

# South East Region Natural Resource Management Evidence Plan

2022-2026



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### **More information**

Rebecca Bradley, Delivery Support Team, South East Local Land Services

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing October 2022. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Local Land Services or the user's independent adviser.

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# Executive Summary

The protection and enhancement of natural resources in South East NSW is a shared responsibility among a range of federal, state, local government and community organisations. Increased climate extremes and emergencies events in recent years have placed significant stress on the natural resources and land managers of South East NSW. We are reshaping our Natural Resource Management (NRM) services to meet these challenges and support our increasingly diverse customer base.

This evidence plan provides supporting materials that have guided the development of the South East NRM Plan including the objectives, key results, and actions. It includes an introduction (Section 1), a summary of processes completed to help support the development of the NRM Plan (Section 2), a summary of key evidence supporting the identification of priorities (Section 3), a reflection on how we know that identified activities are the right ones (Section 4), and how the plan is aligned with state and federal requirements (Section 5).

The NRM plan was developed in three stages. First, we reviewed our Catchment Action Plan (CAP) which is a comprehensive plan with fundamental elements and concepts that continue to apply to NRM in our region and updated some of the statistics and spatial data. Secondly, we consulted with stakeholders at six local area focussed online workshops to identify priorities from the ground up. At the workshops we: reviewed local evidence from the CAP and other sources; identified top threats and priority activities that address these threats; and identified the types of land managers in the area and how to best work with them. This information was analysed and compiled as a Appendix under the three themes that emerged: native vegetation, soils, and aquatic assets. The three goals in the South East NRM plan address these three themes. We also prepared additional Appendixs on climate change predictions and management, threatened species priorities and maps. Thirdly, we drafted the NRM Plan and had it reviewed by the South East LLS Board and the Australian Government (DAWE). The South East Board focussed on the strategic alignment of the NRM plan with the LLS business more broadly, and the DAWE review focussed on the alignment of the NRM plan with Australian Government priorities under our Regional Land Partnerships agreement.

We have followed processes and drawn on evidence that makes us confident that the goals, key results, and actions we have identified in our plan will deliver improved NRM outcomes for the South East region. Details on these processes and evidence are presented in this evidence plan.





# 1. Introduction

The protection and enhancement of natural resources in South East NSW is a shared responsibility. South East LLS NRM services support and enable land managers to better manage natural resources, to reverse their decline, and support land uses that are sustainable and productive<sup>1</sup>. We seek to do so in a collaborative way, working in partnership with land managers and stakeholders.

Recent years have highlighted significant stresses to the natural resources in South East NSW, prompting a review of LLS NRM priorities. We are reshaping our NRM services to meet these challenges. We are also responding to the need to service an increasingly diverse customer base, increasing demand in environmental and commodities markets for sustainable land management, the need to tightly target our resources for maximum impact, and working with changes in stakeholders, partners, and opportunities in NRM.

This evidence plan is a supporting document to the South East LLS NRM Plan. It outlines how we developed the NRM Plan, what information we used, how targets and actions will deliver outcomes and how the plan meets state and federal requirements.

South East NRM planning up to this point has been guided by our Catchment Action Plan<sup>2</sup> (CAP) specifically and South East Local Land Services Strategic Plan more broadly. The CAP was comprehensive, and many fundamental elements and concepts of the plan continue to apply to NRM in our region. The CAP is a foundational document for the development of our 2022-2026 NRM Plan. We built on it by updating data and statistics, identifying current organisational and stakeholder priorities, and emerging threats and opportunities through evidence reviews and workshops. We then provided our Board, NRM and Senior Managers to provide feedback on the draft plan before it was finalised.

Our South East NRM Plan 2022-2026 is aligned with the new LLS NRM Framework 2022-2026<sup>3</sup>. Three landscape themes emerged during the development of our plan: connectivity of native vegetation, soil health and aquatic assets. Additional themes of collaboration and focus on biosecurity risks also emerged and spanned all three themes. The key results, actions, and initiatives from the LLS NRM Framework were incorporated into our South East NRM Plan where applicable under our three landscape themes, thus aligning our plan to the framework.



- 1 State of NSW through Local Land Services (2021). Local Land Services NRM Framework 2021-2026
- 2 South East Local Land Services (2014). South East Catchment Action Plan 2014 - 2023
- 3 State of NSW through Local Land Services (2021). Local Land Services NRM Framework 2021-2026.



# 2.0 Processes used to develop the NRM Plan

## 2.1 Plan development

The steps taken in the South East in the development of the NRM Plan are illustrated in Figure 1 and were:

- Reviewing the South East Catchment Action Plan (CAP) and updating social and economic local area statistics and priority mapping.
- Collating and reviewing LLS planning, consultation, and evaluation documents to help identify revised priorities for key stakeholders, customers, and customer aspirations.
- Reviewing the Australian Government Threatened Species Strategy and Regional Land Partnerships priorities and identify priorities and actions for the south-east NSW landscape.
- Reviewing NSW Government threatened species priorities and actions for the south east NSW landscape and consideration of how LLS can contribute.
- Reviewing climate change predictions and adaptations relevant to south east NRM.
- Designing and running six local area online consultation workshops (October 2021) with South East LLS staff and stakeholders to review CAP priorities, identify priorities for the next 5 years, clarifying threats to local landscapes and identifying community engagement priorities.
- Collating and analysing workshop results and sharing with workshop participants for feedback.
- Drafting the NRM plan and providing the evidence plan for review by South East LLS Board, Senior Managers and NRM staff.
- Incorporating SE Board and other feedback into final Plan.

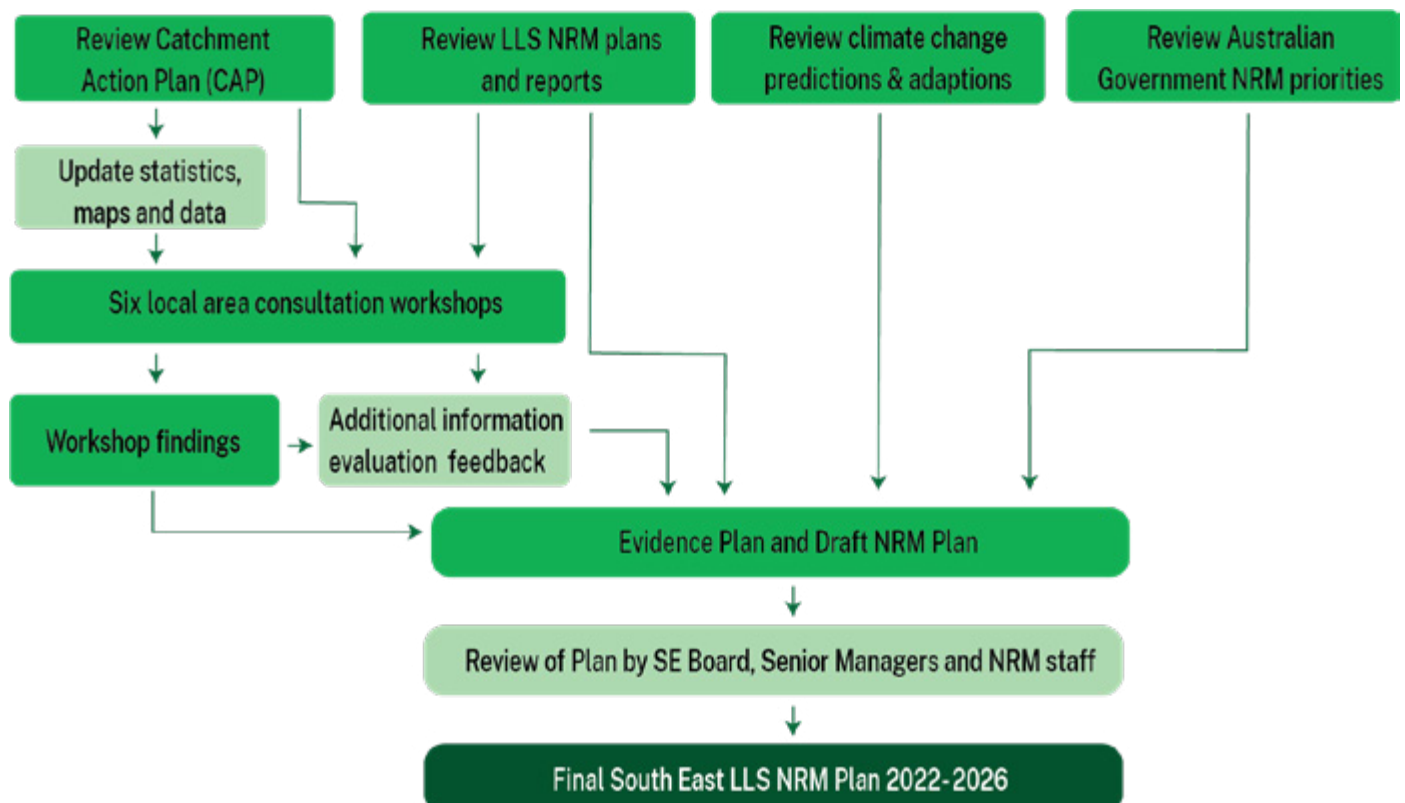


Figure 1: Process of NRM plan development



## 2.2 Knowledge gathering and evaluation

The South East LLS Catchment Action Plan 2014 – 2023 (CAP) was the foundational source of knowledge for the South East NRM Plan 2022-2026. The CAP is a comprehensive document providing a detailed picture of the South East region with strategies and priorities to maintain landscape resilience. It also established drivers of change through state and transition models. The South East region has distinct landscapes and communities on the coast, tablelands, and slopes. These landscapes, assets (including human, social, economic, and natural) and NRM programs are also described in the CAP.

A desktop review of climate change predictions for South East NSW and tools to manage natural resources under these changes was prepared as Appendix A.

A desktop review of the Australian Government's Threatened Species Strategy 2021-31 identified priority species found in South East NSW, threats to these species relevant to our region, and cost-effective management activities for these species and is presented in Appendix B.

Six community and stakeholder workshops were held reflecting our six local area landscapes in October 2021. Participants were provided with information on known threats to landscape health and priority areas for intervention with current data (including spatial) and statistics. They were then invited to share new plans, knowledge and information about projects and priorities. Workshop content and findings are documented in Appendix C. Analysis of workshop harvests led to the identification of the NRM Plan themes, key result areas and actions and initiatives.

South East area data, maps and statistics including land use, populations, economic considerations were updated with details provided in Section 3 of this Evidence Plan and Appendix D.

Workshop participants identified additional sources of information, as did our internal review process. These are incorporated into Sections 3.0 and 4.0 of this Evidence Plan and key references are listed in the bibliography.

LLS initiatives that informed our understanding of the aspirations of community and their priorities include the South East LLS Strategic Plan 2021-2026, South East LLS's NRM Evaluation, South East Musters, regular Landcare Community of Practice meetings facilitated by the South East LLS Regional Agricultural Landcare Facilitator, consultations with local Aboriginal community by our Aboriginal Community Support Officers, and ongoing project engagement collaborations by South East LLS NRM and Agricultural Advisory staff.





## 2.3 Assessment of key stakeholders and requirements

South East LLS currently have a formal arrangement with the Australian Government as their service provider, delivering projects on their behalf within South East NSW under the Regional Land Partnerships Program. The Australian Government are a key stakeholder for this plan, along with their priority outcomes. RLP Outcomes relevant to the South East NSW region include:

### Environment Outcomes:

**Outcome 1:** By 2023, there is restoration of, and reduction in threats to, the ecological character of Ramsar Sites, through the implementation of priority actions.

**Outcome 2:** By 2023, the trajectory of species targeted under the Threatened Species Strategy, and other EPBC Act priority species, is stabilised or improved. Also see Appendix B.

**Outcome 3:** By 2023, invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions.

**Outcome 4:** By 2023, the implementation of priority actions is leading to an improvement in the condition of EPBC Act listed Threatened Ecological Communities.

### Agriculture Outcomes:

**Outcome 5:** By 2023, there is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity, and vegetation.

**Outcome 6:** By 2023, there is an increase in the capacity of agriculture systems to adapt to significant changes in climate and market demands for information on provenance and sustainable production.

The South East LLS Community Participation Plan (2019) and Aboriginal Community Participation Plan (2019) prepared for the Regional Land Partnerships Program identified key stakeholders for NRM activities in South East NSW. These stakeholders have an interest in NRM activities and have interacted with South East LLS in the past. These plans also provide guidance on the support needs and aspirations of stakeholders who have participated in previous consultations, and opportunities for their engagement. This information was considered in the drafting of this plan.

1. Organisations and individuals invited to participate in our consultation process were included based on their knowledge of and active work with the community delivering NRM services. Regional stakeholders provided input into this plan via one of three opportunities:
2. Participation in the annual South East Landcare Muster (May 2021), an opportunity for groups and organisations to meet and highlight issues of importance to their operations and member base.
3. Participation in one of six online workshops conducted in October 2021. (Appendix C provides a summary of the feedback provided during these workshops including participants).
4. Provide feedback on the summary of NRM Plan Review consultation workshops (also incorporated into the summary of feedback provided in Appendix C).

For the purpose of the South East NRM Plan, and to provide an updated consultation opportunity, local South East LLS staff were asked to identify key stakeholders who represented and/or worked with a range of NRM focused organisations and individuals in their local area. These stakeholders were invited to attend workshops, and if they were unable to attend were consulted with directly. All interactions from June 2021 onwards were virtual due to restrictions associated with the COVID-19 pandemic.

Stakeholders are also able to provide comments and suggestions via regular contact with South East LLS staff in the delivery of our programs and partnerships and knowledge of customer aspirations have been included in the consultation process via involvement of key staff.

## 2.4 Community engagement

The term “community” in its broadest sense includes all people who live work, study, own property, conduct private or government business or visit the South East region.

South East LLS customers are a subset of the community and are defined as “any land managers within the region”. This includes both private and public land managers and does not differentiate between ratepayers and non-ratepayers.

Community engagement occurred through our stakeholders, acknowledging that the variety of groups consulted work with and/or represent various members of the community as described in Sections 2.2 and 2.3.

During the six online consultation workshops conducted in October 2021, participants were asked to reflect on the type of customers they support, what their current NRM support needs have been and recommendations for future engagement. This feedback has informed the NRM plan in the design of deliverables and actions and is summarised in Appendix C.

## 2.5 Internal governance and Board engagement

The South East LLS Board sets the strategic direction of land services in the region, which are aligned with state directions and are regionally relevant. The South East LLS Board recently developed the South East LLS Strategic Plan 2021-2026, which includes priorities and measures of success for NRM under the ‘Landscape Management Pillar’. These priorities and measures are incorporated into the South East LLS NRM Plan.

These strategies are operationalised under the direction of the South East LLS General Manager and his Management Team (SEMT). NRM services are coordinated by the Stakeholder and Investment Coordinator within the Delivery Support Team. The Stakeholder and Investment Team coordinate the Regional Land Partnerships agreement, the state funded NRM program, and other investments. They also facilitate NRM collaboration through coordinating regular meetings of NRM staff and liaising within LLS outside the region. NRM delivery staff report to Local Area Managers who typically have financial delegation for NRM projects and Aboriginal Community Support Officers report to the Stakeholder and Investment Coordinator.

The South East LLS Board members were informed of the NRM Plan preparation process and provided comment on the draft report.

## 2.6 Identification of threats and prioritization of actions

We used the South East CAP as a platform to guide decision making for prioritising activities that address key landscape threats. Drivers of change (threats and shocks) and management activities to increase landscape resilience were used to develop state and transition models (following the framework on Figure 2 and Figure 3) for:

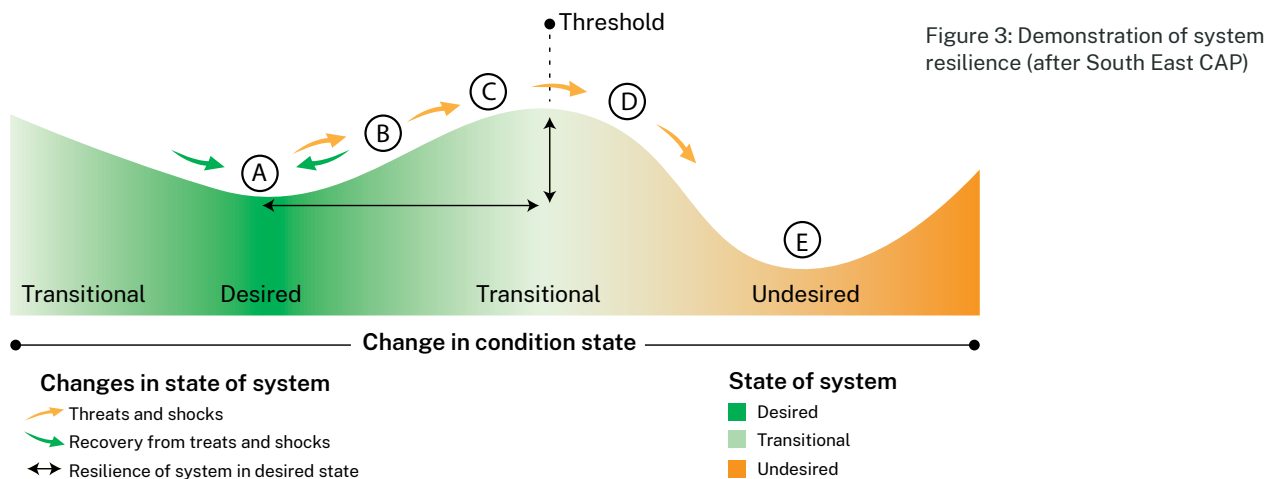
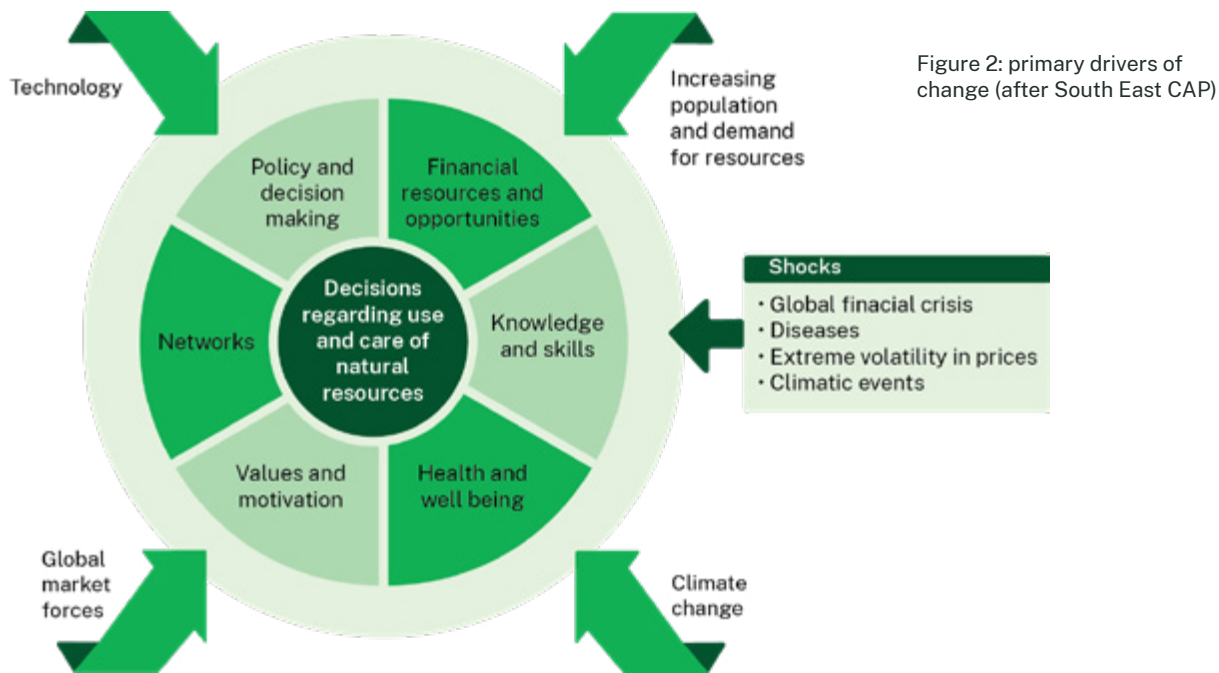
- Community (social capital)
- Aboriginal community cultural landscape
- Grazing landscapes

The transition models help to identify the key activities that will be most cost-effective to contribute to landscape health for priority themes and recognises the various factors that contribute to influencing change.

During the preparation of the South East NRM Plan 2022-2026 we also recognised that recent impacts of drought, bushfire and flooding have exacerbated some issues and highlighted the need for more immediate action, beyond the recommendations of the CAP. We have considered the landscape in this lens to provide higher priority to targeted activities that will address negative impacts on healthy landscapes and supporting sustainable land use as a result of these impacts.

We also considered the types of customers we support in South East NSW because primary drivers of landscape change are often influenced by social factors (Figure 2) throughout the NRM plan development process and to help identify and prioritise specific actions that have high probability for motivating and supporting land managers to contribute to healthy landscapes and sustainable land use.





## 2.7 Monitoring and evaluation

The monitoring and evaluation process for the NRM Plan has been established to assist in evaluating our progress in contributing to the South East region NRM Plan. It will allow us to see what is working and how, what isn't working and consider why and adjust our efforts as required.

The success of the South East NRM Plan is measured against three goals:

1. Customers are improving and restoring native vegetation.
2. Customers are protecting and improving soils.
3. Customers are improving and restoring riparian lands.

Performance assessment for each Key Result within these goals have been chosen to reflect:

- Good governance, collaboration, and adaptive management.
- Increasing land manager participation and adoption of recommended practice.
- an increase in awareness and collaboration to protect and enhance priority NRM assets.

They are also aligned with the LLS state-wide reporting framework performance measures.

Monitoring the progress of activities towards the NRM plan will be incorporated into LLS achievements reporting, with information collected and reported annually. This regular collection of information will allow for identification of progress and consideration of adjustments that may be required.

# 3.0 Information used to inform the NRM Plan

## 3.1 - Consultation Information

Feedback received from community associated with the drafting of the South East LLS Strategic Plan during 2021 identified our community's top three priorities as threatened species and habitat conservation, sustainable agronomy, and biosecurity (pest plants and animals) (South East LLS Strategic Plan supporting document).

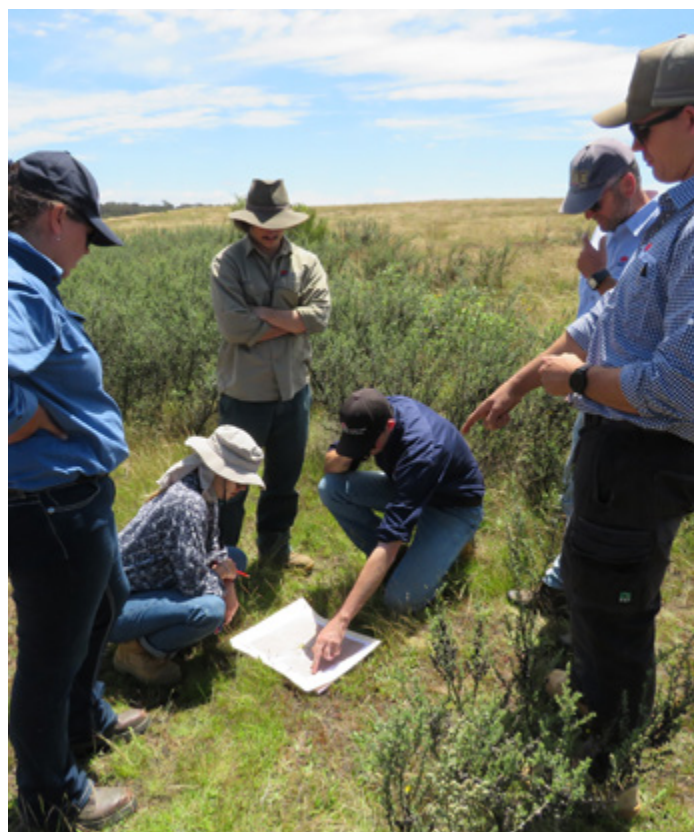
The primary consultation for the NRM Plan was through the six consultation workshops with full details in Appendix C. Participants (including LLS staff) provided feedback on top threats and key goals/targets for NRM activities in the future. Community groups, other government agencies and individuals discussed and captured future needs.

Common areas for consideration in future priorities to effectively address top threats to landscape health identified via these workshops were:

- Faith in our partnerships. Staff have identified the key to successful delivery of landscape scale programs is to include partnerships and collaboration. They value our role in ensuring collaboration of organisations to share knowledge, resources, and emerging ideas; in creating opportunity to form formal partnerships to ensure access to technical and specialised knowledge for a project; providing opportunity to work closely with community groups to deliver positive on-ground projects; providing opportunity to support Aboriginal groups design and deliver their own priority projects to care for country.
- Prioritising land manager education initiatives and opportunity to integrate messages with particular focus on biodiversity and landscape connectivity for the benefit of a range of threatened species; soil health to protect fragile and productive landscapes; focus on iconic threatened species and endangered ecological communities as a tool for landholder engagement.

- A need for continual improvement in our knowledge relating to opportunities for landholders such as carbon markets, impacts of climate change and connections to traditional ecological knowledge and cultural values in a landscape.
- The need to implement support to land managers to address large scale landscape issues, particularly those that have been exacerbated because of the bushfires including large scale erosion and loss of key connectivity habitat.
- The importance of incorporating pest animal management activities to complement NRM investment in landscape health.
- Concern for the impact of approved clearing activities on biodiversity values of the South East landscape.

Key landscape themes identified through the workshops were Native Vegetation Connectivity, Aquatic Assets and Soil Health (Appendix C). Actions identified under each theme are presented on (13-14p).





## Native Vegetation/ Connectivity

- Ensure good understanding of connectivity priorities in the landscape and educate land managers about this.
- Provide education and awareness raising opportunities for land managers regarding native vegetation values including threatened species and native grasses.
- Provide support to the implementation of projects that enhance connectivity and protect priority vegetation communities and threatened species habitat.
- Ensure a good understanding of the potential impact of climate change predictions and support land managers to prepare for this.
- Improve collaboration, knowledge, and resource sharing among stakeholders' groups.
- Provide support to community groups to implement their priority projects.
- Ensure NRM messages are incorporated into other functions supporting landscape health – agricultural advice, biosecurity support for example.
- Promote local leaders and innovators to enable peer to peer learning.
- Connect land managers to information to assist their decision making such as up to date research, information about climate markets and climate change predictions.
- Support Aboriginal Community to share traditional practices and participate in local projects, application of cultural burning as an ecological tool and implementing projects of their design.
- Increase land manager awareness of cultural values in the landscape.
- Ensure pest animal threat abatement activities are incorporated into projects to protect priority natural assets.
- Increase land manager capacity to manage invasive non-native grasses and promote a range of management activities including application of traditional ecological practices.

## Soil Health

- Increase land manager awareness of vulnerable soils, and how to manage soils to prevent erosion, maintain healthy soils and store carbon.
- Increase land manager awareness of the value of native pastures and how to manage them for good soil health, moisture retention, soil stability and weed suppression.
- Support land managers to implement grazing management practices that focus on retention of perennial groundcover and preparation for future drought.
- Support land managers to implement practices that protect vulnerable soils.
- Provide a role to improve collaboration, knowledge, and resource sharing among stakeholder groups.
- Provide support to community groups to implement their priority projects.
- Ensure NRM messages are incorporated into other functions supporting landscape health – agricultural advice, biosecurity support for example.
- Promote local leaders and innovators to enable peer to peer learning.
- Increase land manager awareness of cultural values in the landscape.

## Aquatic Assets

- Support education and awareness raising activities for land managers to understand the role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), resilience to erosion, water retention and their value and benefit.
- Educate and support land managers to manage riparian weeds including willows.
- Invest in large scale projects in high value waterways including improvements to threatened fish habitat, reducing threats to industries reliant on these natural resource assets or to demonstrate activities that prepare for climate change predictions.
- Provide a role to improve collaboration, knowledge, and resource sharing among stakeholder groups in South East NSW.
- Provide support to community groups to implement their projects.
- Ensure NRM messages are incorporated into other functions supporting landscape health – agricultural advice, biosecurity support for example.
- Promote local leaders and innovators to enable peer to peer learning.
- Connect land managers to information to assist their decision making.
- Support Aboriginal Community to share traditional practices and participate in local projects, application of cultural burning as an ecological tool and implementing projects of their design.
- Increase land manager awareness of cultural values in the landscape.
- Ensure pest animal threat abatement activities are incorporated into projects to protect priority natural assets.

## 3.2 – Science, economic and social information

### Regional profile

There is a high level of diversity across the landscape, environment and social dynamics within South East NSW and many land managers are reliant on the natural resource assets of the region to support their businesses. Since 2016, South East LLS has operated under a local area support model which allows each local area to tailor services to the socioeconomics of each area. Our six local areas are South Coast, Far South Coast, Goulburn, Yass, Monaro and Palerang (Figure 1).

A review of the socio-economic statistics for the South East Region identified that there have not been significant changes since the preparation of the South East Catchment Action Plan, with key (updated – from Australian Bureau of Statistics, (ABS 2017, 2021)) information in **Table 1**, **Table 2** and **Table 3**.

