Local Land Services

Hunter Region Natural Resource Management Plan 2023-2028

NSW GOVERNMENT

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Hunter Region Natural Resource Management Plan 2023 – 2028

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More information

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Front cover image: Regent Honeyeater. Credit: Lachlan Hall.

Executive Summary

The Natural Resource Management (NRM) Plan (the Plan) provides a contemporary overview of landscape assets, threats and opportunities in the Hunter Local Land Services (Hunter LLS) region of NSW, and develops a strategic approach to informing and targeting future investments in the region aligned to the Australian Government's Regional Land Partnerships (RLP) 5-year outcomes, and Local Land Services' (LLS) regional priorities. This meets Hunter LLS' obligations under the Service Level Agreement as part of the RLP Program and provides a sound basis for future NRM investment and partnership opportunities in the Hunter region.

The development of the Plan has been informed by extensive community and stakeholder consultation over the past two years, considering the aspirations of local Aboriginal community and Traditional Owner groups, private landholders, government and non-government partners, Landcare and the broader community. This provides a comprehensive resource for all land managers in the Hunter and Mid-Coast areas to inform their decision making around the specific natural resource priorities in a sub-catchment and what some of the approaches to improving the environmental and community outcomes might be.

It's intended the Plan will be responsive and adaptive to changes in both specific regional, state and federal priorities as well as shifts in community priorities and expectations over time and as such will be reviewed annually, or more often if required. The Plan seeks to support decision making by the community in prioritising investment, rather than be a prescriptive list of projects and programs to be delivered.

This plan also recognises that we are in both a challenging and exciting period of transition. The impacts of climate change will require enormous amounts of adaptation in the way we support our communities to manage, protect and utilise the natural resources of the region. At the same time new and future changes to the way in which we value and manage our natural resources will provide significant opportunities for private and public land managers. The emergence of natural capital markets is expected to significantly shape our approaches to management of natural resources over the period of this plan.

Photo 1: Revegetation at Kooragang Wetlands. Credit: HLLS.

Acknowledging Traditional Custodians

Hunter Local Land Services recognises that Aboriginal and Torres Strait Islander Peoples are the oldest continuous living cultural group in the world.

We pay our deepest respects to the Traditional Custodians of the Fresh and Saltwater Lands and Country right across the region, and we honour their Elders through the thousands of generations. Hunter Local Land Services also acknowledges the diverse and rich cultures of all Aboriginal and Torres Strait Islander Peoples living in the Hunter and Manning Great Lakes Regions who willingly share their sacred traditional knowledge in land and environmental management to ensure Country and Waters are protected, restored, and preserved in ways for everyone to enjoy.

The Board and staff of Hunter Local Land Services are extremely proud of the long standing and collaborative relationship with our dedicated Aboriginal Community Advisory Group (ACAG). Nominated members from the nine Local Aboriginal Land Councils and numerous Aboriginal-led organisations across the Hunter and Manning Great Lakes advise and guide Hunter Local Land Services on strategies and actions to benefit Aboriginal Communities in the Hunter and Great Lakes Regions.

We remain committed to working with the Aboriginal communities of this region so that the coming years are inclusive of Aboriginal knowledge and cultures which come from continued and unbroken connections to Country and Community.

Dr Elizabeth McEntyre
Worimi and Wonnarua First Nations Woman and Elder
Hunter Local Land Services

Photo 2: Cultural Burning at Hollydene Travelling Stock Reserve, Upper Hunter. Credit: HLLS.

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Photo 3: Barnard River Habitat. Credit: HLLS.

Introduction to the NRM Plan

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1. Introduction

1.1 Local Land Services

LLS is a regionally focused NSW government agency that delivers advice, information and support to landholders, farmers and the broader community. The agency operates with 11 regional operational units across the state. In each region, regional priorities are integrated into the delivery of the state LLS objectives outlined in the State Strategic Plan 2020-2030.

Hunter LLS is responsible for undertaking a broad range of services in the Hunter region (Figure 1) including sustainable agriculture, NRM, biosecurity (disease, pest animal and new weed incursions) and emergency management. All services are underpinned by effective communications and engagement providing customer services to our community including 17,000 LLS ratepayers and 25,000 landholders who contribute to Hunter Catchment Contributions (HCC).

The Hunter Local Strategic Plan 2022-2027 and supporting strategies priorities and directs Hunter LLS' customer services, partnerships and investment across the region for the next five years. It sets the outcomes for Hunter LLS, defines its organisational priorities, outlines the strategies through which the outcomes and priorities will be addressed, and describes how the organisation will measure success.

Photo 4: Hunter landscape. Credit: HLLS.

1.2 The Hunter Region

The Hunter region covers an area of 33,000 square kilometres, east of the Great Dividing Range, from the valleys of the Goulburn River, floodplains of the Hunter and Williams Rivers. Along the coast the region extends north from Lake Macquarie to Taree and three nautical miles out to sea.

The region has a rich Cultural Heritage, and its landscapes and natural resources traditionally sustained a significant Aboriginal population. There are many important Cultural sites and landscapes throughout the catchment, and these continue to be managed by local Aboriginal communities.

Around 670,000 people currently live in the region. The major population centres are in Newcastle and Lake Macquarie, Cessnock and Maitland local government areas. Other major urban centres include Nelson Bay, Raymond Terrace, Dungog, Singleton, Muswellbrook, Scone, and Taree.

The region is home to the Barrington Tops World Heritage Area, and Wollemi, Yengo, Goulburn River, Hunter Wetlands, Wallarah, Myall Lakes and Crowdy Bay National Parks. The major waterways are the Manning, Karuah, Wallamba, Myall, Hunter, Williams, Paterson, Goulburn and Pages rivers and Wallis Lakes, Myall Lakes, Port Stephens, Lake Macquarie, and Lake Munmorah. The Hunter Estuary and Myall Lakes systems are Ramsar listed as nationally and internationally significant wetland sites for migratory and resident shorebirds, while Port Stephens-Great Lakes (State) and Hunter Marine Park (National) has significant soft coral and sponge gardens, which provide important habitat for many marine species.

The natural resources of the Hunter region support a wide range of industries, including agriculture, coal mining, power generation, forestry, fishing, tourism and recreation. Residential and commercial development dominates the coastal fringe.

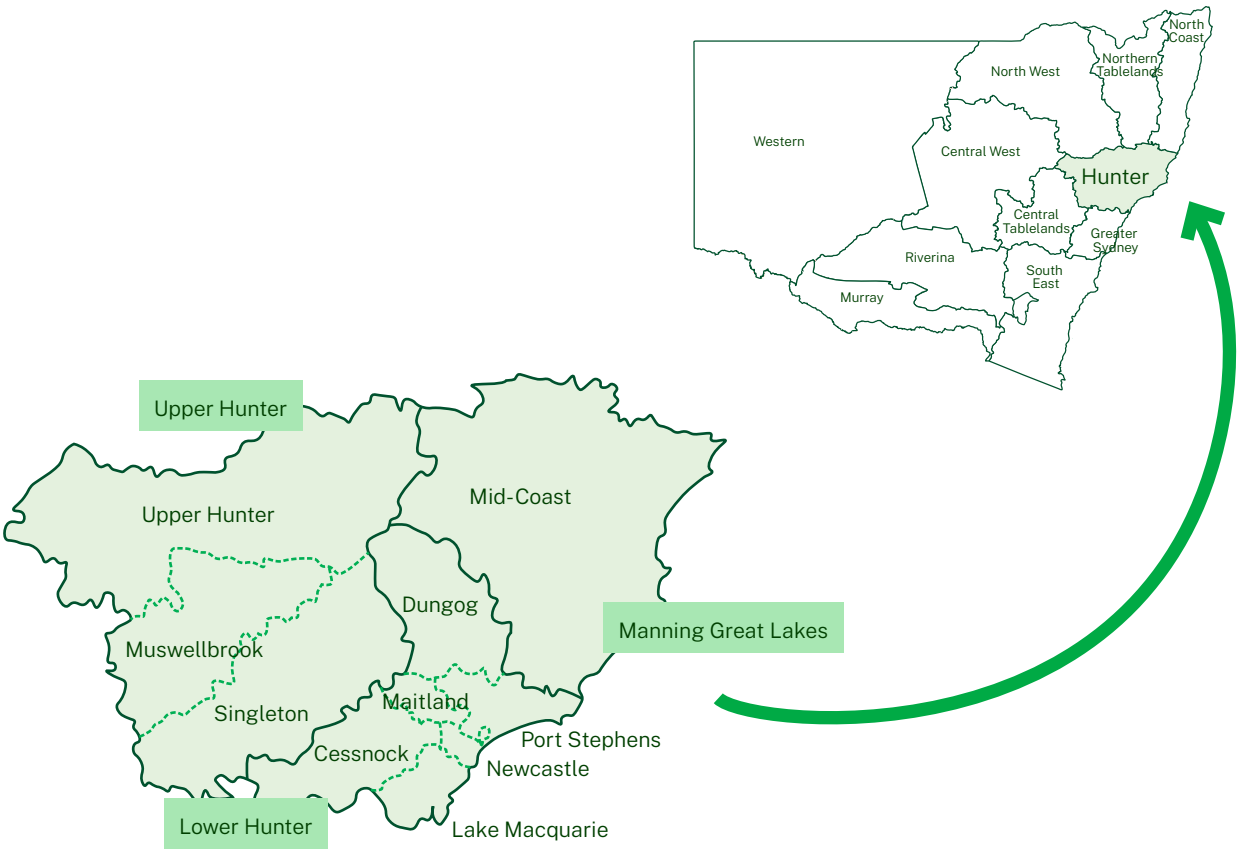


Figure 1. Hunter Local Land Services.

1.3 What is Natural Resource Management?

A healthy environment is fundamental to the wellbeing of our communities, the enduring connection of Aboriginal people to Culture and Country, and a productive agricultural sector. NRM Regions Australia, the peak body for 54 regional NRM organisations across Australia of which Hunter LLS is one, and the Natural Resources Commission, and independent agency that regulates NRM in NSW, defines NRM as:

> Natural Resource Management is the integrated management of the natural resources that make up Australia's landscapes, such as land, water, soil, plants, and animals. It recognises that people and their livelihoods rely on the health and productivity of our landscapes, and their actions as stewards of the land play a critical role in maintaining this health and productivity.

In 2022 the NSW Government released the Natural Capital Statement of Intent that defines natural capital as 'the world's stocks of natural assets and the services that flow from them, which include geology, soil, air, water and all living things'. Further, it sets out that natural capital is a way of thinking about nature in much the same way as traditional capital – if we invest in it, it creates value, and if we degrade it, we limit its value.

Without effective leadership, prioritisation and collaboration, NSW risks further decline in soil health, water quality, and native vegetation condition, resulting in loss of agricultural productivity, tourism and community wellbeing, alongside loss of species, ecosystems, and ecosystem services. The role of the NRM Plan is to coordinate regional efforts to maximise effort towards improved NRM condition in the landscape.

1.4 Purpose of the NRM Plan

The governance, strategic framework and approach to supporting NRM decision making has evolved considerably in NSW and nationally over the past decade. NRM remains a key integration point for community aspirations, targeted outcomes and collective action, but is no longer driven by a single organisation and plan. In NSW this has involved broadening regional service delivery to combine NRM with sustainable agriculture, biosecurity and emergency management through LLS.

As a regional NRM service provider, the Australian Government requires Hunter LLS to develop and maintain an NRM Plan to inform future funding and regional service delivery investment priorities and partnership opportunities. In line with the NLP requirements, the plan must:

- Be based on best available information
- Provide evidence to inform actions that contribute to outcomes
- Build on and address gaps in existing plans and strategies rather than replace them
- Be a living document to be reviewed regularly.

The Plan will inform NRM program development and investment in the Hunter LLS region over the next five years (2022 – 2027), towards our goal of 'Healthy, diverse and connected natural environments' and our vision to enable communities to respect, protect and sustain healthy, productive and profitable landscapes.

The development of the Plan has been informed by extensive community and stakeholder consultation over the past two years, considering the aspirations of local Aboriginal people and Traditional owner groups, government and non-government partners, Landcare and community.

1.5 Local Land Services' role in NRM

The NRM sector is a busy space with many government and non-government organisations playing a role. LLS' role is defined in our state-wide NRM Services Framework 2021-2026, which is to support and enable land managers to better manage natural resources to avoid or reverse their decline, maintaining land uses that are sustainable and productive. The Framework guides our decision making, key customers and partners, approach to increase the adoption of management practices that improve the condition and health of our natural resource assets across NSW landscapes.

By 2026, 80 per cent of our customers receiving our NRM services have adopted improved NRM practices on their properties.

- Demonstrating best practice and communicating through champions, case studies
- Providing tailored information, extension and advice
- Delivering priority on ground interventions.
- Building collaboration and partnerships across tenures
- Coordinating and prioritising effort
- Maintaining trust and connection with our customers and investors.

1.6 Consultation and Input

Consultation has been undertaken to develop the technical and spatial information behind the plan and develop a broad understanding of community NRM expectations and aspirations.

Key consultation steps included:

- Internal consultation sessions with key staff based on priority themes including visions and management actions;
- Advice from staff and other technical experts regarding the best available spatial information to represent natural resource assets and threats;
- Key stakeholder review of approach and intent of draft prioritisation mapping by sub-catchment;
- Liaison with key expert and technical LLS staff to inform objectives, key results and actions components of the plan;
- Peer review of draft plan (ongoing).

More detailed information about the community consultation is provided at Appendix B.

1.7 NRM Themes, Objectives and Key Results

Throughout the Plan, four key asset themes have been identified, representing the diverse and complex landscapes within the Hunter LLS region. The Plan contains a separate chapter for each theme documenting the key objectives, results, actions and initiatives, key NRM assets relevant to the theme, the threats identified for those assets that influence their integrity and compromise their function in the landscape, and how these have identified through prioritisation principles, underpinned by spatial, technical and stakeholder information relevant to the Hunter LLS region.

Each theme takes an Objectives and Key Results (OKRs) approach, which is a collaborative goal-setting methodology used by teams and individuals to set challenging, ambitious goals with measurable results. Each theme has its own set of OKRs, supported by more specific initiatives and actions, metrics, condition indicators and monitoring approach.

Each theme is expanded into individual sub themes, which are identified by assets with common features, threats, and actions.

Theme 1

Native Vegetation and Terrestrial Biodiverse Ecosystems

By 2028 there is improved condition and resilience of native vegetation and biodiversity in the landscape

Theme 2

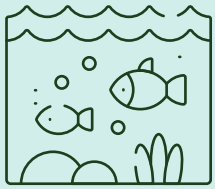
Soil and Land

By 2028 there is improved condition and productivity of soil and land

Theme 3

Rivers and Aquatic Biodiversity

By 2028 there is improved condition of rivers and aquatic biodiversity



Theme 4

Estuary, Coastal and Marine Biodiverse Ecosystems

By 2028 there is improved condition of estuary, coastal and marine ecosystems

Figure 2: Hunter LLS NRM Plan themes and objectives. This section is further detailed in Section 2 of the Plan.

Each theme objective further identifies key initiatives and actions specific to the asset, supported by additional information relevant implementation, monitoring and review.

1.8 State Government Plans and Frameworks

Guiding NRM across NSW, the following strategies have been considered in the development of the NRM Plan:

- NSW Biodiversity Conservation Act and the Saving Our Species Program (and related Strategies)
- NSW Marine Estate Management Strategy 2018-2028
- NSW Climate Change Policy Framework 2016
- Net Zero Plan Stage 1: 2020–2030
- NSW Government Natural Capital Statement of Intent 2022.

1.9 LLS Plans and Frameworks

LLS works with communities to build knowledge and skills to enable them to make better decisions about the land they manage. There are various plans and strategies that have been developed to help communicate and guide the work of LLS across NSW, as summarised below:

- LLS Strategic Plan 2020-2030 – state-wide overarching document that sets the vision, goals and strategies for the organisation. It defines organisational priorities and outlines the way services will be delivered to build resilient communities and meet local needs.
- LLS NRM Framework 2021-2026 – a state-wide document that sets the strategic direction of NRM services. It outlines the key priorities for our NRM Services to respond to these challenges and contribute to productive and sustainable land use across NSW.
- Hunter Local Strategic Plan 2021-2026 – nests under the state-wide strategic plan, Hunter's Local Strategic Plan sets out how decisions are made locally, and service delivery prioritised based on the needs of our customers, stakeholders and investors.
- Hunter LLS Supporting Strategies 2021-2026 (Landscape, Emergency, Primary Production, Biosecurity and Communications and Engagement).
- NSW LLS Aboriginal Engagement Strategy 2020 – articulates the model for engagement, partnership and opportunities for co-design between Aboriginal people and communities and LLS.
- Hunter River Management Plan 2020.
- Hunter LLS Regional Strategic Weed Management Plan 2022-2027.
- Hunter LLS Regional Strategic Pest Animal Plan 2022-2027.
- Hunter LLS Industry Strategies (Dairy, Oyster, Poultry & Egg, Wine and Equine).
- 3-year Service Delivery Plans.

1.10 Australian Government Priorities

The Australian Government's Department of Agriculture, Water, and the Environment (DAWE) is responsible for protecting and improving natural resources such as soils, water, vegetation, and biodiversity through the delivery of the Australian Government's environment and sustainable agriculture programs.

The National Landcare Program (NLP) is the key program across Australia committing to protect and conserve these important resources. The program has several programs nested within it, including the Regional Land Partnerships (RLP) program and other programs, such as Smart Farms, Caring for World Heritage places, Indigenous Protected Areas, and Indigenous Rangers, 20 Million Trees and Invasive Species Solutions programs.

The RLP program engages 54 NRM regional bodies across Australia to deliver key actions, of which Hunter LLS is one, to connect with communities and achieve outcomes at a regional scale, across the whole nation.

This program aims to protect and conserve some of the most important natural resources and assets, identified as matters of national environmental significance, through six program objectives. The objectives and priority assets relevant to the Hunter region are identified in this section.

1.11 Matters of National Environmental Significance

Matters of National Environmental Significance (MNES) are defined as: listed threatened species and ecological communities; migratory species protected under international agreements; Ramsar wetlands of international importance; the Commonwealth marine environment; World Heritage properties; National Heritage places; and nuclear actions. The following MNES are identified within the Hunter Region and incorporated into the NRM Plan for the Hunter.

World Heritage
• Gondwana Rainforests of Australia – Barrington Tops Area (Barrington Tops and Mount Royal National Parks) • Greater Blue Mountains World Heritage Area
Nationally significant wetlands
• Ellalong Lagoon • Wallis Lake • Barrington Top Swamps • Crowdy Bay National Park • Shortland Wetlands
Ramsar wetlands of international importance
• Hunter Estuary • Myall Lakes
Nationally threatened species (Vulnerable, Endangered, Critically Endangered)
133 threatened species • 9 amphibians • 8 reptiles • 39 birds (including listed migratory, migratory marine and terrestrial migratory) • 14 mammals (terrestrial) • 63 plants (species and species habitats may, likely or known to occur) • 11 of these species are listed under the 2021-2031 National Threatened Species Strategy (below) • Additional species under nomination for national listing

Nationally threatened ecological communities (Vulnerable, Endangered, Critically Endangered)
• 14 threatened ecological communities
Migratory species- JAMBA CAMBA, ROKAMBA
• 35 migratory and migratory marine species
Commonwealth marine areas
• Hunter Marine Park (Port Stephens)

Table 1: MNES in the Hunter Region (Source: Protected Matters Search Tool (DAWE) and EPBC Nominations List) Appendix C identifies the list of MNES identified assets listed in the Hunter region. Additional species under nomination listing are also identified at the time of publishing.

The National Threatened Species Action Plan 2022-2032 identifies 110 priority species and 20 priority places identified for national priority investment and action. The following species and priority places are identified in the strategy are found in, or are reliant on habitats, or migrate to important locations within the Hunter region:

Terrestrial

- Regent Honeyeater *Anthochaera phrygia*~^
- Swift Parrot *Lathamus discolor*~
- Eastern Curlew *Numenius madagascariensis*~^
- Australasian Bittern *Botaurus poiciloptilus*~
- Koala (Qld, NSW, ACT) *Phascolarctos cinereus* *
- Brush-tailed Rock Wallaby *Petrogale penicillata* *
- New Holland Mouse Pookila *Pseudomys novaehollandiae* *
- Native Guava *Rhodomyrtus psidiodes**
- Wollemi Pine *Wollemia nobilis**^

Marine/Estuarine

- Green Turtle *Chelonia mydas**~
- Cauliflower Soft Coral *Dendronephthya australis* (Port Stephens)*^
- Grey Nurse Shark (eastern) *Carcharias taurus**
- White's Seahorse *Hippocampus whitei**

Priority Place:

- Greater Blue Mountains, NSW*

*Newly listed since the 2015-2020 Threatened Species strategy in the Hunter, ~Migratory or mobile species ^locally endemic, or known to be significantly reliant on habitats in the Hunter.

In addition to MNES, the new National Soils Strategy 2021-2041, launched by the Australian Government recognises Australian soils as a key national asset for all stakeholders.

The strategy goals determine prioritising of soil health, empowering soil innovation and stewardship and strengthening of soil knowledge and capability for land managers to manage and maintain healthy soils.

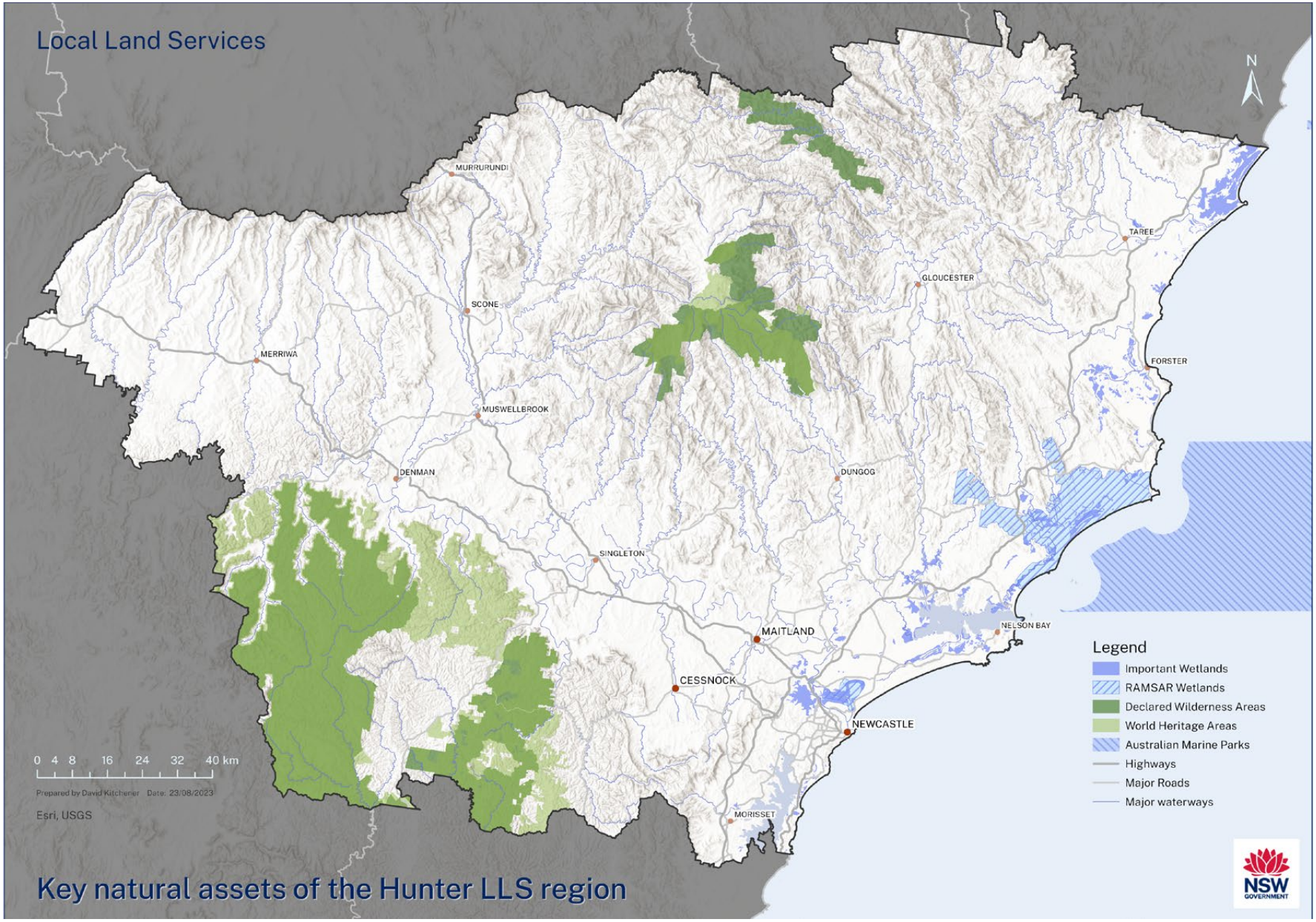


Figure 3. Key natural assets of the Hunter LLS region.

1.12 Regional Land Partnerships 5-year Outcome Statements

The RLP program invests in regional programs delivering national priorities across Australia which contribute to its five-year outcome statements. Hunter's NRM Plan contributes to each of these outcome statements, as indicated in Table 2 below.

RLP five-year Outcome Statements	Theme Alignment	Key Assets
1: There is restoration of, and reduction in threats to, the ecological character of Ramsar sites, through the implementation of priority actions.	Terrestrial Biodiversity Estuary, Coast and Marine	Hunter Estuary Ramsar Wetlands Myall Lakes Ramsar Wetlands
2: The trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species, is stabilised or improved.	Terrestrial Biodiversity Rivers and Aquatic Estuary, Coast and Marine	EPBC listed Species-Fauna, Flora, Other
3: The invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions.	Terrestrial Biodiversity Rivers and Aquatic	Gondwana Rainforests of NSW, QLD (Barrington NP and Royal NP) Greater Blue Mountains World Heritage Area
4: The implementation of priority actions is leading to an improvement in the condition of EPBC Act listed Threatened Ecological Communities.	Terrestrial Biodiversity Rivers and aquatic Estuary, Coast and Marine	Threatened Ecological Communities
5: There is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity, and vegetation.	Terrestrial Biodiversity Soil and Land Rivers and aquatic Estuary, Coast and Marine	Agricultural aquacultural managed lands or tenures (beef, sheep, cropping, horticulture, viticulture, mixed farming)
6: 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.	Terrestrial Biodiversity Rivers and Aquatic Soil and Land Estuary, Coast and Marine	Agricultural, fisheries and aquacultural managed lands or tenures (beef, sheep, cropping, horticulture, viticulture, mixed farming)

Table 2: Regional Land Partnerships 5-year outcomes, Hunter NRM Plan themes, and key assets identified.

1.13 Investment in NRM

Hunter LLS has a long-standing diverse investor base, which has enabled it to deliver complex and varied services and programs.

Hunter LLS' main investors in NRM are:

- Australian Government (National Landcare Program)
- State Government - NSW Treasury (such as the NRM Services program, NSW Environmental Trust, other key state funded programs)
- Hunter Catchment Contributions – local government ratepayers in the Hunter Catchment (Hunter Valley Flood Mitigation Scheme and catchment activities) www.lls.nsw.gov.au/regions/hunter/projects-and-programs/hunter-catchment-contributions
- LLS Rates (Biosecurity, Animal Health, Emergency Management and Stock ID Systems)
- Corporate and private investors and co-investors (e.g. mining sector).

The organisation applies efficiencies and leverage to programs by seeking in kind or co-contributions across investment sources to allow scalable programs and ensure appropriate resourcing for its technical, extension and advisory services, and project staff that enable action on the ground with communities, partners and stakeholders.

Additional investment streams and opportunities beyond the current investment sources include other private investment, natural capital and environmental accounts initiatives. Seeking longer term investments towards more stable and consistent delivery is the highest priority for investment in NRM in the region.

Photo 6: Fencing and revegetation at Halls Creek, Upper Hunter. Credit: HLLS.

1.14 Prioritisation Framework

To ensure Hunter LLS' approach to implementing programs and activities with its communities is strategic and cost effective, the Plan outlines sound prioritisation principles and practices.

Enabling improved NRM decision making and improving on-ground outcomes is dependent on a complex array of planning and delivery considerations, including the desires of communities, having all the information, having time and resources to respond and act, and at what scale can the organisation act combined with finite resources available to leverage effort (Figure 4).

We have identified some key prioritisation principles and approaches in this section to manage these challenges and guide Hunter LLS' approach and effort.

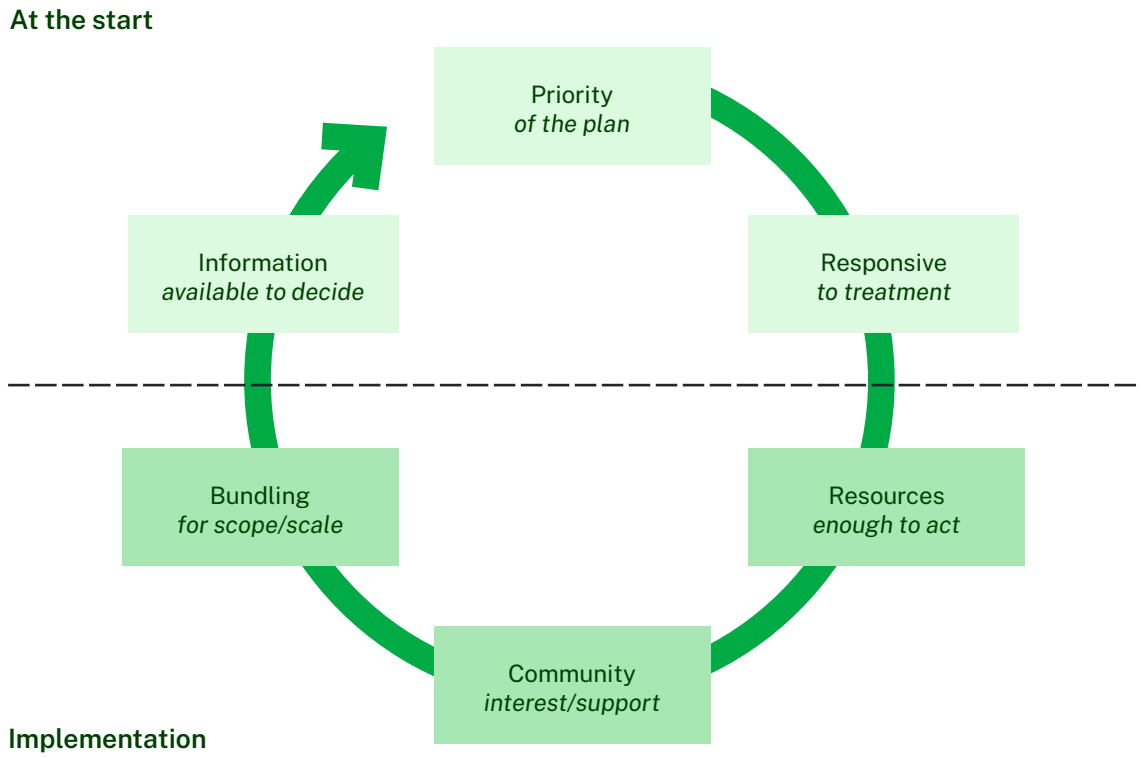


Figure 4: The cycle of planning towards the desired outcome factors in six key considerations that require constant checking and rechecking to maintain and deliver effective programs.

State-wide and regional prioritisation principles

Consistent with current state-wide LLS NRM Framework, a key guiding internal document identifying core role and services objectives across NSW through the 11 regional organisations, Hunter LLS will endeavour to apply these state standard prioritisation principles as detailed below, to align to a state-wide consistent decision-making approach.

Principles are identified as biophysical (unique natural assets) and social (unique and diverse communities) principles for investment, effort and action in NRM.

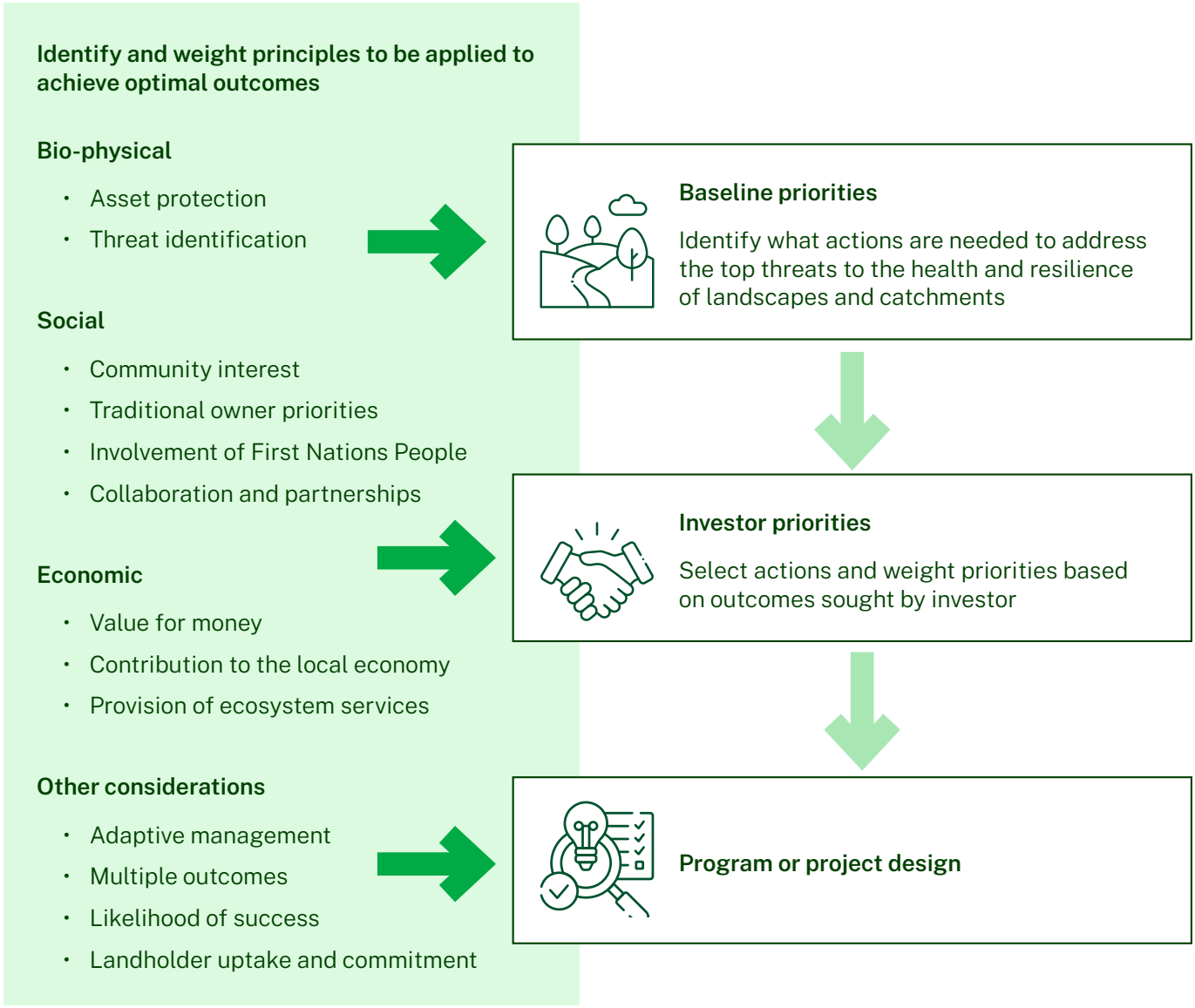


Figure 5. Prioritisation of projects and investment.

Biophysical principles

Natural Assets

Protection, rehabilitation and repair of high value assets is important. A high value asset is a physical asset rather than an ecosystem process. It may be, for example, a vegetation community, ecosystem, waterway, wetland, sub-catchment, healthy soils or a specific species or population.

An asset may be considered high value because of its:

- rarity and level of endemism (irreplaceability)
- intactness, or lack of disturbance
- role in the ecosystem (such as a keystone species or in ecosystem function)
- conservation status
- species richness
- cultural or spiritual significance
- recreational or social significance
- economic value.

Threat mitigation and identification

Assets face many threats. Vulnerability of an asset to a specific threat or a specific set of threats must be considered when prioritising effort and investment.

Threats may be emerging and/or they may be persistent, i.e. they can be a particular weed species or pest animal, or they can be a process such as fragmentation, lack of genetic diversity, erosivity, sedimentation etc. The threat may or may not be at the same location as the asset that is being protected.

It is important that the root cause of decline in asset condition is identified and prioritised. On occasions it may be appropriate to address the symptoms when urgent action is required, however effective planning should allow for effective long-term interventions to address ongoing threats.

The increasing severity and frequency of natural disasters is now a very real threat to NSW, with some regions at higher risk than others. Considering the cumulative impacts of natural disasters and how they impact the ability of a natural assets to bounce back or return to a stable state of equilibrium will be critical to maintaining objectives to retain and enhance ground and vegetation cover, which serves to protect against erosion, flood and drought risks.

Targeted investment

Concentrating NRM investment and provision of services to biodiversity hotspots, river reaches or building on existing community engagement fosters greater landscape and catchment health and resilience outcomes, than scattering and spreading investment across unconnected sites. This targeted approach is also more likely to result in better landscape function and the ability to improve NRM outcomes at a landscape scale and with longer term investment and outcomes.

Ecosystem function and services

Improved ecosystem services and/or natural capital benefits the wellbeing and prosperity of communities. Contribution to ecosystem service provision, such as carbon sequestration, soil improvement, improvement in water supply and farm productivity will be considered while planning and prioritising NRM program and projects.

Social Principles

Community Interest and Wellbeing

Undertaking activities with high community interest will lead to better and more enduring environmental outcomes, incorporating local knowledge and contributing additional resources. Initial investment can often be a catalyst for change, increasing community interest and building capacity of local groups, leading to an increased likelihood for long-term success.

Where community wellbeing has been challenged by frequent natural disasters, Hunter LLS will take this into account and be responsive and adaptive in its delivery to review, maintain and enhance individual and community capacity and willingness to participate and lead NRM initiatives.

Landholder/stakeholder uptake and commitment

Confidence of landholder/stakeholder interest and uptake – for example where there are multiple benefits of an activity or program, and a commitment to implement or continue the activity into the future because it demonstrates a positive outcome or benefit will be taken into consideration when planning and prioritising NRM activities, ensuring there is a long-standing legacy and enduring outcomes for the environment and the community.

Reconciliation

LLS will actively seek to understand and incorporate priorities of Local Aboriginal Land Councils, Traditional Owners in the design of NRM program and projects, including the incorporation of Traditional Ecological Knowledge and values associated with particular assets.

Activities will be prioritised when there is an opportunity to be led and/or involve First Nations People, especially when this involvement results in social benefits such as employment and training opportunities.

Cooperation

Coordination and collaborative action can lead to better and more enduring outcomes, due to an increased interest and sense of ownership that involvement brings with it; and the knowledge, expertise, experience, and resources that others can bring.

There is value in working in partnership with others to ensure activities are undertaken in a coordinated manner to get the best outcome for the health and resilience of landscapes and catchments.

Photo 7: Managing Our Creek, Community workshop, Lower Hunter. Credit: HLLS.

Spatial prioritisation

In the early stages of the Plan's development, it was determined that sub-catchments would be the most appropriate management unit. Sub-catchments are likely to have similar natural resource assets and threats, similar or related land use, and be a relatable unit for social planning and program implementation – landholders in a sub-catchment are likely to identify with each other.

While not a familiar planning unit to all stakeholders and partners, all agreed with the approach and rationale during consultation sessions. This sub-catchment approach was taken, with support from community and stakeholders, in the effort to further break down the regions landscapes and use these units of scale to describe the assets and values to geographic areas that are more practical for planning and implementation of the Plan.

Hunter LLS has therefore identified 62 unique sub-catchments (Figure 6). Many of these are familiar to the community, and form landscape areas for targeted and strategic effort.

To determine how Hunter LLS will invest its effort and resources, to ensure the above principles are efficient, effective and provide legacy, it will need to identify spatially which natural asset/suite of assets is considered the highest value asset for protection, rehabilitation, or repair within the landscape.

Spatial prioritisation on a sub-catchment scale will be informed by specific criteria and associated assets.

Criteria will be specific for each Theme and are selected as being most representative (*for example, for Native Vegetation and Terrestrial Biodiverse Ecosystems Theme, threatened vegetation is an identified criterion, another is corridor/connectivity areas in the landscape*).

Each of the identified criteria is then weighted against the attributes identified within each sub-catchment landscape unit:

- Location
- Extent
- Significance of the assets identified (such as conservation status, risk rating etc.).

Sub-catchments will then be spatially ranked from highest to lowest priority for each Theme and the attributes identified through a ranking system.

An example of how this will work is included as Table 3 below. This example, for the Native Vegetation and Terrestrial Biodiversity theme, shows three criteria and attributes (threatened flora and fauna score, threatened ecological community score and connectivity and corridors score) used to generate a rank for all sub-catchments from 1-62.

Sub-Catchment	Flora & Fauna Score	Flora & Fauna Rank	TEC Score	TEC Rank	Connectivity & Corridors Score	Connectivity & Corridors Rank
Avon	5.75	37	8	16	0.09	60
Baerami	7.25	30	1	53	0.13	55
Black	11	13	4	31	0.37	28
Bow	2.5	62	3	44	0.03	62
Bowman	4.5	49	1	53	0.19	49
Central Karuah	5.75	37	8	16	0.48	16
Coolongolook	14.75	5	16.5	8	0.42	20
Cooplicurripa	3.5	54	1	53	0.28	35
Dart	4.25	51	4	31	0.43	18
Dingo	7.5	28	3	40	0.19	47
Dora Creek	15.25	2	4.5	28	0.61	5
Doyles	4.25	50	4	31	0.37	26
Ellenborough River	4.5	48	1	53	0.28	37
Glendon	3.25	60	10.5	13	0.18	50
Glennies	7.75	25	8.5	15	0.28	36
Halls	5.25	44	1	53	0.15	54

Table 3: Example of summarised results, following spatial analysis of the criteria and attributes, used to inform which sub-catchments are most likely to satisfy benchmarks for targeted investment.

A higher ranking indicates those sub-catchments contain or represent the greatest number of criteria and most valued attributes or identifies opportunities to enhance, maintain or create corridor links across the landscape.

The rankings can then be combined or compared across Themes. Sub-catchments with higher rankings for multiple Theme objectives can be identified in the planning stage, providing opportunities for collaboration and integrated services.

The rankings provide a framework for understanding where the priorities are in the region. To ensure the accuracy in this spatial prioritisation analysis for assets across each of the four themes and within the sub-catchment-based units, the spatial data sourced for this analysis has been checked to ensure:

- It is tested for rigor, accuracy and relevance across the Hunter region
- Where possible, incorporates data sets developed through existing prioritisation processes (such as high value assets, assets at most risk, connectivity and corridors)
- Is aligned to theme objectives, national, state and regional priorities
- Incorporates or considers knowledge or local expert input, through consultation with key stakeholders.

Data limitations

Spatial data only included Federally listed species and communities based on the reliability and consistency across the Hunter region. Therefore, it did not incorporate State listed and regionally significant data which in some instances was inconsistent and or deficient.

Ranking by sub-catchment provides a coarse assessment of landscape areas that may be of most importance for investment, services and action which will then allow for more detailed planning within the identified sub-catchments, and localised geographic landforms and related assets, and consider social prioritisation principles.

Using the prioritisation approach taken in this plan, Hunter LLS is also developing an interactive prioritisation tool to assist with program planning and implementation of the priorities in this NRM Plan. The tool can then be used to inform comprehensive consultation process with state, community, Aboriginal and Landcare bodies and expert input.

Understanding that priorities will change over time, the intention is to provide the best available data and tools at a sub-catchment scale. The spatial information and tool will be flexible and be maintained as an up-to-date resource for community and stakeholders.

Prioritisation of investment on Private Lands for Public Benefit

In addition to prioritisation at a sub-catchment scale, Hunter LLS has a mechanism in place to ensure that investment in activities on private lands align to the Theme objective, so that it will meet cost-effective public benefit requirements, provide strong environmental benefit and other criteria (such as risk or compliance) providing a sound rationale to support decision making and allocation of investor funds.

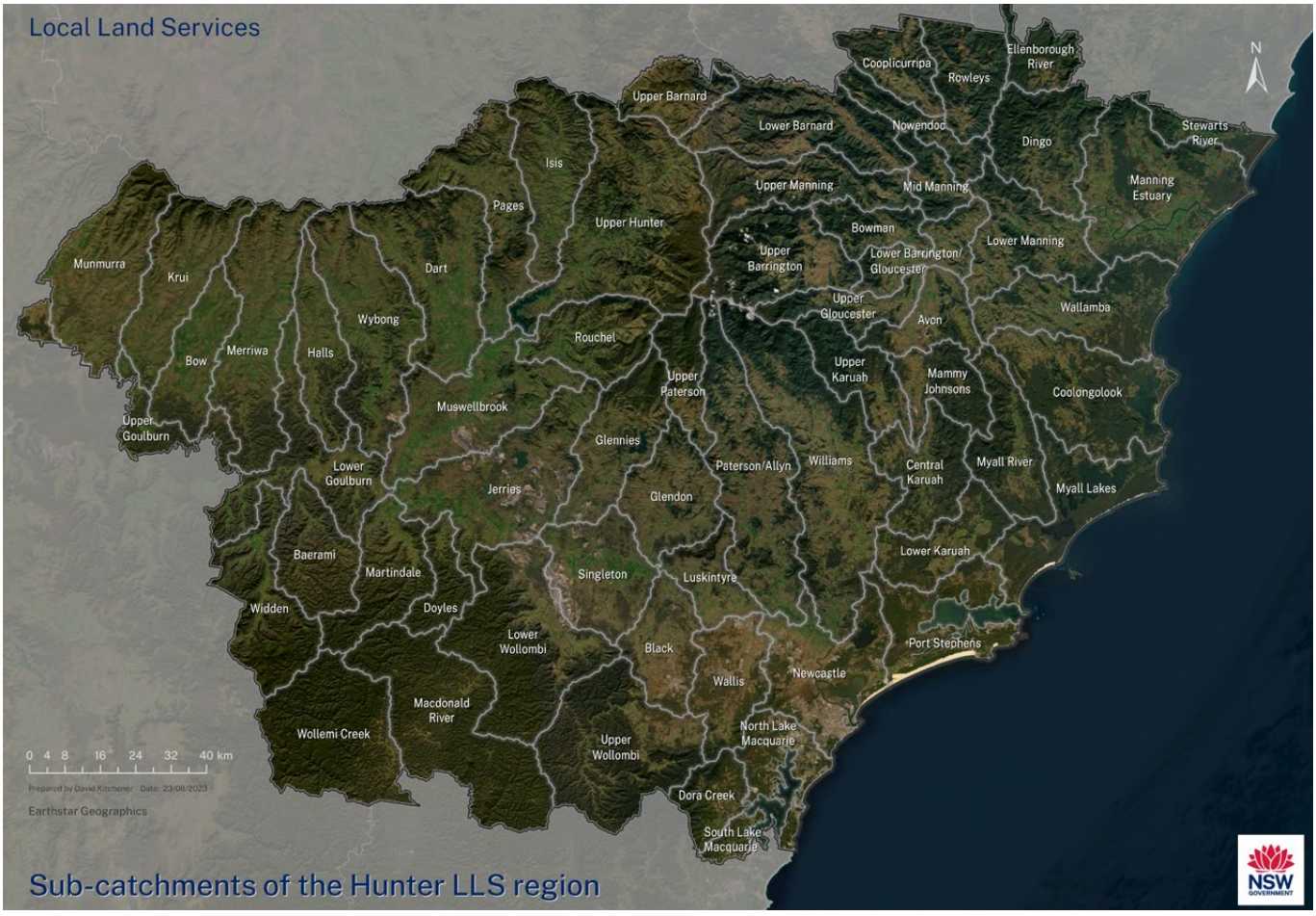


Figure 6. Hunter Region's 62 sub-catchments.

