The Noosa River Plan

Whole of catchment management

NOOSA COUNCIL

www.noosa.qld.gov.au
General Enquiries: 8.30 am - 5.00 pm Monday to Friday (excluding public holidays)
By telephone: (07) 5329 6500 (including after hours emergencies)
By email: mail@noosa.qld.gov.au
Fax: (07) 5329 6501
Street Address: 9 Pelican Street, TEWANTIN
Postal address: PO Box 141, TEWANTIN QLD 4565

Acknowledgements

Council wishes to thank all interested stakeholders who have provided their time and energy to help guide the development of this strategy.

Disclaimer

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Message from the Mayor

The Noosa River begins as a small stream in the northernmost reaches of Cooloola. It then snakes its way for 60 km through the Great Sandy National Park to end in a wondrous tangle of remarkable lakes in Noosa Shire.

The Noosa River system is as integral to the Noosa Shire's charm as are its national parks and beaches. On any fine Sunday, hundreds of locals and visitors can be found enjoying the grassy parklands alongside the river next to Gympie Terrace. While children frolic in the shallows, kites, sea eagles and ospreys hover overhead, hunting for fish. Human fish hunters are also plentiful, with hopeful anglers casting lines from shore, jetty or boat. Meanwhile, canoeists and stand-up-paddle boarders slip past; the ferry toots its horn, and motorboats laden with sightseers head upstream to the river's Everglades.

It would be difficult to put a figure on the economic value of the Noosa River, and arguably one shouldn't try. Its real worth is better measured in human wellbeing and in safeguarded biodiversity.

The Noosa River regularly achieves the highest health rating in South-East Queensland. That is in large part because so much of the river resides in the Cooloola section of the National Park. And for that we have environmental activists to thank, particularly those in the Noosa Parks Association and also the Cooloola Committee. During the 1960s, 1970s and 1980s, many battles were fought by these groups to stop logging, mining and development in Cooloola.

The success of those lobbyists guarantees that our river has a healthy start in life. It also resonates with many in today's community, especially those many individuals and organisations who continue to focus their efforts on river and catchment health.

But their efforts are no reason for complacency. There are still myriad human influences on the waterways. Sediment from the Kin Kin catchment, urban run-off from Noosaville and Tewantin, and the impacts of hundreds of powered craft, all take their toll. Furthermore, recent research has revealed the historical decline of aquatic species in the river, most particularly a spectacular recent reduction of tiny critters in the river bed. This is cause for genuine concern.

Even back in 2001, a Healthy Waterways publication titled Discover the Waterways of South-East Queensland asked a pertinent question about the Noosa River: "Will we love it to death?"

Of course, we must ensure that we do not wreak further damage on this magnificent natural asset, and this Plan is part of that undertaking by Noosa Council.

I congratulate the Council staff, community representatives, residents, business owners and my fellow Councillors on working together to create this important document.

If the Noosa River is to maintain its enviable health rating, and hopefully improve its biodiversity, then this Plan is an essential blueprint for that effort.

Everyone can play a role in protecting and enhancing our spectacular river system.

Tony Wellington
Noosa Mayor

Introduction

The Noosa River system is the major waterway of the Noosa Shire and forms part of the Noosa Biosphere Reserve ®. The river is recognised internationally for its high environmental and scenic values flowing from the catchment's rich biodiversity and habitat.

Many Noosa residents have a long-held, deep social connection with the river as the lifeblood of the community, which contributes to a strong sense of place. The waterways and wetlands of the catchment also form a vital part of the Kabi Kabi traditional lands with ongoing cultural significance.

The Noosa River is a valuable natural, social and economic asset to the people of the region and visitors alike.

Our vision is that the Noosa River is recognised as the healthiest and most biodiverse system in South East Queensland.

The Noosa River Plan has been prepared to achieve this vision and seeks to maintain and improve on the environmental and community values associated with the river system, by managing key threats to these values, and responding to change.

The Plan applies to Noosa's freshwater creeks, wetlands, lakes, river estuary, coastal creeks and groundwater, and incorporates a whole-of-catchment management approach to land-based and on-river activities. The plan also seeks to reduce diffuse pollution flowing from the land, to enhance the health of our coastal waters, beaches and reef.

This balance can be achieved through improved land and water management practices and on-ground action, education and regulatory compliance, and better monitoring of the river and its environs.

Much of this can only be done effectively through a partnership approach, involving residents, community groups, traditional owners, industry, businesses and the relevant government agencies.

The Noosa River Plan outlines river planning, community and environmental values of the river, and ecological and hydrological characteristics of the catchment. It highlights key management challenges such as runoff, pollution, development impacts, habitat destruction, increased visitor and boating numbers and a changing climate.

This plan is structured under three priority areas:

- River health and biodiversity
- Sustainable use and enjoyment
- Working together.

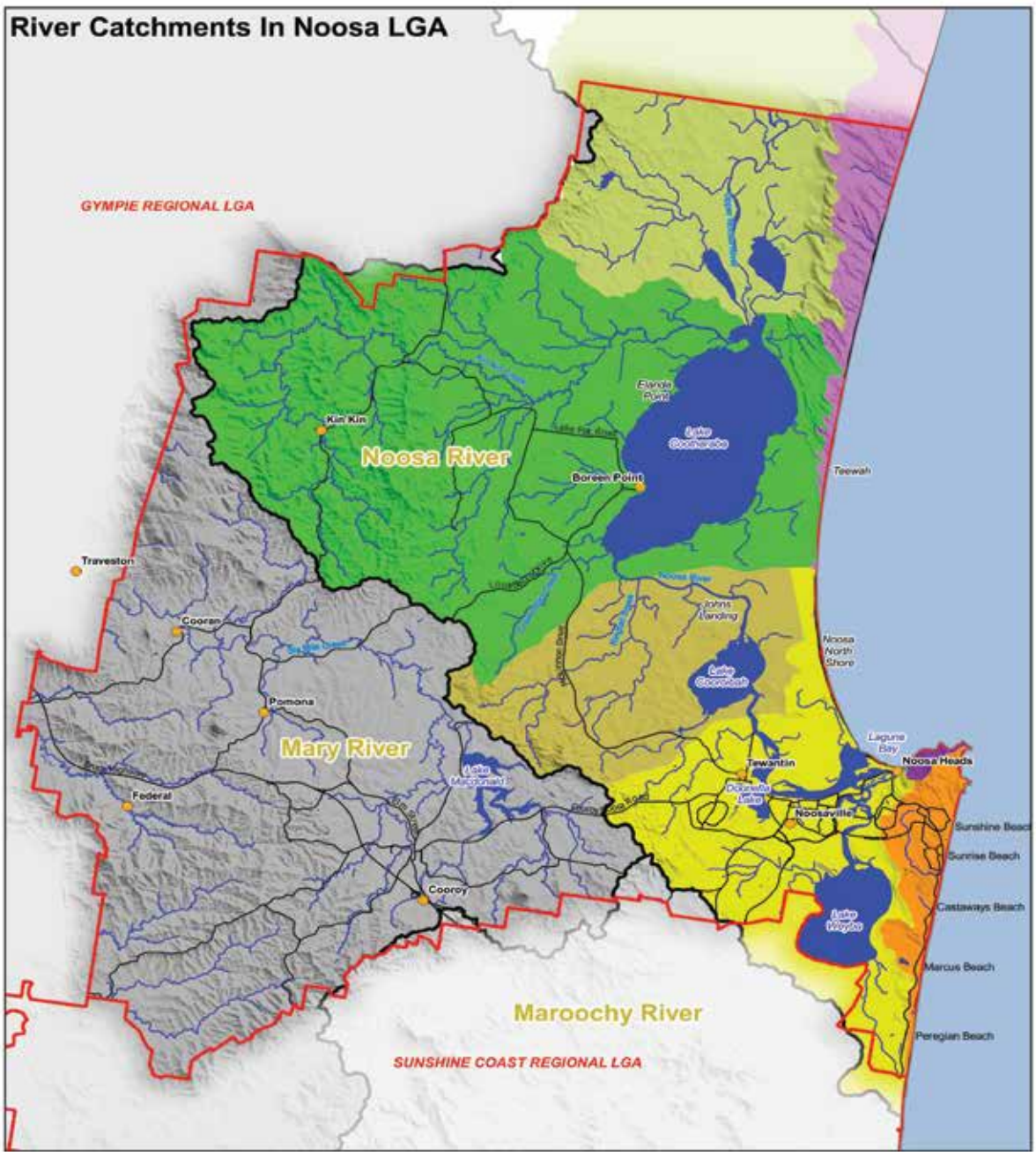
Each priority area has several clear objectives and details a number of management issues including threats, impacts and opportunities, as well as current and potential future management actions. The Plan provides a prioritisation framework for managing the different threats and impacts and this has guided the development of the 5-year Action Plan for implementation.

The Monitoring and Evaluation section outlines some specific targets that Council seeks to achieve in related to river management in Noosa, as well as baselines and how they will be measured. Some of these are already articulated in the Noosa Environment Strategy, while there is another specific to this River Plan. These targets support effective measurement of the success of River Plan actions, as well as those of other plans.

Noosa River Values

Catchment & Hydrology

The Noosa River catchment is one of two major river systems located in the Noosa Shire and covers 63% of the Noosa Local Government Area.

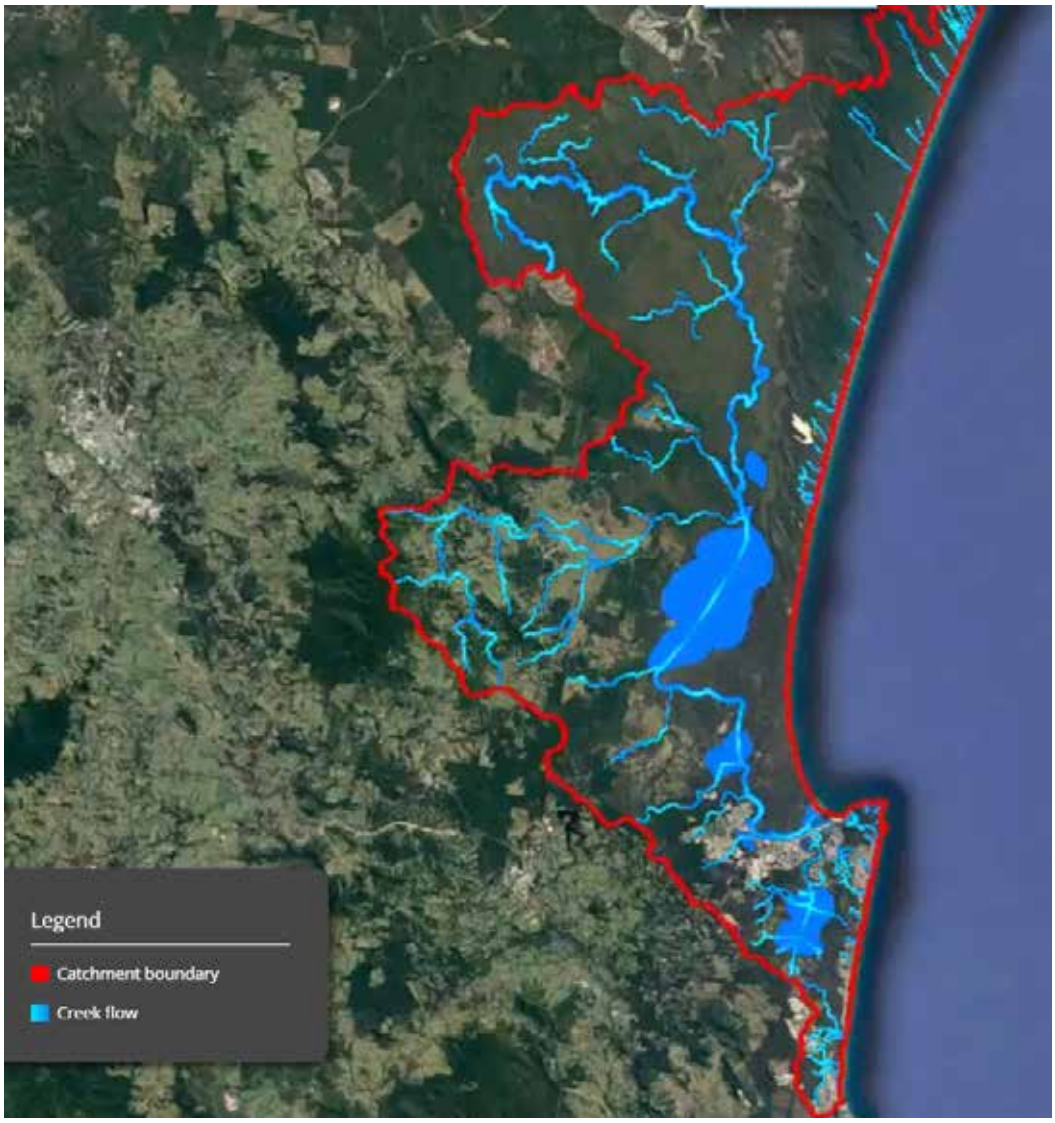


Major river catchments in the Noosa local government area.

With its headwaters emerging from the Cooloola Section of the Great Sandy National Park, the catchment encompasses around 854 square kilometres and includes a stream network of approximately 1,505 kilometres.

The Noosa River is one of the few Queensland Rivers that enjoy a continuous year-round freshwater inflow It has substantial groundwater input from a number of sources including large sand masses and undulating landscapes, and is connected via groundwater through a continuous wetland system which extends up to Tin Can Bay.

The tidal limit of the river encompasses Lake Cootharaba (the largest of the lakes), fed by the freshwater tributaries of Teewah Creek in the north, and the rural hinterland creeks of Kin Kin, Cooloothin and Ringtail in the west. The catchment also includes smaller coastal waterways that flow directly to the sea.



Creek flows of the Noosa River catchment (Queensland Wetlands Program – Walking the Landscape).

Ecological values

The Noosa River is arguably south-east Queensland's only substantially-natural major river system, due to the considerable areas of remnant vegetation. Large areas of undisturbed bushland adjoining the headwaters of the river are protected as National Park or State Forest, and over 100 Council-managed Bushland Conservation Reserves are located throughout the catchment.

The upper reaches of the river are near pristine and unmodified, and this natural ecology and character changes progressively closer to the river mouth. The river foreshores are mostly developed through the lower reaches around Tewantin, Noosaville and Noosa Heads, with some areas of Noosa North Shore and around the lakes still maintaining a natural riparian edge.

Significant parts of the catchment's freshwaters and estuary are designated 'high ecological value' under the Environmental Protection (Water) Policy 2009. The management intent for these waters is to maintain an effectively unmodified water condition.

The Noosa River Wetlands and Lake Weyba are listed in the Wetlands of National Importance Directory and constitute a groundwater-fed connected system which provides discharge to swamps, springs, creeks, lakes, the estuary and coastal environment. These wetlands play an important hydrological and ecological role including:

- groundwater recharge and discharge
- surface water infiltration
- flood control through short-term storage of floodwaters
- habitat for populations of native plants and animals, including threatened species
- habitats for animals at vulnerable stages in their life cycles
- refuge for animals during drought.

This spectacular and extensive system of freshwater, brackish and saline lakes, marshes, heathlands and estuary, is one of few such complex wetland systems on the eastern-Australian seaboard.

The majority of the estuary falls within 6,000ha of declared Fish Habitat Areas (FHA). Queensland's FHA networks are protected against physical disturbance from coastal development, while still allowing legal fishing. Most of Noosa's FHAs are classified 'management A' (of the highest value) and are vital to the commercial and recreational fisheries of the region. These areas include the largest seagrass beds in south-east Queensland, long reaches of fringing mangroves forests which feature all seven of the Sunshine Coast's known mangrove species, and saltmarsh areas, home to the vulnerable Water Mouse.

The Noosa River is unique among Queensland estuaries in that it transitions from freshwater to hypersaline waters in the lakes. The freshwater lowlands provide habitat for endangered freshwater fish, such as the Honey Blue-eye and Oxleyan Pygmy Perch, while the estuary harbours Australian bass, bream, flathead, dart, garfish, jewfish, mangrove jack, sea mullet, tailor and whiting, as well as mud and sand crabs, and many species of prawns.

Along the seaward edge of the river catchment, the coastal creeks and wallum vegetation are a stronghold for threatened species including acid frogs, Ground Parrots and Glossy Black Cockatoos. The beaches and sand dunes provide nesting habitats for the endangered loggerhead and vulnerable green marine turtles every summer.

Surveys of migratory shorebirds have revealed the Noosa River mouth, sandbanks and adjoining Noosa North Shore as an area of 'National and International Importance' for shorebird conservation in Australia. More than 50 species of shorebirds have been recorded, including many species protected under international agreements.

The Noosa River system forms part of the Noosa Biosphere Reserve ® which was designated by the United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Man and the Biosphere Program in 2007 – it was a first for Queensland. This designation with extended by UNESCO for a further 10 years in 2019.

noosa® biosphere

Social and economic benefits

For thousands of years the Noosa River has provided a focal point for the Kabi Kabi traditional owners. The bounty of the river – fish, oysters, pipis - were traded throughout indigenous communities and shellfish middens are now a characteristic of the banks of the lower Noosa River. Fishing seasons were linked to the flowering seasons of certain plants, fish were speared and oysters accessed by diving. When Europeans first visited the area, this trade continued, until the resources were gradually depleted by a burgeoning population.

The natural beauty of the river, its habitats and wildlife are now a drawcard for relaxing, socialising and enjoyment. Hundreds of thousands of domestic and international visitors access the river each year which generates millions of dollars for the local and state economy.

The Noosa estuary is a focal point for recreation, water sports and visitor activities. It offers safe anchorage for cruising yachts, mooring locations for recreational boating and prospects for living on the river.

The river also provides a livelihood for many, including commercial fishing and tourism. Commercial jetty operations supply a diverse range of motorised and non-motorised watercraft for eco tours and hire, whilst the popularity of recreational fishing throughout the estuary and offshore supports local businesses. These industries rely on a healthy river system and collectively provide residents and visitors with a host of recreational opportunities and freshly caught seafood.

On a broader scale, the hinterland areas of the river catchment, historically cleared for timber in the 1850s to 1900s, were the early foundation of Noosa's economy. These areas evolved as the heart of the Shire's rural industries with timber, beef and dairy cattle comprising the major sectors, followed by significant fruit and vegetable production. The local freshwater creeks and wetlands provided water for stock and crop irrigation during these times and continue to play a pivotal role in a productive

catchment. Today, local agricultural operations are small scale but diverse with land still being used for stock and crops, as well as a host of other uses which build rural enterprise.

Noosa's Local Economic Plan identifies rural enterprise as a priority sector moving forward. The plan recognises that Noosa is already well known for food, and the increasing demand for clean, green, sustainably-produced local food and beverages suggests there are opportunities to build on the local agriculture sector and establish a premier food and beverage brand.

The benefits the community derives from the Noosa River system are underpinned by good water quality, healthy habitats and diverse and abundant aquatic life. These benefits are of social, cultural and economic importance and contribute to our quality of life.

Catchment and waterway health

Since 2001, Noosa Council has been part of one of Australia's most comprehensive freshwater, estuarine and marine monitoring programs delivered by Healthy Land and Water (formerly Healthy Waterways).

This Ecosystem Health Monitoring Program provides an annual health assessment of south-east Queensland's major catchments, estuaries and Moreton Bay. It delivers a Report Card rating from A (excellent) to F (poor) for each river catchment, based on the monitoring results.