Figure 4: Local areas of the South East LLS region





**Table 1:** South East landscape use, local governments, and major centres

	South Coast	Far South Coast	Goulburn	Yass	Monaro	Palerang
Total area (km <sup>2</sup> )	5664	9,842	12,897	6515	15,345	5,319
Land management (% area)						
Conservation	81.6	82.3	55.5	41.4	77.7	64.8
Agriculture	10.1	14.8	39.5	54.7	21.1	27.3
Urban	7.8	2.8	4.8	3.8	1.2	7.7
Other	0.5	0.1	0.2	0.0	0.0	0.2
Local government areas						
	Kiama (5%)	Bega Valley (65%)	Goulburn-Mulwaree (25%)	Yass Valley (61%)	Snowy Monaro Regional (100%)	Queanbeyan-Palerang Regional (100%)
	Shellharbour (3%)	Eurobodalla (35%)	Upper Lachlan (55%)	Hilltops (39%)		
	Shoalhaven (80%)		Wingecarribee (21%)			
	Wollongong (13%)					
Major centres						
	Wollongong, Ulladulla, Nowra, Kiama, Shellharbour	Batemans Bay, Bega, Eden, Narooma	Bowral, Crookwell, Goulburn, Moss Vale	Booroowa, Yass	Cooma, Jindabyne, Bombala	Braidwood, Queanbeyan

**Table 2:** South East natural assets (ABS, 2021)

	South Coast	Far South Coast	Goulburn	Yass	Monaro	Palerang
Area of TSRs (ha)	47	581	1335	1220	3858	702
Number of estuaries	44	54	0	0	0	0
Number of threatened species	330	279	339	175	206	232
Number of TECs	10	6	9	3	6	7
Number of EECs	26	17	18	2	8	12
Length of coastline (km)	307	366	0	0	0	0
Total stream length (km)	17102	36508	39169	16425	45374	17759
Major river catchments	Clyde, Lake Illawarra, Port Hacking, Shoalhaven	Bega, Clyde, Deua/Moruya, Tuross, Towamba	Hawkesbury, Lachlan, Shoalhaven, Lake George	Lachlan, Murrumbidgee	Snowy, Murrumbidgee, Genoa, Tuross	Shoalhaven, Murrumbidgee, Lake George, Moruya, Clyde
Predominant landforms	Rolling hills and coastal alluvial plains, defined by the escarpment and cooler highlands area to the west	Beaches and rocky headlands, estuaries, and coastal lakes. Coastal floodplains rising to undulating slopes and ranges	Rolling undulating hills, scattered woody areas, and extensively cleared grazing lands	Rolling undulating hills, scattered woody areas, and extensively cleared grazing lands	Alpine and sub-alpine areas, rolling treeless plains, forest, and woodlands to the west and east on mountain ranges	Rolling undulating hills, scattered woody areas, and extensively cleared grazing lands

**Table 3:** Summary of Human Assets South East NSW (ABS, 2021)

	South Coast	Far South Coast	Goulburn	Yass/ Boorowa	Monaro	Palerang
Population	420,381	72,949	90,325	35791	20795	61100
Aboriginal population (% of total)	3.5	4.4	2.7	3.4	2.2	3.1
Median age	40.8	52.9	45.1	43.5	43.8	38.2
Unemployment (%)	6.8	6.3	4.7	4.3	3.3	4.0
Industry of employment sector						
1	Health care and social assistance	Health care and social assistance	Health care and social assistance	Public administration and safety	Accommodation and food services	Public administration and safety
2	Retail trade	Accommodation and food services	Retail trade	Health care and social assistance	Public administration and safety	Retail trade
3	Education and training	Retail trade	Accommodation and food services	Retail trade	Retail trade	Health care and social assistance
4	Public administration and safety	Education and training	Education and training	Agriculture, forestry, and fishing	Education and training	Construction
5	Administrative and support services	Public administration and safety	Public administration and safety	Accommodation and food services	Agriculture, forestry, and fishing	Professional, scientific, and technical services
Number of agri-businesses	795	772	1806	1468	720	560
Total area occupied by agriculture (km <sup>2</sup> )	570.6	1457.5	5092.2	3564.3	3236.6	1452.3
Local Aboriginal Land Councils	Batemans Bay, Illawarra, Jerringa, Nowra, Pejar, Ulladulla	Batemans Bay, Bega, Bodalla, Cobowra, Eden, Merrimans, Mogo, Wagonga	Batemans Bay, Cowra, Illawarra, Ngunnawal, Nowra, Onerwal, Pejar, Ulladulla	Brungle Tumut, Cowra, Ngunnawal, Onerwal, Pejar, Young	Bega, Bodalla, Brungle Tumut, Cobowra, Eden, Merrimans, Mogo, Wagonga	Batemans Bay, Bodalla, Cobowra, Mogo, Ngunnawal, Nowra, Pejar, Ulladulla, Wagonga

## Threats, drivers, and barriers for managing landscape health

The key threats to landscape health and drivers of change identified in the South East CAP (Table 4) have not changed, however in recent years there has been a greater emphasis on climate variability impacts (such as fire and drought). Emerging science and innovations to adapt to a changing climate are reviewed in Appendix A (and summarised later in this section).





Table 4: Key threats to landscape health and driver of change (after South East CAP)

Natural Resource Asset	Key Threat	Drivers of change
Native Vegetation/ Connectivity	<ul style="list-style-type: none"> <li>• Loss of key habitat and connectivity.</li> <li>• Land that is managed beyond its capability.</li> <li>• Inappropriate use of chemicals, cultivation, and fire.</li> <li>• Weeds, pest, and diseases.</li> <li>• Climate variability impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and skills.</li> <li>• Financial resources and opportunities.</li> <li>• Policy and decision making.</li> <li>• Social capital.</li> <li>• Values and motivation.</li> <li>• Climate change.</li> </ul>
Land and soils	<ul style="list-style-type: none"> <li>• Loss of ground cover.</li> <li>• Inappropriate use of chemicals, cultivation, and fire.</li> <li>• Land that is managed beyond its capability.</li> <li>• Weeds, pest, and diseases.</li> <li>• Climate variability impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and skills.</li> <li>• Financial resources and opportunities.</li> <li>• Policy and decision making.</li> <li>• Social capital.</li> <li>• Values and motivation.</li> <li>• Climate change.</li> </ul>
Aquatic assets	<ul style="list-style-type: none"> <li>• Land that is managed beyond its capability.</li> <li>• Invasive species and aquatic diseases.</li> <li>• Loss of native riparian vegetation.</li> <li>• Localised streambank or streambed erosion.</li> <li>• Reduction in large woody debris (rivers).</li> <li>• Sedimentation and reduced water quality.</li> <li>• Reduction in water quantity and habitat.</li> <li>• Climate variability impacts.</li> <li>• Barriers to water flow and/or fish passage.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and skills.</li> <li>• Financial resources and opportunities.</li> <li>• Policy and decision making.</li> <li>• Values and motivation.</li> <li>• Climate change.</li> </ul>

Key barriers that prevent land managers from making decisions to reduce key threats to landscape health were identified in the South East CAP (**Table 5**). A recent LLS customer benchmarking project (IPSOS 2021 Landholder Benchmarking Research 2021, prepared for NSW Local Land Services) interviewed 1902 land managers including those within South East LLS to investigate their access to and interest

in services provided by LLS. The survey sought comment on barriers to adopting best management practices. Time constraints continue to be a key barrier, with more than one in four (28%) reporting this as having a very negative or fairly negative impact on their property goals. In addition, one in four (25%) landholders report availability of skilled labour as a negative barrier and one in five consider their level of cash flow (23%) as a key barrier.

**Table 5:** Key barriers to decision making (after South East CAP)

Primary Driver	Examples of Issues Raised
Financial Resources and Opportunities	<ul style="list-style-type: none"> <li>Declining terms of trade.</li> <li>Debt to income ratios.</li> <li>Increasing land process.</li> <li>Land use conflict - prime agricultural lands, priority aquaculture areas, natural environments, and urban development.</li> <li>Farm profitability.</li> <li>Lack of critical infrastructure.</li> <li>High cost of effectively restoring degraded landscapes.</li> </ul>
Knowledge and Skills	<ul style="list-style-type: none"> <li>Managing land and water within its capacity.</li> <li>Land and water management practices.</li> <li>Knowledge and skills gaps.</li> </ul>
Health and Wellbeing	<ul style="list-style-type: none"> <li>Ageing farmers and Landcare volunteers.</li> <li>Farm succession issues.</li> <li>Available Time.</li> </ul>
Values and Motivation	<ul style="list-style-type: none"> <li>Impact of historic land use.</li> <li>Community demand to live in certain location.</li> <li>mixed demographics and values set.</li> </ul>
Networks	<ul style="list-style-type: none"> <li>High turnover in land ownership.</li> <li>High rates of absentee landholders.</li> <li>Disconnect between land managers and water users.</li> <li>Decision making in isolation.</li> </ul>
Policy and Decision Making	<ul style="list-style-type: none"> <li>Misalignment of plans and policies.</li> <li>Changing priorities for investment.</li> <li>Poor implementation of planning frameworks.</li> <li>Absence or decline in extension support.</li> <li>Pressure from population growth.</li> <li>Pressure on natural resources.</li> <li>Over allocation of water.</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>Changes to rainfall patterns/temperature.</li> <li>Sea level rise.</li> <li>Increased frequency of extreme climatic events, changes to weed distribution, plant and animal range and distribution.</li> </ul>



## Climate change predictions and adaptations for NRM

Temperatures in the Illawarra, South East and Tablelands Regions have been increasing since about 1960, with higher temperatures experienced in recent decades (NSW OEH 2014a, b). The warming is predicted to be on average about 0.6°C warmer soon (2020 – 2039) increasing to about 2 °C in the far future (2060-2079) in the South East and Tablelands and increasing by 1.9°C in the Illawarra.

There will be more hot days and fewer cold nights. In the South East and Tablelands, rainfall is projected to decrease in spring and winter and increase in autumn. In contrast in the Illawarra, rainfall is predicted to decrease in winter and increase in summer and spring. Average fire weather and number of days with severe fire weather is predicted to increase in summer and spring.

An integrated regional vulnerability assessment of South East NSW identified areas of regional vulnerability as a result of climate change impacts and offer a range of strategies, many of which are relevant to this NRM Plan and are summarised in Appendix A.

A series of tools are available for land managers, to assist them in adapting to a changing climate and provide support for the implementation of this NRM Plan and are discussed in further detail in Appendix A. These decision-making tools can support Project Officers in the design and delivery of climate ready projects, including:

- Actions that improve carbon sequestration and reduce emissions in agriculture.
- Design of revegetation activities to be climate ready (climate-ready revegetation – a guide for natural resource managers.
- Freshwater biodiversity and climate change – guides to improve the long-term capacity of freshwater ecosystems to adapt and reduce biodiversity loss.
- Climate Refugia NSW, supporting decision making to identify probably refugia from climate change.

## Social information

### Market segmentation

South East LLS have completed customer segmentation analysis for the South East Region (Circ consulting, 2020) and have identified a range of potential ‘customer types’ and highlighted likely motivations for engaging with South East LLS services. These customer types were discussed during the 6 online consultation meetings to identify

recommended ways to improve engagement in the future. These are discussed in Appendix C.

This information, confirming that support to businesses reliant on natural resources within the south east is a key consideration in the development of NRM priorities and that there are a range of barriers to land managers making land management decisions that will reduce key threats to landscape health. Consultation indicating that these barriers may be overcome by providing access to credible information, opportunities to link activities to financial benefits and provision of support for labour and financial incentives to complete activities.

### Supporting Aboriginal Community to care for country

Key documents that help identify priorities in supporting Aboriginal community include the recently completed LLS Aboriginal Engagement Strategy (2020) and the South East LLS Aboriginal Engagement Plan (draft).

The LLS Aboriginal Engagement Strategy (2020) has been prepared to assist Local Land Services improve their services, by developing a deeper understanding of Aboriginal communities and integrating this knowledge into our work through creation of partnerships based on co-design and collaboration.

Principles consistent with the Our Place on Country Strategy, the LLS Aboriginal Engagement Strategy has six key principles including 1) Acknowledge, value and embed Aboriginal cultural knowledge and world views in program delivery and business as usual.; 2) Respect Aboriginal people’s rights, obligations and roles as Traditional Custodians of the land, sea and waterways; 3) Promote and strengthen connections to culture and identity; 4) Prioritise economic independence for Aboriginal people through increased employment and enterprise development; 5) Establish and maintain meaningful ongoing relationships with Aboriginal people and Country; 6) Recognise appropriate engagement and connection with Aboriginal people and Country as core to our service delivery.

The South East LLS Aboriginal Engagement Plan (2019) identifies a vision of Aboriginal communities Caring for Country, reviving and practising culture. Aspiring to supporting Aboriginal communities managing Country to protect and promote

Aboriginal cultural heritage sites and values, with Traditional Ecological Knowledge acknowledged and incorporated in land management programs to achieve biosecurity, agricultural production, and natural resource management outcomes as defined within the South East LLS Strategic Plan.

The South East LLS Aboriginal Engagement Plan also aspires to:

- **Enriching relationships** – By respecting and having knowledge of Aboriginal people and their cultures, South East Local Land Services staff, customers, and contractors will deepen their connections to enable the provision of culturally respectful and appropriate services.
- **Enhancing respect** – Respect for Aboriginal communities enhances relationship, embraces diversity, and promotes harmony.
- **Creating opportunities** – Providing opportunities for Aboriginal people to help protect and strengthen Aboriginal cultural heritage conservation, share traditional land management and care for Country.

Aboriginal communities are present across the South East NSW, represented by various groups including, but not limited to Local Aboriginal Land Councils, Elders groups, traditional owners, family groups and individuals. Providing genuine support to Aboriginal community requires open and regular contact with these representative groups, providing opportunity for co-design of projects. Recent Bushfire Recovery project investment in South East NSW has provided this opportunity and assists in identifying priority activities to support these communities including training, support for projects and for the protection of cultural values in South East NSW. Information to support decision making includes recently completed survey of training support needs, preparation of digital support and record keeping tools for Aboriginal community, along with conversations to identify and co-design projects.

## Natural assets

### Native Vegetation and connectivity

The Department of Infrastructure, Planning and Environment regularly review the change in area of woody vegetation across NSW, monitoring the loss of vegetation cover associated with agriculture, forestry, and other infrastructure activities. Their most recent report, completed in 2019, reveals trend across NSW

in reduction of woody vegetation (**Figure 5**). The report identifies woody vegetation clearing across the state attributed to both agricultural and forestry activities and did not include factors associated with bushfire. The clearing figure for 2019 exceeds the 2009-2017 average highlighting an alarming trend in declining area of remnant native vegetation. This image provides a summary of clearing impacts across NSW, with the report indicating this is a common trend in South East NSW, highlighting the importance of land holder education in the value of native vegetation in their landscape.



Figure 5: State-wide landcover and tree study (NSW DPIE)

A range of digital tools are available within South East NSW to assist in identifying priority areas in the landscape to focus efforts to maximise protection and enhancement of native vegetation including protection of threatened species habitat. Digital information referred to in this NRM planning includes:

- Current Bionet records for threatened species including matters of national significance, TEC's and EECs.
- Landscape connectivity modelling, predicting areas of core and linking habitat across South East NSW, which can be filtered for different forest landscapes such as open woodlands.



## Soil Health

### Strategies for soil health

The Australian Government have set a goal in the National Soils Strategy of: *“Australia’s soils being recognised and valued as a key national asset, ensuring it is better understood and sustainably managed to benefit and secure our environment, economy, food, infrastructure, health, biodiversity and communities now and into the future”*(National Soils Strategy).

The National Soils Strategy 2021-2041 provides goals and objectives to work towards including:

**Goal 1:** Prioritise soil health including 1a recognise the value of soil; 1b strengthen leadership and partnerships to address national soil priorities; 1c Advocate the importance of soil; 1d improve Australia’s international leadership in soil knowledge, awareness, and management.

**Goal 2:** Empower Soil innovation and stewards including 2a Promote soil stewardship; 2b Optimise soil productivity, sustainability, and resilience; 2c Help protect and enhance Australia’s environment through effective soil management; 2d Increase and maintain soil organic carbon.

**Goal 3:** Strengthen soil knowledge and capability; including 3a increase soil knowledge for better decisions; 3b measure benefits of improved soil management; 3c Make Australian soil information and data available; 3d Build and retain diverse soil expertise.

These goals help to provide priorities for consideration in the development of the South East NRM Plan and the design of priority activities supporting land managers understand, value, and improve soil health.

### Soil carbon

Soil carbon is a key indicator of soil health. While it is not a plant nutrient, carbon is present in every living organism and is a dominant component of organic matter. Organic carbon is present in many different forms in the soil involved in all aspects of soil fertility and health.

The turnover of carbon in productive environments is rapid. As the productivity, as indicated by growth of plant material, and net primary production of carbon decreases the soil organic carbon pool increases. This indicates a decreasing rate of soil carbon turnover in less productive environments. However, those soils have a high capacity for storage of soil carbon and grassland soils store more soil carbon than other ecosystems (**Table 6**). For further information refer to *Soil Carbon and Organic Matter Fact Sheet 6 (LLS 2020)*.

### Strategies for farmers to build soil organic carbon

Soil Organic Carbon (SOC) plays an important role in stabilising soil structure, holding and releasing plant nutrients and contributing to soil water holding capacity. SOC is also a large sink of carbon with potential to mitigate climate change by storing carbon in the soil that would otherwise be warming the atmosphere. Increasing SOC has production benefits, as well as opportunities to diversify income through carbon markets and sustainability credentials.

Adding carbon, reducing losses of carbon, and protecting existing carbon in the soil are the three main pathways for increasing SOC. Management strategies to increase SOC act on these pathways by enhancing the inputs and minimising the losses.

**Table 6:** Typical distribution of carbon in different environments (after LLS 2020)

Environment	Net primary production of C(t/ha/year)	Soil organic carbon pool (t/ha)
Rainforests	11	80
Temperate forests	6	100
Grasslands	3	150
Desert	0.05	1

There are ten ways that farmers can build soil carbon (**Figure 6**) with further information available in *Ten Ways to Build Soil Carbon* (LLS 2021).

	Adding carbon to the system	Reducing carbon losses from the system	Protecting carbon in the system
<b>1) Pasture management</b> Optimise pasture growth through species selection and input management.	More biomass production.	Good ground cover/less soil erosion.	Good ground cover/less soil erosion Deep roots adding carbon at depth. Improved soil structure. Nitrogen available for microbial population (from legumes).
<b>2) Grazing management</b> Optimise the intensity and timing of grazing (and rest).	More biomass production.	Good ground cover/less soil erosion.	Deep roots adding carbon at depth. Improved soil structure. Diverse microbial population.
<b>3) Cover crops( incl. green manure and inter-row crops)</b> Grow crops to keep the soil covered in between mail crops.	More biomass production.	Good ground cover/less soil erosion.	Nitrogen available for microbial population (from legumes).
<b>4) Pasture cropping</b> Sowing winter cereals into perennial pastures.	More biomass production.	Less soil disturbance.	Improved soil structure.
<b>5) Changing crop-pasture sequence</b> Increase the frequency or duration of pastures in a cropping rotation.	More biomass production, especially in roots.	Less soil disturbance.	Improved soil structure. Nitrogen available for microbial population (from legumes).
<b>6) Adding lime gypsum, nutrients</b> Optimise plant growth by managing chemical and physical soil constraints.	More biomass production.		Nitrogen available for microbial population.
<b>7) Adding carbon-rich materials</b> Compost, manure, biosolids.	Addition of organic matter More biomass production.		Addition of microbes.
<b>8) Minimising or strategic tillage</b> Eliminate or reduce mechanical cultivation of the soil.		Less soil disturbance.	Improved soil structure.
<b>9) Stubble retention</b> Retain crop residues on the soil surface.	Remove less biomass from system.	Surface protected by residues from erosion.	
<b>10) Restoring degraded sites</b>	More biomass production.	Good ground cover/ Less soil erosion Less soil disturbance.	Improved soil structure.

Figure 6: Overview of 10 ways to build soil carbon (after LLS 2021)

## Aquatic assets

### Wetlands of International Importance (Ramsar)

One wetland of International Importance (under the Ramsar Convention) is present within South East NSW, being Blue Lake, which lies within the alpine region of NSW within Kosciuszko National Park 3 km north west of Charlotte Pass. The Lake is in a near natural state and is maintained by DPIE, National Parks and Wildlife Service. Current management issues for this listed wetland are linked to biosecurity risks associated with recreational uses of the area and encroachment of weeds. Support for activities to reduce biosecurity risks is of high priority.

### Identifying Priority Waterways

Identifying priorities for protection of riparian values and the management of threats to waterways in the South East Catchment Action Plan referred to the use of the Riverstyles mapping framework. Since the development of the Catchment Action Plan, prioritisation process for riparian health has been developed by DPIE, applying the High Ecological Values Aquatic Ecosystems (HEVAE) framework to identify surface and groundwater systems with high conservation values, presenting them within a spatial mapping tool.



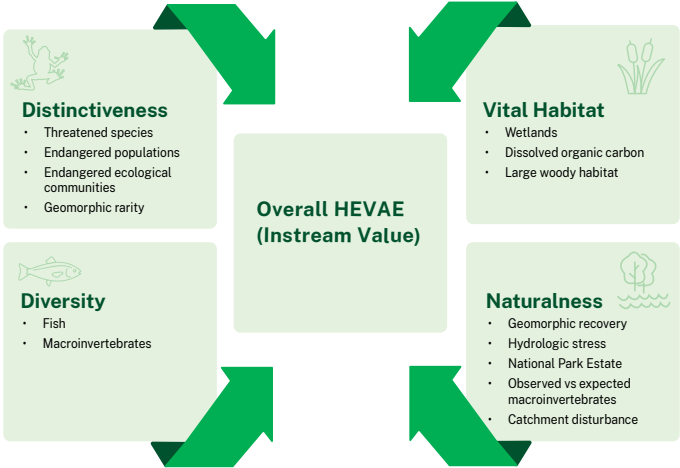
This prioritisation method, a national framework, goes further than the Riverstyles methodology assigning an instream value to a length of river to determine the importance of each river relative to others. Identifying rivers of high importance or high value allows for their protection and enhancement.

DPIE has collated information from across government agencies to improve the assessment, and we can now view the instream value of inland freshwater rivers and coastal rivers above the tidal limit using **DPIE's HEVAE** mapping tool. Criteria used to assess river values using HEVAE are shown in Figure 7.

Referring to this assessment tool can assist in identification of higher priority waterways for future priority interventions, with priority reaches identified for South East NSW and highlighted in the mapping (Appendix D).

Further supporting information can be found in the recent study South East Catchment and Waterways Bushfire Recovery Plan. Completed by Alluvium (2021) on behalf of Shoalhaven Eurobodalla and Bega Valley Councils this study models precited impact of bushfire followed by higher-than-average rainfall on the stability of coastal waterways including the Shoalhaven River and south.

This modelling has identified several priority sites in needs of immediate intervention to protect a range of values including water quality, habitat specific to rivers and estuaries, protect Aboriginal cultural and heritage values and ensure the catchments provide for economic values, uses and opportunities. These values reflect the values of LLS and therefore provide guidance to recommend priority areas for intervention within this plan. Priority waterways are summarised as;



**Figure 7:** The four HEVAE criteria and associated attributes used to assess NSW catchments

Recommendations for key activities to contribute to rehabilitation within the region are focused on the re-establishment of native vegetation, with suggested strategies including:

- Stock exclusion along riparian corridors, allowing for revegetation of banks.
- Weed control of invasive weeds such as *Rubus fruticosus*, *Lonicera japonica*, *Delairea odorata* and *Zantedeschia aethiopica* in severely fire-affected areas, to promote resilience of endemic species.
- Vertebrate pest control to compliment revegetation activities.
- Plantings of additional endemic species to promote long-term resilience, where there is low diversity of regenerating species.
- Planting endemic grass species (e.g., *Phragmites* sp., *Carex* sp. or *Juncus* sp.) directly into sediment slugs when flows are low, to stabilise sediment loads and slow their release into estuarine systems.

LGA	# Priority waterways identified	Length priority waterways (km)	Catchments containing priority waterways
Shoalhaven City Council	18	55	Clyde river, Conjola Lake, Currumbene Creek, Shoalhaven River, St Georges basin
Eurobodalla Council	40	132	Clyde River, Moruya River, Tuross river, Wallaga Lake
Bega Valley Shire Council	20	127	Towamba River, Tuross River, Wallaga Lake, Wonboyn River

## Threatened ecosystems and species

### Australian Government priorities

The Australian Government Threatened Species Strategy has identified 100 species as having priority for protection across Australia. Analysis of these species (in Appendix B) found that eighteen are likely to benefit from management intervention in South East NSW. These are summarised in Table 7.

**Table 7:** Threatened Species Strategy species occurring in South East NSW and potential actions for protection/ enhancing populations

Species	Location in South East NSW	Threats	Cost effective management activities
<i>Phascolarctos cinereus</i> Koala (Qld, NSW, ACT)	Bungonia, Numeralla, Nullica and Murrah ARKS plus scattered populations predominantly in the east.	Increased intensity and frequency of drought and high temperatures, disease, habitat loss and mortality due to vehicles and dogs.	Private land management incentives to encourage natural regeneration and tree planting, engaging with community through koala monitoring programs, dog management and habitat requirements, partner with NSW Koala Strategy.
<i>Pomaderris walshii</i> Carrington Falls Pomaderris	Only known from upper catchment of Kangaroo River in two small populations. Total area of occurrence about three lineal kilometres including private land.	Lack of knowledge regarding potential cause of species decline; risk from catastrophic events.	Stock fencing, fire planning, augment population with ex-situ material, negotiate land management agreements and monitor effectiveness of activities.
<i>Thinornis cucullatus</i> Hooded Plover (eastern)	On or near Sandy beaches from Jervis Bay south.	Disturbance from humans, domestic dogs, predation by foxes and native Corvids.	Continued support of shorebird ranger program to reduce human impacts, fox control programs, working in partnership with NSW SOS program.
<i>Lathamus discolor</i> Swift Parrot	Non-breeding habitat (Feb - Oct). Mostly on the coast and SW slopes.	Habitat loss and fragmentation. Habitat mostly outside conservation reserves.	Private land management incentives to encourage natural regeneration and tree planting and encourage community involvement in annual surveys in partnership with NSW SOS program.
<i>Anthochaera phrygia</i> Regent Honeyeater	Non-breeding habitat. Flagship woodland bird of dry open forest and woodland. Occasionally forage in flowering coastal swamp mahogany & spotted gum forests.	Habitat degradation notably box gum woodlands and competition with larger more aggressive honeyeaters.	Private land management incentives to encourage natural regeneration, tree planting, and provide information on ecology and conservation requirements for the species.
<i>Botaurus poiciloptilus</i> Australasian Bittern	Known to use coastal wetlands in non-breeding season with tall dense vegetation, particularly bullrushes. Only 7% of distribution occurs on reserves in NSW.	Clearing or modification of wetlands for urban or agricultural development and extraction for irrigation.	Work with Birdlife Australia and NSW SOS program to work on priority sites to improve wetland management, manage runoff and targeted research for non-breeding habitat use.

Species	Location in South East NSW	Threats	Cost effective management activities
<i>Galaxias tantangara</i> Stocky Galaxias	Known from one location on Tantangara Creek, Kosciuszko NP.	Predation by trout and loss of riparian vegetation. Known site was fire affected. Current recovery project aims to create additional habitat.	Work on stage 2 of the Stock galaxias recovery project: - expand Eucumbene Borrows restoration work; - additional surveys to continue post-fire monitoring / progression of identifying alternative sites; - schedule 1st translocation into Stage 1 Dam at Eucumbene, either from Tantangara Ck or captive.
<i>Hippocampus whitei</i> White's Seahorse	St Georges Basin & possibly Lake Illawarra records (Conservation Assessment 2020). Associated with Cauliflower Soft Coral.	High impact of habitat loss (soft corals, sponges and sea grass). Can use artificial habitat.	Further surveys required in this region (TSSC 2020, p. 3).
<i>Dendronephthya australis</i> Cauliflower Soft Coral	Found for the first time in Jervis Bay in 2018 (Conservation Advice). Confined to estuarine environments at depths 1-18m.	Sand inundation, damage from boat anchoring and moorings, natural predation by the sea slug.	Conduct further surveys based on habitat suitability models. Partner with NSW DPI (Fisheries).
<i>Rhodomyrtus psidioides</i> Native Guava	1 record in SE NSW (source DPIE, 2011). Coastal and sub-coastal littoral, temperate and sub-tropical rainforest.	It is likely that historical land clearing has led to decline in abundance of the species from the south east. Highly susceptible to myrtle rust.	Extend its geographic range southward. Support propagation and ex-situ conservation. Support techniques to increase resistance to Myrtle Rust. Support sharing of knowledge of traditional therapeutic use (treatment of wounds/anti-microbial).
<i>Litoria raniformis</i> Growling Grass Frog, Southern Bell Frog	Once distributed on the southern slopes of the Monaro. Not currently known from SE NSW region. Usually found in or around swamps or billabongs along floodplains and river valleys.	removal of ground cover, lack of appropriate flooding regime, predation on eggs and tadpoles from exotic fish, possibly Chytrid, chemicals.	None known for South East.
<i>Burramys parvus</i> Mountain Pygmy-possum	Entirely within Kosciuszko NP.	Habitat loss, fragmentation and degradation from ski resort development, rising temperatures and subsequent loss of snow cover due to climate change, fire.	Partner with NSW SOS program.