Native Vegetation and Terrestrial Biodiverse Ecosystems

2

2. Theme 1 - Native Vegetation and Terrestrial Biodiverse Ecosystems

This theme identifies terrestrial based native vegetation and the biodiversity (flora and fauna) and unique ecosystems in these landscapes.

Terrestrial is defined as not being directly reliant on riparian, estuarine or marine environments or landforms. Acknowledging that many fauna species, and some flora, are mobile and can move between landscapes, for the purposes of this theme they are identified as land-based species where their dominant habitat is within terrestrial vegetation. Ecosystems refers to the dynamic interactions and roles of plants, animals and other organisms in maintaining balance and cycles in landscapes, including unique habitats that provide for a suite of dependent flora and fauna.

Landforms and landscapes representing the unique and important biodiverse ecosystems in the Hunter region are identified in this theme, with key objectives and actions identified as key focus for partner, community, and land manager action.

2.1 Assets, Threats, Objectives and Key Results

Native vegetation assets in the Hunter Region

The Hunter Region is characterised by several key landforms, species and habitats, protected within two World Heritage Areas (WHA). The Greater Blue Mountains WHA contains, amongst others, Wollemi & Yengo National Parks, and adjoins Goulburn River National Park, while the Gondwana Rainforests of Australia WHA contain the Barrington Tops National Parks.

The Upper Hunter contains the most threatened grassy box woodlands and open eucalypt forests in the Hunter region, which are typically found as small remnants, fragmented through farming, mining, development or land clearing practices. These small remnants lack structural integrity and have limited plant species diversity, such as lack of under-storey plants. Several areas with large intact remnants contain important endemic and threatened species habitats, within the broader Hunter Valley, and in the Lower Hunter Cessnock Biodiversity area and areas to the north of the Greater Blue Mountains WHA.

Coastal and forested habitats considered wet sclerophyll are also protected within reserved and private lands, and contain significant Koala habitats, and other habitats for a range of threatened species. Unique coastal dense heath vegetation is limited to growing on sand or in coastal clay on bedrock soils supports the threatened Dwarf Heath Casuarina.

Rainforests, forests and alpine habitats are largely protected within the two WHA areas and coastal reserves, but face substantial threats from increasing climate change impacts such as extreme weather events (fire, floods, storms) and new or increased weed and pest animal threats. Where rainforests including floodplain and lowland rainforests are retained on private landholder property, fragmentation and weed competition presents an ongoing risk.

Within the Native Vegetation and Terrestrial Biodiversity theme, four sub-themes have been identified representing important ecosystems for protection, retention, and enhancement.

1A. Dry open forest and woodland ecosystems – refer section 2.4.1

1B. Rainforest vegetation ecosystems – refer section 2.4.2

1C. Wet sclerophyll forests and ecosystems – refer section 2.4.3

1D. Alpine or sub-alpine vegetation ecosystems – refer section 2.4.4

Threats to native vegetation and terrestrial biodiverse ecosystems

The mitigation of key threats and loss of native vegetation and terrestrial biodiversity are dependent on increased awareness and adoption of effective future land management practices and actions. These can be identified as three main threat profiles:

Historic and current poor practices: Clearing, degradation or disturbance including historic land clearing, development, poor land management actions such as removal of understorey vegetation, poor biosecurity management (pest and weeds) and activities such as firewood collection, over fertilisation, chemical use or overgrazing, arson or inappropriate fire management, illegal access, clearing and dumping. Land or vegetation removal resulting in fragmentation of native vegetation reduces available wildlife corridor and fragments or isolates species to sparse numbers and reduces population viability. Loss and lack of historic cultural land management knowledge and practices. Lack of data to understand and manage complex implications of the above activities.

Climatic threats: Increased frequency, intensity and extent of fire, flood and drought stress and related extreme weather events, more variable and rising temperatures in alpine areas and lack of species adaptation.

Environmental threats: Invasive plants such as transformer weeds, e.g. exotic vines and scramblers (an invasive plant species that has the capacity to change the character, condition, form or nature of one or more ecosystems), or pathogens (such as Phytophthora or Myrtle Rust); fragmentation and senescence attributed to historic and current poor practices, such as isolation or loss of genetic diversity or breeding potential, predator and pest animal threats such as vertebrate pests that predate or displace native species, pest animals (such as herbivores, deer or feral pig) that damage or harm biodiversity or vegetation, and other species identified as key threats.

Actions identified in *Key Initiatives and Actions* below are directly aligned to mitigating or responding to threats identified in this theme.

Objective and Key Results

Objective 1:

By 2028 there is improved condition and resilience of native vegetation and biodiversity in the landscape.

Key Result 1.1

Improve the connectivity and linkage of habitats to maintain corridors for wildlife, and reinstate native vegetation, ***as measured by area (ha) of native vegetation enhanced, rehabilitated or protected (State-wide Metric/SWM***).

Key Result 1.2

Enhance and reinstate the structure of important native vegetation and habitats and their functions to maintain critical ecosystem functions and services, ***as measured by area (ha) of native vegetation enhanced, rehabilitated or protected, area (Ha) of weed/ pest control (vertebrate) (SWM)***.

Key Result 1.3

Reduce or abate threats and/or disturbance to biodiversity and key habitats to mitigate loss of biodiversity or threats to population viability, ***as measured by area (ha) of threatened species, populations or ecological communities enhanced, rehabilitated or protected (SWM)***.

Key Initiatives and Actions

Action 1a. Protect and sustain the integrity of high value remnant vegetation and habitats on private land.

Action 1b. Promote natural regeneration or improve the structural integrity and condition of native vegetation and habitats, such as key stone species, under-storey and habitat features (such as via strategic weed control or habitat augmentation).

Action 1c. Create and enhance connectivity, wildlife corridors or linkages to existing remnant vegetation by protecting, reinstating or regenerating native vegetation.

Action 1d. Control or reduce vertebrate pests or predator threats to biodiversity.

Action 1e. Monitor biodiversity and landscape health through indicator or flagship species.

Action 1f. Promote and encourage adoption of practices to landholders that reduce threats and conserve native vegetation, habitats and biodiversity, protect natural capital and prepare or adapt to climate change.

Action 1g. Protect biodiversity from human disturbance or other environmental threats.

Action 1h. Promote or facilitate private long-term conservation or stewardship of high value native vegetation and biodiverse habitats, through environmental stewardship programs or markets.

Action 1i. Identify and manage key data or knowledge gaps to assist with future recovery or restoration efforts and appropriate decision making.

Alignment to Regional Landcare Partnership Outcomes

Alignment to Regional Land Partnerships 5-year Outcomes:

- Invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions
- The trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species, is stabilised or improved
- The implementation of priority actions is leading to an improvement in the condition of EPBC Act listed Threatened Ecological Communities
- There is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation
- 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.

2.2 Monitoring, Evaluation, Reporting (MER) and Prioritisation

How will Hunter LLS measure success?

The following measures of success will be used to assess how Hunter LLS is improving the condition and resilience of native terrestrial vegetation and biodiversity in the Hunter region.

LLS Delivery and Customer Metrics

- Area (ha) of native vegetation enhanced, rehabilitated or protected
- Area of threatened species, populations or ecological communities enhanced, rehabilitated or protected
- Area (Ha) of weed control
- Area of pest control (vertebrate)
- Number of stakeholder partnerships
- Number of community groups supported
- Number of Aboriginal stakeholder partnerships
- Area managed with traditional ecological knowledge
- Number of Aboriginal people working on Country has increased.

Condition Indicators (Local Strategic Plan)

Improved condition of natural resource assets, soil and land, native vegetation and biodiversity, rivers and aquatic biodiversity, and estuarine and marine ecosystems.

Monitoring approach

- Spatial data and assessment
- Condition monitoring indicators and tools
- Flagship/indicator surveys (indicators for landscape health)
- Fauna or flora monitoring
- Evaluation/participant surveys (practice change, skills and knowledge, decision making)
- Register of participation/agreements
- Register of participation/employment
- Register of species specific/recovery plan actions implemented.

Prioritisation

To maximise benefits for 5-year delivery, the prioritisation is based on the presence of native vegetation and biodiversity values in the Hunter region, identified at a landscape scale, and intersected with the 62 sub-catchments.

Prioritisation principles

The selection of priority landscapes for strategic action is based on both spatial information and importance including: species and places, risk of extinction, multiple landscape benefits, continuity and partnership potential, importance to people, uniqueness and representativeness to the region (further rationale, approach and key data information can be found in Appendix A).

Spatial prioritisation

To assist in identifying high-value landscapes for protection, enhancing native vegetation, connectivity and the biodiversity it sustains, multiple environmental layers based on multiple criteria have been incorporated to spatially identify priority sub-catchments for action or investment (Table 4) that will lead to achieving the identified Key Results 1.1 to 1.3.

Key Result 1.1

Improve the connectivity and linkage of habitats to maintain corridors for wildlife, and reinstate native vegetation.

Key Result 1.2

Enhance and reinstate the structure of important native vegetation habitats and their functions to maintain critical ecosystem functions and services.

Key Result 1.3

Reduce or abate threats and/or disturbance to biodiversity and key habitats and to mitigate loss of biodiversity or threats to populations viability.

Prioritisation of Native Vegetation and Terrestrial Biodiverse Ecosystems	
Criteria	Attributes within sub-catchments for ranking
High conservation value native vegetation	Highest number of listed vegetation communities present within a sub-catchment (rank and score in order of conservation status, example Critically Endangered= highest scored)
Vegetation connectivity	Extent of identified corridors and patch size >10ha extent (and non-vegetated lands identified for potential enhancement) (regional and local)
High conservation value flora and fauna species*	Highest diversity of listed or identified species (either national, state listed and regionally significant species**) (rank and score in order of conservation status, example Critically Endangered= highest scored)
Other significant landscape areas	N/A

Table 4: Prioritisation criteria for native vegetation and terrestrial biodiverse ecosystems.

*Regionally significant species identified are based on validation from researchers, or species experts.

**Note several species identified in this prioritisation approach are also identified in other detailed species-based recovery plans and programs as known 'indicator or flagship' species and are known to represent a broad suite of other species or actions that provide broader landscape benefits.

Environmental values mapping to inform priority actions for investment

The spatial prioritisation of native vegetation and terrestrial biodiverse ecosystems below should be read in conjunction with the Sub-theme descriptions and identified National, State and Regional priority species and vegetation communities detailed in Tables 5 to 8.

Priority sub-catchments for threatened flora and fauna species

To produce the sub-catchment threatened species richness map, BIONET presence data were obtained for 124 Federally listed threatened flora (77) and fauna (47) threatened species. The species data were intersected with the 62 sub-catchments, the scores being based on the count of all species in each sub-catchment (rather than the projected area), then weighted based on EPBC status, where Critically Endangered is assigned the highest score and Vulnerable the lowest. Figure 9 below only considers the number of different species and their status, using a scaled score of 0 to 1. The scorings were: Critically Endangered – 1, Endangered – 0.5, Vulnerable - 0.25. Migratory and migratory marine species were excluded to reduce bias and overlap.

The highest priority sub-catchment areas represent the greatest abundance of threatened flora and fauna species weighted for the degree of potential threat within a given sub-catchment (Figure 7). Notably many of the coastal sub-catchments containing high species abundance include Manning Estuary, Coolongolook, Port Stephens and Newcastle, which may be partially attributed to the high level of known survey effort. Other high priority sub-catchments identified include Wallis, Black, Upper and Lower Wollombi and Jerries, Williams and Paterson.

It is important to note that lack of available species data may be attributed to sub-catchments containing low to very low species richness and further investigation may be required. In particular examples include the Upper Hunter catchments including Bow and Krui and Glendon. (Refer to Appendix A).

Photo 5: Hexham Swamp, Newcastle. Credit: Hunter Bird Observers Club.

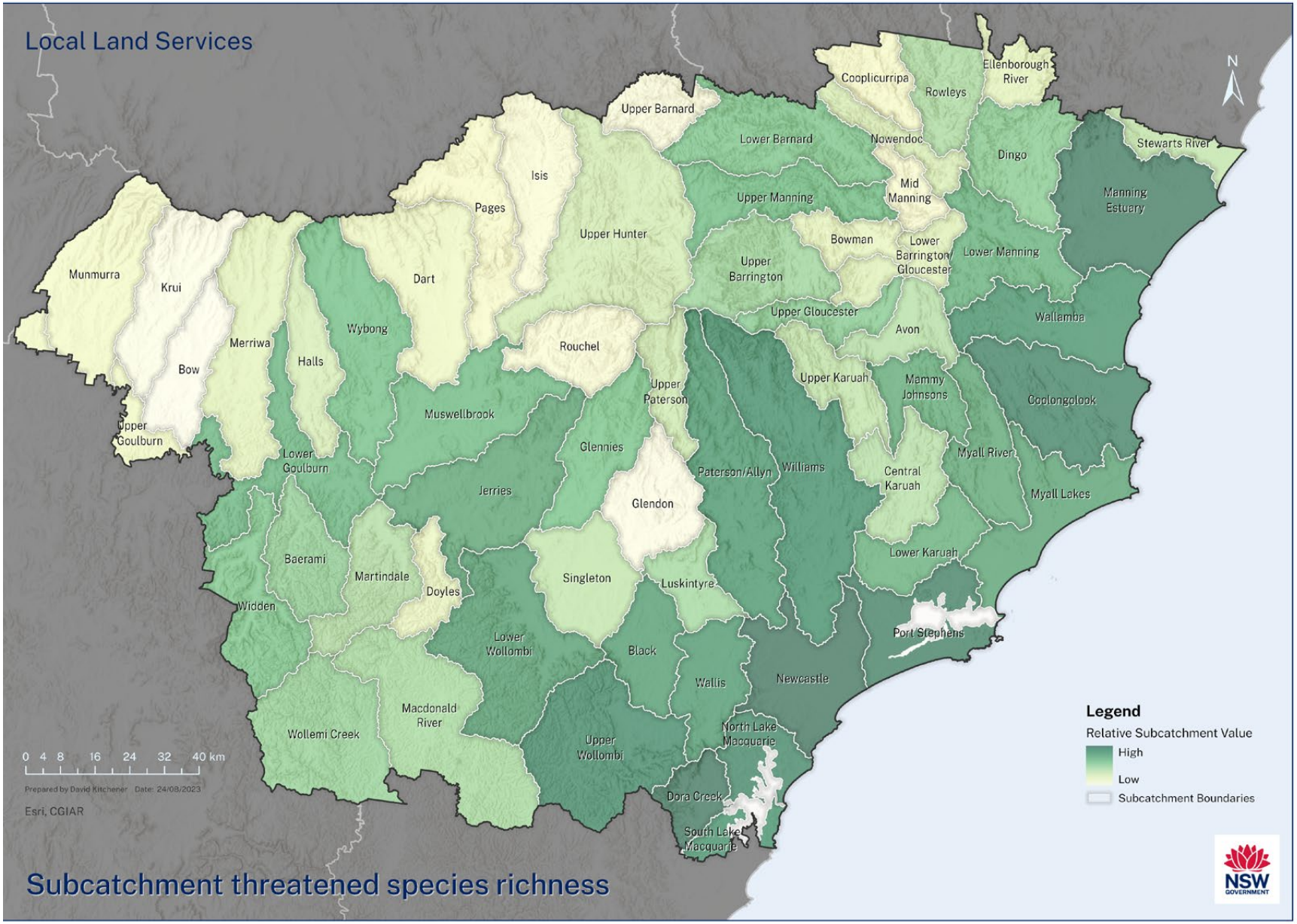


Figure 7: Priority sub-catchments for threatened flora and fauna species.

Priority sub-catchments for Threatened Ecological Communities (TECs)

The combined TEC footprints were intersected with the 62 sub-catchments, the scores being based on the count of all TECs in each sub-catchment (instead of the projected area), then weighted based on EPBC status. The scorings include: Critically Endangered –1, Endangered –0.5, Vulnerable -0.25.

Two priority sub-catchment maps were produced, with the first incorporating all TECs and the weighting described above. The highest priority sub-catchment areas therefore represent the greatest number of Threatened Ecological Communities, weighted for the degree of threat within a given sub-catchment (Figure 8).

The second map only incorporated the Critically Endangered Ecological Communities (CEECs), represented as a proportion of the extant native vegetation in each sub-catchment. Being only CEECs, no weighting was applied. The highest priority sub-catchments therefore represent where Critically Endangered Ecological Communities make up the highest proportion of native vegetation remaining within that sub-catchment (Figure 9).

The current extent and distribution of the critically endangered White-box Yellow-box Blakely's Redgum Grassy Woodlands and Grassland is highly fragmented and sporadic. This is indicated within the Upper Hunter sub-catchment as containing lower priority compared to the multiple Lower Hunter and Manning Great Lakes sub-catchments. It may also be attributed to limited or no vegetation mapping data and should be considered requiring further investigation into new or locally available mapping.

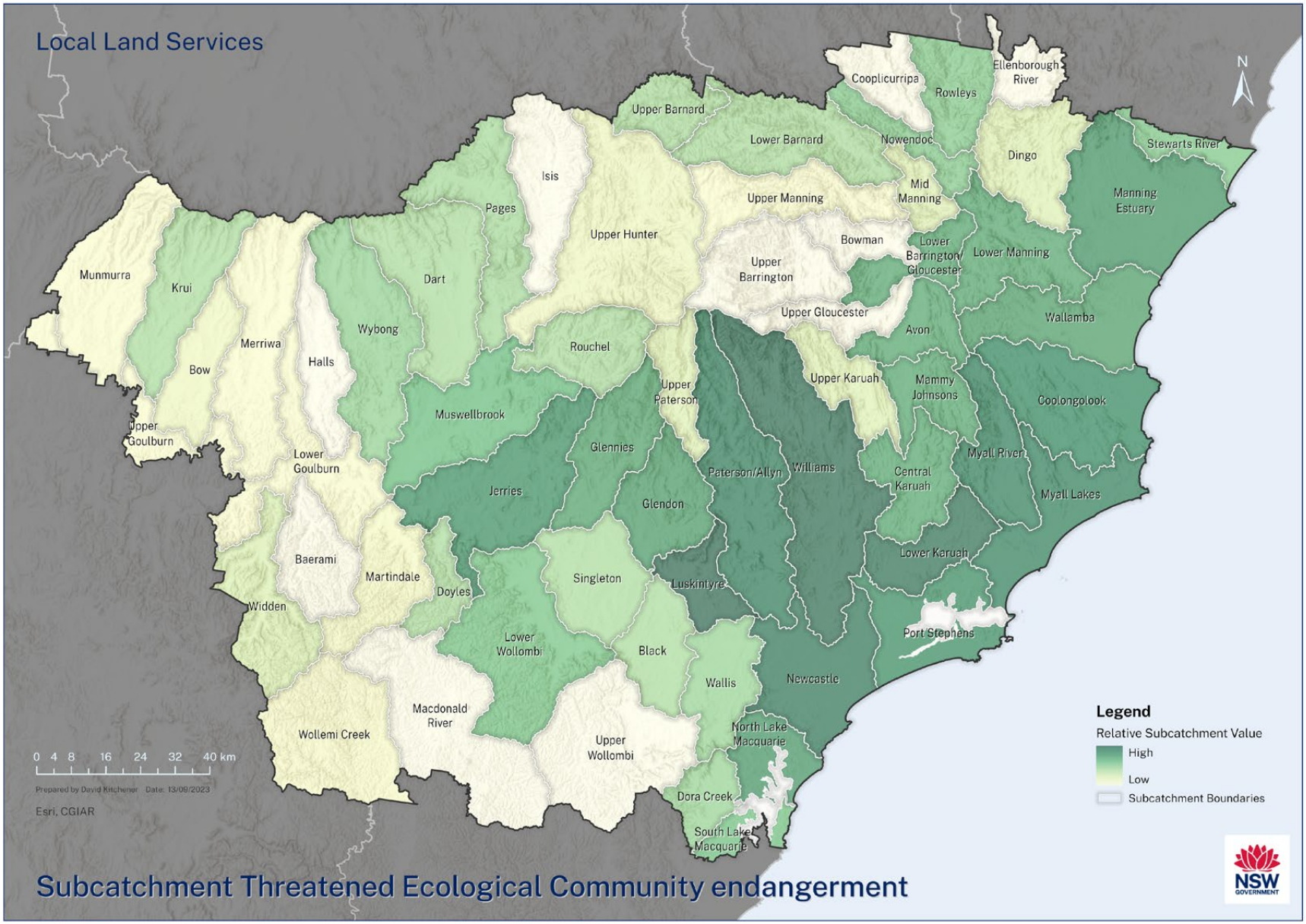


Figure 8: Priority sub-catchments for Threatened Ecological Community biodiversity.

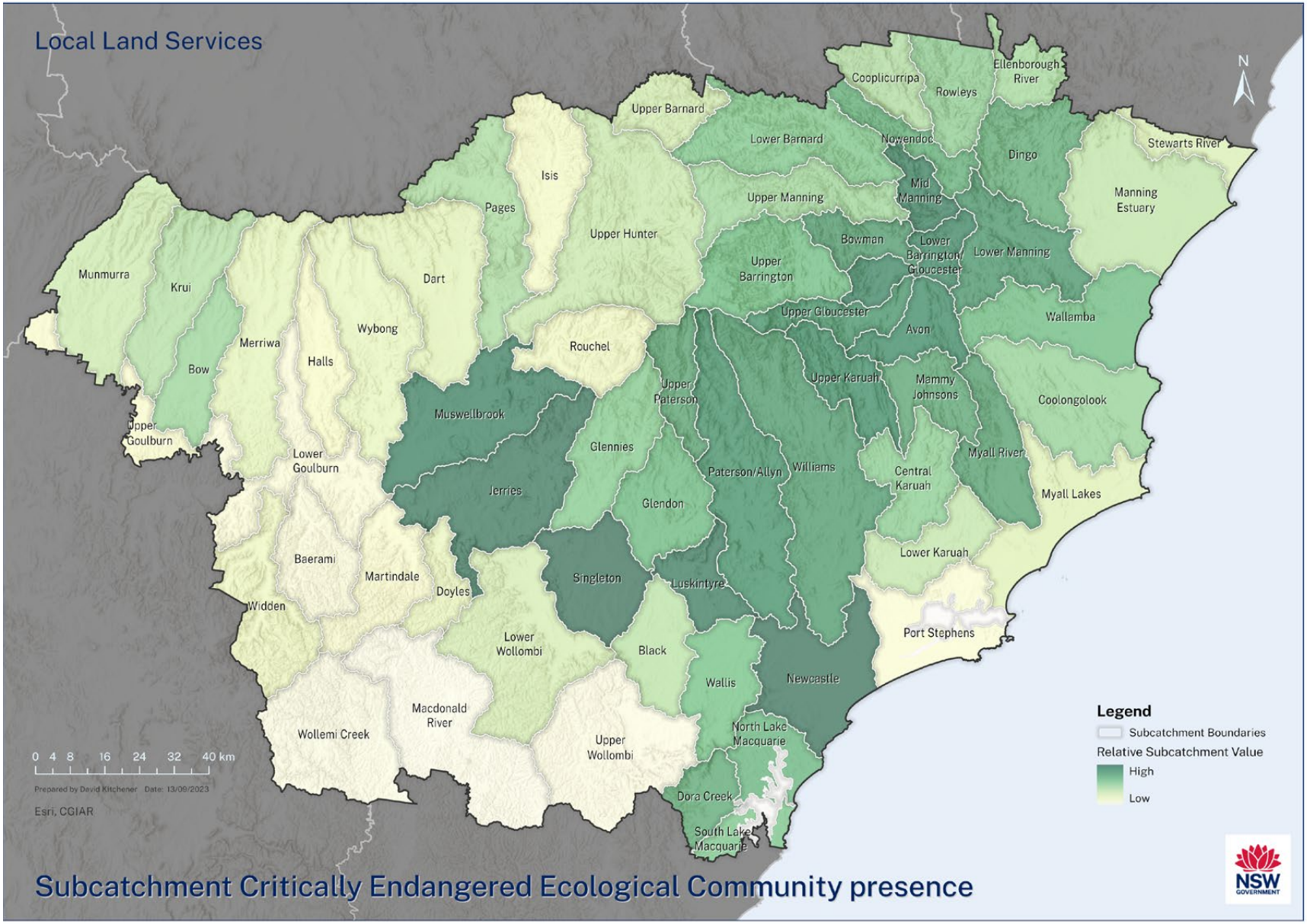


Figure 9: Priority sub-catchments for Critically Endangered Ecological Communities.

Priority sub-catchments for Connectivity links and Climate Change Corridors

The connectivity analysis represents native forests as 'patches' which can be joined by potential 'connectivity links' (within a certain distance). These data can be applied to identify and prioritise areas where connectivity potential between two fragmented patches is viable. Areas with high numbers of short linkages represent a better opportunity to create habitat connectivity than areas with a low number of long linkages. To develop a score, the links were intersected with the 62 sub-catchments, the total number of links in a sub-catchment being divided by the average link length for the sub-catchment. High numbers of short links create a number approaching 1, while few, long linkages create a number approaching zero.

The climate change corridor analysis uses the proportion by area of a given sub-catchment that these corridors occupy. Note that the three corridor types (coastal, moist and dry) can overlap, making it possible for the areal sum of the 3 corridors to occupy more than 100% of the total area of a sub-catchment. However, the different corridor types represent different potential for the species and communities present and therefore it was reasonable to consider the total area of corridors in developing a ranking, rather than counting multiple corridors as one.

The links analysis calculated the total number of links divided by the average length, while the climate change analysis used total corridor area as a proportion of the sub-catchment. These two factors were given equal weight in calculating a final prioritisation score. The highest priority sub-catchments therefore represent where the greatest opportunities exist to enhance connectivity and to establish habitat with a higher degree of resilience to climate change (Figure 10).

Interestingly the connectivity links data have similarities to the climate change corridors mapping data, especially where the three different corridor types overlap. Sub-catchments containing the potential for increasing and enhancing connectivity include Upper Hunter, Port Stephens and Williams. The lower priority sub-catchments such as Barrington, Lower Barrington and Gloucester, Martindale, Baerami and Widden is attributed to the presence of large areas of intact bushland and existing corridors. Other lower priority sub-catchments Krui and Bow, may be attributed to the greater extent of clearing and the subsequently limited opportunities for fragmented bushland patches to reconnect.

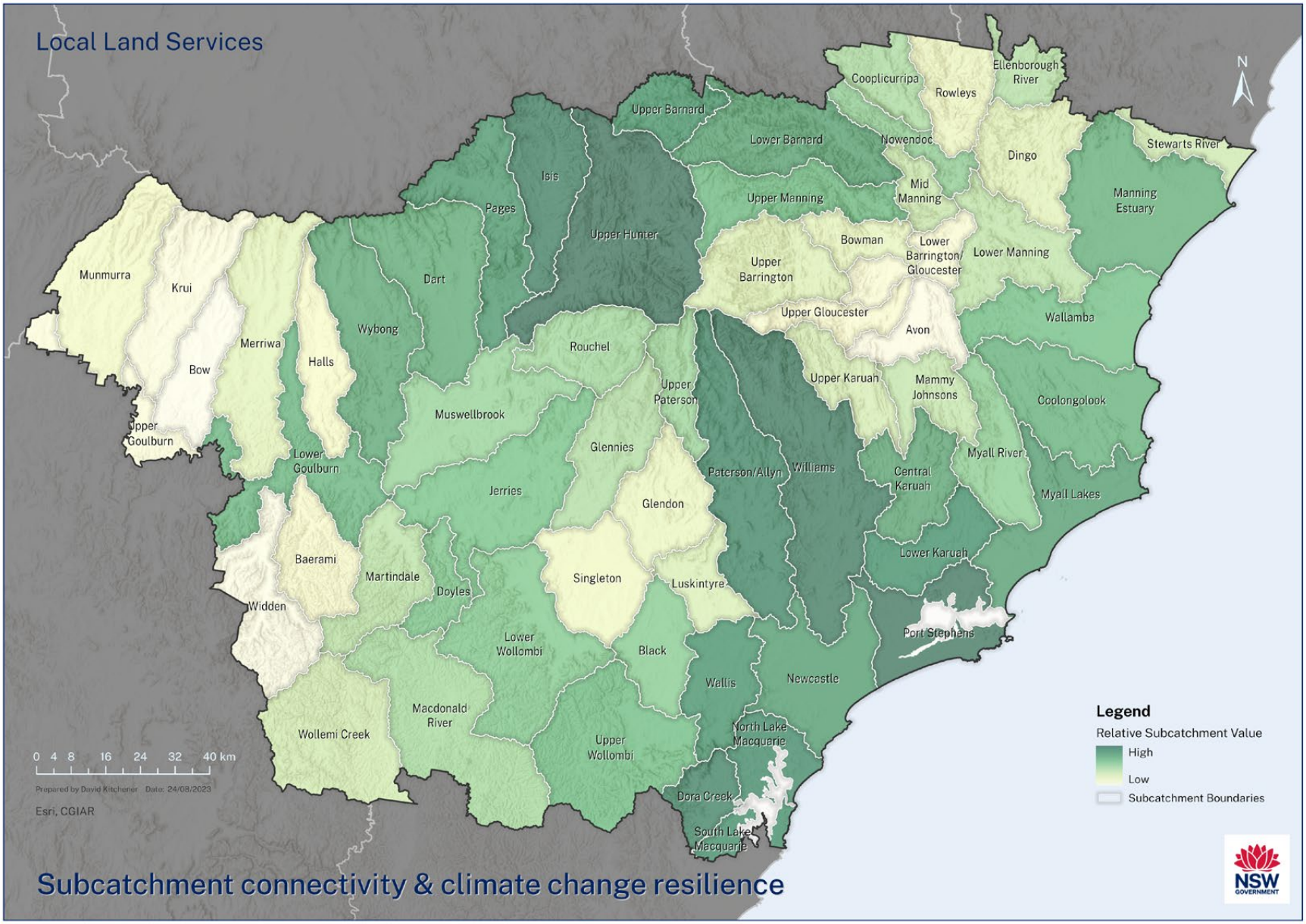


Figure 10: Priority sub-catchments for connectivity and climate change resilience.

2.3 Native Vegetation and Biodiverse Ecosystems Sub-themes

Sub-theme 1A: Dry open forests and woodland ecosystems priority assets

The Hunter Valley and its landforms is one of the most unique features of the region, with woodland and forests extending into sub-coastal areas that are normally found to the west of the Great Dividing Range, due to geological formations causing a significant 'gap' in the range that provides a connection to western landscapes allowing drying westerly winds and influencing species and vegetation as a result.

The valley and inland escarpments contain 6 distinct forest and woodland vegetation listed as Threatened Ecological Communities (Nationally listed, TEC). Of these, four are listed as Critically Endangered, and three are endemic to the Hunter Valley. Of the Endangered Ecological Communities (State Listed, EEC), two are also representative of one of the Federally listed TECs.

The Hunter Valley is identified as one of the most important refuge areas for the critically endangered migratory Regent Honeyeater and Swift Parrot and, as a result, the Lower Hunter Valley, and Wollemi NP Key Biodiversity Areas are identified in this landscape. These woodlands and forests support 34 woodland bird species identified as in severe decline across eastern NSW and can be represented by flagship indicator species the Regent Honeyeater and Painted Honeyeater for key actions that benefit a suite of species, including birds, mammals, reptiles and amphibia. Species listed below represent the most threatened, unique and flagship species, where actions taken represent benefits for a larger suite of species and habitats.

Adjoining the valley floor, the escarpments and valleys of the Greater Blue Mountains World Heritage Area and Goulburn River National Park and Watagans National Park (and associated reserves) are important refuges for biodiversity and vegetation. The World Heritage Area represents more than 70 plant communities, including 56 open forest and woodland communities, contribute to the exceptional diversity of eucalypt-dominated ecosystems within the World Heritage Area, with over 150 eucalypt species.

State and Local Government, Aboriginal land managers, landholders, Landcare and NGOs have significant interest in the protection of these unique landscapes containing such unique biodiversity of the region.

Investment and management of this theme builds on previous efforts over multiple years engaging private landholders, Landcare, Aboriginal land managers and working with key collaborators and partners and building momentum for key actions and regional outcomes in the region, on both private and public lands.

Hunter Region Priority Assets for Dry Open Forests and Woodland Ecosystems		
Regional Investment Priority	Protect, enhance and retain unique biodiversity and ecosystems represented in dry forest and woodlands of the Hunter Valley	
National Priority Assets *(CE= Critically Endangered)* *(*Listed in Threatened Species Strategy)* *(n=under nomination for EPBC listing)*	**Places**: Greater Blue Mountains World Heritage Area (also a Key Biodiversity Area), Ellalong Lagoon **TECs**: Central Hunter Valley eucalypt forest and woodland (CE)*, White Box Yellow Box Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands (CE), Kurri Sand Swamp Woodland(n), Warkworth Sands Woodland of the Hunter Valley (CE), Hunter Valley Weeping Myall Woodland (CE) **Birds**: Regent Honeyeater*(CE), Swift Parrot*(CE), Eastern Hooded Robin, Painted Honeyeater, Gang-gang Cockatoo **Mammals**: Brush Tailed-rock Wallaby*, Koala*, Spotted-tail Quoll, Large-eared Pied Bat **Amphibians and Reptiles**: Booroolong Frog, Striped Legless Lizard **Plants**: North Rothbury Persoonia (CE), Cravens Grey Box, Denman Pomaderris (CE)	
State Priority Assets *(CE= Critically Endangered)* *(# EECs listed are representative of the federal listed TEC Central Hunter Valley eucalypt forest)*	**Places**: Lower Hunter - Area of Regional Koala Significance **EECs**: Lower Hunter Spotted Gum Ironbark Forest, Central Hunter Ironbark-Spotted Gum-Grey Box Forest#, Central Hunter Grey Box-Ironbark Forest#, Quorrobolong Scribbly Gum Woodland, Hunter Valley Footslopes Slaty Gum Woodland **Plants**: Pokolbin Mallee, Slaty Red Gum	
Regional Priority Assets	**Places**: Cessnock Biodiversity Area (including private and Indigenous owned Tomalpin Woodlands), also known as Lower Hunter Key Biodiversity Area, Tomalpin Woodlands and Tumblebee, Sedgefield TSR, Baiame Cave, Muswellbrook Common, Mudgee-Wollar Key Biodiversity Area (bounding both Central Tablelands and Hunter LLS regions incorporating the Goulburn River NP) **Plants**: Native mistletoe (Needle-leaf, Box, Grey and Long Flowered)	
Condition statement	Woodlands and dry forests have been fragmented through land clearing, mining and development, particularly along the valley floor. Fragmented remnants on private lands lack understorey, and connectivity. Tomalpin woodlands is one of the largest expanses of private Aboriginal community owned forest and woodland habitat providing critical habitat for biodiversity.	
Sub Theme Threats		
Clearing, degradation or disturbance	• Illegal or other firewood or large woody debris collection • Illegal clearing • Clearing of understorey • Wildfire threat (human or environmental initiated)	• Removal of keystone species such as mistletoe and Grey-headed Flying Fox habitat • Vegetation disturbance or damage (deer, wild pig) • Grazing pressure on understorey species • Drought pressures
Predator and pest threats	• Noisy Miner (Key threatening process-Regent Honeyeater) • Vertebrate pests (fox, feral cat, wild pig) • Vertebrate herbivorous threats (deer, wild pig)	
Fragmentation and senescence	• Lack of seed bank or viable regeneration • Paddock or other trees impacted by grazing or compaction • Low population viability	

Sub Theme Threats	
Transformer weeds	• Weeds impacting on integrity (St John's Wort, Blue Heliotrope, African Olive, Lantana)
Lack of awareness or knowledge	• Non-compliance of legislative frameworks • Poor land management practices • Loss of cultural and traditional owner land management practices
Lack of data	• Poor data to inform best management practice or interventions

Sub Theme Initiatives and Actions	Management Action or Practice Change
1A.1a. Protect and sustain the integrity of high value remnant vegetation	Improved grazing management Conserve large remnants
1A.1b. Promote natural regeneration or improve the structural integrity and condition of habitats and native vegetation	Control transformer weeds and encourage natural regeneration Reinstate structure of vegetation (such as mistletoe, species diversity, understorey and midstory species diversity, woody debris and hollows)
1A.1c. Create and enhance connectivity, wildlife corridors or linkages	Create or maintain wildlife or vegetation corridors Expand and connect to existing remnants Protect or enhance condition of stepping-stone vegetation or landforms (such as dams, mature paddock trees)
1A.1d. Control or reduce vertebrate pests or predator threats	Control vertebrate predator pests (wild pig, fox) Control herbivores or browsing threats (wild pig, deer) Control Noisy Miners in breeding season for Regent Honeyeater (listed recovery action)
1A.1e. Monitor biodiversity and landscape health	Maintain woodland bird indicator monitoring in targeted landscapes Support priority species and habitat condition monitoring Involve and support community in citizen science
1A.1f. Promote and encourage adoption of practices to landholders	Involvement and participation in learning events (field days, workshops, training events) Engagement of private landholders through one-on-one tailored property management advice
1A.1g. Protect biodiversity from human disturbance or other environmental threats	Engage landholders in planning and strategies Adopt Indigenous cultural land management practices and knowledge Reduce arson, dumping and illegal firewood collection through engagement
1A.1h. Promote or facilitate private long-term conservation or stewardship or environmental market-based programs	Encourage landholders with high value, intact remnants to engage in conservation initiatives
1A.1i. Identify and manage key data or knowledge gaps	Support or facilitate research or formal monitoring activities

<table>
<tr><td>Priority sub-catchments</td><td colspan="2">Key intact Dry Forests and Open Woodland remnants for protection
• Lower Hunter: Cessnock Biodiversity Area (NPWS, Aboriginal and private owned lands) Upper Wollombi, Black, Wallis sub-catchments
• Upper Hunter: Merriwa, Halls, Bow and Krui</td></tr>
<tr><td></td><td colspan="2">High priority remnants with the greatest threat and risk of decline
• Lower Hunter: Upper Wollombi, Black, Wallis
• Upper Hunter: Lower Goulburn, Merriwa, Halls, Bow, Munmurra, Widden, Baerami, Dart, Martindale</td></tr>
<tr><td colspan="2">Key Collaborators and Partners</td><td>Formal Networks and Working Groups</td></tr>
<tr><td colspan="2">DPE-Saving Our Species, National Parks and Wildlife Service and NSW Koala Strategy
Hunter Region Landcare Network
Aboriginal Land Managers (Wanaruah, Mindaribba, Biraban LALC)
Worimi Green Team Indigenous Rangers
BirdLife Australia (National Recovery Team)
Local Government (Cessnock City Council, Maitland)
Biodiversity Conservation Trust
Hunter Local Land Services (TSR)
Local Land Services (Central Tablelands, Central West, Northern Tablelands, North West, Riverina and Greater Sydney)</td><td>• Hunter LLS Woodland Bird Working Group
• LLS State-wide Regent Honeyeater Habitat Working Group
• National Recovery Team for the Regent Honeyeater (LLS representation on Habitat Working Sub-Group)
• MOU-Hunter Region Landcare Network and Hunter LLS
• LLS Regional Pest and Weed Advisory Groups
• TAS, VIC, NSW, QLD-Woodland Bird Conservation Action Plan Working Group (LLS and others)</td></tr>
<tr><td colspan="3">Community Participants</td></tr>
<tr><td colspan="3">• Landcare Network and local community groups (industry-agriculture and viticulture and environment groups)
• Public Land managers (NPWS, Crown Lands and Local Government)
• Aboriginal Land Managers
• Private Landholders (small-medium landholders, lifestyle, conservation, peri urban, hobby farmers)
• Primary producers (agriculture, viticulture)
• Hunter Local Land Services (TSR)
• BirdLife Australia and Hunter Bird Observers Club
• Universities and research organisations</td></tr>
<tr><td>Alignment to other sub themes</td><td colspan="2">Theme 2 Soils: Sub Themes 2A Groundcover, Soil Health, Function, 2B: Soil erosion and soil degradation.
Theme 3 Rivers and Aquatic: Sub Themes 3A Improve River Ecological Health, 3B Reducing riverbank erosion and risk.</td></tr>
</table>

Table 5: Hunter region priority assets for Dry Open Forests and woodland ecosystems.

Cross regional action for a most critically endangered woodland species

Seven Local Land Services regions collaborated over 5 years to provide key action for the critically endangered woodland bird, the Regent Honeyeater through the National Landcare Program.

Projects targeted key habitats, through education and on ground actions for the critically endangered Regent Honeyeater, a flagship species for woodland birds in NSW.

Coordinating a NSW wide LLS approach enabled cross collaboration on key messaging, resource development for community education, working with the National Recovery Team, and responsive actions, such as post bushfire and pre breeding threat abatement actions. Key partners included Department of Planning and Environment, BirdLife Australia, Australian National University and Landcare.

https://scone.com.au/boosting-regent-honeyeater-numbers/

Photo credit: BirdLife Australia.

Sub-theme 1B: Rainforest vegetation and ecosystems – priority assets

Rainforests in the region sustain a broad range of native fauna, and unique and complex rainforest species.

Three nationally listed rainforests in the Hunter include Littoral Rainforest (LR), Subtropical Lowland Rainforest (SLR) and Lowland Rainforest on the Floodplain (LRF), including within the Gondwanan Rainforests of Australia World Heritage Areas, of which the Barrington Tops and Mount Royal National Parks are two of 45 reserves within the World Heritage Area network. Other rainforest communities occur in moist gullies or footslopes. Species listed below represent the most threatened, unique and flagship species, where actions taken represent benefits for a larger suite of species and habitats.

Littoral Rainforests are restricted to the coast between Lake Macquarie and Harrington, and subtropical Lowland Rainforests occur on both public and private lands in small remnants, north of Maitland, and generally 20km inland from the coast to the ranges.

This theme builds on efforts over several years engaging private landholders (more recently since 2019-20 bushfire events through critical rainforest habitats), Landcare, Aboriginal land managers and working with key collaborators and partners and building momentum for key actions and regional outcomes in the region, on both private and public lands.

Hunter Region Priority Assets for Rainforest Vegetation and Ecosystems	
Regional Investment Priority	Retain and protect rainforests and biodiversity in the Hunter region
National Priority Assets *(CE= Critically Endangered)* *(*Listed in Threatened Species Strategy)* *(n=under nomination for EPBC listing)*	**Places**: Gondwana Rainforests of Australia, Myall Lakes Ramsar Wetlands **TEC's**: Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (CE) (LR); Subtropical Lowland Rainforest (SLR) of Subtropical Australia; Ben Halls Sphagnum Moss Cool Temperate Rainforest (n) **Birds**: Rufous Scrub-bird **Mammals**: Spotted-tail Quoll*, Greater Glider, Grey-headed Flying-fox, Parma Wallaby **Amphibians**: Giant Barred Frog **Plants**: Magenta Lilly Pilly, Native Guava*(CE), Scrub Turpentine (CE), Manning Yellow Solanum (n)
State Priority Assets *(CE= Critically Endangered)* *(# EECs listed are representative of the federal listed TEC Central Hunter Valley eucalypt forest)*	**EECs**: Lower Hunter Valley Dry Rainforests in the Sydney Basin and NSW North Coast Bioregions, Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions, Ben Halls Sphagnum Moss Cool Temperate Rainforest **Places**: Barrington Tops National Park
Regional Priority Assets	**Places**: Barrington Tops and Gloucester Tops-Key Biodiversity Area, Worimi Conservation Lands
Condition statement	Subtropical lowland and littoral rainforests have been extensively cleared on coastal zones and floodplains for development and grazing. In NSW, littoral rainforest represents less than 1% of all rainforests, largely occurring on public reserves or Aboriginal managed lands as small remnant patches. Subtropical lowland rainforest often occurs as small remnants, isolated trees, or restricted to riparian corridors predominantly throughout the Mid Coast LGA

Sub Theme Threats	
Clearing, degradation or disturbance and lack of regeneration	• Clearing from rural, agricultural and urban development leading to edge effects, degradation and further fragmentation • Fragmentation and restriction of range to riparian or small corridor patches • Poor grazing management causing loss or damage to plants, soil compaction, erosion, nutrients and weed dispersal • Loss or reduced pollination, due to decline in critical pollinator species • Human disturbance including trampling, rubbish dumping, arson and building of informal tracks (such as trail bike tracks or jumps)
Wildfire / Climate change	• Loss of vegetation during fire events of fire sensitive species and subsequent lack of regeneration • Prolonged dry periods causing dieback or weakened plant health
Transformer weeds	• Invasion and establishment of weeds (Lantana, Asparagus ferns, Cats-claw Creeper)
Homogenisation	• Homogenisation of rainforest species with non-endemic native plants (garden plants)
Pest or predators	• Browsing or predation on species (flora and fauna) (wild pig, fox, deer)
Pathogens	• Dieback and weakened health of characteristic species due to pathogens such as myrtle rust

Sub Theme Initiatives and Actions	Management Action or Practice Change
1B.2a. Protect and sustain the integrity of high value remnant vegetation	• Improved grazing management • Conserve large intact remnants
1B.2b. Promote natural regeneration or improve the structural integrity and condition of habitats and native vegetation	• Control transformer weeds (cats claw creeper, asparagus, lantana) and encourage natural regeneration • Promote biosecurity practices that reduce spread of pathogens or weed spread
1B.2c. Create and enhance connectivity, wildlife corridors or linkages	• Create wildlife or vegetation corridors, including along riparian corridors • Expand and connect to existing remnants • Protect mature paddock trees
1B.2d. Control or reduce vertebrate pests or predator threats	• Control vertebrate predator pests (wild pig, fox) • Control herbivores or browsing threats (wild pig, deer)
1B.2e. Monitor biodiversity and landscape health	• Involve and support community in citizen science • Strategic monitoring for target species and habitat condition
1B.1f. Promote and encourage adoption of practices to landholders	• Involve community in learning events (field days, workshops, training events) • Engage private landholders through one-on-one tailored property management advice
1B.2g. Protect biodiversity from human disturbance or other environmental threats	• Support planning and strategies to minimise impacts

<table>
<tr><td>Priority sub-catchments</td><td colspan="2">Biodiversity richness and relative importance for protection:
• Mid Coast: Upper Barrington, Nowendoc, Rowleys

High priority remnants with the greatest threat and risk of decline:
• Lower Hunter: Upper Paterson
• Mid Coast: Manning and Coolongolook (LR), Upper Gloucester, Rowleys (SLR), Lower Manning, Dingo Creek</td></tr>
<tr><td colspan="2">Key Collaborators and Partners</td><td>Formal Networks and Working Groups</td></tr>
<tr><td colspan="2">DPE-Saving Our Species, National Parks and Wildlife Service
Landcare Networks
Local Government (Mid Coast, Port Stephens, Newcastle, Lake Macquarie)
Biodiversity Conservation Trust
North Coast Local Land Services
BirdLife Australia/ Hastings Bird Watchers
Research institutes
Ecologists
Rural Fire Service</td><td>N/A</td></tr>
<tr><td colspan="3">Community Participants</td></tr>
<tr><td colspan="3">• Landcare Network and local community groups (environment groups)
• Public Land managers (NPWS, Crown Lands and Local Government)
• Aboriginal Land Managers (and Aboriginal Elders)
• Private Landholders (small landholders, lifestyle, conservation, peri urban, hobby farmers)
• Primary producers (agriculture)
• BirdLife Australia and Hastings Birdwatchers</td></tr>
<tr><td>Alignment to other sub themes</td><td colspan="2">Theme 2 Soils: Sub Themes 2A Groundcover, Soil Health, Function
Theme 3 Rivers and Aquatic: Sub Themes 3A Improve River Ecological Health, 3B Reducing riverbank erosion and risk</td></tr>
</table>

Table 6: Hunter region priority assets for Rainforest Vegetation and ecosystems.

Stakeholder led recovery planning- Mid Coast

Following the 2019-20 Black Summer Bushfires, through Australian Government Funding, Hunter LLS worked with key partner Mid Coast Council to develop Bushfire Threatened Species Actions Plans for the mid coast region, in response to significant impacts to natural assets and species in the area, including sensitive rainforest vegetation.

Two plans were developed, one identifying key actions for priority birds, mammals, amphibia, and key habitats including Threatened Ecological Communities, and the other specific to Koala populations. Plans were developed with over 30 stakeholders' input through extensive consultation, including Landcare, Aboriginal, researchers and experts, state and local government representatives.

