foxes across all land tenures</li> <li>• Pasture management and property management planning to 'soften' the landscape and improve general connective values</li> <li>• Monitor and manage mistletoe in linked areas and 'stepping stone' remnants</li> </ul>
7 Copperhannia District	<ul style="list-style-type: none"> <li>• Work with neighbours and the wider community to strengthen cross tenure links through management of weeds and feral animals across park, State forest and private property boundaries</li> </ul>

<b>Cross-K2W activities</b>	
Threatened Species Recovery	<ul style="list-style-type: none"> <li>• Targeted action in priority sites for recovery of site-managed threatened species</li> <li>• Promote a spectrum of voluntary conservation instruments – Habitat for Wildlife membership, Land For Wildlife property registration, Wildlife Refuge, Conservation Covenant</li> <li>• Promote management of farm dams and development of artificial wetlands for frogs</li> <li>• Trial the use of weed and bird identification applications in community wildlife surveys</li> </ul>
Targeted weed management – localised populations	<ul style="list-style-type: none"> <li>• Chilean Needle Grass (4ha) at Peelwood</li> <li>• Coolatai Grass (40ha) at Foggs Crossing</li> <li>• Blackberry and willow (various locations)</li> </ul>

**Kanangra-Boyd to Wyanga la Link Investment Areas**

**IDENTIFIED INVESTMENT AREA STRATEGIES:**

- Wyangala Foreshores: Collaborative management of goats using wooded hills for movement; monitor and manage mistletoe in linked areas.
- Abercrombie Corridor: Revegetation to enhance riparian corridor and assist landscape-wide management of serrated tussock; coordinated control of goats and deer along the river, and in strategic connections between the river and ridgelines.
- Keverstone Corridors: Revegetation to buffer and enhance north-south ridgelines and connections linking Keverstone SCA to Gillindich NR and migration routes to the south, and Razorback NR to the north.
- Keverstone Corridors: Revegetation to buffer and enhance north-south ridgeline corridors linking Keverstone NR with forests, woodlands and the Abercrombie River to the north.
- Copperhania Corridor: Revegetation to buffer and enhance north-south connections linking Copperhania NR with forests, woodlands and the Abercrombie River to the south.
- Collaborative Fox Control: Extension of the Boorowa feral animal control program to control foxes across all land tenures.
- Copperhania Connections: Work with neighbours and the wider community to strengthen cross tenure links through management of weeds and feral animals across park, state forest and private property boundaries.
- Kanangra Connections: Work with neighbours and the wider community to strengthen cross tenure links through management of weeds and feral animals across park, state forest and private property boundaries.



The map shows areas where greatest benefit

Investment Area



## What will success look like?

### **Outcome 1 - Native vegetation that is resilient to current and future disturbances**

- Area of native vegetation increased and maintained above 30% of K2W Link area.
- Natural connections reestablished and enhanced.
- Condition and habitat attributes of larger vegetation patches improved and maintained.
- Native grasslands improved and maintained.
- Voluntary conservation agreements established in priority areas.
- Quantitative outcomes in indicator species, with increase / decrease depending on desirability.

### **Outcome 2 - Landholders working together to reduce the impacts of invasive species**

- Enthusiasm – with more people more people getting involved in Landcare and Collaborative Aboriginal projects.
- Large areas are 'feral free' with reduced spread from source areas and pest animal populations are below environmental damage thresholds.
- New, emerging and widespread invasive species are controlled.
- Healthy pastures that are resistant to weed invasion.

### **Outcome 3 – Landholders, local communities and organisations working in collaboration**

- Awareness turned into action.
- Local communities and landholders taking ownership of the program.
- Acknowledgement and respect of the traditional and cultural ties inherent in the landscape and the sacredness of the environment to Aboriginal people.
- Active working partnerships between local Aboriginal groups and organisations.
- A community of stakeholders who are aware, supportive, and actively engaged in increasing native habitat.

### **Outcome 4 – Understanding and acknowledgement of the benefits and need for connectivity conservation**

- Production of educational and informational material to increase knowledge and raise awareness.