Species	Location in South East NSW	Threats	Cost effective management activities
<i>Pseudophryne corroboree</i> Southern Corroboree Frog	Entirely within Kosciuszko NP.	Chytrid fungus, damage to breeding sites, climate change.	Partner with NSW SOS program.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Known populations in Bungonia and Monaro IBRA regions and Nattai.	Predation by foxes, competition with feral goats; small population risks.	Manage the impact of pest animals and monitor population response.
<i>Eucalyptus imlayensis</i> Imlay Mallee	Mt Imlay National Park near Eden (80 plants).	Lack of knowledge regarding potential cause of species decline; risk from catastrophic events.	Partner with NSW SOS program.
<i>Pseudomys novaehollandiae</i> New Holland Mouse	Known to occur between Batemans Bay and Nowra and Southern Highlands and predicted to occur between these areas (NSW OEH Species Profile).	Loss and modification of habitat, inappropriate fire management, predation by foxes and cats and climate change.	Recommended for post-fire conservation status assessment (Legge et al 2021). Review cost-effective management activities once new assessment complete.
<i>Neophema chrysogaster</i> Orange-bellied Parrot	Infrequent non-breeding on coast (Recovery Plan 2016). Saltmarshes, dunes & adjacent areas within 10km of the coast and more than 2km from developed areas.	Habitat loss (in SE NSW).	Coastal restoration works away from developed areas may contribute to improving the trajectory for this species.
<i>Numenius madagascariensis</i> Eastern Curlew	Non-breeding, coastal, particularly ICOLs. Breeds in Russia and NE China.	Development pressure and human disturbance in foraging sites, hydrological changes to ICOLs.	Continued support of shorebird ranger program to reduce human impacts, and manage development pressure.

### Threatened Ecological Communities

Further threatened species values present within the South East Region are as diverse as the landscape and include a range of Endangered Ecological Communities, Threatened Ecological Communities and threatened species in addition to those identified under the Threatened Species Strategy. Current knowledge of the known and predicted locations of these landscape values exists in digital form, along with recommended actions for their protection which can provide support to increasing the priority of on-ground activities that complement the protection and/or enhancement of these values.

Based on threats identified at a landscape scale, recommendations of threatened species advisors and success of past projects, top priorities for future activities should be focused on:

- Increase land manager awareness of threatened species values on private property.
- Provide assistance to land managers to protect and enhance habitat for threatened species.
- Implement landscape scale pest animal management programs where pests have been identified as having a negative impact on threatened species or their habitat.

## World Heritage

One identified World Heritage Area is located within South East NSW, being the Greater Blue Mountains World Heritage Area, including 1 million hectares of national park and wilderness dominated by temperate eucalypt forest. The Management Vision for the area is “That the outstanding natural and cultural values and integrity of the Greater Blue Mountains World Heritage Area are identified, protected and conserved and presented in an ecologically sustainable and culturally appropriate manner. The Greater Blue Mountain World Heritage Area Strategic Plan (2009) identifies a range of threats to the integrity of the area including uncontrolled or inappropriate use of fire, inappropriate recreation and tourism invasion by pest species, loss of biodiversity and geodiversity, impacts of human induced climate change and lack of understanding of heritage values. The plan also recognises the challenges associated with the number and diversity of neighbours.

The World Heritage Area is managed by DPIE, National Parks and Wildlife Services. However, priority management actions identified in the Strategic Plan have been identified to support the protection of the World Heritage area, advocating for supporting neighbouring land managers reduce threats to the area via supporting complementary land management activities; increased community awareness of and appreciation for the values of the World Heritage Area and neighbours and community are included in opportunities to protect and enhance these values.



## Other LLS related services

### Agriculture

Following consultation with Agricultural advisory specialists across NSW, Local Land Services have recently prepared the LLS Agricultural services framework, guiding recommended actions for achieving the goal “to increase on farm productivity, sustainability and resilience to climate variability and enhancing the condition of natural assets”. There are a range of recommendations in this paper which help identify priorities within this NRM plan.

Agriculture businesses and industries contribute significantly to the prosperity of local communities and the NSW economy. Data from the Australian Bureau of Agriculture and Resource Economics and Sciences puts the gross value of agricultural production in New South Wales at \$11.7 billion in 2018/19, which was 19 per cent of the total gross value of agricultural production in Australia (\$60 billion).

Over the last two decades, Local Land Services’ (and those of its predecessors) have been instrumental in increasing on farm productivity and sustainability: Our agriculture services assist producers and industries meet important challenges facing the agricultural sector. This has been achieved through our highly skilled and experienced Agriculture services staff. The LLS Agricultural services framework identifies the priority to continue to invest in the development and training of staff to ensure that producers receive the best quality advice and service.

This framework recommends that priority will be given to:

- **Sustainable productivity:** To support agricultural enterprises to remain viable amid increasing land and production costs, to make decisions that will lead to increases in productivity in a sustainable way that does not deteriorate nature assets.
- **Natural assets:** To support agricultural businesses recognise the financial benefits of maintaining sustainable environmental management through the production and promotion of sustainable products.
- **Risks associated with climate variability and market disruption:** Supporting producers to manage the risks associated with major climate disruptors to decrease impact on on natural assets, the wellbeing of people and communities, recovery time and productivity.

## Biosecurity

Under the Biosecurity Act 2015 framework, biosecurity is a shared responsibility where government, industry, and the people of NSW work together to protect the economy, environment, and community from the impacts of pest animals. Public and private land managers all have a shared and equal responsibility to eliminate and minimise biosecurity risks across land in NSW.

A key focus of the South East Regional Strategic Pest Animal Management Plan is improved pest animal management outcomes via enhanced engagement, participation, and delivery of coordinated pest animal management activities across all land tenures. This plan provides guiding principles for effective pest animal management at a landscape scale. This plan identifies those priorities for management and protection of assets in South East NSW includes deer, pig, fox, feral cat, wild dog, rabbit and goat. Many of these species have been identified as key threats to the protection and enhancement of threatened species and/or habitat values and actions to manage these pest species will have multiple benefits.

The success of pest animal management in South East NSW is measured against the four outcomes of the RSPAMP:

- **Outcome 1:** The South East RSPAMP is effective in supporting the community to reduce pest animal impacts.
- **Outcome 2:** The South East community shares the responsibility for pest animal management.
- **Outcome 3:** The impact of priority pest animals on priority assets is reduced, and their spread contained.
- **Outcome 4:** New pest species in the region are detected and incursions are eradicated.

Pest animal distribution maps are available at <https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/publications/distribution-maps-for-vertebrate-pests> and are based on state-wide data compiled from reports submitted and gathered. Reference to this mapping, along with regular consultation with community helps to identify areas where pest animal management activities will complement the protection and enhancement of priority natural assets.

Further knowledge regarding the location and movement of pest animals within South East NSW are also being gathered by South East LLS on a regular basis via the delivery of our projects and support to customers. This information will continually inform and support decisions to identify priority activities to reduce the threat to priority natural assets.

NSW DPI recommends that best practice pest animal management programs should involve:

- a focus on reducing pest animal impacts rather than just removing pest animals.
- managing actual rather than perceived impacts.
- strategic management (e.g., sustained ongoing management rather than sporadic 'crisis' management).
- coordinated group management rather than individual management.
- integrated use of approved management techniques that are the most effective, target specific, humane and safe ones that are available.

These principles should continue to be adopted within the South East NRM Plan to focus on integrating priority pest animal management activities where they are identified as having an impact on a priority asset, to encourage a landscape scale approach to pest animal management and apply a range of suitable management tools.





## Weed management

The South East Regional Weed Management Plan (2017-2022) provides guiding principles for weed management that have been agreed upon by various stakeholders working in this space.

The Vision for this plan is *Government, industry and the people of the South East working together to protect the environment, economy and community from the negative impacts of weeds.*

The goals, objectives and outcomes for this plan align with those of the NSW Biosecurity Strategy 2013-2021 and the South East Local Land Services Local Strategic Plan 2016-2021, which provided the overarching policy framework.

The goals of the plan include:

- Responsibility for regional weed biosecurity is shared by the whole South East community.
- Weed biosecurity supports profitable, productive, and sustainable primary industries.
- Weed biosecurity supports healthy, diverse, and connected natural environments.
- Weed biosecurity is supported by coordinated, collaborative and innovative leadership.

Completing a review of the South East landscape, land uses, stakeholders' interests and legislative requirements, this plan identifies priority weeds for the South East LLS region based on a rigorous weed prioritisation and expert review process. Priority species are managed based on the Biosecurity framework of prevention, eradication, containment, and asset protection and provides guidance in considering invasive species that should be targeted as part of NRM programs and key messages that should be provided to land managers as part of their projects. For example, priority is given under this plan for the management of African Lovegrass under the asset protection category, identifying the importance of reducing the impact on assets of high environmental, economic or social value from this species. Further guidance for location specific programs can be found in LGA weed management plans.

## 3.3 – Information from stakeholders and the community

In addition to the NRM Plan review consultation workshops, South East LLS regularly consult with community and stakeholders via the delivery of programs and via formal networking mechanisms such as the South East Muster, South East Regional Community of Practice, and membership to a range of community groups.



# 4.0 How our targets and actions will deliver the goals/outcomes

Consideration of the above information provides clear direction for Objectives and Key results to be included in the South East NRM Plan, along with guidance in priority actions to successfully achieve these.

Consultation with staff, customers and stakeholders identified a range of priority themes. In consideration of the actions required within these themes, goals can be condensed to three distinct landscape themes, relevant to South East NSW and include:

- Native Vegetation
- Soils
- Aquatic assets.

The key to our success is in identifying the priority activities, priority locations across South East NSW and in delivering the right mix of services that support improved decision making in land managers across NSW.

The transition models prepared within the South East CAP provides insight into the activities required to drive change towards protection and enhancement of natural resources. Models were prepared for various aspects of land management and provide insight of the key activities that are anticipated will lead to improvements to landscape health, as identified previously.

Review of past Natural Resource Management Programs in South East NSW and regular feedback provided during workshops and other community events highlight that our methods of engaging and supporting land managers with decision making and adopting best management practices are the right approach for this region.

Access to a range of digital tools and landscape information assist in identifying priority areas in the landscape based on the asset we are seeking to protect or enhance.

South East LLS are clear on our role in the provision of NRM services to community in South East NSW. The protection and enhancement of natural resources in

South East NSW is a shared responsibility among a range of State and local government and community organisations. South East LLS NRM services support and enable land managers to better manage these natural resources, to reverse their decline, and support land uses that are sustainable and productive. South East LLS seek to do so in a collaborative way, working in partnership with land managers and various stakeholder groups who provide a range of technical expertise to ensure success.

## Native vegetation

Consultation and literature review unanimously identified the value of retention and improvement of native vegetation for multiple benefits to healthy landscapes. Priority activities have been identified in:

- Conducting education initiatives to increase land manager understanding of the role of native vegetation, promotion of the value of protecting habitat for key threatened species, supporting the development of property plans to manage risks associated with climate variability and understanding the soil carbon balance at a farm scale.
- Supporting land managers via financial incentives to protect and enhance priority habitat.
- Implementing pest animal management programs to reduce impacts to priority habitat.
- Implementing projects that highlight specific threatened species for multiple benefits.

ANU sustainable farms promote their comprehensive research program, with over 20 years of data investigating the benefits of protecting natural resources on farms for the benefit of farms, farmers and profits. Their recommendations provided in recent publication *Ten ways to improve the natural assets on a farm* provide suggestions on priority activities to be implemented at a farm scale to contribute to landscape health. Priorities identified here highlight the value of improved native vegetation values that are connected

in the landscape such as riparian zones, multipurpose shelter belts and paddock trees, enhancing values surrounding farm dams and sensitive management of native pastures. Research conducted via this organisation helps to substantiate the economic value to farmers from contributing to reducing these key threats to landscape health.

NSW DPI have presented information in their report *Abatement opportunities from the agricultural sector in NSW (2021)*, identifying opportunity for significant emissions abatement via vegetation-based sequestration. Two pathways are available for land managers including participating in ecosystem services markets or land management practice changes which contribute to abatement but are non-market activities. NSW DPI have identified that encouraging natural regeneration of native vegetation including regrowth or rehabilitation of degraded and low productivity value areas provides opportunity for sequestration, however environmental plantings are encouraged as one of the largest sequestration opportunities that may also provide production benefits.

Recommendations regarding key threats to many identified significant species include the retention and improvement to existing remnants of native vegetation in the landscape and focus on improving connectivity between these remnants via protecting paddock trees, small patches and increasing these.

Consultation with land managers has identified key barriers to adopting these best management practices including lack of awareness of the financial benefits to farms from protection of native vegetation; lack of knowledge of planning the most effective location of these native vegetation protection and enhancement initiatives; and lack of access to sufficient cash and/or labour resources to implement priority activities.

Access to digital resources including known and predicted locations of priority threatened species and connectivity modelling assists in targeting locations for priority activities across South East NSW. Experience demonstrates the effectiveness of South East LLS model of offering financial incentives to land managers and assessing priority locations for investment based on an environmental services ratio, ensuring we are investing in successful programs and have ensured we are obtaining best value for our investment.

Key partnerships for successful delivery of this theme will include with land managers, community groups, Aboriginal groups, threatened species professionals and research organisations focused on improvements to farm biodiversity.

## Soils

Consultation recommends:

- Increasing land manager awareness of vulnerable soils, methods for how to manage soils to prevent erosion, maintain healthy soils and store carbon.
- Increasing land manager awareness of the value of native pastures and how to manage them for good soil health, moisture retention, soil stability and weed suppression.
- Supporting land managers to implement grazing management practices that focus on retention of perennial groundcover and preparation for future drought.

Land capability mapping has been completed for the South East NSW landscape, providing clear guidelines for appropriate land use across our various and diverse landscapes. Key threats to soil health have been identified as land managed beyond its capability.

South East LLS have access to a range of evidence based educational resources to support land managers in understanding soil properties, appropriate use of these, along with methods to prevent erosion, maintain healthy soils and store carbon. Evaluation of past workshops and training courses provides confirmation that attendance at these awareness raising opportunities assists land manager to improve their decision making regarding the management, protection, and improvement of their soils.

NSW DPI *Abatement opportunities from the agriculture sector in NSW (2021)* provides an overview of the opportunities to improve sequestration of carbon within soils, with methods including conversion of paddocks to perennial pasture, improved grazing management to reduce bare ground, remediation of degraded landscapes. These methods have been demonstrated via past projects to also provide multiple benefits to land managers in improved productivity and stability of soils, along with building public benefit.

Financial incentives programs, along with engagement with local community and Aboriginal groups are essential elements for success.



## Aquatic assets

Riparian land is defined as ‘any land which adjoins, directly influences, or is influenced by a body of water, with the width of interest determined by the landscape setting. Riparian lands are of ecological and economic importance in South East NSW.

Principles in riparian management have been long understood. Prioritising the protection of areas currently in good condition, along with rehabilitation of significant areas – significant due to the habitat they provide threatened species, resource they provide local economies or representation of significant riparian features.

Recommendations for cost effective activities include:

- Management of livestock access to waterways.
- Retention and improvement of existing riparian vegetation including weed management, invertebrate pest management.
- Enhancement of existing riparian vegetation via revegetation activities in-stream and on adjacent terrestrial areas.
- Improvement of connectivity along waterways and between terrestrial remnants.

Past projects delivered in South East NSW have demonstrated the value of the development and delivery of information resources for land managers to understand techniques to manage and improve this key resource along with investment in protection of priority areas that include protection of key habitat and areas relied upon by local economies.

Financial incentives programs, along with engagement with local community and Aboriginal groups are essential elements for success.



# 5.0 How our NRM Plan and processes meet Australian Government requirements

The South East NRM Plan 2022-2026 is designed to meet requirement under our Regional Land Partnerships agreement with the Australian Government as specified below.

**Does the new Natural Resource Management Plan complement, rather than duplicate, any existing Natural Resource Management Plans for the region and address the following requirements:**

**(i) identify and describe the 5-year Outcomes and Investment Priorities that are relevant to the region.**

Addressed in Section 2 of the NRM Evidence Plan

**(ii) describe stakeholder aspirations for natural resource management in the region, and where possible, how these align with the 5-year Outcomes and other relevant Australian Government priorities.**

Addressed in Section 3.1 of the NRM Evidence Plan

**(iii) identify and prioritise natural resource management actions based on knowledge of:**

**(A) location and condition of natural resources, including the Investment Priorities.**

Addressed in Section 1 of the NRM Plan

**(B) threats to, or impacts on, natural resources.**

Addressed in Section 2.6 of the NRM Evidence Plan and Section 2.0 of the NRM Plan

**(C) prioritisation methods for determining the most cost-effective management actions, including decision support and spatial mapping tools; and**

Addressed in Sections 2.6 and 4 of the NRM Evidence Plan

**(D) methodologies for assessing the effectiveness of management actions.**

Addressed in Section 2.7 of the NRM Evidence Plan and Section 5 of the NRM Plan

**(iv) identify how the delivery of Projects will contribute to 5-year Outcomes and Investment Priorities for the Management Unit.**

Addressed in Section 4 of the NRM Evidence Plan

**(v) identify how the Natural Resource Management Plan(s) will be implemented with comprehensive Community participation.**

Addressed in Section 3.3 of the NRM Evidence Plan

**(vi) identify Indigenous peoples' land and sea management aspirations for the relevant Management Unit, including how they relate to 5-year Outcomes, and strategies to prioritise and implement them.**

Addressed in Section 3.3 of the NRM Evidence Plan

**(vii) incorporate traditional ecological knowledge, where appropriate, in accordance with agreed protocols and with prior approval of the Indigenous custodians of the knowledge.**

Addressed in Section 3.2 of the NRM Evidence Plan

**(viii) describe key collaborations, for example between the Service Provider, industry and/or Community groups, for delivery of 5-year Outcomes.**

Addressed in Section 4 of the NRM Evidence Plan

**(ix) identify the monitoring and reporting processes in place and how they are utilised to measure the achievements and the effectiveness of the Natural Resource Management Plan(s); and**

Addressed in Section 2.7 of the NRM Evidence Plan and Section 3 and 5 of the NRM Plan

**(x) include any other relevant content**

**Explain how you involved the community, including the Indigenous community in the development of the new NRM Plan.**

Addressed in section 2.4 of the NRM Evidence Plan.

**Make the new NRM Plan publicly available at no cost to the community within 3 months of Board approval.**

# 6.0 Supporting Information

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# Appendix

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# Climate change predictions for southeast NSW and tools to manage natural resources under these changes

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# Climate change predictions

Climate change projections for the South East and Tablelands Region and the Illawarra Region were prepared and summarised by the Office of Environment and Heritage (2014a, b) under the NSW and ACT Regional Climate Modelling project (NARcliM1.0) (State of NSW 2021). Temperatures in the Illawarra, South East and Tablelands Regions have been increasing since about 1960, with higher temperatures experienced in recent decades (NSW OEH 2014a, b). The warming is predicted to on average about 0.6°C warmer in the near future (2020 – 2039) increasing to about 2 °C in the far future (2060-2079) in the South East and Tablelands and increasing by 1.9°C in the Illawarra. There will be more hot days and fewer cold nights. IN the South East and Tablelands, rainfall is projected to decrease in spring and winter and increase in autumn. In contrast in the Illawarra, rainfall is predicted to decrease in winter and increase in summer and spring. Average fire weather and number of days with severe fire weather is predicted to increase in summer and spring.

An updated project (NARcliM1.5) was released in 2020 a series of spatial models have been collated for our NRM plan. These models used the RCP4.5 scenario which assumes modest cuts in greenhouse gas emissions over the century and stabilised radiative forcing by 2100. These models predict maximum and minimum seasonal temperatures, rainfall and soil moisture.

# Regional vulnerability to climate change impacts and strategies to reduce vulnerability

An integrated regional vulnerability assessment (IRVA) of southeast NSW (not including the Illawarra) conducted in 2012 took the view that climate affects multiple systems and so risks from climate require a systematic, coordinated response (NSW OEH 2012, a, b and see Figure 1). It identified six areas for regional vulnerability: competition for water resources, economic sustainability, land use change, ecosystem function and services, regional infrastructure, and community. Best practice adaptation involves considering all the contextual conditions influencing the region’s exposure and sensitivity to climate change, as well as the ability of the community to adapt. Establishing and fostering connections across sectors ensures that adaptation approaches are within their broader context and integrated into management.

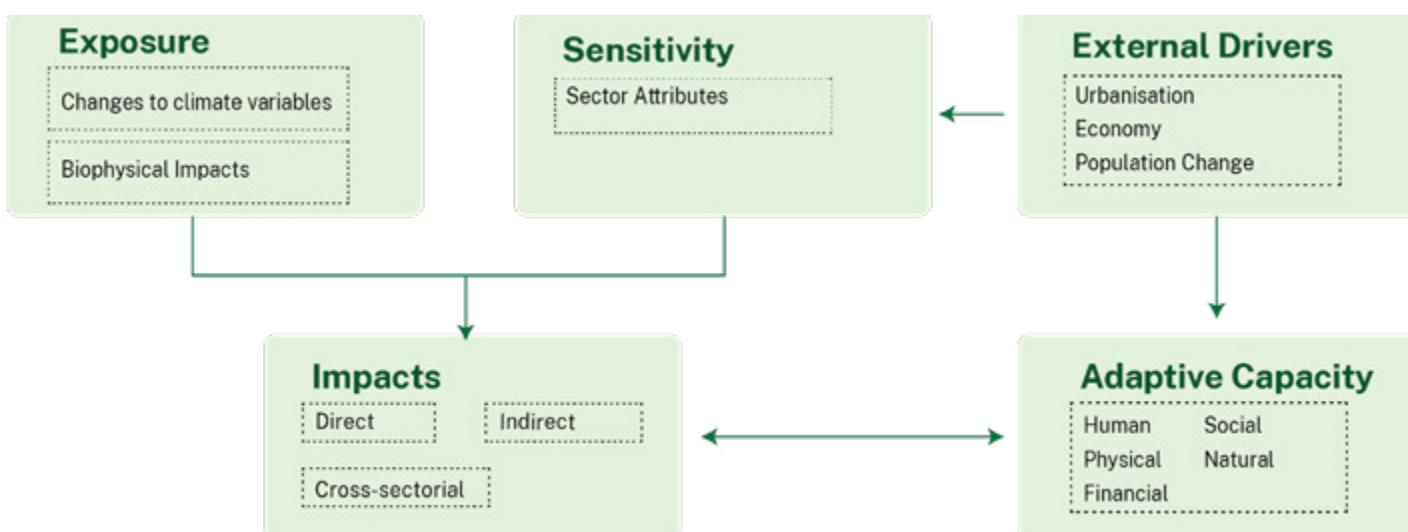


Figure 1: Vulnerability model - integration of impacts and adaptive capacity for multiple sectors

The six areas of regional vulnerability to climate change impacts and potential strategies to reduce vulnerability that relate directly to Local Land Services NRM services are presented in **Table 1**. This work was completed almost 10 years ago so some of the strategies are in place, others have been superseded by new strategies. The value in this information is how it supports the recommended activities from South East LLS's NRM Plan workshops.

**Table 1:** Regional climate change vulnerabilities and strategies to reduce vulnerability that relate to Local Land Services NRM services (after OEH 2012)

Vulnerability	Climate change impacts	Potential strategies
Competition for water resources	<ul style="list-style-type: none"> <li>Decreasing availability of regional surface and ground water resources.</li> <li>Decrease in surface water quality, due to an increase in more intense rainfall events, increased soil erosion, decreased vegetation growth, increased frequency of bushfire and increased incidence of algal growth.</li> <li>Impact on farm productivity due to competition for water resources.</li> </ul>	<ul style="list-style-type: none"> <li>Provide incentives for best practice land management for water quality.</li> </ul>
Economic sustainability	<ul style="list-style-type: none"> <li>Changes to rainfall seasonality, increased incidence of drought and increased soil erosion impacting directly on the productivity of primary production systems.</li> <li>Decreased ecosystem function and services impacting directly on the productivity of primary production systems.</li> <li>Increased number and change in extent of pest species, including feral animals and weeds.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the dynamics of business viability to identify 'tipping points' for business closure to assist planning to avoid loss of viability.</li> <li>Work with farmers to ensure that natural industry adjustment processes have the best possible long-term outcomes.</li> <li>Assist farmers to take advantage of new opportunities arising from changing climate and policy environments.</li> </ul>
Workforce	<ul style="list-style-type: none"> <li>NRM – workforce capacity is constrained by the ability to attract professionals. Particularly in local government. Sub-regional differences in the workforce and leadership skills of landholders are significant contributors to vulnerability to climate change.</li> <li>Agriculture - the impacts of an ageing population, economic viability of farming and prolonged drought has implications for the adaptive capacity of the workforce.</li> </ul>	<ul style="list-style-type: none"> <li>Expand communication of NRM issues and policy to the community and elected local government representatives to build understanding of the need to adequately resource the area with skilled staff.</li> <li>Facilitate leadership training for landholders and primary producers and provide greater opportunities to employ these leadership skills in regional communities.</li> </ul>
Land-use change	<ul style="list-style-type: none"> <li>Decreased land use for agricultural production, affecting the local economy and local fresh food supply.</li> <li>Changes to vegetation management on private land and in the extent and condition of remnant vegetation (may be positive).</li> <li>Increased pressure on groundwater aquifers from an increase in the number of bores.</li> <li>Greater need for bushfire buffer zones and hazard reduction from bushfires to protect a greater number of dwellings and infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Create more opportunities for communication and engagement in the planning process between state and local governments on NRM issues.</li> <li>Land use planning – accounts for primary production, incorporates natural hazard risk and emergency management, considers the impact of climate change on food resources and security, and balances natural and social capital.</li> <li>Commission research into the impacts of rural residential development on the region's natural resources and primary production.</li> </ul>

Vulnerability	Climate change impacts	Potential strategies
Ecosystem function and services	<ul style="list-style-type: none"> <li>• Changes in hydrological functioning due to changes in rainfall intensity and seasonality affecting wetlands and rivers, decreasing aquatic and wetland biodiversity and ecosystem function.</li> <li>• Increasing soil erosion due to greater rainfall intensity compromising the health of the region's soils and waterways.</li> <li>• Changes to biodiversity – habitats and ranges, remnant vegetation extent and condition, changes in bushfire regimes and longer-term impacts of weed invasion.</li> <li>• Increasing saltwater intrusion into estuaries and groundwater and associated salinity issues.</li> <li>• Increased intensity and frequency of bushfires leading to land managers clearing vegetation buffer zones; this in turn affects the extent and condition of native vegetation.</li> <li>• Diminishing availability of water in the landscape for allocation to the environment, leading to increased competition for water resources.</li> <li>• Changes to pasture species and growth affecting agricultural productivity, leading to increased grazing intensity, loss of ground cover and decreasing terrestrial biodiversity and ecosystem function.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a better understanding of the impact of the combined effects of ecosystem change and the potential retreat to the east of the NSW cropping zone for local agricultural systems.</li> <li>• Make greater use of models using landscape configuration and habitat matrices to help ensure effective conservation in the face of landscape change.</li> <li>• Develop improved understanding by land managers and water professional of the relationship between soil health, storage of moisture in the soil profile and run off into rivers.</li> <li>• Conduct research into the region's ecosystems for example saltmarsh, and weed ecology under changing climatic regimes.</li> </ul>
Community	<ul style="list-style-type: none"> <li>• Increased frequency and intensity of natural hazards – increasing basic levels of self-reliance in emergency preparedness, increasing expectation of emergency service provision.</li> <li>• Increasing mental health issues associated with coping with greater extremes in climatic conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Run awareness programs about emergency preparedness, the need for community cooperation, and how to increase self-reliance.</li> <li>• Expand prevention health care strategies and programs and integrate health care services into scenario planning for extreme events.</li> </ul>



## Tools to manage natural resources under a changing climate

There are a range of tools to help adapt to a changing climate. AdaptNSW lead by NSW Environment Energy and Science (EES) is a source of resources for climate adaptation, and a selection of these are summarised here. Resources are also available from the Department of Primary Industry (DPI) stemming from their Climate Change Research Strategy. The strategy has three areas of focus: energy, carbon opportunities and climate resilience (NSW DPI 2018).

This section starts with carbon sequestration and emission reduction in agriculture because the risk of significant impact is reduced under lower emissions scenarios, as well as the rate of change which allows time for adaptation measures to operate (Banks 2015). It also includes tools from Adapt NSW including revegetation guidelines for a changing climate, supporting freshwater biodiversity to adapt to a changing climate and climate refugia modelling.

## Actions for carbon sequestration and emissions reduction in agriculture

Agriculture is dependent on climate, so as the intensity and incidence of severe weather events increases into the future, productivity risk will also increase. Primary producers and landowners will play an important role in reducing greenhouse gas emissions in NSW. The extensive nature of agricultural land-use in NSW provides a large potential 'carbon sink' through sequestration. Sequestration and emissions reduction also contribute to economic growth for regional communities and create environmental benefits. Full details are available in the report *Abatement Opportunities from the Agricultural Sector in NSW* (available at <https://www.dpi.nsw.gov.au/v2/climate/about-dpi-climate/climate-change-research-strategy>).

## Accessing carbon markets

Markets to sell and buy carbon emissions is one of the main policy instruments to mitigate climate change. The primary market mechanism for trading carbon from sequestration projects in Australia is the Emissions Reduction Fund (ERF). Participation in the ERF is voluntary and operates according to a baseline and credit model, whereby emitters can earn credits by reducing emissions below a baseline level and land holders can earn credits by sequestering carbon above a baseline level of carbon stored in the vegetation on their land (NSW DPI 2021). The ERF has a single buyer (the Australian Government) and prices are determined through regular auctions of Australian carbon credit units (ACCUs), which are awarded to bidders willing to provide abatement at the lowest cost. Most projects relate to vegetation management with methodologies developed for avoided deforestation, human induced regeneration, and environmental plantings.