Several aspects of these LLS plans were recorded as webinars, for public viewing, and the final plans and priorities have been used to guide on ground investment, engagement and action.

www.youtube.com/watch?v=qys7p2hKgJo

Sub-theme 1C: Wet sclerophyll forests and ecosystems priority assets

Within the east coast of the Hunter region, a diverse mix of vegetation and ecosystems are protected within the public reserve system, and on private lands fragmented through coastal development zones, with semi-rural areas further inland cleared for grazing or small urban centres. Vegetation includes dry and wet sclerophyll forests, freshwater wetlands (lagoons, swamp and fens), and heath (interspersed with small rainforest remnants).

Within these coastal and floodplain landscapes, the vegetation types identified as most threatened are: River-flat Eucalypt Forest on Coastal Floodplains, Swamp Sclerophyll Forest on Coastal Floodplains, and Coastal Swamp Oak (Casuarina glauca) Forest.

Species listed below represent the most threatened, unique and flagship species, where actions taken represent benefits for a larger suite of species and habitats.

Habitats in the coastal zones support a diverse array of fauna, representing significant habitats for the most iconic Koala, and other endangered fauna. Within state identified Areas of Regional Koala Significance (ARKS), the following ARKS have been prioritised at a state and regional level, Kiwarrak, Comboyne (Middle Brother), Hawks Nest, Khappinghat and Port Stephens are the most important ARKS in the region, with wet sclerophyll forests comprising the dominant habitat in these areas.

This theme builds on previous efforts over several years engaging private landholders, Landcare and working with key collaborators and partners and building momentum for key actions and regional outcomes in the region, on both private and public lands. Increasing resources and focus on the Koala and initiatives since the 2019-20 Black Summer Bushfires have driven LLS role in broader landscape restoration projects and collaborators.

Photo 8: Koalas at Bootawa, Manning Great Lakes. Credit: Hunter LLS.

Hunter Region priority assets for wet sclerophyll forests and ecosystems	
Regional Investment Priority	Improve connectivity and condition for wet sclerophyll forests, ecosystems, and biodiversity
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)* *(n= under nomination for EPBC listing)* *(CE=critically endangered)*	**Places:** Myall Lakes Ramsar Wetlands, Hexham Swamp, Shortlands Wetland Centre, Crowdy Bay National Park **TECs:** River-flat Eucalypt Forest on Coastal Floodplains, Swamp Sclerophyll Forest, Coastal Swamp Oak (Casuarina glauca) Forest **Birds**: Regent Honeyeater (CE)*, Swift Parrot (CE)*, Australasian Bittern*, Eastern Glossy Black Cockatoo **Mammals**: Koala*, Long Nosed Potoroo, Greater Glider, Grey-Headed Flying Fox, New Holland Mouse*, Parma Wallaby, Spotted-tailed Quoll **Amphibia**: Giant Burrowing Frog, Green and Gold Bell Frog, Giant Barred Frog **Plants**: Biconvex Paperbark
State Priority Assets	**EECs:** Hunter Floodplain Red Gum Woodland, Hunter Lowland Redgum Forest, Swamp Sclerophyll Forest on Coastal Floodplains **Mammals**: Yellow-bellied Glider **Populations:** Areas of Regional Koala Significance -Kiwarrak, Comboyne (Middle Brother), Crowdy Bay, Hawks Nest, Khappinghat, Port Stephens and Barrington
Regional Priority Assets	**Places:** Cattai Wetlands, Woodberry Swamp, Hastings-Macleay Key Biodiversity Area
Condition statement	Wet sclerophyll forests are fragmented with small remnants on private lands, and more intact remnants on public reserved lands within the coastal areas and floodplains Black Summer Bushfires 2019-20 burnt across average 71% /122,000 Ha of coastal habitats within ARKS, and adjoining landscapes (within Crowdy Bay, Kiwarrak, Comboyne (Middle Brother), Khappinghat ARKS), including impacts to adjoining lands (that also connect to Littoral Rainforest-See Rainforests) These fire sensitive species and habitats were severely impacted in selected areas on private, Forestry and public lands, and numerous species were impacted by severe population loss, following existing impacts from preceding droughts
Sub Theme Threats	
Fragmentation	• Cleared forests for agricultural lands, timber or urban areas causing reduced connectivity of forest and floodplain vegetation • Lack of connectivity impacting on native fauna with large populations ranges, reducing population viability • Increased risk of road strike injury or death to ground dwelling species moving between remnant vegetation for breeding or feeding
Wildfire/climate change	• Increased rainfall and associated flooding and inundation • Increased intensity and spread of wildfires causing loss of canopy species and impacts to arboreal and ground dwelling fauna
Degradation and lack of regeneration	• Removal or overgrazing of small remnant vegetation and understorey species, allowing for increased compaction or weed spread
Overgrazing or stock impacts	• Direct damage or compaction to native vegetation through grazing (cattle) • Strike or death to native fauna to Koala (cattle, horse)
Transformer Weeds	• Loss of understorey species from transformer weeds such as lantana

Sub Theme Threats	
Pest or predators	• Increased competition, predation or toxicity on native fauna by predator vertebrate pests (fox, wild pig, cane toad) • Increased damage or disturbance to native plants (wild pig, deer)
Pathogens	• Dieback and weakened health of characteristic species due to pathogens such as myrtle rust and phytophthora • Poor biosecurity practices and spread of phytophthora
Lack of nesting/roosting sites	• Removal or fragmentation of large stands of canopy trees preferred for pollen or leaf specialist or roosting sites • Removal or loss of hollow bearing trees

Sub Theme Initiatives and Actions	Management Action or Practice Change
1C.1a Protect and sustain the integrity of high value remnant vegetation	• Reduce stock or horse grazing or trampling • Conserve large remnants or wetlands
1C.1b Promote natural regeneration or improve the structural integrity and condition of habitats and native vegetation	• Control transformer weeds (lantana, vines) and encourage natural regeneration • Reinstate structure of vegetation (such specific canopy species diversity or understorey species, or woody debris and hollows) • Promote biosecurity practices that reduce spread of pathogen or weed spread
1C.1d Control or reduce vertebrate pests or predator threats	• Control vertebrate predator pests (wild pig, fox) • Control herbivores or browsing threats (wild pig, deer) • Encourage responsible pet ownership (dog)
1C.1e Monitor biodiversity and landscape health	• Support priority species and habitat condition monitoring • Involve and support community in citizen science
1C.1f Promote and encourage adoption of practices to landholders	• Involve community in learning events (field days, workshops, training events) • Engage private landholders through one-on-one tailored property management advice
1C.1g Protect biodiversity from human disturbance or other environmental threats	• Support planning and strategies to minimise impacts • Adopt cultural land practices and indigenous knowledge
1C.1h Promote or facilitate private long-term conservation or stewardship or environmental market programs	• Encourage landholders with high value, intact remnants to engage in conservation initiatives

Priority Sub-catchments	
	Biodiversity richness and relative importance for protection: • Mid Coast: Dingo Creek, Myall Lakes **High priority remnants with the greatest threat and risk of decline:** • Lower Hunter: Port Stephens • Mid Coast: Lower Manning, Stewarts River, Wallamba

Key Collaborators and Partners	Formal Networks and Working Groups
DPE-Saving Our Species, National Parks and Wildlife Service and NSW Koala Strategy Landcare Networks, community groups Aboriginal Land Managers/Traditional Owner teams BirdLife Australia University of Newcastle and Western Sydney Local Government (Mid Coast, Port Stephens, Dungog) Biodiversity Conservation Trust Forestry Corporation NSW North Coast Local Land Services	Existing networks or collaborations enabling community action: • Hunter LLS and Mid Coast Council MOU agreement • MOU agreements-Mid Coast to Tops Landcare Connection, Hunter Region Landcare and Hunter LLS • Bushfire Threatened Species Recovery Stakeholder group in the Mid Coast • LLS Regional Pest and Weeds Advisory Groups
Community Participants	
• Landcare Network and local community groups (Koala and environment groups) • Public Land Managers (NPWS, Crown Lands and Local Government) • Aboriginal Land Managers • Taree Indigenous Development and Employment (TIDE) • Private Landholders (small landholders, lifestyle, conservation, peri urban, hobby farmers) • Primary producers (agriculture) • Forestry Corporation NSW • BirdLife Australia, Hastings Birdwatchers	
Alignment to other sub themes	Theme 2 Soils: Sub Themes 2A Groundcover, Soil Health, Function Theme 3 Rivers and Aquatic: Sub Themes 3A Improve River Ecological Health, 3B Reducing riverbank erosion and risk Theme 4 Marine, Coastal and Estuary: Sub Theme 4B: Forested or riverine and freshwater wetland coastal ecosystems

Table 7: Hunter Region priority assets for wet sclerophyll forests and ecosystems.

Sub-theme 1D: Alpine or sub-alpine vegetation and ecosystems – priority assets

Alpine and sub-alpine habitats are restricted to the reserves within the Barrington Tops and Mount Royal National Park (also the Gondwana Rainforests of Australia World Heritage Areas) and ranges to the north of the Barrington, adjoining ranges in the North Coast and Northern Tablelands LLS regions.

Iconic restricted alpine vegetation includes the Snow Gum-Mountain/Manna Gum, dominated by Snow Gum occurs on low crests and plateaus above 1300m.

This theme builds on previous efforts over many years with public reserve managers and adjoining private landholders, working with key collaborators and partners and building momentum for key actions and regional outcomes in the region. In particular, strengthening of partnership programs have formed following the 2019-20 Black Summer Bushfires, building on long term coordinated programs including the management and containment of scotch broom, and the Upper Hunter wild dog program.

Monitoring post bushfire weed containment in sensitive alpine vegetation

Through Hunter Local Land Services and the National Landcare Programs CSIRO MER Network Pilot, National Parks and Wildlife have established a major monitoring program in the Barrington Tops National Park.

Following the Black Summer Bushfires 2019-20, a significant area of fire burnt through target weed areas of scotch broom and ox-eyed daisy. In partnership with Local Land Services, a significant post fire weed containment and volunteer program was deployed, in the efforts to enable natural regeneration of important alpine habitats, for the Broad-toothed Rat or Tooarrana.

Recovery of alpine sedges and understorey, is critical for this endangered alpine species.

The monitoring was established in these areas, and will identify recovery and rehabilitation benefits of the responsive weed program.

https://www.environment.nsw.gov.au/news/fire-brings-plant-population-back-from-brink

Photo: Broad-toothed Rat. Credit: Peter Beard, DPE.

Hunter Region priority assets for Alpine or sub-alpine vegetation and ecosystems	
Regional Investment Priority	Retain and protect unique alpine or sub-alpine vegetation, species and ecosystems of the Hunter Region and adjoining public lands.
National Priority Assets *(*Listed in Threatened Species Strategy 2021-2031)* *(n=under nomination for EPBC listing)*	**Places**: Gondwana Rainforests of Australia World Heritage Areas (Barrington Tops and Mount Royal National Parks), Barrington Top Swamps **TECs**: Ben Halls Sphagnum Moss Cool Temperate Rainforest(n) **Birds**: Rufous Scrub Bird **Mammals**: Broad Toothed Rat, New Holland Mouse* **Amphibians**: Davies' Tree Frog, Giant Burrowing Frog **Plants**: Fragrant Pepperbush, *Euphrasia arguta*
State Priority Assets	**EECs**:
Regional Priority Assets	**Places**: Barrington Tops and Gloucester Tops-Key Biodiversity Area
Condition statement	Alpine or sub alpine vegetation and habitats are well protected within the public reserve system, however since 2019-20 Black Summer Bushfires have been impacted by fire scar. Buffer areas on private lands adjoining these landscapes also need ongoing management and protection, to prevent further degradation and maintain the integrity of existing protected areas
Sub Theme Threats	
Wildfire/climate change	• Prolonged dry periods causing dieback or weakened peat, swamp or heath vegetation • Loss of vegetation during fire events of fire sensitive species and subsequent lack of, or very slow regeneration • Fire frequency and intensity impacts enabling weed establishment and pest animal access • Loss of important alpine vegetation and shelter for understorey reliant species
Transformer Weeds	• Invasion of weeds (scotch broom, ox-eyed daisy, blackberry)
Pest or predators	• Trampling or grazing by feral animals (deer, wild pig, feral horse) • Predator impacts on ground-dwelling species (wild pig, fox)
Pathogens	• Dieback and weakened health of characteristic species from pathogens such as myrtle rust

Sub Theme Initiatives and Actions	Management Action or Practice Change
1D.1b Promote natural regeneration or improve the structural integrity and condition of habitats and native vegetation	• Support coordinated action to contain transformer weeds (Ox Eyed Daisy, Scotch Broom, Lantana) and encourage natural regeneration • Involve private landholders adjoining reserved lands to participate in strategic restoration projects
1D.1d Control or reduce vertebrate pests or predator threats	• Control vertebrate predator pests (wild pig, fox) • Control herbivores or browsing threats (wild pig, deer) • Control pest animals from trampling or compaction of sensitive plants (wild horse, deer)
1D.1g Protect biodiversity from human disturbance or other environmental threats	• Engage private landholders in planning and strategies • Adopt cultural land practices and indigenous knowledge • Reduce arson and illegal track building • Encourage good biosecurity practices to reduce spread of pathogens in sensitive areas
1D.1e Monitor biodiversity and landscape health	• Support priority species or habitat monitoring • Involve community in citizen science
1D.1i Identify and manage key data or knowledge gaps	• Support or facilitate research or formal monitoring activities
Priority Sub-catchments	**Biodiversity richness and relative importance for protection:** • Upper Hunter: Upper Hunter (Ben Halls Gap) • Mid Coast: Upper Barrington **High priority remnants with the greatest threat and risk of decline:** • Lower Hunter: Upper Paterson
Key Collaborators and Partners	Formal Networks and Working Groups
DPE-Saving Our Species National Parks and Wildlife Service Hunter LLS (Biosecurity) Northern Tablelands LLS (Biosecurity) Research institutes Ecologists	Existing Networks or Collaborations enabling community action: • Upper Hunter Wild Dog Program • LLS Regional Pest and Weeds Advisory Groups
Community Participants	
• National Parks and Wildlife Service • Community volunteers/ Landcare • Traditional Owner Land Management teams • Primary producers (agriculture) • Private Landholders (conservation/lifestyle) • Researchers/ecologists	
Alignment to other sub themes	Theme 1: Terrestrial Biodiversity: Sub-theme 1B Rainforest vegetation and ecosystems

Table 8: Hunter Region priority assets for Alpine or sub-alpine vegetation and ecosystems

Soil and Land

3

3.1 Theme 2 - Soil and Land

This theme identifies soil and land outcomes for improving the health and functioning of soil and land in supporting agricultural production, ecosystem function and biodiversity conservation. This depends on applying sustainable management practices to productive agricultural landscapes, including achieving and maintaining good perennial groundcover, and retaining woody native vegetation on steep land.

Delivery of soil and land outcomes generally occurs in conjunction with biodiversity outcomes for the vegetation communities they sustain. Landscapes and threatened ecological communities are therefore identified which are associated with priority sub-catchments in the Hunter region for this theme. Key results, initiatives, actions and collaborators are identified to achieve key results presented under the theme objective.

3.2 Assets, Threats, Objective and Key Results

Soil and Land assets in the Hunter

Within the Soils and Land theme, the following important assets for the Hunter region have been identified as important to improve:

- Healthy, functioning soils
- Year-round perennial groundcover
- Stable highly erodible soils.

Threats to Soil and Land

Assets	Key Threats identified
Healthy, functioning soils	• Overgrazing • Low pasture perenniality • Inappropriate grazing management strategies • Inadequate groundcover • Changing seasonal conditions • Nutrient decline • Organic matter decline • Acidification • Erosion
Year-round perennial groundcover	• Overgrazing • Low pasture perenniality • Inappropriate grazing management strategies • Inadequate groundcover • Changing seasonal conditions • Drought • Weeds
Stable highly erodible soils	• Erosion • Land use beyond capability • Inappropriate clearing • Inappropriate soil disturbance on highly erodible land • Inadequate groundcover • Overgrazing • Drought • Salinity

Objective and Key Results

Objective 2:

By 2028 there will be an improved condition and productivity of soil and land.

Key Result 2.1

Manage land and groundcover to improve soil health and function, ***as measured by area of land managed for improved soil condition (SWM).***

Key Result 2.2

Manage soils to reduce impacts from soil erosion and soil degradation, ***as measured by area of land managed for improved soil condition (SWM).***

Key Result 2.3

Improve climate change adaptation of soil and land management practices, ***as measured by area managed for improved agricultural production.***

Key Initiatives and Actions

Action 2a. Improve and maintain effective year-round perennial groundcover through profitable and sustainable grazing practices, to improve soil health and water quality.

Action 2b. Facilitate implementation of improved soil nutrient management and water use efficiency, to improve soil function and water quality.

Action 2c. Control soil erosion in priority areas, conserve soil and improve water quality and ecological health.

Action 2d. Promote knowledge and adoption of climate change adaptations to agricultural production systems and practices, to improve climate change resilience and facilitate improved access to market-based opportunities.

Action 2e. Support landholders to develop and implement whole farm, grazing, drought and flood management plans, to improve decision-making, access to market opportunities and implementation of sustainable agricultural practices that adapt to climate change.

Action 2f. Implement coordinated catchment health improvement projects to improve soil, land and vegetation management practices, water quality, ecological health and landscape resilience.

Alignment to Regional Landcare Partnership Outcomes

Alignment to Regional Land Partnerships 5-year Outcomes:

- There is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation.
- 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.

3.3 Monitoring, Evaluation, Reporting, Prioritisation

How Hunter LLS will Measure Success?

The following measures of success will be used to assess how we are improving the condition and resilience of soil and land in the Hunter region.

LLS Delivery and Customer Metrics

- Area (ha) land managed for improved soil condition
- Area (ha) managed for improved agricultural production
- Area (ha) of native vegetation enhanced, rehabilitated or protected
- Area (ha) of significant species or EECs enhanced, rehabilitated or protected
- Stream length (km) of river/estuary enhanced, rehabilitated or protected
- Number of projects undertaken to protect Aboriginal Cultural Heritage or Traditional Ecological Knowledge
- Number of stakeholder partnerships
- Number of community groups supported
- Number of 1:1 landholder advice consultation
- Number of awareness raising/capacity building event participants
- Number of training event participants
- Number of Aboriginal opportunities for people to support LLS decision making.

Condition Indicators (Local Strategic Plan)

Improved condition of natural resource assets, soil and land, native vegetation and biodiversity, rivers and aquatic biodiversity, and estuarine and marine ecosystems.

Monitoring approach

- Spatial data
- Field assessment
- Condition monitoring
- Project evaluation
- Project reporting
- Participant survey and evaluation
- Database of agreements, advice and participation.

Prioritisation

Key Result 2.1: Manage land and groundcover to improve soil health and function

The priority sub-catchments identified for improving perennial groundcover through sustainable grazing practices to improve soil health and function; reduce nutrient loss, conserve soils, and improve water quality was based on:

- The proportion of rural land capability class 1-7 land with poor groundcover (<70%)

This calculation excluded land capability class 8 land (cliffs, lakes, and swamps), water, conservation lands, urban areas and mining operational areas.

Prioritisation identifies sub-catchments higher intensity grazing, which are associated with greater periods of low groundcover relative to catchments with predominantly regular grazing land. Comparison between sub-catchments in similar landscapes such as the Manning, Great Lakes or Lower Hunter Valley Floor also shows where groundcover is proportionally lower relative to other catchments.

The overall priority sub-catchments for managing land and groundcover to improve soil health are indicated in Figure 11, noting that due to mapping limitations, priority areas for improving soil health may occur in other catchments.

Key Result 2.2: Manage soils to reduce impacts from erosion and soil degradation

Priority catchments for reducing the impacts of soil erosion and degradation including salinity are based on those having:

- Highly erodible soils, based on soil dispersibility
- Dryland salinity, based on saline geology
- Gully erosion, based on soil erosion mapping.

These have been limited to the Hunter River catchment as this outcome is delivered as a priority Hunter Catchment Contributions funded program which despite co-investment is limited to the Hunter Valley by funding source.

Prioritisation identifies catchments containing significant areas of Permian aged sedimentary geology, which is associated with coal deposits on the Central Hunter Valley Floor. This geology is associated with the presence of highly dispersible soils and high hazard and occurrence of dryland salinity.

The overall priority catchments for reducing impacts from soil erosion and degradation are indicated in Figure 12, noting that due to mapping limitations, priority areas for soil erosion and degradation may occur in other catchments.

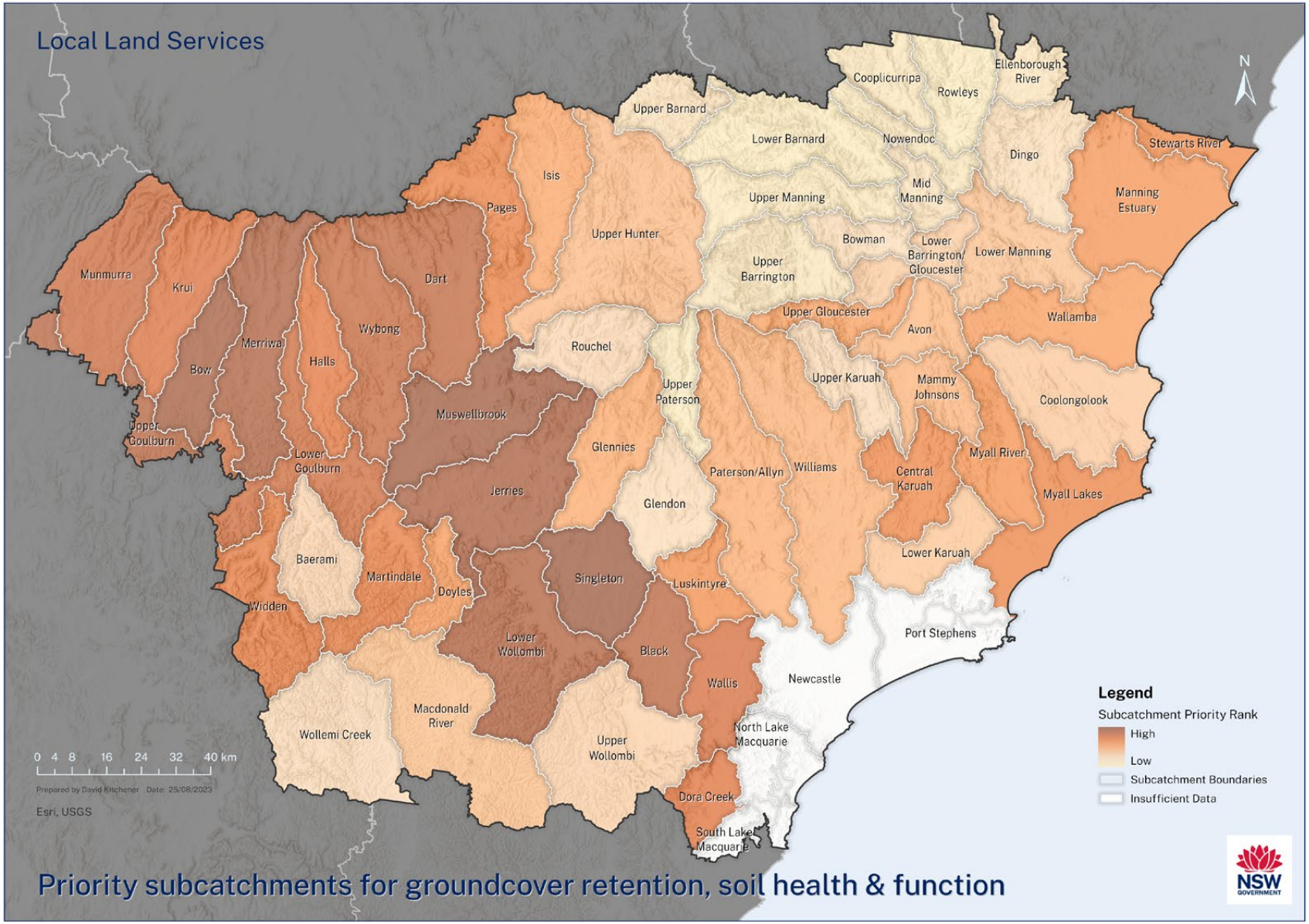


Figure 11: Priority sub-catchments for groundcover retention, soil health and function.

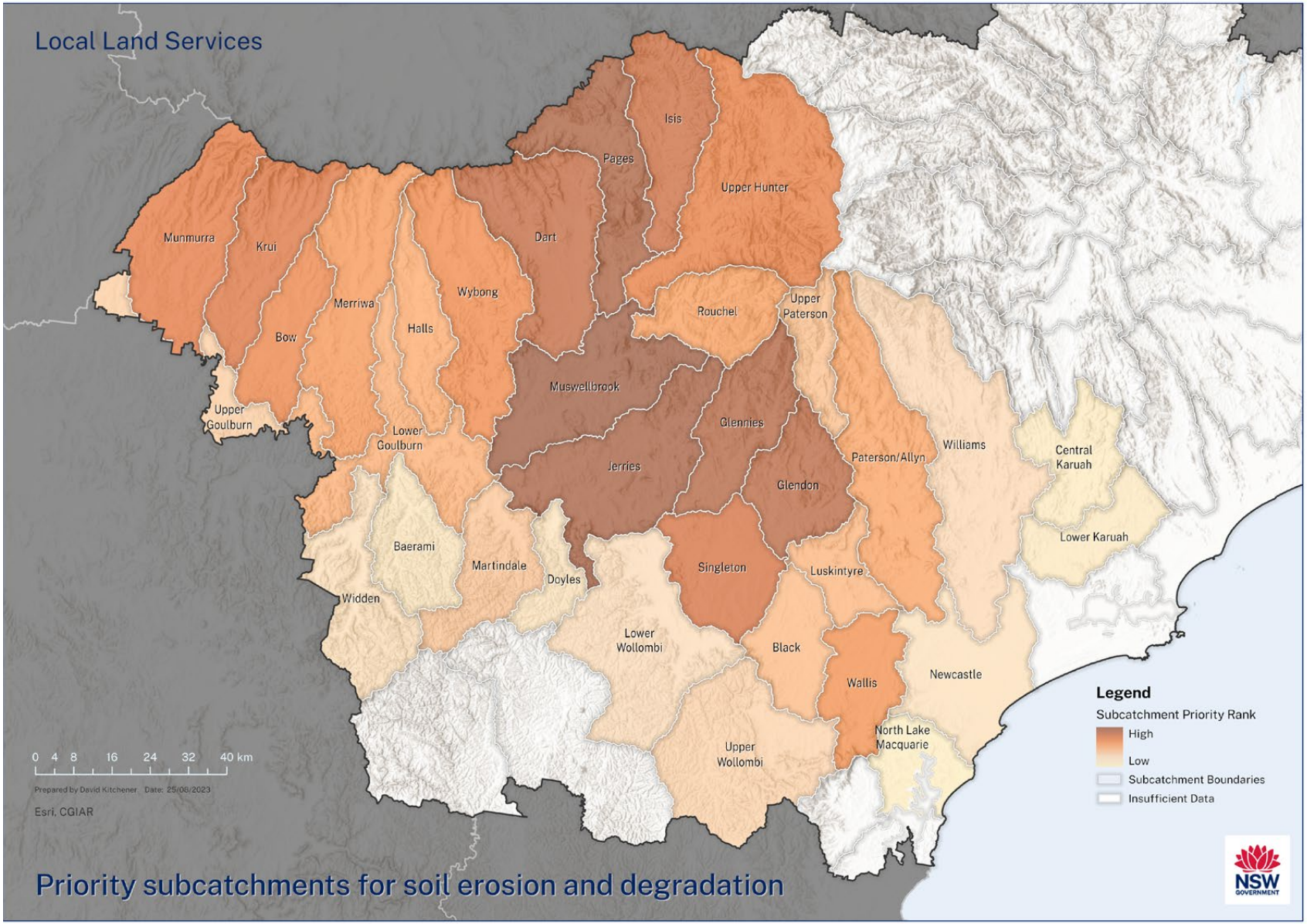


Figure 12: Priority sub-catchments for soil erosion and soil degradation.

3.4 Soil and Land Sub-themes

Sub theme 2A: Groundcover, Soil Health, Function priority assets for action

Groundcover, Soil Health and Function **Hunter Region priority assets for action**	
Regional Priority Investment **Priority Landscapes and Threatened Ecological Communities**	**Merriwa Plateau and Foothills**: • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands **Central and Upper Hunter Valley Floor:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands • Central Hunter Valley Eucalypt Forest and Woodland • Hunter Floodplain Red Gum Woodland • Hunter Lowland Redgum Forest **Western and Southern Barrington Foothills:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands • Central Hunter Valley Eucalypt Forest and Woodland • Lowland Rainforest of Subtropical Australia **Northern Lower Hunter Valley:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Oak Forest • Lower Hunter Spotted Gum Ironbark Forest **Southern Hunter Valley:** • Central Hunter Valley Eucalypt Forest and Woodland • Hunter Floodplain Red Gum Woodland • Lower Hunter Spotted Gum Ironbark Forest • Hunter Valley Weeping Myall Woodland • Central and Lower Manning • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest **Upper Manning:** • Lowland Rainforest of Subtropical Australia **Mid Coast Coastal Lakes and Estuaries:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)*	**Birds:** Regent Honeyeater*, Swift Parrot* **Mammals**: Koala*, Spotted-tail Quoll* **Reptiles**: Striped Legless Lizard **Plants:** Bluegrass (*Dichanthium setosum*) **TECs**: Central Hunter Valley Eucalypt Forest and Woodland, Lowland Rainforest of Subtropical Australia, Coastal Swamp Oak Forest, Coastal Swamp Sclerophyll Forest, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Hunter Valley Weeping Myall Woodland

Groundcover, Soil Health and Function Hunter Region priority assets for action	
State Priority Assets	**EECs:** Lower Hunter Spotted Gum Ironbark Forest, Hunter Floodplain Red Gum Woodland, Hunter Lowland Redgum Forest, Hunter River Red Gum Population in the Hunter Catchment, Hunter Valley Footslopes Slaty Gum Woodland **Plants:** Slaty Red Gum
Regional Priority Assets	Productive, perennial native pastures
Condition statement	Maintaining effective levels of perennial groundcover throughout the year, across all seasons and seasonal conditions is essential for achieving sustainable grazing practices that support profitable production, improve soil health and deliver ecosystem services including water quality and biodiversity conservation. These outcomes can continue to be maintained or improved despite climatic extremes where good grazing and land management decision-making occurs is response to seasonal conditions. This has been apparent during and following the extreme 2019 drought, extreme 2019-20 fires and major 2021-22 floods, where land managed within capability has maintained or improved condition at a property scale. At a property scale, across all landscapes threatened ecological communities are generally regenerating and improving in condition through good groundcover and grazing management practices. This varies at a property scale including the contrasting situation where decline in the condition of soils, land and ecological communities has occurred where sub-optimal grazing and land management practices have been applied through the extreme weather events.
Sub Theme Threats	
Overgrazing	Loss of productive pasture species, increased weeds and reduced drought resilience
Low groundcover	Increased erosion risk and reduced pasture production, organic matter and nutrient and water retention
Low pasture perenniality	Increased weeds and reduced water use efficiency, organic matter and drought resilience
Erosion	Reduced soil and land productivity, affecting crop and pasture establishment and reducing production
Clearing	Loss of perennial pastures that support production and provide drought resilience Loss of native woody vegetation that provides shade, shelter and ecosystem services underpinning production Loss of native perennial pastures
Nutrient loss	Decline in soil fertility and organic matter, causing reduced crop and pasture production

Sub Theme Initiatives and Actions	Management Action or Practice Change
Action 2a. Improve and maintain effective year-round perennial groundcover through profitable and sustainable grazing practices, to improve soil health and water quality	• Implement and adapt sustainable grazing strategies to improve soil health based on monitoring and managing soils, nutrition, pastures and stocking rate • Monitor and maintain year-round groundcover by adjusting grazing frequency and intensity for seasonal conditions
Action 2b. Facilitate implementation of improved soil nutrient management and water use efficiency, to improve soil function and water quality	• Pasture and soil assessment to guide feed and nutrient management budgets and decision making • Sustainable and strategic grazing to maintain good year-round perennial groundcover

Sub Theme Initiatives and Actions	Management Action or Practice Change
Action 2d. Promote knowledge and adoption of climate change adaptations to agricultural production systems and practices, to improve climate change resilience and facilitate improved access to market-based opportunities.	• Producers connecting with networks, information and business planning support to inform consideration of environmental market-based opportunities at farm enterprise scale
Action 2e. Support landholders to develop and implement Whole Farm, Grazing, Drought and Flood Management Plans, to improve decision-making, opportunities and practices adapting to climate change.	• Develop and implement farm and grazing plans that are responsive to changing seasonal conditions and profitable market-based opportunities through sustainable production • Develop and implement drought and flood plans and strategies based on early, adaptive decision making

Priority Sub-catchments	
	Merriwa Plateau and Foothills: • Munmurra, Krui, Bow, Merriwa, Halls, Wybong, Dart, Lower Goulburn **Central and Upper Hunter Valley Floor:** • Muswellbrook, Jerries, Singleton **Western and Southern Barrington Foothills:** • Upper Hunter, Isis, Pages, Singleton **Northern Lower Hunter Valley:** • Williams, Paterson/Allyn **Southern Hunter Valley:** • Wallis **Central and Lower Manning:** • Manning Estuary, Lower-Mid Manning, Dingo, Lower Barrington / Gloucester, Avon **Upper Manning:** • Upper Gloucester, Lower Barnard, Upper Manning **Mid Coast Coastal Lakes and Estuaries:** • Wallamba, Coolongolook, Myall River, Central Karuah, Lower Karuah

Key Collaborators and Partners	Formal Networks and Working Groups
Landholders Community Agricultural industry groups Hunter Water Mining industry Landcare networks and groups Councils	Existing networks or collaborations enabling community action: • Hunter Region Landcare Network and Hunter LLS MOU • Mid Coast to Tops Landcare Connection and Hunter LLS MOU • Mid Coast Council and Hunter LLS MOU • LLS Regional Weeds Advisory Group

Community Participants
Landholders Agricultural industry groups Hunter Water

Alignment to Other Sub Themes	Theme 1 Terrestrial Biodiversity: Sub Themes 1A: Dry open forests and woodland ecosystems, 1B: Rainforest vegetation and ecosystems, 1C: Wet sclerophyll forests and ecosystems Theme 2 Soils: Sub Theme 2B: Soil Erosion and soil degradation Theme 3 Rivers and Aquatic: Sub Themes 3A: Improve River Ecological Health, 3B: Reducing riverbank erosion and risk Theme 4 Marine, Coastal and Estuary: Sub Theme 4B: Forested or riverine and freshwater wetland coastal ecosystems

Table 9: Hunter region priority assets for ground cover, soil health and function.

Sub theme 2B: Soil erosion and soil degradation - priority assets for action

Soil Erosion and Soil Degradation **Hunter Region priority assets for action**	
Regional Priority Investment **Priority Landscapes and Threatened Ecological Communities**	**Merriwa Plateau and Foothills:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands **Central and Upper Hunter Valley Floor:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands • Central Hunter Valley Eucalypt Forest and Woodland • Hunter Floodplain Red Gum Woodland • Hunter Lowland Redgum Forest **Western and Southern Barrington Foothills:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland • Central Hunter Valley Eucalypt Forest and Woodland **Southern Hunter Valley:** • Hunter Valley Weeping Myall Woodland • Warkworth Sands Woodland
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)*	**Birds:** Regent Honeyeater*, Swift Parrot* **Mammals:** Koala*, Spotted-tail Quoll* **Reptiles:** Striped Legless Lizard **Plants:** North Rothbury Persoonia, Scrub Turpentine, Illawarra Greenhood **TECs:** White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Central Hunter Valley Eucalypt Forest and Woodland, Warkworth Sands Woodland, Hunter Valley Weeping Myall Woodland
State Priority Assets	**EECs:** Lower Hunter Spotted Gum Ironbark Forest, Hunter Floodplain Red Gum Woodland, Hunter Lowland Redgum Forest, Hunter River Red Gum Population in the Hunter Catchment, Kurri Sand Swamp Woodland, Quorrobolong Scribbly Gum Woodland, Hunter Valley Footslopes Slaty Gum Woodland. **Plants**: Slaty Red Gum
Regional Priority Assets	Effective groundcover on dispersible soils, drainage lines and saline areas Woody native vegetation on steep land

Soil Erosion and Soil Degradation **Hunter Region priority assets for action**	
Condition statement	The dispersible soils which characterise the Central Hunter Valley coalfields are highly erodible and often associated with dryland salinity hazard, particularly in drainage lines. These areas have a long history of over clearing and overgrazing, resulting in land degradation occurring through widespread gully erosion, which was exacerbated by the extreme 2019 drought and major flooding in 2021-22. These actively eroding areas are generally land in poor condition which in some cases has degraded to a lower land capability unable to support grazing, while generating significant downstream water quality impacts through high turbidity, salinity and sedimentation of instream pools. Continued erosion is resulting in direct habitat loss for threatened ecological communities in some areas. With appropriate management to stabilise erosion, these areas can significantly improve in condition and generate major positive water quality and instream habitat benefits, while regenerating and increasing the extent and condition of threatened ecological communities.
Sub Theme Threats	
Erosion	Loss of productive land and ecological services, including degrading terrestrial and aquatic habitat and reducing downstream water quality and river ecological health
Salinity	Dryland salinity causes loss of land productivity, increasing erosion severity, degrades habitats and increases river salinity
Overgrazing	Lack of effective groundcover from overgrazing increases erosion risk
Low groundcover	Erosion risk increases as groundcover reduces
Drought	Erosion risk is greatest during drought due to bare ground and low groundcover
Land use beyond capability	Land degradation in various forms including erosion occurs when land use exceeds the inherent capacity of land to sustain a given land use and associated practices Eroded and saline land can have reduced land capability

Sub Theme Initiatives and Actions	Management Action or Practice Change
Action 2c. Control soil erosion in priority areas to conserve soils and improve water quality and ecological health	• Soil and salinity assessment to inform best practice soil stabilisation and remediation • Strategic gully erosion control structural works and revegetation • Increase woody natural regeneration on steep land and highly erodible soils
Action 2a. Improve and maintain effective year-round perennial groundcover through profitable and sustainable grazing practices, to improve soil health and water quality	• Ensure land use practices are consistent with land capability • Strategic or excluded grazing of eroded areas to achieve and maintain good perennial groundcover • Implement and adapt sustainable grazing strategies to improve soil health based on monitoring and managing soils, nutrition, pastures and stocking rate
Action 2e. Support landholders to develop and implement whole farm, grazing, drought and flood management plans, to improve decision-making, opportunities and practices adapting to climate change.	• Develop and implement farm and grazing plans that are responsive to changing seasonal conditions and market-based opportunities through sustainable production • Develop and implement drought and flood plans and strategies based on early, adaptive decision making

Soil Erosion and Soil Degradation **Hunter Region priority assets for action**	
Action 2f. Implement coordinated catchment health improvement projects to improve soil, land and vegetation management practices, water quality, ecological health and landscape resilience	• Partner with community and industry groups, stakeholders and investors to improve natural resource condition at a catchment scale, for improved sustainable production and improved habitat for threatened ecological communities and species
Priority Sub-catchments	**Merriwa Plateau and Foothills**: • Dart **Central and Upper Hunter Valley Floor:** • Muswellbrook, Jerries, Singleton **Western and Southern Barrington Foothills:** • Isis, Pages, Glennies, Glendon
Key Collaborators and Partners	Formal Networks and Working Groups
Landholders Community Local Government Agricultural industry groups Mining industry Landcare networks and groups	Existing networks or collaborations enabling community action: • Hunter Region Landcare Network and Hunter LLS MOU • LLS Regional Weeds Advisory Group
Community Participants	
Private and public landholders Community groups Agricultural industry groups Mining industry	
Alignment to Other Sub Themes	Theme 1 Terrestrial Biodiversity: Sub Themes 1A: Dry open forests and woodland ecosystems, 1C: Wet sclerophyll forests and ecosystems Theme 2 Soils: Sub Theme 2A: Groundcover, soil health and function Theme 3 Rivers and Aquatic: Sub Themes 3A: Improve River Ecological Health, 3B: Reducing riverbank erosion and risk

Table 10: Hunter region priority assets for soil erosion and soil degradation.

Photo 9: Fenced dam, Travelling Stock Reserve. Credit: HLLS.

Rivers and Aquatic Biodiversity

4

4.1 Theme 3 – Rivers and Aquatic Biodiversity

This theme identifies diverse but complementary rivers and aquatic biodiversity outcomes which primarily depend on improving riparian native vegetation, being the vegetation within and immediately adjacent to streams. Increasing riparian native vegetation extent reduces erosion risk and flood risk, while improving riparian and instream aquatic habitat condition and connectivity improves ecological health, at a range of scales.

Landscapes and threatened ecological communities are identified which are associated with priority sub-catchments in the Hunter region for this theme. This reflects that delivery of rivers and aquatic biodiversity outcomes usually occurs in conjunction with outcomes for the terrestrial and estuarine vegetation through which rivers flow. Key results, initiatives, actions and collaborators are identified to achieve key results presented under the theme objective.

4.2 Assets, Threats, Objective and Key Results

Rivers and aquatic biodiversity assets in the Hunter

The rivers of the Hunter Region are highly diverse and span diverse bioregions, climatic zones and land uses. The Hunter and Goulburn River systems connect the Greater Blue Mountains and Barrington Tops World Heritage Areas with the Hunter Estuary Ramsar wetlands. The Myall River connects to the Myall Lakes Ramsar, while the Manning and Karuah Rivers connect Barrington Tops and the Great Dividing Range to important estuarine habitats.

Combined with the many tributary rivers, creeks and brooks, this extensive network of streams provides critical aquatic biodiversity habitats for multiple ecosystems and species. This occurs in landscapes cleared for mining, agriculture and population growth, where rivers provide the significant remnant biodiversity habitat within multiple Threatened Ecological Communities. This also occurs in intact landscapes including adjoining world heritage areas where rivers provide refuge for the recovery of ecosystems and threatened species from drought, fire and flood impacts.

Within the river and aquatic biodiversity theme, the following assets for the Hunter region have been identified as important to protect and enhance:

- Riparian native vegetation, including natural regeneration and woody vegetation
- Stable vegetated riverbanks
- Connected riparian and instream habitats, including drought refuge pools.

Threats to rivers and aquatic biodiversity assets

Assets	Key Threats identified
Riparian native vegetation, including natural regeneration and woody vegetation	• Overgrazing • Erosion • Clearing • Inadequate riparian regeneration • Inadequate riparian buffer • Weeds • Pigs • Climate change and extreme weather
Stable vegetated riverbanks	• Drought • Floods • Overgrazing • Erosion • Inadequate riparian vegetation • Inadequate riparian buffer • Weeds • Inappropriate excavation works • Pigs • Climate change and extreme weather
Connected riparian and instream habitats, including drought refuge pools	• Drought • Floods • Overgrazing • Erosion • Sedimentation • Inadequate riparian vegetation • Inadequate riparian buffer • Fire • Weeds • Water extraction • Inappropriate instream works • Carp, pigs and other pests • Climate change and extreme weather

Objective and Key Results

Objective 3:

By 2028 there is improved condition of rivers and aquatic biodiversity.

Key Result 3.1

Improve river ecological health by improving riparian and instream habitat condition, ***as measured by: 1. stream length of river enhanced, rehabilitated or protected; and 2. area of significant species or EECs enhanced, rehabilitated or protected.***

Key Result 3.2

Reduce riverbank erosion and flood risk by revegetating riverbanks, ***as measured by: 1. stream length of river enhanced, rehabilitated or protected; and 2. area of native vegetation enhanced, rehabilitated or protected.***

Key Initiatives and Actions

Action 3a. Improve riparian vegetation condition and connectivity along priority river ecological health reaches.

Action 3b. Revegetate riverbanks through natural regeneration and riparian plantings, along priority riverbank erosion reaches.

Action 3c. Stabilise strategic erosion sites to facilitate revegetation, along priority riverbank erosion reaches.

Action 3d. Improve the condition of endangered Hunter River Red Gum population remnants.

Action 3e. Protect and improve drought refuge pools and priority habitat for Platypus and endangered Manning River Helmeted Turtle along priority reaches.

Action 3f. Increase the scale of strategic reach-based revegetation through river rehabilitation works to reduce flood risk under the Hunter Valley Flood Mitigation Scheme.

Action 3g. Support landholders to develop and implement Property Riparian Plans along strategic river reaches to improve river ecological health and reduce riverbank erosion.

Alignment to Regional Landcare Partnership Outcomes

Alignment to Regional Land Partnerships 5-year Outcomes:

- The trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species, is stabilised or improved
- There is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation
- 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.

4.3 Monitoring, Evaluation, Reporting (MER), Prioritisation

How will Hunter LLS measure success?

The following measures of success will be used to assess how we are improving the condition and resilience of rivers and aquatic biodiversity in the Hunter region.

LLS Delivery and Customer Metrics

- Stream length (km) of river/estuary enhanced, rehabilitated or protected
- Area (ha) of native vegetation enhanced, rehabilitated or protected
- Area (ha) of significant species or EECs enhanced, rehabilitated or protected
- Area (ha) of native revegetation
- Area (ha) of weed management
- Area (ha) of pest control (vertebrate)
- Number of agreements that deliver native vegetation enhancement, rehabilitation or protection
- Number of projects undertaken to protect Aboriginal Cultural Heritage or Traditional Ecological Knowledge
- Number of stakeholder partnerships
- Number of community groups supported
- Number of 1:1 landholder advice consultation
- Number of awareness raising/capacity building event participants
- Number of training event participants
- Number of Aboriginal opportunities for people to support LLS decision making.

Condition Indicators (Local Strategic Plan)

Improved condition of natural resource assets, soil and land, native vegetation and biodiversity, rivers and aquatic biodiversity, and estuarine and marine ecosystems.

Monitoring approach

- Spatial data
- Field assessment
- Condition monitoring
- Project evaluation
- Project reporting
- Participant survey and evaluation
- Database of agreements, advice and participation
- Recovery plan actions reporting.

Prioritisation

Key Result 3.1: Improve river ecological health.

Priority catchments for protecting and enhancing river ecological health and aquatic biodiversity habitats have been identified by combining the priority ranking for the following criteria.

Priority Map: Improve River Ecological Health	
Criteria	Attributes within sub-catchments for ranking
Treatable stream length	Highest extent of woody vegetation
Woody vegetation proportion of stream length	Highest proportion of woody vegetation
High ecological value aquatic ecosystems extent and priority level	Highest combination of extent and priority
Groundwater dependent ecosystems extent and priority	Highest combination of extent of priority

Table 11: Prioritisation criteria for improving rivers and aquatic biodiversity ecosystems.

Prioritisation identifies the highest priority catchments for protecting and managing existing remnant woody riparian vegetation together with priority instream aquatic habitat and ecosystems.

The overall priority catchments for protecting and enhancing ecological health are indicated in Figure 13, noting that due to mapping limitations, priority areas for improving river ecological health may occur in other catchments.

