



**MIDCOAST**  
council

**2022**

# **WATERWAY AND CATCHMENT REPORT**

Reporting on data November 2021 to April 2022



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MidCoast Council 2022 Waterway and Catchment Report  
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# Contents

|  |    |
|--|----|
| Introduction.....  | 4  |
| Methods .....  | 6  |
| Manning River Estuary.....   | 15 |
| Upper Manning Estuary .....  | 16 |
| Dawson River Estuary .....   | 17 |
| Mid Manning Estuary .....  | 17 |
| Lower Manning Estuary .....  | 18 |
| Farquhar Inlet .....   | 18 |
| Lansdowne River .....  | 19 |
| Ghinni Ghinni Creek .....  | 19 |
| Browns Creek .....   | 20 |
| Khappinghat Estuary .....  | 20 |
| Wallis Lake .....  | 21 |
| Mid Wallamba Estuary .....   | 22 |
| Wallamba Cove .....  | 23 |
| Coolongolook Estuary .....   | 23 |
| Pipers Creek.....  | 24 |
| Wallis Lake.....   | 25 |
| Charlotte Bay.....   | 25 |
| Smiths Lake.....   | 26 |
| Myall Lakes .....  | 27 |
| Bombah Broadwater.....   | 28 |
| Myall Lake.....  | 29 |
| Lower Myall Estuary.....   | 29 |
| Karuah River.....  | 30 |
| Karuah River Estuary .....   | 31 |
| The Branch Estuary.....  | 32 |
| Management Actions occurring across the Local Government Area..... | 33 |
| Management Actions - Manning Catchment.....                        | 41 |
| Management Actions - Khappinghat Catchment.....                    | 52 |
| Management Actions - Wallis Lake .....                             | 54 |
| Management Actions - Smiths Lake .....                             | 60 |
| Management Actions - Myall Lakes.....                              | 62 |
| Management Actions - Karuah and The Branch Estuary .....           | 65 |
| Appendix 1 - 2022 Report Card.....                                 | 68 |

# Introduction

The MidCoast Council region depends heavily on the health of our catchments and waterways. The waterways form the basis of the region's economy (supporting tourism and primary production), contribute to our way of life and provide habitat for extraordinary biological systems. The region's catchments are under continued pressure from pollution and impacts associated with catchment land use, development and tourism. If unmanaged this has the potential to result in a decline in the health of our waterways.

All our local waterways are critically susceptible to environmental pressures; a Hepatitis A event in oysters in Wallis Lake in 1997, reoccurring blue-green algae in Myall Lakes, acid sulfate soil runoff in the Manning and Wallamba Rivers and episodic fish kills throughout our catchments are all examples of what can go wrong.

This report has been presented to accompany the 2022 Waterway and Catchment Report Card. It provides the technical information on how the Report Card scores were calculated as well as providing more detail on the results, and the impacts of the extreme climatic conditions including drought, bushfires and flooding during the sampling period.

## Water quality - ecological health

Good management of our lakes, rivers and estuaries requires understanding of how they work, predictions about future conditions and informed choice about actions to get the outcome the community wants. MidCoast Council and the Department of Planning and Environment - Environment Science (DPE-ES) have worked together to put these principles into action.

International best practice suggests that research, modelling, management and monitoring should all use the measures of condition and success. DPE-ES research has allowed the development of a solid understanding of the impacts of catchment activities on estuary health and concluded that abundance of algae and water clarity would be good indicators for the future.

Council used this scientific understanding to form the Water Quality Improvement Plan in 2009, which was designed to achieve a number of specific outcomes, expressed in terms of water clarity and algal abundance. Progress towards these outcomes has been measured using the same measures in the annual report cards.

The MidCoast Council community value the health of our waterways and the Waterway and Catchment Report Card is a tool that Council use to monitor how we are tracking. DPE-ES have undertaken an ecological health monitoring program in Wallis Lake and Khappinghat as part of the state-wide Monitoring, Evaluation and Reporting Strategy (MER). As part of the strategy, these estuaries were selected as two of seven across the state to be sampled each year to track inter-annual variability in two ecological health indicators; chlorophyll a (the amount of algae) and turbidity (the amount of sediment).

Since 2011 the monitoring program has been expanded to cover other key sites across the MidCoast Council area. DPE-ES have provided an independent scientific evaluation on the ecological health of Wallis Lake, Smiths Lake, Karuah River Estuary, Myall Lakes, Khappinghat Estuary and the Manning River Estuary.

Ecological health does not refer to environmental health issues such as drinking water quality, safety for swimming, heavy metal contamination, disease, bacteria, viruses or our ability to harvest shellfish or fish.

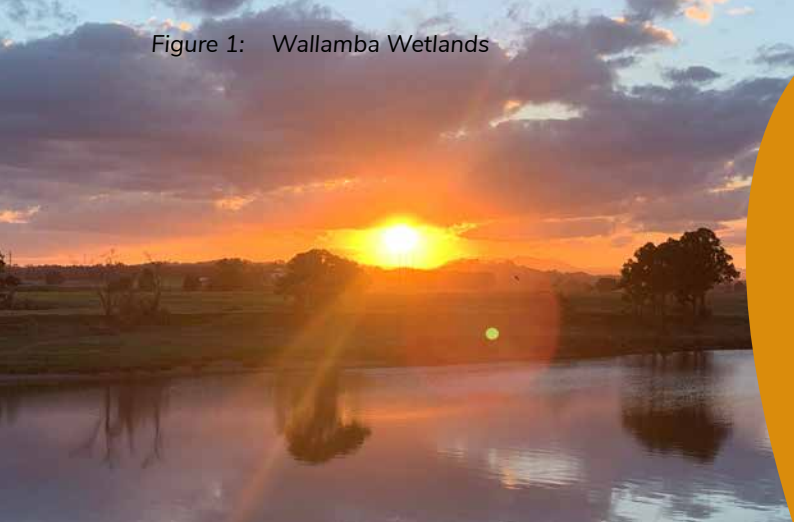


Figure 1: Wallamba Wetlands

Healthy waterways support our local towns and communities, they keep them thriving. They put food on our tables, support our outdoor lifestyle, local economy and provide homes for wildlife, trees and plants of every sort. With healthy waterways our communities have a healthy vibrant future



# Introduction

## Ecological health results presented in easy to understand Report Card

The results of ecological health monitoring have been presented in a Waterway and Catchment Report Card (see Appendix 1) which grades the health of the waterways in a similar way to school Report Cards, with a grade ranging from A (excellent) to F (very poor).

The information provided below includes the background details for the Report Card including the objectives, methods and a detailed description of the results.

## Report Card objectives

The objectives for the Report Card are:

1. To report on ecological health.
2. To track progress on management actions.

These objectives are specifically achieved by providing information to:

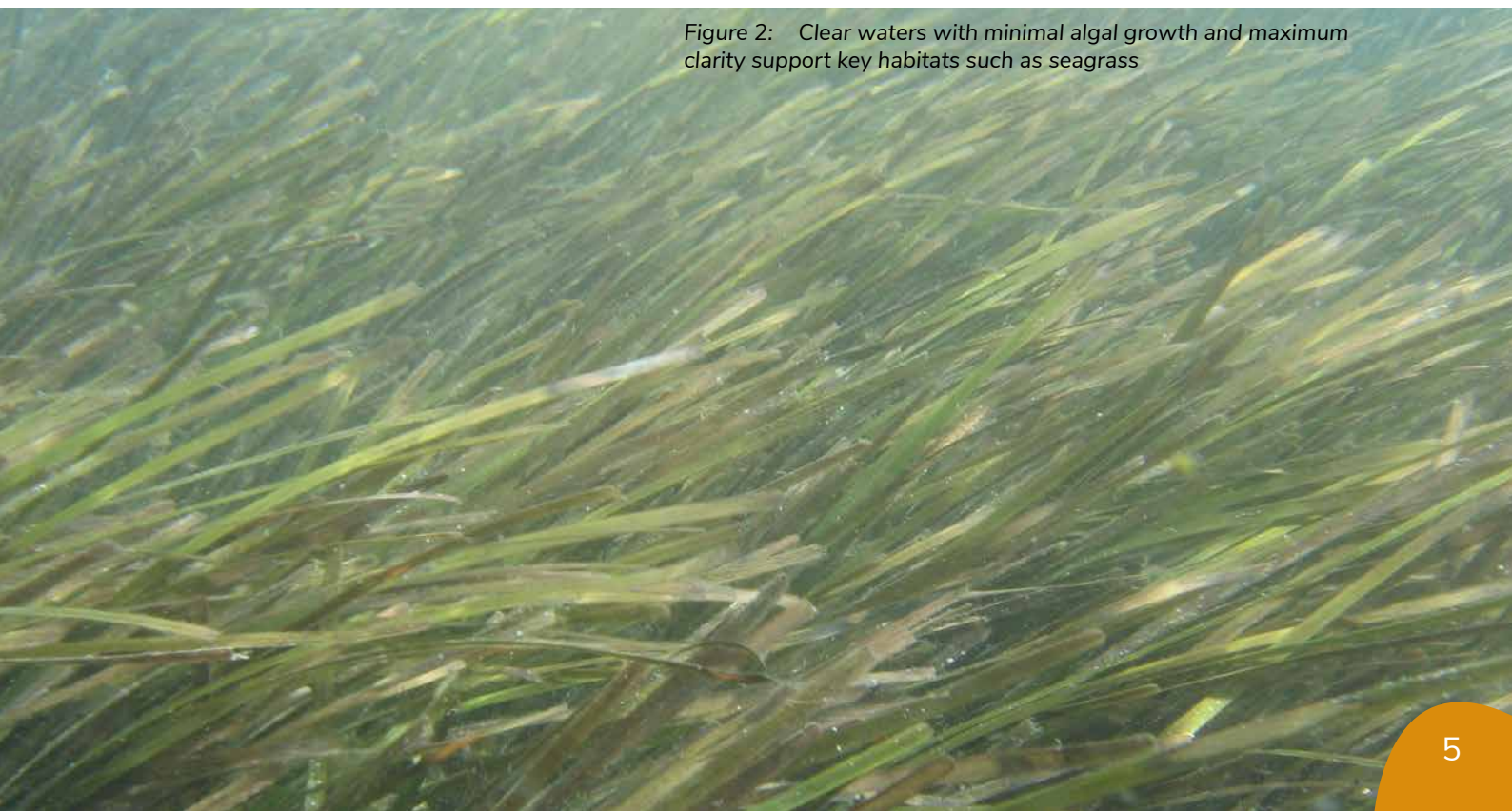
- Assist in the current and ongoing protection of “high conservation” areas that provide substantial water quality and biodiversity benefits to the rivers and estuaries.
- Guide and report on the remediation of areas that have high pollutant loads and highlight areas that may require further action.
- Help protect all waterways against further declines in water quality.