## Sequestration and emission reduction

Primary producers can play an important role in reducing emissions and increasing carbon sequestration. Agriculture currently contributes about 15% of the NSW greenhouse gas emissions (NSW DPI 2020). Actions that take up and store carbon in vegetation and soil (sequestration) and reduce greenhouse gases released by livestock, soil and vegetation clearing (emissions reduction) address climate change, create environmental benefits and contribute to regional economic growth. Some opportunities satisfy the criteria for market-based activities aligned to the ERF while others could occur outside the ERF. These non-market opportunities include small-scale on-farm activities that often complement agricultural production.

Feasible opportunities to sequester carbon and reduce emissions include (Figure 2):

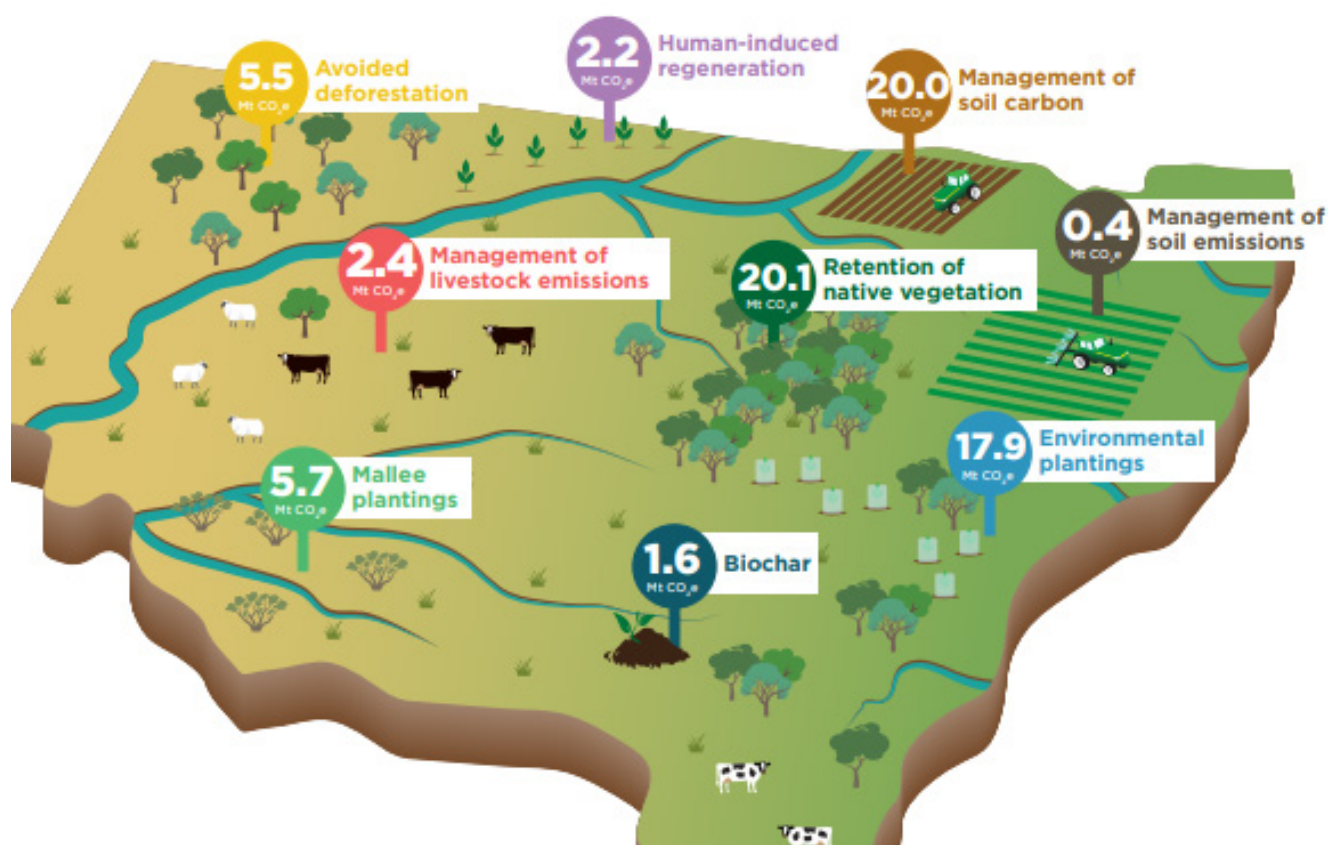
### Sequestration

- Protecting or enhancing native vegetation is one of the most cost-effective vegetation-based sequestration activities (called avoided deforestation and avoided clearing in the ERF market).
- Management of natural regeneration or regrowth (human-induced regeneration in the ERF market) is also cost effective. Activities that promote regrowth include reducing livestock grazing intensity, stopping regrowth control, and suppressing weeds and pests.
- Reforestation can provide significant abatement over the next 20 years and have substantial co-benefits.
- Managing carbon in soil (estimating sequestration of carbon in soil using default values, and measurement of soil carbon sequestration in agricultural systems in the ERF market) and includes activities such as converting cropland to pasture, pasture and grazing management, and cropping methods such as reduced tillage and stubble retention. Other activities include remediation of landscapes and sustainable intensification.
- Increasing ground cover would also reduce soil carbon loss from erosion. A 10% increase in cover could sequester between 2.5 and 15 tonnes of carbon per hectare (NSW DPI 2020).

### Emission reduction

- Methane released from livestock represents around 75% of greenhouse gas emissions from agriculture. It is feasible to reduce emissions through dietary and herd management for cattle and sheep and these are incorporated into ERF markets.
- Animal effluent management and reducing greenhouse gas emissions from fertiliser in irrigated cotton are included in the ERF market.
- Biochar – produced by heating biomass in the absence of oxygen can reduce emissions from composting manure. Storing carbon in biochar could be recognised in a future ERF method.
- Modified management of rice crop stubble and irrigation management can more than halve methane emissions.

Figure 2: Feasible opportunities to store carbon and reduce greenhouse gas emissions from NSW agriculture. Values are in megatonnes of carbon dioxide equivalent. Values for vegetation management show sequestration potential in biomass by 2030 (after DPI 2020)



## Benefits of carbon farming to agriculture

‘Many activities that sequester carbon or reduce greenhouse gas emissions assist farm businesses, for example by improving soil quality. Building soil organic matter improves nutrient and water-holding capacity of soils and buffers against drought. Increased perenniality and ground cover will protect soil from erosion during storms and increased tree cover can provide shelter to stock and crops in heat waves. Greater tree cover can also provide habitat and food for wildlife and increase resilience to disease and pests. These practices will be vital to maintaining agricultural productivity under climate change.

Generating income through carbon sequestration or emissions reduction (‘carbon farming’) can provide an additional income stream, which can be used to reinvest on farms, employ local contractors and improve the resilience of farming systems. The money can be used to restore land, while carbon sequestration through vegetation and soil management supports biodiversity and improves soil quality.’ NSW DPI 2020.

## Climate-ready revegetation – a guide for natural resources managers (v2)

A compilation of online tools available to assist natural resource managers to incorporate uncertainties associated with climate change when planning revegetation activities is presented by Hancock et al (2018). The guide is based on the premise that survival and resilience will be enhanced for species and local populations with large, genetically diverse populations. The guide provides step-by-step instructions on where to find and how to use climate projections and how to consider the suitability of species and provenances for revegetation projects. The three steps are:

1. Where to find and how to use climate projections for the site
2. How to consider which plant species will be sustainable for the proposed vegetation site
3. How to consider an appropriate provenance strategy

## Freshwater biodiversity and climate change

Guidance for land and water managers on conservation management to improve the long-term capacity of freshwater ecosystems to adapt and reduce biodiversity

loss is provided by Banks (2015). The report projects the vulnerability of over 500 plants and animals to climate change in NSW and choices for management strategies. It also details how environmental management of non-climatic threats at local and regional scales can be used to alleviate the impacts of climate change to fish species and communities.

The report identified that the most important action to reduce the impact of climate change on freshwater biodiversity is a reduction in emissions. Under climate change models, most species are expected to decline to some extent. Loss of environmentally suitable habitat would most heavily affected groups like the crayfish, frogs, Odonata and Hemiptera. Many species of spiny crayfish (*Euastacus* spp.) are endemic to NSW, restricted in their dispersal capacity, and in many projected scenarios, were severely threatened by extinction due to climate change.

Some of the key findings from Banks (2012) relevant to Southeast NSW NRM are:

- The Clyde and Shoalhaven basins is one of five areas in the state for further action to protect freshwater habitats that are most likely to complement existing protected area networks allowing biodiversity to respond to a changing climate (page 52).
- The Great Eastern Ranges initiative provides a good example of a coordinated approach that should help species track and adapt to changing climates. However, it would be good to increase the focus of this initiative to include freshwater biodiversity, not just terrestrial. Improvements can be made by restoring riparian vegetation that buffers streams from adjacent land use as well as improving the quality of instream habitats (page 44).
- The priority of different actions that mitigate non-climate related impacts (such as fish barriers) was consistent within the Murray-Darling Basin but more variable across coastal catchments (page 45).

## Climate Refugia

[ClimateRefugiaNSW](#) (OEH and Macquarie University, no date) is a decision support tool to identify and visualise probable refugia from climate change for over 300 species listed as threatened in NSW. The tool is an interactive website that provides projections of areas that contain climate, soil or topographic conditions commonly found through each of the species current range. It also identifies regions likely to be refugia for multiple species.



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# Australian Government Threatened Species Strategy 2021-31 Priorities in southeast NSW

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## Background

Local Land Services is the Natural Resource Management (NRM) service provider to the Australian Government. Under this partnership South East Local Land Services delivers Australian Government NRM priorities. The newly released Threatened Species Strategy 2021-2031 (Australian Government 2021) has identified 100 priority threatened species across Australia. This document identifies those species which occur in Southeast NSW, where they occur, what condition they are in and what threats they face and management actions that could reduce their risk of extinction in our region.

## Priority species in south east NSW

There are a total of twenty-six priority species with records in southeast NSW (**Table 1**). Eighteen of these species would benefit from management intervention in the south east. The remaining eight species (\* in Table 1) would receive little benefit from management in the south east because there is little suitable habitat, they are locally extinct, or they are marine species. They are not considered further in the South East LLS NRM plan.

## Threats to and management activities for priority species

South East LLS is well situated to deliver Australian Government outcomes at a local level. The *NSW Local Land Services Act* (2013) ensures the proper management of natural resources and application of sound scientific knowledge to achieve fully functioning and productive landscapes. It encourages collaboration and shared responsibility and provides incentives to landholders that promote land and biodiversity conservation. Therefore, we can work with private land managers and partner with community and other government agencies to address threats and deliver threatened species outcomes. **Table 2** specifies threats and management activities for Australian Government priority threatened species considered in our NRM Plan 2021-2026.

Table 1: Australian Government priority threatened species with records in southeast NSW

Common name	Condition/status
<b>Birds</b>	
Australasian Bittern	NSW (EN), Aust. (EN)
Eastern Curlew	NSW (not listed), Aust. (CR)
Hooded Plover (eastern)	NSW (CR), Aust. (VU)
Orange-bellied Parrot	NSW (CR), Aust. (CR). Very few individuals survive in the wild
Plains-wanderer*	NSW (EN), Aust. (CR). Not typical for SE NSW
Red-tailed Black Cockatoo (SE) Coastal*	NSW (CR), Aust. (EN). Not typical for SE NSW
Regent Honeyeater	NSW (CR), Aust. (CR)
Swift Parrot	NSW (EN), Aust. (CR)
Freshwater fish	
Stocky Galaxias	NSW (CR), Aust. (CR)
<b>Frogs</b>	
Growing Grass Frog, Southern Bell Frog	NSW (EN), Aust. (VU)
Southern Corroboree Frog	NSW (CR), Aust. (CR)
<b>Mammals</b>	
Brush-tailed Rock-wallaby	NSW (EN), Aust. (VU)
Eastern Quoll*	NSW (EN), Aust. (EN). Presumed extinct in wild in SE NSW
Koala (Qld, NSW, ACT)	NSW (VU), Aust. (VU)
Mountain Pygmy-possum	NSW (EN), Aust. (EN)
New Holland Mouse	Not listed in NSW, Aust (VU) little recent work
Numbat*	NSW (EX), Aust. (EN). Extinct
<b>Marine animals</b>	
Australian Sea-lion*	NSW (not listed), Aust. (EN). Occasionally haul out in SE NSW
Cauliflower Soft Coral	NSW (EN), Aust. (EN). More information required
Green Turtle*	NSW (VU), Aust. (VU)
Grey Nurse Shark (eastern)*	NSW (CR), Aust. (CR)
Olive Ridley Turtle*	NSW (not listed), Aust. (EN). Typical distribution NT and Qld
White's Seahorse	NSW (EN), Aust. (EN). Cryptic marine species. Endemic to Qld and NSW
<b>Plants</b>	
Carrington Falls Pomaderris	NSW (EN), Aust. (CR)
Imlay Mallee	NSW (CR), Aust. (EN)
Native Guava	NSW (CR), Aust. (CR). One specimen recorded in Kangaroo valley

\* Species not considered in the south east NRM plan



Table 2: Threats and management activities for priority species in southeast NSW

Species	Location in South East NSW	Threats	Cost effective management activities
<i>Phascolarctos cinereus</i> Koala (Qld, NSW, ACT)	Bungonia, Numeralla, Nullica and Murrah ARKS plus scattered populations predominantly in the east.	Increased intensity and frequency of drought and high temperatures, disease, habitat loss and mortality due to vehicles and dogs.	Private land management incentives to encourage natural regeneration and tree planting, engaging with community through koala monitoring programs, dog management and habitat requirements, partner with NSW Koala Strategy.
<i>Pomaderris walshii</i> Carrington Falls Pomaderris	Only known from upper catchment of Kangaroo River in two small populations. Total area of occurrence about three lineal kilometres including private land.	Lack of knowledge regarding potential cause of species decline; risk from catastrophic events.	Stock fencing, fire planning, augment population with ex-situ material, negotiate land management agreements and monitor effectiveness of activities.
<i>Thinornis cucullatus</i> Hooded Plover (eastern)	On or near Sandy beaches from Jervis Bay south.	Disturbance from humans, domestic dogs, predation by foxes and native Corvids.	Continued support of shorebird ranger program to reduce human impacts, fox control programs, working in partnership with NSW SOS program.
<i>Lathamus discolor</i> Swift Parrot	Non-breeding habitat (Feb - Oct). Mostly on the coast and SW slopes.	Habitat loss and fragmentation. Habitat mostly outside conservation reserves.	Private land management incentives to encourage natural regeneration and tree planting and encourage community involvement in annual surveys in partnership with NSW SOS program.
<i>Anthochaera phrygia</i> Regent Honeyeater	Non-breeding habitat. Flagship woodland bird of dry open forest and woodland. Occasionally forage in flowering coastal swamp mahogany & spotted gum forests.	Habitat degradation notably box gum woodlands and competition with larger more aggressive honeyeaters.	Private land management incentives to encourage natural regeneration and tree planting and provide information on ecology and conservation requirements for the species.
<i>Botaurus poiciloptilus</i> Australasian Bittern	Known to use coastal wetlands in non-breeding season with tall dense vegetation, particularly bullrushes. Only 7% of distribution occurs on reserves in NSW.	Clearing or modification of wetlands for urban or agricultural development and extraction for irrigation.	Work with Birdlife Australia and NSW SOS program to work on priority sites to improve wetland management, manage runoff and targeted research for non-breeding habitat use.
<i>Galaxias tantangara</i> Stocky Galaxias	Known from one location on Tantangara Creek, Kosciuszko NP.	Predation by trout and loss of riparian vegetation. Known site was fire affected. Current recovery project aims to create additional habitat.	Work on stage 2 of the Stock galaxias recovery project: <ul style="list-style-type: none"> <li>Expand Eucumbene Borrows restoration work.</li> <li>Additional surveys to continue post-fire monitoring / progression of identifying alternative sites.</li> <li>Schedule 1st translocation into Stage 1 Dam at Eucumbene, either from Tantangara Ck or captive.</li> </ul>
<i>Hippocampus whitei</i> White's Seahorse	St Georges Basin & possibly Lake Illawarra records (Conservation Assessment 2020). Associated with Cauliflower Soft Coral.	High impact of habitat loss (soft corals, sponges and sea grass). Can use artificial habitat.	Further surveys required in this region (TSSC 2020, p. 3).

Species	Location in South East NSW	Threats	Cost effective management activities
<i>Dendronephthya australis</i> Cauliflower Soft Coral	Found for the first time in Jervis Bay in 2018 (Conservation Advice). Confined to estuarine environments at depths 1-18m.	Sand inundation, damage from boat anchoring and moorings, natural predation by the sea slug.	Conduct further surveys based on habitat suitability models. Partner with NSW DPI (Fisheries).
<i>Rhodomyrtus psidioides</i> Native Guava	1 record in SE NSW (source DPIE, 2011). Coastal and sub-coastal littoral, temperate and sub-tropical rainforest.	It is likely that historical land clearing has led to decline in abundance of the species from the south east. Highly susceptible to myrtle rust.	Extend its geographic range southward. Support propagation and ex-situ conservation. Support techniques to increase resistance to Myrtle Rust. Support sharing of knowledge of traditional therapeutic use (treatment of wounds/anti microbial).
<i>Litoria raniformis</i> Growling Grass Frog, Southern Bell Frog	Once distributed on the southern slopes of the Monaro. Not currently known from SE NSW region. Usually found in or around swamps or billabongs along floodplains and river valleys.	Removal of ground cover, lack of appropriate flooding regime, predation on eggs and tadpoles from exotic fish, possibly Chytrid, chemicals.	None known for South East.
<i>Burramys parvus</i> Mountain Pygmy-possum	Entirely within Kosciuszko NP.	Habitat loss, fragmentation and degradation from ski resort development, rising temperatures and subsequent loss of snow cover due to climate change, fire.	Partner with NSW SOS program.
<i>Pseudophryne corroboree</i> Southern Corroboree Frog	Entirely within Kosciuszko NP.	Chytrid fungus, damage to breeding sites, climate change.	Partner with NSW SOS program.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Known populations in Bungonia and Monaro IBRA regions and Nattai.	Predation by foxes, competition with feral goats; small population risks.	Manage the impact of pest animals and monitor population response.
<i>Eucalyptus imlayensis</i> Imlay Mallee	Mt Imlay National Park near Eden (80 plants).	Lack of knowledge regarding potential cause of species decline; risk from catastrophic events.	Partner with NSW SOS program.
<i>Pseudomys novaehollandiae</i> New Holland Mouse	Known to occur between Batemans Bay and Nowra and Southern Highlands and predicted to occur between these areas (NSW OEH Species Profile).	Loss and modification of habitat, inappropriate fire management, predation by foxes and cats and climate change.	Recommended for post-fire conservation status assessment (Legge et al 2021). Review cost-effective management activities once new assessment complete.
<i>Neophema chrysogaster</i> Orange-bellied Parrot	Infrequent non-breeding on coast (Recovery Plan 2016). Saltmarshes, dunes & adjacent areas within 10km of the coast and more than 2km from developed areas.	Habitat loss (in SE NSW).	Coastal restoration works away from developed areas may contribute to improving the trajectory for this species.
<i>Numenius madagascariensis</i> Eastern Curlew	Non-breeding, coastal, particularly ICOLs. Breeds in Russia and NE China.	Development pressure and human disturbance in foraging sites, hydrological changes to ICOLs.	Continued support of shorebird ranger program to reduce human impacts, and manage development pressure.

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# South East LLS NRM Plan Workshop findings November 2021

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# Part 1

## Introduction

South East LLS called on staff, members of our community and partners to come along and provide input at local workshops to inform our 5-year NRM plan.

Restrictions associated with the Covid-19 pandemic made consultation with stakeholders and community in the development of this plan a challenge.

However, we have confidence in the process used via the consultation with key staff, community and stakeholders who brought with them extensive knowledge and experience of analysing, prioritising and delivering on-ground outputs for the protection and enhancement of Natural Resource values in South East NSW.

As South East LLS manages the delivery of services to customers via a local area model, we held 6 online workshops in October 2021 to gather evidence on local needs and priorities so that our NRM plan is locally relevant as well as being aligned with state and national plans.

The workshops were an opportunity to:

- Check in with staff and partner organisations, reflecting on existing and emerging priorities, to assist in addressing the top threats to landscape health in South East NSW.
- Reflect on the support needs and interests of land managers within South East NSW.
- Consider priority activities and initiatives to contribute to the LLS NRM Framework in South East NSW.
- Consider who we need to work with to implement these priorities, including LLS customers and collaborative partnerships.

This document provides a summary of the feedback from the workshops.

## Why we were asking for help

South East LLS are developing a Natural Resource Management (NRM) Plan and are looking to ensure we included local considerations. At the workshops we identified NRM priorities from the ground up to help join the dots between local needs and state and national plans.

Our plan will be built to align with the recently endorsed NSW [LLS NRM Framework](#) but with a South East focus. It will also incorporate our priorities as a service provider to the Australian Government under the National Landcare Program.

The key LLS NRM Framework messages that we focussed on during the workshops were:

- That widespread adoption of land manager NRM practice change is the central goal of LLS' NRM services.
- That the top threats to achieving the health and resilience of the regions landscapes and catchments should be identified.
- That NRM services should be aimed at working with land managers to mitigate these top threats.
- That NRM services should be customer-centric, should utilise innovative economic and social approaches, should be delivered in partnership with Aboriginal people, and should prioritise the collaboration and engagement activities necessary to support practice change.

## About the workshops

During the workshops, participants were provided a presentation to explore the recently approved LLS NRM Framework and consider the task being asked of them.

Feedback was provided during workshops via a MURAL Board for each Local Area, where workshop participants were asked to reflect on top threats and priority actions for landscape health including:

- Existing South East Catchment Action Plan Priorities.
- Updated mapping of landscape health indicators and location of past investment (LLS).
- What should LLS continue to deliver?
- What should LLS stop delivering?
- Who are the customers of NRM services in SE NSW and what motivates their interest/ what are their support needs?
- What should LLS consider as future priorities under the lens of Catchment Action Plan, immediate need due to recent climatic challenges, interests of the community, interests of the Aboriginal community and the priorities of our investors (NSW and Australian Government)?
- Any other missing priorities that should be considered.
- Tools to measure success of the plan.

## How we prioritised actions and analysed workshop feedback

To help identify top priorities, we combined our current knowledge of NRM resources in our region with the top threats to their health. We then considered them through the lenses of a) the role of Local Land Services, b) immediate support needs of local areas and communities due to ongoing challenges resulting from impacts of the 2019/20 summer bushfires and drought, and c) the priorities of our major investors including the Australian Government.

Feedback collected from workshops and post-workshop correspondence was collated, grouped, and analysed in the context of the LLS NRM Framework. Five priority themes emerged: collaboration, connectivity, biosecurity, ground cover and aquatic assets.

Feedback from Mural Boards at each local area workshop were tabulated in spreadsheets and grouped

by the 5 priority themes. The comments under each theme were then converted to actions. These are presented in Part 2 of the report.

## South East priority regional themes and actions

The actions from the 6 local area workshops were grouped under the five priority themes and identify priority regional actions. These are presented below.

### Collaboration

- Providing a role to improve collaboration, knowledge and resource sharing among stakeholder groups in South East NSW.
- Providing support to community groups to implement their projects.
- Ensuring NRM messages are incorporated into other functions supporting landscape health – agricultural advice, biosecurity support for example.
- Promotion of local leaders and innovators to other land managers to enable peer to peer learning.
- Connecting land managers to information to assist their decision making such as up to date research, information about climate markets and climate change predictions.
- Support Aboriginal Community to share traditional practices and participate in local projects application of cultural burning as an ecological tool and implementing projects of their design.
- Increase land manager awareness of cultural values in the landscape.

### Connectivity

- South East LLS ensuring good understanding of connectivity priorities in the landscape and educating land managers about them.
- South East LLS providing education and awareness raising opportunities for land managers regarding native vegetation values including threatened species and native grasses.
- Southeast LLS providing support to implement projects that enhance connectivity and protect priority vegetation communities, threatened species habitat.
- South East LLS ensure good understanding of the potential impact of climate change predictions and supporting land managers to prepare for this.



## Biosecurity

- Ensure pest animal management activities are incorporated into projects to protect priority natural assets.
- Increase land manager capacity to manage grassy weeds and promote a range of management activities including application of traditional ecological practices.
- Ensure messaging is consistent with stakeholder groups.

## Groundcover

- Increase land manager awareness of vulnerable soils, and how to manage soils to prevent erosion, maintain healthy soils and store carbon.
- Increase land manager awareness of the value of native pastures and how to manage them for good soil health, moisture retention, soil stability and weed suppression.
- Support land managers to implement grazing management practices that focus on retention of perennial groundcover and preparation for future drought.

## Aquatic assets

- Support education and awareness raising activities for land managers to understand the role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), resilience to erosion, water retention and their value and benefit.
- Education and support to land managers for the management of riparian weeds including willows.
- Investment in large scale projects in high value waterways including threatened fish habitat, to reduce threats to industries reliant on these natural resource assets or to demonstrate activities that prepare for climate change predictions.
- Support to NRM reliant industry via for effluent management and water quality initiatives.



# Part 2: Local Area Workshops

## Palerang Local Area

The Palerang Local Area workshop was held on 11th October 2021 and included participants representing South East LLS, NSW DPIE Threatened Species, Upper Murrumbidgee Landcare, Queanbeyan Palerang Regional Council, Capital region Small Farms Network and Upper Shoalhaven Landcare. Participants were asked to consider Tablelands landscape priorities (Figure 1), and provided feedback via Mural (Figure 2).

A summary of this feedback has been collated and includes a range of suggested actions for future focus in our NRM Planning including:

## Collaboration

- Provide the role of enhancing communication among organisations and individuals with an interest in protecting NRM values of South East NSW to ensure collaboration, shared knowledge and shared resources.
- Ensure South East LLS are incorporating NRM key messages into broader landscape management views (agricultural use, biosecurity focus).
- Provide support to community groups and individuals implementing projects, encouraging neighbours to work together for shared outcomes, encouraging

community initiatives to collect information on the condition of local environments (such as water watch).

- Promotion of local leaders and innovators to other land managers to enable peer to peer learning.
- Connect land managers to information to assist their decision making such as up to date research, information about climate markets and climate change predictions.

## Connectivity

- Ensure Southeast LLS maintains awareness of bushfire impacts, recovery progress and threatened species values in need of protection.
- Focus on understanding landscape connectivity and use of connectivity modelling as a measuring tool.
- Increase land manager awareness of climate change predictions and support the planning and implementation of projects to account for these.
- Target improved connectivity across landscapes, enhancing individual landholder understanding of their place in the landscape.
- Ensure land manager understanding of threatened species values in the landscape and how initiatives can protect/enhance habitat for priority species.

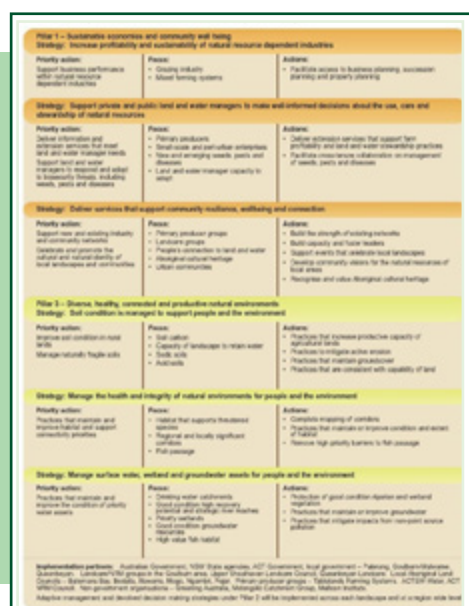


Figure 1: South East Catchment Action Plan Tablelands Priorities



Figure 2: Palerang Mural Board



## Biosecurity

- Ensure pest animal and plant management activities supporting land managers are linked to protecting priority assets.
- Enhance land manager skills in the management of grassy weeds and impact on threatened species including application of traditional ecological knowledge practices.
- Ensure South East LLS provide consistent messaging to land managers in line with the role of other stakeholders.

## Groundcover

- Provide education and increase land manager awareness of vulnerable soils.
- Provide education and increase land manager awareness of soil management and provide access to evidence-based information.
- Provide education and increase land manager awareness of techniques for the management and the values of native pastures, methods for assessing pastures and groundcovers, role of groundcover and links to soil health, moisture retention, erosion and weed suppression.
- Increase land manager awareness of soil health measurement indicators and provide access to measurement tools to ensure land managers have quality decision making.

## Aquatic Assets

- Provide land managers with education and increase awareness of the role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), water retention and their values and benefits to their farm.
- Implement projects that focus on protection of high-quality riparian areas such as Mongarlowe and Corang Rivers.





# Goulburn Local Area

The Goulburn Local Area workshop was held on 19th October 2021 and included participants representing South East LLS, NSW Farmers, Southern Highlands Landcare Network, Wingecarribee Shire Council, Regional Development Australia, DPI Fisheries, DPIE, DPIE (Threatened Species), Illawarra Local Aboriginal Land Council, Upper Lachlan Shire Council. Participants were asked to consider Tablelands and Highlands landscape priorities (Figure 1, Figure 3) and provided feedback via Mural (Figure 4).