Over the last 18 years, the Report Card for the Noosa River catchment has consistently fluctuated between A (excellent condition) and B (good condition) which is the best in the region.

The monitoring also picks up long-term 'trends' about pollutant loads in Noosa's waterways which have increased due to an increase in sediment (mud) and nutrients generated from the land.

The data also shows nutrient increases and water clarity decreases throughout the river reaches downstream of Lake Cootharaba, including Lake Cooroibah and the lower Noosa estuary.

Also across the catchment, an interconnected network of native vegetation, wetlands and riparian areas provide vital linkages between core protected areas. This network supports highly biodiverse ecosystems and helps protect water quality by capturing sediment and filtering run off.

Managing for change

The Noosa River system is a natural asset facing increasing pressures. On a broad catchment scale management actions are required to protect the quality of water in the system.

Sediment runoff and other pollution from rural and urban areas affects water quality, aquatic habitats and biodiversity. Riparian areas and wetlands can be degraded by both urban development and overgrazing. Water is extracted from freshwater creeks and wetlands in rural areas for irrigation and stock. Water bores throughout the catchment also provide residents with access to groundwater reserves, whilst town water supplies are drawn from the upper catchment for residents in urban areas of the Cooloola Coast.

The residential population of the Noosa Shire is about 55,000 people, however during peak holiday periods this figure can increase markedly with overnight visitors and day visitors. For example, the Noosa region welcomed 2 million overnight and day visitors who spend almost $900 million in the year to March 2018, and these trends are likely to continue (Tourism Noosa Annual Report, 2017-18). This seasonal influx results in high volumes of boat traffic on the river and high numbers of people using foreshore areas along the lower reaches of the estuary.

The Noosa River Marine Zones, in place since 2009, regulate some boating-related uses, however these rules are not well understood or typically observed by the recreational boating public. Across Queensland, the recreational boating industry has expanded rapidly with one in every 19 people now owning a boat and/or a Jet Ski. This leads to high demand for marine infrastructure to service this growth.

The Noosa River accommodates cruising yachts, over 100 swing moorings for recreational vessels, boats at anchor and houseboats for living on the river. For many years there has been a proliferation of abandoned and derelict vessels in the river, anchored vessels left unattended for long periods of time and swing moorings located in seagrass meadows of declared Fish Habitat Areas. These vessels often occupy prime positions along the river and contribute to congestion, clutter and safety concerns for other river users. People live on the river without the required approvals with some on-board occupants discharging waste directly into the river.

Managing this demand while keeping the ecological and social values of the river is the greatest challenge of all management agencies involved with river, and the Noosa community as a whole.

River Health and Biodiversity

The Noosa Environment Strategy has identified several core strategies and multiple outcomes under the theme of Waterways, Wetlands & Coasts. Many of these are related to our community's desire to maintain a healthy and biodiverse river. To support achievement of these outcomes, this section of the River Plan seeks to achieve three key objectives;

1. Aquatic biodiversity is improved, preserved and enhanced in diverse instream, riparian and wetland habitats.
2. Water quality is improved through whole of catchment management and sustainable use management on land and in riparian areas.
3. Pollution sources are identified, and discharge into the river is effectively managed to reduce impacts on waterways, wetlands and coasts.

Riparian and wetland habitats

Riparian areas and wetlands are important to water quality and the overall health of the river catchment due to their vital hydrological and ecological roles in filtering surface runoff, regulating water temperatures and providing habitat for wildlife and fish. These habitats can be impacted by weeds and pest animals, as well as human uses including vegetation clearing, overgrazing and urban development, and in some instances, recreational use.

When degraded riparian areas in the estuary are coupled with high levels of boat wash, accelerated streambank erosion occurs which further diminishes the environmental services these habitats provide.

A number of key initiatives are underway to help conserve riparian areas and wetlands on public and private lands including:

- Environment Levy land acquisition program
- Land for Wildlife
- Voluntary Conservation Agreements
- Bushland Conservation Reserve management
- Community Bushland Care Program
- Keep It in Kin Kin partner project
- The Noosa Planning Scheme.

However clear gaps exist in our collective knowledge regarding the 'habitat condition' of Noosa's waterways, particularly with regard to steep headwater areas, freshwater creeks and tributaries.

In 2017 Council commissioned a condition assessment of Shire's waterways which included an assessment of their recovery potential to rehabilitation efforts. This information helped inform the new Planning Scheme in the further protection of key areas and will guide future rehabilitation strategies and partner projects. The waterways assessment applied to:

- Steep headwater areas
- Freshwater creeks and tributaries
- Paperbark/sedgeland dominated non-riparian wetlands
- Noosa River estuary.

Keep It in Kin Kin

In addition to the LIDAR analysis to analyse the extent of soil loss from landslips, this partner project incorporated an extensive survey of Kin Kin's creek banks to locate infestations of Cats Claw Creeper vine (Dolichandra (Macfadyena) unguis-cati).

This 'transformer 'weed species is a riparian menace. It smothers trees, shrubs and understory species in riparian areas, causes canopy collapse of mature trees due to the weight of vines, and can change soil chemistry.

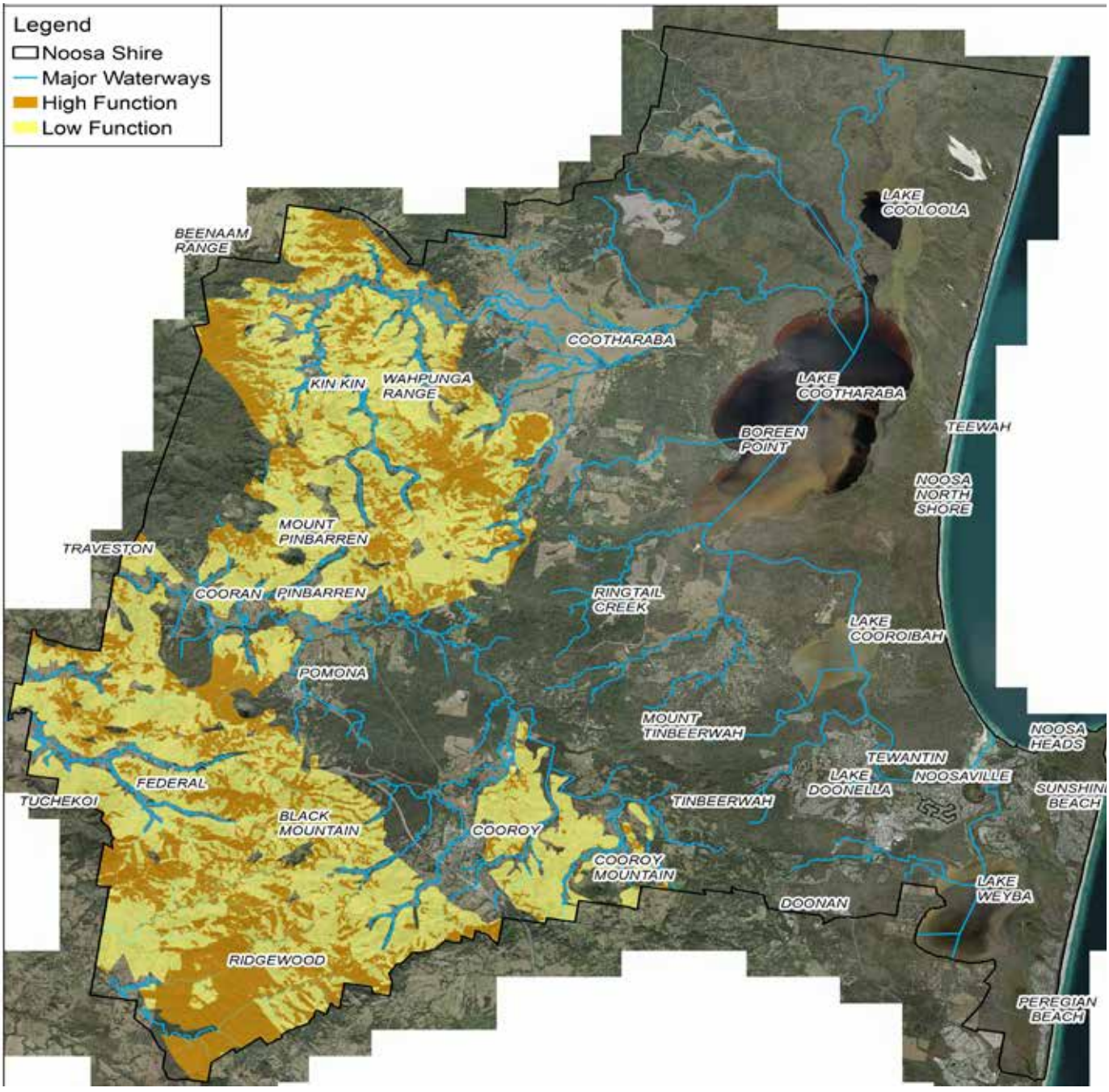
Left untreated Cat's Claw Creeper dominates and completely degrades the integrity of riparian habitats and creek banks, causing erosion and reducing biodiversity.

Stage 2 of Keep It in Kin Kin proposes implementation of a rural landholder extension program to support landholders to protect riparian areas and wetlands, improve land management practices and reduce rural runoff.

Steep headwaters

Steep headwaters comprise mostly of confined drainage lines and waterways that are intermittent in nature. The condition assessment demonstrated steep headwaters in Noosa consistently occur at the 80-90 metre contour and above this contour mass failures (i.e. landlslips) have occurred in the 2011 and 2013 floods.

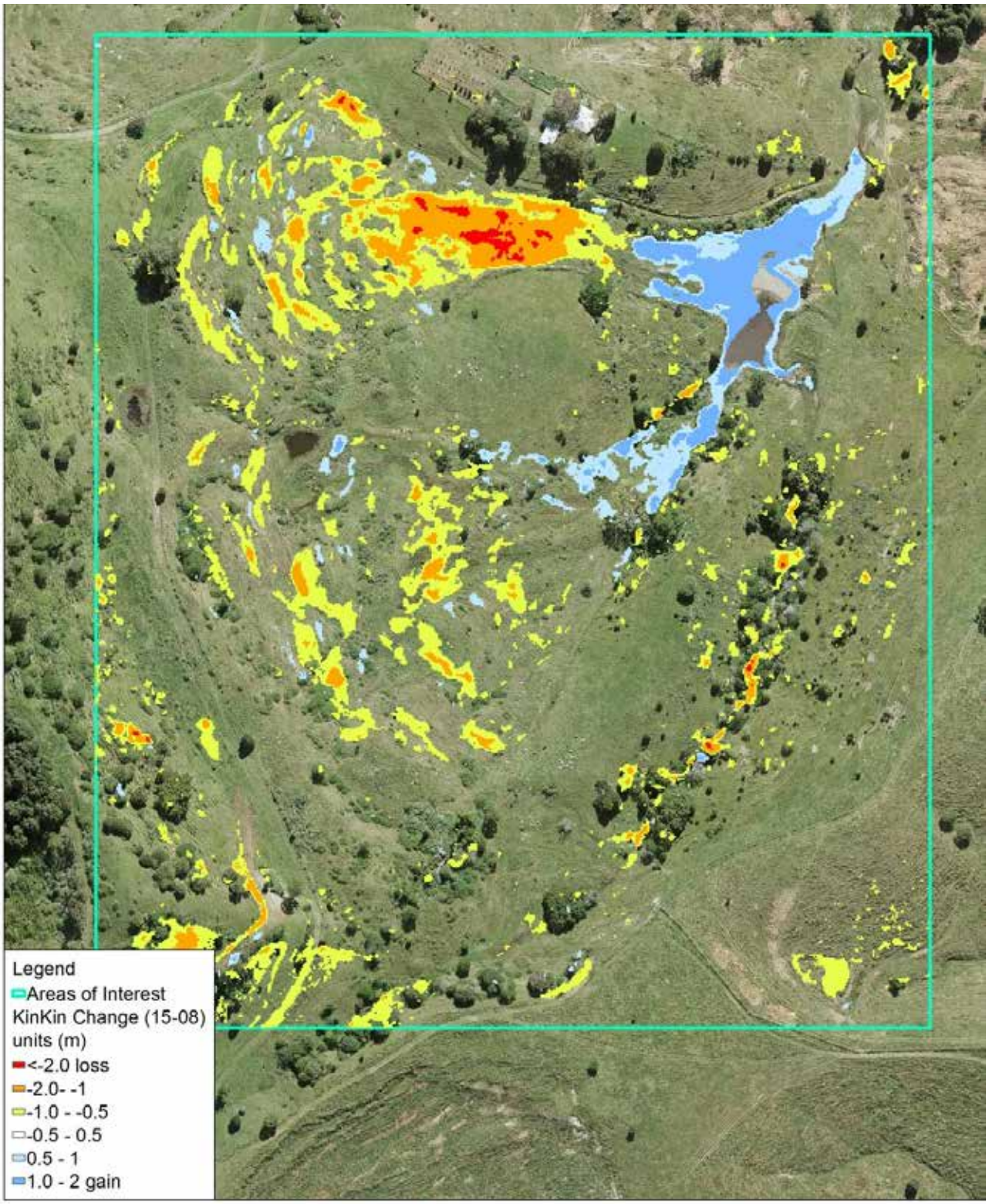
When mass failures occur in the steep headwater areas, sediments and other debris flow down the hillside into the waterway networks below impacting water quality, aquatic habitats and fisheries. It is therefore imperative land above the 80-90 metre contour is managed sensitively with due regard to maintaining deep rooted trees and shrubs to ensure the integrity of the fragile steep headwaters is maintained.



Map 3 - Steep headwaters of Kin Kin Beds

Evidence of significant degraded steep headwater areas across the Shire is substantiated by the LIDAR analysis conducted as part of the Keep It in Kin Kin project.

Other areas within the Noosa River catchment containing similar geology have comparable issues, such as the Sandy Creek sub-catchment (refer Map 4).



Map 4 - Active landslip areas within the Sandy Creek sub catchment.

Recommendations of the condition assessment that could result in the retention and reinstatement of deep rooted vegetation to stabilise vulnerable steep headwater areas, include:

- Targeted management of Cats Claw Creeper and other transformer weeds.
- Mosaic treatment and gradual infill planting where slips and erosion has or is likely to occur.
- Large-scale revegetation of steep headwater areas.
- Promotion of native forest management activities and regrowth retention in targeted areas.
- Investigation and application of carbon, water quality, vegetation and biodiversity offsets where possible into steep headwater areas.
- Extension programs to support the grazing industry's adoption of sustainable/safe stocking rates.

Freshwater creeks and tributaries

Freshwater creeks and tributaries progressively transfer sediments downstream with accumulation and floodplain formation occurring on the inside bend, and significant erosion and sediment removal occurring on the outside bends. Due to vegetation clearing and changed hydrological regimes throughout the catchment, accelerated erosion of outside bends are a key issue that requires careful attention with management focussed on stabilising these areas.

For prioritisation purposes, high-value freshwater creeks and tributaries are identified as "protected reaches in good condition", "unprotected reaches of regional conservation significance", and "reaches of local conservation value". These waterway reaches are the highest priority for resourcing in order to keep them in good condition (Refer Map 5).

Recommendations of the assessment for rehabilitation of high value freshwater creeks and tributaries include:

- Targeted management of Cats Claw Creeper and other transformative weeds.
- Management of feral animals (pigs and deer) that significantly impact streambank stability and water quality.
- Exclusion of stock, installation of off-stream watering points and fencing (including flood fencing techniques).
- Retention of vegetation on the toe of the waterway reach.
- Revegetation of the entire riparian zone.
- Detailed site-based fluvial geomorphological assessment for problem areas, with more invasive remediation such as installation of large woody debris instream for habitat or bank stabilization, toe stabilisation, installation of timber/concrete piles or other flow velocity reduction techniques
- Stormwater capture and treatment before entering the waterway to attenuate pulses of water flow which can create erosion.
- Investigation and application of carbon, water quality, vegetation and biodiversity offsets where relevant to riparian areas.
- Retrofitting and reconstruction of road crossings in wetland areas to reduce the effect of narrowing and concentrating flow causing both upstream and downstream river bank and bed disturbance.

Map 5: Ecosystem Recovery Priority of River Reaches

Queensland Government

Healthy land & water

Legend
- 1 - Protected reach in good condition throughout
- 1 - Unprotected reach in good condition throughout
- 2 - Unprotected reach of regional conservation significance
- 3 - Reach of local conservation value
- 4 - Deteriorating strategic reach
- 5 - Linking reach and significant remnant section
- 6 - Reach with moderate recovery potential
- 7 - Reaches requiring significant levels of investment for recovery
- no data

Sister Tree Creek
Golden Gully
Pender Creek
Wahpunga Creek
Eudlama Creek
Banyan Creek
Kinmond Creek
Kin Kin Creek
West Kin Kin Creek
Fern Creek
Sandy Creek
Sandy Creek LB
Cooloothin Creek
Pinbarren Creek
Six Mile Creek
Coles Creek
Cooroora Creek
Ringtail Creek
Cooroibah Creek
Skyring Creek
Middle Creek
Six Mile Creek LB
School Creek
Frogmouth Creek
Death Henderson Creek
Woory Creek
Cranks Creek
Eenie Creek
Keyser Creek
Burgess Creek
Sunrise Creek
Happy Jack Creek
Blackfellows Creek North
Coorooy Creek
Blackfellows Creek South
Weipa Creek
Murdering Creek
Petrejan Creek
Lorikeet Creek

0 1 2 4 6 8 10 Kilometers

1:125,000 printed A3
GDA 1994 Zone 56
Data Sources: Queensland Government, Healthy Land and Water, Noosa Landcare, Mary River Catchment Coordinating Committee
10 cm Imagery 2016, Noosa LiDAR 2015

GDA

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Supported by ESRI Australia

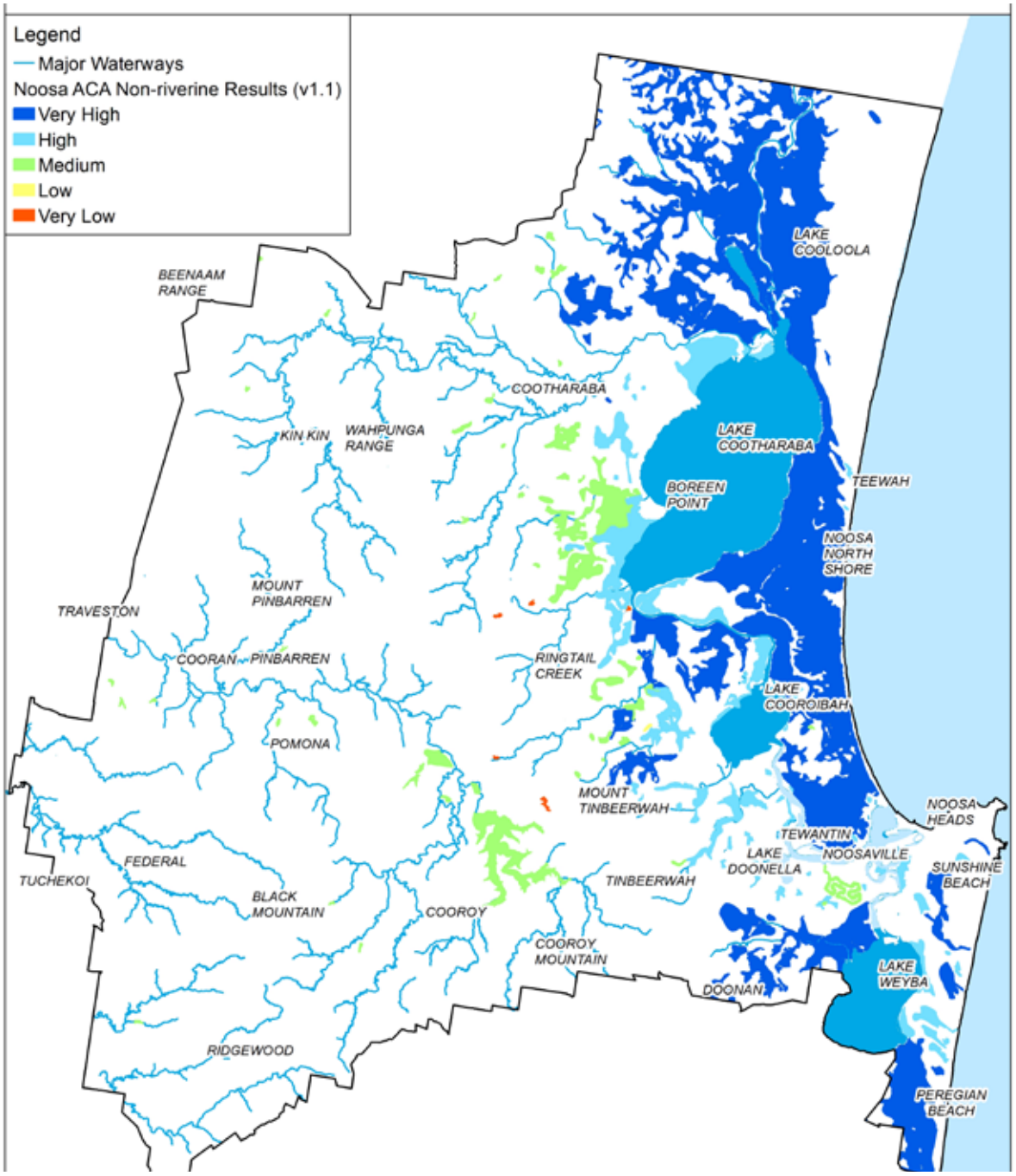
Cartographer: S. Mooney, M. Wallace, R. Lyons, B. Wedlock
Version: 4 September 2017

Paperbark/sedgeland dominated non-riparian wetlands and river estuary

Paperbark and sedgeland dominated non-riparian wetlands and estuarine areas have existing and comprehensive datasets to prioritise the ecological value of these habitats through the Queensland Wetland Program's AquaBAMM methodology and Aquatic Conservation Assessment scores.

