



The Coastal Rivers and Estuaries Project - an Environmental Trust funded project

Summary of findings

July 2021



Deua River campground, Deua National Park (Lucas Boyd, DPIE)

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NSW coastal catchments

The Coastal Rivers and Estuaries Project

The Environmental Trust asked the Natural Resources Commission to undertake the Coastal Rivers and Estuaries Project, which aimed to:

- improve the knowledge and understanding of health, threats, stressors, management and funding for coastal rivers and wetlands
- evaluate lessons learned, barriers and enablers for success, governance models and innovative approaches
- provide strategic recommendations to guide prioritisation of investment into NSW coastal river and estuary health
- improve riparian rehabilitation through benchmarking good practice guidelines for riparian rehabilitation management.

During the project, we conducted extensive literature and data review, consultation with more than 25 key stakeholders, stakeholder workshops, and met with the Advisory Group established by the Trust to advise and guide the

project. This paper provides a summary of the project's key findings.

What are coastal rivers and estuaries?

Coastal rivers and estuaries in NSW include all waterways east of the Great Dividing Range. While most of these catchments outflow to NSW marine waters, the Snowy and Genoa river catchments outflow to the Victorian coast. In this summary:

- **coastal river** refers to the freshwater portion of a coastal catchment upstream of the tidal limit for the highest astronomical tide
- **estuary** refers to the catchment portion downstream from this tidal limit.

Estuaries extend laterally to include saltmarshes and mangroves that can be inundated by tides as well as coastal wetlands and intermittently closed and open lakes and lagoons. There are 184 estuaries along the NSW coast (Roper *et al* 2011).



Chaelundi Nature Reserve (A. Ingarfield DPIE)

Coastal river and estuary health

The health of rivers and estuaries is also referred to as their condition, and is the overall state of key features and the physical and ecological processes that underpin functioning ecosystems, such as (adapted from DEPI 2013):

- **species and communities** – the native plants and animals that are dependent on the river or estuary for habitat, feeding or breeding
- **habitat** – the home of an organism, plant or animal
- **connectivity** – the ability of species and communities to move to a different patch of habitat, and also the connection between surface water and groundwater and floodplains
- **water quality** – the physical, chemical and biological characteristics of water including such things as salinity, oxygen, pollutants, nutrients, temperature or sediment
- **riparian vegetation** – the plants that occur alongside a waterway
- **physical form** – the channel, bed and banks, their shape both across and along the waterway, and the composition and erodibility of the material that forms them
- **hydrological regime** – the pattern of flow in the river or estuary including the quantity, quality and timing of water
- **ecosystem processes** including nutrient cycling and carbon storage.

Stakeholders report declining health in coastal rivers and estuaries (Environmental Trust 2017). However, a consistent trend or change in condition across all catchments is not readily apparent from the available and comparable state-wide datasets. Some rivers and estuaries are in good health, some poor, some show changes over time, and others are stable (EPA 2020; Roper *et al* 2012).

Overall, coastal rivers and estuaries in NSW are in moderate condition, and urbanised or developed catchments are generally in poor condition (EPA 2018).

Although a recent study shows that estuaries are warming and acidifying as the climate warms (Scanes *et al* 2020).

Table 1 provides regional information on coastal river and estuary health.

The amount of data, its quality and analysis vary considerably between catchments and more data and information is available for estuaries than coastal rivers.

While data and reporting are available, we found that indicators of ecosystem health for coastal rivers and estuaries have not been consistently collected or reported over time, which means trends in health are not clear.

One such indicator, the long-term reporting tool called the river condition index is used to assess the health of coastal rivers, but it does not include water quality, which is one of the key matters considered when in assessing waterway health.

Significant threats are impacting the health of coastal catchments, including agricultural runoff, urban stormwater discharge, vegetation loss, water use and climate change.

Climate change is driving major changes in our environment and the effects are expected to become more pronounced and increase in severity over the next century (EPA 2018).

However, there is currently limited advice on how to mitigate or plan for predicted changes occurring in estuaries and rivers from climate change.

What does this mean?