A summary of this feedback has been collated and includes a range of suggested themes for future focus in our NRM Planning including:

## Collaboration

- Provide a role of enhancing communication among organisations and individuals with an interest in protecting NRM values of South East NSW to ensure collaboration, shared knowledge and shared resources.
- Ensure South East LLS are incorporating NRM key messages into broader landscape management view (agricultural use, biosecurity focus).
- Support to community groups implementing projects, encouraging neighbours to work together for shared outcomes, encouraging community initiatives to collect information on the condition of local environments, including on TSRs (such as

landholder monitoring of biodiversity values, pest animals, weeds and other threats).

- Promotion of local leaders and innovators to support peer to peer learning among land managers.
- Connect land managers to information including up to date research, opportunities in climate markets, etc.
- Increase opportunity for Aboriginal Community to share traditional ecological practices and participate in local projects.
- Increase land manager awareness of cultural values in the landscape.

## Connectivity

- Focus on landscape connectivity and increase our understanding of biodiversity values of western parts of local area (improve information understanding).
- Improve land manager awareness of climate change predictions and plan projects to account for these.
- Target improved connectivity across landscapes, enhancing individual land manager understanding of their place in the landscape and provide support for planning the protection of biodiversity values at a farm scale.
- Increase awareness raising activities to support land managers to recognise significant biodiversity values, including an increased understanding of native vegetation definitions and responsibilities under biodiversity legislation.



Figure 3: South East Catchment Action Plan South Coast & Highlands Priorities

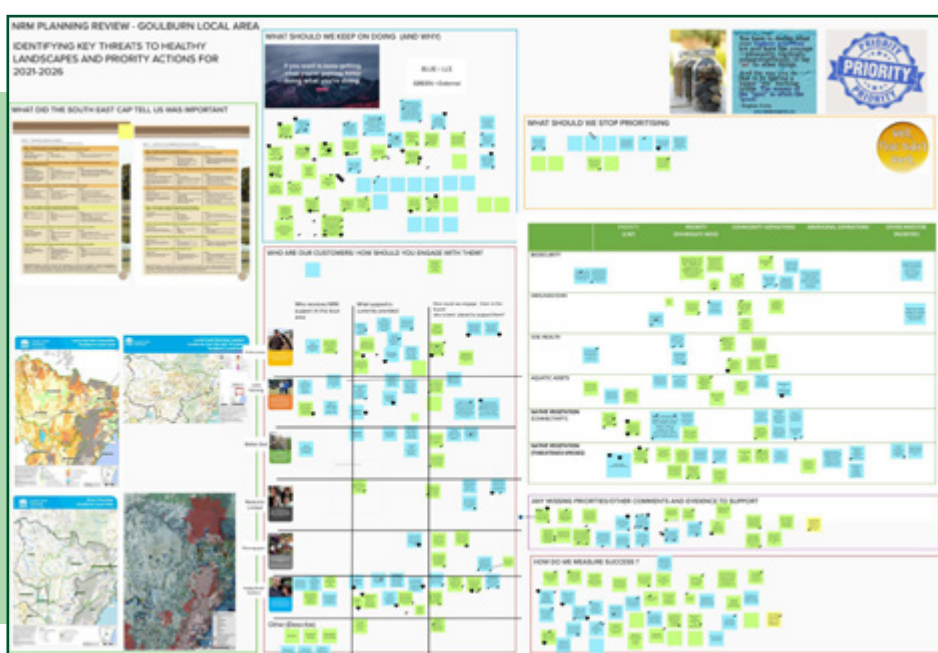


Figure 4: Goulburn Mural Board

- Ensure land manager understanding of threatened species values in the landscape and how initiatives can protect/enhance habitat for priority species.
- Implement projects that support land managers to protect and enhance habitat for priority species, for example education programs to help people understand land capability and why sensitive sites need to be protected as part of a regional plan; ongoing education programs for weed identification and management (e.g. serrated tussock)
- Implement a program to review and update threatened species sightings within the broader region.
- Incorporate data collected through citizen science initiatives to inform decision making, for example data collected in ebird.org

## Biosecurity

- Ensure land manager's pest animal and plant management activities are linked to protecting priority assets.
- Enhance land manager skills in the management of grassy weeds and reduce their impact on threatened species including application of traditional knowledge practices.
- Ensure consistent messaging to land managers in line with other stakeholders' roles.
- Continue implement pest animal initiatives linked to protection of biodiversity assets.

## Groundcover

- Implement education and awareness activities with land managers regarding management of vulnerable soils.
- Implement education and awareness raising activities of soil management activities and provide access to evidence-based information to support land manager decision making.
- Implement education and awareness raising activities regarding the management and value of native pastures, assessing pastures and groundcovers, role of groundcover and links to soil health, moisture retention, erosion, weed suppression etc.

## Aquatic Assets

- Implement education and awareness raising activities with land managers regarding the role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), resilience to erosion, water retention and their value and benefit.
- Implement riparian zone protection projects in partnership with Water NSW.
- Implement projects to protect priority waterways (rare riverstyles, habitat for platypus).
- Implement education and provide support to land managers for the management of riparian weeds including willows.





## Yass Local Area

Yass Local Area workshop was held on 21st October 2021 and included participants from Southeast LLS, Boorowa Landcare Group, Gunning District Landcare, Yass Valley Council and DPIE. Participants were asked to consider Slopes landscape priorities (Figure 5) and provided feedback via Mural (Figure 6). Workshop comments were grouped under these themes and are summarised in the dot points below.

## Collaboration

- Collaborate with agencies and community groups to increase landholder and community knowledge of land management framework and of Aboriginal cultural values in the landscape.
- Provide support to community groups and individuals implementing projects.
- Connect land managers to information (including spatial) such as climate research, carbon and biodiversity markets, soil management, hydrogeological mapping and government priorities and programs
- Increase opportunity for Aboriginal Community to share traditional practices and participate in local projects including application of cultural burning and other traditional land management practices.

## Connectivity

- Ensure that landscape connectivity is a top priority for LLS focussing on threatened species and ecological community themed projects (including TSRs).
- Increase land manager awareness of the benefits of planning for climate change and of maintaining biodiversity values such as remnant vegetation, paddock trees, shelter belts and riparian areas.
- Support land managers to implement plans and incorporate climate change resilience into restoration projects.

## Biosecurity

- Continue coordinating pest, weed and disease management activities linked to protecting priority natural assets (native plants, animals and ecosystems) focussing on cats, rabbits, foxes, carp and redfin and emerging biosecurity threats.
- Enhance land manager skills in management of grassy weeds and impact on threatened species including application of traditional knowledge practices.
- Ensure consistent messaging to land managers in line with Council role in weed management.



Figure 5: South East Catchment Action Plan Slopes Priorities



Figure 6: Yass Mural Board



## Groundcover

- Increase land manager awareness of vulnerable soils, and how to manage soils to prevent erosion, maintain healthy soils and store carbon).
- Increase land manager awareness of the value of native pastures and how to manage them for good soil health, moisture retention, soil stability and weed suppression.
- Support land managers to implement grazing management practices that focus on retention of perennial groundcover and preparation for future drought.

## Aquatic Assets

- Increase land managers awareness of the value and role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), resilience to erosion and water retention.
- Support land managers to protect and enhance priority waterways through activities such as weed control (notably willows), managing livestock access and revegetating with native plants.
- Support our staff and customers to use digital tools to inform investment such as HGL mapping.

Support land managers to participate in large scale projects in high-risk areas such as Boorowa River, Hovell's Creek, threatened species refuge sites.



# Monaro Local Area

The Monaro Local Area workshop was held on 26th October 2021 and included participants representing South East LLS, Upper Snowy Landcare Association, DPI Fisheries, Australian River Restoration Center, Upper Murrumbidgee Landcare, DPIE, Monaro Farming Systems. Participants were asked to consider Monaro landscape priorities (Figure 7) and provided feedback via Mural (Figure 8).

Workshop comments were grouped under these themes and are summarised in the dot points below.

## Collaboration

- Improve communication among organisations and individuals with an interest in protecting NRM values of Southeast NSW, providing land managers with balanced messages regarding production and conservation values on the Monaro.
- Collaborate to increase land manager and community knowledge of land management framework with respect the protection of native grasslands.
- Collaborate and maintain partnerships to deliver landscape projects in particular threatened species, aquatic values protection.
- Support SELLS staff and networks to retain quality and trained staff to support NRM programs.
- Support to community groups implementing projects.

- Connect land managers to current information – research, climate markets, various agency priorities and programs, etc.
- Support and promote land manager champions and encourage industry peer-support.
- Increase opportunity for Aboriginal Community to share traditional practices and participate in local projects; application of cultural burning as an ecological tool; Increase awareness of cultural values in the landscape.

## Connectivity

- Focus on landscape connectivity and increased understanding of biodiversity values of priority vegetation types, balancing conservation in a productive landscape.
- Increase land manager awareness of climate change predictions and advocate for planning and implementing projects to account for these.
- Target improved connectivity across landscapes, enhancing individual land manager understanding of their place in the landscape and provide support for planning for the management of biodiversity values at a farm scale.
- Increased awareness raising activities to support land managers recognise significant biodiversity values from paddock trees, shelter belts and existing remnants.

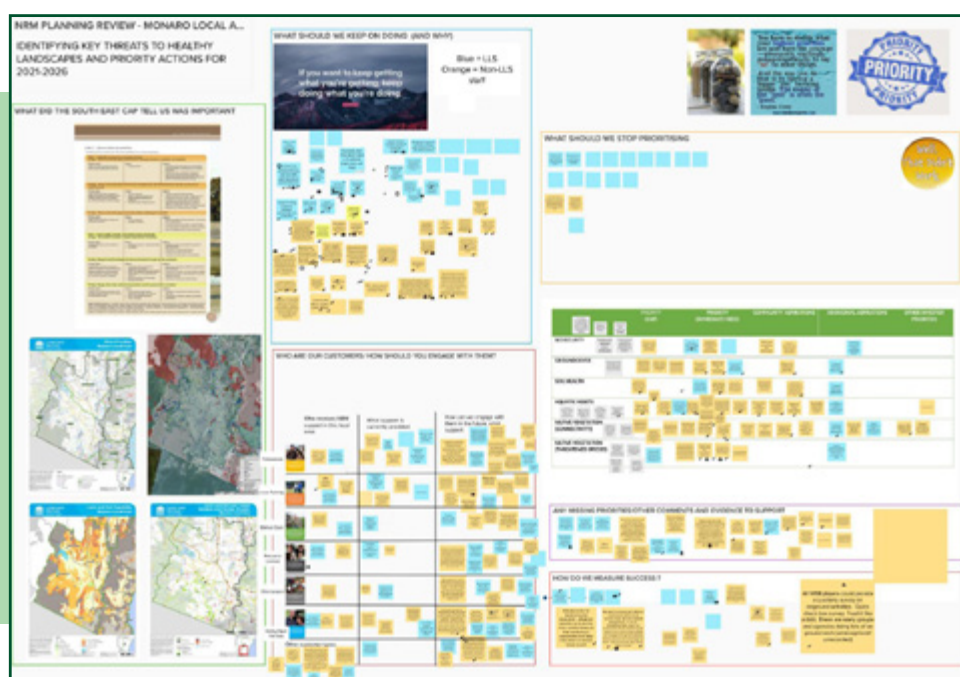
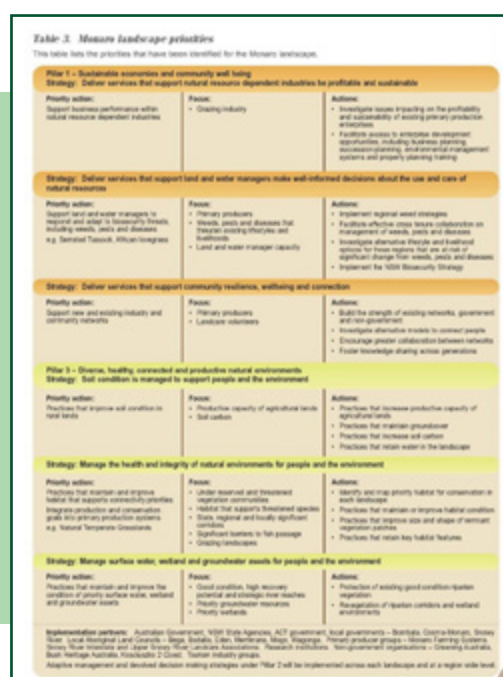


Figure 7: South East Catchment Action Plan Monaro Priorities

Figure 8: Monaro Mural Board



- Continue partnership projects with the protection of threatened species as a focus.
- Biosecurity
- Ensure land manager pest animal and plant management activities are linked to protecting priority assets and reducing impact on native wildlife/ native vegetation community recovery and productive landscapes.
- Enhance land manager skills in management of grassy weeds (serrated tussock, ALG).

## Groundcover

- Increase education and awareness raising activities in soil management and provide access to evidence-based information to support land manager decision making.
- Support land managers access to seasonal condition updates, understand and implement groundcover monitoring and alignment with productivity values.
- Support land managers with soil testing and interpretation, including support to long term soil carbon project.
- Increase education and awareness raising activities for land managers regarding the management and value of native pastures, assessing pastures and groundcovers, role of groundcover and links to soil health, moisture retention, erosion, weed suppression etc.
- Increase education and provide support to land managers to address large scale erosion as a result of droughts/ bushfires and past land management activities

## Aquatic assets

- Support Education and awareness raising activities for land managers to understand the role of aquatic assets on farm including biodiversity pathways (waterways, wetlands, farm dams), resilience to erosion, water retention and their value and benefit as well as the impact off-farm to water quality and waterway impacts
- Education and support to land managers for the management of riparian weeds including willows.
- Investment in large scale projects in high value waterways including threatened fish habitat.





## South Coast Local Area

The South Coast Local Area workshop was held on 26th October 2021 and included participants representing South East LLS, Shoalhaven Landcare Association, Landcare Illawarra, Shoalhaven City Council, Kiama City Council, NSW Crown Lands, Dairy NSW, DPIE Environment, Energy and Science; DPIE Biodiversity and Conservation; DPIE (Henry). Participants were asked to consider South Coast and Highland landscape priorities (Figure 3) and provided feedback via Mural (Figure 9).

A summary of this feedback has been collated and includes a range of suggested themes for future focus in our NRM Planning including:

## Collaboration

- Collaborate among agencies and groups to improve coordination of funding, access to experts in emerging NRM topics, support for local area planning and ensure consistent messaging across agencies.
- Support to community groups implementing and coordinating project- such as local seed collection and propagation.
- Connect land managers to information – research, climate markets, various agency priorities and programs, property planning and small area landholdings specific information.
- Increase opportunity for Aboriginal Community to share traditional practices and participate in local projects application of cultural burning as an ecological tool.

- Increase land manager awareness of cultural values in the landscape.
- Support Aboriginal community in implementing projects of their design.

## Connectivity

- Focus on landscape connectivity and increased understanding of biodiversity values of priority vegetation types, particularly in light of impacts of bushfire on priorities.
- Target improved connectivity across landscapes, enhancing individual land manager understanding of their place in the landscape and support for planning biodiversity values at a farm scale and increased revegetation efforts.
- Increased awareness raising activities and provide information to support land managers recognise significant biodiversity values (flora and fauna), understand difference in weeds and native species.
- Coordinated programs with BCT for long term conservation options for high conservation value vegetation.
- Support land managers with projects that protect TECs and corridors for threatened species.

## Biosecurity

- Ensure pest animal and plant management activities are linked to protecting priority assets and reducing impact on native wildlife/ native vegetation community recovery – priorities including deer, emerging deer, fox, and cat programs.

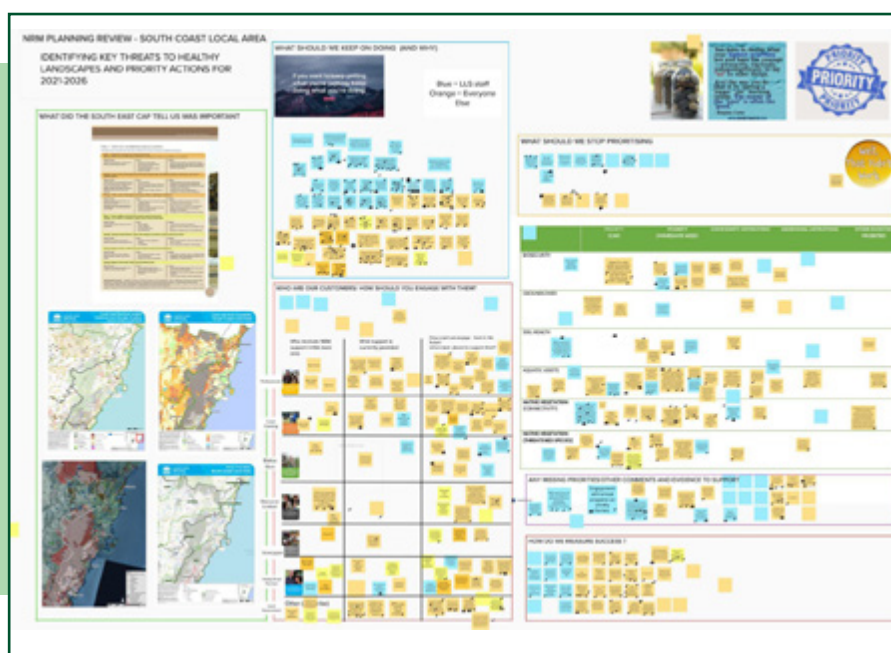
[illegible]

Figure 8: South East Catchment Action Plan South Coast Priorities

Figure 9: South Coast Mural Board

- Ensure consistent messaging to land managers in line with Council role.
- Continue coordinated pest animal management initiatives linked to the protection of biodiversity assets, seek support for longer term coordinated projects.
- Support for biosecurity planning and understanding biosecurity risk such as imports with hay and silage.

## Groundcover

- Implement Education and raise land manager awareness of vulnerable soils/ Acid Sulphate Soils. Provide land managers financial assistance to manage vulnerable soils.
- Implement Education and raise land manager awareness of soil management best practice and share evidence-based information to assist land managers to understand the full picture of soil health and apply rapid assessment tools.

## Aquatic assets

- Landscape-scale focus by supporting land managers through protection of priority waterways with a focus on erosion management, sediment management adjacent to waterways, protection of existing riparian habitat and woody weeds (willow and coral trees in priority catchments).
- Support to NRM reliant industry via effluent management (dairy) and water quality initiatives (oyster farmers).
- Education and support for land managers for the management of riparian weeds including willows, erosion mitigation.
- Coordinated activities with other agencies e.g., MEMS, local govt and DPIE coasts and flood teams.
- Consideration of climate change impacts and preparation for these.





# Far South Coast Local Area

The Far South Coast Local Area workshop was held on 28th October 2021 and included participants representing Southeast LLS, NSW Farmers, DPIE, NPWS, Bega Valley Shire Council, Eurobodalla Shire Council and Far South Coast Landcare Association. Participants were asked to consider South Coast and Highland landscape priorities (Figure 10) and provided feedback via Mural (Figure 11).

A summary of this feedback has been collated and includes a range of suggested themes for future focus in our NRM Planning including:

## Collaboration

- Collaborate among agencies and groups to improve coordination of funding, access to experts in emerging NRM topics, support for local area planning. It was identified that there are a range of planning initiatives in progress and not yet completed that will help inform priority NRM project activities on private lands.
- Support to community groups implementing and coordinating projects- such as local seed collection and propagation.
- Support citizen science projects for monitoring threatened species.
- Connect land managers to information – research, climate markets, offset arrangements, various agency priorities and programs, property planning

- Increase opportunity for Aboriginal Community to share traditional practices and participate in local projects application of cultural burning as an ecological tool and develop their services as a business.
- Increase land manager awareness of cultural values in the landscape and protection of these due to impacts of climate change.
- Support Aboriginal community in implementing projects of their design.

## Connectivity

- Focus on landscape connectivity and increase land manager understanding of biodiversity values of priority vegetation types, particularly considering impacts of bushfire on priorities and promote planting of climate resilient species.
- Target improved connectivity across landscapes, enhancing individual land manager understanding of their place in the landscape and support for planning biodiversity values at a farm scale and increased revegetation efforts.
- Increased awareness raising activities to support land managers recognise significant biodiversity values (flora and fauna), understand difference in weeds and native species.
- Implement projects that focus on protecting and enhancing TECs, EECs and corridors for threatened species.



Figure 10: South East Catchment Action Plan Far South Coast Priorities

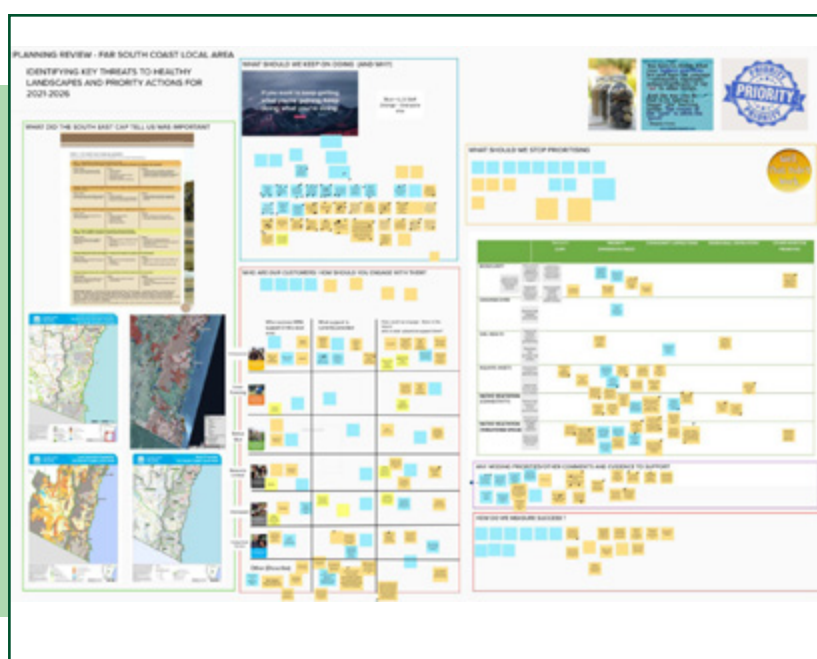


Figure 11: Far South Coast Mural Board



## Biosecurity

- Ensure pest animal and plant management activities are linked to protecting priority assets and reducing impact on native wildlife/ native vegetation community recovery – priorities including deer, emerging deer, pig, fox, Indian/Common Myna, rabbit (Eurobodalla) and more sensitive wild dog programs.
- Ensure consistent messaging to land managers in line with Council role. Support for integrated management of lovegrass and fireweed.
- Continue coordinated pest animal initiatives with land managers, linked to protection of biodiversity assets, seek support for longer term coordinated projects.

## Aquatic assets

- Protection of priority waterways including hanging swamps, Upper Clyde, Upper Tuross, saltmarsh, and good condition waterways. with a focus on erosion management, sediment management adjacent to waterways, protection of existing riparian habitat, recovery from bushfire impacts.
- Support to NRM reliant industry via effluent management (dairy) and water quality initiatives (oyster farmers).
- Education and support to land managers and community groups for management of and monitoring of riparian condition and water quality.
- Coordinated activities with other agencies e.g., MEMS, local govt and DPIE coasts and flood teams.
- Consideration of climate change impacts and preparation for these within projects.



# Part 3: NRM customers in South East NSW

As part of the six workshops, participants were also asked to reflect on the type of land managers they frequently support, the type of services these customers are regularly seeking and to provide suggestions for activities to improve customer support in the future based on their experiences and feedback provided by land managers.

The responses were varied, and also included on the MURAL boards. A summary of the feedback, based on each landholder type is summarised here:

(Note it was discussed and acknowledged that they landholder types are broad, and many customers can easily fit in a number of 'types' during their lifetime. This exercise was for the purpose of encouraging workshops participants to consider key activities to motivate a range of customers, rather than a one approach suits all)





Type of Landholder	Current Interest in NRM activities	Recommendations for future support activities.
Professional	<ul style="list-style-type: none"> <li>Property planning workshops</li> <li>Farm forecasting support.</li> <li></li> <li>Soil testing subsidies and workshops</li> <li>Bushfire recovery support.</li> </ul>	<ul style="list-style-type: none"> <li>Offer whole farm planning support.</li> <li>Offer financial management support and links to financial benefits of NRM activities.</li> <li>Offer links to information regarding carbon farming and accreditation schemes.</li> <li>Collaborate with professional networks such as MLA, AWI, NSW Farmers.</li> <li>Support for soil testing and analysis.</li> <li>Foster industry partnerships.</li> <li>Incentives that provide access to technology / farming improvements.</li> </ul>
Love Farming	<ul style="list-style-type: none"> <li>New ideas for farm management.</li> <li>NRM subsidies for on- ground activities</li> <li>Soil testing subsidies and workshops.</li> <li>Bushfire Recovery support.</li> <li>Various workshops and training events in many topics.</li> </ul>	<ul style="list-style-type: none"> <li>Offer whole farm planning support.</li> <li>Offer links to credible information, financial benefits of NRM activities.</li> <li>Continue to offer NRM incentives programs.</li> <li>Develop educational materials including demonstration sites, webinars and short videos.</li> <li>Continue property visits and messages to integrate NRM, Ag and Biosecurity activities.</li> </ul>
Status Quo	<ul style="list-style-type: none"> <li>Sometimes a late adopter or to be involved in a project.</li> <li>Have received NRM incentives and Bushfire Recovery Support.</li> <li>More likely to be involved in baiting activities.</li> </ul>	<ul style="list-style-type: none"> <li>Promotion of financial benefits of NRM activities.</li> <li>Financial incentives to participate in NRM activities.</li> <li>Use social support networks to encourage adoption such as neighbours and community groups.</li> <li>Integrate NRM messages with Biosecurity services such as rabbit/pig management support.</li> </ul>
Resource Limited	<ul style="list-style-type: none"> <li>Occasionally attend workshops/social events.</li> <li>Assistance with accessing Bushfire Recovery assistance.</li> </ul>	<ul style="list-style-type: none"> <li>Financial incentives required to engage in NRM activities</li> <li>Ensure educational activities also have social element and timing is appropriate.</li> <li>Offer educational materials in written format to allow for reading at their own time.</li> <li>Integrate messages with other services such as mental health support.</li> </ul>
Disengaged		<ul style="list-style-type: none"> <li>Ensure good internet presence.</li> <li>Consider workshops etc with other regions (i.e., in Sydney for absentee landholders).</li> <li>Consider messages via alternative networks such as dirt bike clubs or other magazines.</li> <li>Consider language barriers.</li> </ul>
Hobby Farmer	<ul style="list-style-type: none"> <li>Small farms support networks.</li> <li>Landcare and Bushcare and other community groups.</li> <li>Interest in workshops and demonstrations.</li> <li>Interest in financial incentives.</li> <li>Every Bit Counts project was good to provide introductory materials.</li> <li>Use of Rural Living Handbook for education.</li> </ul>	<ul style="list-style-type: none"> <li>Support to the groups that support this demographic; work with groups who are well placed to offer support.</li> <li>Provide clear information on natural assets that should be protected on their lands.</li> <li>Target coordinated projects to encourage land holders to work together.</li> <li>Relevant for many threatened species projects.</li> <li>Introductory workshops.</li> </ul>
Other		<ul style="list-style-type: none"> <li>Improve on-going support for Aboriginal groups.</li> <li>Improve understanding of cultural values across all landholder types.</li> <li>Collaborate with Council and other groups for consistent messaging.</li> <li>Consider school engagement program.</li> </ul>