This prioritisation process is based on a number of criteria including aquatic naturalness, catchment naturalness, diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity, and representativeness. High value habitats are the highest priority for resourcing in order to keep them in good condition.

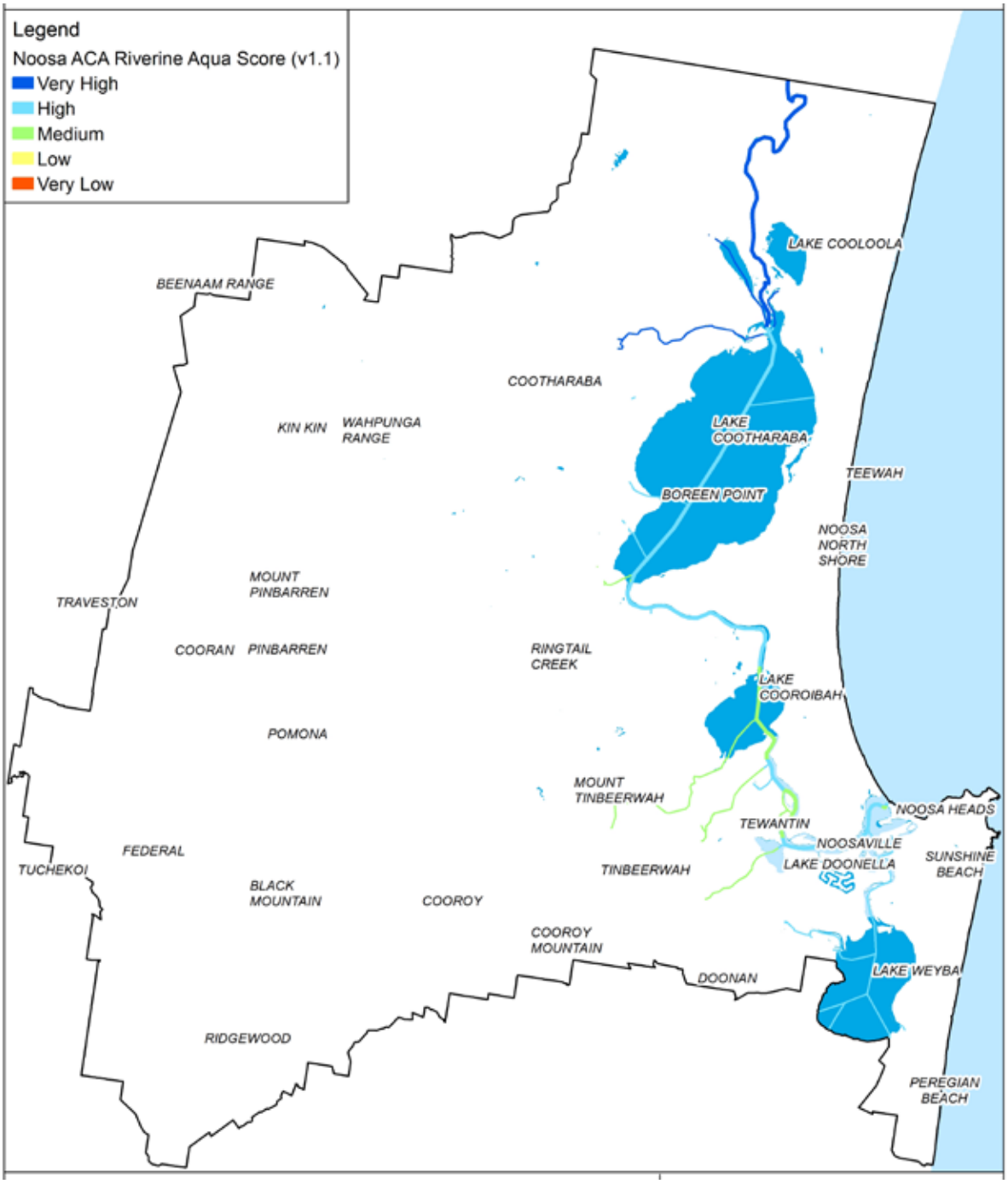
Recommendations of the condition assessment include initiatives that could provide wetland value, and water quality outcomes, within non-riparian wetlands (refer Map 6) and the estuary (refer Map 7).



Map 6 - Aquatic Conservation Assessment Non-riverine Wetlands

These include:

- Targeted management of Cats Claw Creeper and other transformative weeds.
- Management of feral animals (pigs)
- Exclusion of stock and fencing.
- Revegetation within the wetland and wetland buffer areas.
- Engagement and or regulatory programs to upgrade effluent disposal systems and their impact on producing discharge into shallow aquifers in targeted areas such as Cootharaba.
- Reinstatement of surface freshwater flow and condition, in and around wetlands where channelization or alteration has occurred.



Map 7 - Aquatic Conservation Assessment Riverine Results for Estuarine Wetlands

Climate change considerations

Riparian and wetland habitats in the catchment are expected to experience more frequent and intense damage during heavier rainfall events, and more extensive and destructive flooding such as wetland silting and loss of soil and nutrients from riparian zones. These areas will also become more susceptible to weed incursions. During extended dry conditions, environmental flows and water quality are likely to decline and affect aquatic life and waterway recreational activities. Other potential impacts include;

- Increased sea and river temperatures that have the capacity to;
  - Increase the acidity of the water, impacting on some species
  - Disrupt breeding cycles of some species
  - Cause tropical species to move further south, with associated environmental and social impacts
  - Cause deoxygenation of waters, leading to more frequent fish kills
- Sea level rise may also increase saltwater inundation into freshwater areas.
- Less predictable rainfall can introduce more variability into the system, with some species less able to adapt.
- More severe storm events can also
  - Increase flow of contaminants into the river
  - Increase erosion on stream banks due to wave action

Implementation of the key initiatives identified in this plan will improve the capacity of riparian and wetland habitats to respond to disturbance by resisting damage and recovering quickly. These interventions aim to increase the resilience of high-value habitats to stressors, maintain water quality, and secure vital refuge for native wildlife, include aquatic life. These initiatives demonstrate best practice and aim to maximise and optimise the natural values and ecosystems services of riparian and wetland habitats, building resilience to climate change impacts.

The development of an assessment and monitoring tool to gauge the condition and ecosystem heath of groundwater and wetlands will help evaluate vulnerabilities and impacts overtime, including impacts of climate change, contaminants, domestic bores, and saline intrusion into aquifers.

Oyster reef habitat

In the Noosa River system oyster reefs that were once plentiful, became commercially and functionally extinct by the 1940s as a result of intensive dredging of oyster lease areas and the removal of live oyster beds and the underlying bedrock (Thurston 2015). As a consequence, large areas of intertidal and subtidal 'hard substrates' required for oyster spat to settle, grow and form reefs, were lost.

Oyster reefs are in decline globally due to human factors such as overharvesting, pollution and introduced disease. These habitats provide resources for fish and other aquatic life, and have the capacity to filter and remove nutrients from the water column. These important ecological services and community benefits are often cited as the principal purpose of oyster reef restoration.

Concerns about Noosa's lost oyster reef habitat and the status of fish and Noosa's fisheries became the catalyst for the partner project Bring Back the Fish, bringing together the Noosa Biosphere Reserve Foundation, Noosa Council, Noosa Parks Association, Thomas Foundation and The Nature Conservancy. The initiative consists of three elements:

1. Direct restoration of lost oyster reef habitat in the Noosa estuary.
2. An assessment of the benthic biodiversity in the Noosa estuary.
3. An assessment of erosion prone areas in the Kin Kin sub-catchment (i.e. Keep it in Kin Kin).

Planning for these projects incorporated collaboration between partners and relevant science-based research about the Noosa River fisheries and management options for the restoration of aquatic habitats to improve these fisheries. This collaboration and research included:

- Noosa River Expert Workshop which produced the report History of Aquatic Restoration and Management Options for Noosa Estuary and Lakes 2014.
- The Nature Conservancy Oyster Restoration Scoping Study which produced the report Restoration of Noosa Estuary – An Assessment of Oyster Recruitment 2014.
- University of Queensland historical ecology study in the Noosa River which produced the report Historical Ecology of the Noosa Estuary Fisheries 2015.
- University of Sunshine Coast, Bring Back the Fish which produced the pilot program Oyster Reef Restoration in the Noosa River estuary 2017-19.

In November 2017, fourteen (14) oyster reefs made of large hessian bags filled with recycled oyster shells were installed in the Noosa estuary by the University of the Sunshine Coast. Monitoring over the subsequent year showed all reefs had oyster spat settlement with an average of 300 spat per metre in May. By November 2018, some juvenile oysters had grown to 60 mm in diameter.

The first year's monitoring report provided data on the four key success criteria:

- The experimental units remained in their locations.
- There was no damage or interference to adjacent seagrass or mangrove habitats.

Eddie Game (The Nature Conservancy), and Brian Walsh (Noosa Parks Association), conducting oyster spat trials

- High levels of oyster recruitment was observed. The shells had not yet formed a stable matrix (joined together), but were showing signs of doing this and had not been expected to in the first year.
- The 'interaction with the public' measure failed, due to the damage to the units by boat propellers, requiring the removal of 11 of the reefs after 15 months, providing key learnings for future reef design, placement and signage.

The next phases of oyster reef restoration in the Noosa River is to be implemented under a Partnership Agreement with The Nature Conservancy (TNC);

- Optimal design (2019-2020) will utilise the learnings, monitoring and evaluation of the initial trial stage already completed to determine the design, locations and most cost effective method of reef restoration.
- Full restoration (2020-2021) seeks to construct reefs at feasible locations identified during the design stage. The anticipated outcomes of this partner project include the restoration of oyster reefs to enhance the biological and structural complexity across the network of fish habitats in the Noosa estuary, improved ecosystem health and an increase in biodiversity and fish abundance.

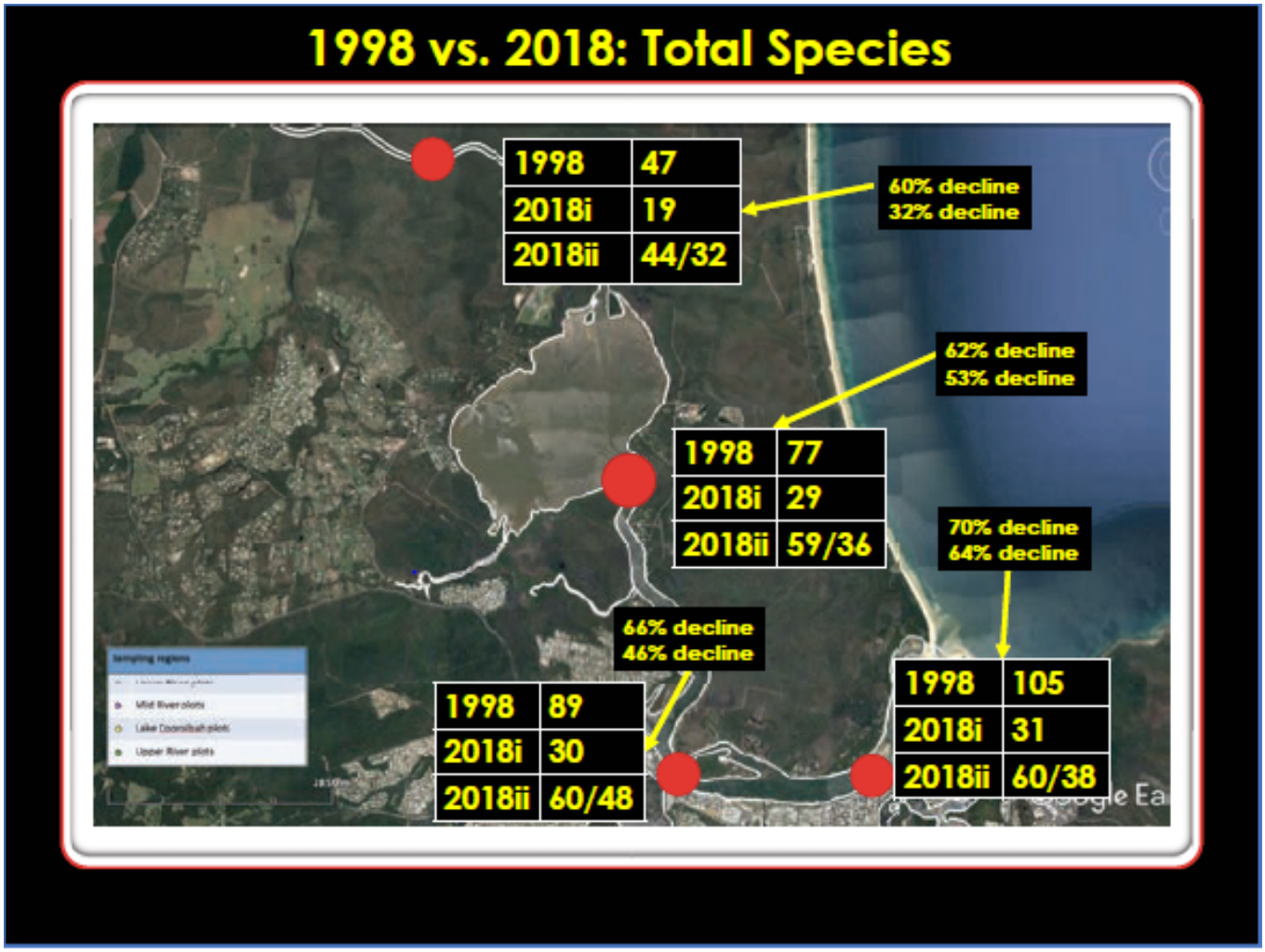
Benthic biodiversity

In 2018 a study of benthic biodiversity in the Noosa River was commissioned by the Noosa Biosphere Reserve Foundation as part of the Bring Back the Fish partner project.

The study was conducted by the University of Queensland and Murdoch University along a gradient from the river mouth to the upper lakes region, and compared benthic fauna sampled in 1998 with the benthic fauna sampled in 2018. The aim of this research was to assess the impacts of human activities on food web dynamics in the estuary.

Benthic fauna is a critical component of the estuary's aquatic food web and forms the diet of many fish targeted by both commercial and recreational fishers. It also performs important ecosystem services such as irrigating sediment to recycle oxygen and nutrients, and stops sediment resuspension by forming binding tube mats (Skilleter, Moffitt, Loneragan, 2018).

The sampling results showed a dramatic decline in the number of benthic fauna sampled, with 1114 individuals from 50 species collected in May 2018, at the same locations where over 9000 individuals from 150 species were collected in 1998.



Total numbers of species collected at each of the four locations along the Noosa River estuary in 1998 and again in 2018. Two numbers are shown for 2018 sampling i.e. 2018i represents the number of species sampled in May, while 2018ii represents the number of species sampled in November, with a threefold increase in effort. This is shown as two numbers (e.g. 44/32), the first is all species, and the second excludes rare species (i.e. those only found as a single individual). The % change in species number is shown for May and November, excludes rare species.

Densities within the samples were also smaller in 2018, with many samples only containing a few individuals. This large decline triggered a resampling regime in November 2018 which coincided with spring recruitment of many benthic species with invertebrate larvae. In addition, the sampling effort (i.e. the number of samples at each location) was increased three-fold.

November's sampling resulted in more species beingfound, however many occurred as single individuals (or rare species) despite the increased sampling effort. With the individual or rare species excluded, the 2018 sampling regime identified a 30-65% overall decline in benthic fauna in the Noosa River compared to the 1998 sampling (Skilleter et al, 2018).

The benthic study has identified a substantial decline in the abundance and diversity of benthic fauna in the river bed compared to 20 years ago. Further assessment about the impacts from a range of human activities on the benthos needs to occur, to build knowledge and understanding of these dynamics. This in turn will inform ecosystem-based management of the Noosa estuary and support sustainability of Noosa's fisheries.

The authors of the study suggest that the primary cause for the decline in benthic fauna is the amount of sediment in the river and its regular resuspension. The report suggests that this may be exacerbated by the lack of flushing, preventing the sediment escaping, given the amount of time since the river last flooded.

The likely cause of sediment in the river is activities within the upper catchment, especially areas such as Kin Kin Creek where riparian habitat is not as complete as in other areas of the catchment. Sediment would take many years to flow through the different lakes before getting into the estuary. River Plan actions will take time to achieve the desired improvements. Localised impacts from rural roads, stock accessing waterways and poor erosion and sediment control around development sites adjacent to the river are also likely to contribute to the problem. The regular resuspension of sediment is potentially caused by several activities;

- General wind and wave action across shallow lakes causes resuspension of sediments into the water column.
- Human activities such as boating and recreation result in localised, regular resuspension.
- Commercial fishing activities, especially the use of beam trawls, would resuspend sediment within the river system and prevent seagrass and benthic fauna from re-establishing.

The River Plan proposes a range of actions to deal with the issues identified as part of this report.