## Environmental values

The environmental values that management actions in the catchment are aiming to achieve are:

1. Minimal algal growth.
2. Minimal sediment inputs and maximum clarity.
3. Intact aquatic habitats like seagrass, macrophyte and riparian vegetation.

Figure 2: Clear waters with minimal algal growth and maximum clarity support key habitats such as seagrass



## Methods

### Development of Report Card grades

The monitoring program has assessed the Ecological health of Wallis, Smiths and Myall Lakes, Manning and Karuah River Estuaries and the Khappinghat Estuary. There are a number of steps taken to determine the score for each zone and subsequent Report Card grade:

1. Selecting the indicators.
2. Identifying the guideline values.
3. Collecting the data.
4. Calculating the zone score.
5. Allocating the Report Card grade.

### Selecting the indicators

In order to meet the objectives of the Report Card, indicators must report on ecological health but also be able to report on the outcomes of management actions. The management actions are linked to the environmental values set for the region (listed above), and the indicators selected have been shown to be responsive to catchment management actions.

There are many different estuary reporting programs world-wide, with indicators specifically chosen to suit local conditions or issues.

Chlorophyll and turbidity are commonly used as they are proven to be very informative and responsive indicators, see Table 1.

## Why a Report Card?

Report Cards are an effective way to check on the health of our waterways. They help us compare current conditions with the condition we would like them to be. Scientists use indicators to 'health check' our waterways. Just as your body temperature is used as an indicator that something may be wrong with your own health, indicators are used to show if something is out of balance or unhealthy in the system. The indicators are selected to assess the overall health or ecological condition. The results of the Report Card are used to guide future management actions and ensure long-term ecological health of our catchments.

### Activity

What we do on the land impacts on the quality of water that runs off. If the quality of the runoff is poor it puts stress on the environment.



### Stressors

Stressors are changes to the environment that result from the activity, these can lead to ecological harm. Stressors can include nutrients, acid leachate and sediment in the water (turbidity).



### Ecological impacts

Ecological condition grades are a combination of turbidity (water clarity) and algae (measured as chlorophyll) scores.



# Methods

Algal growth can be measured by assessing chlorophyll a levels in the water and sediment inputs are assessed by measuring the turbidity (see feature box). These indicators are easy to measure and directly relate to the environmental values. The extent of seagrass beds is also an excellent ecological indicator of a healthy functioning ecosystem (see feature box).

Seagrass is the basis of the food web in healthy estuaries. Seagrass provides essential habitat and food for marine life. Where seagrass is abundant so is aquatic life and as such, it is an excellent indicator of ecological health. Seagrass growth is affected by a number of factors including nutrient levels, algal growth, physical removal and water clarity. Water clarity (turbidity) is directly linked to seagrass growth and can be used as a surrogate for ecological health. When water clarity is high, seagrass is abundant as there is plenty of light for it to thrive.

While macrophytes and riparian vegetation are not currently measured, low chlorophyll and turbidity levels are necessary to ensure healthy habitats. Expansion of the program in the future is likely to include assessment of these habitats.

Table 1: Indicators used in various estuarine monitoring programs

| Monitoring Program   | Chlorophyll a | Turbidity | Dissolved Oxygen | Nutrients | Riparian vegetation | Seagrass | Other critical habitats (e.g coral) |
|--|---------------|-----------|------------------|-----------|---------------------|----------|-------------------------------------|
| South East Queensland Ecosystem Health Monitoring Program      | ✓             | ✓         | ✓                | ✓         | ✓                   | ✓        | ✓                                   |
| Chesapeake Bay EcoCheck program                                | ✓             | ✓         | ✓                |           |                     | ✓        | ✓                                   |
| Northern Rivers CMA Ecohealth                                  | ✓             | ✓         | ✓                |           | ✓                   |          |                                     |
| New South Wales Monitoring, Evaluation and Reporting Program * | ✓             | ✓         | F                |           | F                   | ✓        |                                     |
| MidCoast Council Report Card (this program)                    | ✓             | ✓         | F                |           | F                   | F        |                                     |

F - future

\* New South Wales Monitoring, Evaluation and Reporting Program also samples fish in a limited number of sites

The New South Wales Monitoring, Evaluation and Reporting Program, concluded that measurement of chlorophyll a and turbidity provides an effective measure of the short-term response of estuary health to management actions. Seagrass and other macrophytes provide a long-term integration of estuary health.

Dissolved oxygen has been widely used as an indicator of the amount of oxygen in the water column with many critical aquatic processes dependent on a healthy level and minimal variability. MidCoast Council and the New South Wales Monitoring, Evaluation and Reporting Program both acknowledge that dissolved oxygen is an important variable to measure but have not done so to date, due to logistical reasons. There are plans to include this indicator in future monitoring activities.

# Methods

## Identifying the guideline values

A healthy ecosystem refers to a system which has normal ranges of diversity and function. These 'normal' ranges have been established from extensive monitoring of estuaries across New South Wales. To establish these ranges, sites that represent a variety of ecological conditions from pristine (reference) sites to highly degraded have been sampled over a number of years. The data for pristine (reference) sites have been used to establish the guideline values which are fundamental for ranking the ecological health of a site.

A guideline value is the value which indicates that a variable is outside the 'normal range' and could trigger further investigation. In our context, we have used the guideline value to indicate conditions which are not desirable for continued waterway health.

A guideline value is specific to different types of estuary. In this study, Wallis Lake, Pipers Creek, Charlotte Bay, Bombah Broadwater and Myall Lake Estuary were all classified as 'Lakes', Mid Wallamba Estuary, Karuah Estuary, Wallamba Cove, Dawson River, Farquhar Inlet, The Branch Estuary, Lower Myall Estuary and Upper, Mid and Lower Manning Estuary River were classified as a 'River estuary' and Khappinghat was classified as a 'Creek estuary' (Roper et al. 2011).

Table 2: Guideline Values for NSW Estuaries (from Roper et al. 2011)

|                     | Turbidity (NTU) | Chlorophyll ( $\mu\text{g/L}$ ) | pH |
|---------------------|-----------------|---------------------------------|----|
| Lake                | 6.7             | 2.5                             |    |
| River estuary (mid) | 1.9             | 2.2                             |    |

Figure 3: Algal growth in the Pipers Creek Catchment.

## Algae

Algae or microscopic plants are always present in waterways but if conditions change and are suited to algal growth, blooms can occur. Blooms may occur if there is a lot of nutrients in the water which can come from urban stormwater, fertiliser runoff from farms and gardens and seepage from septic tanks. Algal blooms can reduce the amount of light reaching seagrass beds limiting their growth. When blooms of algae die and start to decay, the resulting bacterial activity can reduce oxygen concentrations in the water column, possibly leading to fish kills.

## Chlorophyll a

Chlorophyll a is a pigment found in plants and is an essential molecule for the process of photosynthesis (the conversion of light energy to chemical energy resulting in the consumption of carbon dioxide and the production of oxygen and sugars). In estuarine and marine waterways, chlorophyll a is present in phytoplankton such as cyanobacteria, diatoms and dinoflagellates. Because chlorophyll a occurs in all phytoplankton it is commonly used as a measure of phytoplankton biomass (EHMP 2008).





# Methods

## Collecting the data

The MidCoast Council region has been divided up into reporting zones. A zone is actually a broad area within the estuary rather than a discrete point (see maps in Results Section) and may be represented by a single sample or by multiple samples. Six zones were sampled in Wallis Lake Estuary (Mid Wallamba Estuary, Coolongolook Estuary, Wallamba Cove, Pipers Creek, Wallis Lake and Charlotte Bay). There are eight zones in the Manning River Estuary (Middle, Upper, Lower, Dawson and Lansdowne River Estuaries, Browns and Ghinni Ghinni Creeks and Farquhar Inlet), three zones in the Myall Lakes (Myall Lake, Bombah Broadwater and Lower Myall Estuary), two zones in Karuah (Karuah Estuary and The Branch Estuary) and one zone in the Khappinghat Estuary and one zone in Smiths Lake.

Samples were collected on six occasions between summer and autumn from November 2021 to April 2022. This represents the part of the year when the highest chlorophyll concentrations are expected.

At each of the selected sites, samples were taken in accordance with the New South Wales Monitoring, Evaluation and Reporting protocols which are described in full in Roper et al. (2011). At each of the 'Lake' sites, turbidity was measured using a calibrated probe suspended at a depth of 0.5 metres for five minutes as the boat drifted or was motored (generally covering a distance of at least 300 metres), logging data every 15 seconds. The final value for the 'site' sampled was the average of all the logged data. During the drift, at least five samples of the top 1 metre of the water column were collected and combined in a bucket. At the end of the drift, a single 200 millilitre sample for chlorophyll a analysis was taken from the composite in the bucket.

For the river estuary sites, an 'underway sampler' is used to pass water past the probe whilst the boat travels at a regulated speed along a transect upstream from the middle to the upper part of the estuary. The turbidity is calculated as the mean of logged values for the transect. At two sites along the transect, composite water samples are collected for chlorophyll a analysis.