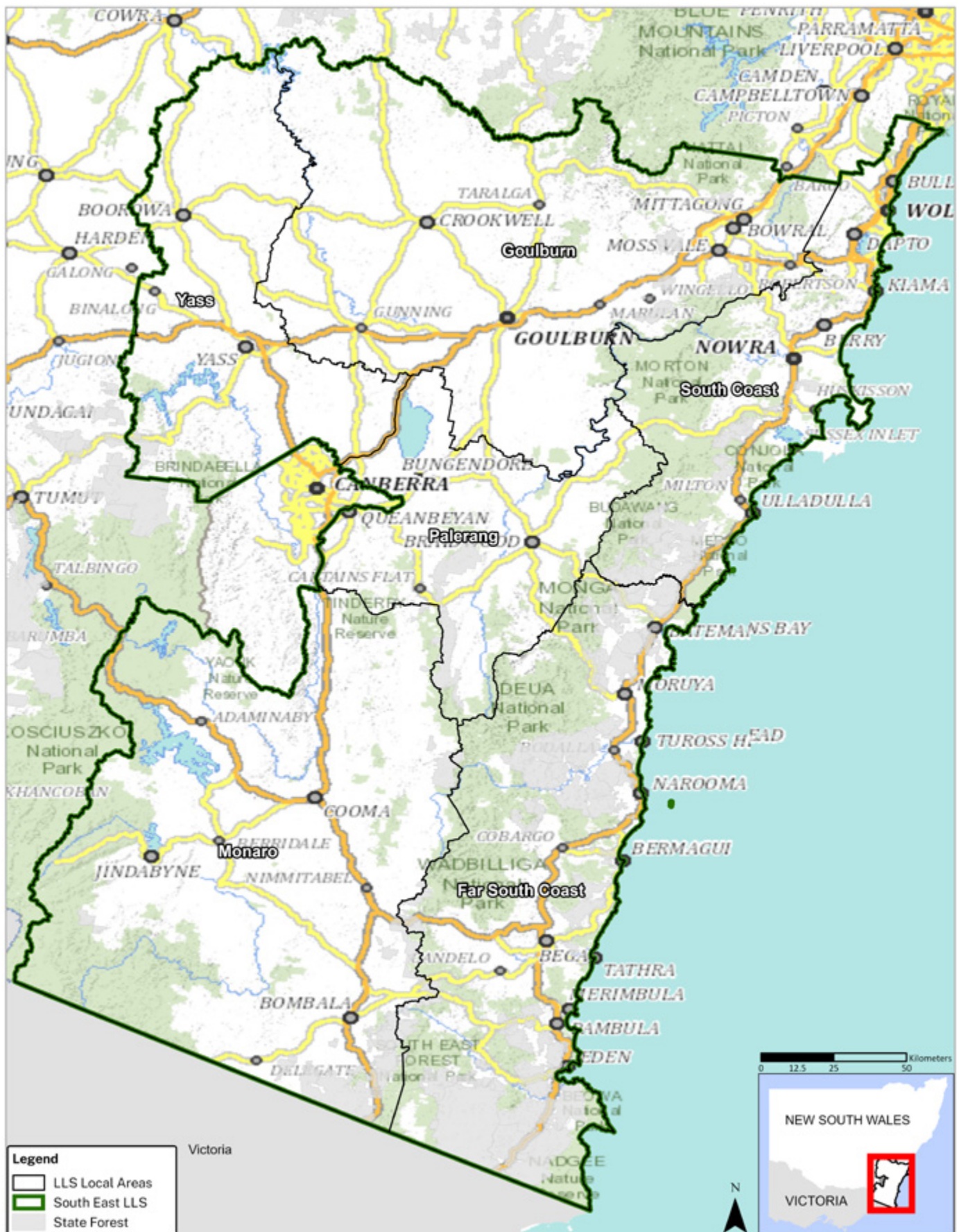
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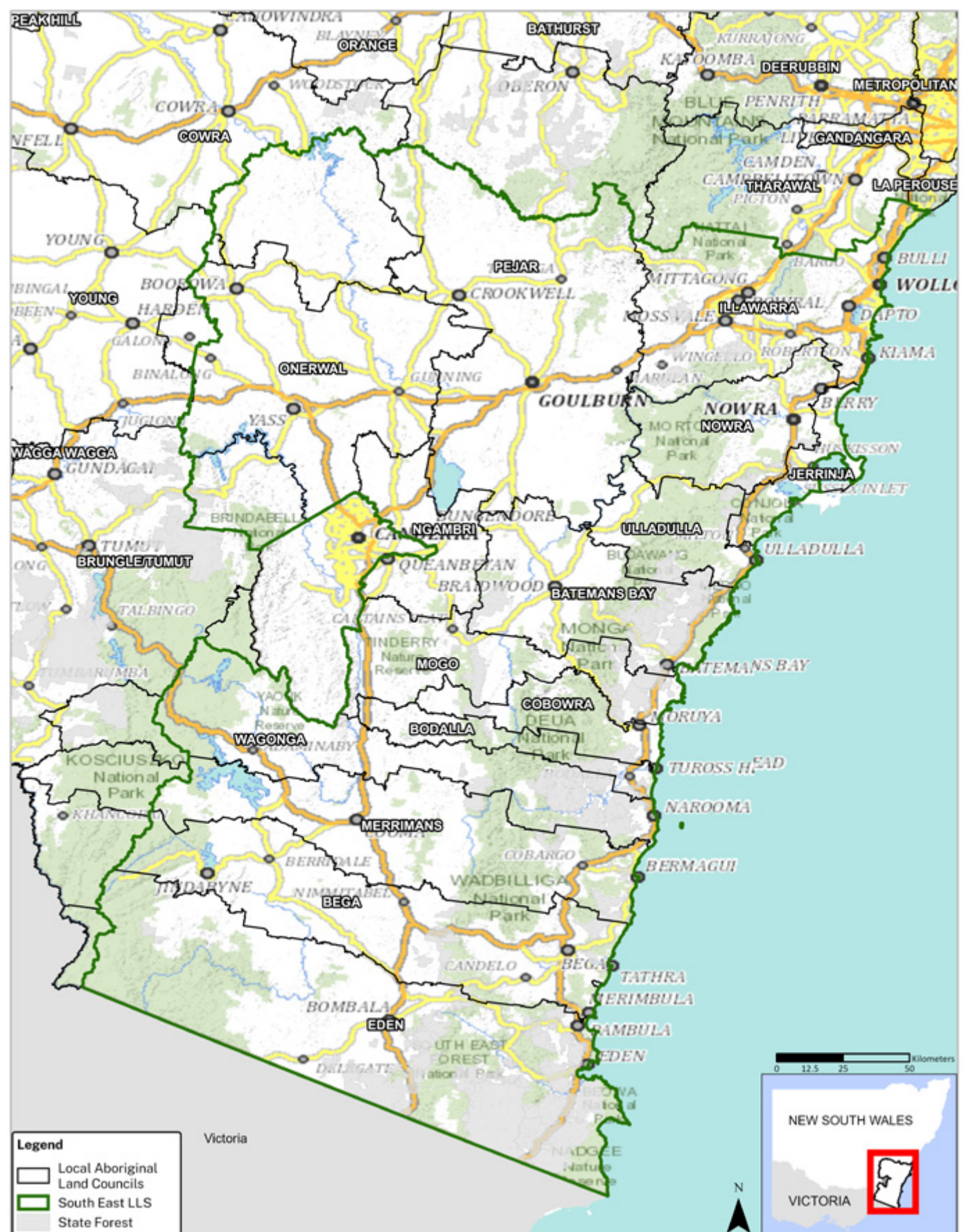
# 1.0 Geographical Boundaries

## South East LLS Areas





## Local Aboriginal Land Council Boundaries

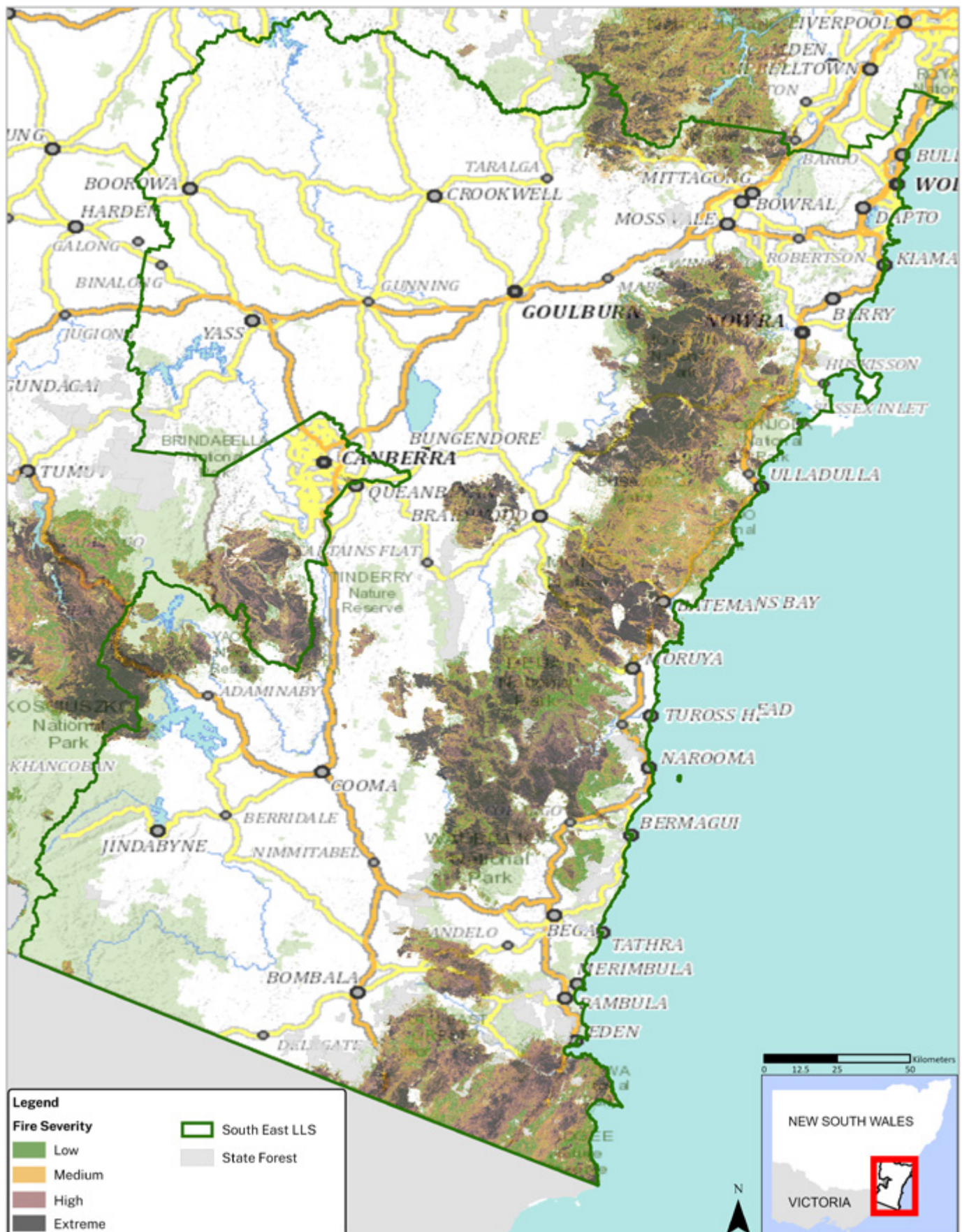


Data source: NSW Government Spatial Services 2021. NSW Administrative Boundaries Theme - NSW Local Aboriginal Land Council. Administrative Theme of the Foundation Spatial Data Framework (FSDf).



## 2.0 Extent of 2019-2020 Summer Bushfires

## 2019 - 2020 Bushfire Severity

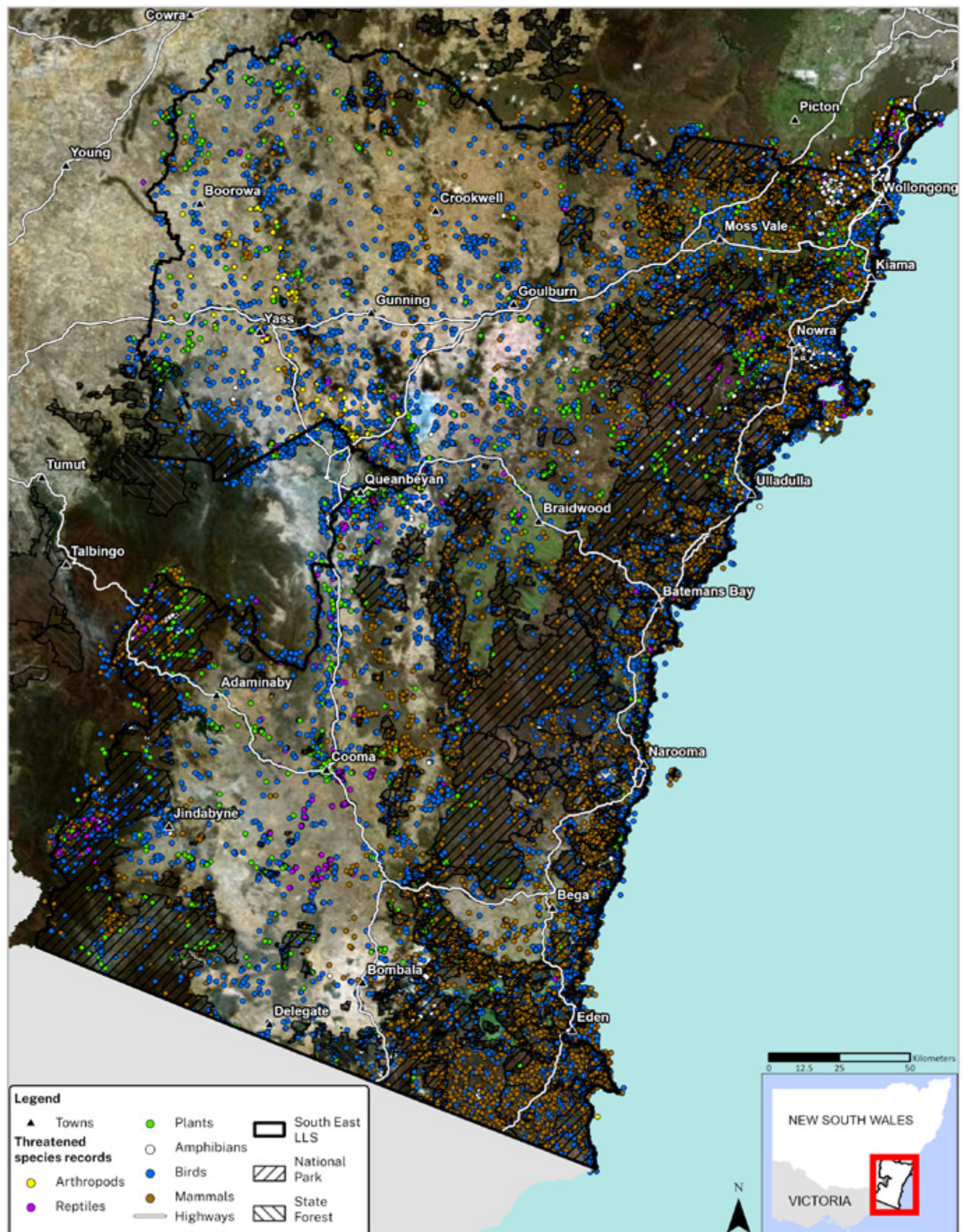


Data source: NSW DPIE 2020. Fire Extent and Severity (FESM) 2018/19.



### 3.0 Threatened Species Values

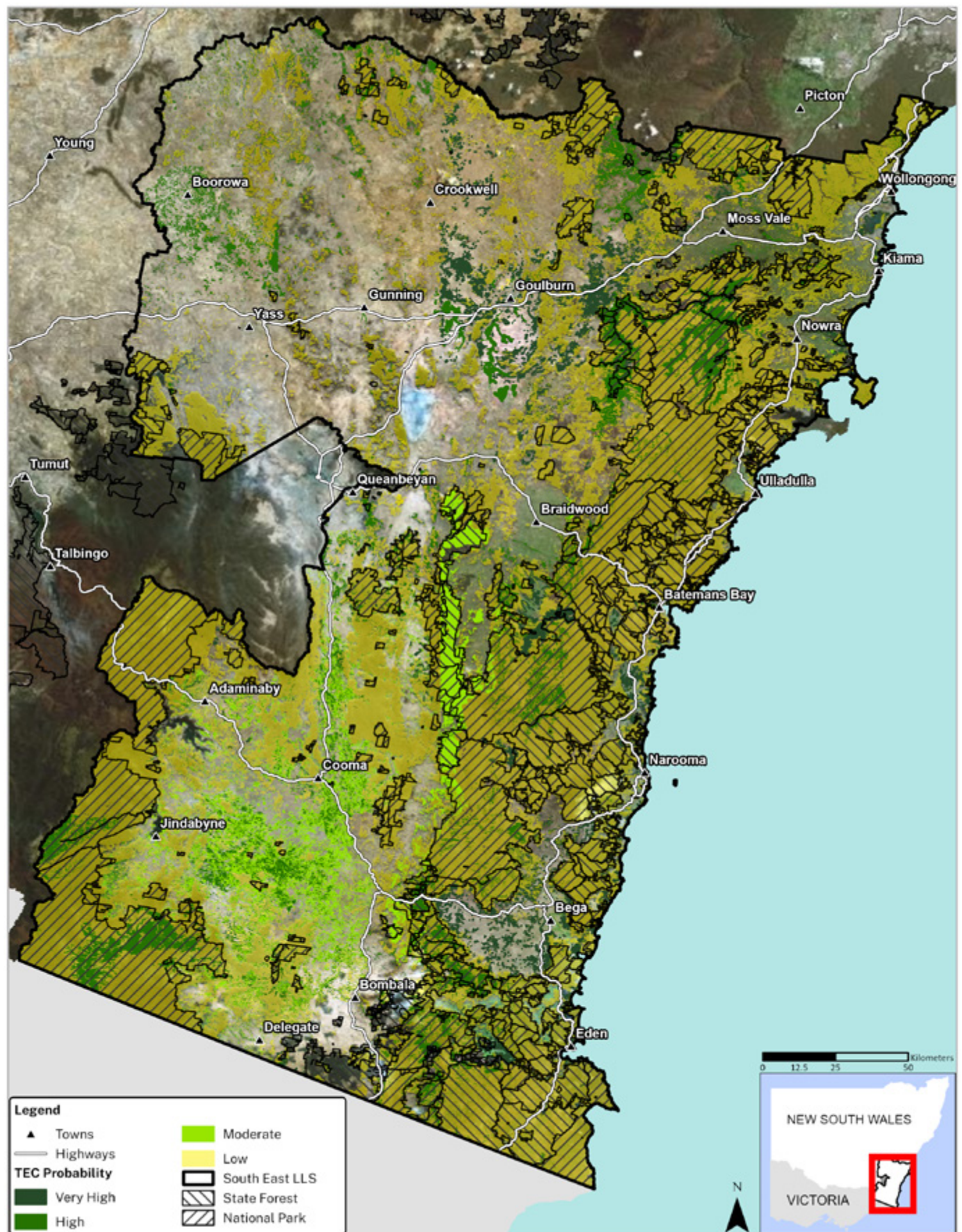
Commonwealth and or NSW Threatened Species Sightings 2011-2021



Data source: Atlas of Living Australia. Accessed November 2021



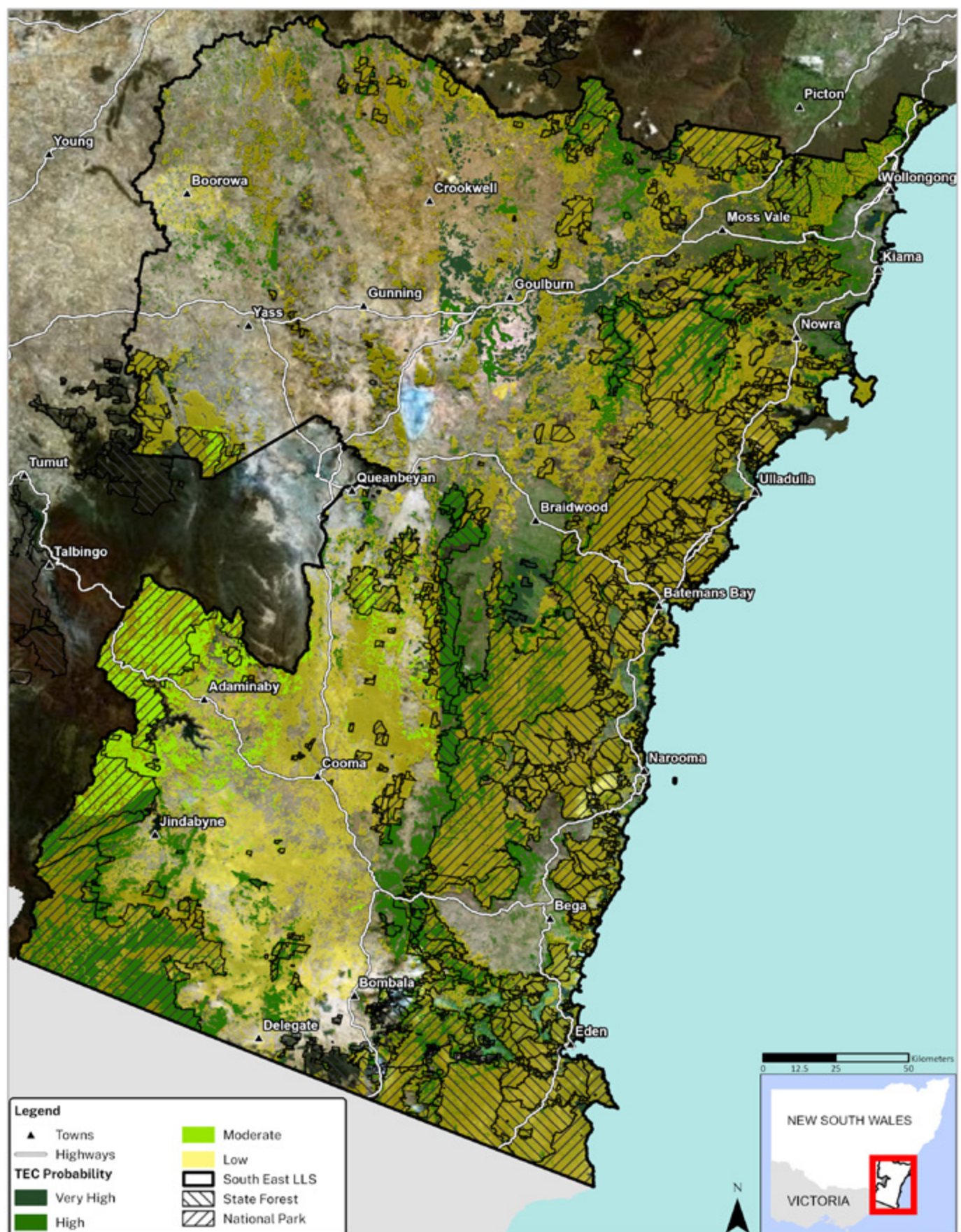
## Probability of NSW Threatened Ecological Communities Occurring



Data source: Eco Logical Australia 2015. Compilation of Biometric Mapping. Prepared for South East Local Land Services.



### Probability of Commonwealth listed Threatened Ecological Communities Occurring

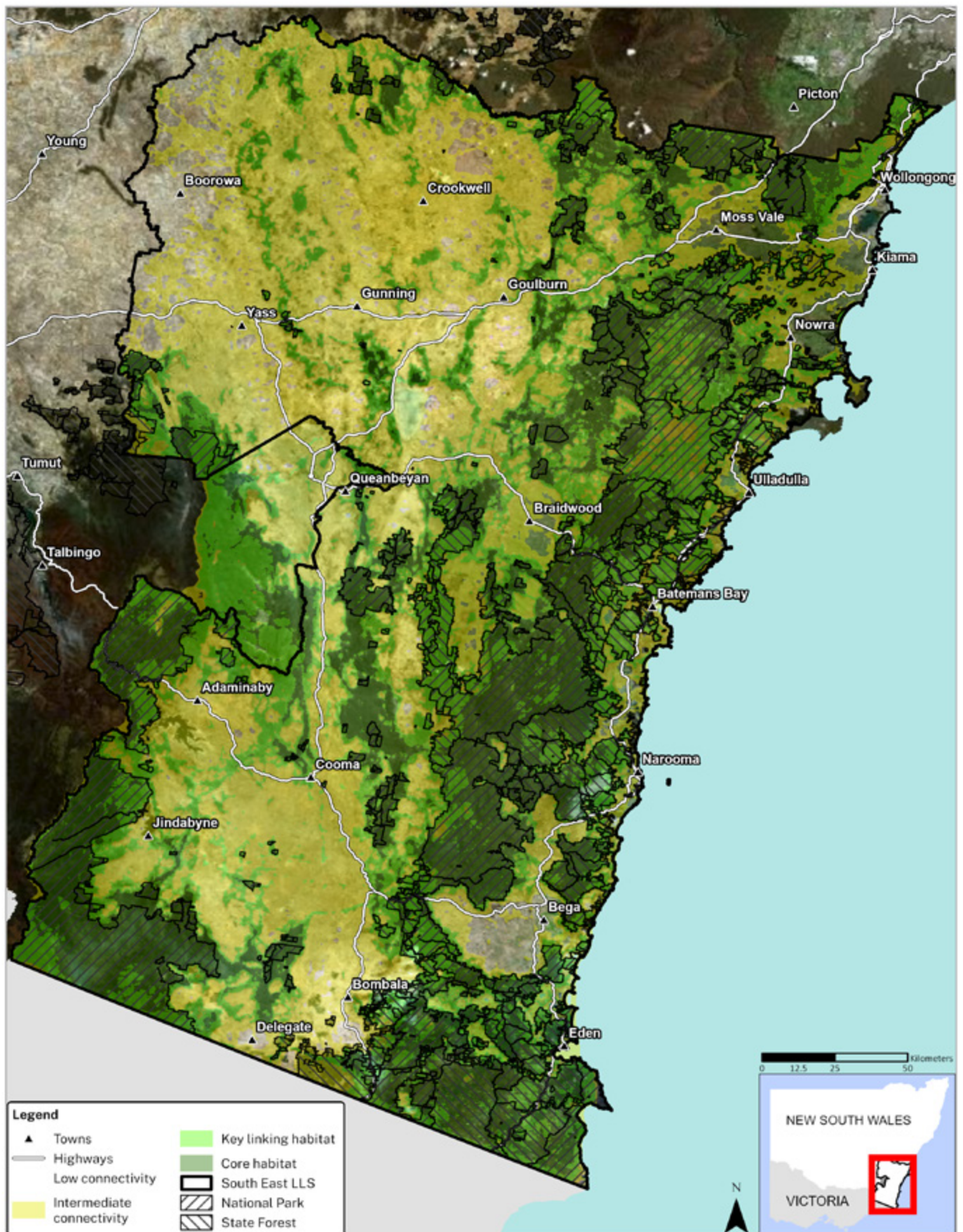


Data source: Eco Logical Australia 2015. Compilation of Biometric Mapping. Prepared for South East Local Land Services.



## 4.0 Native Vegetation woodland/forest connectivity

### Native Vegetation Connectivity

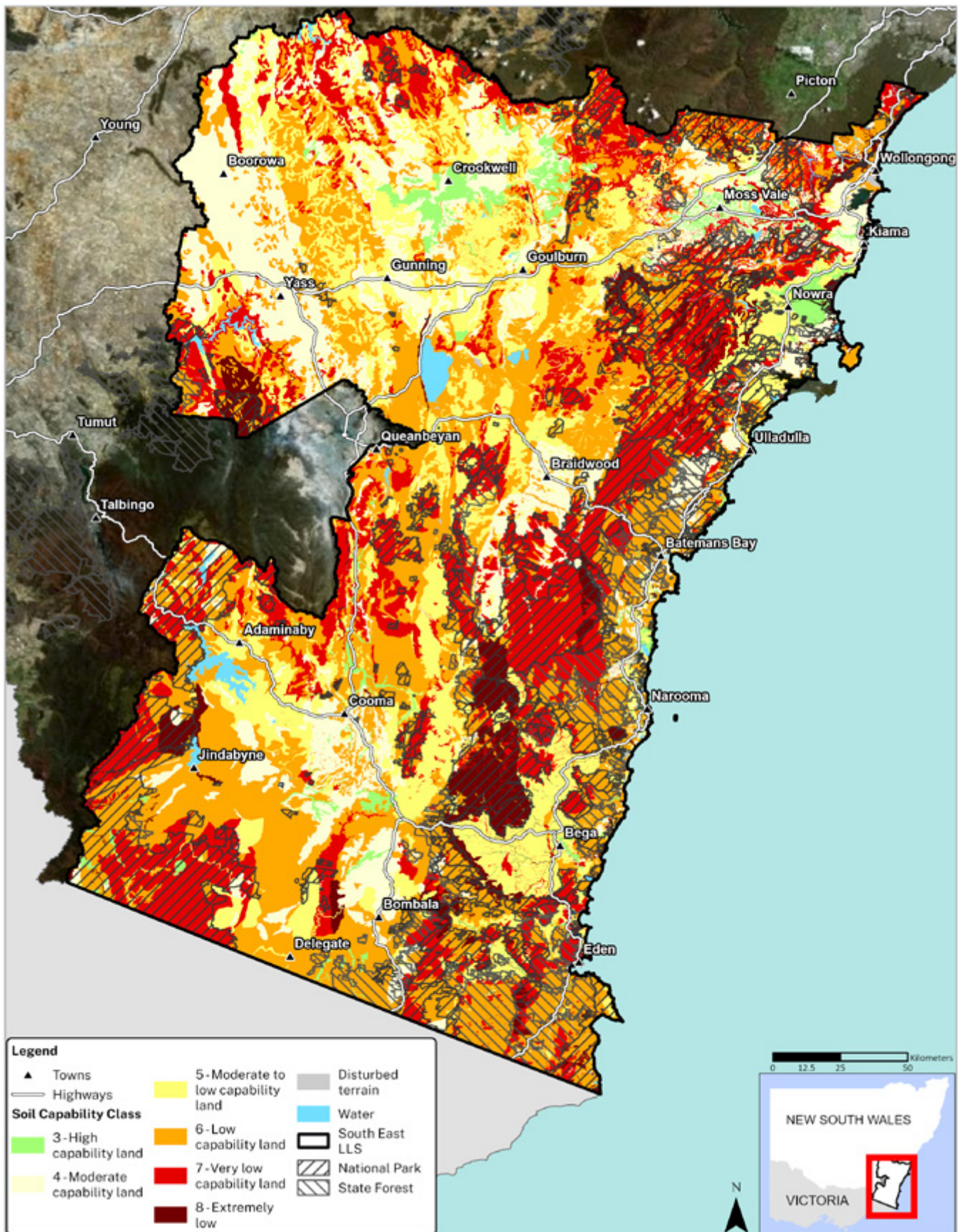


Data source: South East Local Land Services 2015. Climate Adaptation Plan South East Region. Draft. Internal Report.