NSW catchment health programs would benefit from:

- strategic long-term monitoring, evaluation and reporting to enable changes in catchment health indicators to be tracked consistently over time
- incorporating water quality in the long-term reporting tool – the River Condition Index
- being designed to address the threat to catchment health or if the threat cannot be removed, ensuring the environment can continue to provide ecosystem services
- specific advice on how to plan for and build the resilience of coastal rivers and estuaries to the impacts of climate change.

Table 1: Coastal river and estuary health

River condition 2018 (EPA 2018)	Estuary health 2018 (EPA 2018)	Estuary data 2020 (Scanes <i>et al</i> 2020)
Overall - moderate, no change reported from 2015-2018	Overall - moderate	Overall - estuaries warming and acidifying over 12 years
<ul style="list-style-type: none"> ▪ good to very good for the south coast 	<ul style="list-style-type: none"> ▪ poor or very poor for urbanised catchments in the central region 	<ul style="list-style-type: none"> ▪ estuaries have warmed by 2.16 °C in the last 12 years, with lagoons warming the fastest
<ul style="list-style-type: none"> ▪ good for central and north coast 	<ul style="list-style-type: none"> ▪ poor for several developed or agricultural catchments of the north and south coast 	<ul style="list-style-type: none"> ▪ all estuaries acidifying, with lagoons and creeks acidifying the fastest and lakes the slowest
<ul style="list-style-type: none"> ▪ moderate for the far north coast and Hunter River 	<ul style="list-style-type: none"> ▪ moderate to good health for the remainder with some showing improvement such as Wallamba River, Myall Broadwater, Durras and Nadgee Lakes 	<ul style="list-style-type: none"> ▪ variable salinity with creeks and lagoons becoming less saline, rivers increasing in salinity and no significant changes in lakes or back dune lagoons
<ul style="list-style-type: none"> ▪ poor for the Sydney coast / Georges River 		

Current stakeholders and programs

There are many organisations and stakeholders involved in managing coastal rivers and estuaries – we’ve provided a list of these stakeholders and their roles in the **Appendix**.

The key NSW government organisations with major roles in funding projects and managing coastal rivers and estuaries include Local Land Services, Department of Primary Industries - Fisheries, local government and the Marine Estate Management Authority.

While the arrangements are complex, we found there are no material overlaps in roles and responsibilities, but we did identify a potential gap. In NSW, most of these organisations either don’t have boundaries that relate to a specific catchment boundary or their responsibilities, resourcing or strategic intent does not allow for catchment-based management.

We found there’s over \$120 million currently being invested in coastal rivers and estuaries, primarily through the Marine Estate Management Strategy and the Coastal and Estuary Grants Program, but much of the focus appears to be in estuaries with less focus on coastal rivers.

Table 2 provides a summary of the programs, and the known funding and focus areas.

Over time there have been many changes to government agencies and local government amalgamations, and these have impacted the availability of resources, advice and engagement for catchment management

Without community and landholder involvement and ownership in catchment programs, successful implementation can be difficult to achieve.

Table 2: Funding programs and where they focus investment

Program	Focus area
Marine Estate Management Strategy - Stage 1 Marine Estate Management Authority, \$45 million over two years until 2020	Marine estate including estuaries, coastal land, and ocean
Coastal and Estuary Grants Program Department of Planning, Industry and Environment’s Environment, Energy and Science group, \$67.5 million over 5 years until 2020-21	Estuaries and coastal land
Local Land Services - devolved grant programs	State-wide
Environmental Restoration and Rehabilitation (Environmental Trust)	State-wide
Flagship Fish Habitat Rehabilitation (DPI)	Coastal catchments
Habitat Action Grants (DPI)	State-wide
Aboriginal Fishing Trust Fund	State-wide
Conservation Management Program	State-wide
Community Environment Program	National
Environment Restoration Fund	National
Local Government and other agencies	Local area

What does this mean?