Figure 4: Department of Planning and Environment staff carry out monitoring of the waterways in the MidCoast Region

Figure 5: Department of Planning and Environment staff carry out monitoring of the waterways in the MidCoast Region

Chlorophyll a samples are immediately filtered (within one hour) under mild vacuum and the filter frozen until analysis. Chlorophyll a is extracted into acetone and chlorophyll a concentration is determined by spectrometry.

# Methods

Seagrass depth range is calculated by measuring water depth at the shallow limit and deep limit of seagrass cover across three transects at a sampling site. One transect is a routine transect used in the survey each year. The remaining two transects are randomly located within 50 m each side of the routine transect. The mean shallow limit is subtracted from the mean deep limit to give the depth range for that site. All depths are standardised to a number of standard height markers in proximity to the sampling sites within the lake to remove potential errors from changing water levels.

A report card grade is calculated following the analysis method outlined in the New South Wales sampling and reporting protocols (OEH, 2016). Briefly, the seagrass depth range scores are based on not only the recorded depth range for a specific year, but also how that compares to the previous year, meaning how seagrass has progressed, recovered or regressed over time since the previous survey. The seagrass score is presented separately in the report card and does not affect the overall ecological health grade.

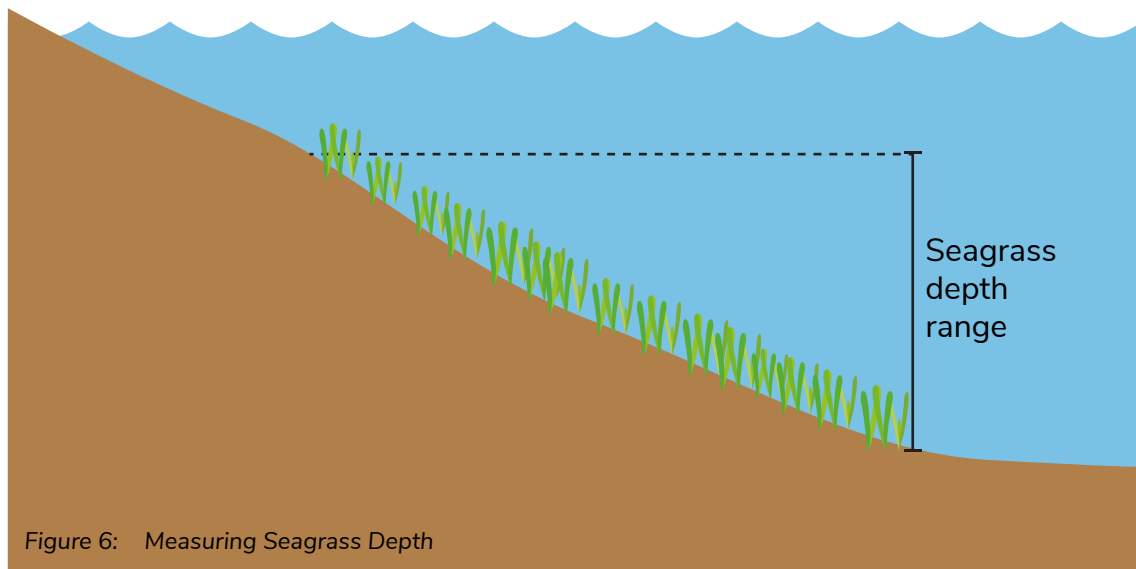


Figure 6: Measuring Seagrass Depth

Figure 7: Roadside sediment runoff

## Sediment

Sediment from the land can be washed into waterways when it rains. If land is poorly managed, large amounts of sediment can wash into our waterways. Sediment also comes from roads and pathways washing directly into the stormwater and then the estuaries.

Too much sediment in the water reduces the amount of light reaching the bottom and is detrimental to seagrass which require light for growth. Seagrass is critical for the health of estuaries as it provides essential habitat for fish and invertebrates which support bird life and the local tourism and aquaculture industries. Excess amounts of suspended particles can also smother benthic organisms like sponges, irritate the gills of fish and transport contaminants.

## Turbidity

Turbidity provides a measure of sediment in the water. It is the measure of light scattering by suspended particles in the water column, providing an indication of the amount of light penetration through the water column (EHMP 2008).



# Methods

## Calculating the zone score

The measured values of all indicators are summarised into one value which can then be compared between different reporting zones.

Two basic calculations have been performed for each zone:

- Non-compliance score – are the indicator values non-compliant with the guideline value?
- Distance from the benchmark score – how far from the guideline value are the indicator values?

The distance measure is a recognition that the guideline values only allow for two possible states, compliant and non-compliant. The distance measure provides for more sensitivity for ecological condition along the gradient from good to poor.

## Calculating the non-compliance score

The non-compliance score is simply calculated by taking the number of samples that are above the guideline value as a proportion of the total number of samples taken in the sampling period. The non-compliance score is then expressed as a value between 0 and 1, with 0 equal to none of the values being non-compliant (i.e. all compliant) and 1 equal to all values being non-compliant.

Non-compliance score equals the number of samples non-compliant with guideline value divided by the total number of samples.

## Calculating the distance from benchmark score

The distance score has been expressed as a proportion between 0 and 1 to be standardised with the non-compliance score. To do that, the distance score is expressed as a proportion of the worst expected value (WEV) with a score of 0 equal to the benchmark value, and 1 equal to the worst expected value for each of the indicators.

The worst expected value has been determined by examination of a data set for all of New South Wales. The 98th percentile value was selected as the worst expected value Table 3. In the small number (2%) of circumstances where measured values were greater than worst expected value, the distance measure became 1 (which is the highest possible value).

Table 3: Worst expected value for Condition Calculations

|             | Turbidity WEV (NTU) | Chlorophyll WEV (µg/L) |
|-------------|---------------------|------------------------|
| Lake        | 20                  | 30                     |
| River (mid) | 60                  | 30                     |
| Lagoon      | 20                  | 30                     |

Distance of each non-compliant value equals: (measured value - guideline value) / (worst expected value - guideline value).

The distance score is calculated as the mean distance from the guideline of those values that are non-compliant for the reporting period.

Once the non-compliance and distance score have been calculated, the geometric mean of both scores is calculated to arrive at a single score that can be used to assess the condition of each indicator in that zone.

$$\text{Final score for indicator} = \sqrt{\text{non-compliance} \times \text{distance score}}$$

The final 'zone score' for each reporting zone is then the simple average of the indicator scores.

# Methods

## Allocating the Report Card Grade

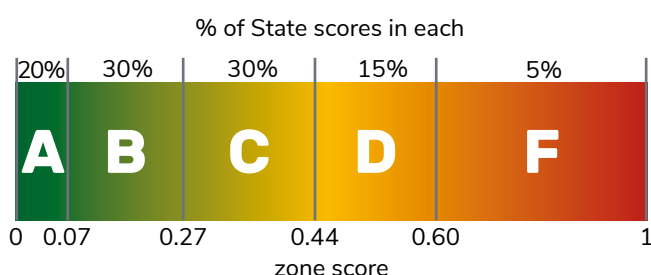
Defining the Report Card grade is an important step in the development of the Report Card. The grade definitions below are linked to the environmental values outlined above and are structured to allow easy comparison between each system and over time.

It is important that the cut-off values for each grade reflect the condition of each zone in comparison to a broader scale of condition across all New South Wales estuaries (i.e. an 'Excellent' grade represents an excellent condition for a New South Wales estuary). To assist with the derivation of cut-offs, scores were calculated for 130 zones across a wide range of New South Wales estuaries using the same guidelines and worst expected values as the MidCoast analyses. Cut-offs were then defined as representing a percentage of the scores for the state (Table 4). For example, a zone score less than 0.07 defined the 20% of best zone scores in the state and this became our 'Excellent' grade (see Table 4 for other cut-offs). We did not use a score of 0 as 'Excellent' because, as a consequence of how the guideline values are calculated, we expect that even pristine reference sites will exceed guideline values 20% of the time. The definition of the grades and description are shown in Table 4.

Table 4: Report Card results, definitions, descriptions and cut-off

| Grade | Result    | Definition  | Description                         |
|-------|-----------|---|-------------------------------------|
| A     | Excellent | All environmental values met (The indicators measured meet all of guideline values for almost all of the year)              | The best 20% of scores in the State |
| B     | Good      | Most environmental values met (The indicators measured meet all of the guideline values for most of the year)               | Next 30% of good scores             |
| C     | Fair      | Some of the environmental values met (The indicators measured meet some of the guideline values for some of the year)       | Middle 30% of scores                |
| D     | Poor      | Few of the environmental values met (The indicators measured meet few of the guideline values for some of the year)         | Next 15% of poorer scores           |
| F     | Very Poor | None of the environmental values met (The indicators measured meet none of the guideline values for almost all of the year) | The worst 5% of scores in the State |

Figure 8: Relationships between grades, zone scores and state percentiles



## Summary of the process for calculating the zone score

In summary, the process for calculating the zone involved:

- Calculating the proportion of time that the measured values of the indicator are above the adopted guideline limits or Guideline Values.
- Calculating the distance/departure from the guidelines for that indicator - the extent the data extends past the guideline value and approaches the worst expected value (WEV) for that indicator.
- Calculating the geometric mean of the non-compliance and distance scores to get a final score for



# Methods

that indicator for each zone.

- Averaging the scores for the two indicators at each site – this gives the 'zone score'.
- Grade the zone based on the zone score as A, B, C, D, F.

## Rainfall results

The amount of rainfall that occurs around the period of sampling for the Report Card (September – April each year) influences the Report Card results. If there is more rain, there is more runoff in the catchment resulting in greater quantities of sediment and nutrients entering our waterways.

The sampling period for 2021-22 was wetter than average with a total of 1000mm.

The rainfall data is taken from the Forster Bureau of Meteorology rainfall station (Tuncurry Marine Rescue and Whoota Station) ([www.bom.gov.au/climate/data](http://www.bom.gov.au/climate/data)). Similar trends were seen in data throughout the MidCoast Area.