## 5.0 Soil Capability

### Land and soil capability

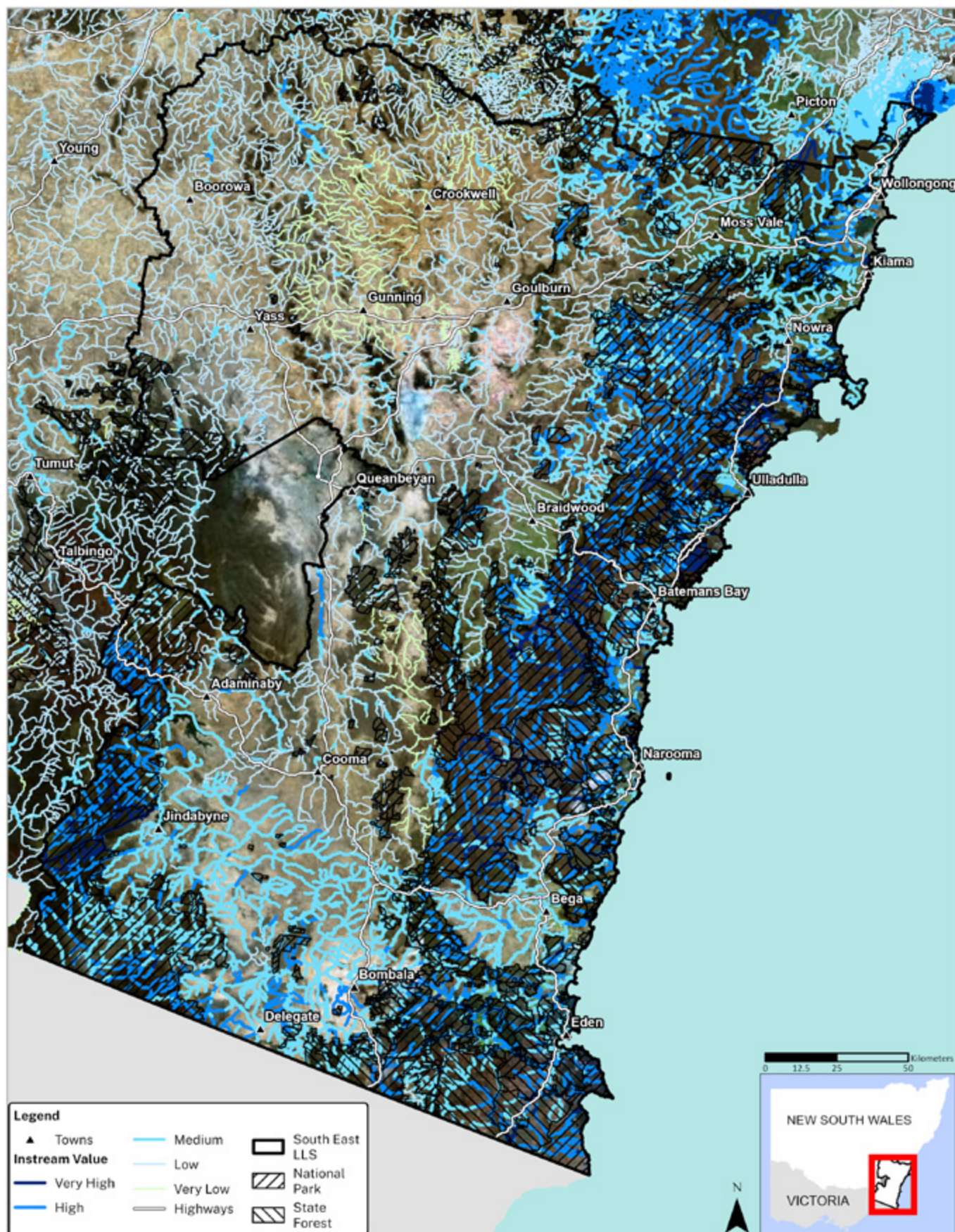


Data source: Office of Environment and Heritage (OEH) 2012. The land and soil capability assessment scheme – second approximation



## 6.0 Aquatic Assets Priorities

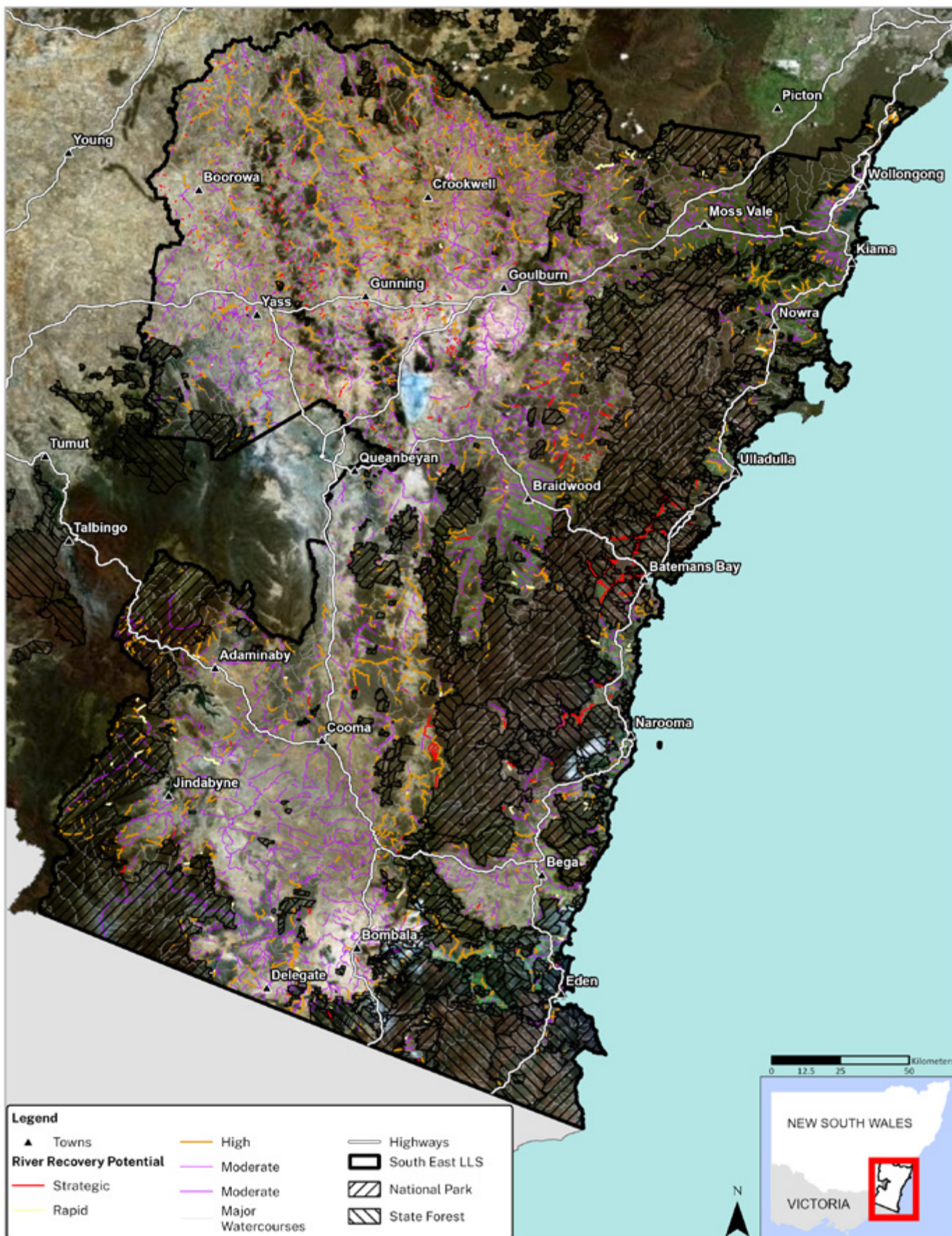
### High Ecological value aquatic systems



Data source: NSW DPIE 2022. Environmental Values of NSW Rivers: HEVAE. Ecological values of rivers are mapped using the HAVAE National Framework.



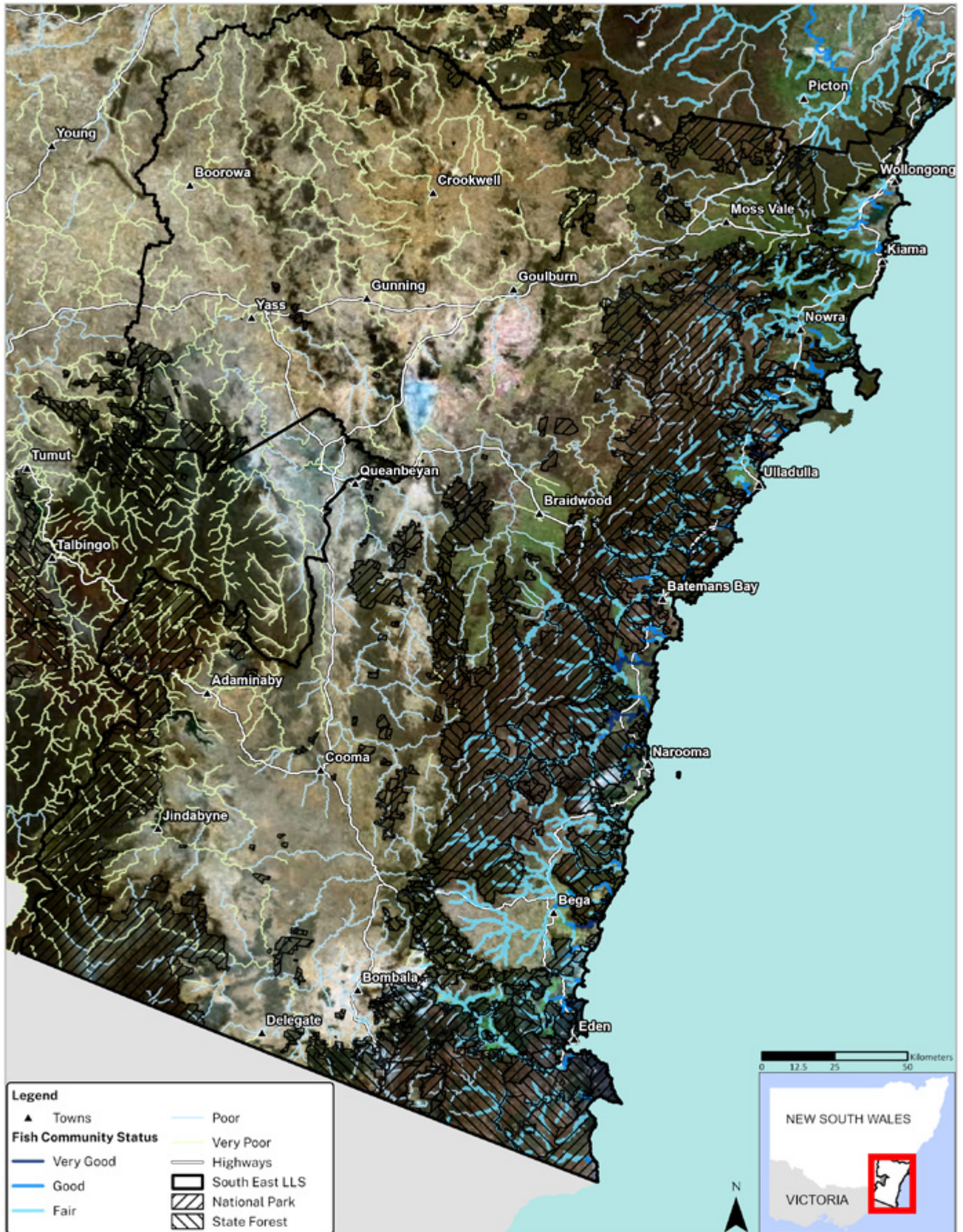
## River Recovery Potential



Data source: NSW DPIE & Macquarie University 2022. NSW River Styles Database.



## Freshwater Fish Community status



Data source: NSW DPI 2016. Fish communities and threatened species distributions of NSW.

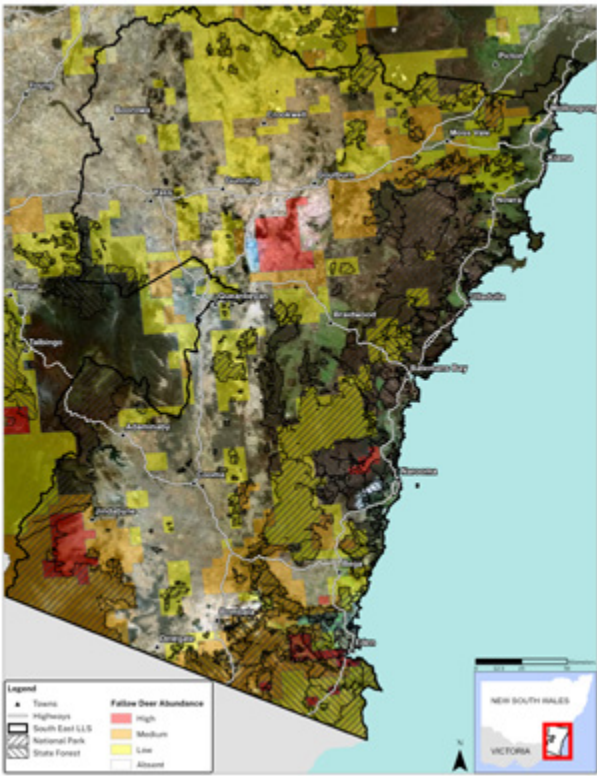


# 7.0 Pest Animal Distribution

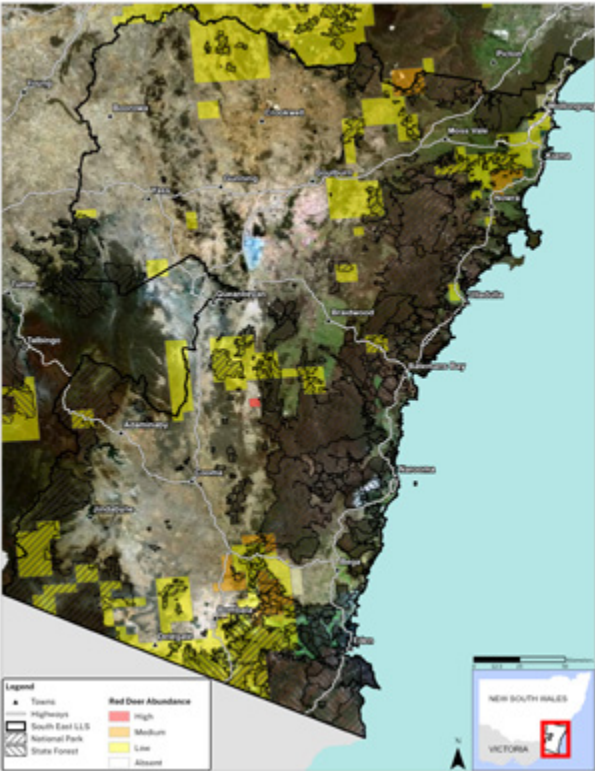
2020 Chital Deer Distribution and relative Abundance



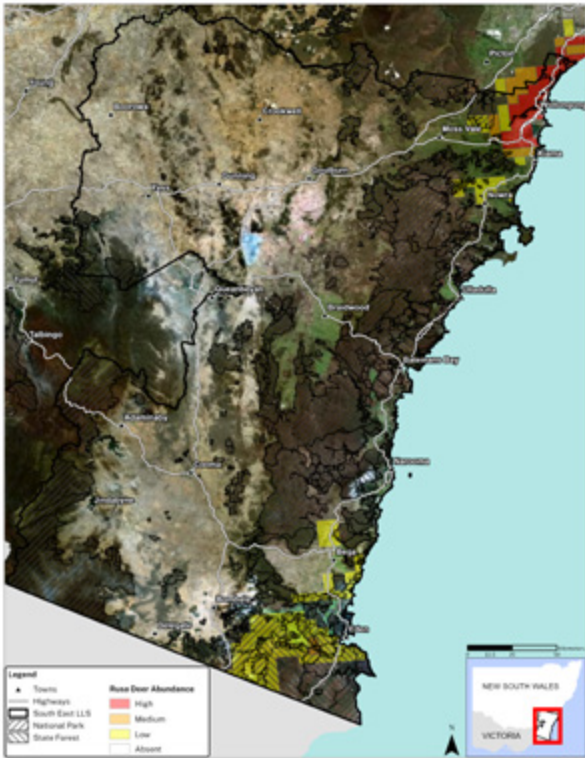
2020 Fallow Deer Distribution and relative Abundance



2020 Red Deer Distribution and relative Abundance

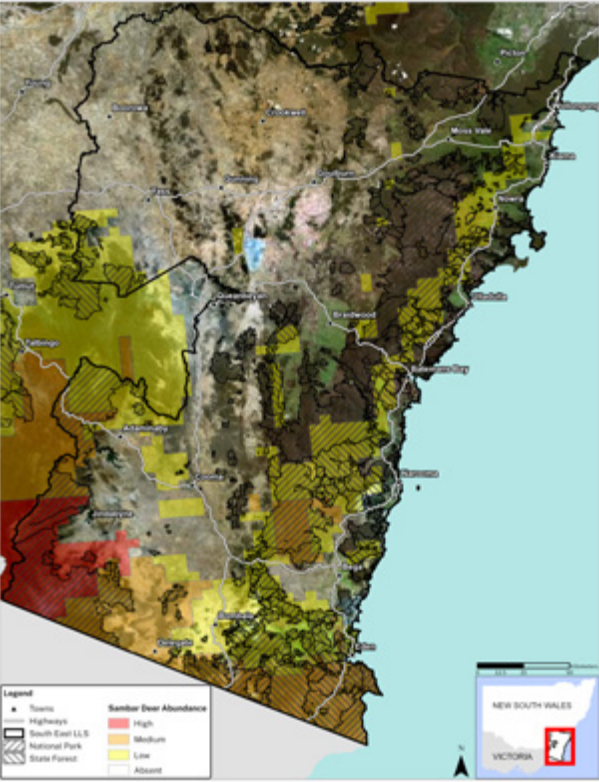


2020 Rusa Deer Distribution and relative Abundance

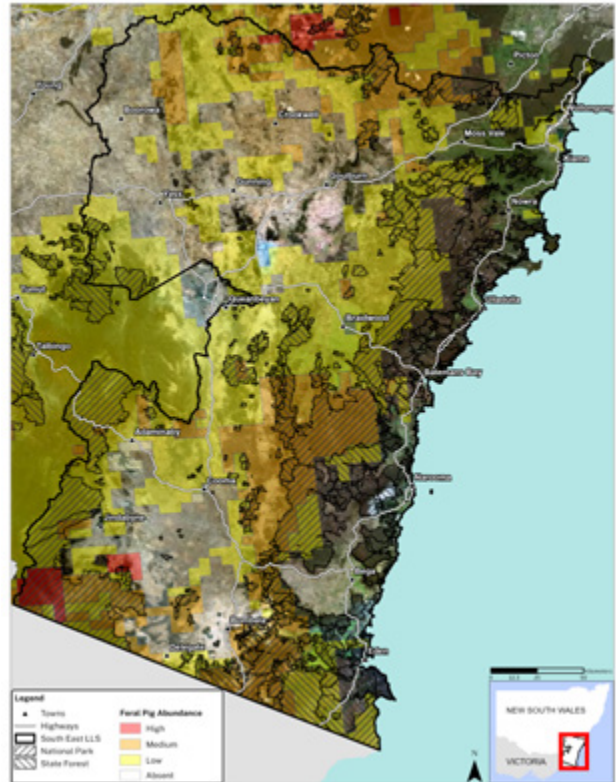




2020 Sambar Deer Distribution and relative Abundance



2020 Feral Pig Distribution and relative Abundance



Data source: NSW DPI 2020. Distribution maps for vertebrate pests.

# Appendix E: South East NSW priorities for the Regional Land Partnerships Program

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## How we prioritise natural resource management projects in South East NSW

South East LLS follow a process to help prioritise our NRM projects, as described in this NRM Plan. This process is done collaboratively with our partners to ensure we are addressing mutually agreed priorities.

In the South East, our natural assets are grouped into the landscape themes of connected native vegetation, healthy soils and resilient aquatic assets and we understand the threats to these assets and drivers of change as described in this plan. Each project is crafted so that it addresses the challenges and opportunities presented by our diverse landscape and the many players involved in managing it.

The process that we follow for prioritising natural resource management projects is:

1. Broadly scope the project against the objectives of the program.
2. Liaise with local staff and identify collaborators.
3. Use spatial tools to assist us with identifying priority assets at the appropriate scale.
4. Increased importance provided to projects that may contribute to multiple outcomes – particularly opportunity to address threats associated with climate change predictions.
5. Co-design the project:
  - Engage with primary partners.
  - Identify threats and potential actions to address threats.
  - Assess the feasibility and costs of actions.
  - Define project goals, time frames, budgets, roles and responsibilities.
  - Identify monitoring and evaluation, and adaptive management approaches.

## Aligning natural resource management projects with Australian Government Priorities

Six Regional Land Partnership Program Outcomes are relevant to the South East Region, with many opportunities for collaboration and shared priorities.

### Outcome 1: The ecological character of Ramsar sites is maintained or improved

*By 2023, there is restoration of, and reduction in threats to, the ecological character of Ramsar sites, through the implementation of priority actions.*

Mouse Ear hawkweed, first identified within Kosciuszko National Park in 2014, forms dense mats and displaces all other plants, creating monocultures which decreases biodiversity and impacts threatened species habitat. It therefore poses a significant threat to the unique alpine vegetation communities of the Blue Lake Ramsar site and surrounding areas.

South East LLS has partnered with the NSW National Parks and Wildlife Service through the Regional Land Partnerships 'Defending Blue Lake Ramsar Site (from Mouse Ear Hawkweed and other threats) project' (RLP-MU13-P10). The project has delivered an integrative approach using new drone technologies, detector dogs and community volunteers to undertake surveillance to identify, control and eradicate Mouse Ear Hawkweed (*Hieracium pilosella*) from sites within and surrounding the Blue Lake Ramsar site in Kosciuszko National Park.

Over the first three years of the Defending Blue Lake Ramsar Site from Mouse Ear Hawkweed and other threats, Southeast Local Land Services and National Parks and Wildlife Service (NPWS) have eliminated the weed threat from hawkweed across 388 hectares in and around the 338-hectare Blue Lake Ramsar Catchment. Together with dedicated community volunteers, over 3500 hours of surveillance and control of all hawkweed plants, as well as detection and reporting of pest animal threats has provided increased protection of the Blue Lake catchment.

Innovative techniques, such as the first-ever use of Weed Eradication Detector Dogs and remote helicopter insertion deployment of staff and volunteers to survey remote areas adjacent to the catchment for hawkweeds, has led to increased volunteer participation, robust

mapping and control of hawkweeds and pest animals, and enhanced ability to complete the first documented weed eradication from NSW, removing the threat of hawkweed from Blue Lake permanently. In the 2020- 21 season, despite searching 210 hectares in and around the Blue Lake Ramsar catchment, less than 0.5 m square of hawkweed plants were found. This demonstrates that mouse ear hawkweed eradication is advancing, thanks to support from NLP2 and a range of dedicated partners.

Despite these efforts, the weed continues to pose a threat to the site, and there is a need for continued investment to maintain surveillance and control activities.

Future funding will continue this program, with a focus on the following activities:

Multi-year services agreement and partnership between South East LLS and NPWS to deliver on- ground project services, such as:

- On-going weed distribution and pest animal distribution surveys using human volunteer teams, dogs, and innovative technologies such as drones.
- Supporting volunteer teams and community engagement in the program through direct funding of operations and also education programs for bushwalkers and tourists.

Opportunities to explore and leverage for a new program:

- Compliment partner programs, for example the National Park Performance Scorecards program.
- Work closely with NPWS' threat abatement programs (deer and feral animal work).
- Focus on community volunteer component, build on it and do it better.
- Focus on In-kind contribution from NPWS.
- Broader education about Ramsar wetlands and the importance of wetlands more broadly across the South East region.

## **Outcome 2: The trajectory of species targeted under the Threatened Species Strategy, and other Environment Protection and Biodiversity Conservation Act 1999 priority species, is improved.**

*By 2023, the trajectory of species targeted under the Threatened Species Strategy, and other Environment Protection and Biodiversity Conservation Act 1999 priority species, is stabilised or improved.*

Consultation and literature review unanimously identified the value of retention and improvement of native vegetation for multiple benefits to healthy landscapes. Priority activities have been identified in:

- Conducting education initiatives to increase land manager understanding of the role of native vegetation, promotion of the value of protecting habitat for key threatened species, supporting the development of property plans to manage risks associated with climate variability and understanding the soil carbon balance at a farm scale.
- Supporting land managers via financial incentives to protect and enhance priority habitat.
- Implementing pest animal management programs to reduce impacts to priority habitat.
- Implementing projects that highlight specific threatened species for multiple benefits.

A review of the Protected Matters Search Tool (MNES Report) for the South East Region, there are 253 threatened species identified as occurring or potentially occurring with the region. Access to information to support decision making in the South East include NSW Bionet results to understand the current and historical location of the species. Threatened species profiles help to identify recommended management actions and reviewing past initiatives of Local Land Services and various government and community partners help to identify local priority actions. Of the 253 threatened species, we recommend priority action for projects that focus on:



Species	Location in South East NSW	Threats	Cost effective management activities
<b>Mammals</b>			
<i>Phascolarctos cinereus</i> Koala (Qld, NSW, ACT)	Bungonia, Numeralla, Nullica and Murrah ARKS plus scattered populations predominantly in the east.	Increased intensity and frequency of drought and high temperatures, disease, habitat loss and mortality due to vehicles and dogs.	<p>Private land management incentives to encourage natural regeneration and tree planting within priority locations, upon consultation with NSW and local government and community partners, ensuring complementary activities to NSW Koala strategy investment. Incentives would include:</p> <ol style="list-style-type: none"> <li>1. Priority Project areas identified based on current knowledge of priority habitat for Koala (ARKS), including reference to mapping and partnerships.</li> <li>2. Landholders invited to express their interest in participating in a project to protect and/or enhance Koala Habitat in priority areas.</li> <li>3. Proposed sites assessed using an Environmental Services ratio that considers the role of the proposed site in contributing to landscape health of Koala population and potential habitat provision.</li> <li>4. Consultation with Saving Our species partners/ threatened species experts to ensure appropriate investment.</li> <li>5. Establishment of monitoring program to identify baseline condition data.</li> <li>6. Negotiation of on-ground works project with private land managers, provision of financial assistance for priority works, completion of 10 year management agreement.</li> <li>7. Community awareness programs also completed to increase land manager awareness of and interest in contributing to the protection of this significant asset.</li> </ol> <p>Additional activities should include:</p> <ul style="list-style-type: none"> <li>• Engaging with community through koala monitoring programs including audio and physical monitoring activities.</li> <li>• Supporting community with dog management and landscape scale herbivore pest animal management.</li> <li>• Ensuring collaboration with community groups and NSW Koala Strategy via local advisory groups.</li> </ul>

Species	Location in South East NSW	Threats	Cost effective management activities
<b>Mammals</b>			
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Known populations in Bungonia and Monaro IBRA regions and Nattai.	Predation by foxes, competition with feral goats; risks associated with small population size.	Maintain formal partnerships with NPWS, Friends of Brush tailed rock wallaby and Shoalhaven Landcare to support on-going population monitoring activities;  Enhance capacity of community to undertake feral animal management activities via awareness raising activities and support strategic baiting programs.
<i>Dasyurus maculatus</i> (Spot-tailed Quoll)	Known Populations in Barren Grounds, Tallaganda, Monga and Eurobodalla.	Predation by foxes, predation and competition by feral cats and wild dog.	Maintain formal partnerships and establish new partnerships with community and Aboriginal groups to establish health records and monitoring for known and new populations.  Supporting known populations via baiting to reduce threats including increasing land manager capacity to monitor for and manage feral animals, along with provision of baiting and pest animal management support.
Yellow Bellied Glider	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.  Records along coastal areas of Southeast Region, particularly Eurobodalla, Bega Valley.	Key threats include: <ul style="list-style-type: none"> <li>Loss and fragmentation of habitat. (Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources).</li> <li>Loss of hollow-bearing trees (Den, often in family groups, in hollows of large trees).</li> <li>Loss of feed trees (Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein).</li> <li>Impact of bushfires and flooding on presence of large hollow bearing trees.</li> </ul>	Private land management education and incentives to protect and enhance yellow bellied glider feed trees. An incentive program may include: <ol style="list-style-type: none"> <li>1. Priority Project areas identified based on current knowledge of the extent of Yellow Bellied Glider habitat.</li> <li>2. Landholders invited to express their interest in participating in a project to protect and/or enhance Yellow Bellied Glider habitat and feed trees.</li> <li>3. Proposed sites assessed using an Environmental Services ratio that considers the role of the proposed site in contributing to landscape health of Yellow Bellied Glider populations and potential habitat provision.</li> <li>4. Consultation with Saving Our species partners/ threatened species experts to ensure appropriate investment.</li> <li>5. Establishment of monitoring program to identify baseline condition data.</li> <li>6. Negotiation of on-ground works project with private land managers, provision of financial assistance for priority works, completion of 10 year management agreement.</li> <li>7. Community awareness programs also completed to increase land manager awareness of and interest in contributing to the protection of this significant asset.</li> </ol> Additional activities to include: Undertake monitoring for populations in priority areas; Increase community awareness of the Yellow-bellied Glider and encourage community involvement in its conservation



Species	Location in South East NSW	Threats	Cost effective management activities
<b>Mammals</b>			
<i>Petauroides volans</i> Greater Glider	<p>Records along coastal areas of Southeast Region, particularly Eurobodalla.</p> <p>These populations are facing a very high risk of extinction in the near future.</p> <p>Example populations including:</p> <ul style="list-style-type: none"> <li>A population of Greater Gliders on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway and cleared land exceeding 500 m in width to the west.</li> <li>A population of Greater Gliders on the south coast of NSW is situated between Crooked River (Gerroa) to the north and Shoalhaven Heads Road in the town of Shoalhaven Heads to the south.</li> </ul>	<p>Tree clearing, forest destruction, bushfires and climate change are placing Greater glider populations at risk.</p> <p>Extreme concerns regarding status of populations following bushfires and flooding events that have impacted suitable habitat including hollow bearing trees and food sources.</p> <p>Lack of connectivity to surrounding habitat due to development.</p> <p>Vulnerability of small population size, susceptible to threats including loss of individuals and threats impacting habitat quality and food ( eg drought, floods and too frequent fires).</p>	<p>Support to community groups undertaking greater glider population monitoring to improve understanding of extent of existing populations; working in partnership with NSW and Local government agencies.</p> <p>Community education initiatives to encourage protection and enhancement of greater glider habitat on private property.</p> <p>Enhance habitat via strategic revegetation, establishment of corridors to improve potential for future movement of greater gliders.</p>

Species	Location in South East NSW	Threats	Cost effective management activities
<b>Birds</b>			
<i>Thinornis cucullatus</i> Hooded Plover (eastern)	On or near Sandy beaches from Jervis Bay south.	Disturbance from humans, domestic dogs, predation by foxes and native Corvids.	Maintain formal partnerships with NPWS, local government and community groups to support: <ul style="list-style-type: none"> <li>Increased capacity of community to contribute to feral animal management activities on private lands by conducting awareness raising activities.</li> <li>Reduced human impact on habitat including domestic dog management and incentives for protection of wetland and saltmarsh habitat.</li> <li>Continued support of shorebird ranger program - supporting monitoring and management activities.</li> </ul>
<i>Botaurus poiciloptilus</i> Australasian Bittern	Known to use coastal wetlands in non-breeding season with tall dense vegetation, particularly bullrushes. Only 7% of distribution occurs on reserves in NSW.	Clearing or modification of wetlands for urban or agricultural development and extraction for irrigation.	
<i>Numenius madagascariensis</i> Eastern Curlew	Non-breeding, coastal, particularly ICOLs. Breeds in Russia and NE China.	Development pressure and human disturbance in foraging sites, hydrological changes to ICOLs.	
<i>Lathamus discolor</i> Swift Parrot	Non-breeding habitat (Feb - Oct). Mostly on the coast and SW slopes.	Habitat loss and fragmentation. Habitat mostly outside conservation reserves.	Private land management incentives to encourage natural regeneration and tree planting and encourage community involvement in annual surveys in partnership with NSW SOS program. This program would be delivered in conjunction with Box Gum Grassy Woodlands incentives program(s) and would include: <ul style="list-style-type: none"> <li>Priority Project areas identified based on current knowledge of the extent of Box Gum Woodland.</li> <li>Landholders invited to express their interest in participating in a project to protect and/or enhance Box Gum Grassy Woodland.</li> <li>Proposed sites assessed using an Environmental Services ratio that considers the role of the proposed site in contributing to landscape health of Box Gum Grassy woodland and potential habitat provision.</li> <li>Consultation with Saving Our species partners/ threatened species experts to ensure appropriate investment.</li> <li>Establishment of monitoring program to identify baseline condition data.</li> <li>Negotiation of on-ground works project with private land managers, provision of financial assistance for priority works, completion of 10 year management agreement.</li> <li>Community awareness programs also completed to increase land manager awareness of and interest in contributing to the protection of this significant asset.</li> </ul>
<i>Anthochaera phrygia</i> Regent Honeyeater	Non-breeding habitat. Flagship woodland bird of dry open forest and woodland of Southern Tablelands and SW Slopes. Occasionally forage in flowering coastal swamp mahogany & spotted gum forests.	Habitat degradation notably box gum woodlands and competition with larger more aggressive honeyeaters.	