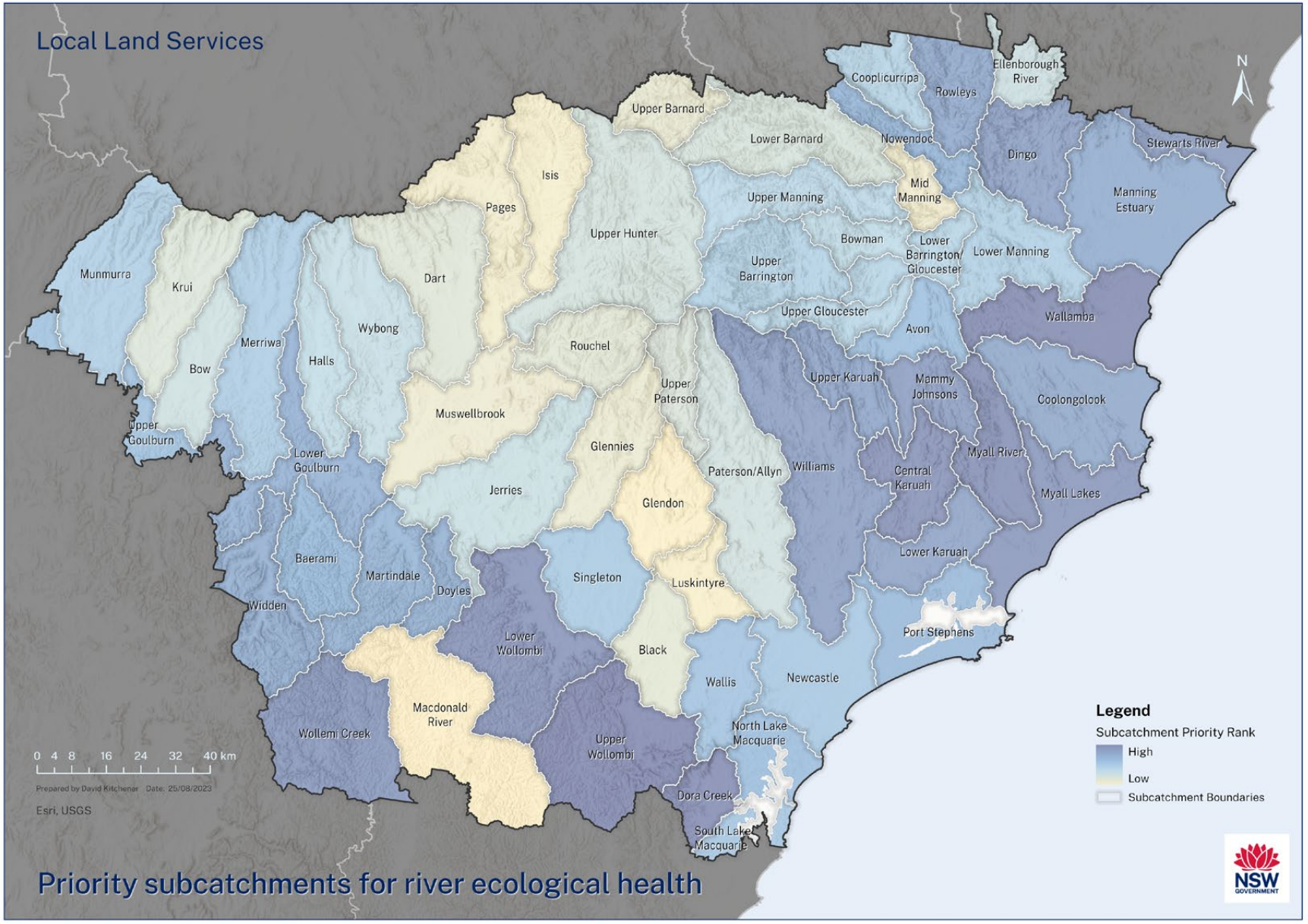


Figure 13: Priority sub-catchments for river ecological health.

Key Result 3.2: Reduce riverbank erosion and flood risk.

Priority catchments for reducing flood riverbank erosion and flood risk have been considered and identified together, as achieving these outcomes involve the same primary strategy of increasing riparian woody vegetation.

Priority catchments for reducing riverbank erosion and flood risk have been identified by combining the priority ranking for the following criteria.

Priority Map: Reduce Riverbank Erosion and Flood Risk	
Criteria	Highest Ranking Catchments
Livestock density	Highest average livestock densities
Treatable stream length	Highest treatable stream length available to revegetate riparian areas
Increase in woody vegetation	Highest where the ("Delta Green") rate of increase in woody vegetation is lowest
Proportion of non-woody vegetation	Highest where the proportion of non-woody vegetation (or cleared areas) relative to woody vegetation is highest

Table 12: Prioritisation criteria for reducing riverbank erosion and flood risk.

Prioritisation identifies the highest priority catchments for increasing woody riparian vegetation through changed grazing and other management practices.

The overall priority catchments for reducing riverbank erosion and flood risk are indicated in Figure 14, noting that due to mapping limitations, priority areas may occur in other catchments.

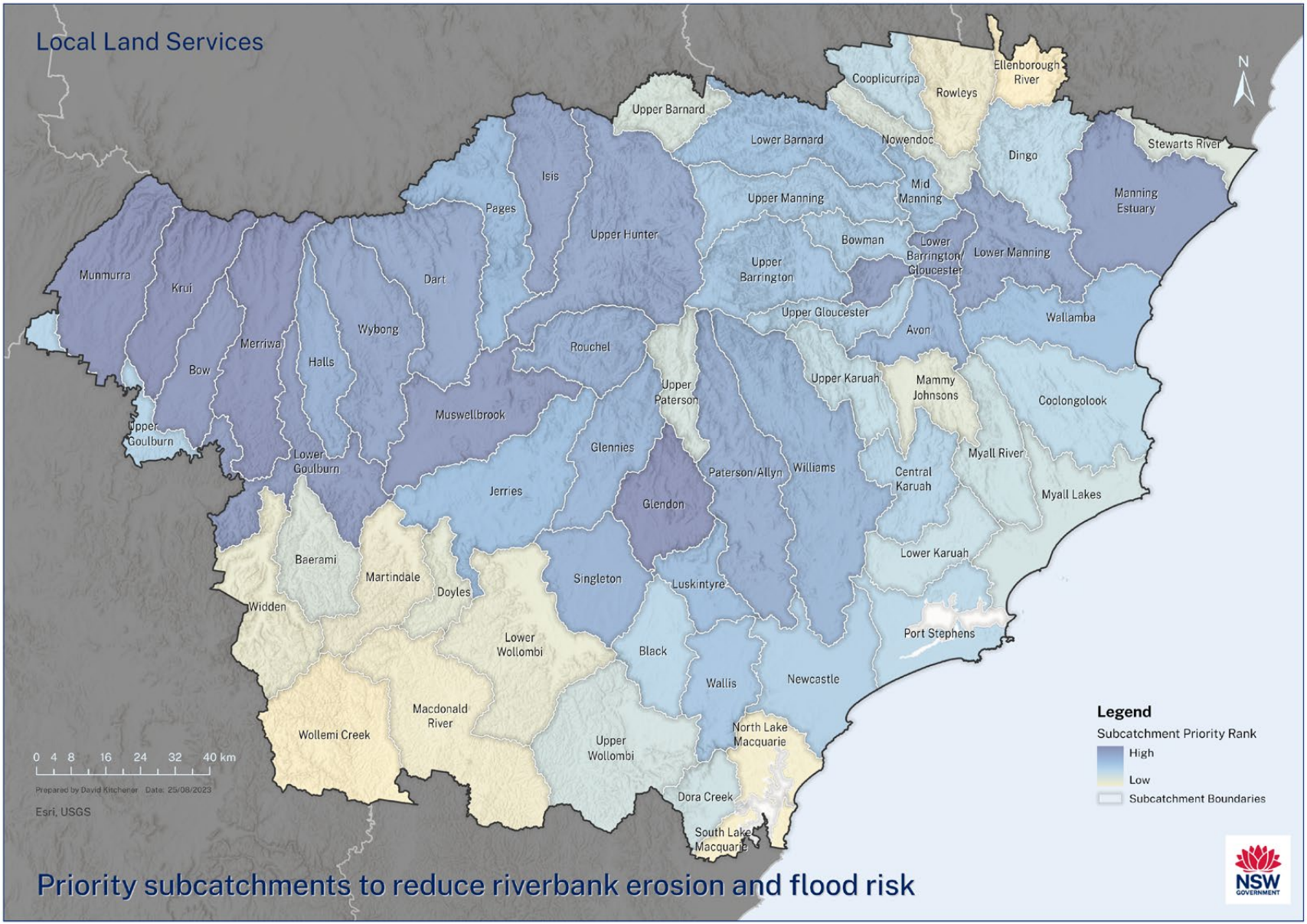


Figure 14: Priority sub-catchments to reduce riverbank erosion and flood risk.

4.4 Rivers and Aquatic Biodiversity Sub-themes

Sub-theme: 3A River Ecological Health – priority assets

River Ecological Health **Hunter Region priority assets for action**	
Regional Investment **Priority Landscapes and Threatened Ecological Communities**	**Southern Hunter Valley:** • Central Hunter Valley Eucalypt Forest and Woodland • Hunter Floodplain Red Gum Woodland • Lower Hunter Spotted Gum Ironbark Forest **Northern Lower Hunter Valley:** • Hunter Floodplain Red Gum Woodland • Lowland Rainforest of Subtropical Australia • Coastal Swamp Oak Forest • Lower Hunter Spotted Gum Ironbark Forest **Hunter Coastal Lakes and Estuaries:** • Hunter Floodplain Red Gum Woodland • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest **Northern Lower Manning:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest **Mid Coast Coastal Lakes and Estuaries:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)* *(n=under EPBC nomination listing)*	**Birds:** Regent Honeyeater*, Swift Parrot* **Mammals:** Koala*, Spotted-tail Quoll*, Grey-Headed Flying Fox **Amphibia:** Giant Burrowing Frog, Booroolong Frog **Reptile:** Manning River Helmeted Turtle (n) **TECs:** Central Hunter Valley Eucalypt Forest and Woodland, Lowland Rainforest of Subtropical Australia, Coastal Swamp Oak Forest, Coastal Swamp Sclerophyll Forest **WHA:** Greater Blue Mountains World Heritage Area
State Priority Assets	**EECs:** Lower Hunter Spotted Gum Ironbark Forest, Hunter Floodplain Red Gum Woodland, Hunter Lowland Redgum Forest, Hunter River Red Gum Population in the Hunter Catchment.
Regional Priority Assets	Riparian native vegetation Instream refuge pools Platypus habitat Manning River and Hunter River Turtle habitat Aboriginal and cultural heritage (within riparian zones)

River Ecological Health **Hunter Region priority assets for action**	
Condition statement	Areas of significant remnant riparian vegetation are generally associated with moderate to good condition river reaches. These areas support riparian forests, which actively regenerate and supply seed for downstream natural regeneration of lower condition river reaches. They provide key habitat features for threatened fauna, including connectivity and a range of ecosystem services including water quality. Rivers dominated by remnant riparian vegetation have resilience to major flood threats although strategic interventions to address local threats such as erosion may be required. Management of weed and pest animal threats, together with grazing management, are the focus to improve or maintain riparian vegetation condition. Instream drought refuge pools for platypus, turtles, fish and other aquatic species vary in condition but are often in degraded condition through grazing, weeds, invasive species and other local threatening processes, particularly during and post drought.
Sub Theme Threats	
Drought	Loss or decline of aquatic habitat dependent species and riparian native vegetation Increased risk of erosion
Floods	Riverbank erosion, loss of riparian vegetation and loss of property infrastructure
Overgrazing	Lack of natural regeneration causing erosion and decline in the condition of riparian vegetation and instream habitats
Riverbank erosion	Loss of productive land and riparian vegetation Downstream sedimentation and decline in instream habitat
Sedimentation from sheet, rill and gully erosion	Loss of instream habitat pools and geomorphic diversity Reduced water quality
Inadequate riparian vegetation	Increased risk of flood impacts, including riverbank and riverbed erosion Lack of natural regeneration and replacement of old remnant vegetation
Fire	Increased intensity of major wildfire causing loss or decline of riparian vegetation canopy
Weeds	Loss or decline in native understory and natural regeneration
Water extraction	Reduced water availability and water quality, reducing instream habitat condition including drought refuge pools
Inappropriate instream works	De-stabilisation of riverbanks and riverbeds, causing river erosion and sedimentation
Carp, pigs and other pest animals	Instream habitat decline through reduced water quality and loss of instream and riparian vegetation Predation on native fauna by predator pests
Climate change and extreme weather	Increased severity of major flooding causing increased flood risks, riverbank erosion and loss of riparian vegetation and regeneration

Sub Theme Initiatives and Actions	Management Action or Practice Change
Action 3a. Improve riparian vegetation condition and connectivity along priority river ecological health reaches	• Protect remnant riparian vegetation through fencing, excluded or strategic grazing, and off stream water • Weed and pest animal control
Action 3b. Revegetate riverbanks through natural regeneration and riparian plantings, along priority riverbank erosion reaches	• Excluded or strategic grazing to promote natural regeneration • Maintain good groundcover adjoining rivers
Action 3c. Stabilise strategic erosion sites to facilitate revegetation, along priority riverbank erosion reaches	• Riverbank erosion control works and revegetation
Action 3d. Improve the condition of endangered Hunter River Red Gum population remnants	• Revegetation with local provenance • Fencing, excluded or strategic grazing, and off stream watering
Action 3e. Protect and improve drought refuge pools and priority habitat for Platypus and endangered Manning River Helmeted Turtle along priority reaches	• Exclude stock from refuge pools and nesting sites • Riverbank revegetation using local provenance • Weed and pest animal control • Monitor population
Action 3g. Support landholders to develop and implement Property Riparian Plans along strategic river reaches to improve river ecological health and reduce riverbank erosion	• Property scale riparian plans

Priority Sub-catchments	
	Southern Hunter Valley: • Upper and Lower Wollombi, Doyles, Lower Goulburn, Widden **Northern Lower Hunter Valley:** • Williams **Hunter Coastal Lakes and Estuaries:** • Newcastle, Dora Creek **Northern Lower Manning:** • Manning Estuary, Dingo, Rowleys **Mid Coast Coastal Lakes and Estuaries:** • Wallamba, Coolongolook, Myall River and Lake, Upper, Central and Lower Karuah, Mammy Johnsons, Port Stephens

Key Collaborators and Partners	Formal Networks and Working Groups
Landholders Community DPE –Water Reconstruction NSW Agriculture and mining industry Landcare networks and groups Universities Councils Soil Conservation Service	Existing networks or collaborations enabling community action: • Mid Coast Council and Hunter LLS MOU • Mid Coast to Tops Landcare Connection and Hunter LLS MOU • Hunter Region Landcare Network and Hunter LLS MOU

Community Participants	
Private and public landholders DPE – Water Community and industry groups Councils	
Alignment with other sub themes	Theme 1 Terrestrial Biodiversity: Sub Themes 1A: Dry open forests and woodland ecosystems, 1B: Rainforest vegetation and ecosystems, 1C: Wet sclerophyll forests and ecosystems Theme 2 Soils: Sub Theme 2A Groundcover, soil health and function, 2B Soil Erosion and soil degradation Theme 3 Rivers and Aquatic: Sub Theme 3B Reducing riverbank erosion and risk Theme 4 Marine, Coastal and Estuary: Sub Theme 4A: Estuarine and marine ecosystems, 4B: Forested or riverine and freshwater wetland coastal ecosystems

Table 13: Hunter region priority assets for river ecological health.

Sub-theme 3B: Riverbank Erosion and Flood Risk – priority assets for action

Reducing Riverbank Erosion and Flood Risk **Hunter Region priority assets for action**	
Regional Investment **Priority Landscapes and Threatened Ecological Communities**	**Merriwa Plateau and Foothills:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands • Central Hunter Valley Eucalypt Forest and Woodland **Central and Upper Hunter Valley Floor:** • Central Hunter Valley Eucalypt Forest and Woodland • Hunter Floodplain Red Gum Woodland **Western and Southern Barrington Foothills:** • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands • Central Hunter Valley Eucalypt Forest and Woodland **Central and Lower Manning:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest **Mid Coast Coastal Lakes and Estuaries:** • Lowland Rainforest of Subtropical Australia • Coastal Swamp Sclerophyll Forest • Coastal Swamp Oak Forest
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)* *(n=under EPBC nomination listing)*	**Birds**: Regent Honeyeater*, Swift Parrot* **Mammals**: Koala*, Spotted-tail Quoll*, Grey-Headed Flying Fox **Amphibia**: Giant Burrowing Frog, Booroolong Frog **Reptile**: Manning River Helmeted Turtle (n) **TECs**: Central Hunter Valley Eucalypt Forest and Woodland, Lowland Rainforest of Subtropical Australia, Coastal Swamp Oak Forest, Coastal Swamp Sclerophyll Forest **WHA**: Greater Blue Mountains World Heritage Area
State Priority Assets	**EECs:** Lower Hunter Spotted Gum Ironbark Forest, Hunter Floodplain Red Gum Woodland, Hunter Lowland Redgum Forest, Hunter River Red Gum Population in the Hunter Catchment
Regional Priority Assets	Riparian native vegetation Instream refuge pools Platypus habitat Manning River and Hunter River Turtle habitat Aboriginal and cultural heritage (within riparian zones)

Reducing Riverbank Erosion and Flood Risk **Hunter Region priority assets for action**	
Condition Statement	Areas of significant remnant riparian vegetation are generally associated with moderate to good condition river reaches. These areas support riparian forests, which actively regenerate and supply seed for downstream natural regeneration of lower condition river reaches. They provide key habitat features for threatened fauna, including connectivity and a range of ecosystem services including water quality. Rivers dominated by remnant riparian vegetation have resilience to major flood threats although strategic interventions to address local threats such as erosion may be required. Management of weed and pest animal threats, together with grazing management, are the focus to improve or maintain riparian vegetation condition. Instream drought refuge pools for platypus, turtles, fish and other aquatic species vary in condition but are often in degraded condition through grazing, weeds, invasive species and other local threatening processes, particularly during and post drought.
Sub Theme Threats	
Drought	Loss or decline of aquatic habitat dependent species and riparian native vegetation Increased risk of erosion
Floods	Riverbank erosion, loss of riparian vegetation and loss of property infrastructure
Overgrazing	Lack of natural regeneration causing erosion and decline in the condition of riparian vegetation and instream habitats
Riverbank erosion	Loss of productive land and riparian vegetation Downstream sedimentation and decline in instream habitat
Sedimentation from sheet, rill and gully erosion	Loss of instream habitat pools and geomorphic diversity. Reduced water quality
Inadequate riparian vegetation	Increased risk of flood impacts, including riverbank and riverbed erosion Lack of natural regeneration and replacement of old remnant vegetation
Fire	Increased intensity of major wildfire causing loss or decline of riparian vegetation canopy
Weeds	Loss or decline in native understory and natural regeneration
Water extraction	Reduced water availability and water quality, reducing instream habitat condition including drought refuge pools
Inappropriate instream works	De-stabilisation of riverbanks and riverbeds, causing river erosion and sedimentation
Carp, pigs and other pest animals	Instream habitat decline through reduced water quality and loss of instream and riparian vegetation Predation on native fauna by predator pests
Climate change and extreme weather	Increased severity of major flooding causing increased flood risks, riverbank erosion and loss of riparian vegetation and regeneration

Sub Theme Initiatives and Actions	Management Action or Practice Change
Action 3a. Improve riparian vegetation condition and connectivity along priority river ecological health reaches.	• Protect remnant riparian vegetation through fencing, excluded or strategic grazing, and off stream water • Weed and pest animal control
Action 3b. Revegetate riverbanks through natural regeneration and riparian plantings, along priority riverbank erosion reaches.	• Excluded or strategic grazing to promote natural regeneration. • Riverbank revegetation using local provenance • Maintain good groundcover adjoining rivers
Action 3c. Stabilise strategic erosion sites to facilitate revegetation, along priority riverbank erosion reaches	• Riverbank erosion control works and revegetation
Action 3d. Improve the condition of endangered Hunter River Red Gum population remnants.	• Revegetation with local provenance • Fencing, excluded or strategic grazing, and off stream watering
Action 3f. Increase the scale of strategic reach-based revegetation through river rehabilitation works that reduce flood risks under the Hunter Valley Flood Mitigation Scheme.	• Riverbank revegetation using local provenance
Action 3g. Support landholders to develop and implement Property Riparian Plans along strategic river reaches to improve river ecological health and reduce riverbank erosion.	• Property scale riparian plans

Priority Sub-catchments	
	Merriwa Plateau and Foothills: • Munmurra, Krui, Bow, Merriwa, Lower Goulburn **Central and Upper Hunter Valley Floor:** • Muswellbrook **Western and Southern Barrington Foothills:** • Isis, Glendon **Central and Lower Manning:** • Manning Estuary, Lower and Mid Manning, Lower Barnard, Lower Barrington/ Gloucester, Avon **Mid Coast Coastal Lakes and Estuaries:** • Wallamba

Key Collaborators and Partners	Formal Networks and Working Groups
Landholders Community DPE – Water Reconstruction NSW Agriculture and mining industry Landcare networks and groups Universities Councils Soil Conservation Service	Existing Networks or Collaborations enabling community action: • Mid Coast Council and Hunter LLS MOU • Mid Coast to Tops Landcare Connection and Hunter LLS MOU • Hunter Region Landcare Network and Hunter LLS MOU

Community Participants	
Private and public landholders DPE –Water Community and industry groups Councils	
Alignment with other sub themes	Theme 1 Terrestrial Biodiversity: Sub Themes 1A: Dry open forests and woodland ecosystems, 1B: Rainforest vegetation and ecosystems, 1C: Wet sclerophyll forests and ecosystems Theme 2 Soils: Sub Theme 2A Groundcover, soil health and function, 2B Soil Erosion and soil degradation Theme 3 Rivers and Aquatic: Sub Theme 3B Reducing riverbank erosion and risk Theme 4 Marine, Coastal and Estuary: Sub Theme 4A: Estuarine and marine ecosystems, 4B: Forested or riverine and freshwater wetland coastal ecosystems

Table 14: Hunter region priority assets for reducing riverbank erosion and flood risk

Estuary, Coastal and Marine Biodiverse Ecosystems

5

5.1 Theme 4 – Estuary, Coastal and Marine Biodiverse Ecosystems

Estuary, coastal and marine biodiverse ecosystems are complex and diverse. This Plan focuses on three ecosystem types:

Estuarine wetlands and habitats are described as where wide parts of rivers meet the ocean. An estuary encompasses tidal waters of the major rivers and its tributaries - including the banks and beds of the waterway. For example, the Hunter Estuary extends from the Port of Newcastle to the tidal limits at Seaham weir on the Williams and Gostwyck on the Paterson about 75 km away from the sea. The vegetation types are influenced by varying levels of salinity and includes mangrove swamps and salt marshes. Examples include Hunter Estuary and Myall Lakes.

Coastal wetlands and habitats typically occur along the length of the coast – ocean beaches, shallow ocean waters, rocky headlands, islands and inland wetlands with freshwater (adjoining estuarine systems).

Forested or riverine wetlands occur at low lying areas on uncompressed sediments along river systems and floodplains. An example is Coastal Swamp Oak Forest ecological community – nationally protected forested wetland found near estuaries, coastal lagoon tidal flats and dunes swales, e.g. Cattai Wetlands.

These systems not only are the most productive in terms of ecosystem function and environmental and biodiversity values including globally for migratory species reliant on these refuges, they are also economically and socially important, especially for food production within the fisheries, aquaculture and agriculture (on floodplains) sectors. The reliance on the protection of natural capital and maintaining a healthy balance of these systems to sustain industries is a high priority in the Hunter region.

Several coastal estuaries in the Hunter are very important internationally for some of the highest biodiversity, including migratory species and two are recognised as internationally listed Ramsar wetlands, and another as a nationally significant wetland for migratory shorebirds.

This theme would be implemented in collaboration with local government, who have a lead role in development Catchment Management Plans relevant to broad stakeholder collaboration and key actions to manage and protect coastal catchments.

5.2 Assets, Threats, Objective and Key Results

Estuary, Coastal and Marine assets in the Hunter

The Hunter is home to two internationally listed Ramsar wetlands, the Hunter Estuary and Myall Lakes, and both are significant refuges for migratory and cryptic species reliant on important estuarine and marine habitats. Adjoining the Myall Lakes Ramsar wetlands is the Hunter Marine Park, which is Nationally listed for its significant coastal and marine values and the Port Stephens estuary is nationally recognised as an important migratory shorebird site.

Estuary, riparian and aquatic, coastal and marine vegetation and habitats, are geographically restricted within the Hunter Wetlands Ramsar site (Newcastle sub-catchment), and estuaries in the Wallis, Manning and Lake Macquarie, and are very important for migratory birds, fish and crustacea, and act as important coastal and floodplain forests are restricted to sections adjoining major rivers. Coastal habitats including island dunes and beach habitats support marine species such as turtle, shorebirds and seabirds as important breeding habitats. Key threats including climate change issues and extreme weather events (fire, floods, storms), sea level rise, loss of drought refuge areas, fragmentation and hybridisation, and impacts from disturbance and weeds and loss of international habitats such as wetlands due to development and global climate change that impact on migratory species that also rely on wetlands in the Hunter.

Within the Estuary and Marine theme, the following assets **or sub-themes** for the Hunter region have been identified as important:

4A. Estuarine and marine ecosystems

4B. Forested or riverine and freshwater wetland coastal ecosystems.

Threats to Estuary, Coastal and Marine assets

Human disturbance, practices or actions: Clearing, degradation or disturbance including historic land clearing, development, poor land management actions such as removal of floodplain vegetation, poor biosecurity management (pest and weeds) and activities such as fertilisation, chemical use or overgrazing, littering, pollution or installation of infrastructure in sensitive areas. Land or vegetation removal resulting in fragmentation of native vegetation and human or related disturbance to breeding or feeding animals. Loss and lack of historic cultural land management knowledge and practices. Lack of data to understand and manage complex implications of the above activities.

Climatic threats: Increased frequency, intensity and extent of fire, flood and drought stress and related extreme weather events within increased siltation, flood damage, more variable and rising sea levels, increased sea level rise and lack of retreat pathways or climate refugia.

Environmental threats: Invasive plants such as transformer weeds (an invasive plant species that has the capacity to change the character, condition, form or nature of one or more ecosystems), fragmentation and senescence attributed to historic and current poor practices, such as isolation or loss of genetic diversity or breeding potential, predator and pest animal threats such as vertebrate pests that predate or displace native species, pest animals (such as fox, feral cat or feral pig or poisonous cane toads) that damage or harm biodiversity, and other species identified as key threats.

Objective and Key Results

Objective 4:

By 2028 there is improved condition of coast, wetland and estuarine ecosystems.

Key Result 4.1

Improve the condition of priority coastal vegetation and wetland communities, ***as measured by 1. area (ha) of significant species or EECs enhanced, rehabilitated or protected and 2. Area (Ha) of wetlands enhanced, rehabilitated or protected.***

Key Result 4.2

Protect the condition and function of marine and estuary vegetation and habitats in priority areas, ***as measured by 1. area (ha) of significant species or EECs enhanced, rehabilitated or protected and 2. stream length (km) of river/estuary enhanced, rehabilitated or protected.***

Key Result 4.3

Reduce priority threats to marine and estuary habitats, and coast and wetland habitats ***as measured by 1. area (ha) of weed management 2. area (ha) of pest control (vertebrate).***

Key Result 4.4

Improve the resilience of fisheries and aquaculture farming systems (and practices) to the impacts of climate change, ***as measured by increases in knowledge and skills***.

Key Initiatives and Actions

Action 4a. Implement coordinated pest animal control programs (including monitoring) to reduce the threat of vertebrate predators and pests on native vegetation and fauna.

Action 4b. Implement new or expand on existing coordinated and long-term weed control programs focusing on protecting and enhancing high priority biodiverse coastal, estuarine and wetland vegetation communities.

Action 4c. Reduce human related disturbance to breeding fauna and migratory species or marine or estuary vegetation in coastal and marine habitats through active community engagement and awareness campaigns.

Action 4d. Support landholders to reduce nutrient and sediment loads, pollution, litter, plastics to improve aquatic habitat diversity and water quality.

Action 4e. Support floodplain agriculture, fisheries and aquaculture to adapt to climate change and extreme weather.

Action 4f. Improve and protect habitat and hydrological connectivity (for ecological function) between and within estuaries, floodplains and shorelines.

Action 4g. Implement indicator (environmental sensor) or target species monitoring and surveys to support strategic actions, including citizen science.

Action 4h. Support floodplain agriculture, fisheries and aquaculture to trial or adopt evidence based NRM practices that have both environmental and economic or financial benefits.

Action 4i. Actively promote values to industry, community, visitors and drive multistakeholder action.

Alignment to Regional Landcare Partnership Outcomes

Alignment to Regional Land Partnerships 5-year Outcomes:

- The trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species, is stabilised or improved
- There is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation
- 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.

5.3 Monitoring, Evaluation, Reporting (MER), Prioritisation

How will Hunter LLS measure success?

The following measures of success will be used to assess how we are improving the condition and resilience of native vegetation and biodiversity in the Hunter region.

LLS Delivery and Customer Metrics

- Stream length (km) of river/estuary enhanced, rehabilitated or protected
- Area (ha) of native vegetation enhanced, rehabilitated or protected
- Area (ha) of significant species or EECs enhanced, rehabilitated or protected
- Area (ha) of native revegetation
- Area (ha) of weed management
- Area (ha) of pest control (vertebrate)
- Number of agreements that deliver native vegetation enhancement, rehabilitation or protection
- Number of projects undertaken to protect Aboriginal Cultural Heritage or Traditional Ecological Knowledge
- Number of stakeholder partnerships
- Number of community groups supported
- Number of 1:1 landholder advice consultation
- Number of awareness raising/capacity building event participants
- Number of training event participants
- Number of Aboriginal opportunities for people to support LLS decision making.

Condition Indicators (Local Strategic Plan)

Improved condition of natural resource assets, soil and land, native vegetation and biodiversity, rivers and aquatic biodiversity, and estuarine and marine ecosystems.

Monitoring approach

- Spatial data
- Field assessment
- Condition monitoring
- Project evaluation
- Project reporting
- Monitoring of marine debris
- Participant survey and evaluation
- Flagship species monitoring
- Database of agreements, advice and participation
- Recovery plan actions reporting.

Prioritisation for Estuary, Coast and Marine

Prioritisation principles

To select priority landscapes for strategic action based on species and places, risk of extinction, multiple landscape benefits, continuity and partnership potential, importance to people, uniqueness and representativeness to the region and (further rationale, approach and key data info can found in Appendix A).

The selection of priority species and places for estuary and marine habitats and environments includes:

- Internationally important Ramsar wetlands, the Hunter Estuary Wetlands and Myall Lakes in the Hunter Region. These wetlands support critically endangered Eastern Curlew, endangered Australasian Bittern and the vulnerable Green and Golden Bell Frog
- Nationally important estuary (freshwater and saline) wetlands including Hexham Swamp, Port Stephens, Wallis Lake and adjacent estuary islands, Lake Macquarie
- Areas with high potential for habitat restoration and connectivity to other ecosystems and landscapes with a focus on TEC listed communities such as East Coast Subtropical and Temperate Floodplain Eucalypt Forests, Coastal Swamp Sclerophyll Forest of NSW and Southeast Queensland, will meet the obligation under the Ramsar convention.

Alignment of strategic and coordinated planning with key organisations and stakeholders to achieve common environmental outcomes, key results, initiatives, and actions with respect to reducing the impact of key threats on-ground activities, community engagement and participation.

Spatial prioritisation

To identify landscapes that are of the highest priority to retain, protect or connect native vegetation and the biodiversity it sustains, a spatial prioritisation approach will identify locations within each sub-catchments and for this theme identified four criteria to identify spatial investment areas.

Key Result 4.1: Improve the condition of priority coastal vegetation and wetland communities.

Key Result 4.2: Protect the condition and function of marine and estuary vegetation and habitats in priority areas.

Key Result 4.3: Reduce priority threats to marine and estuary habitats, and coast and wetland habitats.

Key Result 4.4: Improve the resilience of fisheries and aquaculture farming systems (and practices) to the impacts of climate change.

Criteria	Attributes within sub-catchments for ranking
High conservation value estuary, marine or coastal vegetation	Highest listed vegetation and extent (rank and score in order of conservation status, example Critically Endangered= highest scored)
Vegetation connectivity	Extent of identified corridors extent (and non-vegetated lands identified for potential enhancement) (regional and local)
High conservation value species*	Spatial distribution of national, state and regionally significant species (rank and score in order of conservation status, example Critically Endangered= highest scored)
Other significant landscape areas	Protected Places, Key Biodiversity Areas and Ramsar Wetlands, Marine Parks, Significant migratory species feeding grounds
Economically important zones for industries	Fisheries, aquaculture and floodplain agriculture in estuary zones

Table 15: Prioritisation criteria for coastal, marine, wetland and estuary vegetation and habitats.

Environmental values mapping to inform priority actions for investment

The sub-catchment combined assets and environmental values is comprised of threatened flora and fauna species, threatened ecological communities and environmental values i.e. internationally and nationally important wetlands input data. The spatial analysis incorporates 4 coastal TECs, threatened fauna species and different wetland types, intersected with 14 coastal sub-catchments.

In Figure 15, the scores are based on the count of all species within each sub-catchment (rather than the projected area), weighted based on the EPBC status (Critically Endangered being the highest and Vulnerable the lowest); the number of Threatened Ecological Communities, similarly weighted based on the EPBC status; and the number and type of wetlands present, also weighted to represent importance (Ramsar being the highest and locally-important being the lowest).

Each of these three factors was given equal weight in the final ranking. The highest priority sub-catchment areas therefore represent a combination of high value species, communities and assets. The Newcastle sub-catchment contains the highest combined assets and environmental values, followed by Coolongolook and Port Stephens.

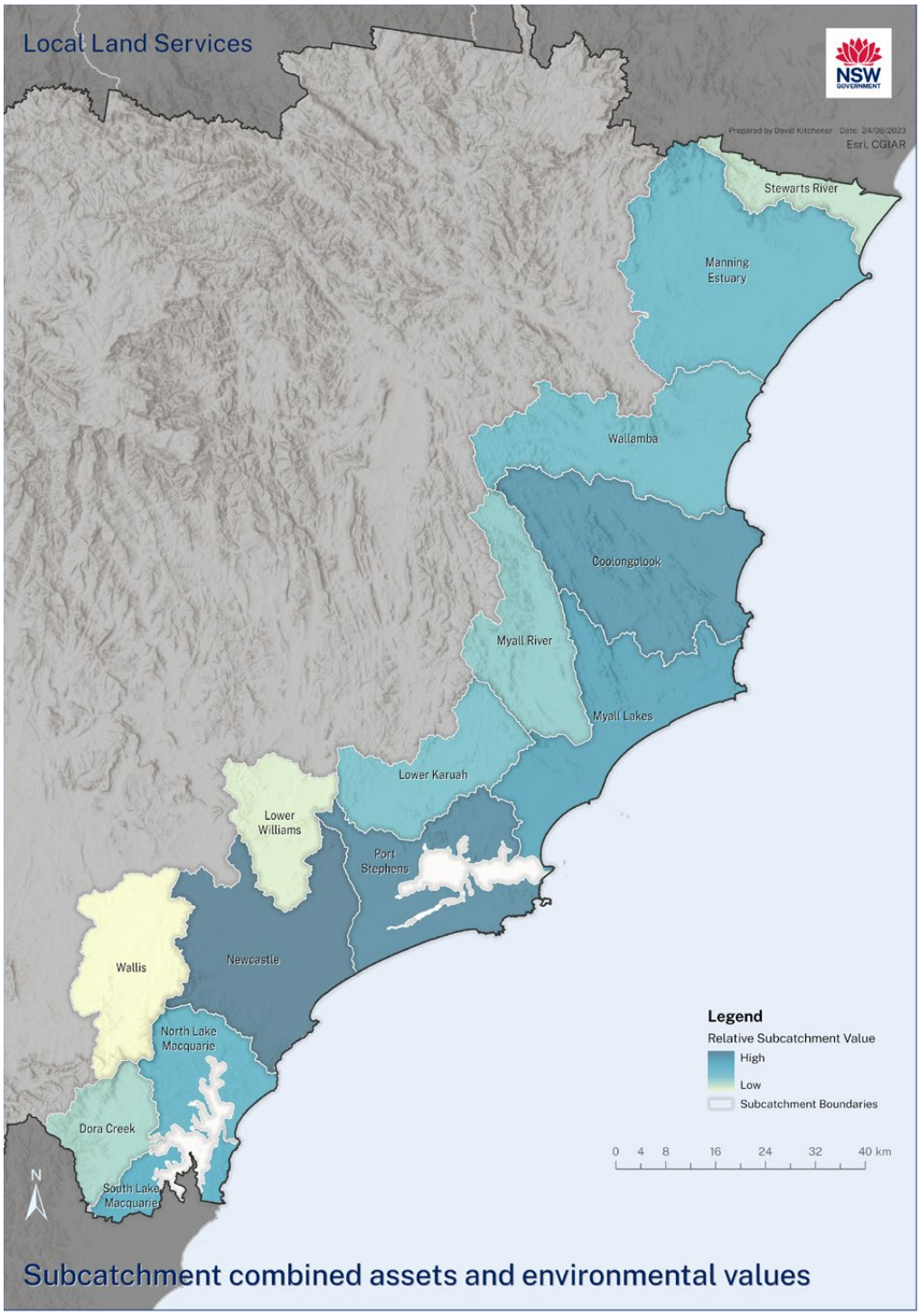


Figure 15: Sub-catchment combined assets and environmental values.

Sub-catchment connectivity and climate change resilience was assessed using the same spatial analysis methodologies as outlined in the Native Vegetation and Terrestrial Biodiversity theme. These two factors were given equal weight in calculating a final prioritisation score. The highest priority sub-catchments therefore represent where the greatest opportunities exist to enhance connectivity and to establish habitat with a higher degree of resilience to climate change (Figure 16).

Below are the priority sub-catchments for action or investment include Port Stephens and Lake Macquarie, both sub-catchments have a high score, correlating with greater habitat values. Whereas the low score within Myall Lakes is attributed to the large wetland system and contiguous intact native vegetation providing minimal opportunity for creating corridor links. It is considered a high priority with regards to species diversity and richness.

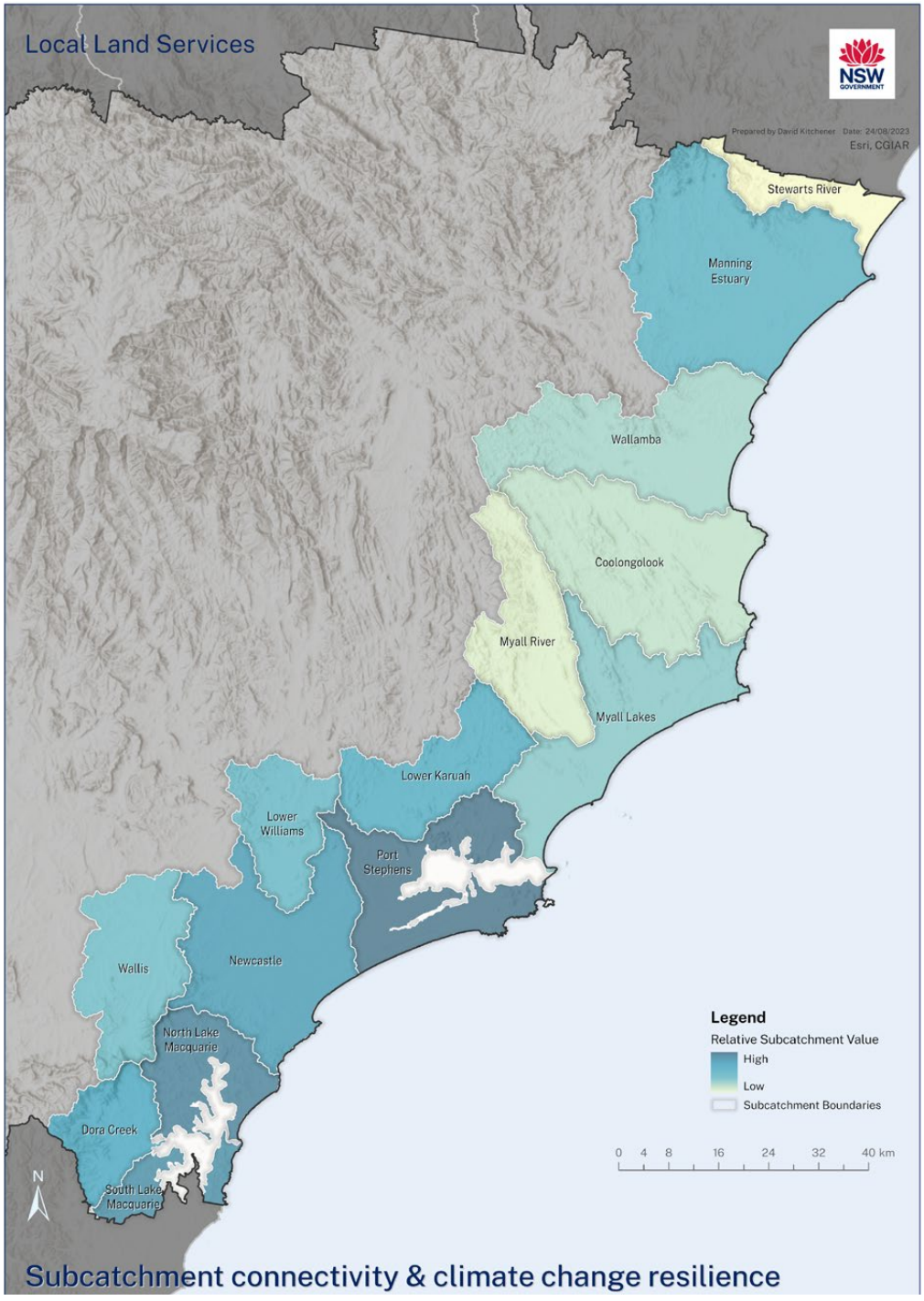


Figure 16: Sub-catchment connectivity and climate change resilience.

Estuary Health Monitoring

Through an Australian Government funded initiative, Climate Ready Aquaculture, LLS, fisheries and aquaculture groups engaged researchers to study marine and estuary ecosystems in the Wallis Lake.

This estuary system is significant for its environmental and economic values. Multiple sensors are installed in and around infrastructure and locations in the lake to monitor various habitats and their values. Additional real-time sensors will monitor pH and temperature shifts.

These data will inform future actions to protect or create key habitats such as seagrass, oyster reefs or other structures to restore and protect the unique values under increasing pressure of climate change to sustain viable industries and preserve estuary ecosystems.

www.youtube.com/watch?v=UWAuVFYfJcM

5.4 Estuary and Marine Sub-themes

Sub-theme 4A: Estuarine and marine ecosystems

Significant ecological communities within estuary and marine zones include Subtropical and Temperate Coastal Saltmarsh and Posidonia australis Seagrass Meadows of the Manning-Hawkesbury Ecoregion.

Estuaries of the highest importance are the Hunter Estuary Wetlands Ramsar site, Hunter Marine Park, Port Stephens Estuary, Manning Estuary, Lake Macquarie containing expanses of intact seagrass (*Posidonia*, *Zostera*, *Halophila* and *Rupia* species), and ranging from large to small intact areas of coastal saltmarsh (saltwater couch, samphire and sea rush dominated). Adjoining areas of mangroves, mudflats and coastal beach also provide valuable feeding zones and habitat for an array of threatened fauna, including migratory species such as shorebirds (29 migratory shorebird species, internationally listed under JAMBA, CAMBA, ROKAMBA international migratory agreements) marine species such as turtle, seabirds, and support fisheries dependent species, and provide ecosystems services such as filtration and sediment management and are important for fisheries and aquaculture industries.

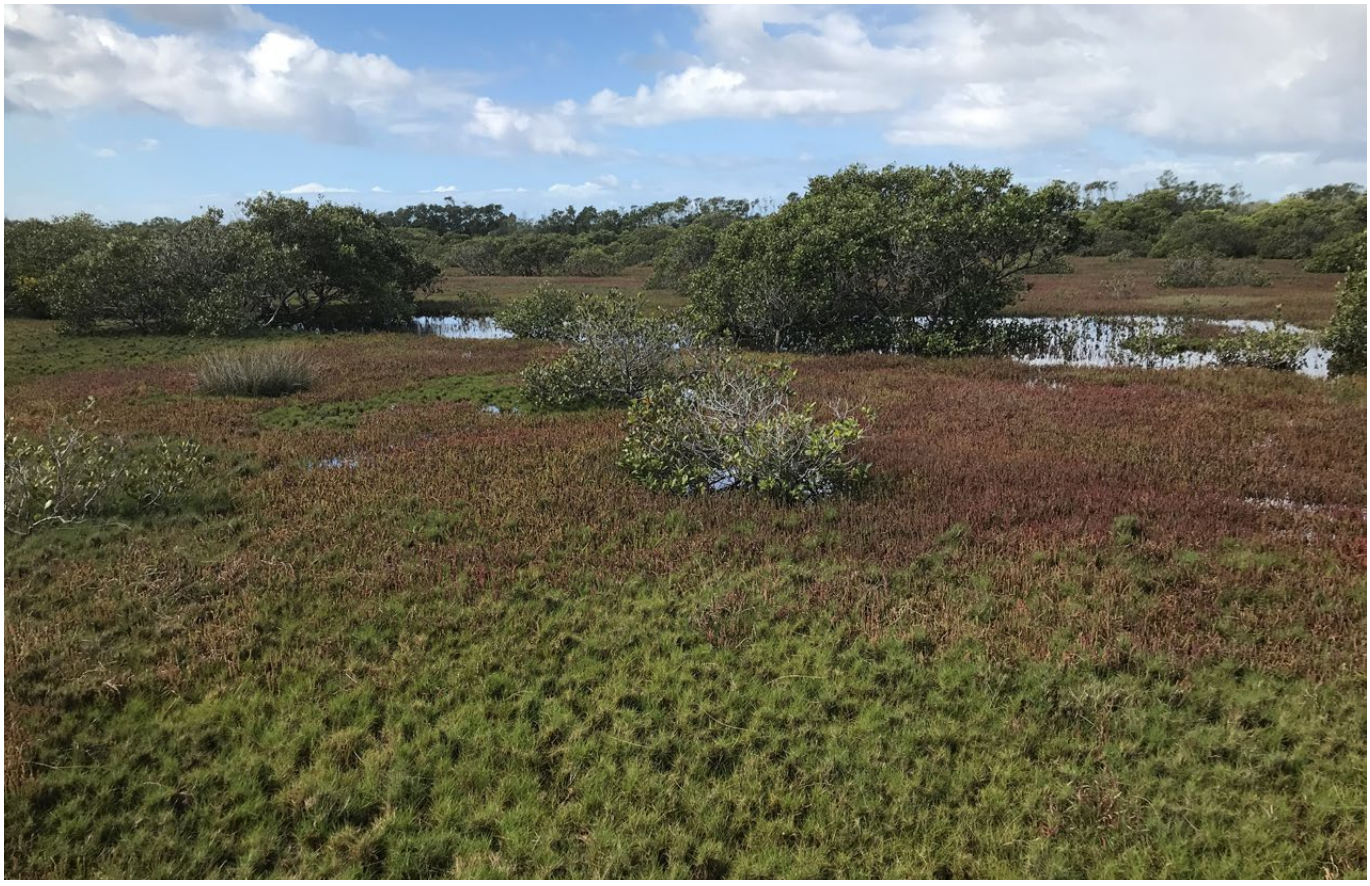


Photo 10: Sub-tropical and temperate saltmarsh community, Kooragang Wetlands, Lower Hunter. Credit: HLLS.