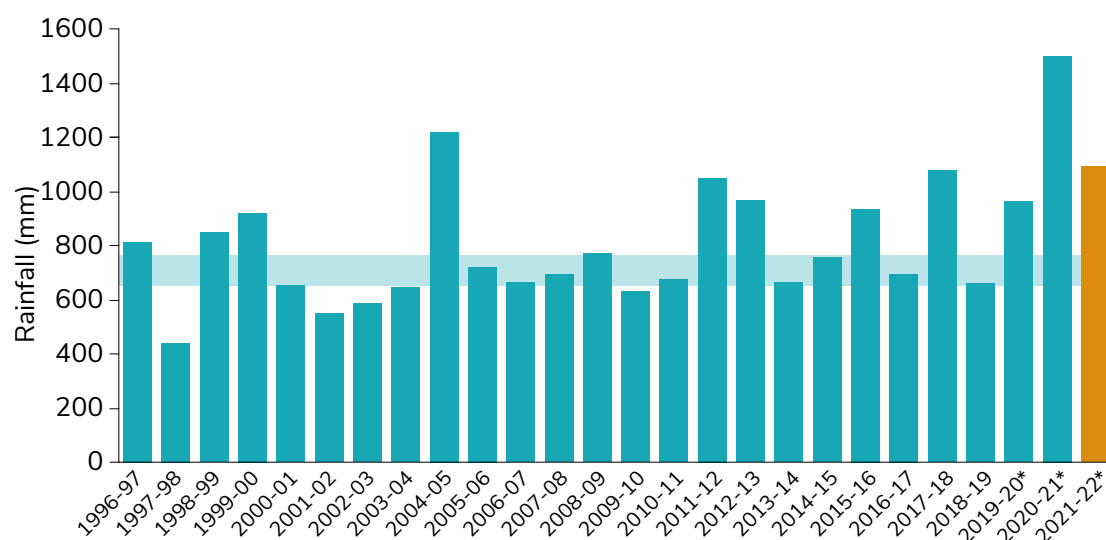


Figure 11: Data presented includes total rainfall. \* data collected from Whoota Station.

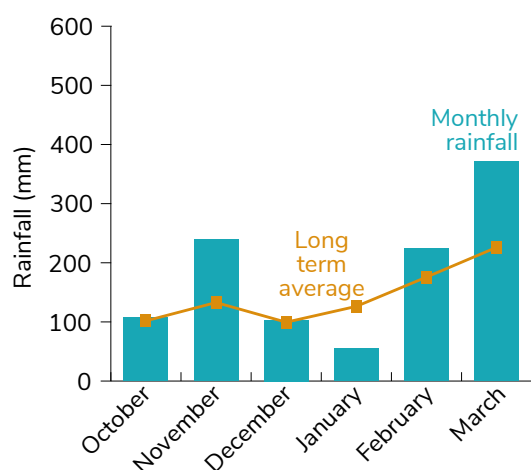


Figure 9: Monthly observed and long term average rainfall during the 2020-21 monitoring program at Whoota (bom.gov.au)

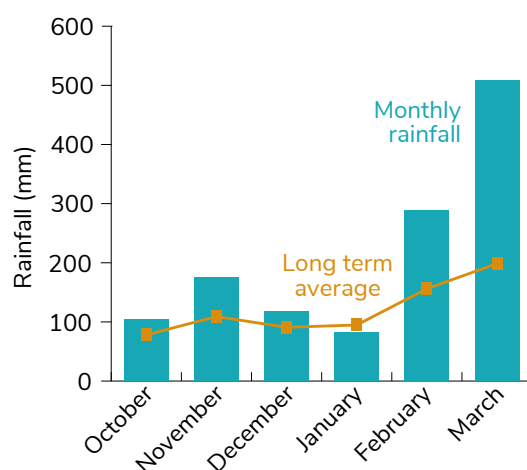


Figure 10: Monthly observed and long term average rainfall during the 2020-21 monitoring program at Taree Airport (bom.gov.au)

# Methods

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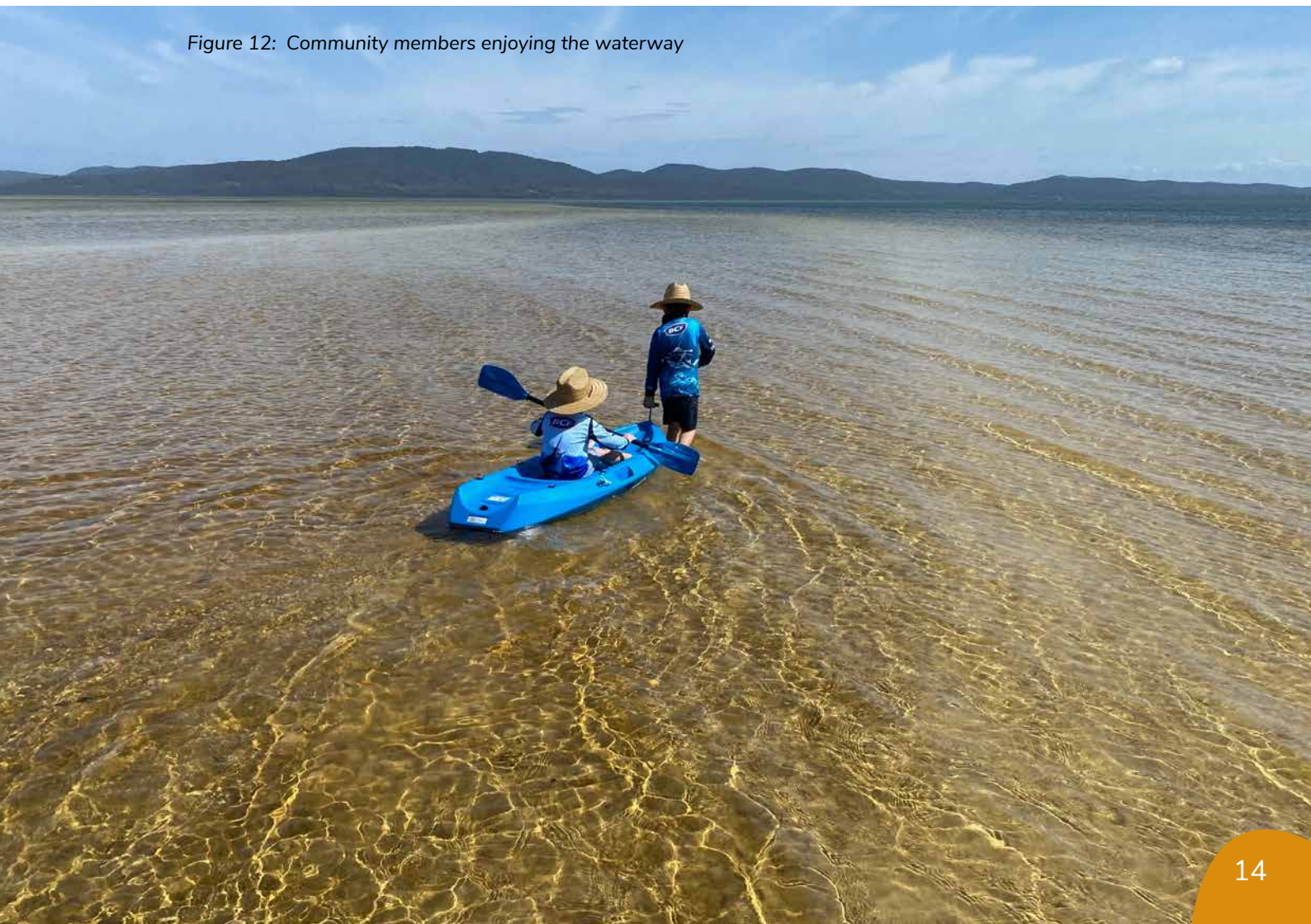
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## Acknowledgements

The methodology presented here was developed by the Department of Planning and Environment - Environment Science (DPE-ES) with input from Hodge Environmental and the International Water Centre.

Figure 12: Community members enjoying the waterway



# Manning River Estuary

## Catchment description

The Manning River has a catchment area of 8,420 square kilometers, which makes it the sixth largest on the coast of NSW. The Manning River is unique on the NSW coast because it is a double delta with two river entrances at Harrington and Old Bar. The main land uses within the catchment are urban development, beef cattle grazing, dairying, oyster growing and forestry. Significant areas of the catchment are also conserved within National Parks and Nature Reserves. The majority of the catchment's population live in the estuarine zone around the town centres of Taree, Wingham, Cundletown, Harrington and Old Bar.



Figure 13: Manning River



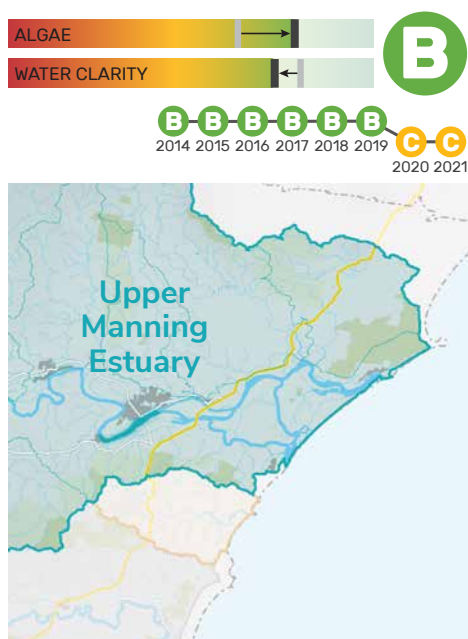


# Manning River Estuary

The mid and lower sections of the Manning River estuary have remained in good ecological condition this year, while the upper Manning River estuary improved from fair to good. With the Manning sites being in fixed locations and another wetter-than-average summer, salinity was generally lower on sampling dates than is desired for MER sampling. The lower salinity of the samples is indicative of water that had recently reached the receiving waters, rather than true estuarine samples. There were very few opportunities to sample estuarine conditions due to the wet summer, particularly toward the end of the sampling program (autumn).

Turbidity was consistently higher throughout the estuary this year than last year while algal abundance generally decreased. The Dawson River estuary was downgraded to fair condition. This year we began monitoring three new tributaries: Lansdowne River, Ghinni Ghinni Creek and Browns Creek to gain more information about the nutrient and sediment inputs from these catchments to the estuary.