Barriers to fish passage

The Noosa River is recognised as important habitat for commercially and recreationally significant fish species such as sea mullet, tailor, trevally, garfish, dart, bream, flathead and whiting, and is a stronghold refuge for threatened species such as the Honey Blue-eye, Oxleyan Pygmy Perch and Estuary Ray.

Fish require passage throughout the river system as part of their life cycles for the purposes of breeding and spawning, feeding, juvenile migration, predator avoidance, and territorial behaviour.

Man-made structures such as weirs, culverts, causeways, bridges and dams can form partial or complete barriers which inhibit fish movement. This can be through an actual physical blockage of the waterway or through alteration of the natural flow conditions. Other barriers include weed and sediment chokes, or chemical barriers such as pollution or acidification of waterways.

In 2017 Council commissioned an assessment of barriers to fish passage throughout the Noosa River system to identify sites for remediation to restore aquatic connectivity. This was achieved through:

- Retrieval of data from State agencies and Council of known man-made structures within waterways such as weirs, culverts and bridges.
- Comprehensive field surveys and assessment of known and new barriers.

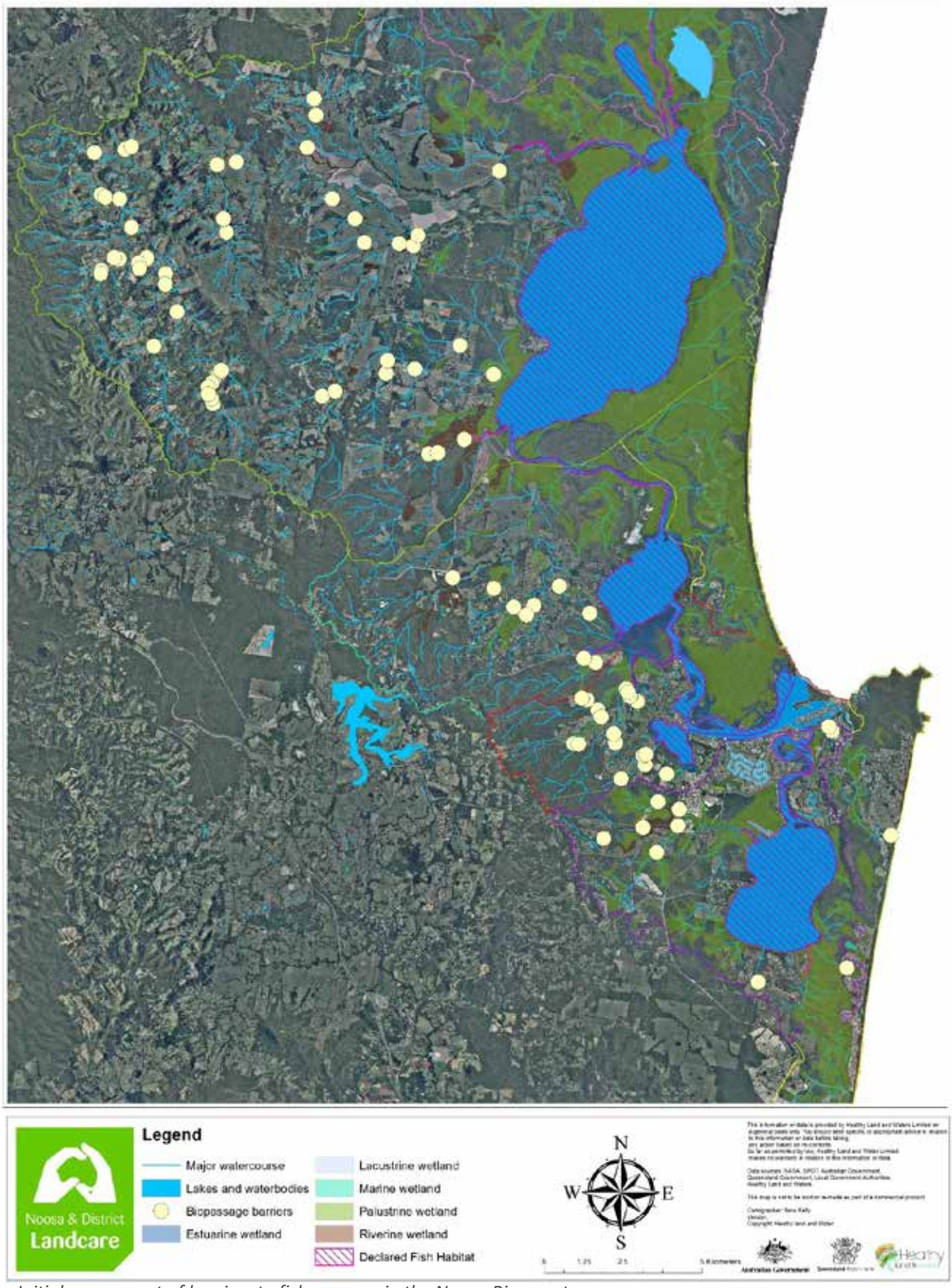
The initial assessment identified 100 barriers using criteria based on connectivity length, stream class and habitat quality.

Twenty-nine of these barriers were further investigated using detailed site data and a rapid appraisal and assessment, followed by a cost-benefit analysis of remediating each structure. Twelve (12) barriers scored the highest, indicating a significant level of fish passage outcomes and cost-benefit effectiveness through remediation. These barriers include a weir in Kin Kin Creek, a damming structure in Cranks Creek and 10 culverts located throughout the catchment's freshwater tributaries.

Predictive modelling scenarios identify that further to existing pressures from population growth and coastal development, fisheries production will be impacted by changed patterns of rainfall and flow events, increasing water temperatures, fish habitat transitions and changes in stock distribution.

The loss of longitudinal and lateral connectivity in waterways imposed by instream barriers is considered a widespread contributor to the reduction in diversity, abundance and distribution of fish and other aquatic fauna. A growing body of evidence supports the need for prioritising and undertaking a systematic program of barrier remediation.

Culvert barrier to fish passage



Initial assessment of barriers to fish passage in the Noosa River system.

Migratory shorebird habitat

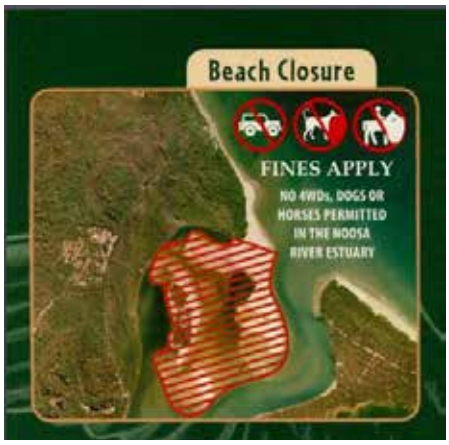
Every spring and summer the Noosa River mouth and estuary becomes home to thousands of migratory shorebirds that have left their breeding grounds in arctic Asia, Alaska and the North Pacific.

The shorebirds move through Noosa until autumn, building up strength to undertake their journey back to their breeding grounds, however some juveniles may remain the whole year until mature enough to undertake the migratory journey.

Australia is an ecologically important location for migratory shorebirds within the East Asian-Australasian flyway with an estimated two million shorebirds migrating annually. To ensure their conservation the Australian Government has fostered international cooperation through a range of important agreements (Department of the Environment and Energy, 2017).

Migratory shorebirds must have space, food and protection from predators and disturbances to recuperate from their long flights. Conservation of these habitats for migratory birds both within Australia and along their migration routes is essential to their survival. In key areas, particular recreational activities may need to be excluded or it may be necessary to limit the number of people using an area at one time during the period between October and March when the majority of shorebirds will be present (Department of the Environment and Energy, 2017).

To ensure Noosa's important shorebird habitats are protected from human disturbances, Council, under Local Law 4, established a 'beach closure' on the Noosa North Shore adjacent to the river mouth.



The beach closure prohibits access of 4WDs, dogs and horses. The public are still able to access the beach and river by foot and/or by boat.

The Noosa River mouth is a dynamic environment and despite changes in river channel alignment and shifting sand shoals, migratory shorebirds still utilise these areas.

Education and regulatory compliance activities would help reinforce Council's intent to uphold international agreements for the protection of migratory shorebird habitats in the Noosa Biosphere®.

Marine turtles nesting habitat

From late spring through to autumn the beaches of the Sunshine Coast become nesting habitats for marine turtles to lay their eggs. These species are mainly the endangered Loggerhead turtle (*Caretta caretta*) and less frequently, the vulnerable Green turtle (*Chelonia mydas).*

Marine turtles are migratory species and their global populations are in decline. Key threats include:

- Increased sky-glow and altered light horizons at nesting beaches. This disrupts hatchling ocean-finding behaviour and causes increased hatchling mortality. It also alters adult turtle nest site selection with resulting reduction in adult female nesting population.
- Excessive loss of eggs and hatchlings from feral and native predators, and egg collection for human consumption. It is estimated that the regular loss of more than 30% of a season's egg/ hatchling production (through predation or human consumption) threatens the sustainability of the population.
- Marine debris. Mostly synthetic items such as plastic and rubber, principally impact on marine turtles via ingestion and entanglement. There are indications that a major part of the small post-hatchlings in their first months of life are ingesting synthetic debris with resulting elevated mortality as they travel along the coast.
- Boat strike and propeller cuts. Records indicate that an order of magnitude of 50-100 turtles are killed annually from interaction with vessels in Queensland. The majority of this mortality occurs with loggerhead and green turtles occurs in shallow coastal waters adjacent to cities and ports.

In the Noosa region, volunteers from Coolum and North Shore Coast Care monitor turtles and nesting habitats from Peregian Beach to Noosa's Main Beach. This work is undertaken in partnership with the Department of Environment and Science as part of the Queensland Marine Turtle Conservation Strategy. A key outcome for the conservation of marine turtles is protection of their nesting habitat.

Coast Care volunteers are trained and accredited to identify and record the turtle species, nesting locations and frequency, protect nests from fox predation, and monitor the hatchling and emergence success of nests.

The volunteers are heavily dependent on early-morning beach walkers who are often the first to observe the female turtle tracks in the sand from the previous evening's arrival.

During turtle nesting season (November to April), Coast Care provides Council with the monitoring data to ensure the nesting sites along the eastern beaches are identified as part of Council's fox control program, and observed during Council operations such as beach raking, beach access maintenance and coastal drainage works.

This integration of information helps to ensure the marine turtle nesting habitats are protected, and the hatchling emergence success is optimised.

There is a paucity of information regarding the nesting behaviour of marine turtles on the Noosa North Shore.

This vast stretch of beach within the boundaries of the Noosa Shire also forms part of the Great Sandy National Park's Cooloola Recreation Area which permits 4WD vehicle access and beach camping.

It is a popular destination with holiday makers, particularly during the summer months (i.e. peak turtle nesting season) and is not monitored by Coast Care volunteers.

An opportunity exists to establish a monitoring program on the North Shore to determine if the beach is utilised by nesting marine turtles. This information could help direct feral animal control in this area, to ensure all known marine turtle nesting sites within the Noosa region are known and protected.

The Queensland Marine Turtle Conservation Strategy identified the Sunshine Coast region as a hotspot for a number of key threats to endangered loggerheads populations. The State's Conservation Strategy proposes a number of remedial actions to mitigate these threats:

- A Sea Turtle Sensitive Area Model Code (developed by the State) may be included into a local government planning scheme as a standalone code to manage sky-glow.
- Targeted feral (fox, wilddog) animal control in areas identified annually through turtle nest monitoring.
- Litter capture and behaviour change campaigns to reduce waterborne litter and marine debris locally.
- Boating related behaviour change campaigns such as 'Go slow for those below' (developed by the State) to help reduce boat strikes and propeller cuts.

Rural runoff

The hinterland sub-catchments within the broader Noosa River catchment have the potential to deliver sediment-laden runoff to waterways and wetlands when it rains, especially former timbered areas which have typically been replaced by agricultural lands and road networks.

This transition has involved broad clearing across the landscape (including hill slopes) for crop growing and animal raising and has made these landscapes vulnerable to soil loss.

Runoff from these areas can contain elevated quantities of sediment, nutrients and chemical contaminants (e.g. animal faeces, fertilisers and pesticides), and microbial contaminants.

The Kin Kin sub-catchment is the largest area of modified landscape in the Noosa catchment and a major source of sediments entering waterways.

In 2015, the Noosa Biosphere Reserve Foundation commissioned Noosa and District Landcare to undertake a LIDAR (Light Detection & Ranging) study.

This study provides the basis of partner project Keep It in Kin Kin which aims to reduce rural runoff, improve land management practices and protect riparian areas and wetlands.

The LIDAR imagery from 2008 to 2015 was compared to identify erosion hotspots most in need of intervention to keep soil on the land and out of waterways. The analysis revealed that up to 2.3 million tonnes of sediment was mobilised in this area over a 7 year period. Based on an average soil replacement cost of $30/tonne, the cost of this soil productivity loss exceeds $60M. The LIDAR study provides relevant, science-based research to inform management of landslips, erosion hotspots and where to target investments to repair degraded waterways and wetlands.

All the Shire's residents have an 'environmental duty of care' under the Environment Protection Act to ensure their land-based activities do not adversely affect environmental flows, water quality, riparian areas, wetlands and in-stream habitats. However there is a lack of a specialised advice and on-ground practical support in this area for rural landholders.

Kin Kin landslip

Landholder extension programs enable rural sectors to achieve best management practices, and are the preferred non-statutory approach by governments and those in the rural sector.

These programs can cover a wide range of land management and production issues including soil health, grazing and use of fertilisers and chemicals. For example, throughout catchments in central and northern Queensland, landholder extension programs are being implemented to help reduce the impacts of rural runoff into the Great Barrier Reef.

An extension program requires a long-term commitment to landholders. The Keep It in Kin Kin partner project delivers some landholder extension activities throughout the sub-catchment. This program is an important mechanism to foster sustainable land use in rural areas and will be further supported.

Unsealed rural roads

As well as farming practices, unsealed rural roads are potentially a major source of sediment entering local waterways when it rains. A study by SEQ Catchments identified unsealed roads contribute more sediment than gravelled roads. An unsealed road is categorised as a route accessible by vehicles that are not sealed, metalled, or gravel roads.

A critical factor in determining the contribution of sediment from unsealed roads to waterways relates to the level of connectivity of 'table drains' entering these receiving waterways. A table drain is a v-shaped, trapezoidal or parabolic shaped surface drain located immediately adjacent to the edge of a road.

This research demonstrated that lowering connectivity to waterways requires that water is either discharged from table drains or spread across vegetated landscapes where the sediment can settle or the flow is directed into detention basins for sediment settling.

Council builds and maintains all roads in the Shire to the Australian Standards, however an investigation of the sediment contribution from unsealed rural roads to local waterways in the Noosa River catchment has not been undertaken. Without a means to quantify the sediment loads delivered to waterways from unsealed rural roads it is anticipated this potentially major pollution source will continue unabated. A rural roads sediment study is required focused on unsealed roads and drainage channelization.

Climate change considerations

Predictive modelling scenarios anticipate more frequent and intense storms are likely to create higher flows in freshwater creeks and estuaries resulting in more runoff, increased bank erosion and landslips, exacerbating the rural and urban runoff pressures.

During extended dry conditions, flows in freshwater creeks and estuaries are likely to decline and affect waterways recreation and aquatic life. Sea level rise is likely to increase water levels in the estuary and place more pressure on native species, impact wetlands and make conditions more favourable for some pest animal and plant species in the future.

Urban runoff

Urban runoff is a mixture of treated and untreated stormwater. It is a major source of pollution delivered to waterways via the stormwater network and contains sediments, nutrients, chemical and microbial contaminants, and gross pollution such as litter.

Stormwater quality improvement devices, particularly water sensitive urban design (WSUD) infrastructures play a key role in reducing stormwater velocity and pollutants entering waterways. In new residential developments, the installation of bioretention basins has become the most common WSUD stormwater quality treatment. Bioretention basins are a hybrid engineered and vegetated filtration device used to remove sediment, nutrients and litter from urban stormwater runoff.

In existing urban areas, stormwater quality improvement devices such as gross pollutant traps (GPTs) were installed long before the bioretention basin technology. GPTs can intercept pollutants such as soil, silt, leaves, hydrocarbons and litter before entering the receiving waters. Some bioretention basins and GPTs are also installed on privately-owned land as part of a development condition.

Both Council-owned and privately-owned bioretention basins and GPTs require more regular maintenance to help avoid the urban runoff and pollutant impacts impacting the Noosa River.

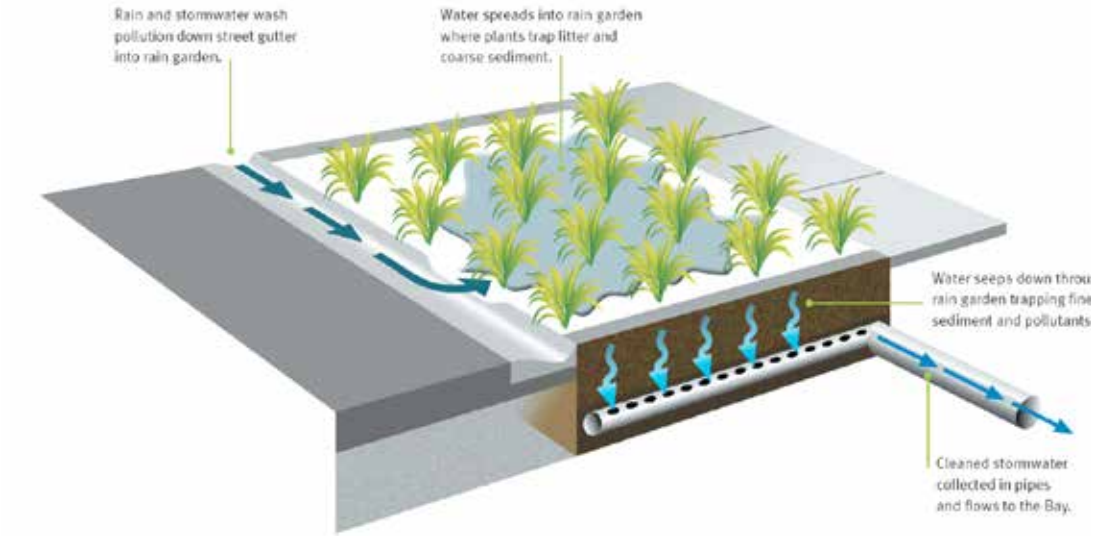
Council has a statutory management responsibility under the Environment Protection Act to ensure the quality of stormwater leaving new residential development achieves the State Planning Policy's pollution reduction targets and in existing residential developments, water pollutant loads to receiving waters are reduced.

Upgrading and renewing stormwater quality improvement devices and providing for ongoing maintenance over the life cycle of these assets are essential for their ongoing effectiveness to reduce stormwater velocity and pollutants entering waterways.

This is best done through implementation of a stormwater quality improvement program that ensures:

- periodic review and systematic maintenance and renewal of Council and privately-owned stormwater improvement infrastructure
- renewal opportunities for stormwater quality improvement devices (including litter capture devices) are comprehensively investigated, and prioritised
- all stormwater quality improvement devices are managed and maintained over the life cycle of the asset to ensure treatment efficiencies are maintained.

A stormwater quality improvement program also offers Council and the stormwater management industry opportunities to innovate through trials of new technologies.



Recreational waters and public health

It is well know that recreational water quality will deteriorate when subject to heavy rainfall events.

This is due to runoff of stormwater containing pollutants from land surfaces, gardens, parks, farms, roads, footpaths and drainage systems.