Estuary Rehabilitation **Hunter Region priority assets for action**	
Regional Investment Priority	Improve priority estuarine vegetation and marine ecosystems in the Hunter, Port Stephens, Manning and Lake Macquarie estuary systems
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)* *(n=under EPBC nomination listing)*	**Places:** Hunter Estuary Ramsar Wetland, Myall Lakes Ramsar Wetlands, Hunter Marine Park, Wallis Lake and adjacent estuarine islands, Port Stephens Estuary, Lake Macquarie Estuary **TECs:** Sub-tropical and Temperate Coastal Saltmarsh, Swamp Oak Forest, Posidonia australis Seagrass Meadows of the Manning-Hawkesbury Ecoregion **Birds**: Eastern Curlew*, Australasian Bittern*, Curlew Sandpiper, Little Tern, Gould's Petrel. **Amphibians:** Green and Golden Bell Frog **Reptiles:** Green Turtle* **Fish:** White's Sea Horse, Grey Nurse Shark (eastern) **Marine:** Cauliflower soft coral*
State Priority Assets	**Places**: Kooragang Wetlands, Hexham Swamp, Port Stephens-Great Lakes Marine Park
Regional Priority Assets	**Plants:** *Posidonia*, *Zostera*, *Halophila* and *Rupia* seagrass species, Mangroves **Places**: Manning Estuary, Rocky Knob Aboriginal Place
Condition Statement	**Manning Estuary** - contains remnant saltmarsh, mangrove and seagrass with estuarine lagoons and coastal floodplain forests, predominately on private lands, it is subject to sedimentation from upstream freshwater runoff from agricultural lands and listed as nationally important for migratory and resident shorebird habitat at the mouth of the river at Harrington and Farquhar Inlet. Important for fisheries and aquacultural industries. **Hunter Estuary** - declared as an internationally important Ramsar wetland and one of the largest estuarine wetlands in NSW and most important for waders or shorebird species containing expanses of coastal saltmarsh, mangroves and mudflats and seagrass, and man-made structures benefitting migratory species. While largely intact and reserved within National Parks system, threats include upstream runoff, pollution, nutrient and sedimentation, transformer weeds, climate change and sea level rise impacts, loss of roosting sites/degrading infrastructure (including tidal structures), pest animals and human disturbance. **Port Stephens Estuary and Marine park** - a significant estuary for marine life, with several protected areas, this estuary is coastally developed and a popular recreational and tourist attraction with pressures on natural systems, which include coastal saltmarsh, mangroves and mudflats and seagrass. Protected areas within the Marine Park and National Parks (including sections of the Myall Lakes Ramsar Wetland) and Council reserves at least provide sanctuary for important marine habitats, threats include upstream agricultural runoff, pollution, nutrient and sedimentation, climate change and sea level rise impacts, reduced available roosting sites, pest and domestic animals and human disturbance, and some impacts such as aquaculture infrastructure on seagrass habitats. Important for fisheries and aquacultural industries. **Lake Macquarie Estuary** - is an important estuary, that is dominated by coastal development, high recreation and tourist attractions, which is predominately protected through small public reserves (Council/Crown), and is dominated by large intact stands of seagrass, with only a very small saltmarsh remnant at Speers Point managed by Council. Internationally recognised wetlands.

Estuary Rehabilitation **Hunter Region priority assets for action**	
Condition Statement	**Wallis Lake estuary -** River mouths and lake systems that contain marine and estuary values, important for fisheries and aquacultural industries and internationally recognised wetlands. **Karuah River** - mangrove, saltmarsh, Khappinghat and Black Head Lagoon-saltmarsh on private lands, Wallis Lake-Saltmarsh, seagrass and mangrove on private and public lands. **Smith's Lake** - contains seagrass and is a saline lagoon system, intermittently open to the sea, located north of the Myall Lakes Ramsar wetland, although not connected. **Coastal beaches and islands** (Broughton, Little Broughton, Cabbage Tree also are very important for shoreline and other breeding sites for shorebird, seabird and turtle.
Sub Theme Threats	
Clearing, degradation or disturbance	• Vegetation disturbance or damage (deer, wild pig) • Grazing pressure on understorey species • Damage to sensitive vegetation through poor practices • Non-compliance of legislative frameworks
Acid Sulphate Soils	• Grazing pressure on understorey species • Lack of understorey • Poor drainage or drought causing loss of surface water
Transformer weeds	• Weeds impacting on estuarine systems (Spiny Rush, Pampas Grass, Groundsel Bush, Bitou Bush)
Nutrients, debris, runoff and pollution	• Marine debris entanglement, ingestion • Chemicals, silt and fertiliser entering estuary systems • Flood incidents causing increased debris, chemical and nutrients into systems • Sediment and runoff from unsealed roads/gravel roads • Poor management of effluent or nutrients, causing algal blooms
Lack of awareness or knowledge	• Non-compliance of legislative frameworks • Poor land management practices • Loss of cultural and traditional owner land management practices
Predator and pest threats	• Cane toad (poisonous) • Vertebrate pests (fox, feral cat, wild pig, domestic dog)
Human disturbance	• Access to sensitive sites, disturbing or damaging breeding or feeding species by beach goers, visitors, fishers or 4WD
Lack of data	• Insufficient data to inform decisions
Extreme weather or climate change events	• Loss or reduction of fire sensitive vegetation from increasing frequency or more intense fires • Drought, flood and rising temperatures, change in PH or bleaching • Loss of retreat pathways or climate refugia through rising sea levels

Sub Theme Initiatives and Actions	Management Action or Practice Change
4a. Implement coordinated pest animal control programs (including monitoring)	• Control vertebrate predator pests (wild pig, fox, feral cat) • Control herbivores or browsing threats (wild pig, deer) • Monitor for, report and contain Cane Toads
4b. Implement new or expand on existing coordinated and long-term weed control programs	• Control transformer weeds and encourage natural regeneration • Adopt cultural land practices and Indigenous knowledge
4c. Reduce human related disturbance to breeding fauna and migratory species or marine or estuary vegetation	• Protect sensitive areas or sensitive vegetation/ habitats • Increase awareness • Improve poor practices • Adopt protective practices i.e., sensitive moorings, oyster reefs, barriers • Educate pet owners and present them accessing sensitive areas
4d. Support landholders to reduce nutrient and sediment loads, pollution, litter, plastics	• Promote practices that reduce inputs into estuary systems • Support floodplain farmers to enhance and protect riparian zones • Seal gravelled roads or manage floodplain drainage
4e. Support floodplain agriculture, fisheries and aquaculture to adapt to climate change and extreme weather	• Plan, prepare for climatic impacts • Improve timely decision making • Implement trial or demonstration activities • Support whole farm planning with floodplain and riverine landholders
4f. Improve and protect habitat and hydrological connectivity (for ecological function)	• Improved grazing management • Conserve large remnants • Manage flood gates, drainage or infrastructure • Reinstate structure of vegetation (such as direct planting of seagrass)
4g. Implement indicator (environmental sensor) or target species monitoring and surveys	• Maintain indicator monitoring in targeted landscapes • Support priority species monitoring • Involve community in citizen science
4h. Support floodplain agriculture, fisheries and aquaculture to trial or adopt evidence-based NRM practices that have both environmental and economic/ financial benefits	• Encourage landholders with high value, intact remnants to engage in conservation initiatives • Encourage industries and land managers to participate in carbon or other environmental markets • Implement trial or demonstration activities • Support whole farm planning with floodplain and riverine landholders
4i. Actively promote values to industry, community, visitors and drive multistakeholder action	• Maintain stakeholder engagement initiatives • Maintain coordinated action and stakeholder networks, such as formal networks for high priority estuarine wetlands and systems, such as Hunter Estuary wetlands

<table>
<tr><td>Priority Sub-catchments</td><td colspan="2">Biodiversity and ecosystems: Newcastle, Myall Lakes, Manning, Port Stephens, Lower Manning, Dingo sub-catchments
Fisheries and aquaculture: Coolongolook, Port Stephens, Manning, Wallis sub-catchments</td></tr>
<tr><td colspan="2">Key Collaborators and Partners</td><td>Formal Networks and Working Groups</td></tr>
<tr><td colspan="2">DPE-NPWS and SOS
Local Government (Mid Coast, Port Stephens, Newcastle, Lake Macquarie)
DPI Fisheries
Fisheries and Aquacultural industries and cooperatives
Landcare Networks and Coastcare community groups
Marine community organisations (such as OCCI, OceanWatch, Take3, CHUG)
BirdLife Australia and birdwatching groups
Mining Companies (Hunter Estuary)
Local Aboriginal Land Councils/Traditional Owner Groups
Research institutes</td><td>• Marine Debris Network
• Manning, Port Stephens and Hunter Shorebird working groups (LLS/BirdLife led)
• Catchment Management Plan working groups (Local Government led)
• Hunter Estuary Alliance (Local Government led)</td></tr>
<tr><td colspan="3">Community Participants</td></tr>
<tr><td colspan="3">DPE-NPWS and SOS
Local Government (Mid Coast, Port Stephens, Newcastle, Lake Macquarie)
Landcare Groups
Recreational users/tourists (including beach-goers, 4WD, boaters/fishers, tourism operators)
Private landholders
Farmers/primary producers (upstream)
Fisheries, agriculture (including poultry, beef and dairy) and aquaculture land and sea managers
Local Aboriginal Land Councils/Traditional Owner Groups</td></tr>
<tr><td>Alignment to Other Sub Themes</td><td colspan="2">Theme 1 Terrestrial Biodiversity: Sub Themes 1B: Rainforest vegetation and ecosystems, 1C: Wet sclerophyll forests and ecosystems
Theme 2 Soils: Sub Theme 2A: Groundcover, soil health and function, 2B: Soil Erosion and soil degradation
Theme 3 Rivers and Aquatic: Sub 3B: Reducing riverbank erosion and risk
Theme 4 Marine, Coastal and Estuary: Sub Theme 4B: Forested or riverine and freshwater wetland coastal ecosystems</td></tr>
</table>

Table 16: Hunter region priority assets for estuary rehabilitation.

Sub-theme 4B: Forested or riverine and freshwater wetland coastal ecosystems

Within the coastal zones, a diverse mix of habitat types are protected within the public reserve system, and fragmented through coastal development zones, with semi-rural areas further inland cleared for grazing or small urban centres. Vegetation including forested or riverine sclerophyll and swamp forests, freshwater wetlands (lagoons, swamp and fens) adjoin estuarine systems and littoral zones.

Forested or Riverine and Freshwater Wetland Coastal Ecosystems **Hunter Region priority assets for action**	
Regional Investment Priority	Protect the condition and function of forested or riverine and freshwater wetland habitats
National Priority Assets *(*Threatened Species Strategy 2021-2031 listed)* *(n=under EPBC nomination listing)*	**Places:** Hunter Estuary Ramsar Wetland, Myall Lakes Ramsar Wetlands, Crowdy Bay National Park, Shortland Wetlands Centre **TECs**: Coastal Swamp Sclerophyll Forest, Coastal Swamp Oak Forest, Subtropical Coastal Floodplain Eucalypt Forest(n) **Birds**: South-eastern Glossy Black Cockatoo*, Swift Parrot*, Regent Honeyeater*, Australasian Bittern* **Mammals**: Koala*, Greater Glider, Grey-headed Flying-fox, Spotted-tail Quoll*, Long-nosed Potoroo **Amphibians**: Green and Golden Bell Frog, Stuttering Frog
State Priority Assets	**Places:** Kooragang Wetlands, Hexham Swamp-Tomago Wetlands, Areas of Regional Koala Significance-(Wallingat NP, Crowdy Bay, Port Stephens, Karuah-Myall Lakes and Khappinghat) **EEC's**: Swamp Sclerophyll Forest on Coastal Floodplains, Freshwater Wetlands on Coastal Floodplains **Mammals**: Yellow-bellied Glider **Birds**: Magpie Goose, Bush-stone Curlew (Port Stephens population) Invertebrates: Giant Dragonfly
Regional Priority Assets	**Places:** Worimi Conservation Lands, Woodberry Swamp, Cattai Wetlands, Rocky Knob Aboriginal Place. Lake Macquarie Key Biodiversity Area, Biraban Conservation Lands
Condition Statement	The main freshwater wetlands along the coast are located within private and public reserved systems (Crowdy Bay, Hexham-Tomago, Myall, Woodberry and Cattai wetlands). These wetlands provide large freshwater systems important for waterbirds, frogs, migratory species, native fish, invertebrates and hydrological systems. These wetlands are largely in good condition, and well protected. Surrounding the wetlands and estuary systems, riverine and forested swamps are important for ecological connectivity, stabilising hydrology and protecting against acid sulphate soils. The canopy trees provide important habitats for arboreal species. Key threats such as weeds, pests and inappropriate fire regimes threaten these systems.
Sub Theme Threats	
Clearing, degradation or disturbance	• Vegetation disturbance or damage (deer, wild pig) • Grazing pressure on understorey species • Damage to sensitive vegetation through poor practices • Non-compliance of legislative frameworks

Sub Theme Threats	
Acid sulphate soils	• Grazing pressure on understorey species • Lack of understorey
Transformer weeds	• Weeds impacting on swamp or wetland systems (Spiny Rush, Pampas Grass, Groundsel Bush, Bitou Bush, Blackberry, vine and water weeds)
Nutrients, debris and pollution	• Chemicals, silt and fertiliser entering wetland systems • Sediment and run-off from unsealed roads/gravel roads • Poor management of effluent or nutrients, causing algal blooms
Lack of awareness or knowledge	• Non-compliance of legislative frameworks • Poor land management practices • Loss of cultural and traditional owner land management practices
Predator and pest threats	• Cane toad (poisonous) • Vertebrate pests (fox, feral cat, wild pig, gambusia) • Rats and rabbits (threat to breeding colonies)
Human disturbance	• Access to sensitive sites, disturbing or damaging breeding or feeding species by visitors
Lack of data	• Insufficient data to inform decisions
Extreme weather or climate change events	• Loss of retreat pathways or climate refugia through rising sea levels • Loss or reduction of fire sensitive vegetation from increasing frequency or more intense fires

Sub Theme Initiatives and Actions	Management Action or Practice Change
4a. Implement coordinated pest animal control programs (including monitoring)	• Control vertebrate predator pests (wild pig, fox, feral cat) • Control herbivore or browsing threats (wild pig, deer) • Monitor for, report and contain Cane Toads
4b. Implement new or expand on existing coordinated and long-term weed control programs	• Control transformer weeds and encourage natural regeneration • Adopt cultural land practices and indigenous knowledge
4d. Support landholders to reduce nutrient and sediment loads, pollution, litter, plastics	• Promote practices that reduce inputs into freshwater and estuarine systems • Seal gravelled roads, or manage floodplain drainage
4e. Support floodplain agriculture, fisheries and aquaculture to adapt to climate change and extreme weather	• Plan, prepare for climate impacts • Improve timely decision making • Implement trial or demonstration activities • Support whole farm planning with floodplain and riverine landholders
4f. Improve and protect habitat and hydrological connectivity (for ecological function)	• Improved grazing management • Conserve large remnants • Manage flood gates, drainage or infrastructure to maintain freshwater flows • Promote retention of vegetation and reduce clearing

Sub Theme Initiatives and Actions	Management Action or Practice Change
4g. Implement indicator (environmental sensor) or target species monitoring and surveys	• Maintain indicator monitoring in targeted landscapes • Support priority species monitoring • Involve community in citizen science
4h. Support floodplain agriculture, fisheries and aquaculture to trial or adopt evidence-based NRM practices that have both environmental and economic/ financial benefits	• Encourage landholders with high value, intact remnants to engage in conservation initiatives • Encourage industries and land managers to participate in carbon or other environmental markets • Implement trial or demonstration activities • Support preparation or planning to manage for bushfires • Adopt Traditional Owner or cultural land management practices • Support whole farm planning with floodplain and riverine landholders
Priority Sub-catchments	**Biodiversity and ecosystems:** Newcastle, Wallis, Myall Lakes, Port Stephens, Manning sub-catchments
Key Collaborators and Partners	Formal Networks and Working Groups
DPE-NPWS and SOS Local Government (Mid Coast, Port Stephens, Newcastle, Lake Macquarie) Landcare Networks and Coastcare community groups BirdLife Australia and birdwatching groups LALCs and Traditional Owner Groups Research institutes	• Catchment Management Plan working groups (Local Government led) • Hunter Estuary Alliance (Local Government led)
Community Participants	
DPE-NPWS and SOS Local Government (Mid Coast, Port Stephens, Newcastle) Landcare Groups Birdwatching groups Recreational users/tourists (including beach-goers, visitors to reserves, tourism operators) Private landholders Farmers/primary producers (including Beef, Poultry and Dairy) Local Aboriginal Land Councils/Traditional Owner Groups (Worimi, Biripi)	
Alignment to other sub themes	Theme 1 Terrestrial Biodiversity: Sub Themes 1B: Rainforest vegetation and ecosystems, 1C: Wet sclerophyll forests and ecosystems Theme 2 Soils: Sub Theme 2A Groundcover, soil health and function, 2B Soil Erosion and soil degradation Theme 3 Rivers and Aquatic: 3A River Ecological Health, Sub 3B Reducing riverbank erosion and risk Theme 4 Marine, Coastal and Estuary: Sub Theme 4A Estuarine and marine ecosystems

Table 16: Hunter region priority assets for forested or riverine and freshwater wetland coastal ecosystems.

Preparing for and adapting to climate change

6

6.1 Preparing for and adapting to climate change

Australia-wide, climate change is emerging as one of the biggest drivers of change to our natural and social capital. Communities and natural resource managers need to plan for more frequent and intense flooding, fires, droughts and storm events, and consider how to best plan to mitigate the impacts to our natural systems, cultural values and productive enterprises. Ongoing knowledge sharing is essential to underpin better planning and enable behaviour change to ensure the region and its social and natural capital remains resilient and enable informed and timely decisions about climate adaptation and mitigation.

Hunter LLS' Local Strategic Plan 2021-2026 recognises the need to prepare for and adapt to climate change and the threats and opportunities it presents to our landscapes, communities and industries. Ensuring climate change considerations are embedded in our NRM planning will enable communities to adapt and respond as well as identify and engage with emerging opportunities. This increasing level of risk and threat will require well planned and resourced long-term interventions, as not only are we now dealing with the challenges and problems caused by the last 200 years of ecosystem degradation, but we have escalating levels of threat and risk over the next two decades and beyond. The NSW Government has established a clear commitment to halving emissions by 2030 and achieving net zero emissions by 2050 under the NSW Climate Change Policy Framework.

It's clear that climate change is already impacting on the Hunter region, and communities and businesses are already making decisions that enable them to adapt and respond.

6.2 Assets at risk from a changing climate

Climate change is forecast to increasingly impact a range of regional systems including agricultural (affecting crops, evaporation of surface water, stock health and disease risk), natural ecosystems, regional infrastructure and fire management. Some projection for regional climate change trends in the Hunter region are outlined below:

- Near future climate projections for the Hunter region indicate mean temperature rises of 0.7 degrees Celsius by 2030.
- By 2030 annual rainfall is projected to increase across most the region, with the greatest increases expected in autumn. Small decreases are expected in the Upper Hunter during summer and spring.
- Cold nights are projected to decrease across the region by an average of 6 nights per year by 2030. The greatest decreases are seen in the north of the region during winter which is projected to experience an additional 5-10 fewer cold nights per year. Changes in cold nights can have significant impacts on native ecosystems and agricultural crops reliant on cold winters.
- By 2030 severe fire weather is projected to increase across the region in summer. Little change is projected for spring and winter and autumn fire risk is decreasing. Declines during autumn are likely due to increases in projected rainfall. These increases are being seen during the peak fire risk season (summer).
- Hot days are projected to increase across the region by an average of 5 days per year by 2030. The greatest increases are seen in the central parts of the region around Merriwa, Scone and Muswellbrook during spring and summer. These regions are projected to experience an extra 5-10 hot days per year.

Source: Interactive climate change projections map | AdaptNSW

Theme	Key Threats identified
Native vegetation and terrestrial biodiverse ecosystems	• Increased frequency and intensity of extreme weather events – storms, floods, droughts, fires • More variable and rising temperatures in alpine areas and lack of species adaptation • Prolonged dry periods leading to increased dieback risk • Increased numbers and changes in distribution and range of pest plants and animals • Increased risk of loss of species diversity and abundance associated with changes in climatic habitat ranges • Increased intensity and spread of wildfire causing loss of canopy species • Increasing temperatures impacting on alpine or other species
Soil and land	• Increased frequency and intensity of extreme weather events – storms, floods, droughts, fires • Increased flooding / erosion impacts to riverbanks and riparian vegetation • Impacts to groundcover retention • Increased soil temperatures impacting on productivity • Increased erosion / rainfall erosivity
Rivers, coastal and aquatic biodiverse ecosystems	• Increased frequency and intensity of extreme weather events – storms, floods, droughts, fires • Increased evaporation associated with higher temperatures • Impacts on environmental values of aquatic ecosystems (rivers, estuaries, wetlands) including saltwater intrusion into freshwater ecosystems • Impacts on water sources used by communities • Increases severity of major flooding causing increased flood impacts, riverbank erosion and loss of riparian vegetation and regeneration
Estuary, coastal and marine biodiverse ecosystems	• Increased frequency and intensity of extreme weather events – storms, floods, droughts, fires • Increased evaporation associated with higher temperatures • Impacts on environmental values of aquatic ecosystems (rivers, estuaries, wetlands) including saltwater intrusion into freshwater ecosystems • Impacts on water sources used by communities • Loss of retreat pathways or climate refugia through rising sea levels

6.3 Hunter LLS role in climate change adaptation and resilience

As a fundamental driver of landscape health and productivity, enabling landholders and communities to make informed and timely decisions around adapting to climate change is becoming a primary focus of LLS across all its core service delivery areas.

LLS has a role in working with community, industries and land managers to increase their resilience to climate change impacts by promoting information, skills and tools to enable landholders to understand and manage the risks to them, their communities and their enterprises, and to demonstrate the benefit of doing so. Climate change adaptation and resilience is essential for landscapes and natural assets, farm businesses and communities alike.

Landscapes and natural assets

Increasing resilience of landscapes and is imperative to absorbing and responding to the impacts of droughts, floods, bushfires and more as well as those derived from a changing climate by supporting NRM projects and practices that:

- Improve waterway and riparian condition in order to make banks resist bigger flows and slow flood celerity – minimise flooding impacts lower in the catchment
- Improve vegetation condition and connectivity
- Improve soil condition
- Improve coast and estuary condition
- Increase role of indigenous land management
- Protect sites that will act as climate change refuges.

Farm businesses

Increasing resilience of farm businesses is imperative to absorbing and responding to the impacts of droughts, floods, bushfires and more as well as those derived from a changing climate by supporting adaptive and informed decision making, including:

- Strategic grazing management
- Pasture Forecaster
- Farm planning
- Nutrition
- Livestock pests and diseases.

Providing timely access to independent and reliable information is a key enabler of planning and action:

- Carbon information clearing house/broker/honest broker
- Identifying opportunities for clients/landholders
- Build staff capacity to deliver new focus areas in NRM services such as environmental markets and climate change advice.

Communities

Increasing resilience of communities by:

- Enabling networking and social capital opportunities, e.g. Landcare, farming groups, EM EPICs
- Disseminating information relating to risks and opportunities
- Partnering with Aboriginal land managers to identify cultural heritage impacted by climate change and options for protection and better management.

Farming forecaster tool

The Hunter LLS Farming Forecaster Tool in partnership with South East LLS and Tasmania and graziers and provides real time soil moisture, local weather, pasture production and livestock performance information for graziers across the region.

This has been supported by many investors, including the Australian Government.

Accessible from a web and app platform, data from 18 probes provide locally relevant information.

The decision support tool enables smart day to day decision making, based on variable weather and soil conditions.

https://farmingforecaster.com.au/RegionSelector

Aboriginal community aspirations, engagement and participation

7

7.1 Aboriginal Community Aspirations, Engagement and Participation

The NRM Plan acknowledges and respects more than 50,000 years of land care and management by Aboriginal Communities, and the intrinsic link between the health and wellbeing of Aboriginal Peoples and the health and wellbeing of Country. This connection with natural resources goes beyond just the physical, and also incorporate the aspects of social and emotional wellbeing, and it's recognised that the rich Aboriginal cultural landscapes still exist today. This section identifies how LLS will prioritise Aboriginal communities' aspirations and values in NRM and how the Aboriginal community will be engaged and participate in NRM planning and activities.

7.2 Partnering with and enabling Community

Aboriginal people have a long history of working on country and within their communities, and their past generational knowledge, and knowledge shared by Elders can contribute to NRM actions in the region. There is a genuine desire for organisations to work with, collaborate and engage with Aboriginal communities in NRM in the Hunter Region.

LLS' Aboriginal Engagement Strategy (AES) articulates a model for engagement, partnership and opportunities for co-design between Aboriginal people and communities and LLS and is designed to enrich relationships, create opportunities and enhance respect for Aboriginal peoples and their communities. The model is based on the principles of self-determination and co-design, and seeks to continue to develop, strengthen and enhance our relationships to mutually achieve and celebrate cultural, social, economic and environmental outcomes. Inherent in this approach is the following suite of principles consistent with Our Place on Country Strategy:

- Acknowledge, value and embed Aboriginal cultural knowledge and world views in program delivery and business as usual
- Respect Aboriginal peoples' rights, obligations and roles as Traditional Custodians of the land, sea and waterways
- Promote and strengthen connections to culture and identity
- Prioritise economic independence for Aboriginal people through increased employment and enterprise development
- Establish and maintain meaningful ongoing relationships with Aboriginal people and Country
- Recognise appropriate engagement and connection with Aboriginal people and Country as core to our service delivery.

LLS holds a longstanding commitment to meaningful engagement with Aboriginal people and communities across NSW. Aboriginal people and communities own and manage large areas of land in NSW and the Hunter region and are key NRM customers and partners. Aboriginal businesses and communities are delivery partners for Hunter LLS' on-ground NRM services and all land managers have much to learn from traditional ecological knowledge and land management practices to improve and enhance contemporary approaches.

The Hunter LLS region is represented by nine Local Aboriginal Land Councils (LALCs), and many Traditional Owner Groups and community organisations. The Hunter region has a rich cultural heritage and its landscapes and natural resources traditionally sustained a significant Aboriginal population.

A dedicated Aboriginal Community Advisory Group (ACAG) was established in 2014 to advise Hunter LLS and its local board on the strategies and priorities that benefit, support and reconnect with traditional practices and peoples.

To enable programs in the region that benefit, support and reconnect with traditional practices and peoples, Hunter LLS supports an ACAG, represented by LALC's and Aboriginal community members, bringing together a diversity of perspectives and representing broader Aboriginal communities' needs.

Several Indigenous ranger or employment enterprises are established in the Hunter region. These operate independently, but are important stakeholders in NRM programs, including working with Hunter LLS and its partners. They rely on key partners and incorporate on-the-job learning and capacity building often reliant on outside investment or support to maintain and develop their teams.

Aboriginal communities are connected to the land. In the last five years activities and initiatives in NRM have been positive, but not without challenges. Involvement in NRM at the time of writing this plan is identified below, identifying aspects that are working well, that could be improved or are key barriers for delivery. It is important to reflect on what has been achieved, what has worked well, and what can be improved to best inform directions and priorities.

Table 17 below identifies the baseline or foundation for Aboriginal engagement and involvement at the start of the implementation of this plan:

Actions	Current involvement with Aboriginal communities in NRM
Maintain	Aboriginal peoples' skills and confidence in cultural burning, and re-connection with traditional land practices is growing in the region. Several established Traditional Owner and Aboriginal Ranger programs are working well, and have diverse investment through external stakeholders. Partnerships with LLS, and their partners, are providing more opportunities to participate in NRM (employment, training, skills and confidence to participate or have a voice in NRM). Employment opportunities through government or organisations is beneficial-to build teams, skills and on the job learning. Relationships between Aboriginal Communities and other organisations is growing. Partnerships are important, where other organisations can contribute expert knowledge, skills or capacity to complement or support Aboriginal Communities' goals. Aboriginal organisations are more connected with each other. Cultural awareness and cultural competency are starting to grow across the region.
Room to Improve Seek solutions	Grants and funding programs are difficult to access, do not always benefit Aboriginal Communities, or are not aligned to priorities for Aboriginal communities, and are often complex, short timeframes and investor identified. Aboriginal communities at times do not feel they are heard, or have a voice in decision making or planning in broader government (State or Federal) decisions. LALCs have limited capacity or resources to manage their lands. Consultation is often not mindful of Aboriginal Communities' social protocols, communication styles or capacity to engage, and often short timeframes. Cultural knowledge is protected by Aboriginal communities, and not always appropriate to share.
Take action Seek solutions	Relationships and trust with government can be broken easily, where community needs, and investor needs are not aligned or there is a lack of awareness or respect for Aboriginal communities' views and priorities. Aboriginal communities are often under-resourced to administer or deliver key projects.

Table 17: Aboriginal communities' involvement in NRM.

The following actions have been identified as key initiatives or aspirational goals to implement in the delivery of this plan, to build on current Aboriginal engagement, participation, and desire to contribute to NRM in the Hunter LLS region over the next 5 years:

Actions	Key initiatives or aspirations identified in the next 5 years
Maintain or expand	Continue investment, or cross agency collaboration, to build Traditional Owner teams or Indigenous Ranger programs with partners and state agencies. Ensure continued employment and on-the-job training programs in NRM programs such as vegetation management, weed control, pest control programs, marine debris, cultural burning, species surveys/habitat monitoring through long term partnerships. Continue investment, or cross agency collaboration, to build Traditional Owner teams or Indigenous Ranger programs with partners and state agencies.
Seek solutions, influence others	In collaboration with Aboriginal organisations continue to invest in training, on the job learning, employment, or mentoring programs in NRM. Continue to embed cultural due diligence in land management and protect cultural heritage, sites, and objects. State agencies such as LLS to act in a facilitation role, to connect Aboriginal communities with other relevant stakeholders, and advocate positively on their behalf.
New initiatives, planning and consultation required	Look beyond the short-term future, and consider future generations-such as programs with students, young people or youth career pathways for Aboriginal youth in NRM. Support diversification for involvement in NRM, conservation and environment, agriculture or agribusiness and innovative practices.

Table 18: Key Aboriginal initiatives or aspirations identified in the next 5 years.

Cultural burn mentoring and training

Hunter LLS is supporting Tocal College in developing an integrated Cultural Burn program in partnership with Firesticks Alliance. The pilot course is the first tertiary qualified course specialising in Indigenous land management with a focus on Cultural burning to be conducted in Australia.

The course builds on the skills and knowledge of Indigenous land management students in both Indigenous Fire Knowledge Practices and western science to understand the positive ecological impacts of Cultural burning and Indigenous land management practices.

In 2022, thirty students have enrolled into the Certificate III course who will learn how to apply the correct fire knowledge to specific types of vegetation to reduce weed infestations, improve the health and function of native vegetation communities, protect native animal habitats, reduce the risks of wildfires and promote resilient landscapes.

Photo: Newcastle Herald.

7.3 Traditional Ecological Knowledge

In the Hunter region, the ACAG plays an integral role in providing input through discussions and recommendations on key plans and strategies that inform the direction and involvement in Hunter LLS NRM programs. This also involves recognising how Traditional Ecological Knowledge is protected according to agreed process and protocols.

The following outlines how Traditional Ecological Knowledge is recognised, in accordance with agreed protocols and with prior approval of the Indigenous custodians of the knowledge:

- Protocols and processes for Cultural burns involves LALCs or Fire practitioners to develop confidentiality agreements and Indigenous Cultural Intellectual property agreements with LLS or other organisations, to ensure that cultural knowledge is protected
- Respect for and recognition of protocols in relation to Cultural knowledge to ensure that it is protected or held by the rightful Aboriginal community, and not owned by other organisations
- LLS support Aboriginal Land Management Organisations (ALMOs) in developing an MOU with LLS working in collaboration ALMOs to inform how Traditional Ecological knowledge is protected
- Relationships take time, and involve social aspects such as events, meetings, and conversations within communities, with Elders and nominated representatives
- LLS support LALCs or Aboriginal communities in facilitating knowledge sharing workshops with government organisations, Landcare etc
- Aboriginal communities lead the way in undertaking cultural due diligence or cultural assessment on private or public land
- Work with our Aboriginal partners to identify where Cultural knowledge can be shared with western knowledge in NRM – where there are dual benefits and shared values, goals, and opportunities to collaborate for meaningful caring of Country
- Explore opportunities for Aboriginal communities to teach other land managers in order to better understand Cultural protocols and develop positive relationships with communities and Elders
- Work in consultation with the ACAG to increase understanding of Aboriginal communities' strong connection to Travelling Stock Reserves (TSRs) and work to facilitated Aboriginal communities to access TSRs for cultural purposes.

Current Initiatives in the Hunter Region (2022)

Several not-for-profit Indigenous ranger or employment enterprises established in the Hunter region are considered important stakeholders in NRM programs, and who work with Hunter LLS and our partners.

A number of these partners incorporate on-the-job learning and capacity building independent of external investments to maintain and develop their teams. They play an important role in engaging and connecting with the local Aboriginal communities and groups. An example of this is the TIDE Ranger program and the Soil Conservation Service led Hunter Aboriginal River-keeper Team (HART).

In the last 5 years activities and initiatives in NRM have seen the delivery of positive and successful programs, while ensuring local Aboriginal groups are consulted, informed, involved and engaged.

Examples include:

> *HLLS's Upper Hunter Cultural Burn demonstration workshops where Aboriginal stakeholder groups were involved in the planning and delivery of Cultural burn plans. Part of the project involved engaging an Indigenous fire practitioner with local knowledge.*
>
> *Build on skills and capacity of Aboriginal land managers to undertake Cultural burning on private property is in progress.*
>
> *Commencing the development of a Memorandum of Understanding with Local Aboriginal Land Councils, e.g. Mindaribba LALC to enable a shared respect and understanding of cultural protocols, future planning of landscape scale NRM program planning and a clear pathway and understanding of cultural protocols.*

Photo 11: Lantana control, Black Creek, North Rothbury, Worimi Ranger Team and NPWS. Credit: NPWS.

Community participation in NRM

8

8.1 Community Participation in NRM

Effective delivery of the NRM Plan will be dependent on the involvement of community, partners, other agencies and NRM stakeholders in the region. Natural resources and actions identified to manage them in the plan are both on private and public lands, and cross tenure collaboration in many locations will be critical to achieve effective outcomes.

This section identifies how we will engage with the private landowners and communities in the Hunter LLS region, to encourage their participation, stewardship and direct involvement to deliver direct and targeted action on the ground.

8.2 Engagement and Participation

LLS will work with its customers, partners and the broader community to provide key skills, information or data to community that assists knowledge and understanding of NRM threats, actions and practices. We will consult on key landholders in priority areas, involve community in NRM projects, and collaborate with key community and stakeholders, and empower them to drive change locally, and support others to follow their lead.

The following four approaches will be the basis of our engagement and alignment with community program co-design, participation and delivery of NRM services (Figure 24).

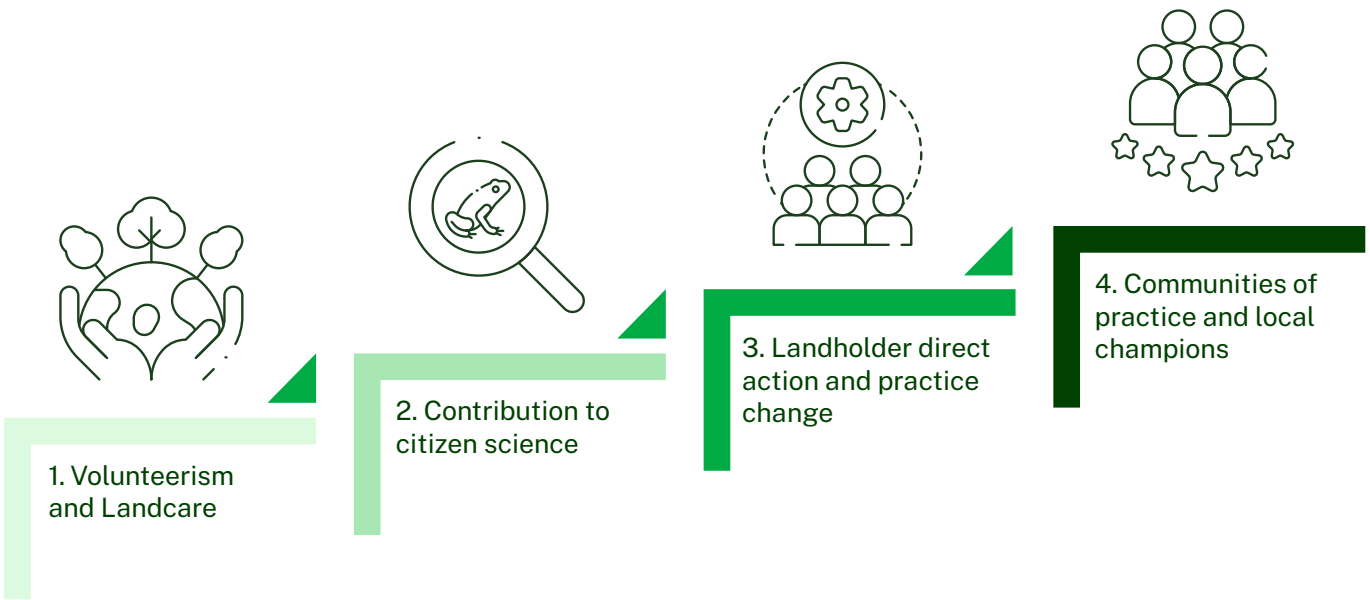


Figure 24: Opportunities for community engagement and participation.

Volunteerism and Landcare

In the Hunter Region, volunteers and Landcare play a very important grass-roots role in driving NRM and biodiversity conservation at a local scale and in doing so provide a critical social network.

Volunteers can be town, city or urban based or can participate outside their local area. Volunteers generally bring their skills experience and enthusiasm as individuals or part of a group and play an important role in building on environmental efforts, providing social benefits, and contributing to individual health and wellbeing. Volunteers vary in age and come from different cultural and professional backgrounds.

Landcare provides a structured way for individuals to volunteer. Groups can be rural or urban based and vary from group to group and offer a cohesive network of individuals working together towards similar NRM and community goals and aspirations. Landcare can be made up of:

- Farmers or individual land managers working on their own land and identify as 'Landcarers'
- Individuals working on public lands such as Council reserves, or National Parks
- Organised Care groups i.e., Landcare, Bushcare, Coastcare, Dunecare, Rivercare Intrepid Landcare (youth based)
- Pest animal committees, producer and industry groups, land management groups, 'Friends of' groups
- Issue based interest groups, e.g. regenerative agricultures, soils, turtles etc.
- Schools
- Aboriginal communities and organisations.

Hunter LLS actively engages with the volunteering and Landcare community in multiple different ways including:

- Working in partnership with the Hunter Region Landcare Networks and Lake Macquarie Landcare (Council led) who provide overarching governance and support to locally based Landcare groups i.e., through a Memorandum of Understanding
- LLS and Landcare NSW have a partnership agreement at a state level and work together to coordinate and resource Landcare across multiple regions in NSW
- Regional Agricultural Landcare Facilitator provides support to the networks and aligns LLS programs with existing or planned Landcare programs
- Hunter team facilitates opportunities for property planning, training, and citizen science and educational programs
- Providing leadership for and facilitating community cross-tenure pest animal management programs.

Hunter LLS will continue to identify linkages of key Landcare programs within key priority areas and will initiate a series of measures to enable support and engagement of the volunteer and Landcare community including:

- Liaison with Landcare Networks and groups to identify and develop landscape scale NRM programs in high priority areas
- Community awareness and engagement activities to build on existing knowledge and skills
- Identify linkages with existing Landcare programs
- Connect active landholder/land managers to Landcare networks and groups.

The NRM Plan identifies volunteers and Landcare as a key stakeholder in driving natural resource management on the ground across all themes.

Provision of resources that enable and support ongoing involvement in NRM include:

- Funding through small grants
- Coordinated community initiatives involving volunteer participation
- Provision of training or resources
- Support to Landcare networks governance, work, health and safety (WHS) and other needs that enable broader Landcare and industry group localised efforts and participation and social cohesion.

Hunter LLS Kooragang Volunteers

The LLS Kooragang Volunteers were established with LLS with the management of the Hunter Estuary Wetlands project in 2011.

They originally supported restoration of the wetlands, but now have expanded their role to provide services for landholder revegetation projects, estuary clean up events, educational days, propagation and nursery management and more.

Restoration and debris clean-up efforts in partnership with Clean4Shore were recognised at a regional Landcare Awards, for their efforts to protect and rehabilitate our local unique environment.

Photo: Clean4Shore

Contribution to Citizen Science

Citizen science is a unique way to collate baseline data that is recorded into formal data sets (such as via Apps) to build species knowledge, monitor species progress over time or to inform targeted actions.

For example, species-based citizen science can track and record the movement of unique, threatened, or rare species, and or new pest incursions with exceptionally low cost, and relies on individuals contributing their observations, through an app or data portal.

Citizen science plays an integral role in the monitoring of species or landscape condition at a local or regional scale. It provides an opportunity to actively engage, support and empower the community. Some examples of Hunter-region citizen science programs include:

- Monitoring new cane toad incursions as part of a cane toad and native frog awareness campaign
- Monitoring Australasian Bittern populations in known habitat sites
- School waterbug surveys to monitor water quality
- Koala monitoring to identify extent and distribution of populations on private land.

Hunter LLS' role will be to:

- Integrate citizen science into the delivery of the Plan by actively promoting available platforms such as FeralScan, Bionet Atlas, ALA, I Spy Koala to record data that aligns with organisational priorities
- Support training opportunities to build skills and confidence in actively participating in citizen science activities
- Work with existing specialist volunteer groups, such as birdwatching groups or marine debris organisations, to facilitate data collection relevant to the NRM Plan
- Work with universities and tertiary institutions in supporting students to develop practical skills, as well as contributing to data gap.

Landholder direct action and practice change

Hunter LLS is committed to providing services to support information, skills and training to enable land managers to make better decisions and adopt improved practices.

Traditionally, participation in NRM programs by landholders has been limited to those who may be motivated by improving natural resource condition from a purely environmental perspective, leading to fragmented program delivery. Poor levels of adoption of NRM practices can be explained by a lack of integration of NRM and agricultural approaches, with the key factors being:

- NRM and agriculture programs have been delivered by extension agents with different world views, landholder networks and desired outcomes
- The social science understanding of behaviour change and adoption has been insufficiently applied in program design and delivery
- The relative advantage (benefits) of NRM practices has not been identified or demonstrated.

LLS can support community to improve their management of natural resources by better integrating NRM and agriculture to enhance the environmental outcomes through a range of services, such as on ground funded or incentivised small projects (partnerships), training, education, extension and advisory (engagement), and providing local information regarding best practice (communication).

Working with individual landholders and land managers through active engagement, provision of resources, and funding in priority areas can support and build on broader regional NRM actions. This approach can lead to practice change which has direct and positive environmental outcomes.

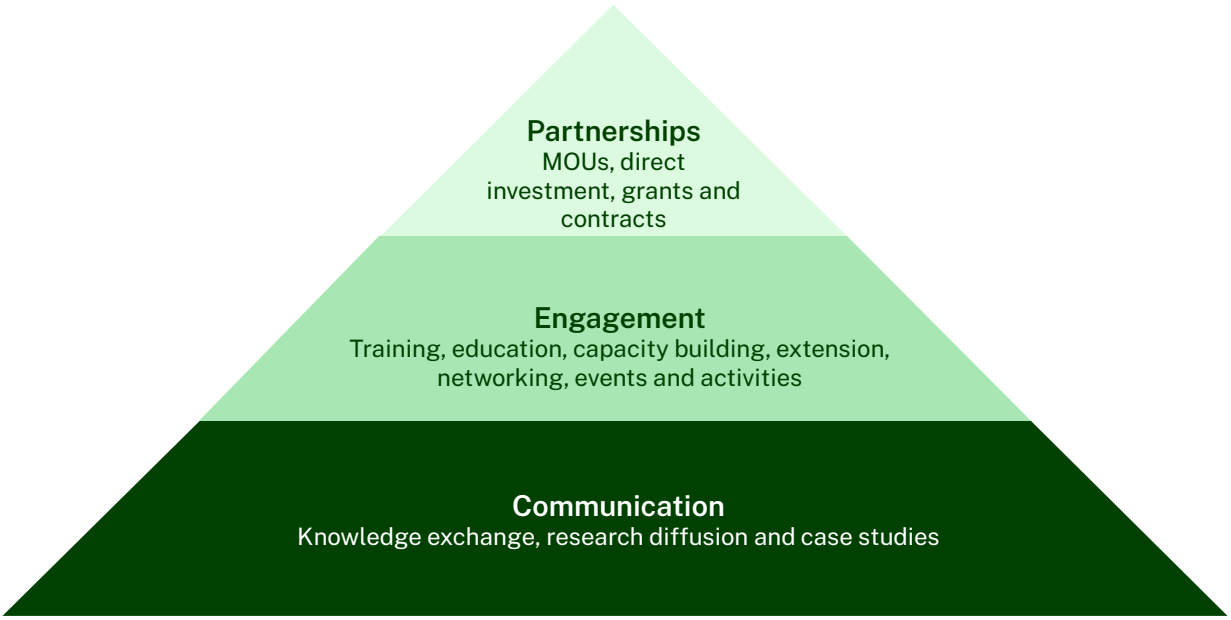


Figure 25. Types of delivery arrangements for landholders.

To enable participation on small, medium and large-scale properties individual landholders require direct and indirect advice and support, such as training and access to information that is locally relevant, and to encourage them to adopt actions that benefit environmental restoration and stewardship, as well as existing obligations such as biosecurity.

By building capacity, knowledge, awareness and skills for landholders in the community, they can actively participate by adopting new practices on their land readily and contribute to broader objectives. Supporting landholders through extension based one-on-one advice and property visits, or through more formal training programs. This enables individuals to identify, prioritise and then enact a plan on their land provides longer lasting and tailored support that also is developed through a trusted and mutually beneficial relationship.

Individuals may also require support such as developing whole farm, property or project specific planning on their land, where multiple land tenures are involved, cross tenure planning may also be appropriate.

For targeted and strategic priority actions, access to incentives funding is an important tool to encourage direct action for natural resource management priorities.

For some land managers, the biggest barrier to adoption will be financial – the cost (time/money/other resources) of taking action is what's preventing the uptake of improved practices and achieving on-ground outcomes, or there is little to no private benefit to the action.

In these cases, incentives can be an efficient and practical approach to enabling priority actions on the ground. Incentives can expedite action on the ground for priority sites and/or to develop priority case studies in order to demonstrate best practice by providing funds to deliver actions now, and not later. Hunter LLS incentives for private lands require in kind or cash contributions (co-investment approach), to ensure public benefits outweigh private ones. Individuals who receive funding through grants or other incentives on their land are contracted to action and practices that may not have been able to be completed by the landholder alone.

Communities of practice and local champions

Communities of practice are informal or formal networks of individuals that meet to share important knowledge and information, as knowledge sharers, and drive or facilitate common interest-based initiatives. Communities of practice can be grass roots landholder representatives or represent wider ranging organisations or groups.

To further empower the community to adopt practices or engage in natural resource management initiatives, community leaders or networks can further demonstrate benefits.

Champions or local leaders are usually early adopters, who can show tried and tested practices to their peers, whether this be agricultural or environmental activities. They can showcase to others the achievements and benefits through field tours, demonstration sites or case studies.

Actions within each theme clearly identifies the benefits of demonstrating best practices by working with and promoting the efforts of champions through peer-to-peer field events, case studies, media, newsletters etc.

Our role is to:

- Promote champions in the region, to encourage community to “follow their lead”
- Act as a champion and demonstrate practices directly through development of static trial sites or demonstration sites, that are accessible to the public
- Facilitate, participate, or coordinate community of practice networks, or work with existing networks to maintain ongoing communication, involvement and knowledge that enables change or adoption of new practices, or facilitates collaborative efforts and initiatives.

Examples of communities of practice include:

- Hunter Woodland Bird Group
- Cane toad awareness stakeholder group
- Peri-urban Biosecurity Network
- Rural Support Network.

Tailored program delivery

Planning our NRM priorities and services at the sub-catchment scale will facilitate a better understanding of local issues including dominant land use type, major NRM assets and risks, as well as an understanding of the relevant landholder types and their likely attributes including motivations and barriers to adoption of improvement NRM practices.

An example of this is LLS’ Every Bit Counts program, launched by the coastal LLS regions in 2018. It was identified that there was a gap in engaging with small property landholders, and that they may not have the same access to resources, training, networks, programs and funding to enable best practice land management decisions as commercial farmers with larger holdings. There was also a lack of connection with like-minded landholders. This was a particularly important issue in the Hunter Region with smaller rural properties (2-20 hectares) make up approximately 71% of landholdings.

A trend for new landholders coming from urban or city lifestyles purchasing regional and rural land has meant there is a high proportion that are less experienced in property management, which adds to challenges in providing ongoing support and advice that is practical and relevant to this stakeholder group.