The lower and mid estuary adjacent to Farquhar Inlet also saw no change in grading, remaining good. The Inlet remained open and tidal all summer with the continual fluvial flows pushing through on the ebb tide. This meant that sampling was done in consistently brackish water at the adjacent site (9-33psu). The salinity here was the highest out of any of the Manning River sites on every sampling occasion.



## Upper Manning Estuary

The Upper Manning River estuary improved from fair to good ecological condition this year. The elevated algal abundance observed last year did not occur this year, with a marked reduction in sample chlorophyll-a (average 7 to 3.8 ug/L, respectively). There were only two exceedances in the fifteen samples which occurred in samples collected when salinity was higher, indicating a longer residence time. On the other sampling trips, samples were taken from practically freshwater (<1psu) and lower algal abundance is expected.

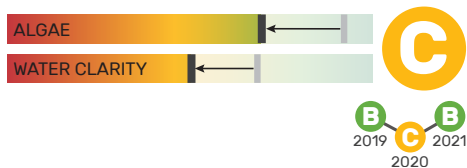
The turbidity guideline value was exceeded in half of samples collected which is not surprising given the samples were taken from freshwater (<1psu), indicative of runoff.

### Estuary description

The Upper Manning Estuary includes the section of river from Tinonee to the western end of Dumaresq Island.



# Manning River Estuary



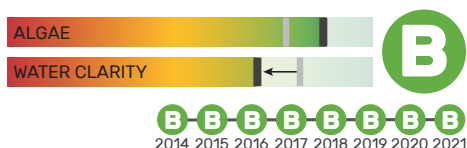
## Dawson River Estuary

The overall grade for the Dawson River decreased from good to fair because of reduced water clarity and, to a lesser extent, an increase in algal abundance. Water clarity exceeded the guideline value by a large amount on five out of six occasions and resulted in a poor water clarity grade. Algal samples exceeded the guideline value by a large amount on one out of six occasions, bearing in mind sampling was done in freshwater (<1psu) on the other five occasions. It is clear from the results of the last few years that there is a need for nutrient and sediment management in this catchment.

pH was recorded below guideline values on half of the sampling trips, indicating the presence of acid-sulphate soils in this sub-catchment and a need for remedial action.

### Estuary description

Dawson River is a tributary of the Manning River. It enters downstream of Taree and receives runoff from Taree's industrial areas as well as a sewage discharge.



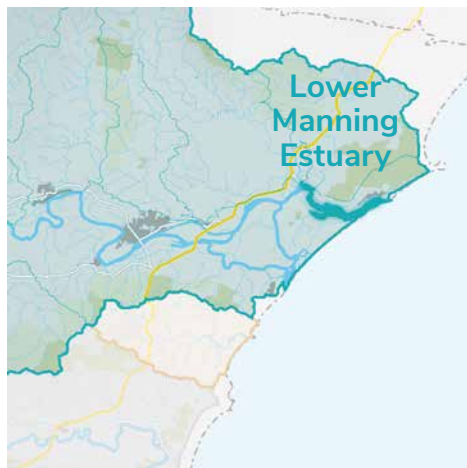
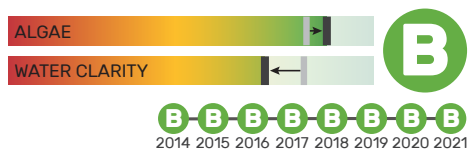
## Mid Manning Estuary

Overall, the mid Manning River estuary remained in good ecological condition this year. The turbidity guideline value was exceeded in three quarters of samples in the mid estuary by moderate amounts due to large freshwater inputs. The chlorophyll guideline value was exceeded only in a small number of samples. The generally high river flow and low salinity kept algal abundance low, despite the runoff carrying nutrients to the river and estuary.

### Estuary description

The Mid Manning Estuary is the river from the western end of Dumaresq Island to the confluence with the Lansdowne River in the north channel, and to the confluence with Warwiba Creek in the south channel of the river. The Mid Manning Estuary also extends into Scotts Creek to the confluence with Bukkan Bukkan Creek.

# Manning River Estuary

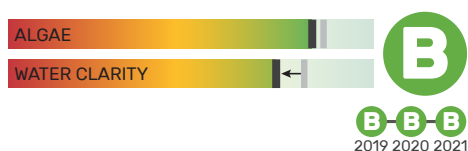


## Lower Manning Estuary

The overall grade for the lower estuary remained good this year. Average salinity in the lower estuary was half the salinity recorded the last year due to persistent rainfall. Algal concentrations and water clarity were consequently lower than last year. The turbidity guideline value was exceeded in over half of samples by moderate amounts, in line with lower salinity readings. The chlorophyll guideline value was exceeded by a small amount in a third of the samples due to lower algal abundance, which is expected as salinity decreases.

### Estuary description

The Lower Manning Estuary is from the Lansdowne River confluence to the river mouth at Harrington, and from the Warwiba and Bukkan Bukkan Creek confluences to the river mouth at Farquhar Inlet.



## Farquhar Inlet

Farquhar Inlet retained its good ecological condition grade this year. Higher turbidity (decreasing water clarity) was recorded consistently compared to last year, exceeding the guideline value on all occasions. The tidal flushing seemingly did little to dilute the turbid fluvial inputs from upstream. Resuspended material from tidal friction on the extensive shoals around this entrance is likely to have also contributed to the high turbidity.

Algae abundance exceeded the guideline values in 40% of samples collected this year. These exceedances were during periods of higher salinity indicating longer residence times for the algae to grow.

Note that guideline values for turbidity and chlorophyll increase as salinity decreases due to known effects of freshwater runoff on water quality. Farquhar Inlet was the only site where a typically brackish salinity range (9-33psu) was recorded.

### Estuary description

Farquhar Inlet is a secondary entrance to the Manning River system that is intermittently open. It is a broad, shallow sand delta at the junction of the Manning River South Arm and Scotts Creek. It is surrounded by agricultural lands and receives runoff from the town of Old Bar.

# Manning River Estuary



C



## Lansdowne River

The ecological condition of the Lansdowne River was graded as fair in its first year of monitoring and assessment. Chlorophyll exceeded the guideline value in one fifth of samples whereas turbidity exceeded guideline values in most samples, often by a high amount.

pH was below guideline values in one sixth of samples, and generally remained low for the remainder of the summer.

### Estuary description

Lansdowne River is a tributary of the Manning River draining to the estuary on the eastern side of Mamboo Island and via Ghinni Ghinni Creek. The catchment includes forested areas but is mainly agricultural land use, some high intensity farming (dairy, poultry and turf). Moto has extensive areas of acid sulfate soils which drain to the river.



B



## Ghinni Ghinni Creek

Ghinni Creek received a good grade for ecological condition in its first year of monitoring and assessment. Half of the algal samples exceeded guideline values and all samples exceeded the turbidity guideline value, but only by a small amount.

pH was below guidelines for rivers in half of the samples which is not surprising given the common sighting of iron rich precipitate along this estuary.

### Estuary description

Ghinni Ghinni Creek connects the Lansdowne River to Manning River at the eastern side of Jones Island. The catchment is mainly agricultural - beef and dairy farming. Moto and Ghinni Ghinni have extensive areas of acid sulfate soils draining to the creek.

# Manning River Estuary



## Browns Creek

Browns Creek scored a fair grade for ecological condition in its first year of monitoring and assessment. Algal abundance was not the problem, with only 40% of samples exceeding the chlorophyll guideline value. Water clarity, on the other hand, scored a poor grade after most of the samples exceeded the turbidity guidelines. On one sampling occasion, there was a large amount of runoff from the urbanised catchment in the estuary, resulting in particularly high turbidity in that sample, and large exceedance of the guideline value.



### Estuary description

Browns Creek is at Taree with urban and light industrial areas draining to the creek.

# Khappinghat Estuary



The Khappinghat improved in its ecological health from fair to good this year, due to a decrease in algal growth compared to last year. The water clarity grade remained the same and the average salinity was similar to last year. The lower algal growth is likely due to less nutrients entering the estuary as the catchment recovers from the extensive fires in 2019-2020.



Salinity was generally within the brackish range typical of intermittently open/closed lagoons when sampling occurred. Turbidity exceeded guideline values in less than half the samples. We expect little exceedance of guideline values given that the estuary is surrounded by a national park. The highest exceedance was at the upstream site when the salinity was 5psu, or 15% as salty as the ocean, reflecting a larger influence of runoff from the catchment following February storms.



# Wallis Lake

## Catchment description

The Wallis Lake catchment extends over 1400 square kilometers and this catchment includes the region's major urban centre of Forster-Tuncurry.

Wallis Lake is one of the most significant producers of Sydney Rock Oysters in Australia and is also central to the local tourism industry, valued at over \$315m per year. The lake is one of New South Wales' top three producing estuarine fisheries, it produces 80% of the states commercial crabs and is utilised extensively for recreation including boating, fishing and swimming.

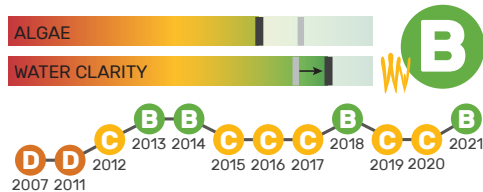
The Wallis Lake catchment contains habitat for threatened and international migratory species and contains 35% of the seagrass beds of New South Wales, as well as the second largest representation of saltmarsh in the State.



Figure 14: Wallis Lake



# Wallis Lake



## Mid Wallamba Estuary

Mid Wallamba Estuary remained in good ecological condition this year. Continual runoff from frequent rainfall resulted in higher than desired algal growth, with two thirds of samples exceeding the guideline value for river estuaries. This is reflected in the higher algal abundance following heavy rainfall in March/April, however only minor exceedance of guideline values occurred. Water clarity has remained good as observed in previous years with two thirds of samples below guideline values. Only minor exceedance of the water clarity guideline values occurred.