Species	Location in South East NSW	Threats	Cost effective management activities
<b>Birds</b>			
<i>Callocephalo n fimbriatum</i> (Gang Gang cockatoo)	<p>Known to occur within the South East Region.</p> <p>In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests.</p> <p>In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.</p> <p>Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts.</p>	<p>Loss of key breeding and foraging habitat from intensive wildfire events and inappropriate hazard reduction burns.</p> <p>Loss and degradation of breeding and foraging habitat from rural and urban development.</p> <p>Lack of knowledge of locations of key breeding habitat and breeding ecology and success.</p> <p>Loss of breeding habitat and impact of bushfires and recent flooding events on populations.</p>	<p>Delivery of community education and incentives program targeting increased awareness of populations and enhancement of priority habitats, including:</p> <ul style="list-style-type: none"> <li>Promotion of the importance of retaining standing dead timber.</li> <li>Private land management incentives to protect and enhance specific Gang Gang cockatoo habitat particularly tall wet forest and dry sclerophyll forest vegetation communities with large trees supporting hollows that are 10cm in diameter and encourage regeneration and expansion for future habitat. Careful management of foraging habitat including the replacement of exotic berry bearing shrubs if they are removed.</li> <li>Support to citizen science initiative to establish monitoring of breeding success in known populations including management and enhancement of hollows suitable for breeding. This is considered particularly important following the impacts of bushfires and flooding events on breeding cycles since 2020.</li> </ul>
Superb Parrot	<p>Superb parrot is known to occur on south western slopes, their core breeding areas bound by Cowra and Yass in the east. In habits Box-Gum, Box- Cypress-pine woodlands.</p>	<p>Loss of key habitat including:</p> <p>Loss of living and dead hollow-bearing trees or competition for use of hollows.</p> <p>Reduced breeding and foraging habitat and competition for foraging habitat and resources from Noisy Miners.</p> <p>Poor regeneration of nesting trees and food resources.</p> <p>Loss of habitat from private native forestry activities.</p> <p>Feeding on grain spills and subsequently being struck by vehicles.</p> <p>Lack of knowledge of population and movement trends in the Superb Parrot.</p> <p>Lack of knowledge about the breeding ecology and breeding success of this species.</p>	<p>Private land management incentives to encourage natural regeneration and tree planting and encourage community involvement in annual surveys in partnership with NSW SOS program. This program would be delivered in conjunction with Box Gum Grassy Woodlands incentives program(s) (as described under Outcome 4).</p>

Species	Location in South East NSW	Threats	Cost effective management activities
<b>Reptiles</b>			
<i>Tympanocryptis osbornei</i> (Grassland Earless Dragon)	Occur on the Monaro Plains near Cooma, with concern regarding population size declining. Recent surveys on the Monaro have found occupancy rate to have decreased.	Negative impact on habitat requirements from changed land management practices, impact of feral animals and weed incursions, impact of climate change on habitat composition.	Work in partnership with NSW DPIE and Australian Government to expand surveys to monitor health of known populations and explore new sites; <ul style="list-style-type: none"> <li>Establish demonstration sites for low impact on-going monitoring and habitat management including promotion of Best Management Practice for grazing and retention and protection of natural grassland remnants and grassland with appropriate structure within the known and former distribution of the species.</li> <li>Work with partners including Landcare and Aboriginal groups to increase land manager awareness of the species, specific habitat requirements and impact of management decisions in native grasslands.</li> </ul>
<b>Fish</b>			
<i>Prototroctes maraena</i> (Australian Grayling)	Predicted to occur in coastal waterways, particularly Eurobodalla and Bega Valley including Clyde, Deua, Towamba and Tuross rivers.	Reduced opportunity for reproduction and migration due to altered flows and temperature regimes resulting from river regulation. Barriers to movement from dams, weirs and road crossings. Increased sedimentation and erosion due to riparian vegetation removal. Decreased water quality due to agricultural runoff and siltation. Predation and competition with introduced fish such as Redfin Perch ( <i>Perca fluviatilis</i> ). Extreme weather events, such as drought and bushfires. Local extinctions could greatly affect the survival of the species as a whole.	Work in partnership with NSW DPI Fisheries to continue monitoring program to detect Australian Grayling populations in coastal waterways. To replicate post bushfire surveys (completed 2022), now following flooding events to assist in identification of priority protection areas. Increase private land manager awareness of species and habitat requirements via awareness raising activities. Deliver landholder incentives in priority areas, following surveys, to reduce threats to reaches with known populations including removal of sedimentation threats and increase riparian vegetation.



Species	Location in South East NSW	Threats	Cost effective management activities
<b>Fish</b>			
<i>Macquaria australasica</i> (Macquarie Perch)	Records within the South East Region including Murrumbidgee River, Mongarlowe River and Abercrombie River.	<p>Barriers to movement from dams, weirs and road crossing.</p> <p>Cold water and insufficient discharge from dams which may disrupt temperature and flow cues for spawning.</p> <p>Loss of deep pool and spawning habitat due to removal of riparian vegetation and increased erosion and siltation and impact of invasive plant species.</p> <p>Infection of Macquarie Perch by Epizootic Haematopoietic Necrosis Virus (EHNV), which is carried by the introduced species Redfin Perch and to a lesser extent, farmed Rainbow Trout.</p> <p>Historic overfishing and current illegal fishing practices.</p> <p>Extreme weather event, such as drought and bushfires.</p> <p>Competition with and predation by introduced fish, particularly Redfin Perch, European Carp, Brown Trout and Rainbow Trout.</p> <p>Pollution from domestic, agricultural and industrial sources.</p>	<p>To continue to deliver on the National Recovery Plan strategies for South East Populations including:</p> <p>The recovery plan sets out six recovery strategies that build toward this overarching objective:</p> <ol style="list-style-type: none"> <li>1. Conserve existing Macquarie perch populations (including historically translocated populations in Cataract Reservoir and the Mongarlowe and Yarra rivers).</li> <li>2. Protect and restore Macquarie perch habitat.</li> <li>3. Understand and address threats to Macquarie perch populations and habitats. Establish additional Macquarie perch populations within the species' natural range.</li> <li>4. Improve understanding of the biology and ecology of the Macquarie perch and its distribution and abundance.</li> <li>5. Increase participation by community groups in Macquarie perch conservation.</li> <li>6. To maintain partnerships developed during the existing Regional Land Partnership Program and build on the initiatives that include (not limited to): <ul style="list-style-type: none"> <li>• Improving the understanding of local populations via supporting ongoing monitoring programs as well as investigating the impact of recent bushfires and flooding events.</li> <li>• Improve habitat via initial and follow up weed management and revegetation activities.</li> <li>• Use our details local knowledge of people and places to partner with DPI Fisheries to deliver targeted genetic rescue services including translocation and conservation stocking of genetically diverse broodfish and/or fingerlings.</li> <li>• Working with Aboriginal and community groups to undertake community engagement activities that increase awareness of the significance of the species.</li> </ul> </li> </ol>

Species	Location in South East NSW	Threats	Cost effective management activities
<b>Fish</b>			
<i>Galaxias tantangara</i> Stocky Galaxias	Known from one location on Tantangara Creek, Kosciuszko NP.	Predation by trout and loss of riparian vegetation. Known site was fire affected. Current recovery project aims to create additional habitat.	Maintain existing partnerships with NPWS and NSW DPI to work on stage 2 of the Stock galaxias recovery project: <ul style="list-style-type: none"> <li>expand Eucumbene Borrows restoration work.</li> <li>additional surveys to continue post-fire monitoring / progression of identifying alternative sites.</li> <li>schedule 1st translocation into Stage 1 Dam at Eucumbene, either from Tantangara Ck or captive.</li> </ul>
<i>Nannoperca australis</i> Southern Pygmy Perch	Small populations in the Upper Lachlan and Upper Murrumbidgee catchments within the South East Region.	Habitat degradation including the loss of riverbank vegetation. Removal or modification of floodplain wetland habitat due to flood mitigation works such as levees and wetland drainage. Dams alter natural river flow and temperature which leads to the drying and fragmentation of wetland habitat. Competition with and predation by introduced fish, particularly Redfin Perch and Eastern Gambusia.	Work in partnership with NSW DPI Fisheries to support a monitoring program to detect Southern Pygmy Perch in the Murrumbidgee River. To build on knowledge of populations following recent bushfire and flooding events to assist in identification of priority protection areas. Increase private land manager awareness of species and habitat requirements. Deliver landholder incentives in priority areas to reduce threats to reaches with known populations including removal of sedimentation threats, increase riparian vegetation.
<b>Plants</b>			
<i>Rhodomyrtus psidioides</i> Native Guava	1 record in SE NSW (source DPIE, 2011). Coastal and sub- coastal littoral, temperate and sub-tropical rainforest.	It is likely that historical land clearing has led to decline in abundance of the species from the south east. Highly susceptible to myrtle rust.	Extend its geographic range southward. Support propagation and ex-situ conservation. Support techniques to increase resistance to Myrtle Rust. Support sharing of knowledge of traditional therapeutic use (treatment of wounds/anti microbial).
<i>Pomaderris walshii</i> Carrington Falls Pomaderris	Only known from upper catchment of Kangaroo River in two small populations. Total area of occurrence about three lineal kilometres including private land.	Lack of knowledge regarding potential cause of species decline; risk from catastrophic events	Stock fencing, fire planning, augment population with ex-situ material, negotiate land management agreements and monitor effectiveness of activities.



Species	Location in South East NSW	Threats	Cost effective management activities
<b>Plants</b>			
<i>Daphnandra johnsonii</i> Illawarra socketwood	Five priority management sites have been identified within the Saving Our Species program in NSW (ordered north to south and including local government area (LGA)). They are: <ul style="list-style-type: none"> <li>• Calderwood - Avondale in Shellharbour, Wollongong LGA</li> <li>• Dunmore Hills in Shellharbour LGA</li> <li>• Minamurra Stockyard in Kiama LGA</li> <li>• Kiama in</li> <li>• Kiama LGA</li> <li>• Foxground-</li> <li>• Toolijooa in Kiama LGA</li> </ul>	Weed incursions. Impact of feral animals including deer. Impact of grazing livestock trampling plants.	Work in partnership with SOS program to support the implementation of priority actions as per the SOS Illawarra socketwood strategy.
Yass Daisy	Located from Crookwell to Wagga Wagga, predominantly in the Yass area. Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities.	Agricultural developments including pasture modification and cropping threaten this species. Intensification of grazing regimes may threaten this species. Invasion of weeds including pasture grasses are a threat. Roadworks (particularly widening or re-routing) is a threat. Inappropriate mowing or slashing in the cemetery sites where species occurs may threaten this species.	Private land management incentives to encourage natural regeneration and tree planting and encourage community involvement in annual surveys in partnership with NSW SOS program. This program would be delivered in conjunction with Box Gum Grassy Woodlands incentives program (as described under Outcome 4).
Warty Zieria	Warty Zieria grows in the Mt Dromedary and Tilba Tilba area. A total of 13 sites are currently known and the total population (all age classes) is about 3,000 plants.	Woody weed invasion, particularly Lantana, resulting in loss of habitat. Grazing and trampling of plants and habitat by grazing stock.  Risk of wildfire destroying local populations.	Weed management, seed collection, propagation and planting in Tilba Tilba area.

### Outcome 3: The natural heritage Outstanding Universal Value of World Heritage properties is maintained or improved.

*By 2023, invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions.*

The Greater Blue Mountains World Heritage Area extends into the South East NSW management unit, where South East LLS has been working with landholders, community groups, and other partners to deliver 'Defending the Greater Blue Mountains World Heritage Area' project (RLP-MU13-P13). South East LLS have engaged with private landholders, neighbours to the world heritage area to support increased awareness of the values of the area and offer education and incentives to manage key threats including pest animal incursion and invasive weeds such as blackberries that may harbor feral animals. The program has also offered awareness raising opportunities for landholders regarding cultural values of the landscape. A key focus of the project has been to protect key assets within the WHA such as the threatened brush-tailed rock-wallaby and complement work being undertaken by NPWS within the GBMWhA Estate.

As per the Blue Mountains World Heritage Area Planning, any future programs in this area would continue a similar program. The invasion of pest species including weeds and feral animals is a key threatening process to the Greater Blue Mountains World Heritage Area (GBMWhA), including to the EPBC listed Threatened Ecological Community, White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and its associated species. The issues are on-going, particularly with impacts of bushfires (2019/20) and Flooding events (2022). The high level of turnover of land ownership, often absentee landholders, requires on-going partnership programs to ensure the World Heritage area is protected from future risks.

Future funding will continue this program, with a focus on the following activities:

- Cross-tenure pest animal campaigns (baiting, trapping, ground and aerial shooting), and a variety of chemical and mechanical weed control methods to manage pest animal habitat on private lands and public reserves adjacent to the World Heritage Area, specifically in the areas of Bullio, High Range, Joadja and surrounding the Guula Ngurra National Park.
- Expand the area of works to include the Great Western Wildlife Corridor between Bullio and Bungonia to support connectivity for the Glossy Black-Cockatoo.
- Landscape-scale monitoring of feral animal populations (pigs, deer, goat, foxes) via thermal imagery surveys.
- Training to strengthen and expand integrated pest and weed management programs and threatened species monitoring, with particular emphasis on encouraging ongoing community and neighbour involvement.
- Traditional Aboriginal fire management programs, in partnership with Firesticks Alliance, and continuation of cultural awareness activities to encourage protection of Aboriginal Cultural sites including rock shelters.
- Continuing to grow landholder engagement across the project area and working with community groups and volunteer networks via a project steering committee and website (NPA Association, Illawarra LALC, Gundungurra Tribal Council).
- Leveraging partnerships and seeking collaboration/co-funding from NSW Government agency partners.
- NPWS Threat Abatement programs
- NPWS new 'EcoHealth' and 'National Parks Performance Scorecard' programs.
- Greater Sydney Local Land Services and Central Tablelands Local Land Services, 'Living on the Edge'.
- DPIE Saving our Species (SoS) program (Brush-tailed rock wallaby, koala and spotted quoll programs).
- K2W Glideways feral animal program and NPA Association's 'Who's Living on my Land'.
- Wingecarribee Shire Council programs (Glossy Black Cockatoo Conservation, Native Vegetation Mapping Project, Southern Highlands Koala Conservation Project, Wall to Wollondilly – River).



## Outcome 4: The condition of Environment Protection and Biodiversity Conservation Act 1999 listed Threatened Ecological Communities is improved.

*By 2023, the implementation of priority actions is leading to an improvement in the condition of Environment Protection and Biodiversity Conservation Act 1999 listed Threatened Ecological Communities*

Consultation and literature review unanimously identified the value of retention and improvement of native vegetation for multiple benefits to healthy landscapes. Priority activities have been identified in:

- Conducting education initiatives to increase land manager understanding of the role of native vegetation, promotion of the value of protecting habitat for key threatened species, supporting the development of property plans to manage risks associated with climate variability and understanding the soil carbon balance at a farm scale.
- Supporting land managers via financial incentives to protect and enhance priority habitat.
- Implementing pest animal management programs to reduce impacts to priority habitat.
- Implementing projects that highlight specific threatened species for multiple benefits.

Twenty seven Threatened Ecological Communities have been identified as known, likely or may occur within the South East Region (according to the Protected matters Search Tool). South East LLS has access to mapping tools such as the compilation of Biometric Vegetation, to assist in identifying the probable presence of TEC within our region. Knowledge of local staff, experience in the delivery of past projects and partnerships with local government and Saving our Species program staff also help add to this knowledge.

Prioritising activities that focus on the protection and enhancement of Threatened Ecological Communities within the South East Region relies on a matrix of considerations, including:

- Reference to mapping data and the likelihood of the TEC occurring in our region.
- Opportunity for LLS to make an impact such as likelihood of occurrence within privately owned lands, recommended management actions within threatened species profiles.

- Consideration of immediate needs such as recent impacts of drought, bushfire and flooding on identified communities, impact of predicted climate change.
- Opportunity to meet multiple outcomes such as improved farm resilience, contribution to reducing potential impacts of climate change and protection of habitat for multiple significant species.

Projects focused on the protection and enhancement of Threatened Ecological Communities would focus on key activities including:

- Conducting education initiatives to increase land manager understanding of the role of native vegetation, promotion of the value of protecting habitat for key threatened species, supporting the development of property plans to manage risks associated with climate variability and understanding the soil carbon balance at a farm scale.
- Supporting land managers via financial incentives to protect and enhance priority habitat.
- Implementing pest animal management programs to reduce impacts to priority habitat.
- Implementing projects that highlight specific threatened species for multiple benefits.

Early assessment of predicted Threatened Ecological Communities (TEC) within South East Region, highlights priority Threatened Ecological Communities for future investment including:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- Subtropical and Temperate Coastal Saltmarsh.
- Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion.
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.
- Natural Temperate Grasslands of the South Eastern Highlands.

South East LLS have delivered a range of projects targeting protection and enhancement of priority native vegetation, with common criteria in their delivery across the region. New projects would follow this successful model, which can be demonstrated by example of a recent project ***Thinking inside the Box Gum woodland***, implemented with the following key steps:

1. Priority Project areas identified based on current knowledge of the extent of Box Gum Woodland.
2. Landholders invited to express their interest in participating in a project to protect and/or enhance Box Gum Grassy Woodland.
3. Proposed sites assessed using an Environmental Services ratio that considers the role of the proposed site in contributing to landscape health of Box Gum Grassy woodland and potential habitat provision.
4. Consultation with Saving Our species partners/threatened species experts to ensure appropriate investment.
5. Establishment of monitoring program to identify baseline condition data.
6. Negotiation of on-ground works project with private land managers, provision of financial assistance for priority works, completion of 10 year management agreement.
7. Community awareness programs also completed to increase land manager awareness of and interest in contributing to the protection of this significant asset.

#### Thinking inside the box gum grassy woodland



<https://www.youtube.com/watch?v=o7lwoPgJ9JI&feature=youtu.be>

## Outcome 5: The conditions of soil, biodiversity and vegetation are improved

*By 2023, there is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation.*

The NRM Plan provides for a range of priorities under the themes of soil, biodiversity and aquatic assets, with key activities contributing to improve and protect the condition of soil, biodiversity and vegetation in the South East Region. Keys for success in increasing land manager adoption of these priority activities is identified to include collaboration with stakeholders and community groups, conducting peer to peer learning, provision of financial incentives and access to educational opportunities associated with key activities.

#### Future priorities for the South East Region include:

Coordination of community group support and development, increasing the capacity of community groups including Landcare, Small Farms and Local industry groups. Community groups engage with soil, biodiversity and vegetation issues through a variety of initiatives and networks across the South East including the Landcare Regional Community of Practice (RCOP). This network connects and encourages collaboration across and between Landcare and other community groups, government agencies (including but not limited to South East Local Land Services), partner organisations and other stakeholders such as Greening Australia, NSW Farmers, Biodiversity Conservation Trust. These collaborations and projects deliver a suite of natural resource management and social capital outcomes. The RCOP continues to thrive with regular injection of new participants from a range of NRM/environment/agriculture/recovery sectors in the region through the South East Local Leaders Program. Since 2015, this program has graduated over 120 leaders embedded in local South East communities who remain connected and supported to share and learn through the alumni network. These initiatives are supported in the South East by the Regional Agriculture Landcare Facilitator (through the National Landcare Program) and the Regional Landcare Coordinator (through the NSW Landcare Program). Activities such as these, along with financial assistance to groups to implement their priority activities, currently coordinated by the Regional Agricultural Landcare Facilitator, are considered essential for the on-going health and cooperation among community networks in South East NSW.

Ensuring opportunities for Aboriginal groups and individuals to participate in activities that increase opportunity and their capacity to care for country and share traditional ecological knowledge in ways that is culturally appropriate. In the future we require dedicated Aboriginal community engagement officer to ensure that Aboriginal groups and individuals have the opportunity and confidence to participate.

Awareness raising activities to assist land managers understand their soil resource, limitations and opportunities to enhance soil fertility and carbon, such as an extension to the Better Land Management Program currently supported by the Regional Land Partnerships Program. A program that offers a suite of activities including access to assistance for soil monitoring and interpretation of soil test results and access to a range of awareness raising opportunities and demonstration sites that highlight key health properties, limitations and opportunities to protect soils for healthy landscapes and agriculture in the region.

Incentives to assist land managers improve their grazing management practices and focus on retention of perennial groundcover, preparation for future drought and enhancing soil carbon, such as an extension to the Local Land Stewards Project currently supported by the Regional Land Partnerships Program. This program supports land manager adoption of improved practices via a combination of 1:1 technical advice and support provided, preparation of farm planning, establishing baseline monitoring and provision of incentives for changed practice that increases perennial groundcover. This program is combined with extension opportunities via grazing discussion groups to help land managers build knowledge and motivation.

#### **Building a Resilience Future, Local Land Stewards Program**



<https://www.youtube.com/watch?v=pZuRzLZMfs4>

## **Outcome 6: Agriculture systems have adapted to significant changes in climate and market demands.**

*By 2023, there is an increase in the capacity of agriculture systems to adapt to significant changes in climate and market demands for information on provenance and sustainable production*

The Southeast NRM Evidence Plan identifies a range of predicted challenges for agricultural systems in the near future, which vary across the diverse region of the South East. South East LLS recognise their role in providing support to primary producers to make informed decisions, based on locally relevant information, to protect their product and landscape, with priorities to focus on:

1. Drought preparedness and planning – understanding key climate change predictions and forecasting trends to ensure land managers are equipped in advance to make good decisions to protect industry and their natural resource base.
2. Soils intelligence – understanding landscape limitations and protecting their natural resource base via access to education, decision making and record keeping tools.
3. Sustainable Livestock production – accessing up to date climate and market trend information to assist their informed decision making regarding livestock health and trading.
4. Increase awareness of and ability to contribute to industry targets including improved grazing and soil management practices.

Priority future activities include:

#### **Drought preparedness and planning: supporting land managers to manage the risk associated with climate variability and to be prepared to respond in a timely manner**

Farming forecaster and seasonal updates ([Home page - PastureForecasting \(farmingforecaster.com.au\)](https://farmingforecaster.com.au)). Developed with graziers, Farming Forecaster places soil moisture, local weather, pasture production and livestock performance information at graziers fingertips. This decision-making tool is well developed in the South East and provides access to important information that can support groups and individuals with their grazing management decisions.



To enhance the value of this tool, South East LLS would prioritise investment in extension officers to support land managers understand how to apply this information to their grazing management decisions, taking into consideration key climate change predictions and local circumstance. The tool can also be further developed via the establishment of local monitoring sites to enhance the information used within the site and increasing it's local relevance across the diverse landscape of the South East.

**Soils Intelligence: supporting land managers to collect and analyse farm data to support decision making that benefits their enterprise and natural assets.**

Development and support of up to date and accessible decision making tools, such as 'Stockplan' and the Soil testing database.

Feedback received from land managers participating in soil awareness workshops have identified that a major barrier to undertaking soil testing is understanding the results. A key to ensuring land managers are poised to adapt to climate and market demands is their confidence in their ability to make good decisions.

Provision of and support to land managers in the use of these tools will assist land managers to collect and maintain good records that will support informed decision making. The Soil Test Monitoring Tool is an Excel-based tool to assist farmers in permanent pastures regions with monitoring of soil test results and associated fertiliser applications on farm helping to improve their land management decision making. The tool would allow farmers to enter soil test data from across their farm and produce graphical reports representing trends over time for the various soil parameters, allowing farmers to easily see their current soil fertility position in relation to maximum pasture production possible. Benefits that the tool would bring to farmers in the permanent pasture regions is an increased capacity to interpret soil test results allowing landholders to make more informed land management actions around soil fertility and health. With collection of soil test data over time the tool will be a key to farmers understanding the power of such data to help them make more informed decisions regarding the use of fertilisers and soil amendments for sustainable and productive pastures. It is anticipated that the introduction of this soil test monitoring tool

will encourage landholders to collect soil tests on a more frequent basis and improve confidence in making decisions based on their data. While this tool is in development, future investment is required to refine and improve access to the tool, along with extension support to land managers as they learn to use the tool.

## Sustainable Livestock Production

Supporting South East Producers maintain knowledge of and confidence in methods required to maintain industry standards such as the MLA carbon neutral 2030 will require support to and promotion of local industry leaders, along with establishment of demonstration sites that provide land managers opportunity to understand what is possible in the South East landscape.

Priority activities to focus on:

- Support land manager capacity in understanding soil carbon management via farm planning and establish demonstration sites within the South East exploring opportunities for on farm carbon management.
- Support land manager capacity to understand and improve their marketing potential, exploring opportunities to promote products based on sustainable practices.
- Support land manager capacity to improve their financial management decision making, ensuring businesses remain viable during fluctuating climate impacts and market demands.

## References:

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[Priorities Action Statement - Actions for Southern Pygmy Perch](#) ([nsw.gov.au](#))

[NSW Koala Strategy](#) | NSW Environment and Heritage

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[Spotted-tailed Quoll](#) - profile | NSW Environment, Energy and Science

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[Searching for Greater gliders by ACF](#)

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[Illawarra Socketwood \(Daphnandra johnsonii\)](#) | Conservation project | NSW Environment, Energy and Science

[Yass Daisy](#) - profile | NSW Environment, Energy and Science



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## Local Land Services

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**T** 1300 795 299  
**E** [enquiry.southeast@lls.nsw.gov.au](mailto:enquiry.southeast@lls.nsw.gov.au)  
**W** [lls.nsw.gov.au](http://lls.nsw.gov.au)