The Every Bit Counts program developed a specific suite of property planning tools and social networks which sought to enable landholders to access the right information and connect to networks of likeminded hobby and lifestyle property owners. In addition, community engagement and capacity building activities were altered to be delivered as on-line content or evening or weekend events to broaden the reach to property owner who may live and work remotely during the week.

Marine Estate Management

Working with landholders, farmers, Mid Coast Council and contractors, Hunter LLS has been protecting the unique marine estate in the Mid Coast region, through the DPI Fisheries Marine Estate Management Strategy program.

Actions include engagement with landholders and farmers in the catchment, to protect riverbank vegetation, soil and banks through managing stock access to waterways, off watering, revegetation and strategic grazing.

Strategic works including gravel road upgrades, and erosion management devices like this one at Pampoolah, provide long term reduction of nutrient, soil and inputs into the marine estate.

Photo: Soil Conservation Service

8.3 Key Collaborators and Partners in NRM

To enable effective delivery of the NRM Plan, Hunter LLS will engage and work with key collaborators and partners in NRM.

These stakeholders are also invested in NRM outcomes in the region and play a role (apart from, or complementary to) LLS role in NRM. They contribute to high level strategy, and project level implementation, including project design, planning and technical input, contribution to knowledge sharing and strategic actions, and leverage of funding and effort through indirect and direct resources (including financial contributions, in kind labour and other contributions).

Principles and benefits for partnerships vary between organisations and program or initiative needs. In general terms partnerships are mutually beneficial, provide advocacy and communication platforms, share knowledge and expertise, focus on shared interests, goals or outcomes.

As a customer focused organisation, committed to investment in services with high impact initiatives that partner across tenures, groups and organisations. LLS takes a leading role in developing partnership and connection across NSW as a “trusted broker of NRM partnerships” by delivering outcomes at scale and through:

- Collaboration and partnerships across private and public land
- Coordination of effort locally and state-wide
- Connections to our 250,000 customers across NSW (landholders) approximately 17,000 in the Hunter region.

Our customers include private land managers and public land managers, and stakeholders including investors and funding bodies, partners and beneficiaries.

Key stakeholders identified as collaborators and partners include other government agencies, who play a specific role in NRM such as legislative, technical, planning for specific environmental programs or focus. State Agencies with a role in NRM in the Hunter region include:

- Department of Planning and Environment
- Department of Primary Industries
- Local Government
- Local Land Services (other regions)
- Other agencies, such as corporations and universities.

Other LLS regions work together at higher state-wide cross collaboration, knowledge sharing and strategic programs and initiatives.

In addition to government agencies, other stakeholders such as:

- Not for profits
- Interest groups
- Community networks such as Landcare
- Aboriginal organisations
- Industry groups.

These stakeholders also play an important role in collaboration and partnerships in NRM in the region. They provide grass roots or community-based involvement, can be involved in implementation and small projects, and act as advocates or leaders within their own networks. These groups also input their own unique perspectives, skills and knowledge, and often represent the community or interest groups when partnering with Hunter LLS.

Our other key partners, also our customers, are landholders.

We work to engage and develop meaningful partnerships with landholders on ground initiatives and actions, showcase NRM practices through case studies, demonstration sites and encourage practice change.

Within Hunter Local Land Services, we also have many formal partnership arrangements in place. These have been developed to recognise value of working together to achieve outcomes. Formal partnerships include Partnership Agreements and Memorandum of Understanding.

Hunter LLS oversees formal advisory groups and committees represented by key stakeholders across multiple agencies, community and other organisations, that contribute to program and project delivery, strategic direction and contributing to knowledge and data sharing, and partnership projects. While the weeds and pest animal committee also play a role in implementing key legislative responsibilities, all three contribute to broader coordination in regional delivery.

- Hunter Regional Weeds Committee
- Hunter Regional Pest Animal Committee
- Aboriginal Community Advisory Group.

Informal collaborators include networks and working groups. These groups are often led by Hunter LLS around specific projects, initiatives or interests, where LLS is often seen as a lead agency when bringing together multiple partners and developing a strategic landscape approach to NRM projects. LLS also participates in external led groups. These networks and working groups play an important role at a project level, and build relationships and collaborative initiatives, knowledge sharing and leverage.

Schools' education in water catchments

Through a long-term partnership with Hunter Water, Hunter Local Land Services has supported schools' catchments and learning programs in the Lower Hunter.

Many schools have participated over the years, and from this many have established environment groups and school-based programs.

Activities involve Waterwatch training, catchment crawls, annual displays at Tocal Field Days, educational presentations, and development of an educational learning-based web page, providing a range of resources and fun activities that promote youth involvement in catchment management.

www.adventuresatyourplace.com.au/

Implementing the plan and measuring success

9

9.1 Implementing the Plan and Measuring Success

Effective implementation of this plan will require additional planning and prioritisation within Themes and within strategic sub-catchments and with communities, applying our prioritisation principles and approach to develop specific programs. It will involve ongoing monitoring of our delivery, including evaluation, review and improvement, and measurement of the impact and outcomes achieved.

The Plan will be reviewed twice within the 5-year delivery period, to ensure that any additional data, investor priorities, additional community consultation and input. An interim review and round of stakeholder feedback will be undertaken 12 months and 36 months after the NRM Plan is approved.

Further planning will be commenced to implement the plan, and include the following foundational activities:

- Planning will need to be scalable, and be developed around capacity, available resources and alignment or tailoring to investor priorities (where they align with the actions identified in this plan), and where actions will be new, or are a continuation of previous effort and momentum
- There will be a need to review our program logic, assumptions, and risks
- There will also be a need to identify cost-effective strategies, such as investment on private lands, and maintain public benefits and probity
- Flexibility and adaptability will be a constant, as new investment sources and priorities arise over the 5-year implementation period
- Additional consultation will be required with key partners, collaborators and delivery partners to confirm and identify roles, resource needs and level of involvement
- Further sub-catchment based analysis of assets and the most effective locations for investment will be required, using the existing spatial data collected in the development of this Plan and interactive spatial prioritisation tool (See Prioritisation in each Theme)
- Additional foundational activities specific to the biophysical locations to be invested in, such as social and community capacity and identifying the most appropriate communication and engagement strategies will need to be developed, applying the Program Theory approach
- Review of any existing baseline, or other monitoring needs will need to be considered
- We will also need to check our monitoring approach is appropriate, to enable ongoing measurement of success.

9.2 Program Planning

Hunter LLS uses Program Theory to develop and implement programs according to this extension model, based on the following framework:

Figure 26. Program Theory approach to Program Planning.

Applying these key questions into project planning in development of projects, and implementing key actions identified in the NRM Plan themes, resource needs can be identified, key stakeholders to be involved in a practical way, and establish this as part of project planning, to implement actions on the ground and within the community.

All of Hunter LLS' desired outcomes and key objectives require our customers to change their behaviour or engage in practices that benefit NRM. People will only change their behaviour when the proposed practice/ behaviour:

- is consistent with their financial, environmental and personal values/motivations;
- provides a Relative Advantage in terms of these values/motivations
- is socially acceptable.

Extension, which is client-focused and addresses these critical factors in behaviour change, can increase the rate and extent of adoption of new practices. Hunter LLS' approach to extension fosters adoption of desired practices by demonstrating the Relative Advantage:

- of best practices to people who are currently unaware of them
- of new practices to people who may benefit from them.

For desired practices which currently have low levels of adoption, we design and deliver programs which:

- Support early adopters to trial new practices and generate local knowledge/experience
- Focus our engagement on the early and late majority
- Quantify the Relative Advantage of the desired practice in terms of financial, environmental and personal values/motivations
- Disseminate the new local knowledge/experience
- Take an appropriately long-term view, aiming to build momentum in adoption and social acceptability for successful practices.

9.3 Cost effective investment on private land

As well as providing services that support practice change and provide a relative advantage for land managers, there are cases where it is good practice to invest public funds for on-ground works to address the highest and most urgent priorities.

In 2018, Hunter LLS engaged consultants to tailor a Benefit:Cost Score calculator (the BCS calculator) to demonstrate a robust metric that could be readily used by Hunter LLS to evaluate and rank project proposals from private landholders seeking incentive funding to implement actions on their land for environmental outcomes.

In addition to assisting users to estimate the level of public benefits associated with projects, it also integrates a number of other key variables required to assess the relative value for money of projects.

The BCS calculator is based on sound economic principles and uses a streamlined form of Benefit:Cost analysis to rank the large numbers of potential projects and can be applied across the Hunter LLS region to a diversity of project types (riparian, biodiversity, wetland/estuary and sustainable grazing).

It is applied in the implementation phase, and is used consistently across targeted incentives funded projects, Since the development of the BCS calculator almost 200 landholder applications have been submitted and assessed, enabling a consistent decision-making approach to investment, ensuring cost effective and environmentally beneficial projects are supported.

Key data are used to populate the BCS calculator includes:

- Project identification details – landholder name and location
- Description of proposed works (e.g. fencing, planting, site preparation, weed control etc.) – in particular the quantity and costs
- Information on the significance of assets (environmental, social and economic values) in which the project site is located (e.g. river reach, wetland, habitat type, soil landscape)
- Knowledge of the values and significance of downstream assets
- Any relevant information that may assist with assessment of project benefits, risks and likelihood of landholder compliance and future management, for example, local knowledge and information, site assessment reports
- A map of the project area and local landscape, ideally available through a GIS application.

9.4 Measuring Success

NRM Services Program Logic

As referenced in Our Role in NRM (Section 1), and how we deliver NRM projects in our regional landscape-scale approach, our focus, state-wide, is to achieve productive and sustainable land use.

The NRM Services Program Logic underpins Hunter LLS' monitoring and reporting approach, and state-wide services, outcomes and visions.

The Themes and Sub-Themes driving NRM Delivery align to this state-wide framework, ensuring consistency and focus in Hunter LLS' approach. State-wide metrics have been adopted in the NRM Plan, aligned with this state-wide framework in Figure 9.

Landscape Management - Natural Resource Management

We enhance the management of our soil and water resources
We deliver natural resource projects, incentives and advice

Foundational plans	Services	Short-term outcomes	Long-term outcomes	Vision & State outcomes	Statewide metrics
LLS State Strategic Plan 2020-2030 Natural Resource Management Framework 2021-26	Landholder practice change Financial returns from NRM Address threats to landscape health and resilience Support Aboriginal People to care for country Collaborate and partner with others Customer service*	NRM programs are tailored to customers' specific needs Landholder adaptation capacity has increased The number of landholders entering environmental markets has increased The economic benefits of NRM practices are better understood Participation of Aboriginal People has increased Aboriginal land management practices are demonstrated Partner and investor satisfaction has increased	The adoption of sustainable NRM practices has increased Habitat quality, connectivity and biodiversity outcomes are improved Waterway health has improved The extent of vegetation cover has increased The impact of invasive species and diseases on environmental values has reduced	**Vision:** Vibrant communities in productive healthy landscapes **NSW State Outcome:** Productive and sustainable land use	Delivery metrics: • Area (ha) of native revegetation • Number of agreements and area (ha) of native vegetation enhanced, rehabilitated or protected • Area (ha) of threatened species, populations or ecological communities enhanced, rehabilitated or protected • Stream length (km) river/estuary enhanced, rehabilitated or protected • Area (ha) of wetland enhanced, rehabilitated or protected • Area (ha) of pest control (vertebrates) • Area (ha) of pest control (invertebrates) • Area (ha) of weed management • Number of weed inspections • Area (ha) of land managed for improved soil condition • Area (ha) of Aboriginal projects Customer and Aboriginal Engagement metrics: • Number of opportunities for people to support LLS decision making and participants • Number of 1:1 landholder advice consultations • Number of community groups supported and participants • Number of awareness raising/ capacity building events and participants • Number of training events and participants

Figure 27: State-wide LLS NRM Framework Program Logic

MERI Strategy and Evaluation Framework

Hunter LLS uses monitoring, evaluation, reporting and improvement (MERI) to understand how investments in public policy and programs are making a difference, and to improve its design and future delivery.

The Hunter LLS MERI Strategy outlines how progress against the Hunter Local Strategic Plan 2021-2026 is demonstrated at an organisational level, through the Measures of Success alongside state-wide metrics.

The strategy also outlines how Hunter LLS applies MERI to all programs and projects, to enable continual improvement and measure our success.

The key components of the MERI framework include:

- Monitoring - the collection of data for indicators specifically selected to measure progress towards achieving program objectives. Often focused on outputs rather than outcomes, can inform program managers about progress in implementation
- Evaluation - the assessment of the monitoring results against the objectives to determine whether progress is being made, and whether the selected indicators are appropriate measures
- Reporting - communication of the results of the program, generally based on the output of monitoring and evaluation activities
- Improvement results from continuous implementation of MERI, as well as dedicated identification and implementation of learning opportunities.

Building on the MERI Strategy and its action plan is Hunter LLS' Continuous Improvement and Learning Review (CILR) process, which aims to identify successes, improvement opportunities and key lessons from program and project delivery, throughout and on completion. Hunter LLS' Evaluation Framework (2020), which identifies five Evaluation Criteria, with eight Key Evaluation Questions, is utilised to formally evaluate programs and projects identified in our Board-approved, three-year Evaluation schedule. The Evaluation Criteria and questions are identified in Table 5 below.

Evaluation Criteria*	Key Evaluation Questions (KEQs)
Impact: The measurable effect of the project in achieving its objectives and outcomes.	KEQ1: To what extent did the project deliver on measurable objectives and outcomes?
	KEQ 2: What, if any, unanticipated positive or negative impacts have resulted?
Effectiveness: How well the project has delivered.	KEQ 3: How well has the project delivered on planned outputs (milestones, deliverables, and other measures)?
Efficiency: The extent to which the project can demonstrate improvements over time.	KEQ 4: How did the efficiency of the project improve over time?
Project Management: The extent to which the project has good management, governance and decision-making processes.	KEQ 5: How well was the project managed?
	KEQ 6: Were there appropriate governance arrangements?
	KEQ 7: Are there processes in place to support continuous improvement and learning?
Legacy: The extent to which project impacts will continue over time.	KEQ 8: To what extent will project impacts occur once funding has finished?

Table 19: Hunter LLS Evaluation Framework (2020) Evaluation Criteria and Key Evaluation Questions.

* Hunter LLS' use of Program Theory in it program planning process addresses the key evaluation questions that were originally drafted for the Appropriateness evaluation criteria, as this process now ensures only projects that demonstrate alignment with relevant plans and identify and reach intended customers are approved for funding and progression.

Monitoring Indicators

As identified within each of the Themes, a Monitoring, Evaluation, Reporting (MER) identifies the relevant monitoring approach to measure impact and outcomes. The metrics identified in the Plan are consistent with LLS NRM Framework and Strategic Plan, recorded as standard state-wide metrics. Additional monitoring approaches are also identified are recorded as reports or synthesis of evaluation or monitoring data and demonstrate trends or shifts in change (biophysical condition and social).

Delivery metrics quantify the actions delivered on the ground as outputs.

Customer and engagement metrics also quantify the actions delivered, and interactions made, and are also measured as outputs.

Condition based indicators measure and monitor the impact of the actions, towards achieving the Key Objectives identified, and determine how successful the project or action has been. This requires a good baseline data collection, sound monitoring approaches, and consistent measurement over a period of time as a trend or projection. These indicators are largely biophysical.

Practice change (or behaviour, capacity, skills) based indicators measure the social shifts. This requires a good baseline data collection, sound monitoring approaches, and consistent measurement over a period of time as a trend or projection or an approach that allows subjective evaluation or other evidence that demonstrates the change has occurred (this could be, for example, a landholder adopting a practice following training or advice directly attributable to the project, it could be directly funded and easily quantified, or be indirect and be recorded by conducting an evaluation or survey.

Measures of Success Delivery Metrics (State-wide):	Monitoring indicators
Stream length (km) of river/estuary enhanced, rehabilitated or protected Area (ha) of native vegetation enhanced, rehabilitated or protected Area (ha) of significant species or EECs enhanced, rehabilitated or protected Area (ha) of native revegetation Area (ha) of weed management Area (ha) of wetland enhanced, rehabilitated or protected Area (ha) of pest control (vertebrate) Area (ha) of Aboriginal projects Area (ha) of land managed for improved soil condition Area (ha) of land managed by improved practices Number of agreements that deliver native vegetation enhancement, rehabilitation or protection	Spatial data Field assessment Data sets and record keeping
Measures of Success Customer and Engagement Metrics (State wide):	
Number of projects undertaken to protect Aboriginal Cultural Heritage or Traditional Ecological Knowledge Number of stakeholder partnerships Number of community groups supported Number of 1:1 landholder advice consultation Number of awareness raising/capacity building event participants Number of training event participants Number of Aboriginal opportunities for people to support LLS decision making Number of Aboriginal stakeholder partnerships Area managed with traditional ecological knowledge Number of Aboriginal people working on Country has increased	Data sets and record keeping Attendance sheets Event records Agreements or partnership documents Database of agreements, advice and participation Aboriginal employment register

Measures of Success Condition Indicators (Local Strategic Plan)	Monitoring indicators
Improved condition of natural resource assets, soil and land, native vegetation and biodiversity, rivers and aquatic biodiversity, and estuarine and marine ecosystems.	Spatial data Field assessment Spatial data and assessment Condition monitoring indicators and tools Flagship/indicator surveys (indicators for landscape health) Fauna or flora monitoring Project evaluation Project reporting Register of species specific/recovery plan actions implemented Research data
Measures of Success Practice Change Indicators (Local Strategic Plan)	
Increased knowledge, skills and capacity for landholders, land managers and community Increased adoption of improved practices	Evaluation/participant surveys (practice change, skills and knowledge, decision making) Interviews and testimonials Project evaluation

Table 20: Measures of success and monitoring indicators.

Regional Land Partnerships MERI Framework

Key measures of success identified through the above state process and frameworks are also aligned to the Regional Land Partnerships Evaluation Plan, which establishes MERI within each of the six RLP outcomes:

- A program logic
- Key Evaluation Questions (KEQs) and sub-questions
- A monitoring plan which outlines what data will be collected, by whom and how often.

To ensure alignment to the RLP program, we have reviewed and identified commonalities between LLS State-wide approach to Program Logic, KEQs and monitoring plan and key indicators.

Program Logic: The NRM Plan program logic, program theory identified in the NRM Plan determines program logic at a high level, and when implementing RLP invested programs, more detailed review and consideration will need to be applied.

Key Evaluation Questions: Both Hunter LLS and RLP KEQS are fully aligned.

Monitoring plan and indicators: Several key indicators align between both LLS and RLP monitoring indicators, in particular delivery metrics at the outcome and activity level, at the project-level and adaptation level. Hunter LLS indicators include delivery and customer metrics, condition indicators and a monitoring approach (biophysical condition and social and practice change based evaluation).

In implementation of Hunter LLS NRM Plan, considerations will need to be further made to determine if additional monitoring and indicators need to be applied, when developing implementation plans, to ensure they meet both the objectives within the Plan and align to specific RLP program logics and specific outcomes.

Photo 12: Regent Honeyeater fenced habitat, Quorrobolong, Lower Hunter. Credit: HLLS.

Acronyms and Glossary of Terms used in the Plan

Acronyms

ALMO – Aboriginal Land Management Organisations
BCA – Biodiversity Conservation Act 2016
ACAG – Aboriginal Community Advisory Group
ARKS – Area of Regional Koala Significance
CE – Critically Endangered
CEEC – Critically Endangered Ecological Community
CHUG – Combined Hunter Underwater Group
DAWE – Department of Agriculture, Water and Environment
DPE – Department of Planning and Environment
DPI – Department of Primary Industries (NSW)
EM – Emergency Management
EPIC – Emergency Information Connection
EPBC – Environment Protection and Biodiversity Conservation Act 1999
EEC – Endangered Ecological Community
HCC – Hunter Catchment Contributions
HJO – Hunter Joint Organisation
HLLS – Hunter Local Land Services
IUCN – International Union for Conservation of Nature
LALC – Local Aboriginal Land Council
LGA – Local Government Area
MNES – Matters of National Environmental Significance
MOU – Memorandum of Understanding
NGO – Non Government Organisation
NLP – National Landcare Program
NPWS – National Parks and Wildlife Service
OCCI – Ocean and Coastal Care Initiatives
OKRs – Objectives and Key Results
SOS – Saving Our Species
SWM – State-wide Metrics
TEC – Threatened Ecological Communities
TIDE – Taree Indigenous Development and Employment
TSR – Travelling Stock Reserve
WHA – World Heritage Areas

Glossary of Terms

Areas of Regional Koala Significance – is Department of Planning and Environment mapping which identifies the locations and extent of important Koala populations across NSW.

Biodiversity – is the variety of plants, animals, micro-organisms and ecosystems that make up our living environment, which is constantly changing.

Biosecurity – is the protection of the economy, environment and community from the negative impacts of pests and diseases and weeds.

Climate refugia – are areas that remain buffered or protected from contemporary climate change feature include environmental stability, size and accessibility.

Conservation status – threatened flora, fauna and vegetation communities may be listed under Federal and State legislation and may fall under extinct, extinct in the wild, critically endangered, endangered vulnerable, conservation dependent.

Keystone species – is an organism that helps define an entire ecosystem. Without its keystone species, the ecosystem would become drastically altered or cease to exist.

Natural regeneration – the natural process by which plants replace or re-establish themselves without intervention by people.

Off-stream watering – pumping water into tanks from creeks and dams which avoids livestock from accessing the water from riverbanks and dams.

RAMSAR Wetland – is a wetland which Australia is a signatory under the Convention on Wetlands of International importance known as the Ramsar Convention which was adopted in 1971.

Transformer weeds – are invasive plant species that have the capacity to change the character, condition, form or nature of an ecosystem, examples include Bridal Creeper, Cape Ivy, Madeira Vine, Lantana and Bitou Bush.

Take3 for the sea – an Australian charity on a mission to rid the oceans of plastic pollution.

Wildlife Corridors – connections across the landscape that link up areas of habitats. They support natural processes that occur in a healthy environment, including the movement of species to find food and water.

Appendices

10

Appendix A: Prioritisation Information

Theme 1: Native Vegetation and Biodiverse Ecosystems Prioritisation Process

Through a spatial analysis, drawing on key natural values, assets, species biodiversity, key habitats and associated risk within the Hunter region, the following has been applied to identify spatial areas at a sub-catchment scale for highest investment as areas of:

(1) biodiversity richness and habitats and relative importance for ongoing protection

(2) biodiversity and habitat areas of greatest threat and risk of decline, using a sub-catchment scale approach.

Within these, in addition, flagship or iconic (or indicator) species/ habitats have been identified, where actions identified provide broader landscape benefits.

Priority Map: Native Vegetation and Terrestrial Biodiverse Ecosystems		
Criteria	Attributes within sub-catchments for ranking	Data Source (spatial data applied)
High conservation value native vegetation	Presence of listed vegetation (number of listed species per sub-catchment-with rank and score in order of conservation status, example Critically Endangered= highest scored)	Threatened Ecological Community spatial maps (EPBC) and DPE-SOS (BCA) prioritised species Conservation Status listing (EPBC and BCA)
Vegetation connectivity	Extent of identified corridors extent as a % per sub-catchment (and non-vegetated lands identified for potential enhancement) (regional and local) Patch sizes >10 ha Identified corridor units within each sub-catchment	HJO Hunter regional corridor units maps-by sub-catchment HJO Patch remnant sizes >10ha
High conservation value species*	Presence of national, state and regionally significant species (flora and fauna) (rank in order of conservation status, example Critically Endangered= highest scored)	National Threatened Species Strategy priority species in the Hunter region (BioNet spatial distribution) MNES Threatened Flora, Fauna lists in the Hunter Region (BioNet Spatial distributions) DPE Saving Our Species-prioritised list for Hunter region (BioNet spatial distribution) DPE-NSW Koala Strategy-Koala Areas of Regional Significance (used as a surrogate for individual Koala records-based on an existing population-based prioritisation process) (Seed Portal) Other regionally identified important species (BioNet spatial distribution) *

Priority Map: Native Vegetation and Terrestrial Biodiverse Ecosystems		
Criteria	Attributes within sub-catchments for ranking	Data Source (spatial data applied)
Other significant landscape areas (no ranking only present/absent)	Protected Places, Key Biodiversity Areas, World Heritage Areas and Ramsar Wetlands	Aboriginal Protected Places Nationally Important Wetlands (MNES) IUCN Key Biodiversity Areas (spatial map, and 50 Km buffer) World Heritage Areas (spatial map) Ramsar Wetlands (spatial map)

Theme 1. Native Vegetation and Terrestrial Biodiverse Ecosystems – Input data

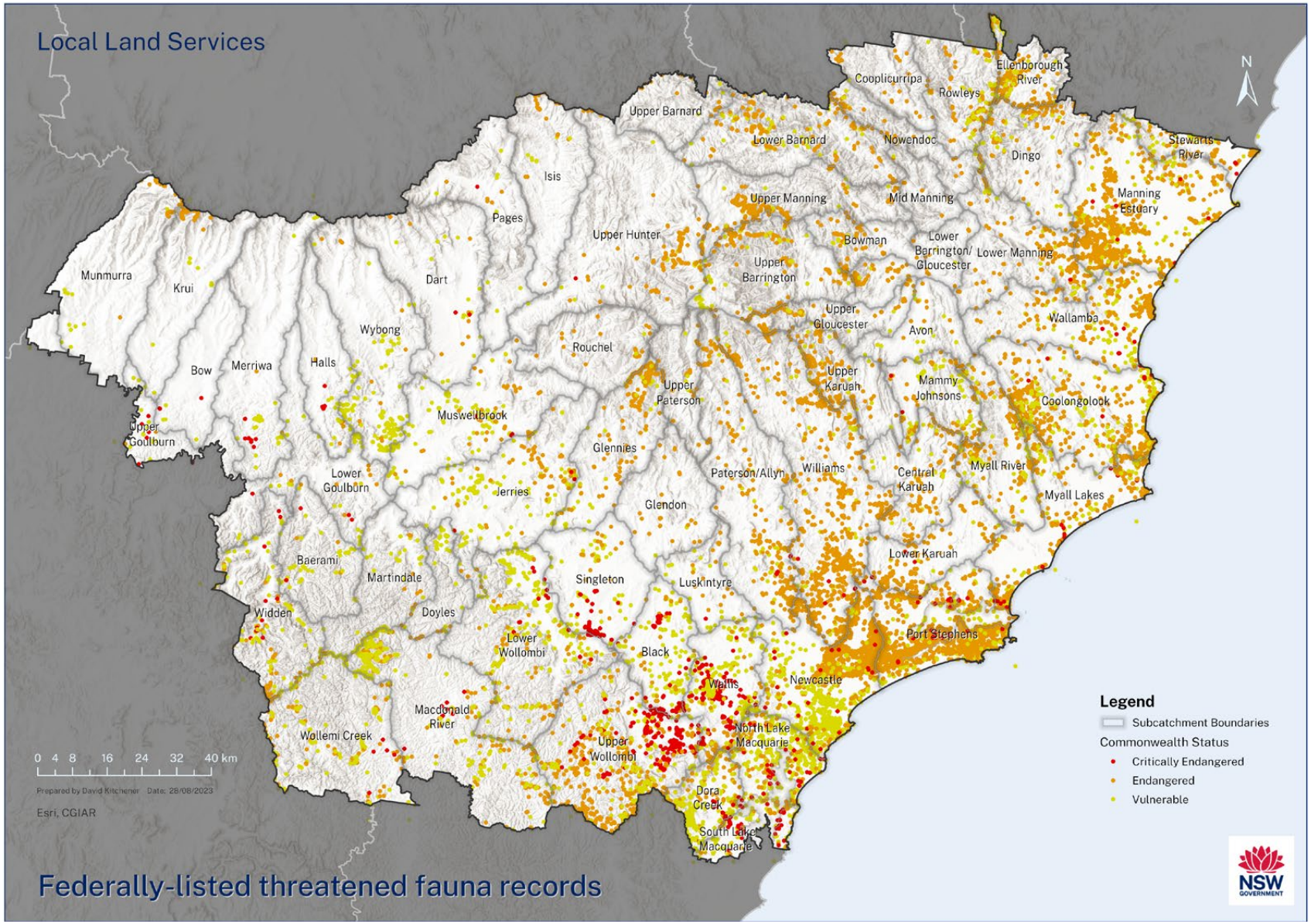


Figure A1: Federally-listed threatened fauna records.

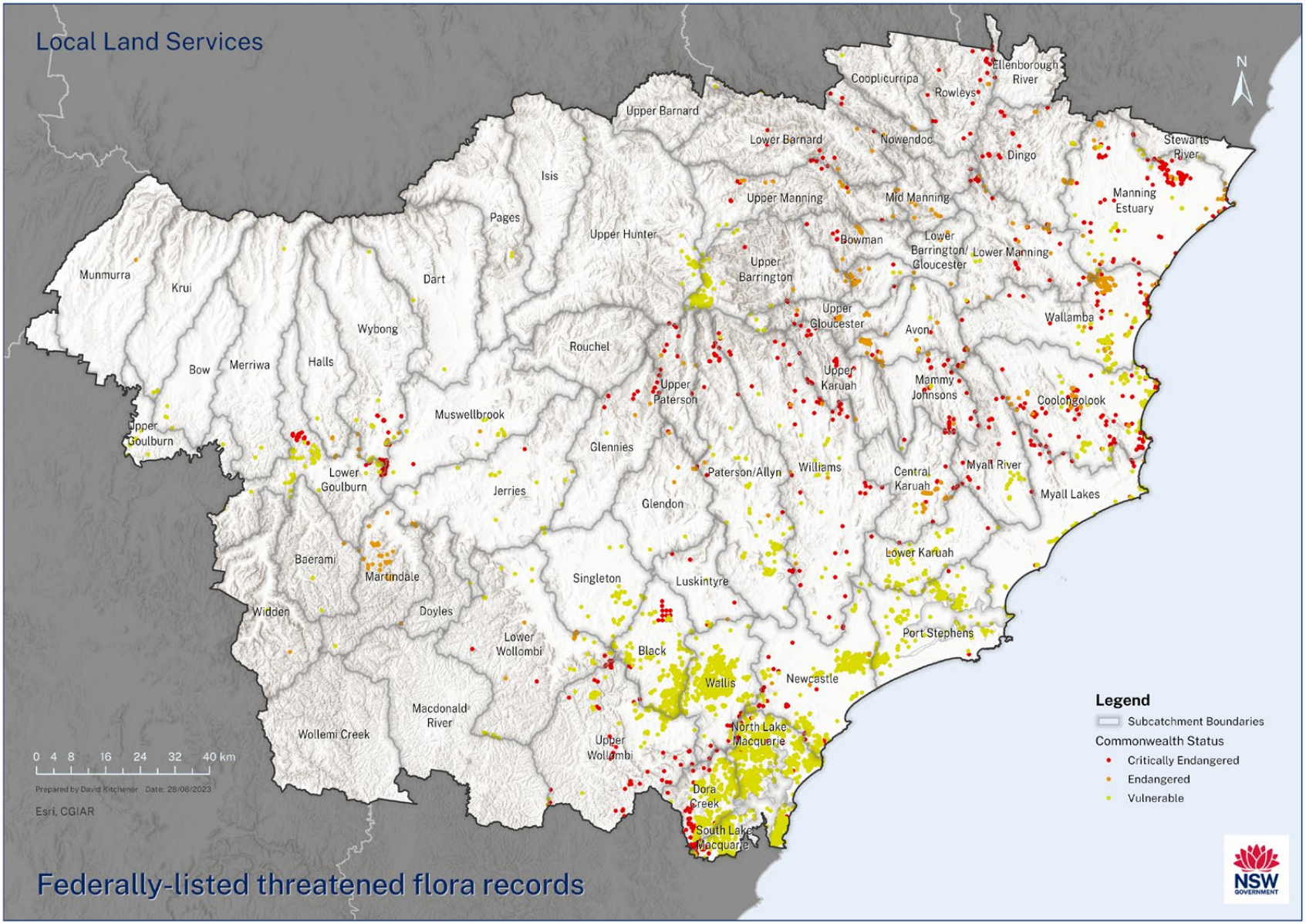


Figure A2: Federally-listed flora records.

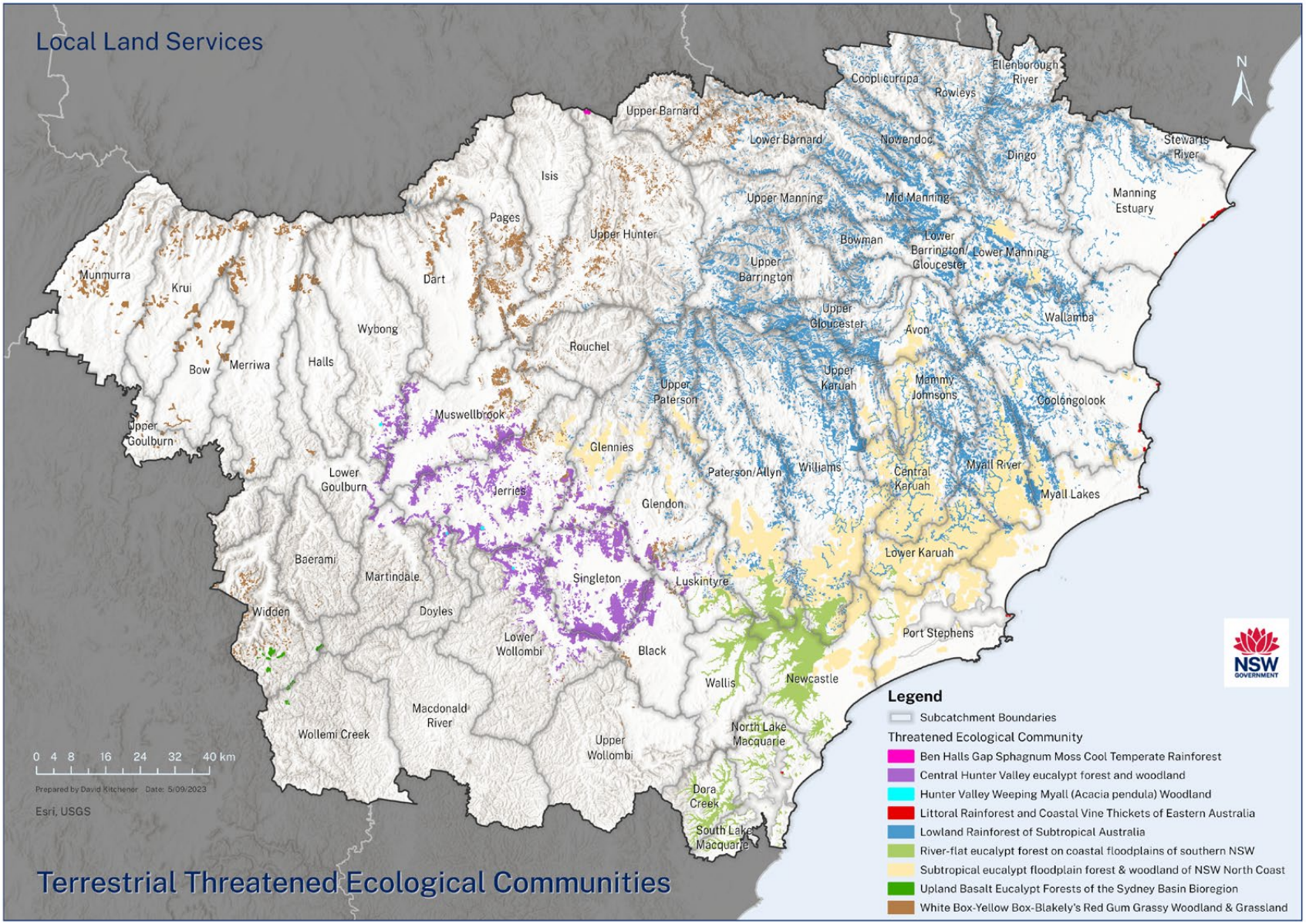


Figure A3: Terrestrial Threatened Ecological Communities.

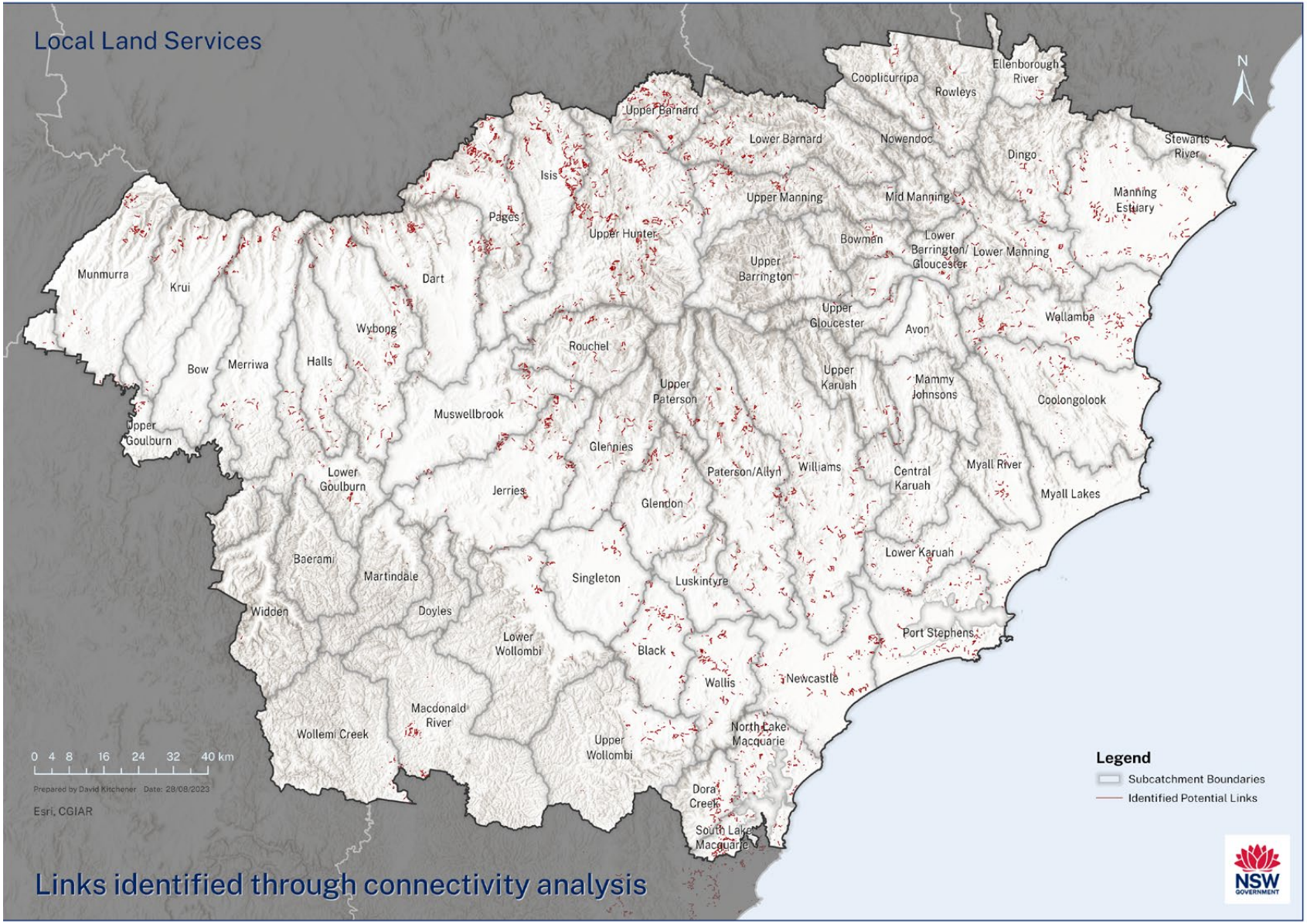


Figure A4: Links identified through connectivity analysis.

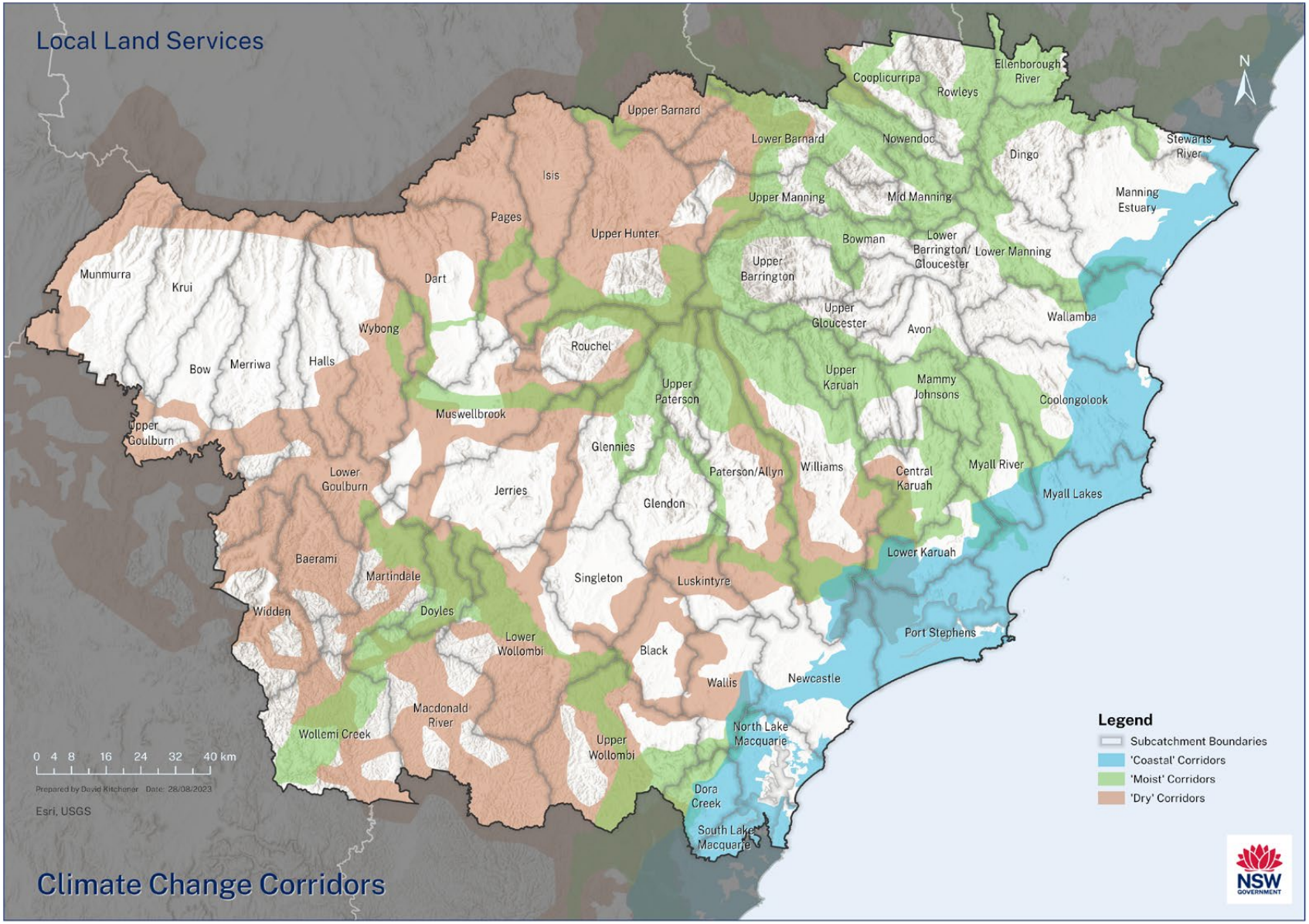


Figure A5: Climate Change Corridors.

Theme 2. Soil and Land – Input data

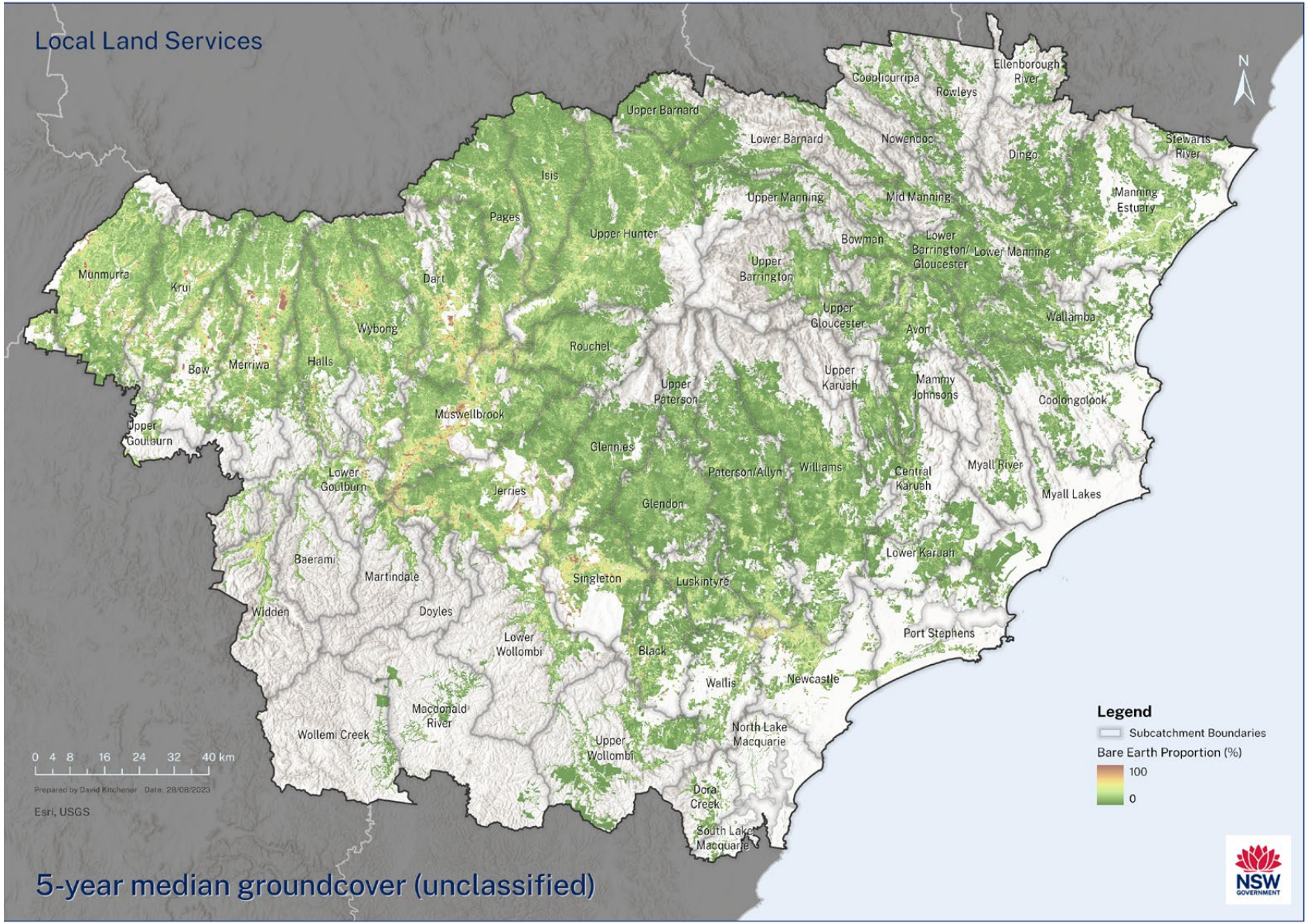


Figure A6: 5-year median groundcover (unclassified).