NSW catchment health programs would benefit from:

- integrated catchment planning and project delivery structures that consider the whole catchment – a catchment-based approach
- linking to existing strategies and programs for coastal catchments, continuing work to avoid duplication in investment and to complement existing investment
- addressing the potential imbalance in funding between coastal rivers and estuaries
- involving community, Traditional Owners, Aboriginal groups, landholders and other stakeholders in the co-design and co-delivery of long-term catchment projects
- recognising the value of Aboriginal knowledge in understanding catchments and for planning and implementing projects.



Mangrove seedlings planted in front of an eroding bank, Shoalhaven River (Daniel Wiecek DPIE)

What makes projects successful?

To understand what makes projects successful, we first asked stakeholders what goes wrong:

- lack of a whole-of-catchment approach
- institutional change has resulted in less capacity for community based natural resource management
- lack of resourcing means no one agency in NSW is adequately resourced to manage large coastal ecosystems
- there is a need for buy-in by all stakeholders, but this is not always attempted or attained
- short-term funding cycles don't allow for ongoing maintenance or monitoring
- ineffective policy, regulation, or compliance for land and water management
- the scale of impact from the works is smaller than the natural variability in the targeted health indicator.

We found there has been little evaluation of the long-term success of regional scale projects. This means we cannot access the full potential knowledge from past projects as we don't know what worked, continues to work or what might be transferable knowledge to another catchment.

But there are evaluations that indicate key success factors for catchment management projects. There's also guidance on good governance or what's needed to effectively and efficiently set up and run programs and projects.

Key success factors for catchment projects:

- address the threat causing the stressor
- strategic planning with a clear understanding of the objectives and expectations
- a single coordinating organisation to drive the project
- involve the community from the early stage
- long-term flexible funding
- engender ownership of the project with ongoing follow up maintenance
- build trust with the community through continuity of service
- learn from other projects, which relies on gaining and sharing knowledge.

Good governance:

- establish processes and behaviours to achieve program goals, comply with all relevant laws and regulations, and satisfy community expectations
- gives government and the community confidence that investment is cost effective, compliant and delivers best possible outcomes while ensuring consistency and rigour
- promotes collaboration, and alignment of knowledge, skills and performance to organisational needs (NRC 2015).

What does this mean?

NSW catchment health programs would benefit from:

- establishing effective, efficient and fit-for-purpose program and project governance structures, and careful planning and design
- managing coastal rivers and estuaries as a whole system – one part of the catchment should not be considered in isolation of the rest of the catchment
- project governance vesting autonomous decision-making with a streamlined project committee of core stakeholders lead by a single project owner
- matching the project committee's capacity with the scale and complexity of the project and enable effective communication with stakeholders
- developing long-term funding models that enable delivery of long-term outcomes
- prioritising funding for monitoring, maintenance and evaluation of project outcomes for a considerable length of time after the completion of onground works
- fostering constructive stakeholder collaboration and partnerships, allowing the time and resources this will take to establish and maintain
- adopting a genuine, honest and transparent approach to engaging with the community, Traditional Owners, Aboriginal groups, industry and landholders in co-design and co-delivery.

Good practices in riparian rehabilitation

Riparian rehabilitation recreates healthy riparian corridor functions, such as habitat, bank stability, filtration of water entering the stream and shading. It can also achieve other outcomes such as flood mitigation, aesthetic and cultural values.

In the late 1990s, Land and Water Australia released a series of guides on riparian rehabilitation (Rutherford *et al* 2000; Lovett and Price 1999; Lovett and Price 2007). These guides still provide very good information, and this has been added to over the years with further guides and research.

Even though good information is available, riparian rehabilitation projects aren't always successful. Common reasons for this include:

- projects often address symptoms of the problem rather than the causes
- actions are not always implemented in the right combinations or at locations that would optimise benefits
- decision-making is commonly ad hoc and planned at too local a scale (Hermoso *et al* 2015)
- projects treat a relatively narrow riparian width, which can lead to persistent poor plant cover, erosion or weeds (Paul *et al* 2018)
- failure to consider drivers of problems at a scale adequate to capture the ecological processes involved
- lack of consideration of socio-economic aspects (Hermoso *et al* 2012).