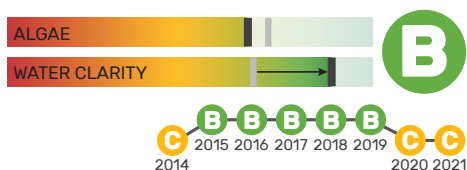
Seagrass improved to fair this year with a slight decrease in depth range however there was less of a decline in range that occurred last year.

### Estuary description

The Mid Wallamba Estuary sub catchment covers almost one third of the Wallis Lake catchment (550 km<sup>2</sup>). The catchment is one of the most modified sub catchments in Wallis Lake. Agriculture is the dominant land use with a small urban centre at Nabiatic. The Mid Wallamba Estuary faces additional localised pressures from the erosion and collapse of stream banks due to its popularity for water sports over the summer period.

The water quality sampling occurs in the estuarine reaches of the river from Wallamba Island to Failford.

# Wallis Lake

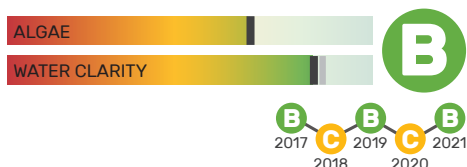


## Wallamba Cove

Wallamba Cove received a higher ecological health grade (good) this year compared to last year (fair) due to improved water clarity. Water clarity improved despite another wetter-than-average summer and salinity remained in the usual range. One possible explanation for improved water clarity is urban runoff from Tuncurry contained less sediment than last year due to frequent but lower intensity rain events cleaning the streets, removing loose sediment from the roads, footpaths and verges, in between sampling trips.

Fewer samples exceeded the chlorophyll guideline values this year however the exceedances were greater than last year. Better water clarity often leads to higher chlorophyll levels as algal abundance increases when more light penetrates the water column.

Overall, water quality was slightly better than the downstream site which is surprising given that the downstream site is further way from runoff from the town centre. This result was mostly driven by sampling in April 2022, where the surface water was slightly fresher and influenced by recent runoff which carries sediment. Runoff is freshwater which initially forms a layer above saline water due to lower density before mixing with the receiving waters.



## Coolongolook Estuary

Coolongolook River Estuary remained in good ecological health this year. Water clarity slightly decreased and algal abundance slightly increased but not enough to affect the overall estuary grade. Algal growth remains the main issue in the estuary as almost all samples exceeded the guideline value this year. Higher algal growth was recorded in the downstream reaches of the estuary, which may signal an influence of catchment inputs from Wallingat and other tributaries further downstream.

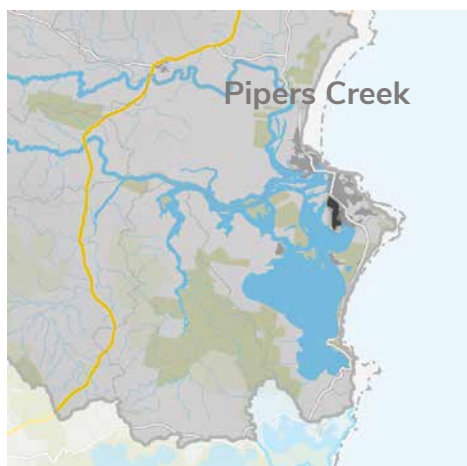
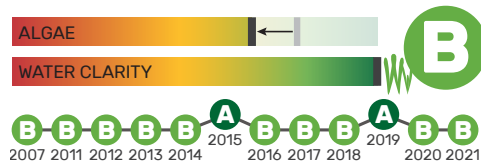
Salinity was similar to last year although a pronounced salinity gradient from Wallis Lake to the upstream of the river was rarely observed. This reflects a longer residence time for water in the river as it enters Wallis Lake and relatively low fluvial inputs.

### Estuary description

The Coolongolook Estuary receives water from the Coolongolook and Wang Wauk Catchments which contains modified landscapes predominantly used for agriculture. All lands within the Coolongolook catchment are on erodible soils. The catchment contains a small urban service centre with a population of around 417.

The water sampling occurs in the estuarine reaches of the river.

# Wallis Lake



## Pipers Creek

This year Pipers Creek remained in good ecological condition despite a decrease in the average water clarity and increase in algal abundance. This continues to be a good result given it receives runoff from a heavily urbanised catchment. There is still a need for ongoing control of nutrients, with all the algal samples exceeding guideline values. This resulted in an algal grade of fair. Water clarity in the creek was generally good but was worse than last year, however there was no exceedance of guideline values.

Seagrass depth range in the adjacent Pipers Bay decreased this year returning the grade to good. This may have been due to frequent runoff and slightly more turbid water from Pipers Creek entering the bay, reducing light available to seagrass.

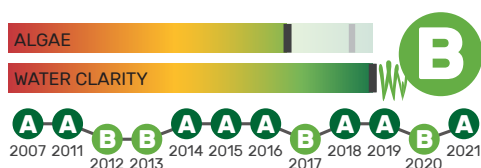
### Estuary description

The majority of the Forster township is located in Pipers Creek Catchment. The rainfall that once infiltrated into the ground through native vegetation now meets impervious surfaces (roofs, roads and footpaths) and runs directly into stormwater drains and Pipers Creek. This stormwater runoff carries with it pollutants such as sediments and nutrients from houses, lawns, roads and pathways. In the past, Pipers Creek and Pipers Bay have experienced large algal blooms and shown signs of poor ecological health. Following large rainfall events, the water from Pipers Creek and Pipers Bay can reach Wallis Lake and Charlotte Bay areas. Reducing the impacts of stormwater from the Pipers Bay Catchment therefore has benefits across the whole of Wallis Lake.

The samples for this Report Card are taken next to Big Island adjacent to Forster Keys.



# Wallis Lake



## Wallis Lake

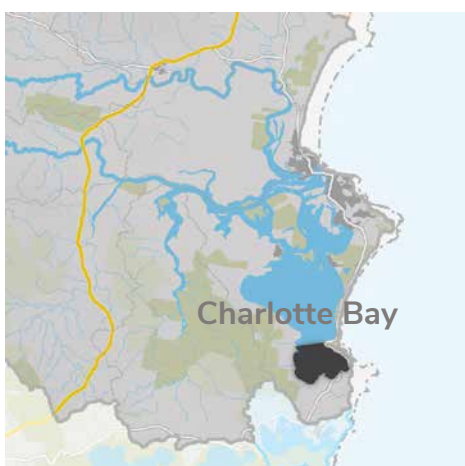
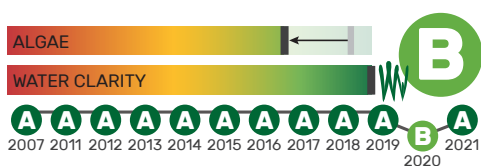
The grade for Wallis Lake changed from excellent to good ecological condition this year. Over half of the algal samples exceeded guideline values, particularly at the end of summer following heavy rains in March and early April 2022. Despite the increased runoff, there were no exceedances of the turbidity guideline value.

Seagrass depth range near Pelican Island and at Forster decreased compared to last year but still retained their good grades. Seagrass depth range remained excellent at Coomba Park.

### Estuary description

Wallis Lake is in the centre of the estuary and receives runoff from a narrow catchment immediately surrounding the lake. Adjoining areas directly influencing Wallis Lake include Coomba Park, Green Point and the rural residential land on the western side of Wallis Lake. During large rainfall events, water from the major rivers and the Pipers Creek catchment flow into this area carrying pollutants with it.

Sampling in Wallis Lake takes place in the centre of the estuary between Yahoo Island in the north and Earps Island in the south.



## Charlotte Bay

The grade for Charlotte Bay changed from excellent to good ecological condition this year. Over half of the algal samples exceeded guideline values, particularly at the end of summer following heavy rains in March and early April 2022. As with the Wallis Lake basin, there were no exceedances of the turbidity guideline value this year. Both water clarity and algal levels were better in Charlotte Bay than Wallis Lake even though the grades were the same. This is due to less runoff affecting water quality in Charlotte Bay with no major tributaries in the immediate area.

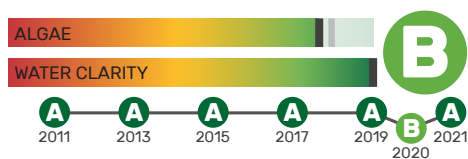
In line with the excellent water quality observed in previous years (good this year), seagrass depth range has the greatest extent at Charlotte Bay out of all monitoring sites in the Wallis Lake system, extending from all shores across the lake floor. Charlotte Bay retained its excellent seagrass depth range grade this year.

### Estuary description

Charlotte Bay covers the southern most part of the Wallis Lake estuary. There is limited mixing between the northern and southern parts of Wallis Lake, therefore the condition of this area is influenced mainly by the surrounding catchment. The catchment is largely vegetated with a small amount of residential, commercial and rural residential land.

Sample collection in Charlotte Bay occurs in the middle of the water body south of Earps Island.

# Smiths Lake



The grade for Smiths Lake continues to hover around the excellent-good threshold and returned to good this year. The drop in grade was due to increased algal growth in the lake. Water clarity remained excellent with no exceedance of guideline values.

The three locations that make up the grade for Smiths Lake include Wamwarra Bay, central Smiths Lake and Symes Bay. The salinity was very similar amongst the three sites throughout the summer, indicating good mixing in the large estuary. There were small exceedances of the chlorophyll guideline value in two thirds of the Wamwarra Bay samples, one third of the central Smiths lake samples, and one Symes Bay sample. These exceedances reflect a small amount of excess algal growth in the lake and this was enough to cause the grade to return to good.

## Estuary description

Smiths Lake has a catchment area of 35.89 square kilometers. It is an intermittently closed and open coastal lagoon and the lake entrance is artificially opened when levels approach 2.1 meters above sea level to prevent flooding of low-lying areas. The catchment of Smiths Lake has a good cover of native vegetation with a significant proportion of the catchment under conservation within the Wallingat and Myall Lakes National Parks. The Smiths Lake township and tourism facilities are situated near the lake's mouth, with impervious surfaces (roofs, roads and footpaths) increasing stormwater runoff into the lake. This stormwater runoff can carry with it pollutants such as sediments and nutrients from houses, lawns, unsealed roads and pets.