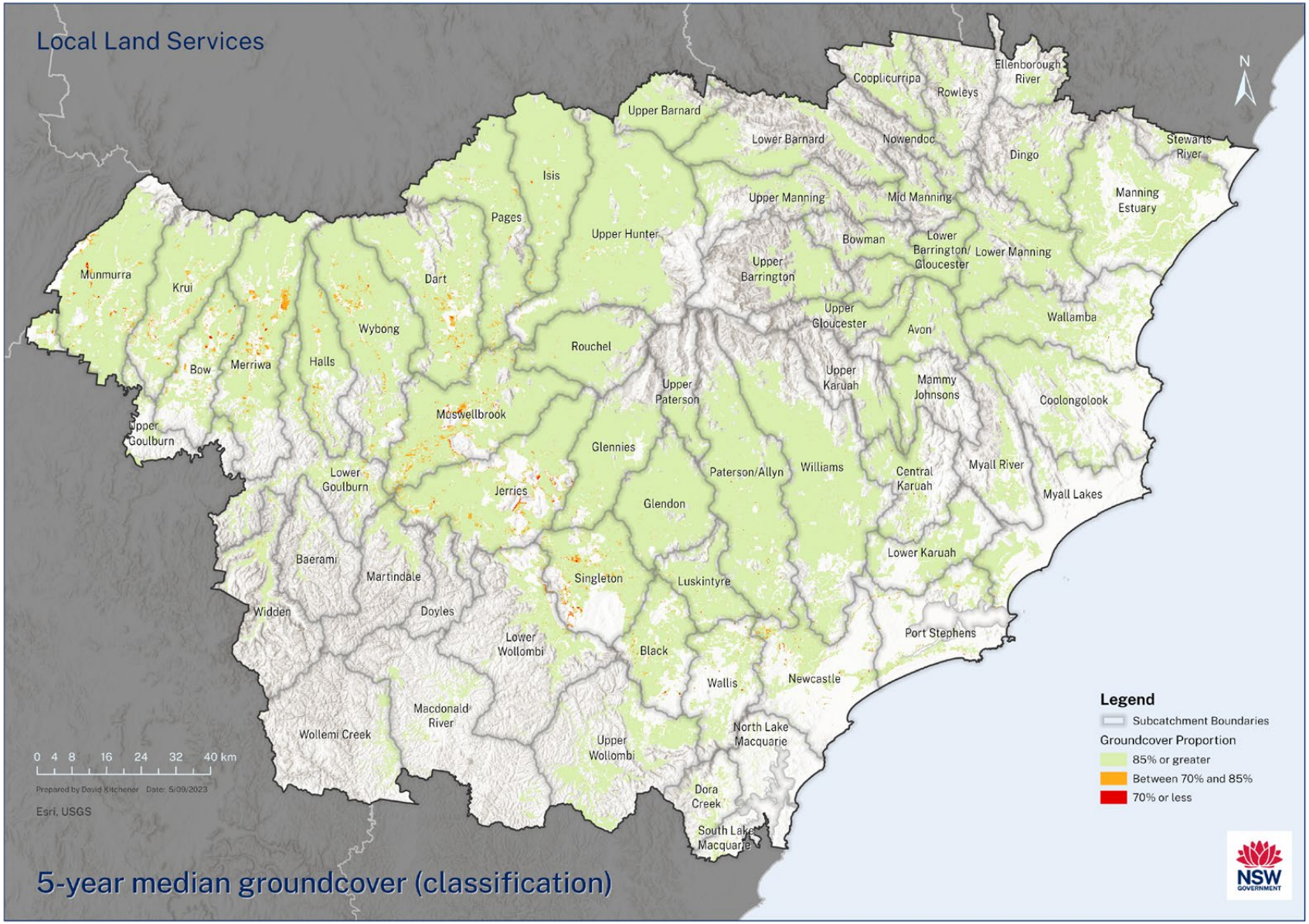


Figure A7: 5-year median groundcover (classified to three key proportions).

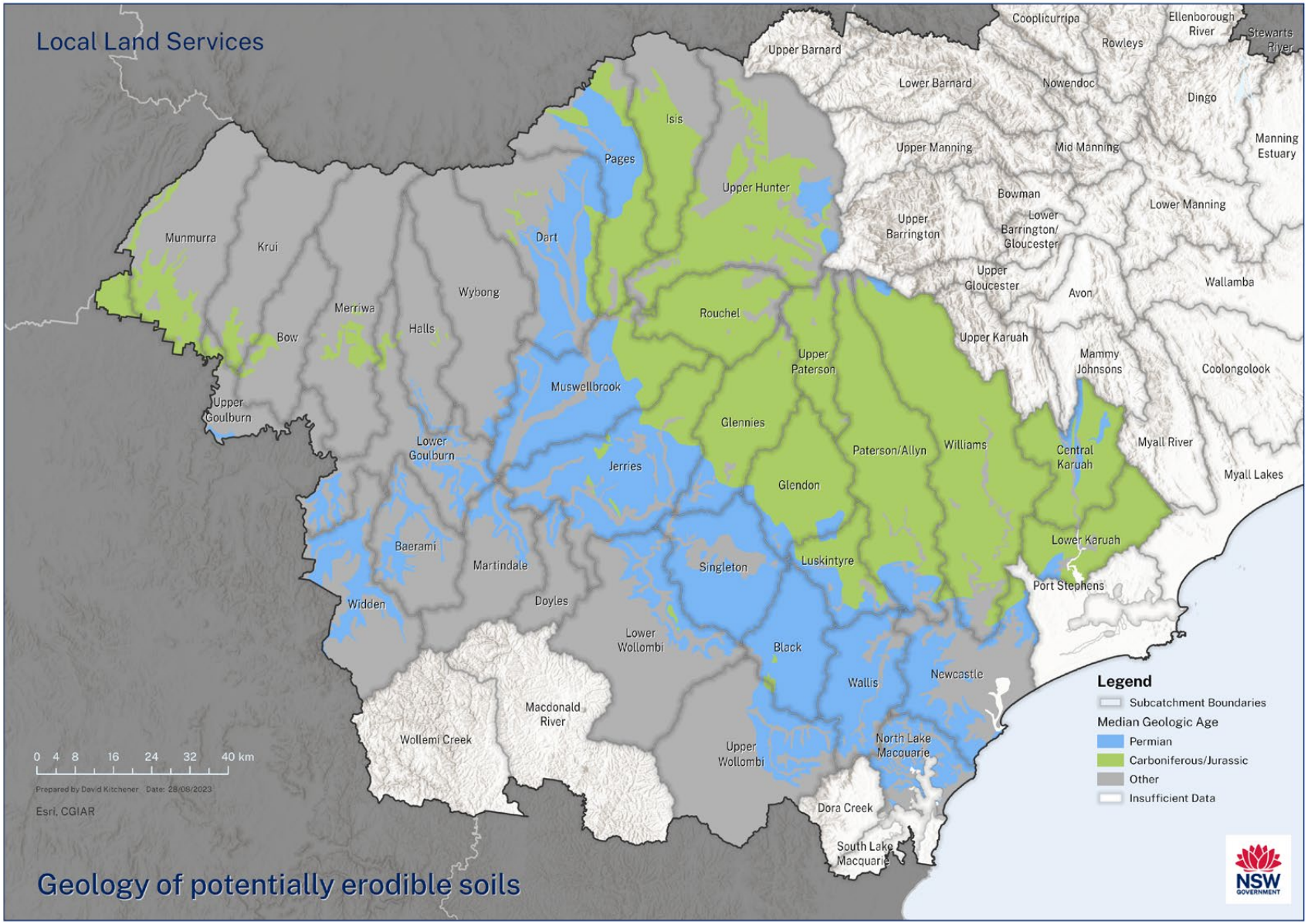


Figure A8: Geology of potentially erodible soils.

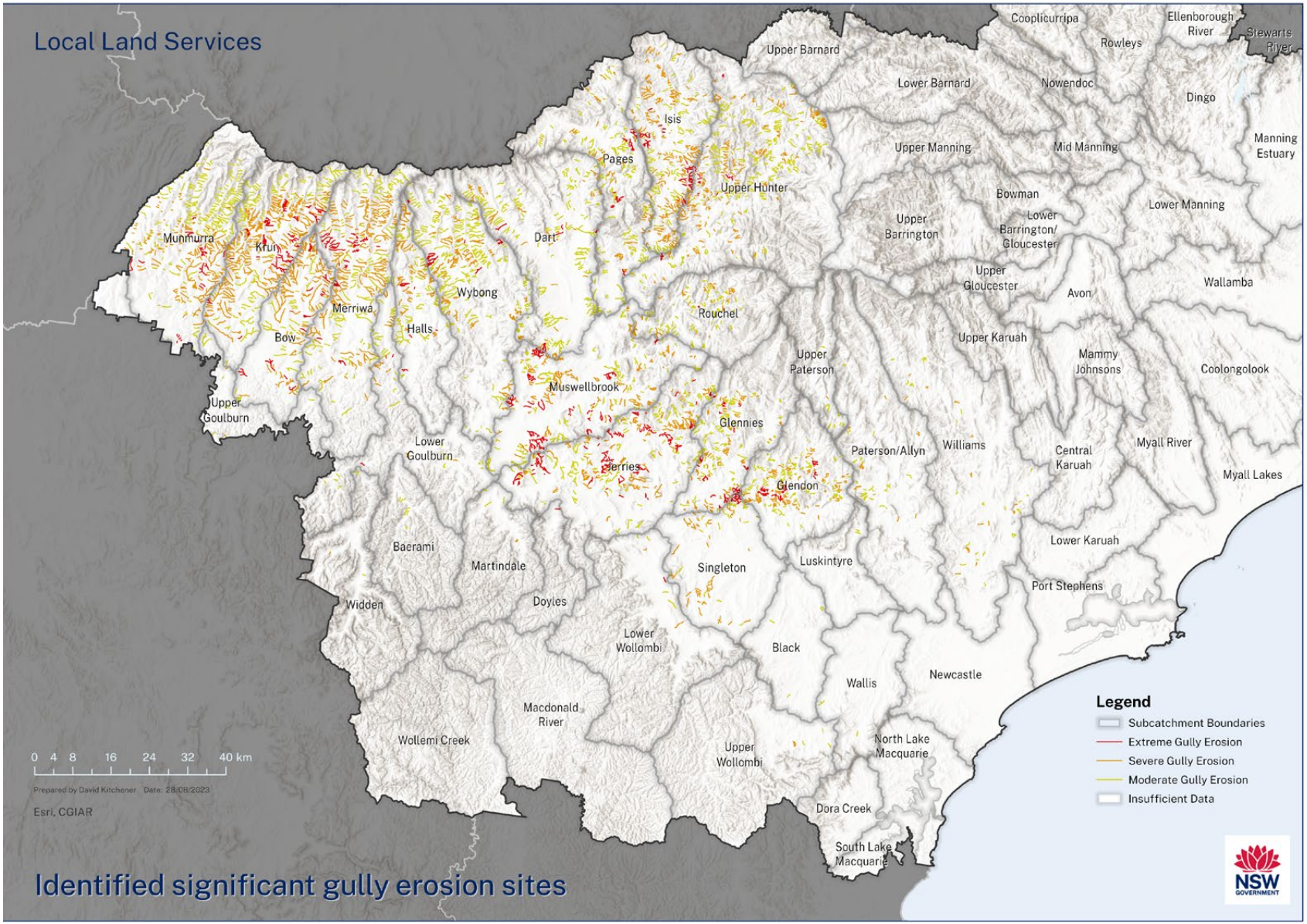


Figure A9: Identified significant gully erosion.

Theme 3. Rivers and Aquatic Biodiversity - Input data

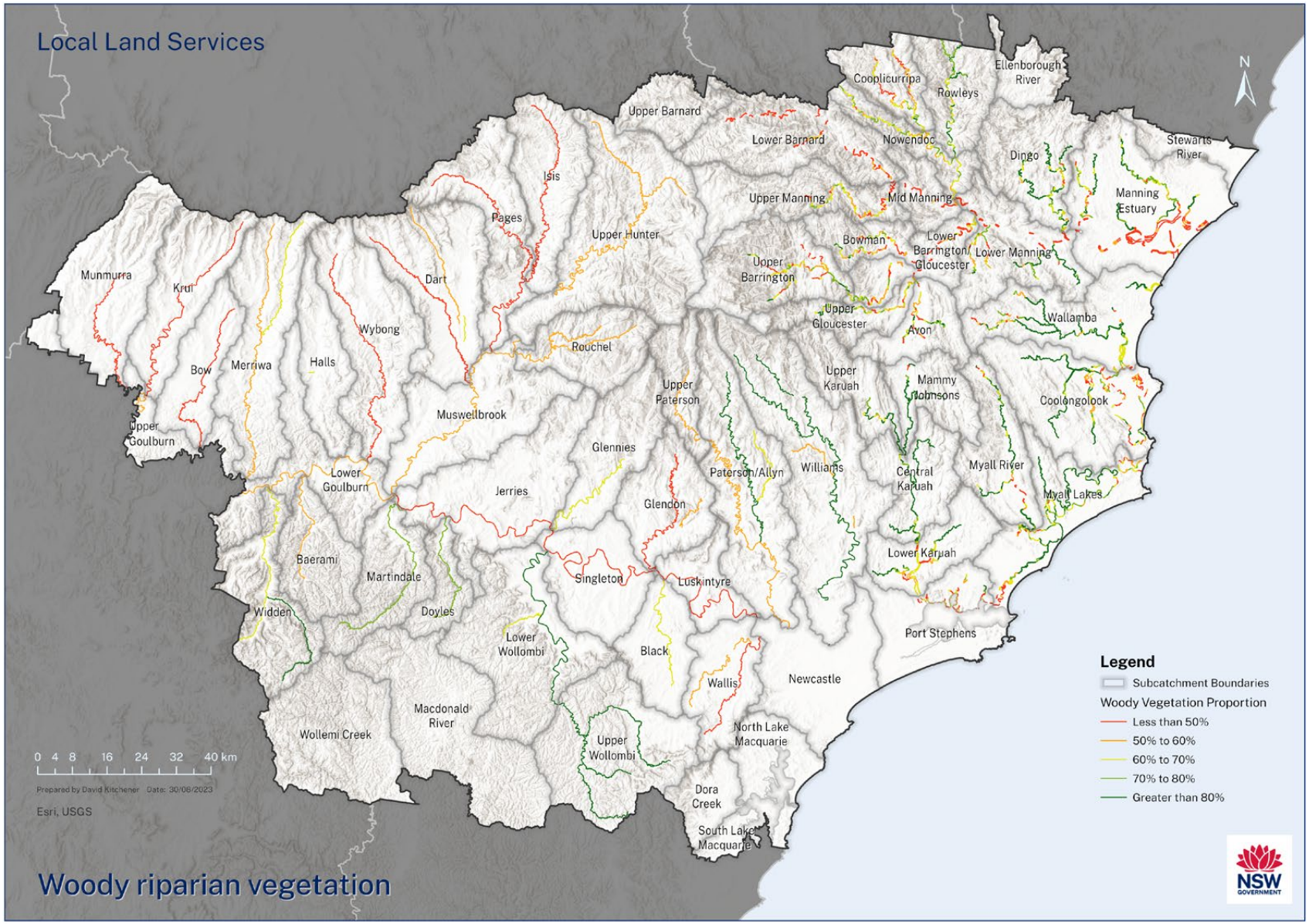


Figure A10: Woody riparian vegetation proportion.

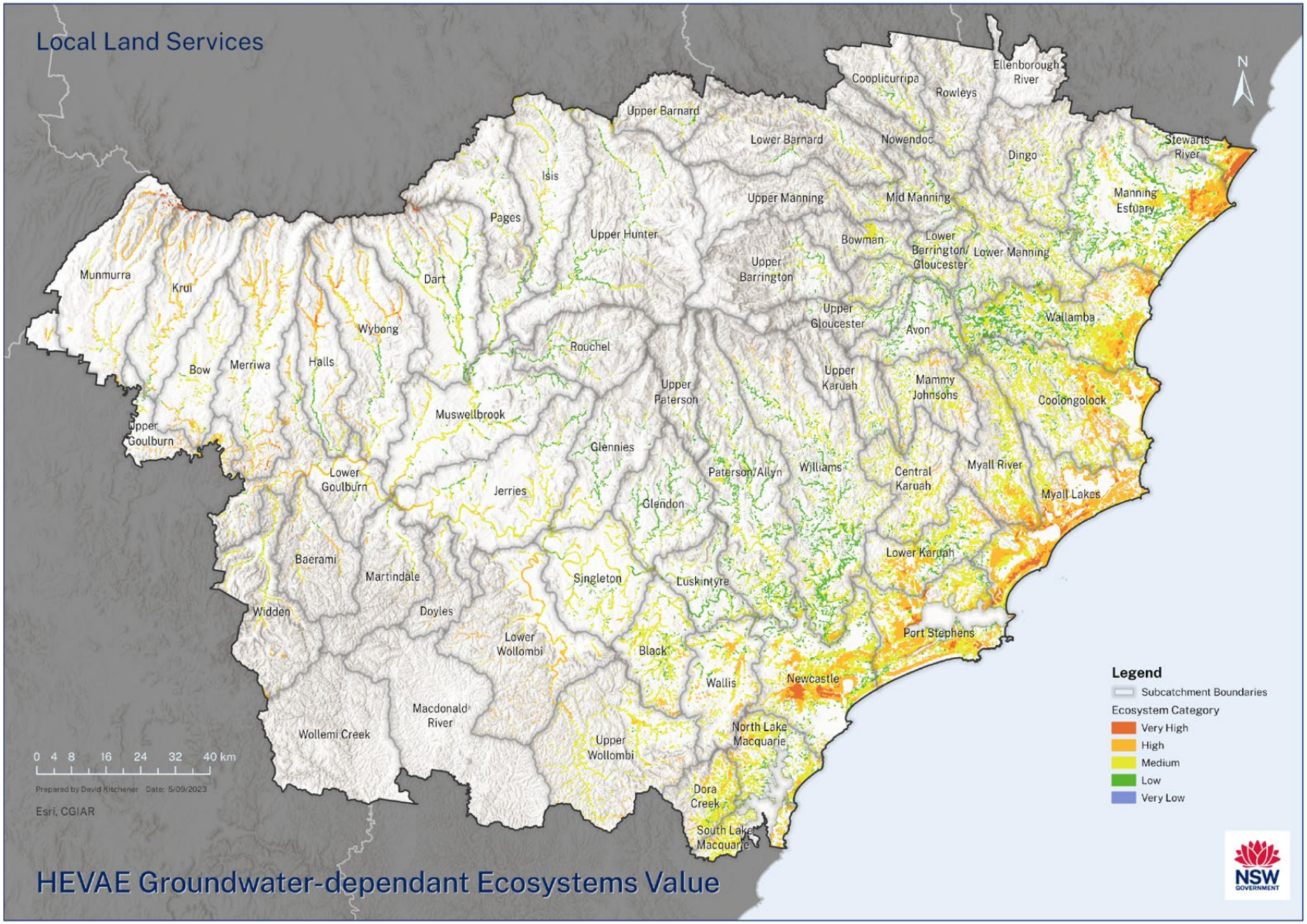


Figure A11: High Ecological Value Aquatic Ecosystems (HEVAE) Groundwater-dependant Ecosystems Value.

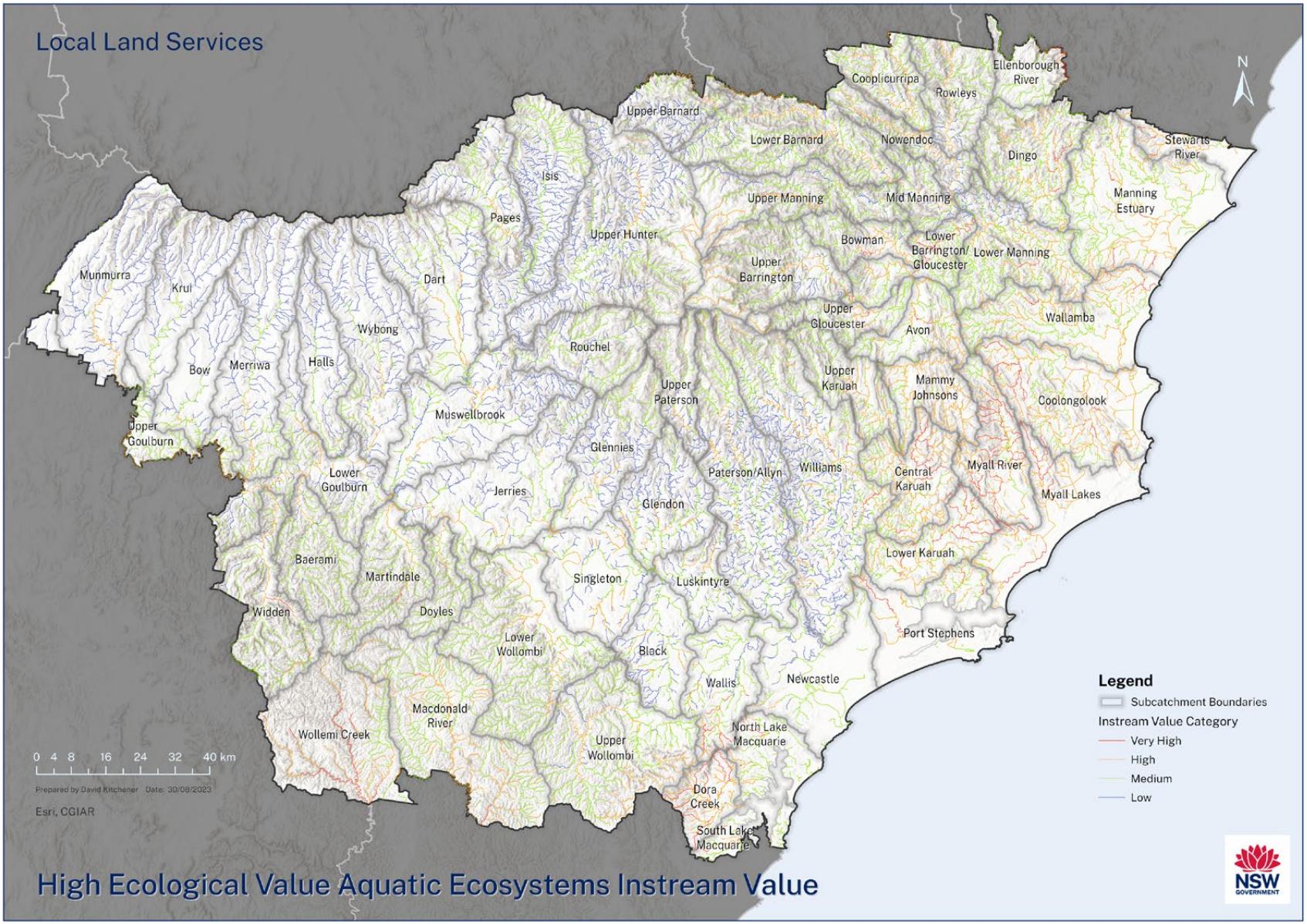


Figure A12: High Ecological Value Aquatic Ecosystems (HEVAE) Instream Value.

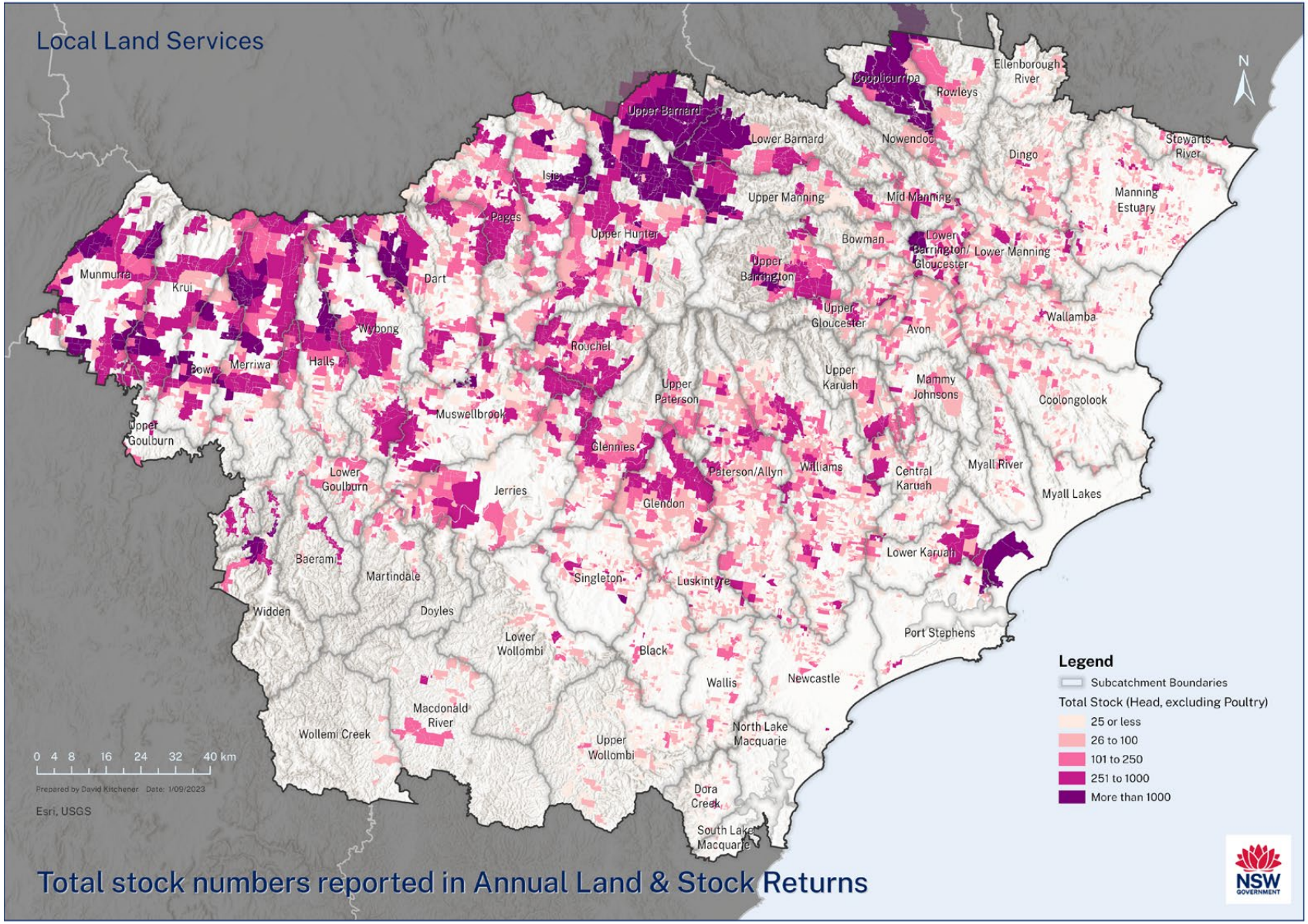


Figure A13: Total stock numbers reported in LLS Annual Land & Stock Returns.

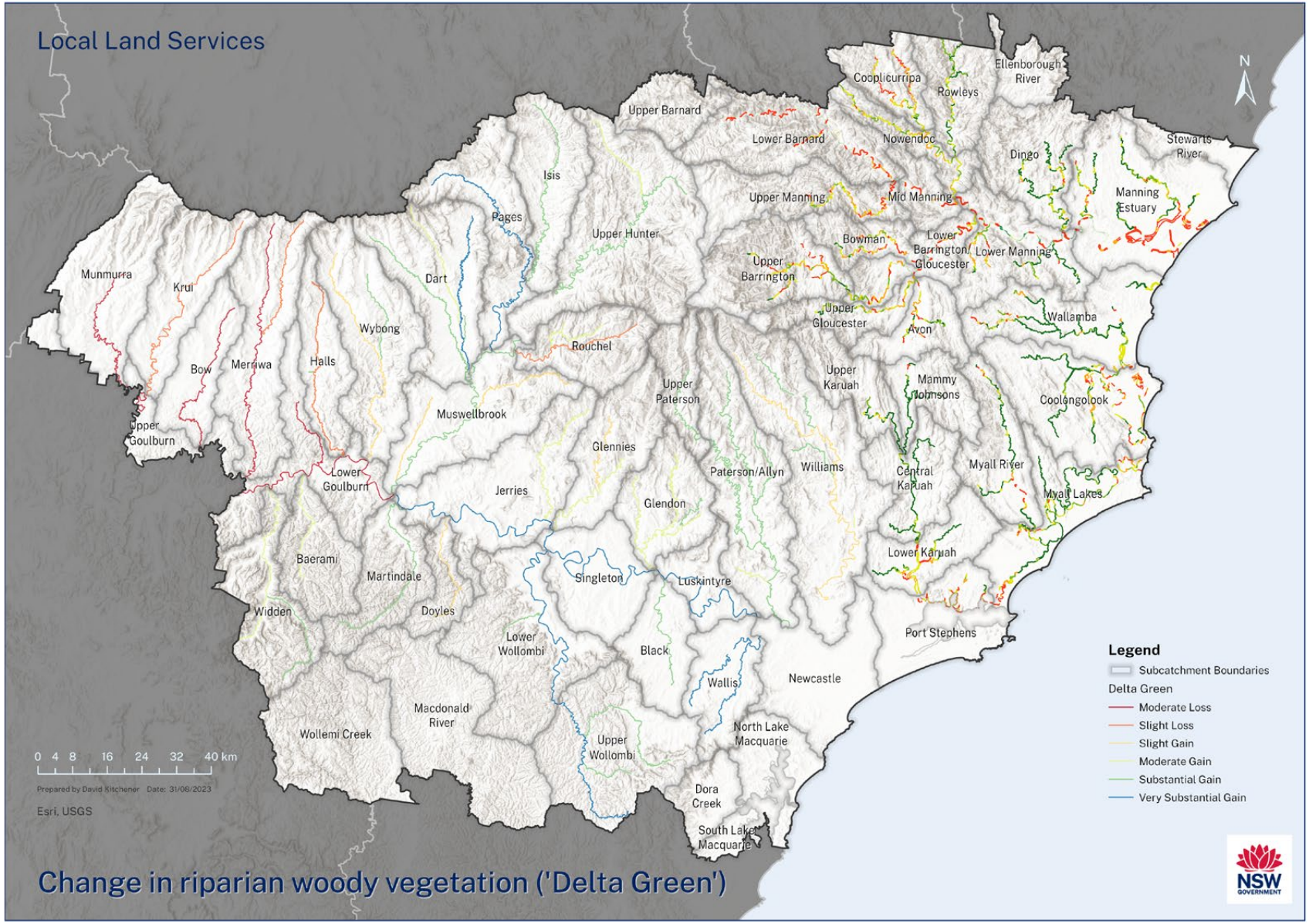


Figure A14: Change in riparian woody vegetation over time ('Delta Green').

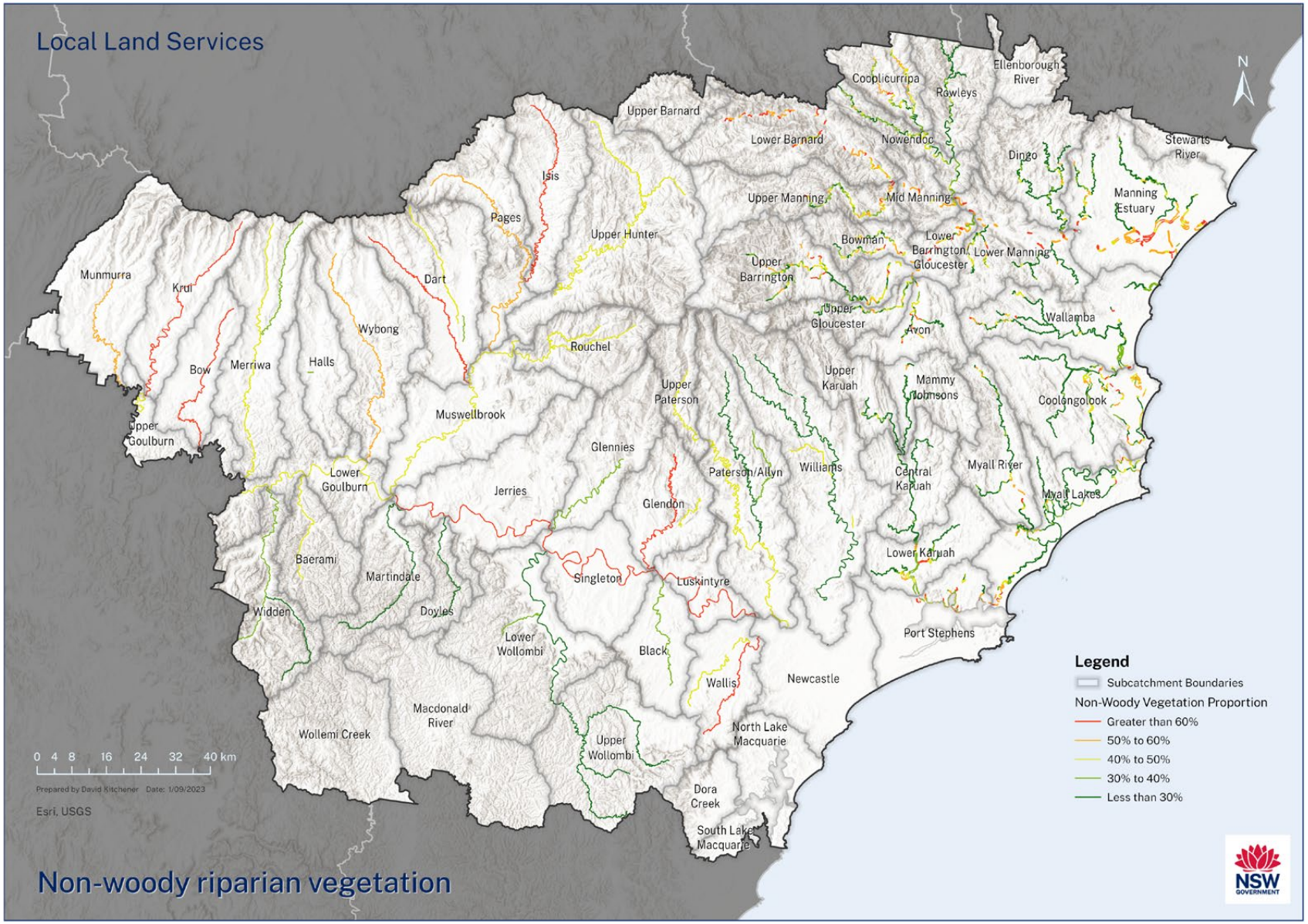


Figure A15: Non-woody riparian vegetation proportion.

Theme 4 Estuary, Coastal and Marine Biodiverse Ecosystems – Input data

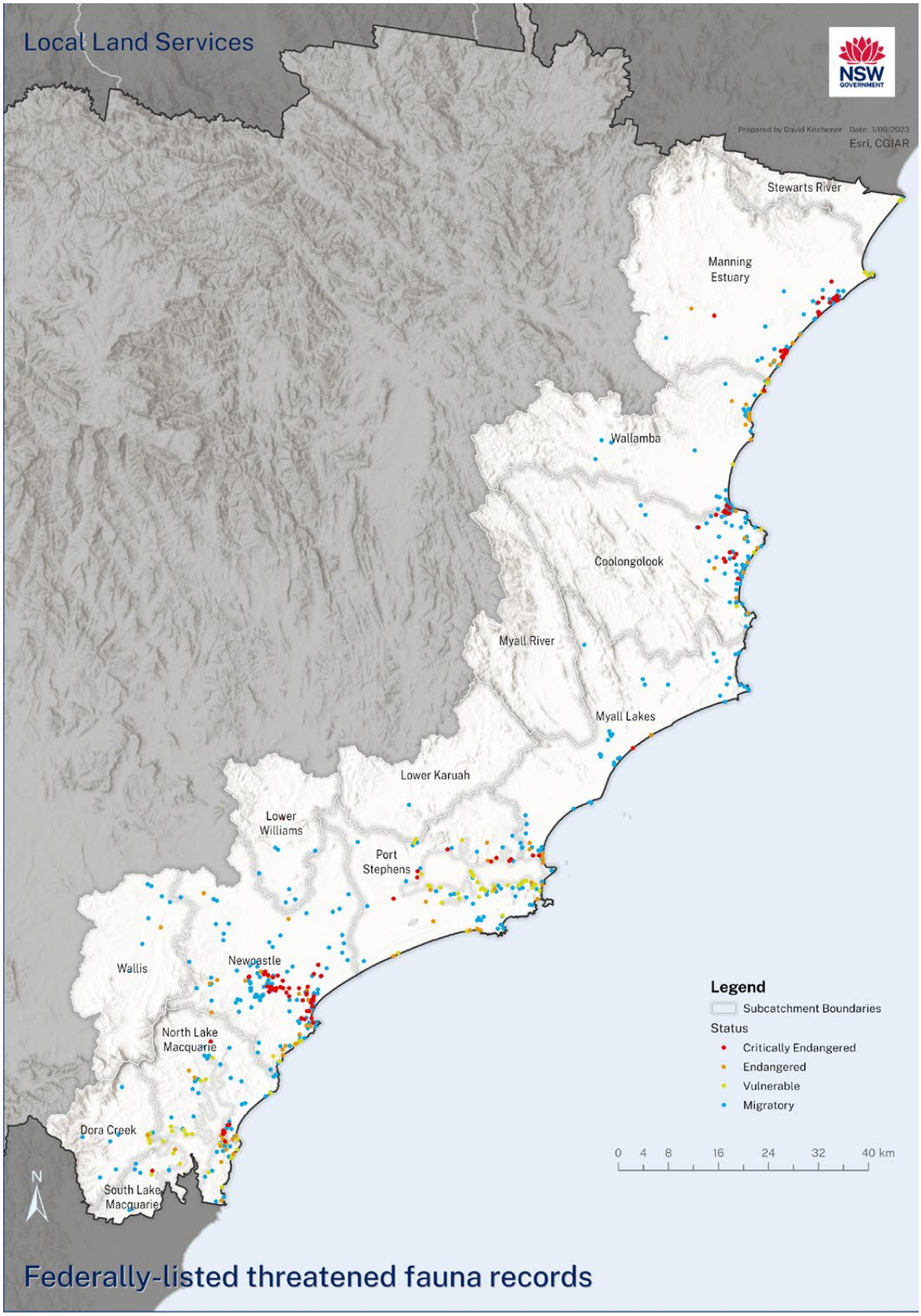


Figure A16: Federally-listed threatened fauna records.

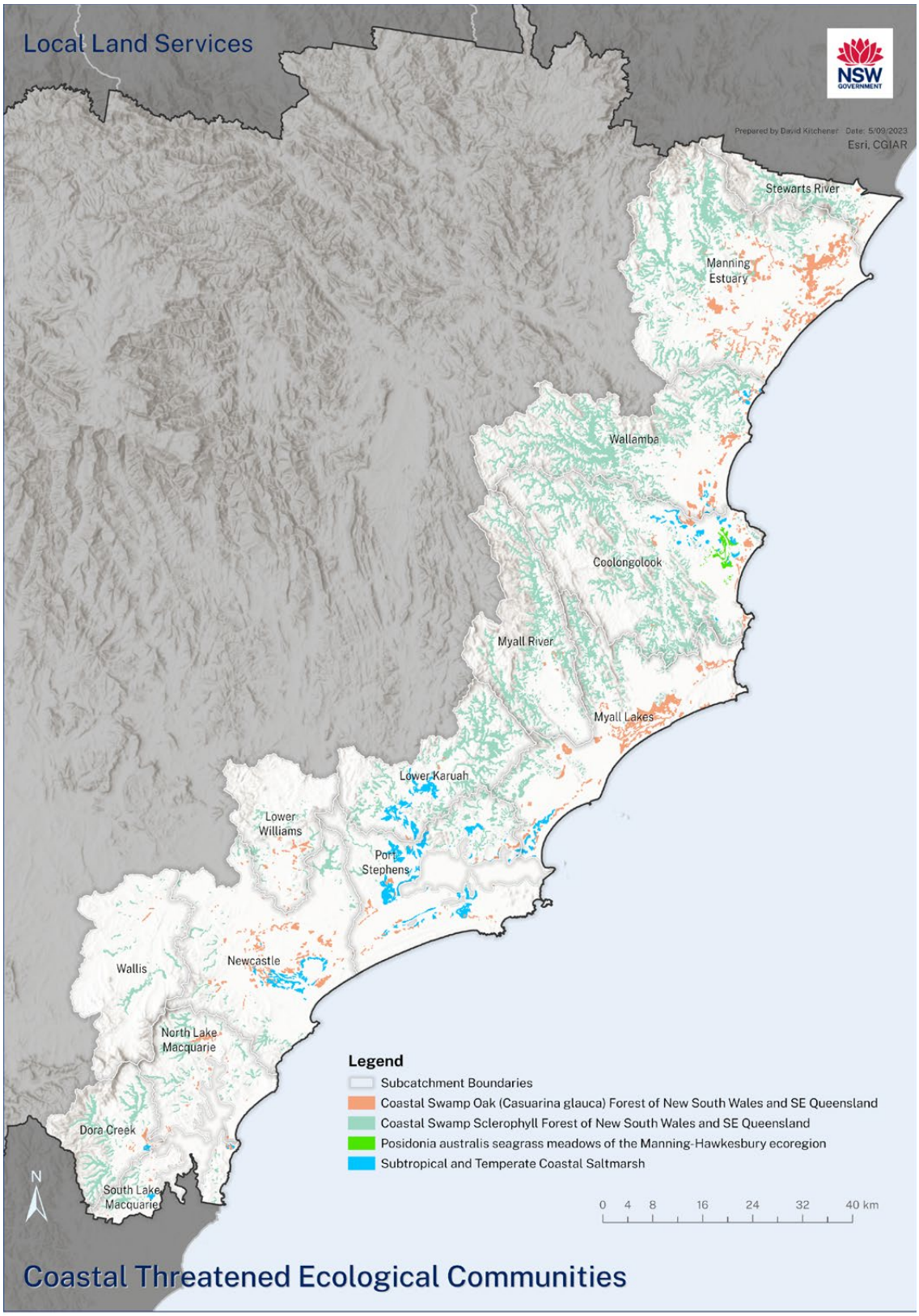


Figure A17: Coastal Threatened Ecological Communities.

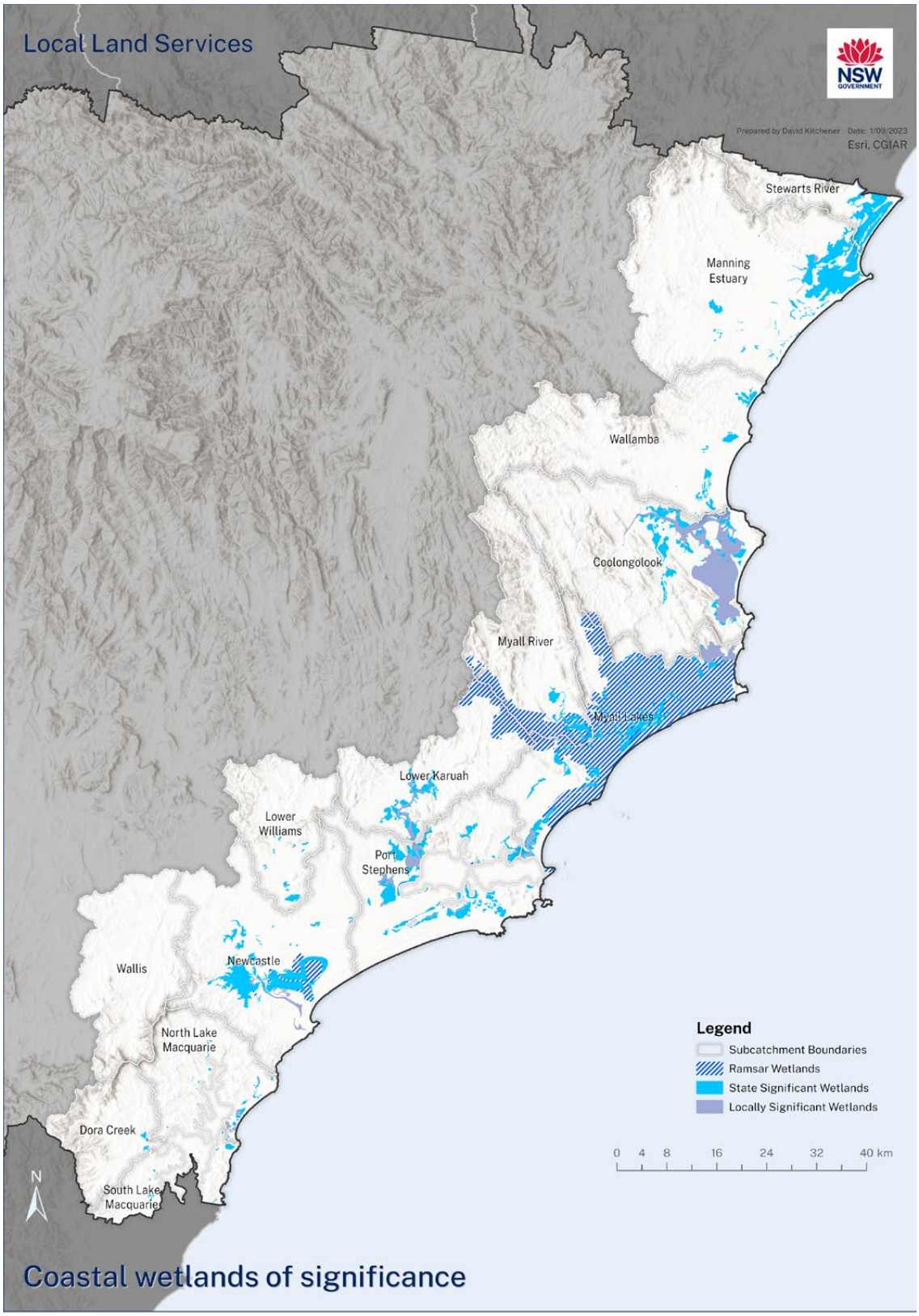


Figure A18: Coastal wetlands of significance.

Figure A19: Links identified through connectivity analysis.

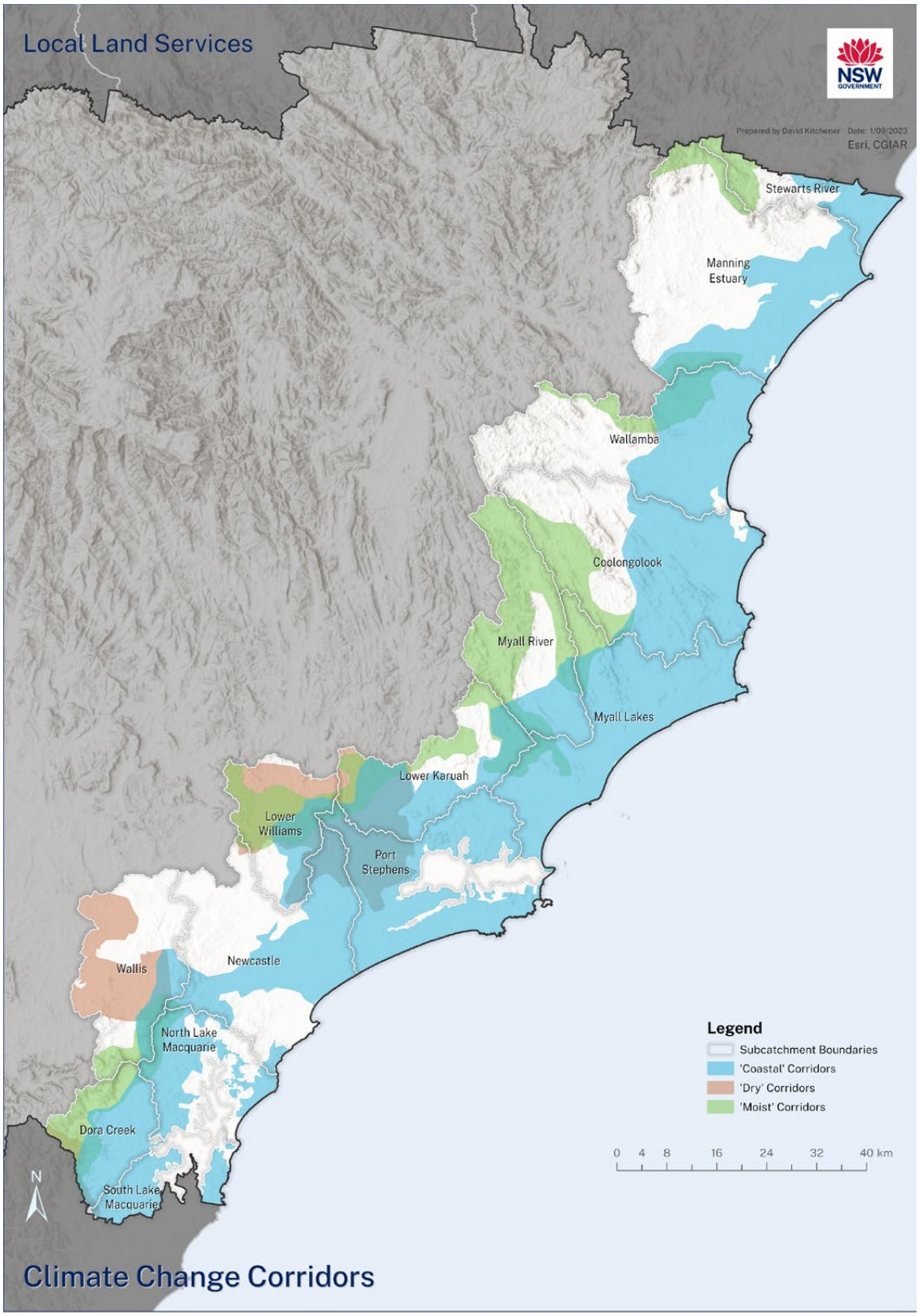


Figure A20: Climate Change Corridors (Coastal).