In addition, projects generally haven't been required to adopt the practices outlined in guidelines

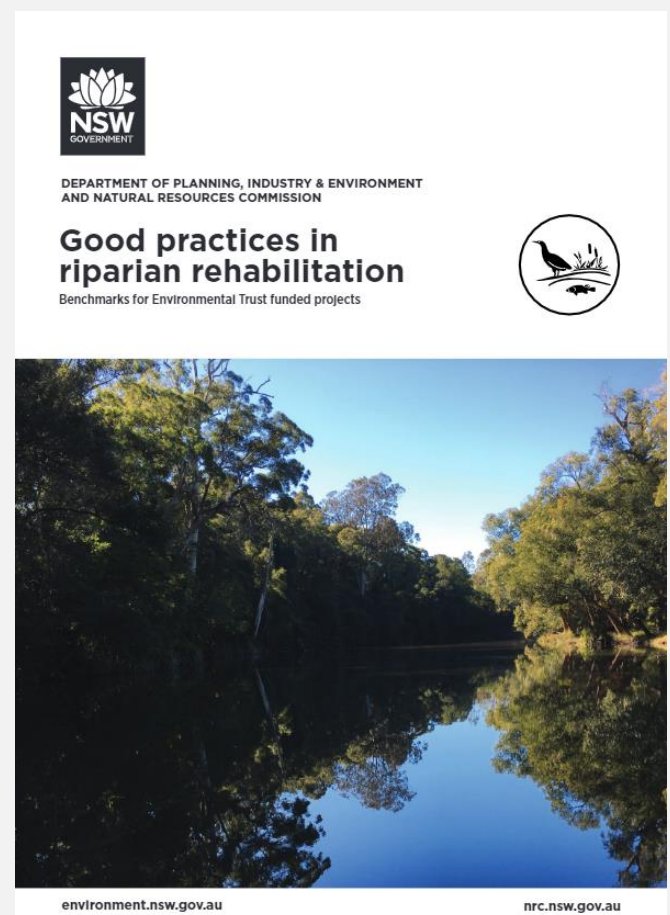
This allows room for the quality of riparian rehabilitation to differ from project-to-project

We found that rehabilitation projects are more likely to achieve beneficial ecological outcomes if good practices are clarified and benchmarks that set minimum requirements are adopted.

What does this mean?

NSW catchment health programs would benefit from:

- Adopting benchmarks that set minimum standards for rehabilitation projects and using these to guide investment decisions
- Applying *Good practices for riparian rehabilitation – benchmarks for Environmental Trust funded projects* (DPIE and NRC 2020), which include benchmarks for:
 - planning and monitoring
 - protecting, establishing and maintaining vegetation
 - riparian corridor and buffer widths
 - erosion control and mitigation
 - reinstating wood in waterways.



Good practices in riparian rehabilitation, cover page showing image of the Williams River, Clarence town (Jenny Weingott, Hunter Local Land Services)

Appendix - stakeholders in coastal rivers and estuaries

Group	Organisation/ program	Role	
NSW Department of Planning, Industry and Environment (DPIE)	Environment, Energy and Science (EES)	Biodiversity and Conservation	<p>A directorate of the DPIE-EES group which covers most of the role of the former Office of Environment and Heritage. Key responsibilities within this directorate are:</p> <ul style="list-style-type: none"> ▪ managing and monitoring rivers and estuaries ▪ biodiversity conservation ▪ providing grants administered through the Office of the Coordinator-General ▪ delivering the Saving Our Species Program, which has some coastal species included and aims to protect associated habitats
		Environmental Trust	DPIE administers the Trust, a statutory independent body that provides grants for environmental projects, including research, restoration, education, and land acquisition.
		Science	Provide river and estuary monitoring, process understanding and management advice to Government and local government
		National Parks and Wildlife Service	Manages national parks, many of which are within the coastal catchments and works with the Biodiversity and Conservation division to deliver the Saving Our Species Program.
		Environment Protection Authority	Primary environmental regulator for New South Wales. They partner with business, government and the community to reduce pollution and waste, protect human health, and prevent degradation of the environment. Provides grants for waste recycling
		Biodiversity Conservation Trust	A statutory not-for-profit that provides funding for private land conservation
		Floodplain Management Program	Provides financial support to local governments and eligible public land managers to help them manage flood risk in their communities, aimed at protecting people and assets. Funding is available for studies, risk management and implementation
Planning and Assessment	Undertakes regional strategic planning, State and local planning policy, coastal policy implementation and local government coordination		
Water	<p>Responsible for surface and groundwater management including ensuring water security for NSW</p> <p>They manage NSW water resources through planning, policy and regulation</p>		
Natural Resources Access Regulator	<p>Established following the independent investigation into NSW water management and compliance (Matthews 2017)</p> <p>Responsible for providing independent, transparent and effective regulation with total carriage of the compliance and enforcement of water management legislation in NSW</p>		