Stormwater diverted to the river can raise levels of pathogens and make it unsafe for swimming or direct recreational contact.

To help monitor and protect the health of residents and visitors, Council commissions regular water sampling of Noosa's popular beaches and recreational waters.

The water samples are analysed to detect the presence of coliform bacteria.

The monitoring program aligns itself with the Guidelines for Managing Risks in Recreational Water (National Health and Medical Research Council, 2008).

Other pollution sources - industry

Industrial business operations can create polluted runoff which enters waterways predominantly via the stormwater network.

Industrial operations with the potential to release contaminants into waterways are referred to as environmentally relevant activities. These businesses are licensed with conditions outlined in their Environment Authority (EA) under the Environment Protection Act. Council undertakes annual inspections of EA licensed businesses to ensure compliance.

In 2016 an initial stormwater pollution investigation of the Noosaville industrial estate revealed pollution had occurred and impacted the local waterway. A further comprehensive investigation of 132 businesses across the Shire also revealed an alarming level of non-compliance, particularly from mechanical workshops and other businesses including marine repair, wood industries and concrete batching.

Following the introduction of the State Government's Green Tape Reduction Act 2012, many previously EA licensed businesses with potential to pollute waterways no longer require a licence or an authorised annual inspection. These businesses are expected to self-regulate and adhere to industry standards.

Council has been working in partnership with local businesses to provide information on environmental compliance and share knowledge. However a formalised risk-based annual inspection program of these non-EA licensed industrial operations is required to monitor activities for the protection of Noosa's waterways under the Environment Protection Act.

Gross Pollutant Trap

Other pollution sources - individual practices

Because stormwater runoff is generated from land surfaces such as footpaths, roads, driveways, yards and roofs, efforts to control stormwater pollution must consider the individual, household, and public behaviours and activities that generate pollution from these surfaces. These common individual behaviours occurring throughout the Noosa River catchment have the potential to generate stormwater pollution:

- Building sites without erosion controls in place (sediment runoff when it rains).
- Back washing swimming pools and spas (releases of pathogens/chemicals).
- Cleaning and painting roofs (runoff of paint/ cleaning substances).
- Car washing (runoff of hydrocarbons/cleaning substances).
- Disposing left over paint and chemicals.
- Applying lawn chemicals.
- Changing motor oil on driveways.
- Disposing of pet waste.
- Illegal dumping of rubbish and recyclables.
- Littering.

When development activities are triggered under the Noosa Planning Scheme there are mechanisms in place such as on-site inspections pre and post development, to prevent waterways pollution. In other instances Council investigations are generally triggered by complaints received– often after the pollution has occurred.

It takes individual behaviour change and proper practices to control such pollution. Therefore it is important to make the community adequately aware and concerned about the significance of their behaviour for stormwater pollution. An ongoing stormwater quality education and compliance program for individual practices is required.

Littering

Litter in and around Noosa's waterway is common place. Hotspots include stormwater outlets, the river foreshores, popular fishing locations, islands in the river and along the beaches. A large portion of litter collected in these areas is plastic.

The scourge of plastics in waterways and the impact on marine life and seabirds resonates with many in the community as a key environmental issue.

An amazing cross-section of dedicated volunteers of all ages, act individually or together for coordinated river and beach clean-ups throughout the year. Key coordinating organisations include:

- Noosa Integrated Catchment Association (NICA)
- Surfrider Foundation
- Clean up Australia Day
- Noosa Community Biosphere Association
- Coolum & District Coastcare
- Sea Shepard
- Corporate organisations (Unitywater, Sofitel Noosa, Peppers Noosa)

A number of groups collate their findings and report on the volume of rubbish retrieved in and around Noosa's waterways each year –

- NICA's River Ranger volunteers fill a 1000L skip bin every 2 months with discarded items and litter from the lower Noosa River estuary.
- Surfrider Foundation volunteers collect 5 tonnes of rubbish annually along the Noosa North Shore to Double Island Point.
- Clean Up Australia Day volunteers 2019 audit of litter collected along the Tewantin riverside recorded over 1,600 plastic items which was 74% of the total number of rubbish items collected.

An important outcome of river and beach clean-ups is the data gathered about rubbish collected at a given location. This data input to the Australian Marine Debris Database helps inform strategies for the long-term prevention of marine debris, including tackling the source of the rubbish.

A morning's haul from the Noosa River by NICA's volunteer

Zero litter to the Noosa River

It is recognised that preventing litter entering waterways in the first place is the most effective and cheapest way of dealing with the litter issue. Noosa Council aims to achieve Zero Litter to the Noosa River by 2030. This is an ambitious undertaking and to achieve it will require a multi-faceted approach of education and infrastructure solutions. A strategy will be developed with the Noosa community to identify the pathway to this target

The Noosa community is already highly engaged in this area. The Boomerang Alliance has taken a lead role in influencing consumer behaviour, especially with regard to plastics through the Plastic Free Noosa campaign. Plastic Free Noosa engages with the retail and hospitality sector, as well as market, festival and event organisers to encourage the take-up of reusable containers and packaging, or switch to commercially compostable alternatives where possible.

Council supports Plastic Free Noosa through a partnership arrangement and provides a Recycling in Schools Program to assist students recycling at school and home. In addition, Council supports volunteer river and beach clean-ups through the provision of rubbish bags and disposal to landfill, and is requiring all tourism and other events on public lands in Noosa to phase out single-use plastics by 2021. Funding is also provided to NICA for their volunteer Riverwatch service which includes regular litter clean-ups in the lower estuary. Council undertakes mechanical street sweeping and manual street cleaning/litter pick-up of key commercial precincts and other areas within the catchment.

Under the Waste Reduction and Recycling Act, Council is authorised to investigate illegal dumping of rubbish and issue infringements for general and dangerous littering. Council can also issue infringements under its own local laws. At present, these are the only mechanisms enacted to curb littering behaviour.

Without further management interventions to ensure individual practices do not impact water quality, littering, plastics and other rubbish will continue to have an impact on the amenity and enjoyment of our waterways, and will continue to have an adverse effect on aquatic habitats, aquatic life and seabirds.

Marine debris – why does it matter?

Marine ecosystems worldwide are affected by human-made litter, much of which is plastic. Wildlife is impacted by marine debris directly through ingestion and entanglement and indirectly through chemical affects.

About half of seabird species across the globe have eaten plastic–this will likely increase to 95% of all seabird species by 2050.

Birds eat everything from balloons to glow sticks, industrial plastic pellets, hard bits of plastic, foam, metal hooks and fishing line.

Approximately one third of marine turtles have likely ingested debris–most items eaten are plastic and positively buoyant.

The regions of highest risk to global marine turtle populations are off the east coast of Australia, South Africa and USA; the East Indian Ocean, and Southeast Asia.

Turtles, seabirds, whales, dolphins, dugongs, fish, crabs and numerous other species are killed and maimed through marine debris entanglement.

CSIRO research into littering and marine debris in Australia identified three useful management interventions to mitigate these impacts. These include:

- Targeted litter education and behaviour change campaigns to stop littering.
- Litter debris traps in both surface and stormwater systems to reduce litter loads to waterways.
- River and beach clean ups to reduce litter deposited in and around local waterways.

In 2017 a trial using 'litter booms' in waterways and 'foreshore and beach cleaning' conducted within the Sunshine Coast Local Government Area, removed 3,493 plastic bottles and 2,659 plastic bags over a four month period.

Trials such as these, implemented in conjunction with targeted litter education and behaviour change campaigns, can deliver tangible outcomes for the community and mitigate the impact of marine debris in Noosa's waterways.

Coastal algal blooms

From 2002 to 2006 *Hincksia sordida*, a non-toxic brown alga has periodically 'bloomed' in Laguna Bay. It forms dense patches within the surf zone of Noosa's Main Beach with large quantities of the alga becoming stranded on the beach by the receding tides. These algal blooms have occurred during spring or early summer and coincided with popular holiday periods and recreational use of the beach and ocean. All other beaches south of Main Beach are not affected by *Hincksia*.

The presence of *Hincksia* is visually unappealing to swimmers and decomposing alga on the beach can emit a sulphurous odour which also deters beach goers. Previous studies and trials aimed at finding the

NICA River Rangers clean up volunteers

source of *Hincksia* and removing the vast biomass of the alga from Laguna Bay both proved inconclusive.

Further research recognised macroalgal blooms (such as *Hincksia*) are a symptom of increasing nutrient loading into aquatic environments which has been demonstrated by the disappearance of blooms in a number of estuarine bays in the USA and UK following the reduction in nutrient input into these systems (Phillips, 2006). The findings from this research suggest *Hincksia* grows in the river and the source of nutrients fuelling the blooms at Noosa must be identified and management strategies developed to reduce nutrient inputs (Phillips, 2006).

Noosa did not experience another algal bloom for over a decade, however in September 2017 *Hincksia* bloomed again in Laguna Bay impacting residents and visitors use of the beach and waterways. This bloom was unexpected and during the 2017/18 spring/summer season caused Council to remove just under 1,000 tonnes of sand and decomposing *Hincksia* from Main Beach to landfill, at a cost of around $100,000.

Following the 2017 bloom, Council put in place a more proactive strategy should *Hincksia* blooms occur again in the future. This followed the approach outlined by Phillips (2006) to identify source populations of *Hincksia* within the estuary and the origin of nutrients inputs fuelling the blooms. It included two key components:

Hincksia algae in Laguna Bay

- Hosting a *Hincksia* workshop with experts in algae biology, groundwater hydrology and water chemistry to provide guidance on *Hincksia* sampling techniques, discussion on potential sources of nutrients which may be fuelling the blooms (including groundwater, stormwater and sewage effluent releases), and a peer-review of workshop proceedings.
- Undertake a *Hincksia* survey and sample collection program in the lower estuary to identify source populations of the alga.

Elevated nutrients in waterways can come from natural and/or human sources (including stormwater runoff and sewage effluent). These inputs can have adverse effects on water quality including the development of coastal algal blooms.

Annual monitoring in the river will hopefully help build our knowledge about potential source populations of *Hincksia* growing in the estuary. It will also help identify the origin of nutrients fuelling the alga blooms. This information may guide development of a management strategy to reduce nutrient inputs (particularly nitrogen) in the river system and potentially reduce and/or mitigate future blooms of *Hincksia*.

Wastewater treatment

Sewage Treatment Plants

The Noosa Coastal Wastewater Treatment Plant provides sewage treatment for 45,000 Noosa residents and accepts influent from a range of different sources, including Council's landfill.

Unitywater is licensed by the Department of Environment and Science (DES) to operate the Noosa sewage treatment plant according to the strict conditions contained in their license. The wastewater treatment process produces high-quality effluent for discharge to the ocean from Burgess Creek. The volume of treated effluent discharged accounts for 90% of the Burgess Creek flow.

In 2017 during the State's review of water quality objectives for the Environment Protection (Water) Policy, the DES informed Council that Burgess Creek has been identified as a highly disturbed sub-catchment in terms of water quality and environmental values. There may be opportunities for Council, the community, and Unitywater to partner in rehabilitation projects at this site, given the Noosa Coastal Wastewater Treatment Plant is not scheduled for an upgrade until at least 2022.

Residential septic systems

In our urban areas the collection and disposal of liquid effluent is on a large scale through a municipal wastewater system, however for our rural areas and smaller settlements, domestic effluent is predominantly disposed of on-site.

Council has authority for oversight of residential on-site wastewater treatment systems and conducts a program of formal audits of wastewater facilities in the Shire which include over 3109 septic installations, 2161 secondary or advanced secondary systems and a further 86 properties relying on holding tanks. Council receives reports from contractors servicing these systems and conducts an average of 100 inspections annually. A review of 100 audit results demonstrated 41 systems were found to be non-compliant.

If not appropriately managed and monitored these on-site septic systems and waste water treatment facilities throughout the catchment have the potential to leak sewage effluent across and below the varied types of receiving environments. Furthermore, human illnesses associated with failed on-site treatment can be caused by *E. coli*, *Giardia*, Hepatitis A, *Cryptosporidium* and *Salmonella*.

In 2016 a background study of on-site effluent disposal was undertaken to inform the new Planning Scheme. The recommendations of the study is to allow advanced septic systems and other waste water treatments be located above the defined flood level, and in accordance with the intent of the zone under the Planning Scheme. However, greater attention is warranted towards the 'operation' of the approved treatment system to ensure protection of public health and environmental values.

Burgess Creek

Living on the river

The Noosa River and adjoining lakes is a nil discharge area for treated and untreated sewage. These provisions are set out in the State's waterways management and marine pollution legislation.

The Department of Transport and Main Roads issue a number of long-term and casual approvals for people to live on the Noosa River either temporarily, intermittently or permanently. As a condition-of-use, the vessel used to live on board must have the appropriate waste holding system on board, occupants must ensure waste is not discharged to the river, ensure that a fixed or mobile pump-out facility is used to empty the holding system, and keep written records of each discharge while the vessel remains in the river.

The waterways management regulations outline the provisions for living on board vessels in the river, and restrict vessels from remaining in the river for more than 48 hours, unless the living on board is in accordance with a State approval.

These conditions are not met by some living on board occupants. Council receives complaints from the general public and other river users that people discharge waste to the river, and are concerned there is no evidence that on-board sewage is monitored and managed appropriately according to the 'conditions of use' set out in the legislation.

Houseboats along the Noosa River

Sustainable use and enjoyment

The role the river plays in the social life of Noosa residents and visitors could not be overstated. The river is a focal point for relaxing, socialising and recreation. It is also a key economic driver, through its attraction to tourists and the long history of recreational and commercial fishing in the estuary and offshore marine waters.

Maintaining the values of the river that have led to it playing such a prominent role, while also ensuring ongoing access to these community benefits is one of the key challenges into the future. The River Plan seeks to achieve this outcome through the delivery of three key objectives;

1. Recreational and commercial use of the Noosa River waterways and foreshores is undertaken in a way that protects ecosystem health, respects the rivers carrying capacity and environment values, and prioritises visual amenity and public safety.
2. Recreational and commercial fishing is undertaken in a sustainable way so there is no long-term decline in fish abundance and diversity.
3. River mouth and foreshores are preserved and protected to ensure the natural form, processes and function of the river are not impacted.

Recreational boating

Approximately 54,000 residents call Noosa Shire home, however this figure can increase markedly during peak holiday times, which results in high volumes of boat traffic on the river and high numbers of people using public foreshore areas. During these peak periods the lower estuary is the busiest section of the river.

Whilst the influx of visitors and holiday-makers contributes significantly to Noosa's economy, the growing levels of recreational boating activity and increased demand for infrastructure have the potential to affect the environmental and amenity values of the river and distract from the user's enjoyment of the waterways.

Noosa River Marine Zone

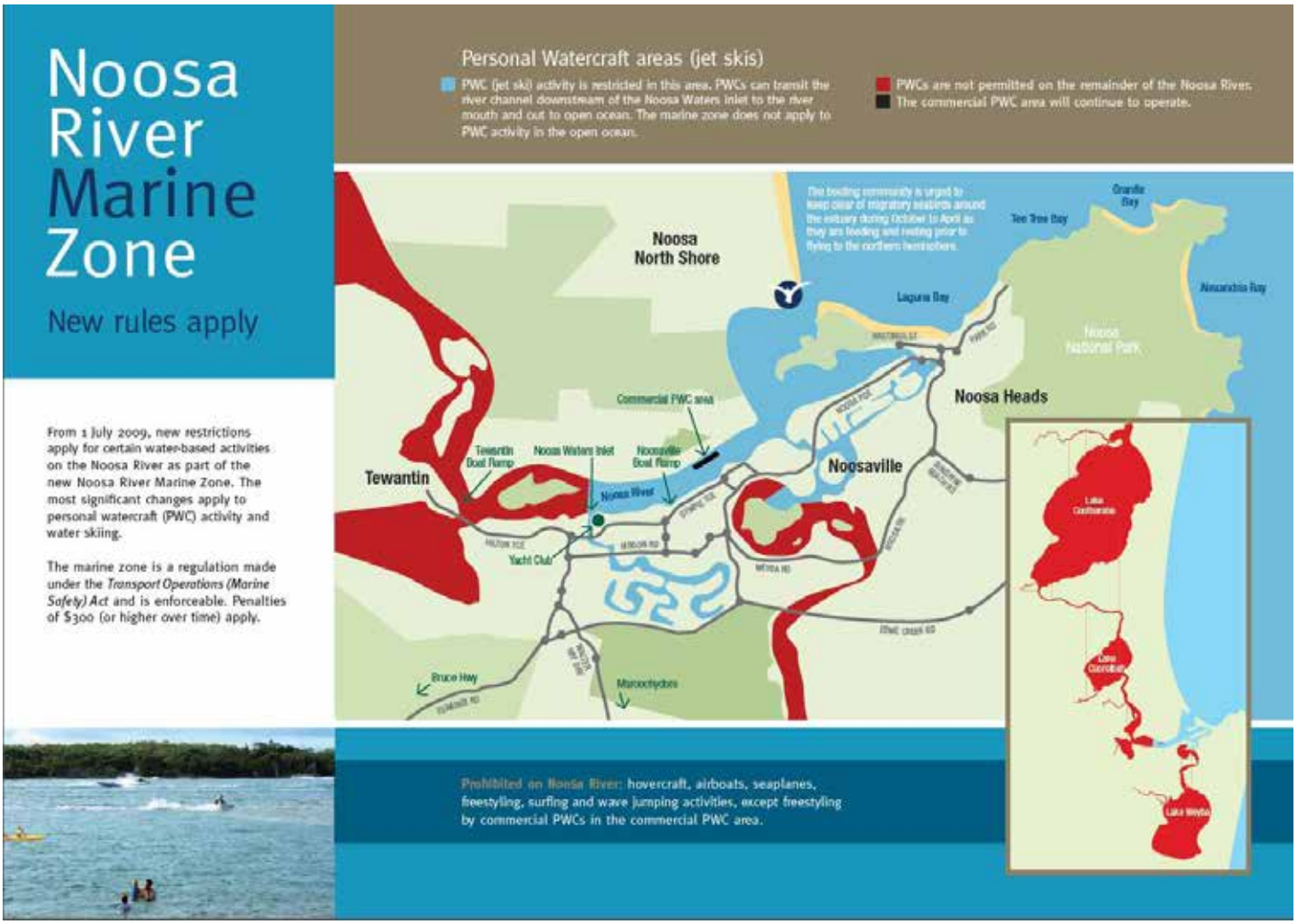
Prior to the State's recreational vessel census, the community were already expressing concerns about the number and type of watercraft using the Noosa River, safety issues, and the increasing competition for space between various river users. These concerns led Council to establish the Noosa River Marine Zone to manage competing community activities in the river.