Key plans, prioritisation frameworks and elicited expert advice has been also incorporated into the formulation of the criteria and data source information and content of the plan:

- (DAWE) 2019-20 Bushfires Recovery Plan for the Greater Blue Mountains World Heritage Area and surrounds*
- (DAWE) Threatened Species Strategy 2021-2031
- (DPE) Cessnock Biodiversity Plan
- (DPE) Saving our Species program (SoS) - Site managed, icon and landscape species and priority areas in our region - this dataset in draft development in 2022, based on a CSIRO prioritisation tool, rationalising 3000 species and ecological communities (listed under the NSW Biodiversity Conservation Act) across NSW to 300 species for priority action and resource allocation. SoS has shared the data with LLS for incorporation to our spatial prioritisation process - *any future revisions will be updated in the plan*
- (DPE) NSW Koala Strategy - Areas of Regional Koala Significance (surrogate for individual Koala records)
- (LLS) Mid Coast Threatened Species and Koala Bushfire Recovery Action Plans 2021*
- (LLS) Shorebird Site Action Plans (Manning, Hunter and Port Stephens Estuaries and Worimi Conservation Lands) 2020*
- (BirdLife) Temperate Woodland Bird Conservation Action Plan (east coast Australia)*
- Ramsar Wetland Ecological Character Descriptions and WHA Plan of Management, Marine Park Strategy
- EPBC or BCA listed species/vegetation communities and associated National Recovery Plans, Conservation Advice or related similar plans and actions
- Local research or ecologist scientific publications.

*Data and priorities were identified with comprehensive consultation with individual stakeholder groups, experts and organisations where additional priorities are raised, including drawing on key information, actions and priorities developed in the last 24 months specific to the Hunter (such as 2019-20 Black Summer Bushfires planning) developed in consultation with a range of local, state and national experts.

Appendix B: Stakeholder Consultation Summary

Stakeholder consultation is integral in identifying the key aspirations for natural resources management within the Hunter region. A consultation survey was developed to engage with our stakeholders through formal and informal online sessions, which was facilitated by Hunter LLS staff. This approach not only connected LLS staff with our stakeholders but also assisted in identifying what is important and opportunities to work more collaboratively, cohesively, and strategically to achieve common NRM outcomes. Due to the overwhelming response to the NRM Plan development, the consultation period was extended to enable the inclusion of additional input and feedback.

The survey questions included:

1. What NRM values, aspirations, key assets, or priorities matter to you?
2. Are the priority outcomes appropriate and representative?
3. What are your aspirations for engagement, delivery, partnerships in NRM? What's working well? Where is there room for improvement?
4. How can this plan strengthen adoption/uptake through the community
5. Is the sub-catchment approach appropriate?
6. Is our prioritisation method appropriate? What (new) data may be missing?
7. How can this plan better prioritise/achieve better NRM outcomes?
8. For Aboriginal peoples and local communities (Landcare, networks, special interest groups, land managers-farmers etc.), what are your aspirations for engagement and delivery or partnerships in NRM, locally or regionally?

Other Surveys and engagement opportunities

The information from other surveys and engagement opportunities were collated to inform the plan and included:

- Bushfire Recovery Workshop 2020
- Oyster and Fisheries Industry Surveys 2018
- Rural Support Network meeting 2021.

Who was consulted

Hunter LLS engaged with eight different sectors including Agricultural Industry groups, Local Government, State Government, Landcare, Local Aboriginal Land Councils, and groups, Not-for-profit and Pest Animal and Weed Committees. Hunter LLS directly engaged with 84 individuals through online consultation sessions or through an online survey. In total we notified over 170 individuals. Through this process we have identified future opportunities to engage with other not-for-profits groups, research groups and Universities. The following table highlights the extent of consultation that was undertaken from November 2021 to February 2022:

Organisation/Group/ Industry	No. attended	No. engaged	No. survey responses	Total
Wine and Viticulture Industry	4	4		8
Oyster and Fisheries Industry	8	8	1	9
Cropping/Beef/Dairy Farmer Groups and Industry	12	18	1	31
Hunter Water	6			6
Local Government: Cessnock, Port Stephens, Muswellbrook, Maitland, Mid Coast, Lake Macquarie, Dungog, Upper Hunter, Singleton, Newcastle	14	10		24
Hunter Joint Organisation	1	1		2
State Government: National Parks and Wildlife Service; Biodiversity Conservation Trust; NSW DPI Fisheries; Rural Fire Service; Transport NSW; Department of Planning and Environment; NSW Department of Primary Industries	11	17	1	29
Landcare networks: Hunter Region Landcare; Network; Lake Macquarie; Mid Coast to Tops Landcare Connections	3	3	4	10
Landcare groups: Martindale; Manning Coastcare	4	1		5
Local Aboriginal Land Councils: Wanaruah, Bahtabah, Biraban, Mindaribba, Awabakal, Worimi, Forster, Karuah, Purfleet-Taree	4	5		9
Aboriginal Community Advisory Group: Community representatives	6	8	1	15
Hunter Regional Pest Animal Committee	7	10		17
Hunter Regional Weeds Committee	5	11		16
Non-profit organisations: BirdLife Australia	3	3		3
Nursery and Garden Industry		2		3
TOTAL	**76**	**90**	**8**	**174**

Key Stakeholder Aspirations, Values, and Issues

Multiple common themes were identified in relation to key priority assets or values, issues, threats, challenges, and opportunities. The information was collated and analysed to identify the alignment to the RLP outcomes within the four themes. The following provides a snapshot of the most important and shared NRM aspirations identified by our partners, stakeholders, and groups.

What is important to our stakeholders - highlights of the key NRM aspirations, priority assets or values.

Key NRM Aspirations and opportunities
• Connecting with community and develop and build partnerships • Collaboration with other agencies and groups at a landscape scale, particularly in biodiversity conservation, revegetation, regional priority weed and pest management and river restoration • Collate baseline data within all the themes to inform the direction of best practice NRM within the 5-year plan • Establish a community of practice, enable data sharing and easy access to information • Build training and skills in the community • Manage Aboriginal Land for agricultural purposes and Cultural awareness • Strong desire to better engage with Aboriginal communities in NRM, and work with Local Aboriginal Land Councils to undertake Cultural Burns • Develop a framework to identify and manage Cultural significance of all assets across the landscape • Strong desire to leave the land in better condition and ensure that there is a win-win for both NRM and farming • Increase awareness of climate change and community resilience • Engage with partners about NRM issues through the plan.

NRM Priority Assets and Values
• Maintain and create wildlife corridors • Maintain and improve water quality in the Hunter catchments • Reverse or mitigate the decline of endemic bird species in the Upper Hunter • Focus on key threatening processes in the Ramsar Wetlands both in the Lower Hunter and Manning Great Lakes • Build on on-ground activities in the Pages in the Upper Hunter • Protection and management of shorebird habitat in the Manning Great Lakes, Lower Hunter and Port Stephens • Improve condition and biodiversity in Cessnock spotted gum and ironbark forests and Central Hunter Valley Eucalypt Forest to improve agricultural productivity • Mitigate threats such as feral pigs to blue carbon ecosystems.

The following table is a complete summary of key NRM Aspirations, priority assets and values.

Category	Aspirations/Asset values & priorities/Issue & threats/opportunities
Threat/Management	Gully erosion Manage priority weeds Vegetation linkages Restoration Weed Management Soil erosion Outline considerations for pest species management Identifying threats to biodiversity values Impact of pigs on blue carbon ecosystems Marine debris Illegal dumping and illegal access Feral animal control Focus on Key threatening processes
Biophysical/Management	Water quality Vegetation condition Threatened species Riparian management/ rehabilitation Landscape scale management Biodiversity conservation Ecosystem services Soil health Wildlife corridors Cover crops and build soil carbon Effective bank stability methods
Community engagement/ stewardship	Develop partnerships Leave the land in better condition Engagement Win-win for NRM and farming Citizen science Engage absentee landholders Ownership and maintenance of riparian areas Interagency expertise and support in community engagement Identify who is doing what across the landscape Establish a Community of Practice Education through effective communication and engagement
Climate Change	Carbon credits Climate change and community resilience Link climate change to regional plans Increase awareness of climate change in relation to changes in future land use
Aboriginal Engagement	Aboriginal community engagement Would like to engage with the Aboriginal community but not sure how Work with LALCs and TO groups to undertake cultural burning Develop framework to identify and manage cultural significance of all assets across the landscape

Category	Aspirations/Asset values & priorities/Issue & threats/opportunities
Aboriginal aspirations	LALCs are large landowners - how can they be supported Ecotourism Support agribusiness i.e. bees, goats Look after whole communities, generational benefit Build training and skills in the community to create employment opportunities Needs to benefit the community Managing land for agricultural purposes and cultural awareness LLS Aboriginal program to include supporting agricultural activities Aboriginal people to apply for funding as landowners Aspirations be informed, involved, contribute, benefit Building partnerships and collaboration in achieving NRM outcomes Tomalpin Woodlands and Tumblebee will be looked at for conservation
Knowledge and resources Practice change	Vegetation data gaps Resourcing and continuity Communicate how and why riparian fencing priorities are funded Measuring practice change Baseline data for NRM priorities Develop homegrown trials and extension activities Early adopters to ground truth sites and identify best management Develop regional training resources Resource sharing Increase understanding of what and where the biodiversity values are Access to reliable management practices data Acknowledge and communicate successful partnerships Training and accreditation in weed control in sensitive areas
Aspirational/partnerships and collaboration	Alignment of water catchment priorities Strategic grazing framework Alignment of pest and weed strategy Collaboration with agencies Cross tenure strategic framework Connecting with community
Spatial prioritisation	Include land, sea, and sky mapping layers and EPA air quality data Needs to be simple and standardised Information should be mapped as baseline data Opportunity for modelling and sensitivity analysis discussion Develop solid assumptions to improve condition
Planning/funding	Integrate NRM Plan into land use planning Strategic land management based on regional biodiversity conservation priorities Align funding for Landcare groups with other funding streams Funding equity across all land managers Develop BMP for landholders and agencies Gap in RFS interaction with fire planning

Stakeholder Consultation Stage 2

Direct consultation with universities, Research groups and technical experts will be undertaken during the second consultation phase. This will be undertaken during the first 12 months of the Plan's release.

Direct engagement will also be undertaken with those groups who were unable to attend the initial stage 1 consultation sessions.

This will provide an opportunity for our partners and stakeholders to provide additional input and any updated information and data that was not included in the first stage.

Appendix C: Matters of National Environmental Significance and State Listed Priority Communities, Species or Places

Table A: Matters of National Environmental Significance: List of current EPBC species, ecological communities or places

(Last Updated: 5 March 2024)

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Ramsar wetland	Hunter Estuary Wetlands	n/a	Hunter	-	Yes	-
Ramsar wetland	Myall Lakes	n/a	Hunter	-	Yes	-
World Heritage	Gondwana Rainforests of Australia	n/a	NSW and QLD	-	Yes	-
World Heritage	The Greater Blue Mountains Area	n/a	NSW	-	Yes	Yes
Marine Park	Hunter Marine Park (Port Stephens)	n/a	Hunter	-	Yes	-
Nationally Important wetlands	Hexham Swamp	n/a	National important wetlands	-	Yes	-
Nationally Important wetlands	Ellalong Lagoon	n/a	National important wetlands	-	-	-
Nationally Important wetlands	Wallis Lake and adjacent estuarine islands	n/a	National important wetlands	-	Yes	-
Nationally Important wetlands	Lake Macquarie	n/a	National important wetlands	-	Yes	-
Nationally Important wetlands	Port Stephens Estuary	n/a	National important wetlands	-	Yes	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Nationally Important wetlands	Salt Ash Air Weapons Range	n/a	National important wetlands	-	-	-
Nationally Important wetlands	Barrington Top Swamps	n/a	National important wetlands	-	Yes	-
Nationally Important wetlands	Jewells Wetland	n/a	National important wetlands	-	-	-
Nationally Important wetlands	Crowdy Bay National Park	n/a	National important wetlands	-	-	-
Nationally Important wetlands	Kooragang Nature Reserve	n/a	National important wetlands	-	Yes	-
Nationally Important wetlands	Shortland Wetlands Centre	n/a	National important wetlands	-	Yes	-
Threatened Ecological Community	Warkworth Sands Woodland of the Hunter Valley	n/a	Critically Endangered	Yes	Yes	-
Threatened Ecological Community	Lowland Rainforest of Subtropical Australia	n/a	Critically Endangered	Yes	Yes	-
Threatened Ecological Community	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	n/a	Critically Endangered	Yes	Yes	-
Threatened Ecological Community	Hunter Valley Weeping Myall (Acacia pendula) Woodland	n/a	Critically Endangered	-	Yes	-
Threatened Ecological Community	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	n/a	Critically Endangered	-	Yes	-
Threatened Ecological Community	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	n/a	Critically Endangered	-	Yes	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Threatened Ecological Community	Central Hunter Valley eucalypt forest and woodland corresponds, largely to three state-listed ecological communities: Central Hunter Grey Box-Ironbark Woodland (Endangered), Central Hunter Ironbark-Spotted Gum-Grey Box Forest (Endangered), Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (Vulnerable)	n/a	Critically Endangered	Yes	Yes	-
Threatened Ecological Community	Ben Halls Gap Sphagnum Moss Cool Temperate Rainforest	n/a	Critically Endangered	Yes	Yes	-
Threatened Ecological Community	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	n/a	Endangered	-	Yes	-
Threatened Ecological Community	Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	n/a	Endangered	-	Yes	-
Threatened Ecological Community	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	n/a	Endangered	Yes	Yes	-
Threatened Ecological Community	Subtropical Coastal Floodplain Eucalypt Forest of northern New South Wales and southern Queensland	n/a	Endangered	Yes	Yes	-
Threatened Ecological Community	Kurri Sand Swamp Woodland	n/a	Endangered	Yes	Yes	-
Threatened Ecological Community	Subtropical and Temperate Coastal Saltmarsh	n/a	Vulnerable	-	Yes	-
Migratory	Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Yes	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Migratory	Eastern Curlew, Far Eastern Curlew	*Numenius adagascariensis*	Critically Endangered	-	Yes	Yes
Migratory	Lesser Sand Plover, Mongolian Plover	*Charadrius mongolus*	Endangered	-	-	
Migratory	Red Knot, Knot	*Calidris canutus*	Vulnerable	-	-	-
Migratory	Great Knot	*Calidris tenuirostris*	Vulnerable	Yes	-	-
Migratory	Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*	Vulnerable	-	-	-
Migratory	Grey Plover	*Pluvialis squatarola*	Vulnerable	-	-	-
Migratory	Sharp-tailed Sandpiper	*Calidris acuminata*	Vulnerable	-	-	-
Migratory	Ruddy Turnstone	*Arenaria interpres*	Vulnerable	-	-	-
Migratory	Asian Dowitcher	*Limnodromus semipalmatus*	Vulnerable			
Migratory	Terek Sandpiper	*Xenus cinereus*	Vulnerable	Yes	-	-
Migratory	Ruff (Reeve)	*Philomachus pugnax*	Migratory	-	-	-
Migratory	Red-necked Stint	*Calidris ruficollis*	Migratory	-	-	-
Migratory	Swinhoe's Snipe	*Gallinago megala*	Migratory	-	-	-
Migratory	Grey-tailed Tattler	*Tringa brevipes*	Migratory	-	-	-
Migratory	Pectoral Sandpiper	*Calidris melanotos*	Migratory	-	-	-
Migratory	Little Curlew, Little Whimbrel	*Numenius minutus*	Migratory	-	-	-
Migratory	Pin-tailed Snipe	*Gallinago stenura*	Migratory	-	-	-
Migratory	Whimbrel	*Numenius phaeopus*	Migratory	-	-	-
Migratory	Broad-billed Sandpiper	*Limicola falcinellus*	Migratory	Yes	-	-
Migratory	Fork-tailed Swift	*Apus pacificus*	Migratory	-	-	-
Migratory	Bar-tailed Godwit	*Limosa lapponica*	Migratory	-	-	-
Migratory	Little Tern	*Sternula albifrons*	Migratory	-	-	-
Migratory	Common Sandpiper	*Actitis hypoleucos*	Migratory	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Migratory	Marsh Sandpiper, Little Greenshank	*Tringa stagnatilis*	Migratory	-	-	-
Migratory	Pacific Golden Plover	*Pluvialis fulva*	Migratory	-	-	-
Migratory	Greater Crested Tern	*Thalasseus bergii*	Migratory	-	-	-
Migratory	Osprey	*Pandion haliaetus*	Migratory	-	-	-
Migratory	Greater Sand Plover, Large Sand Plover	*Charadrius leschenaultii*	Migratory	Yes	-	-
Migratory	Double-banded Plover	*Charadrius bicinctus*	Migratory	-	-	-
Migratory-Marine	Shy Albatross	*Thalassarche cauta*	Endangered	-	-	-
Migratory-Marine	Chatham Albatross	*Calidris canutus*	Endangered	-	-	-
Migratory-Marine	Northern Royal Albatross	*Diomedea sanfordi*	Endangered	-	-	-
Migratory-Marine	Southern Giant-Petrel, Southern Giant Petrel	*Macronectes giganteus*	Endangered	-	-	-
Migratory-Marine	Southern Royal Albatross	*Diomedea epomophora*	Vulnerable	-	-	-
Migratory-Marine	Indian Yellow-nosed Albatross	*Thalassarche carteri*	Vulnerable	-	-	-
Migratory-Marine	Salvin's Albatross	*Thalassarche salvini*	Vulnerable	-	-	-
Migratory-Marine	Black-browed Albatross	*Thalassarche melanophris*	Vulnerable	-	-	-
Migratory-Marine	Antipodean Albatross	*Diomedea antipodensis*	Vulnerable	-	-	-
Migratory-Marine	Campbell Albatross, Campbell Black-browed Albatross	*Thalassarche impavida*	Vulnerable	-	-	-
Migratory-Marine	Wandering Albatross	Diomedea exulans	Vulnerable	-	-	-
Migratory-Marine	Northern Giant Petrel	*Macronectes halli*	Vulnerable	-	-	-
Migratory-Marine	White-capped Albatross	*Thalassarche cauta steadi*	Vulnerable	-	-	-
Migratory-Marine	Sooty Albatross	*Phoebetria fusca*	Vulnerable	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Migratory-Marine	Buller's Albatross, Pacific Albatross	*Thalassarche bulleri*	Vulnerable	-	-	-
Migratory-Marine	Sooty Shearwater	*Ardenna grisea*	Vulnerable	-	-	-
Migratory-Marine	Short-tailed Shearwater	*Short-tailed Shearwater*	Migratory	-	-	-
Migratory-Marine	Streaked Shearwater	*Calonectris leucomelas*	Migratory	-	-	-
Migratory-Marine	Common Noddy	*Anous stolidus*	Migratory	-	-	-
Migratory-Marine	Wedge-tailed Shearwater	*Ardenna pacifica*	Migratory	-	-	-
Migratory-Marine	Great Frigatebird, Greater Frigatebird	*Fregata minor*	Migratory	-	-	-
Migratory-Marine	White-tailed Tropicbird	*Phaethon lepturus*	Migratory	-	-	-
Migratory-Marine	Lesser Frigatebird, Least Frigatebird	*Fregata ariel*	Migratory	-	-	-
Migratory -Terrestrial	White-throated Needletail	*Hirundapus caudacutus*	Vulnerable	-	-	-
Other-marine	Cauliflower Soft Coral (Port Stephens)	*Dendronephthya australis*	Endangered	-	Yes	Yes
Species-Bird	Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Yes	Yes	
Species-Bird	Curlew Sandpiper	*Lathamus discolor*	Critically Endangered	-	Yes	
Species-Bird	Swift Parrot	*Calidris ferruginea*	Critically Endangered	-	Yes	
Species-Bird	Eastern Curlew, Far Eastern Curlew	*Numenius adagascariensis*	Critically Endangered	-	Yes	
Species-Bird	Gang-gang Cockatoo	*Callocephalon fimbriatum*	Endangered	-	-	
Species-Bird	Lesser Sand Plover, Mongolian Plover	*Charadrius mongolus*	Endangered	-	-	
Species-Bird (Marine)	Gould's Petrel, Australian Gould's Petrel	*Pterodroma leucoptera leucoptera*	Endangered	Yes	Yes	
Species-Bird	Rufous Scrub-bird	*Atrichornis rufescens*	Endangered		Yes	

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Bird	Australian Painted Snipe	*Rostratula australis*	Endangered	-	-	
Species-Bird	Australasian Bittern	*Botaurus poiciloptilus*	Endangered	-	Yes	
Species-Bird	South-eastern Hooded Robin, Hooded Robin (south-eastern)	*Melanodryas cucullata cucullata*	Endangered	-	-	
Species-Bird	Red Goshawk	*Erythrotriorchis radiatus*	Endangered	-	-	
Species-Bird	Black-tailed Godwit	*Limosa limosa*	Endangered	Yes	-	
Species-Bird	Common Greenshank, Greenshank	*Tringa nebularia*	Endangered	-	-	
Species-Bird	Painted Honeyeater	*Grantiella picta*	Vulnerable	-	Yes	
Species-Bird	Superb Parrot	*Polytelis swainsonii*	Vulnerable	-	-	
Species-Bird	Malleefowl	*Leipoa ocellata*	Vulnerable	Yes	-	
Species-Bird	Grey Falcon	*Falco hypoleucos*	Vulnerable	-	-	
Species-Bird	White-throated Needletail	*Hirundapus caudacutus*	Vulnerable	-	-	
Species-Bird	Pilotbird	*Pycnoptilus floccosus*	Vulnerable	-	-	
Species-Bird	Greater Sand Plover, Large Sand Plover	*Charadrius leschenaultii*	Vulnerable	-	-	
Species-Bird	South-eastern Glossy Black Cockatoo	*Calyptorhynchus lathami lathami*	Vulnerable	-	-	
Species-Bird	Brown Tree Creeper (south-eastern)	*Climacteris picumnus victoriae*	Vulnerable	-	-	
Species Bird	Diamond Firetail	*Stagonopleura guttata*	Vulnerable	-	-	
Species-Bird	Southern Whiteface	*Aphelocephala leucopsis*	Vulnerable	-	-	
Species-Bird	Swift Parrot	*Calidris ferruginea*	Vulnerable	-	Yes	
Species-Bird	Great Knot	*Calidris tenuirostris*	Vulnerable	Yes	-	-
Species-Bird	Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*	Vulnerable	-	-	

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Bird	Grey Plover	*Pluvialis squatarola*	Vulnerable	-	-	
Species-Bird	Sharp-tailed Sandpiper	*Calidris acuminata*	Vulnerable	-	-	
Species-Bird	Red Knot, Knot	*Calidris canutus*	Vulnerable	-	-	
Species-Bird	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	*Limosa lapponica baueri*	Endangered	-	-	
Species-Bird (Marine)	Shy Albatross	*Thalassarche eremita*	Endangered	-	-	
Species-Bird (Marine)	Northern Royal Albatross	*Diomedea sanfordi*	Endangered	-	-	
Species-Bird (Marine)	Chatham Albatross	*Thalassarche eremita*	Endangered	-	-	
Species Bird (Marine)	Sooty Shearwater	*Ardenna grisea*	Vulnerable	-	-	
Species-Bird (Marine)	White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	*Fregetta grallaria grallaria*	Vulnerable	Yes	-	
Species-Bird (Marine)	Antipodean Albatross	*Diomedea antipodensis*	Vulnerable	-	-	
Species-Bird (Marine)	Fairy Prion (southern)	*Pachyptila turtur subantarctica*	Vulnerable	-	-	
Species-Bird (Marine)	Wandering Albatross	*Diomedea exulans*	Vulnerable	-	-	
Species-Bird (Marine)	Southern Royal Albatross	*Diomedea epomophora*	Vulnerable	-	-	
Species-Bird (Marine)	Gibson's Albatross	*Diomedea antipodensis gibsoni*	Vulnerable	-	-	-
Species-Bird (Marine)	White-capped Albatross	*Thalassarche steadi*	Vulnerable	-	-	-
Species-Bird (Marine)	Indian Yellow-nosed Albatross	*Thalassarche carteri*	Vulnerable	-	-	-
Species-Bird (Marine)	Salvin's Albatross	*Thalassarche salvini*	Vulnerable	-	-	-
Species-Frog	Booroolong Frog	*Litoria booroolongensis*	Endangered	Yes	Yes	-
Species-Frog	Mahony's Toadlet	*Uperoleia mahonyi*	Endangered	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Frog	Littlejohn's Tree Frog, Heath Frog	*Litoria littlejohni*	Endangered	-	-	-
Species-Frog	Giant Burrowing Frog	*Heleioporus australiacus*	Vulnerable	-	Yes	-
Species-Frog	Green and Golden Bell Frog	*Litoria aurea*	Vulnerable	Yes	Yes	-
Species-Frog	Stuttering Frog, Southern Barred Frog (in Victoria)	*Mixophyes balbus*	Vulnerable	-	Yes	-
Species-Frog	Giant Barred Frog, Southern Barred Frog	*Mixophyes iteratus*	Vulnerable	-	Yes	-
Species-Frog	Sphagnum Frog	*Philoria sphagnicola*	Vulnerable	-	-	-
Species-Frog	Davies' Tree Frog	*Litoria daviesae*	Vulnerable	-	-	-
Species-Mammal	Hastings River Mouse, Koontoo	*Pseudomys oralis*	Endangered	-	Yes	-
Species-Mammal	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (south-eastern mainland population)	*Dasyurus maculatus maculatus (SE mainland population)*	Endangered	-	Yes	-
Species-Mammal	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	*Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)*	Endangered	-	Yes	Yes
Species-Mammal	Blue Whale	*Balaenoptera musculus*	Endangered	-	-	-
Species-Mammal	Southern Right Whale	*Eubalaena australis*	Endangered	-	-	-
Species-Mammal	Brush-tailed Rock-wallaby	*Petrogale penicillata*	Vulnerable	Yes	Yes	Yes
Species-Mammal	Greater Glider	*Petauroides volans*	Vulnerable	-	Yes	-
Species-Mammal	Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	-	Yes	-
Species-Mammal	Large-eared Pied Bat, Large Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Yes	Yes	-
Species-Mammal	Fin Whale	*Balaenoptera physalus*	Vulnerable	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Mammal	Corben's Long-eared Bat, South-eastern Long-eared Bat	*Nyctophilus corbeni*	Vulnerable	-	-	-
Species-Mammal	Long-nosed Potoroo (SE Mainland)	*Potorous tridactylus tridactylus*	Vulnerable	Yes	Yes	
Species -Mammal	Parma Wallaby	*Notamacropus parma*	Vulnerable		Yes	
Species-Mammal	Yellow-bellied Glider (south-eastern)	*Petaurus australis australis*	Vulnerable	Yes	Yes	
Species-Mammal	Greater Glider (southern and central)	*Petaurus volans*	Vulnerable		Yes	
Species-Mammal	Broad-toothed Rat (mainland), Tooarrana	*Mastacomys fuscus mordicus*	Vulnerable	-	Yes	
Species-Mammal	Sei Whale	*Balaenoptera borealis*	Vulnerable	-	-	
Species-Mammal	New Holland Mouse, Pookila	*Pseudomys novaehollandiae*	Vulnerable	-	Yes	
Species-Plant	Native Guava	*Rhodomyrtus psidioides*	Critically Endangered	-	Yes	Yes
Species-Plant	Wollemi Pine	*Wollemia nobilis*	Critically Endangered	Yes	-	Yes
Species-Plant	Wyong Midge Orchid 1, Variable Midge Orchid 1	*Corunastylis insignis*	Critically Endangered	-	-	-
Species-Plant	Acacia dangarensis	*Acacia dangarensis*	Critically Endangered	Yes	-	-
Species-Plant	Tuncurry Midge Orchid	*Corunastylis littoralis*	Critically Endangered	Yes	Yes	-
Species-Plant	Leionema lamprophyllum subsp. fractum	*Leionema lamprophyllum subsp. fractum*	Critically Endangered	-	-	-
Species-Plant	Scrub Turpentine, Brown Malletwood	*Rhodamnia rubescens*	Critically Endangered	-	Yes	-
Species-Plant	Euphrasia arguta	*Euphrasia arguta*	Critically Endangered	Yes	Yes	-
Species-Plant	Prasophyllum sp. Wybong (C.Phelps ORG 5269)	*Prasophyllum sp. Wybong (C.Phelps ORG 5269)*	Critically Endangered	-	Yes	-
Species-Plant	North Rothbury Persoonia	*Persoonia pauciflora*	Critically Endangered	Yes	Yes	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Plant	Denman Pomaderris	*Pomaderris reperta*	Critically Endangered	Yes	Yes	-
Species-Plant	Pale Yellow Doubletail, Wingham Doubletail	*Diuris flavescens*	Critically Endangered	-	-	-
Species-Plant	Hairy Geebung, Hairy Persoonia	*Persoonia hirsuta*	Endangered	-	-	-
Species-Plant	Craven Grey Box	*Eucalyptus largeana*	Endangered	-	Yes	-
*Species-Plant	Allocasuarina thalassoscopica	*Allocasuarina thalassoscopica*	Endangered	-	-	-
Species-Plant	Dwarf Kerrawang	*Commersonia prostrata*	Endangered	-	-	-
Species-Plant	Dwarf Heath Casuarina	*Allocasuarina defungens*	Endangered	Yes	Yes	-
Species-Plant	Tylophora woollsii	*Tylophora woollsii*	Endangered	-	-	-
Species-Plant	Milky Silkpod	*Parsonsia dorrigoensis*	Endangered	-	-	-
Species-Plant	White-flowered Wax Plant	*Cynanchum elegans*	Endangered	-	-	-
Species-Plant	Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood	*Pterostylis gibbosa*	Endangered	-	Yes	-
Species-Plant	Eastern Underground Orchid	*Rhizanthella slateri*	Endangered	-	-	-
Species-Plant	Manning Yellow Solanum	*Solanum sulphureum*	Endangered	Yes	Yes	-
Species-Plant	Sandy Hollow Commersonia	*Androcalva rosea*	Endangered	-	-	-
Species-Plant	Guthrie's Grevillea	*Grevillea guthrieana*	Endangered	-	-	-
Species-Plant	Fairy Bells	*Homoranthus darwinioides*	Vulnerable	-	-	-
Species-Plant	Camfield's Stringybark	*Eucalyptus camfieldii*	Vulnerable	Yes	-	-
Species-Plant	Singleton Mintbush	*Prostanthera cineolifera*	Vulnerable	-	-	-
Species-Plant	Grevillea shiressii	*Grevillea shiressii*	Vulnerable	-	-	-
Species-Plant	Prostanthera discolor	*Prostanthera discolor*	Vulnerable	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Plant	Pokolbin Mallee	*Eucalyptus pumila*	Vulnerable	Yes	Yes	-
Species-Plant	Charmhaven Apple	*Angophora inopina*	Vulnerable	-	-	-
Species-Plant	Fragrant Pepperbush	*Tasmannia glaucifolia*	Vulnerable	Yes	Yes	-
Species-Plant	Neoastelia spectabilis	*Neoastelia spectabilis*	Vulnerable	-	-	-
Species-Plant	Knotweed, Tall Knotweed	*Persicaria elatior*	Vulnerable	-	-	-
Species-Plant	Villous Mintbush	*Prostanthera densa*	Vulnerable	-	-	-
Species-Plant	Nabiac Casuarina	*Allocasuarina simulans*	Vulnerable	-	-	-
Species-Plant	Thick-lipped Spider-orchid, Daddy Long-legs	*Caladenia tessellata*	Vulnerable	-	-	-
Species-Plant	Slaty Red Gum	*Eucalyptus glaucina*	Vulnerable	Yes	Yes	-
Species-Plant	Veined Doubletail, Goat Orchid, Veined Donkey-orchid	*Diuris venosa*	Vulnerable	-	-	-
Species-Plant	Three Brothers Wattle, Brother Wattle, Northern Brother Wattle	*Acacia courtii*	Vulnerable	Yes	-	-
Species-Plant	Heath Wrinklewort	*Rutidosis heterogama*	Vulnerable	-	-	-
Species-Plant	Lasiopetalum longistamineum	*Lasiopetalum longistamineum*	Vulnerable	-	-	-
Species-Plant	Biconvex Paperbark	*Melaleuca biconvexa*	Vulnerable	-	-	-
Species-Plant	Black-eyed Susan	*Tetratheca juncea*	Vulnerable	-	-	-
Species-Plant	Austral Toadflax, Toadflax	*Thesium australe*	Vulnerable	-	-	-
Species-Plant	Rufous Pomaderris, Brown Pomaderris	*Pomaderris brunnea*	Vulnerable	-	-	-
Species-Plant	Newcastle Doubletail	*Diuris praecox*	Vulnerable	-	-	-
Species-Plant	Smooth Bush-pea, Swamp Bush-pea	*Pultenaea glabra*	Vulnerable	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Plant	Hakea archaeoides	*Hakea archaeoides*	Vulnerable	-	-	-
Species-Plant	Olearia cordata	*Olearia cordata*	Vulnerable	-	-	-
Species-Plant	Bynoe's Wattle, Tiny Wattle	*Acacia bynoeana*	Vulnerable	-	-	-
Species-Plant	Trailing Woodruff	*Asperula asthenes*	Vulnerable	Yes	-	-
Species-Plant	Wollemi Mint-bush	*Prostanthera cryptandroides subsp. cryptandroides*	Vulnerable	-	-	-
Species-Plant	Small-flower Grevillea	*Grevillea parviflora subsp. parviflora*	Vulnerable	-	-	-
Species-Plant	Androcalva procumbens	*Androcalva procumbens*	Vulnerable	-	-	-
Species-Plant	Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry	*Syzygium paniculatum*	Vulnerable	Yes	Yes	-
Species-Plant	Rylstone Bell	*Leionema sympetalum*	Vulnerable	-	-	-
Species-Plant	Mount Vincent Mintbush	*Prostanthera stricta*	Vulnerable	-	-	-
Species-Plant	Leafless Tongue-orchid	*Cryptostylis hunteriana*	Vulnerable	-	-	-
Species-Plant	Earp's Gum, Earp's Dirty Gum	*Eucalyptus parramattensis subsp. decadens*	Vulnerable	-	-	-
Species-Plant	Bluegrass	*Dichanthium setosum*	Vulnerable	-	Yes	-
Species-Plant	Velleia perfoliata	*Velleia perfoliata*	Vulnerable	-	-	-
Species-Reptile	Purvis' Turtle, Manning River saw-shelled turtle	*Myuchelys purvisi*	Endangered		Yes	
Species-Reptile	Leatherback Turtle, Leathery Turtle, Luth	*Dermochelys coriacea*	Endangered	-	-	-
Species-Reptile	Loggerhead Turtle	*Caretta caretta*	Endangered	-	-	-
Species-Reptile	Hawksbill Turtle	*Eretmochelys imbricata*	Vulnerable	-	-	-

Asset	Place, species or habitat	Scientific Name	Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (Draft)	Identified in NRM Plan	2022-2033 Thr. Sp. Strategy Listed
Species-Reptile	Green Turtle	*Chelonia mydas*	Vulnerable	Yes	Yes	Yes
Species-Reptile	Flatback Turtle	*Natator depressus*	Vulnerable		-	-
Species-Reptile	Striped Legless Lizard, Striped Snake-lizard	*Delma impar*	Vulnerable	-	Yes	-
Species-Reptile	Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	*Aprasia parapulchella*	Vulnerable	-	-	-
Species-Fish	White's Seahorse, Crowned Seahorse, Sydney Seahorse	*Hippocampus whitei*	Endangered	-	-	Yes
Species-Fish	Australian Grayling	*Prototroctes maraena*	Vulnerable	-	-	-
Species-Fish	Black Rockcod, Black Cod, Saddled Rockcod	*Epinephelus daemelii*	Vulnerable	-	-	-
Species-Fish	Grey Nurse Shark (eastern)	*Carcharias taurus*	Critically Endangered	-	-	Yes
Species-Insect	Sydney Hawk Dragonfly	*Austrocordulia leonardi*	Endangered	-	-	-

*Species or species habitat may occur

Table B: Priority Assessment List (currently under assessment) of EPBC nominated species, ecological communities and key threatening processes

(Last updated: 5 March 2024)

Asset	Communities, Species or Places	Scientific Name	Identified in NRM Plan	Assessment Due Date
Species - Plant	Three Brothers Wattle, Brother Wattle, Northern Brother Wattle	*Acacia courtii*	-	30/10/2024
Species - Plant	A Banksia	*Banksia penicillata*	-	30/04/2024
Species - Fish	Redfish	*Centroberyx affinis*	-	30/10/2025
*Species – Reptile	Striped Legless Lizard, Striped Snake-lizard	*Delma impar*	Yes	30/04/2024
Species - Reptile	Hunter Valley Delma	*Delma vescolineata*		30/04/2024
Species - Insect	Grey Skate	*Dipturus canutus*	-	30/10/2025
*Species - Amphibian	Giant Burrowing Frog	*Heleioporus australiacus*	Yes	30/04/2024
Species - Mammal	Brush-tailed Rock-wallaby	*Petrogale penicillata*	Yes	30/10/2024
Species - Mammal	New Holland Mouse	*Pseudomys novaehollandiae*	Yes	30/04/2024
Species - Birds	Little Tern	*Sternula albifrons*	Yes	30/10/2024

Source: Species Profile and Threats Database: https://www.environment.gov.au/sprat-public/action/report-fpal

Table C: List of current state listed BCA and nominated species, ecological communities or places identified in the Plan

State listed species, Endangered Ecological Communities (EECs) already listed at the EPBC listing Table A are not listed below.

Species, EECs listed below are representative of state listed assets, and include Saving Our Species prioritised assets and other identified prioritised assets that are known or recorded in the Hunter Local Land Services Region.

The Saving Our Species 2022 Draft Priority list has been developed through a CSIRO prioritization tool and may be required to be updated at a future time. This tool has prioritized 300 listed species under the Biodiversity Conservation Act and endangered ecological communities (out of 3000 listed state wide).

Asset	State Listed Asset	Species	NSW Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (draft)	Identified in NRM Plan
EEC	Central Hunter Grey Box Ironbark Forest	-	Endangered	Yes	Yes
EEC	Central Hunter Ironbark Forest-Spotted Gum-Grey Box Forest	-	Endangered	Yes	Yes
EEC	Lower Hunter Spotted Gum Ironbark Forest	-	Endangered	Yes	Yes
EEC	Quorrobolong Stringy Bark Forest	-	Endangered	Yes	Yes
EEC	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	-	Endangered	Yes	Yes
EEC	Swamp Sclerophyll Forest on Coastal Floodplains	-	Endangered	-	Yes
EEC	Swamp Oak Floodplain Forest	-	Endangered	-	Yes
EEC	Hunter Floodplain Red Gum Woodland (Eucalyptus camaldulensis) population	-	Endangered	-	Yes
EEC	Freshwater Wetlands on Coastal Floodplains	-	Endangered	-	Yes
EEC	Eucalyptus camaldulensis-Hunter River Red Gum Population in the Hunter Catchment	-	Endangered Population	-	Yes

Asset	State Listed Asset	Species	NSW Listing Status	DPE Saving Our Species Priority Asset 2022-2027 (draft)	Identified in NRM Plan
EEC	Hunter Lowland Redgum Forest	-	Endangered	Yes	Yes
EEC	Hunter Floodplain Red Gum Woodland	-	Endangered	Yes	Yes
EEC	Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	-	Endangered	Yes	Yes
EEC	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	-	Vulnerable	Yes	Yes
EEC	Lower Hunter Valley Dry Rainforests in the Sydney Basin and NSW North Coast Bioregions	-	Vulnerable	Yes	Yes
Invertebrate	Giant Dragonfly	*Petalura gigantea*	Endangered	-	Yes
Reptile	Manning River Helmeted Turtle, Manning River Sawshell Turtle, Purvis' Turtle*	*Wollumbinia purvisi*	Endangered	Yes	Yes
Bird	Magpie Goose	*Anseranas semipalmata*	Vulnerable	Yes	Yes
Plant	Slaty Red Gum	*Eucalyptus glaucina*	Vulnerable	Yes	Yes

APPENDIX D: Hunter NRM Plan, key themes, sub themes, objectives, key initiatives and actions
(as identified in the Plan)

Theme	Sub Theme	Objectives	Key Results	Key Initiatives and Actions
Theme 1 - Native Vegetation and Terrestrial Biodiverse Ecosystems	1A: Dry open forests and woodland ecosystems 1B: Rainforest vegetation and ecosystems 1C: Wet sclerophyll forests and ecosystems 1D: Alpine or sub-alpine vegetation and ecosystems	Objective 1: By 2028 there is improved condition and resilience of native vegetation and biodiversity in the landscape.	Key Result 1.1: Improve the connectivity and linkage of habitats to maintain corridors for wildlife, and reinstate native vegetation, as measured by area (ha) of native vegetation enhanced, rehabilitated or protected. Key Result 1.2: Enhance and reinstate the structure of important native vegetation and habitats and their functions to maintain critical ecosystem functions and services, as measured by area (ha) of native vegetation enhanced, rehabilitated or protected, area (Ha) of weed/ pest control (vertebrate). Key Result 1.3: Reduce or abate threats and/or disturbance to biodiversity and key habitats to mitigate loss of biodiversity or threats to population viability, as measured by area (ha) of threatened species, populations or ecological communities enhanced, rehabilitated or protected.	Action 1a. Protect and sustain the integrity of high value remnant vegetation and habitats on private land. Action 1b. Promote natural regeneration or improve the structural integrity and condition of native vegetation and habitats, such as key stone species, under-storey and habitat features (such as via strategic weed control or habitat augmentation). Action 1c. Create and enhance connectivity, wildlife corridors or linkages to existing remnant vegetation by protecting, reinstating or regenerating native vegetation Action 1d. Control or reduce vertebrate pests or predator threats to biodiversity Action 1e. Monitor biodiversity and landscape health through indicator or flagship species. Action 1f. Promote and encourage adoption of practices to landholders that reduce threats and conserve native vegetation, habitats and biodiversity, protect natural capital and prepare or adapt to climate change. Action 1g. Protect biodiversity from human disturbance or other environmental threats. Action 1h. Promote or facilitate private long-term conservation or stewardship of high value native vegetation and biodiverse habitats, through environmental stewardship programs or markets. Action 1i. Identify and manage key data or knowledge gaps to assist with future recovery or restoration efforts and appropriate decision making.

Theme	Sub Theme	Objectives	Key Results	Key Initiatives and Actions
Theme 2 - Soil and Land	2A: Groundcover, Soil Health, Function 2B: Soil erosion and soil degradation	Objective 2: By 2028 there will be an improved condition and productivity of soil and land.	Key Result 2.2: Manage soils to reduce impacts from soil erosion and soil degradation, as measured by area of land managed for improved soil condition. Key Result 2.3: Improve climate change adaptation of soil and land management practices, as measured by area managed for improved agricultural production.	Action 2a. Improve and maintain effective year-round perennial groundcover through profitable and sustainable grazing practices, to improve soil health and water quality. Action 2b. Facilitate implementation of improved soil nutrient management and water use efficiency, to improve soil function and water quality. Action 2c. Control soil erosion in priority areas, conserve soil and improve water quality and ecological health. Action 2d. Promote knowledge and adoption of climate change adaptations to agricultural production systems and practices, to improve climate change resilience and facilitate improved access to market-based opportunities. Action 2e. Support landholders to develop and implement Whole Farm, Grazing, Drought and Flood Management Plans, to improve decision-making, access to market opportunities and implementation of sustainable agricultural practices that adapt to climate change. Action 2f. Implement coordinated catchment health improvement projects to improve soil, land and vegetation management practices, water quality, ecological health and landscape resilience.
Theme 3 – Rivers and Aquatic Biodiversity	3A: River Ecological Health 3B: Riverbank Erosion and Flood Risk	Objective 3: By 2028 there is improved condition of rivers and aquatic biodiversity.	Key Result 3.1: Improve river ecological health by improving riparian and instream habitat condition, as measured by: 1. Stream length of river enhanced, rehabilitated or protected; and 2. Area of significant species or EECs enhanced, rehabilitated or protected. Key Result 3.2: Reduce riverbank erosion and flood risk by revegetating riverbanks, as measured by: 1. Stream length of river enhanced, rehabilitated or protected; and 2. Area of native vegetation enhanced, rehabilitated or protected.	Action 3a. Improve riparian vegetation condition and connectivity along priority river ecological health reaches. Action 3b. Revegetate riverbanks through natural regeneration and riparian plantings, along priority riverbank erosion reaches. Action 3c. Stabilise strategic erosion sites to facilitate revegetation, along priority riverbank erosion reaches. Action 3d. Improve the condition of endangered Hunter River Red Gum population remnants. Action 3e. Protect and improve drought refuge pools and priority habitat for Platypus and endangered Manning River Helmeted Turtle along priority reaches. Action 3f. Increase the scale of strategic reach-based revegetation through river rehabilitation works to reduce flood risk under the Hunter Valley Flood Mitigation Scheme. Action 3g. Support landholders to develop and implement Property Riparian Plans along strategic river reaches to improve river ecological health and reduce riverbank erosion.

Theme	Sub Theme	Objectives	Key Results	Key Initiatives and Actions
Theme 4 – Estuary, Coastal and Marine Biodiverse Ecosystems	4A: Estuarine and marine ecosystems 4B: Forested or riverine and freshwater wetland coastal ecosystems	Outcome 4: By 2028 there is improved condition of coast, wetland and estuarine ecosystems.	Key Result 4.1: Improve the condition of priority coastal vegetation and wetland communities, as measured by: 1. Area (ha) of significant species or EECs enhanced, rehabilitated or protected; and 2. Area (Ha) of wetlands enhanced, rehabilitated or protected. Key Result 4.2: Protect the condition and function of marine and estuary vegetation and habitats in priority areas, as measured by: 1. Area (ha) of significant species or EECs enhanced, rehabilitated or protected; and 2. Stream length (km) of river/ estuary enhanced, rehabilitated or protected. Key Result 4.3: Reduce priority threats to marine and estuary habitats, and coast and wetland habitats as measured by: 1. Area (ha) of weed management; and 2. Area (ha) of pest control (vertebrate) Key Result 4.4: Improve the resilience of fisheries and aquaculture farming systems (and practices) to the impacts of climate change, as measured by increases in knowledge and skills.	Action 4a. Implement coordinated pest animal control programs (including monitoring) to reduce the threat of vertebrate predators and pests on native vegetation and fauna. Action 4b. Implement new or expand on existing coordinated and long-term weed control programs focussing on protecting and enhancing high priority biodiverse coastal, estuarine and wetland vegetation communities. Action 4c. Reduce human related disturbance to breeding fauna and migratory species or marine or estuary vegetation in coastal and marine habitats through active community engagement and awareness campaigns. Action 4d. Support landholders to reduce nutrient and sediment loads, pollution, litter, plastics to improve aquatic habitat diversity and water quality. Action 4e. Support floodplain agriculture, fisheries and aquaculture to adapt to climate change and extreme weather. Action 4f. Improve and protect habitat and hydrological connectivity (for ecological function) between and within estuaries, floodplains and shorelines. Action 4g. Implement indicator (environmental sensor) or target species monitoring and surveys to support strategic actions, including citizen science. Action 4h. Support floodplain agriculture, fisheries and aquaculture to trial or adopt evidence based NRM practices that have both environmental and economic or financial benefits.

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