Group	Organisation / program	Role	
Housing and Property Group	Crown Land	Land management includes weed and pest control, revegetation projects, cleaning up illegal dumping, waterway management, managing recreational access, and sediment and erosion control. Compliance and enforcement also form part of land management	
AdaptNSW		Provides small community grants to support communities to take action and manage climate change impacts, also provides larger grants for local government to address identified climate change risks and vulnerabilities (mostly asset and people protection, but some more environmental)	
WaterNSW		Supply and seek to improve availability of water that is essential for water users and the communities throughout NSW including through: source water protection, bulk water supply, infrastructure	
Department of Regional NSW	Department of Primary Industries (DPI)	Fisheries	Supports economic growth and sustainable access to aquatic resources through commercial and recreational fisheries management, research, aquaculture development, habitat protection and rehabilitation, regulation and compliance
		Agriculture	Responsible for increasing the productivity and resilience of the agricultural sector through research across livestock, plants and natural resource management areas, as well as providing education and training. It also delivers rural support and community development services through the NSW Rural Assistance Authority
	Local Land Services (LLS)	LLS	Four regional LLSs cover the NSW coast; North Coast, Hunter, Greater Sydney, and South East. They develop strategies for natural resource management, seek funding to implement those strategies and may devolve grants to groups or landholders. They also provide advice and education programs
		Soil Conservation Service	The Soil Conservation Service now sits under the LLS umbrella and provides fee for services onground site planning and project implementation
Other NSW Government bodies	Local Government	Has a wide range of natural resource management responsibilities. Most relevant to this project is the development and implementation of coastal management programs. Many also have levy funding available for works or devolving to community groups	
	NSW Coastal Council	Provides independent and expert advice on matters relating to the Minister's functions under the Act, and in relation to the development and implementation of coastal management programs by local governments	
	Marine Estate Management Authority	Developed the Marine Estate Management Strategy which outlines the benefits of the marine estate, threats to them and initiatives to address the threats. Associated with MEMS is funding to implement the initiatives. Funding is primarily in the estuary landscape	
	Transport for NSW - Roads and Maritime Services	Responsible for management of boating, moorings, debris, spills and biosecurity in the maritime zone. They undertake environmental projects such as riverbank erosion studies and remediation where boating or infrastructure is an issue	

Group	Organisation / program	Role
Commonwealth Government	Forestry Corporation of NSW	Manage State forests, many of which are in coastal catchments. They are legally required to manage potential offsite impacts to waterways
	Department of Agriculture, Water and the Environment	The Department designs and implements Australian Government policy and programs to protect and conserve natural resources and agriculture. Includes funding for community grants, restoration grants, National Landcare Program
Non-Government Organisations	Landcare NSW	Overarching body that represents around 3,000 Landcare groups. Landcare are community-based volunteer groups involved in numerous on-ground environmental projects. They have a role in applying for and implementing projects
	Conservation Volunteers Australia	Service provider for on-ground works - with the help and support of individuals, businesses and governments, Conservation Volunteers Australia engages communities in protecting and restoring the environment including wetlands and rural floodplains
	Greening Australia	Service provider for on-ground works – also has five program areas, only two of which are indirectly related to achieving the objective of this project
	Australian Rivers Restoration Centre	Service provider for on-ground works. Aim to restore and protect Australian rivers and wetlands
Stakeholders	Universities and other research organisations such as CSIRO	Numerous project partners in research regarding coastal rivers and estuaries
	Community groups	Project partners for small to medium scale on-ground projects
	Traditional Owners and Aboriginal groups	Aboriginal people of NSW have a spiritual, social, cultural and economic relationship with their traditional lands and waters, sky, ceremonial and viewing corridors and songlines, including natural values such as flora, fauna and landforms Aboriginal people have a responsibility to care for their Country, which includes coastal rivers and estuaries, the land that surrounds them, and the plants and animals that inhabit them
	Landholders	Key partners in restoration projects on private land
	Industry	Various project partners can provide funding or other inputs to projects. May include industries such as mining, forestry, water users, etc.