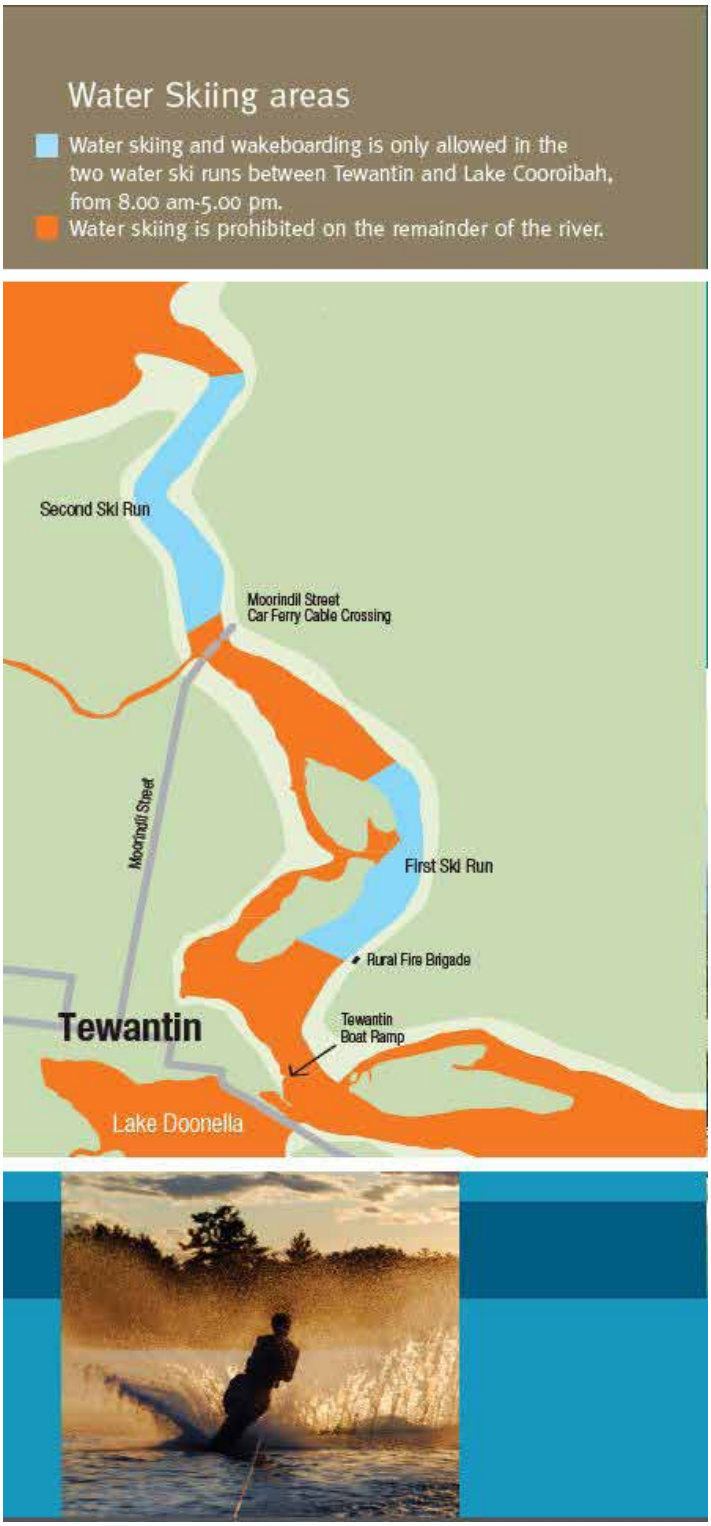
The Noosa River Marine Zone (refer Map):

- Restricts personal Jet Skis to transiting the river downstream of the Noosa Waters Inlet and out to the open ocean.
- Prohibits personal Jet Skis on the remainder of the river.
- Allows commercial Jet Skis to operate within the officially gazetted commercial Jet Ski area in the lower estuary.
- Restricts water skiing to two ski runs in the river, upstream from Tewantin.
- Prohibits hovercraft, airboats, seaplanes, and surfing and wave-jumping activities from operating in the river.

The Noosa River Marine Zone is a regulation made under the Transport Operations (Marine Safety) Act and is enforceable by Noosa Council and the relevant State agencies (i.e. Maritime Safety, Boating and Fisheries Patrol, Water Police).

The Marine Zone has been in place since 2009, however the restrictions regarding personal Jet Ski use and other boating-related uses are not well understood or typically observed by the recreational boating public. A regulatory presence on the river will support better ongoing education and compliance with the existing Marine Zone rules.





Anchoring, mooring and living on the river

The Noosa estuary is an important natural asset and a significant resource for recreation and tourism. It offers safe anchorage for cruising yachts, mooring locations for recreational boating and opportunities for living on the river.

Anchoring

Vessels left unattended at anchor, in some cases for many years, has a negative cumulative impact on the visual amenity of the river and significantly contributes to river clutter. These vessels mostly occupy the lower estuary which is by far the busiest section of the river. They impede river use by others especially those navigating the river in darkness. Vessels left unattended at anchor for long periods of time also frequently break free of their restraints or drag anchors during very high tides and strong winds. These vessels need to be resecured, often by other parties due to absent owners, before causing damage to other vessels or infrastructure.

There are few legislative restrictions regarding anchoring in the Noosa River. There are no provisions regarding 'unattended' anchoring, no provisions to control the 'length of stay,' and no fee associated with anchoring. The current waterways management regulations allow boat owners to leave their vessels unattended at anchor indefinitely in the Noosa River, and Council would like to see this practice stopped.

Mooring

There are 112 authorised buoy moorings located within the Noosa estuary. This number was capped in 2010 by the Harbour Master who determined the river was at capacity and any additional moorings would compromise marine safety. New requests for moorings are placed on a waiting list.

The issues with moorings in the Noosa River relate to:

- Their location contributing to river congestion.
- The number of vessels in very poor condition (such as mooring minders – see below) and the visual impact of neglected vessels occupying prime positions along the river.
- Scouring of seagrass beds from 'swing' type moorings located in declared Fish Habitat Areas (FHA).
- Compliance with the mooring permit's 'conditions of use.'
- Relatively low fee for a mooring permit.

A 'mooring minder' is the term colloquially given to relatively inexpensive boats purchased by a mooring authority (permit) holder specifically for the purpose of reserving the mooring space.

These vessels are often in very poor condition and are left unattended for long periods of time. Aside from the visual impact of neglected vessels, these can also result in safety concerns and damage to other vessels and property if they sink or break free from their moorings, which are also often poorly maintained. As a 'condition of use' for a mooring, authorities in some States require a vessel to be visually suitable for the area, and be maintained in a seaworthy condition.

Living on the river

The State issues a number of long-term and casual approvals for people to live on board vessels in the river either temporarily, intermittently or permanently. These vessels are either at anchor or moored, and there is no fee associated with these approvals.

The legislative provisions restrict vessels being used for living on the river from remaining in the river for more than 48 hours, unless the living on board is in accordance with a State approval.

As a 'condition of use' the vessel used must have the appropriate waste holding system on board. Occupants must ensure waste is not discharged to the river, ensure that a fixed or mobile pump-out facility is used to empty the contents of the waste holding system, and keep written records of each discharge while the vessel remains in the river.

Council receives complaints from general public and other river users that some people discharge waste to the river from their vessels. The Noosa River and adjoining lakes is a nil discharge area for treated and untreated sewage. These provisions are set out in the waterways management and marine pollution legislations.

There are also concerns that those who live on board vessels in the river regularly utilise services Council provides such as parks, amenities, waste collection etc. yet do not contribute financially to the provision of these services as do land-based residents via their rates.

Anchoring, mooring and living on the river is administered by the Department of Transport and Main Roads (TMR) through Maritime Safety Queensland (MSQ). Several key pieces of legislation provide the head of power for the State authorities to manage:

- Use of nominated waterways.
- Ship-sourced pollution.
- Condition and operation of vessels.
- Water traffic and associated infrastructure.

These laws include the Transport Infrastructure Act 1994, Transport Infrastructure (Public Marine Facilities) Regulation 2011, Transport Infrastructure (Waterways Management) Regulation 2012, Transport Operations (Marine Safety) Act 1994 and the Transport Operations (Marine Pollution) Act 1995.

Compliance with these laws and regulations is managed via a system of complaint and information referrals to other State agencies, which include the TMR Boat Harbours Team, Queensland Boating and Fisheries Patrol, Queensland Police Service and the Australian Maritime Safety Authority (refer Table 1 below).

Agency	Referral
TMR Boat Harbours Team	Administers the Transport Infrastructure Act 1994 & Regulation 2012. Applications for living on board approvals. Complaints about living on board vessels. Complaints about anchoring within 30m of a structure. Complaints about construction and works on watercraft.
Maritime Safety Queens-land (MSQ)	Administers and enforces the • Transport Operations (Marine Pollution) Act 1995 & Regu-lation 2018. • Transport Operations (Marine Safety) Act 1994 & Regula-tion 2016. Applications for buoy moorings. Maintains aids to navigation and marine signage. Undertakes related education with industry and community groups.
Australian Maritime Safety Authority (AMSA) on behalf of the Australian Government	Provides Domestic Commercial Vessel (DCV) certification, licencing and compliance as from 1 July, 2018.
Queensland Boating and Fisheries Patrol	Enforces boating safety laws through surveillance and inspection. Implements and enforces compliance with Queensland's fishing rules and regulations. Managing fisheries compliance in Queensland (PDF 1.3MB). Undertakes related education with industry and community groups.
Queensland Police Service (Water Police)	Enforces boating safety laws through surveillance and inspection e.g. speed limits, boat licenses, registrations and complaints.

Table 1 Agencies responsible for managing activities in the Noosa River system.

In addition, Noosa Council investigates complaints under various legislation regarding:

- Unauthorised use of the river foreshores (Local Laws).
- Compliance and education with the Noosa River Marine Zone (Transport Operations Marine Safety Act 1994 and Regulation 2016).
- Pollution of waterways (Environment Protection Act 1994).

In 2014 Noosa Council publically declared interest in taking on the management responsibilities for anchoring, mooring, living on the river. Discussions with the State agencies investigated how these activities could be managed at a local level as opposed to the current state-wide approach.

Local management now seemed a viable option for Council, however would the community be supportive of this approach?

Noosa River Community Jury

In 2015, a 24-member Community Jury of local residents and ratepayers was established to provide recommendations to Council on the topics:

- How can we manage the Noosa River better?
- What role should Council play and what resources should Council apply?

The scope included anchoring, mooring and living on the river, commercial use of the river, and the commercial jetty leases occupying the Noosaville foreshore.

Following their four-month deliberation the majority of the Jury supported the proposition that Council should take over the authority and finances from the State for managing anchoring, mooring, living on the river and commercial use of the river, on the basis it would be a user-pays system funded through alternative means to rates.

The Jury presented Council with 12 recommendations, which were noted by Council, and a proposal to review and update the previous Noosa River Plan (2004) under a whole-of-catchment management framework, was endorsed by Council at its Ordinary Meeting on 19 January, 2017

1. Review, update and implement the Noosa River Plan in a new framework and ratify with formal status to ensure it has authority.
2. Undertake effective monitoring and facilitation of waste tank effluent removal and disposal from vessels.
3. Establish an effective duty of care and policy regarding Aboriginal Cultural Heritage and aboriginal engagement on all aspects of river management.
4. Implement a role with authority on the river around compliance and monitoring.
5. Maintain river catchment protections.
6. Review fees for mooring and anchoring and levy rates for commercial jetties.
7. Establish a Noosa River Management Coordination Committee to oversee river management.
8. Remove abandoned, unattended, unauthorised, derelict and unsafe vessels to an impound area in the river for auction.
9. Review anchoring and mooring locations and types of moorings.
10. Determine a cap and locations for live on boards.
11. Implement lighting and marker options for boats and beacons for safety reasons.
12. Implement stricter management of acceptable commercial uses of the river and assume control of commercial leases.

This River Plan progresses Council's intent to advance discussions with the relevant State agencies for more effective monitoring, compliance and enforcement of existing waterways regulations. If the State is not able to resource this, informed by the Community Jury's recommendations, Council will continue to pursue local management of anchoring, mooring and living on the river and explore a range of mechanisms to better manage commercial use of the river. If the State agrees to a transfer of management responsibilities to Council, it will provide an opportunity to establish an on-river presence and encourage a welcoming, friendly, boating community which supports visitors, as well as the expectations of residents.

It is unlikely however, that a user-pays system (recommended by the Jury) will generate enough revenue to cover all the costs of these management functions. This is still a key challenge for Council and the community.

Noosa River Community Jury

Commerce and infrastructure on the river

Jetty Leases

The 14 commercial jetty leases located along the Noosa River foreshore supply a diverse range of motorised and non-motorised watercraft for eco tours and hire and self-drive or paddle experiences. The leases are predominantly over water i.e. beyond the high water mark, but most include a portion of foreshore land. Collectively these commercial jetty businesses provide a host of recreational opportunities for residents and visitors.

The Noosaville foreshore, where the majority of leases are located, is one of the most popular recreational areas in the Noosa Shire, and accommodates increasing demands for recreational, community and commercial use of the foreshores, particularly during peak holiday times.

The commercial jetty leases are issued and managed by the Department of Natural Resources, Mines and Energy (DNRME) under the Land Act 1994.

DNRME advise that Council cannot be authorised under the Land Act to take on management of commercial leases (which was a recommendation of the Noosa River Community Jury), however Council remains responsible for approval of development within the lease area and management of the public foreshores under its local laws.

In response to increasing demands for commercial and community use of the Noosaville foreshore, Council in consultation with the community and the State, developed a Noosaville Foreshore Land Use Master Plan to help inform future decisions regarding use of this area. The Plan's aim is to protect the integrity of the public foreshore by carefully considering the balance between commercial activities and recreational use.

Formal tenure arrangements or permits are required to conduct commercial and not-for-profit activities on public lands, which must be considered along with the general public's expectations to also freely access this area.

Commercial jetty leases occupying the Noosa River foreshore.

The development of a Memorandum of Understanding (MOU) between Council and DNRME in the future will help identify a jointly agreed set of obligations and mechanisms relating to the ongoing management and monitoring of the commercial activity and jetty leases which includes;

- Regular compliance audits of commercial river leases and adjacent park reserves.
- Early consultation between the two parties regarding proposals for sub-leases or new activities within the lease areas.

Establishing new businesses on the Noosa River

Council receives many enquiries for proposals to establish new businesses on the river. Individually, these proposals have merit, as most are innovative and sometimes unique. However, when considered together with the high volume of other applications, the sheer number of potential approvals would seriously impact upon safety, amenity and congestion in the river. In most instances, these proposals also seek to utilise public boat ramps or public foreshores.

The Noosa River is already congested during peak holiday periods and activity has reached a level where stringent control over new businesses is required. Implementation of stricter management of acceptable commercial uses of the river is also supported by the Noosa River Community Jury recommendations to Council.

To help manage enquires to expand commercial use on the river, Council created the *Guidelines for the Establishment of New Businesses on the Noosa River* in 2006. These guidelines reflect the intent of both the Noosaville Foreshore Master Plan and the Noosa Planning Scheme to not increase the overall scale and intensity of commercial operations on the Noosa River. Relevant topics covered include:

- Jetty operation base required - Commercial water-based businesses are required to operate from an approved commercial jetty. Use of private jetties for commercial activity is not allowed. Council will generally refuse endorsement of any new commercial jetties to be constructed on the Noosa River for commercial activity. Operation of a commercial business from anchor or an authorised buoy mooring in the river is not permitted.
- Use of existing commercial jetties – Proposed new commercial businesses may negotiate with an existing commercial jetty operator for approval to operate from a commercial jetty via a sublease. In most cases approval from DNRME and Council will be required. It is unlikely that an extension of an existing seabed lease area will be approved to enable an expansion in the number of commercial craft allowed to operate from the jetty to facilitate a new business.
- Floating shops - Council does not support establishment of a new floating shop permanently attached to a jetty and used for commercial purposes.
- Use of public boat ramps - The regular launching of commercial hire craft such as boats, canoes, tour vessels, Jet Skis etc. is not permitted from

public boat ramps. Public boat ramps are owned by the State and provide for private vessel owners. Noosa Council supervises the operation of the public boat ramps.

- Use of public jetties. Public jetties are provided for use by private vessel owners and are not authorised for commercial activity. A new business relying upon use of a public jetty will not be approved.
- Sale of food from vessels. The sale of food from a vessel to customers on the banks of the Noosa River is not permitted. Food may only be sold to customers on board or to occupants of another vessel. The vessel and the proprietor must be licensed for the preparation and sale of food as required under the Food Act 2006.
- Waste water. All vessels which are used for living on board must have suitable facilities for holding all sewage and sullage waste. This waste must be discharged to a Council approved shore-based disposal system. Noosa Marina and the Noosa Yacht and Rowing Club has disposal facilities, in addition approved pump-out vehicles can also operate at commercial jetties to remove waste. The Noosa River and adjoining lakes is a nil discharge area for treated and untreated sewage.

These guidelines were created in 2006 and do not specifically address some new and emerging proposals for on-river businesses. For example, in recent years short stay accommodation on vessels at anchor in the river or attached to private jetties are being registered on various accommodation platforms. This practice is in direct conflict with the current guidelines which stipulate –

'Commercial water-based businesses are required to operate from an approved commercial jetty. Use of private jetties for commercial activity is not allowed. Operation of a commercial business from anchor or an authorised buoy mooring in the river is not permitted.'

In some instances the vessels used have not been surveyed to operate as a Domestic Commercial Vessel by Australian Maritime Safety Authority (AMSA), which is now a requirement of national law. AMSA are responsible for safety administration of these vessels in terms of registration, licencing and compliance functions.

To ensure ongoing clarity for new business proponents regarding Council's policy position on these matters, the guidelines will be reviewed and updated and further mechanisms explored to guide and manage commercial activity and use of the river.

Marine infrastructure

Seven public marine infrastructures, including boat ramps, jetties and a floating walkway are provided in the Noosa River system by the State to service the recreational boating public. These marine facilities are funded via recreational boating registrations and are designed and operated to provide functional, safe and convenient access to the river while ensuring no net loss of public access and use of the public foreshore.

In addition, the river system accommodates over 600 privately owned jetties which provide functional, safe and convenient access to vessels. Most private jetties attach to freehold land, although in some instances, private jetties attach to public lands.

There are a number of impacts and considerations for Council and the community regarding:

- Use of public boat ramps (including parking) impacting on surrounding streets and residents.
- Commercial operators using public marine facilities without approval.
- Construction of unapproved boat ramps and jetties which are not designed and/or maintained to standards.
- Potential safety risk of the public accessing unauthorised boat ramps and jetties on public lands.
- Unauthorised boat ramps and jetties located in sensitive public foreshore areas and/or declared Fish Habitat Areas (FHAs).

The construction of jetties require approval from Council under Noosa's Planning Scheme and the

Department of Environment and Science (DES) under the Coastal Protection and Management Act.

Council manages the public marine facilities on behalf of the State, while owners of private jetties are responsible for their jetties' upkeep.

Further information is needed to support future decision-making, including a better understanding of the numbers and types of marine infrastructure in the river and the need to reach a community consensus, in line with the environmental capacity, on what level of infrastructure is appropriate for the Noosa River.

Speed limits & public safety

The lower Noosa estuary is popular and very busy, particularly around Munna Point and the Noosa Spit (Dog Beach). Boats travelling at speed in these areas have created a public safety risk.

In both these locations, Council has also instigated extensive erosion protection works. A temporary speed restriction of 6 knots was put in place whilst the erosion protection works were underway, however this restriction was lifted at the completion of the project.

The boat wash produced from vessels travelling at up to 20 knots around these areas is increasing the risk to people swimming in the river, and contributes to the undermining of the erosion protection works in place.

Council is focused on ensuring recreational boating is conducted in a manner that considers the amenity and safety of other river users and doesn't compromise the capital investments made to protect river banks.

A seasonal speed limit restriction of 6 knots is currently applied in the lower Noosa estuary during the Easter and Christmas holiday periods. The Department of Transport and Main Roads through Maritime Safety Queensland (MSQ) set speed limits in the river. Boating and Fisheries Patrol and the Water Police enforce boating safety laws, including speed limits, through surveillance and inspection.