Samples for Smiths Lake were taken from three locations: Wamwarra Bay, Central Smiths Lake and Symes Bay. These data have been averaged to provide an overall score for Smiths Lake.

Figure 15: Smiths Lake



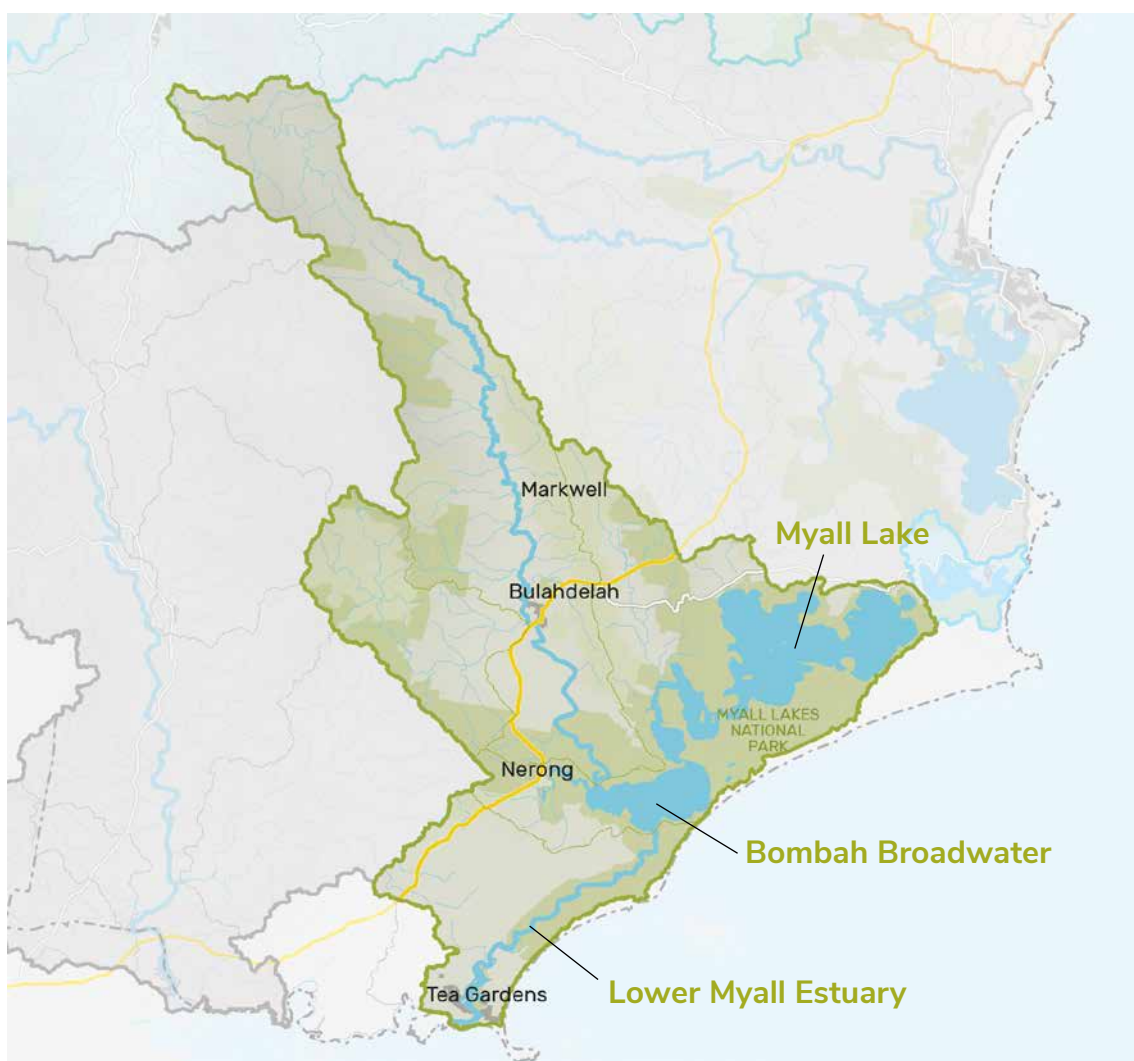
# Myall Lakes

## Catchment description

The Myall Lakes catchment covers 440 square kilometres. Its major tributary is the Myall River, whose headwaters extend to Craven Nature Reserve and the Kyle Range. The catchment is largely occupied by agricultural land, with forestry and protected vegetation in the steeper areas and a small amount of urban land in the townships of Bulahdelah and the well-known tourist destinations of Tea Gardens-Hawks Nest.

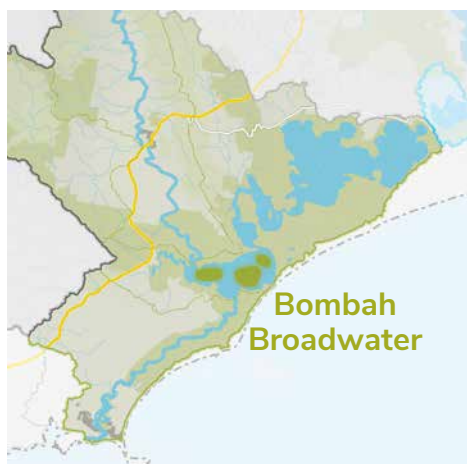
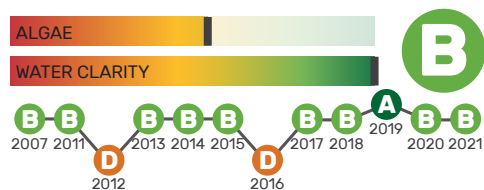
The Myall Lakes and Myall River in particular are part of a large tourism and recreation industry which includes Myall Lakes National Park, one of New South Wales' most visited National Parks with estimated annual visitor numbers of 250,000.

Major issues for the Myall Lakes system include the impacts of rural runoff on water quality including nutrients, noxious weeds and other pathogens. Urban runoff and the impacts from tourism and recreation uses of the lakes and estuaries are more prevalent in the lower reaches of the catchment.





# Myall Lakes



## Bombah Broadwater

Bombah Broadwater remained in good ecological condition this year. The grade was influenced by a poor algal score, with all samples exceeding guideline values by a moderate amount.

The condition of Bombah Broadwater is strongly influenced by runoff from the Myall River catchment, and this was reflected in the lower average salinity of 1.6psu this year compared to 3.2psu last year. The persistent runoff also increased the average turbidity in the estuary to 6.1NTU this year compared to 2.3NTU last year. Despite this increase, no samples exceeded guideline values and water clarity was graded as excellent.

There have also been some reports of blue-green algae scums in the freshwater that remained in the lakes after the continuous rains. This emphasises the need to continue to reduce nutrient runoff from land use activities in the catchment.

## Estuary description

The Bombah Broadwater and Myall Lake are part of the Myall Lakes system which is comprised of four linearly connected brackish to freshwater basins: Myall Lake, Two Mile Lake, Boolambayte Lake and the Bombah Broadwater. The Myall Lakes National Park surrounds the lakes and is listed as a Ramsar wetland of international importance.

While the Bombah Broadwater itself is surrounded by National Park, it receives the majority of its inflow from the upper Myall River and Crawford River catchments which together drain an area of approximately 440 square kilometres. These catchments are largely occupied by agricultural land with forestry and protected vegetation in the steeper areas and a small amount of urban land in the township of Bulahdelah.

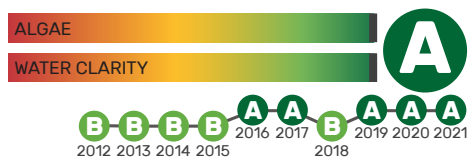
Samples were taken from three sites in the Bombah Broadwater and were combined to give an overall score for the health of the system.

Figure 16: Bombah Broadwater





# Myall Lakes



## Myall Lake

Myall Lake retained its excellent grade this year, with no exceedances of any guideline values. It remains one of the least impacted parts of the Myall system, despite experiencing continuously high-water levels due to persistent rainfall in the last couple of years.

Interestingly, the average salinity in Myall Lake this year was higher than in Myall/Bombah Broadwater (2.9 vs 1.09psu, respectively), despite being further upstream. This reflects the unique hydrology in Myall Lake which has no major tributaries, compared to the Broadwater which receives considerable runoff from the Myall River catchment via Bulahdelah. This is the first time in over a decade of MER monitoring that the average salinity was higher in the lake than the Broadwater.

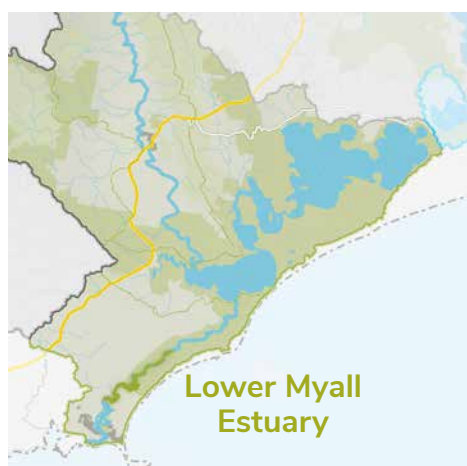
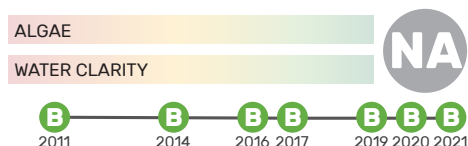
### Estuary description

Myall Lake along with the Bombah Broadwater is part of the Myall Lakes system which is comprised of four linearly connected brackish to freshwater basins: Myall Lake, Two Mile Lake, Boolambayte Lake and the Bombah Broadwater.

The Myall Lakes National Park surrounds the lakes and is listed as a Ramsar wetland of international importance.