References

Department of Planning, Industry and Environment and the Natural Resources Commission (2020), *Good practices for riparian rehabilitation – benchmarks for Environmental Trust funded projects*. Available at: www.environment.nsw.gov.au/research-and-publications/publications-search/good-practices-in-riparian-rehabilitation

Environment Protection Authority (2018), *NSW State of the Environment 2018*. Published online at: <https://soe.epa.nsw.gov.au/>

EPA (2020), *New South Wales State of the Environment reporting*, webpage accessed 16 October 2020, available at <https://www.epa.nsw.gov.au/about-us/publications-and-reports/state-of-the-environment>

Environmental Trust (2017), stakeholder consultation for new major projects prospectus 2018-2020.

Hermoso V, Pantus F, Olley J, Linke S, Mugodo J, and Lea P (2012), Systematic planning for river rehabilitation: integrating multiple ecological and economic objectives in complex decisions, in *Freshwater Biology*, 57(1), 1-9.

Hermoso V, Pantus F, Olley J, Linke S, Mugodo J and Lea P (2015), Prioritising catchment rehabilitation for multi objective management: an application from SE-Queensland, Australia, in *Ecological Modelling*, 316, 168-175.

Lovett S and Price P (1999), *Riparian Land Management Technical Guidelines*, Land and Water Resources Research and Development Corporation, Canberra.

Lovett S and Price P (2007), *Principles for Riparian Lands Management*, Land and Water Australia, Canberra.

Matthews K (2017), *Independent investigation into NSW water management and compliance*.

Natural Resources Commission (2015), *Performance Standard for Local Land Services*. Available at: www.nrc.nsw.gov.au/performance-standard-lls

Paul KI, Bartley R and Larmour J (2018), *Optimising the management of riparian zones to improve the health of the Great Barrier Reef*, National Environmental Science Programme, Tropical Water Quality Hub, CSIRO.

Roper T, Creese B, Scanes P, Stephens K, Williams R, Dela-Cruz J, Coade G, Coates B and Fraser M (2011), *Assessing the condition of estuaries and coastal lake ecosystems in NSW*. Monitoring, evaluation and reporting program, State of the Catchments 2010 – Technical Report Series: Estuaries and Coastal Lakes, Office of Environment and Heritage, Sydney.

Rutherford ID, Jerie K and Marsh N (2000), *A Rehabilitation Manual for Australian Streams*, Land and Water Resources Research Development Corporation, Canberra.

Scanes E, Scanes PR, and Ross PM (2020), Climate change rapidly warms and acidifies Australian estuaries. *Nature Communication* 11, 1803. Available at <https://doi.org/10.1038/s41467-020-15550-z>

Victorian Department of Environment and Primary Industries (2013), *Improving Our Waterways Victorian Waterway Management Strategy*, Melbourne, Australia.

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Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples. The Commission recognises and acknowledges that traditional owners have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We value and respect their knowledge in natural resource management and the contributions of many generations, including Elders, to this understanding and connection.

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Acronyms

DEPI – Victorian Department of Environment and Primary Industries

DPI – Department of Primary Industries

DPIE – Department of Planning, Industry and Environment

DPIE EES – Environment, Energy and Science group within DPIE

EPA – NSW Environmental Protection Authority

LLS – Local Land Services

MEMS – Marine Estate Management Strategy

NRC – Natural Resources Commission

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