To ensure boating speed limits in these areas are appropriate, it may be timely for Council, in consultation with the community, to review the 'seasonal' speed limit restrictions around Munna Point and the Noosa Spit (Dog Beach) with MSQ.

Sustainable fisheries

For centuries, the Kabi Kabi people populated the Noosa region harvesting species such as mullet, pipis and oysters, potentially trading these resources with inland indigenous populations. They caught fish by spearing and netting, and oysters by diving. When settlers arrived in the 1800s, Kabi Kabi used their knowledge of coastal fisheries, to catch, trade and sell fish, crustaceans and shellfish to the growing population (Thurston, 2014).

Noosa's pioneering families also became involved in commercial fishing and the sector expanded with improved transport networks, refrigeration, establishment of the Queensland Fish Board and new markets for Noosa's seafood abundance. Over time, large populations of recreational fishers were also drawn Noosa's scenic beauty and abundant fish stocks, as Noosa became known as a 'haven' for fishers and other visitors (Thurston, 2014).

Today indigenous fishing no longer occurs, recreational fishing continues to grow, and commercial fishing in the river and surrounds includes, an Inshore Net Fishery (N1), a Beam Trawl Fishery (T5) and an Ocean Beach Net Fishery (K8).

In Queensland, commercial, recreational and indigenous fisheries are managed by the Department of Agriculture and Fisheries (DAF). In 2014, the Department commenced an independent review of fisheries management across Queensland and asked for input from stakeholders.

Council made a submission to this review and again on the Green Paper on Fisheries Management Reform in Queensland in 2016. At this time, Council indicated its general support for a commercial fishery in the Noosa River, but ensuring that it was done in an ecologically and economically sustainable way, so that future generations will also benefit from the industry.

Some considerations put forward by Council included:

- Support for overall ecosystem-based management and locality-based fisheries councils.
- More resources need to be applied to fishing management across Queensland and that consideration may be given to a user-pays model.
- With consideration of historical fisheries research by Dr Ruth Thurston and anecdotal evidence, Council has concerns regarding the impact of current and historical fishing activities on the marine biodiversity and abundance in the Noosa River and estuary as well as the surrounding ocean beaches.
- Consider buying back those commercial fishery licenses operating from the NNS and not re-issuing any existing licences due for expiry.
- Considering the current research projects in the Noosa River system and nearshore environment, Council aims to be a pilot program for ecosystem-based management as a demonstration of best practice.
- That Council has particular concerns for the potential environmental impact of prawn beam trawling in the Noosa River system, particularly the river floor (benthic zone) and seagrass beds, thus adversely impacting on overall biodiversity.

Queensland Sustainable Fisheries Strategy 2017-27

Following public feedback on the Green Paper, the State developed a Sustainable Fisheries Strategy (2017-27) as the next step in the reform process. The overwhelming message received during consultation was that all stakeholders wanted reform in the way the State manages fisheries. This included strong support from all sectors for better fishery monitoring, more effective engagement, more responsive decision-making and greater fisheries compliance with regulations (State of Queensland, 2017).

To support further Council input into the State's reform process, Council commissioned an evidence-based analysis of the Noosa fisheries that:

- researched and analysed all available fisheries data for the Noosa River
- identified and engaged with local stakeholders to verify and complement data with local information
- explored different management options available to Council, including an initial cost-benefit analysis of these, and pathways to implementation.

As a result of this study, the *Noosa Fishing Futures* report identified a range of short, medium and long term options for sustainable fisheries management of the Noosa River, estuary, and beaches for Council's consideration.

Some of the options proposed formed the basis for Council's submission to the State's *Discussion Paper: Proposed amendments to the Fisheries Regulation 2008*. Unfortunately some of Council's key suggestions were not incorporated into the revised fisheries regulation;

- The reduction of length of allowable net in the lakes, with Noosa lakes being the only waterways in Queensland where 1500m of net is allowed, as opposed to 600m or 800m elsewhere.
- Introduction of a weekend closure for the Ocean Beach net fishery.

- Reduction in bag limits for pipis do not go far enough, and should have no removal from the beach to prevent commercial harvest, such as is in place in NSW.

Council will continue to advocate for these actions towards a sustainable local fishery. The *Noosa Fishing Futures* report identified a further option to explore with the State a buyout of the T5 Beam Trawl Fishery in the Noosa region, in consultation with the State and commercial fisherman.

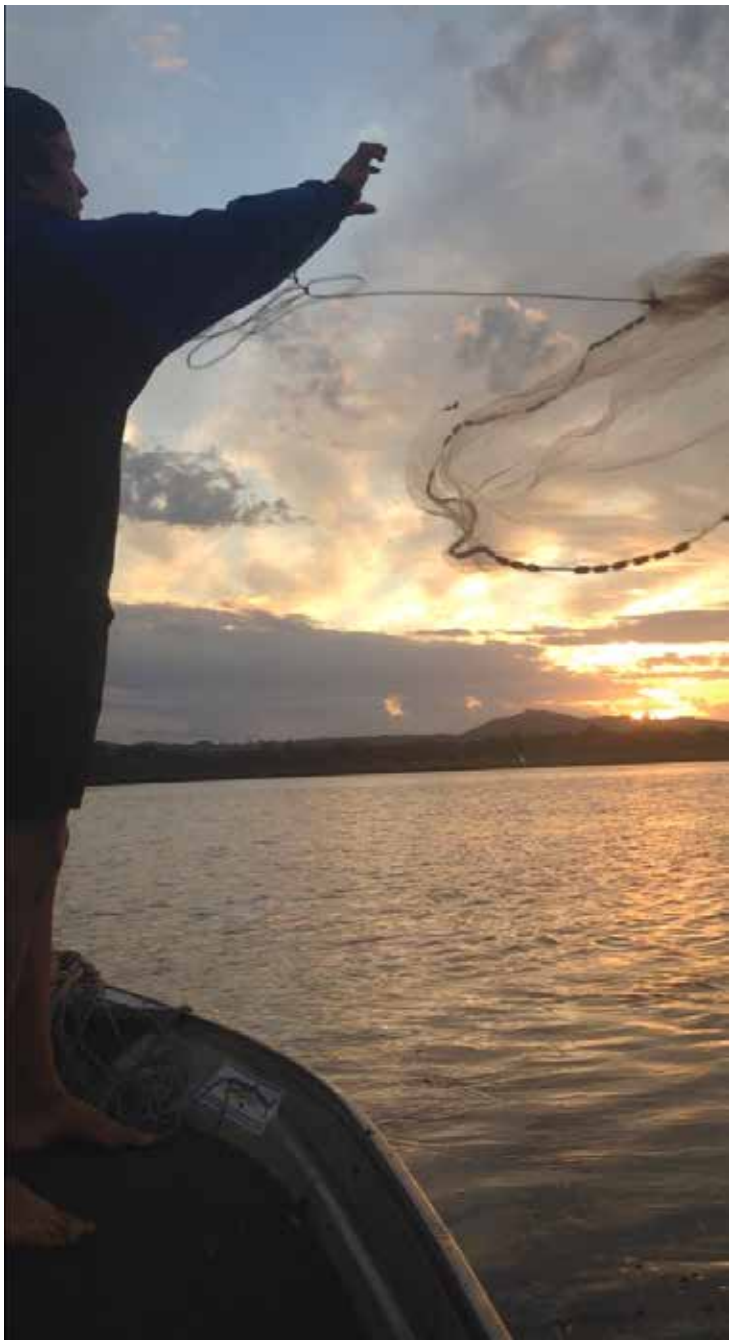
The Noosa river and lakes T5 fishery is one of three T5 sub-fisheries within the Queensland East Coast Trawl Fishery that includes the Brisbane and Logan Rivers, Noosa River and Lakes, and the Laguna Bay area.

Operators in this fishery tow small beam trawls targeting prawns in the river, creeks and inshore areas within 3 nautical miles of the coast. The commercial catch is almost entirely composed of banana prawns, green (bay) prawns and school prawns.

The main species caught in the Noosa T5 area is school prawns. Local commercial fishers indicate no more than eight T5 fishers have historically fished the Noosa area, with as little as two being active in recent years (*Noosa Fishing Futures, 2019*).

The objective of a reallocation (buyout) proposal would result in an investment by Council of funds to purchase the T5 symbols, and would only be available to commercial fishers who have a recorded catch history in the Noosa region over the last five years. The local T5 fishery would then be closed.

The environmental benefits of a T5 buyout are considered by many in the community to be significant, and is consistent with Council's 2016 submission to the Green Paper, where concerns were expressed over the impact of trawling in the river and lakes, particularly in light of current projects underway such as *Bring Back the Fish*.



Noosa River mouth management

The Noosa Spit was established by the Queensland Government's Beach Protection Authority (BPA) in 1978 under the 'Scheme for the Protection of Hays Island and Restoration of Noosa Beach' to protect Hays Island (now Noosa Sound) as a result of severe erosion occurring along the northern revetment.

While these works were effective in the preventing further loss of erosion at the western and eastern ends of the beach respectively, the middle section of the Spit beach has more recently been showing signs of significant erosion.

Council continues to monitor and evaluate the erosion in order to more thoroughly understand the ability of Noosa Spit to perform as a coastal defence to Noosa Sound. A number of detailed shoreline and bathymetric surveys have quantified the overall loss of sand along this foreshore, whilst aerial photography analysis indicates the magnitude of the shoreline recession (refer Figure 2).

Figure 1: Noosa Spit after completion of establishment in 1978 (left) and present day (March 2019) (right). Image QImagery (2019) and Nearmap (2019).

The Noosa Spit establishment works involved large scale dredging and nourishment to permanently shift the location of the river mouth to the north, where it was stabilised with a rock wall and groyne that is still present at the western end of Noosa Main Beach.

Fluctuations in the river direction were evident after the completion of these works, however, in 2010 the Council deemed that the erosion caused by the river fluctuations was threatening the integrity of the Spit. At this point in time, erosion of the western end of the Spit was reducing its length by fifteen meters per year, until the Council intervened with the construction of a geotextile sand container wall at the western end and a submerged geotextile sand container structure at the eastern end.

While it is difficult to predict with absolute certainty what rate of erosion will occur in the future, what is certain is that the erosion is progressive and ongoing at this site, with no historical record of accretion occurring. The rate of erosion may be impacted by the presence of existing vegetation, which could slow the erosion when it falls into the water, but could also be accelerated by extreme weather events or further channel migration.

Erosion along the Noosa Spit beach was worse when only a single channel, adjacent to the beach, was present. The middle channel was naturally opened in early 2018, which relieved some of the erosion pressure on the Spit beach, while the presence of the fallen trees, has provided some limited protection to the shoreline (refer Figure 3 below). A reversal of this pattern, through middle channel siltation, would likely increase erosion rates at the Spit beach.

Figure 2: Current day (June 2019) aerial image with the June 2013 shoreline position shown in blue, showing the progressive erosion over this six year period. Image: Nearmap (2019).

Figure 3: Channel alignment Dec 2017 (left), September 2018 (right). Image: Nearmap (2019)

Shoreline Erosion Management Plan (SEMP)

In November 2018, Council approved the development of a Shoreline Erosion Management Plan (SEMP) for Noosa Spit to provide greater understanding of key coastal processes at play in this area. The development of a SEMP is process guided by State legislation. It will identify management options underpinned by sound science, coastal engineering principles, environment values and the associated community benefits.

The proposed scope of the SEMP includes an investigation of the Noosa River and Main Beach as previous investigations have shown a clear relationship between these two areas. With the following key phases within the project:

1. Background research: Including an update to previous investigations and a review of the latest aerial imagery to understand the coastal evolution.
2. Physical data collection: Collection of tidal and current data to inform the creation of numerical computer model of the area.
3. Coastal process model development: Development of a computer simulation of the area that can be used to assess erosion in the region as well as mitigation strategies.
4. Erosion assessment and conceptual modelling: Quantify existing erosion and test other potential river alignments, including what would happen if there was a 'breakthrough' of the Spit.
5. Options Assessment: Assess options for mitigation of erosion at Noosa Spit, guided by the numerical model and governed by a multi-criteria analysis.
6. Shoreline Erosion Management Plan development

The Shoreline Erosion Management Plan will provide options on how to address erosion at the Noosa Spit beach into the coming decades.

Working together

The River Plan recognises that everyone has a shared responsibility as stewards of the environment, and there are benefits in utilising our collective knowledge and skills through productive and enduring partnerships and alliances.

This approach involves partnerships and alliances with the Kabi Kabi traditional owners, community groups, environment organisations, research organisations and other management agencies. However environmental stewardship also relates to other sectors within the community including farmers, fishers and business operators, as well as the individual resident, river user and visitors to the area.

In order to ensure we retain and improve on the environmental and social values of the Noosa River, the Noosa River Plan seeks to achieve four key objectives in the way we communicate, engage, partner and enable the community in river management;

1. The Noosa community is genuinely engaged and involved in the management of the Noosa River.
2. Aboriginal cultural heritage is protected and Kabi Kabi led river initiatives are supported.
3. Noosa River is celebrated, and its values and benefits are effectively communicated, with a high level of understanding and enjoyment of the river's natural values.
4. Noosa Council works with other agencies responsible for the Noosa River to ensure effective management of the river and a coordinated response to river issues.

The Noosa community has played a significant role in the development of this River Plan through a suite of consultation mechanisms including:

- Noosa River Community Jury process (2015-16).
- Environment Forums with local community groups and environment organisations (2017-19).
- Engagement with Kabi Kabi Traditional Owners and Native Title Applicants for the Noosa Shire (2017 - ongoing).
- Broad public consultation on the Draft River Plan (2018-19).
- Noosa Fishing Futures consultation with the local commercial and recreation fishing industry (2019).

The Community Jury recommendations to Council support local management of anchoring, mooring and living on the river, as well as improved catchment protections and effective engagement with traditional owners.

Feedback from participants at the Environment Forums identified protection of waterways, wetlands and coastal habitats as a top catchment management priority; and reiterated their willingness to be part of an integrated citizen science monitoring network to achieve these aims. Their input also helped shape the Noosa Environment Strategy 2019 and a new Environment Grants Program.

Ongoing discussions with Kabi Kabi representatives identified opportunities for traditional owners to work on country and sustain their cultural and spiritual obligations. These initiatives include protection of cultural sites and values, establishment of an Indigenous Land and Sea Ranger Program and involvement in policy, planning and partner projects. The Indigenous Land & Sea Ranger Program is managed by the Department of Environment and Science (DES) with rangers employed through local indigenous host organisations and funding provided by the Queensland Government.

Land and Sea Rangers have been contracted to work in many regional and remote communities across Queensland and undertake a wide range of environmental restoration activities, community education and visitor management. As well as delivering significant on-ground works, the program has the potential to enrich further understanding of the Aboriginal cultural significance of the Noosa River catchment.

Public feedback on the first draft of the River Plan identified management of the river mouth and Noosa Spit as a key concern within the community and called for its inclusion in development of the final Plan. Through this process, the broader community also helped set priorities for delivery of the River Plan's programs and initiatives. These priorities include managing pollution and litter in the river, protecting wetlands, riparian and coastal areas, reducing sediment from upstream entering the river and controlling recreational use of the river.

The Noosa Fishing Futures engagement with local commercial fisherman, seafood and bait processors and local seafood and bait retailers, helped provide an evidence-based platform for decision making about commercial fishing in and around the Noosa River. This information forms the basis of Council's continuing input into the State's fisheries management reform process.

The Noosa Biosphere Reserve Foundation 'big ideas' grants have progressed partnerships and partner projects to enhance river health and biodiversity. These ambitious, large-scale initiatives, include Bring Back the Fish and Keep It in Kin Kin, and are already underway with significant support from philanthropic investors, Council and local environment organisations.

In addition, Noosa's long-established landcare, catchment care, bushland care, coast care and wildlife care organisations, continue to play a pivotal role as environmental stewards via their enduring engagement with the broader community. This is achieved through delivery of on-ground projects, educational initiatives, monitoring and the provision of volunteer opportunities. These services are valued and supported under Council's Grants Program and operational budgets.

As well as local engagement, Noosa is perfectly placed to work with national and global organisations to invest in and support out local environment. In 2019 Noosa Council entered into an alliance with The Nature Conservancy (TNC), one of the world's most important and trusted on-ground conservation organisations, working in over 70 countries and with more than 600 world-leading scientists on staff. TNC brings a level of support and experience that few other local governments could hope to access. While the initial focus will be on the recovery of oyster reefs in the river, the alliance is broader and will lead to further river-related projects in the future.

A key tenet of the River Plan's implementation is to ensure everyone, whether individually or collectively, contributes to management of the river catchment to achieve common goals and sustainable practices. However not all sectors of the community are currently engaged in helping to keep this spectacular river system healthy.

Opportunities exist throughout the life of this River Plan for genuine partnerships in all areas of catchment management. These efforts support a range of multiple uses and benefits we all derive from living, working and recreating within the river catchment, and offer opportunities for everyone to help enhance river health.

Implementation

The River Plan heralds a new era of catchment management in Noosa, and it is Council's primary role to coordinate and implement the programs and initiatives outlined within the Action Plan.

This River Plan is informed by Noosa Council's overarching Environment Strategy and Sustainability Principles. Actions within this plan are closely aligned with the targets, strategies and outcomes of the Noosa Environment Strategy that was endorsed by Council in June 2019.

The first draft of the new Noosa River Plan was publicly consulted on in 2018. Feedback from the community supported the programs and initiatives proposed, sought inclusion of river mouth and sustainable fisheries management within the final plan, and led to a risk-based assessment of the threats to the environment values and community benefits of the river system, to help set priorities for implementation.

Prioritisation

For the River Plan, a risk-based framework of environmental values and community benefits, versus the threats acting on them, has been developed to assist in prioritising actions. This is a well-established risk-based framework for ensuring management actions are focused on the issues of real concern to communities, and for ensuring investment is undertaken with the best impact. The aim of this approach is to;

- Identify the key values and benefits the community sees in relation to the protecting water quality and key habitats throughout the river catchment and understand how these contribute to the community's way of life.
- Understand threats to these values and benefits and the scale of the potential impact (over a given area, and over a length of time).
- Identify actions that can most appropriately mitigate the main threats to the highest-valued experiences related to the river.

Community input

Feedback from the Noosa Community through River Plan consultation has provided a clear indication of the key values of the Noosa River system, as seen by the Noosa community. This has been achieved through consultation prior to the draft release in 2018, and also as a result of feedback from the first draft, through Your Say Noosa, whereby both quantitative and qualitative data was received regarding issues of importance for the community.

Threats

The Draft River Plan identified the key threats to the environment values of river catchment, which were endorsed by the community via feedback. Many of the threats identified are obvious (e.g. littering and marine debris), some less so (e.g. soil loss, degrading habitats). These threats can be cumulative (i.e. a number of key threats occurring together) and also influenced by time (i.e. one threat might be immediate but minor, while another could be the major and/or occurring several times over a number of decades).

Once identified, the threats are plotted against the values and benefits and an assessment of both the threat and the proposed treatment to reduce the risk of that threat, undertaken. This includes an estimate of likelihood and consequence i.e. how likely an identified threat would impact an environment value or community benefit of the river over time, and the consequence of how big that impact is likely to be. There is an element of subjectivity to this, but community feedback and local expertise have added great value.

By mapping these threats, values and benefits, it soon becomes clear which threats are a very high risk to the environment values and community benefits associated with the river catchment. These high risk threats are prioritised for immediate and/or sustained actions over time. The ultimate goal of this approach is to reduce

all high risks to acceptable risk levels and to ensure cumulative threats are managed together.

Below is a brief, high-level summary of the risk assessments undertaken for Environmental values, and Social, Cultural & Economic benefits, which are both mapped against a broad range of identified threats.

ENVIRONMENTAL	*VALUES*				
THREATS	Clean waters	Intact riparian and wetland vegetation	Habitat for wildlife	Seagrass communities and benthic invertebrates	Abundant fish populations
Rural run-off (sediment, nutrient and other contaminants)	HIGH	MINIMAL	MINIMAL	HIGH	MODERATE
Urban run-off (sediment, contaminants, litter)	HIGH	LOW	LOW	LOW	MODERATE
Clearing of riparian vegetation	MODERATE	HIGH	HIGH	MODERATE	HIGH
Commercial fishing	LOW	MINIMAL	MINIMAL	HIGH	MODERATE
Recreational fishing	MINIMAL	MINIMAL	MINIMAL	LOW	LOW
Increased boating in the lower estuary	LOW	LOW	LOW	MODERATE	LOW

SOCIAL, CULTURAL & ECONOMIC	*BENEFITS*				
THREAT	Natural amenity - enjoyment & relaxation	Kabi Kabi maintaining a connection to the river	Tourism attraction - econmic driver for Noosa	Opportunity for activity/lifestyle	Consumptive use - providing resources to the community
Rural run-off (sediment, nutrient and other contaminants)	MODERATE	LOW	LOW	LOW	LOW
Urban run-off (sediment, contaminants, litter)	MODERATE	LOW	MODERATE	MODERATE	LOW
Clearing of riparian vegetation	HIGH	MODERATE	MODERATE	LOW	MODERATE
Commercial fishing	MODERATE	LOW	MODERATE	MODERATE	MINIMAL
Recreational fishing	MINIMAL	MINIMAL	MINIMAL	MINIMAL	MINIMAL
High amount of boat traffic	HIGH	LOW	LOW	LOW	MINIMAL

Action Plan

The programs and initiatives proposed in the Action Plan feature a mix of approaches including:

- Existing actions within the remit of Council that can be undertaken without requiring existing resources. In some case an enhancing of Council's existing role has been identified.
- New initiatives which can be undertaken by Council that are not currently part of business-as-usual activities. Some of these will require additional funding, through Council budgets, or grants and partnerships, while others can be resourced within the existing Council structure.
- Collaborative action which can be funded by a range of internal and external sources that may or may not have active involvement of Council.
- Advocacy initiatives which require Council to gain the support of the State Government and may require legislative reform.

Where funding is required, Council will allocate funds based on the implementation priorities, as part of the annual budget process. Council will also seek to collaborate and partner with other organisations to fund and deliver on actions within the Plan. Other revenue options may become available through Council's proposed management of anchoring, mooring and living on the river, and via State and Federal government grants, philanthropic investment and industry partnerships.

Over the course of River Plan implementation, Council may also take on several other roles such as:

- Partner – by developing formal and informal relationships and alliances to achieve common goals.
- Funder – by providing grants or funding to local groups and agencies to undertake projects and/or develop services and programs, or conduct research.
- Educator – by raising community awareness and promoting behavioural change.
- Enabler – by supporting and encouraging the community to make positive change and take action.
- Advocate – raising the awareness of State and Federal governments and other stakeholders of the issues raised by the community, as well as initiating or supporting campaigns and programs for positive change.
- Provider – by offering a range of support services to individuals and groups.
- Regulator – providing governance and regulatory controls such as local laws, environmental legislation and planning controls.
- Leader – leading by example through adopting best practice and taking up new technologies and techniques.
- Planner – proactively planning for services and infrastructure, which respond to current and future needs and requirements.

The Action Plan identifies timeframes of action including *short-term* (first 12-18 months), *medium-term* (one to three years) and *long-term* (3 years and over). Ongoing actions are anticipated to occur throughout the five (5) year implementation timeline of the Action Plan.

River Health & Biodiversity				
Program or initiative	**Council's role**	**New initiative/ existing program**		**Desired outcomes**
Objective 1. Water quality is improved through whole of catchment management and sustainable land use management on land and in riparian are-as				
Develop an integrated water monitoring program and network for Council, community and other agencies, including event monitoring of sediments, nutrients and litter for the Noosa catchment.	Partner, enabler, funder	New initiative	Short term	Targeted organisational and citizen-science water quality monitoring programs are collaborating and obtaining information useful to inform management.
Implement rural landholder extension programs to support economic and environmental sustainability.	Partner, funder, enabler	New initiative, enhancing existing programs	Ongoing	Key erosion hotspots are remediated. Best management practices minimise runoff of sediment and other contaminants to Noosa's waterways.
Implement a septic system inspection program in high-priority areas to better understand the impact of these systems on the quality of surface water and groundwater systems.	Provider, enabler	Enhancing existing program	Short-medium term	Landholders are aware of the condition of septic systems and wastewater treatment facilities and encouraged to undertake remediation action.
Improve understanding and monitor changes in groundwater and wetlands and the potential impacts of climate change on their health, through the development of a groundwater and coastal vulnerability assessment and monitoring tool.	Researcher	New initiative	Medium term	A better understanding of local groundwater and wetland systems and the ability to effectively monitor change.
Objective 2. Aquatic biodiversity is improved, preserved and enhanced in diverse instream, riparian and wetland habitats.				
Identify priority riparian land parcels that enhance connectivity and seek to have them managed for environmental outcomes, either through direct purchase by Council or through programs such as Voluntary Conservation Agreements and Land for Wildlife.	Partner, provider, funder, enabler	Existing program	Ongoing	Riparian habitats are rehabilitated and protected.
Implement riparian rehabilitation programs in priority areas and targeted sub catchments.	Partner, provider, funder, enabler	New initiative, enhancing existing programs	Ongoing	Degraded riparian habitats identified as having 'high recovery potential' are rehabilitated. Ongoing weed and pest animal management maintains rehabilitated areas. Riparian areas are protected to stabilise banks, maintain habitats and ecological function.
Implement oyster reef restoration in the Noosa estuary.	Partner, provider, funder, leader	New initiative	Short-medium term	Fish habitats are enhanced through the establishment of oyster reefs at sites in the lower Noosa River estuary.
Support ongoing benthic fauna studies in the Noosa estuary.	Partner	New initiative	Short term	The impacts of human activities on the benthic biodiversity in the Noosa estuary is quantified and informs management to enhance biodiversity.

Implement a fish passage barrier remediation program	Leader, provider	New initiative	Ongoing	Barriers to fish passage in the river system are gradually reduced. Fisheries connectivity builds resilience in the catchment.
Develop a strategy to inform future management of *Hincksia* alga blooms in Laguna Bay.	Provider, researcher	Enhancing existing program	Short-medium term	The role of *Hincksia* in the Noosa River system is better understood and the impacts of *Hincksia* alga blooms are reduced.
Investigate the feasibility of monitoring marine turtle nests on the Noosa North Shore.	Researcher	New initiative	Medium term	The ability to effectively monitor turtle nests on the North Shore is determined. Nest locations inform feral animal control to reduce predation of eggs. Hatchling emergence is optimized to enhance conservation of threatened species.
Conduct regular compliance activities of the Noosa North Shore exclusion zone to protect migratory shorebird habitat.	Educator, provider, regulator	Enhancing existing program	Short-medium term	Migratory shorebird habitat is protected to enhance conservation of threatened species. Residents and visitors are compliant with the exclusion zone restrictions. 4WD, horses and dogs do not access this area.
Objective 3. Pollution sources are identified, and discharge into the river is effectively managed to reduce impacts on waterways, wetlands and coasts.				
Develop a Zero Litter to the Noosa River Strategy with the community to provide a pathway to removing all litter entering the Noosa River by 2030.	Leader, partner, planner, provider	New initiative	Short-medium term	A clear pathway is identified to reduce and remove litter entering the Noosa River. This pathway is implemented with the target of removing all litter entering the river by 2030.
Ensure on ongoing and improved stormwater quality improvement program is in place for Noosa Council infrastructure.	Leader, planner, provider	Existing program	Ongoing	Renewal opportunities for stormwater quality improvement devices are comprehensively investigated, mapped, assessed and prioritised as part of Council's capital works and asset management programs. Renewals are systematically implemented as part of a long-term, stormwater management improvement program. All stormwater quality improvement devices are managed and maintained over the life cycle of the asset to ensure treatment efficiencies are maintained.
Implement a stormwater quality improvement program – Private Development infrastructure.	Educator, enabler, regulator	Existing program	Ongoing	Council continues to require and regulate stormwater management systems and water sensitive urban design in private developments. Private developments comply with their environment obligations and effectively manage inputs into the stormwater system.

Implement a stormwater quality education and compliance program for the community.	Educator, enabler, regulator	Existing program	Ongoing	There is greater understanding within the community of individual practices which pollute waterways via the stormwater system. Sediment runoff from building sites and contaminants from roof painting, pool backwashing and car washing is reduced.
Continue to implement and expand further as an inspection program for industrial operations.	Partner, enabler, regulator	Enhance existing program	Short-medium term	Licensed and non-licensed industrial operators comply with their Environment Authority requirements and general environmental obligation.
Undertake a rural roads sediment study.	Partner, funder	New initiative	Short term	Runoff of sediment from unsealed roads to waterways is quantified and informs future management.
Undertake trials of litter exclusion devices to reduce litter entry into the waterways.	Leader, planner, provider	New initiative	Medium term	The effectiveness of litter exclusion devices is properly assessed as a management tool for the river, and im-plemented where appropriate.

Sustainable Use & Enjoyment				
Program or initiative	**Council's role**	**New initiative/ existing program**		**Desired outcomes**
Objective 1. Recreational and commercial use of the Noosa River waterways and foreshores is undertaken in a way that protects ecosystem health, respects the rivers carrying capacity and environment values, and prioritises visual amenity and public safety.				
Continue to work with relevant State agencies to advocate for and support improved monitoring, compliance and enforcement of regulations on the Noosa River.	Advocate, partner	Existing program	Ongoing	Existing regulations related to the Noosa River are observed and effectively enforced.
Advance discussions with relevant State agencies regarding local management of anchoring, mooring, living on the river as per Community Jury recommendations. Subject to handover of these responsibilities to Council, pursue;	Advocate, partner	New initiative	Short-medium term	State government agrees to local management of these activities and transfers responsibility to Noosa Council.
a) Development of an Anchoring, Mooring and Living on Board Management Plan to identify how Council intends to manage these activities.	Planner, provider	New initiative	Medium term	A clear management framework is established for Noosa Council to regulate anchoring, mooring and living on the Noosa River.
b) State endorsement of the Plans, and enter into a formalised agreement under relevant waterways legislation.	Advocate	New initiative	Medium term	Anchoring, mooring and living on the river is locally managed.
c) A review of anchoring and mooring locations and types of moorings.	Researcher, regulator	New initiative	Medium term	Safe and suitable locations are provided for vessels. Clutter and congestions in the lower estuary is reduced. Impacts on water quality and declared Fish Habitat Areas are reduced.
d) Identification of a cap and locations for living on the river.	Researcher, regulator	New initiative	Medium term	Vessels used to live on board create no impediments regarding use of river foreshores by local residents and the general public.

e) Effective monitoring and facilitation of waste tank effluent removal and disposal from vessels.	Regulator, enabler	New initiative	Medium term	The release of pollutants from vessels into the river system is prevented.
Advocate for removal of unsafe, abandoned and derelict vessels from the Noosa River.	Advocate, provider	New initiative	Medium term	Unsafe, abandoned and derelict vessels are gradually removed from the river.
Investigate legislative amendments to control the 'length of stay' for anchoring.	Researcher, advocate	New initiative	Long term	New provisions in the relevant waterways legislation prohibit long term unattended anchoring in the Noosa River.
Review of seasonal speed limit restrictions around Munna Point and Noosa Spit (Dog Beach) with Maritime Safety Queensland.	Advocate	New initiative	Short term	Speed limits in high use areas are appropriate to ensure public safety and protection of sensitive areas. Changes are supported by the broader community and Maritime Safety Queensland.
Develop a comprehensive database of boat ramps and jetties and review current management of them in the river system.	Planner	New initiative	Long term	The database is shared by all agencies and includes locations and ownership of unapproved jetties on public land. The database provides a basis for more effective future management.
Investigate a means of assessing the carrying capacity of the river in terms of marine infrastructure.	Researcher	New initiative	Long term	Council makes informed, long-term decisions about marine infrastructure in the Noosa River.
Develop a MOU with DNRME to clarify and improve obligations related to ongoing management of commercial jetty leases.	Advocate, regulator	New initiative		Commercial activity around jetties is well managed and Council is working with the State and lease holders cooperatively.
Review Noosa Council's Guidelines for the establishment of new businesses on the Noosa River and investigate other mechanisms to guide and manage commercial activity on the river.	Planner, provider	Enhance existing program	Short term	Updated guidelines provide clarity about acceptable new on-river business proposals.
Objective 2. Recreational and commercial fishing is undertaken in a sustainable way so there is no long-term decline in fish abundance and diversity.				
Continue to provide input to the State's fisheries management reform process for the Noosa region (as part of the Queensland Sustainable Fisheries Strategy 2017-27).	Advocate	Enhancing existing program	Short term	The fisheries resources in Noosa are managed in a genuinely sustainable manner. This includes reduction in overall net lengths in the Noosa Lakes, and changes in closure times and the closure line to reduce conflict in local fishing.
Undertake a local buyout and closure of the T5 Beam Trawl fishery operating in the Noosa River and Laguna Bay.	Provider, partner, advocate, funder	New initiative	Short-medium term	The community is supportive of the buyout proposal, the State supports the proposal and closes the T5 fishery in Noosa.
Work with the local commercial and recreational fishing community to support transition to an economically and environmentally sustainable local industry.	Partner, enabler	New initiative	Medium term	Sustainable commercial fishing operations continue to be supported by Council and the community.
Objective 3. River mouth and foreshores are preserved and protected to ensure the natural form, processes and function of the river are not impacted.				
Develop and implement a Shoreline Erosion Management Plan (SEMP) for Noosa Spit.	Planner, researcher, provider	New initiative	Short-medium term	Greater understanding of key coastal processes at play in this area. Identification of future management options.

Working together				
Program or initiative	**Council's role**	**New initiative/ existing program**		**Desired outcomes**
Establish appropriate communication and engagement mechanisms to facilitate ongoing community involvement in river management.	Provider, enabler	New initiative	Ongoing	The community is engaged and continues to contribute to the management of the Noosa River catchment.
Noosa Council has an on-river presence to deliver a range of environmental and education programs, and support compliance with regulations on the Noosa River.	Provider, educator, regulator, funder	New initiative	Short-medium term	Noosa River Marine Zone rules are understood and observed by the recreational boating public. All waterways regulations and 'conditions of use' are observed by the owners or operators of vessels.
Council works in partnership with a range of stakeholders to coordinate activities and messaging about river health.	Partner, educator, regulator, enabler, funder	New initiative	Ongoing	Noosa Council works with existing community groups to have a presence on the river, regularly engaging with river users.
Promote and support an Indigenous Land and Sea Ranger program for Noosa.	Enabler, partner	New initiative	Short-medium term	Aboriginal cultural heritage is protected and interpreted throughout the river catchment. Kabi Kabi are supported in the ongoing management of the river catchment.
Implement and leverage the alliance with The Nature Conservancy, focusing on fish habitat restoration and explore other avenues to partner on projects to conserve, protect and enhance river health.	Partner, funder	New initiative	Ongoing	Council takes best advantage of the opportunity to access TNC global networks, and this results in implementation of projects to conserve, protect and enhance river health.
Advocate for a multi-use marine protected area to be established in the Noosa Area, to complement those in Moreton Bay and the Great Sandy Straits.	Partner, advocate	New initiative		There is a State government commitment to a multi-use marine protected area to be established in Noosa's estuarine and marine waterways, to provide a framework for future management.
Support community groups undertaking river and beach clean ups.	Partner, funder, enabler	Enhance existing program	Ongoing	Litter and marine debris in and around waterways is reduced.
Support the Plastic Free Noosa initiative and develop and implement targeted community education campaigns.	Partner, enabler	Enhance existing program	Ongoing	Environment organisations collaborate to develop source reduction strategies to reduce litter and marine debris in and around waterways.

Monitoring and Evaluation

The Action Plan will be reviewed annually to monitor and evaluate the efficiency and effectiveness of the programs and initiatives implemented, and investments made. The annual review will examine progress against the stated objectives of the plan, and also enable an appropriate management response to emerging issues and trends occurring in the river system.

The Noosa Environment Strategy incorporates some clear targets, baselines and monitoring for areas of relevance to the Noosa River, and actions within this Plan are designed to support achievement of those targets. The progress towards these will be reported to Council and community annually. This River Plan also adds a further target of removing litter entering the Noosa River by 2030, which aligned clearly with stated outcomes in the Environment Strategy.

It is also proposed the River Plan itself be reviewed and updated every five (5) years. This is to ensure management of the Noosa River system continues to follow current best practice.

Target	Baseline	How progress will be measured
By 2030, zero litter enters the Noosa River from land-based sources.	A baseline will be identified as part of a Strategy to be developed in the first 2 years of this River Plan.	Regular audits will be undertaken at key locations to track progress of this target as infrastructure and education initiatives are put in place.
By 2030, 80% of all grazing land achieves best practice management for agriculture.	A baseline is to be developed using the ABCD framework and classification for grazing lands. 2008 and 2015 LIDAR imagery (Light Detection & Ranging) identified levels of rural lands and sediment lost to erosion over this period.	Every 5 years grazing land condition will be assessed. LIDAR imagery will be undertaken over the same areas as the 2008 and 2015 images during the term of the 10 year Environment Strategy.
Ecosystem health of wetlands and riparian areas is improved.	In 2018, mapped riparian buffers, as identified in the Noosa Planning Scheme, had vegetation coverage of 41.8%. A baseline will be developed to measure ecosystem health of coastal wetlands.	Mapping of vegetation buffers will be reviewed every three years.
By 2030 Noosa has a sustainable fishing industry and increased opportunity for rec-reational fishing.	A baseline will be developed similar to work undertaken elsewhere in Queensland, for the numbers of hours taken for recreational fishers to catch a legal-sized fish.	A biennial survey of recreational fishers and catch times will be conducted.
By 2030, maintain the extent of vegetated buffers and improve diversity of coastal ecosystems.	Existing mapping of vegetation extent of coastal foreshores. Reef surveys have been undertaken on nearshore reefs in 2010/11 and in 2019. In 2016, the Noosa Biodiversity Assessment Report mapped the extent and abundance of regional ecosys-tems.	Review mapping of vegetation extent of coastal foreshores every 2 years. Surveys of reef biodiversity every 5 years. Every 5 years updated regional ecosystem mapping will be used to identify changes in the number and extent of coastal regional ecosystems.
By 2030, the Noosa River and Mary River sub-catchments within Noosa Shire achieve an A rating (or equivalent) for their environmental health.	In 2019, the Noosa River catchment achieved an A- (excellent condition) assess-ment rating for ecosystem health under the HLW Ecosys-tem Health Monitoring Pro-gram.	Council will continue to support and participate in the annual HLW monitoring program.

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