Myall Lake is directly influenced by a small fringing catchment which is contained within the Myall Lakes National Park. During times of high rainfall however, water from the Broadwater (and therefore the Upper Myall River and Crawford River catchments) influences Myall Lake by carrying with it nutrients and algae.

Samples were taken from two sites in Myall Lake and were combined to give an overall score for the health of the system.



## Lower Myall Estuary

Monitoring in the Lower Myall Estuary is not undertaken annually. No results were recorded for 2022.

### Estuary description

The Lower Myall Estuary near Tea Gardens is the mouth of the Lower Myall River and is situated in an area of highly mobile sand features. The river discharges into the moderately sheltered waters of Port Stephens but the river entrance is exposed to swell from the south-east coming through the entrance of the Port. The Lower Myall Estuary receives water from the urban area of Tea Gardens and Hawks Nest and is strongly influenced by the waters of the Bombah Broadwater following rainfall.

# Karuah River

## Catchment description

The Karuah River Catchment is approximately 1460 square kilometres, largely comprised of grazing land, forest and woodland and is sparsely populated, the largest settlements being Karuah (pop.~1000), located at the mouth of the river, and Stroud (pop.~700), located in the centre of the catchment.

Land use in the Karuah River Catchment has undergone continuous change since European settlement beginning with land clearing for forestry and agriculture from the late 19th century. The landscape today is a mosaic of rural landuse, including forestry, grazing industries, poultry production, mining, aquaculture and rural residential areas.

Trends from past water quality monitoring shows periods of high sediment and nutrient loads within the Karuah River; whilst at the same time displaying a range of in-stream biological diversity. In 2011 the Karuah River estuary and Catchment was assessed as being in a moderate ecological condition, but with some significant threats to the system.

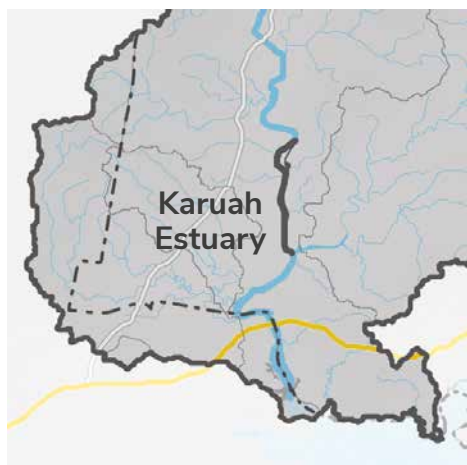
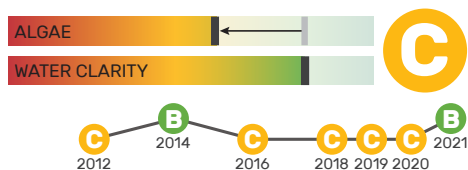


The Branch is a subcatchment of the wider Karuah River Catchment and is approximately 211 square kilometres. The Branch subcatchment is a mosaic of floodplain environments, with steep ridgelines traversing from the upper catchment through to the tidal zone of the river. The subcatchment is sparsely populated, without any settlements. Landuse is primarily grazing land with some forest and woodland in the upper catchment.

Figure 17: Karuah River Catchment.



# Karuah River Estuary



## Karuah River Estuary

Karuah River was in fair ecological condition this year, compared to good last year. There was a slight decrease in turbidity in the river but a marked increase in algal abundance. The difference in algal abundance at the two sampling sites was often quite large, indicating localised algal blooms. Algal samples exceeded guideline values most of the time, and by a high amount when algal blooms were occurring. The good grade for water clarity remained unchanged.

### Estuary description

The Karuah River Estuary is a priority oyster production area which has suffered periodic water quality issues associated with catchment runoff. The Karuah River Estuary discharges into the north western part of Port Stephens, and is the only significant source of sediment to this system.

There are substantial areas of mangrove and saltmarsh habitats in the Karuah River Estuary, which provide food sources and nursery areas to fish, but only very small areas of seagrass (seagrass extent has decreased by almost 80% between 1985 and 2009). Low light availability, due to high turbidity is the most likely reason for the lack of seagrass in the Karuah River Estuary.

The extent of saltmarsh over this time has also reduced, while mangrove has increased. Similar to many estuaries in New South Wales it is suggested that mangrove assemblages have increased at the expense of saltmarsh.



# Karuah River



## The Branch Estuary

The Branch Estuary retained its good grade this year despite the downgrading of Karuah River's ecological condition. The high algal abundance recorded in the main estuary downstream was not observed up in the Branch. Compared to last year, there was an increase in algal abundance and a decrease in water clarity. The sampling trip in April occurred after two wet months leading to exceedance of the turbidity guideline value by a moderate amount, but other exceedances were minor.

### Estuary description

The tidal zone of The Branch River extends to slightly south of the Branch Lane, and discharges into the wider Karuah Estuary and ultimately into the north western corner of Port Stephens Estuary. The estuary is bounded by substantial areas of mangrove and saltmarsh habitats. The Branch is used as a nursery for juvenile oyster production, whilst landuse within The Branch Estuary is largely grazing lands for beef production and rural lifestyle living.

Figure 18: Boats on the Branch





# Management Actions occurring across the Local Government Area



## Southern Estuaries Coastal Management Program – Stage 1

The MidCoast contains many iconic and highly valued estuaries, including the largest coastal lake system in NSW. The southern estuaries include Wallis Lake, Smiths Lake, Myall Lakes, Khappinghat Creek, Black Head Lagoon and the northern foreshores of Port Stephens (including Karuah River, North Arm Cove and Kore Kore Creek), and their contributing catchments.

MidCoast Council is partnering with the community to develop a coastal management program to protect the health of these southern estuaries. The program will identify and manage the social, economic, cultural and environmental values of our waterways.

This coastal area provides stunning natural environments, areas of cultural significance, a multitude of social and recreational benefits for local communities and visitors and is a key contributor to the regional economy. However, the coastal zone is facing increasing pressure from environmental stressors, population growth, urban development, and climate change.

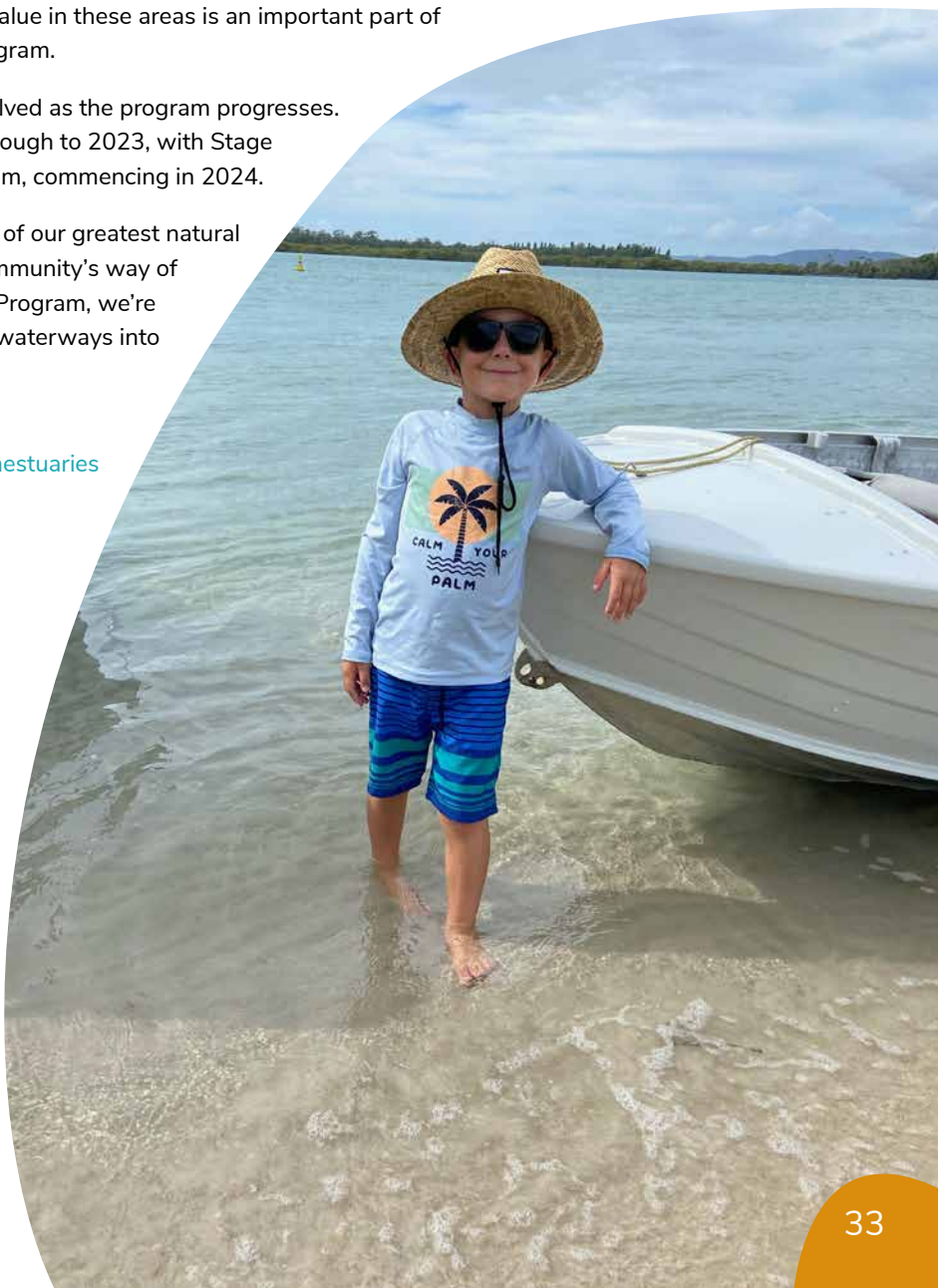
The development of a coastal management program takes place in five stages. During 2022 extensive work was done on stage one to develop a scoping study to help set the direction for the rest of the program. A range of community members, special interest groups, the indigenous community and key stakeholders and delivery partners were consulted throughout the process through community surveys, event days and workshops. Determining how our community uses our waterways, the areas of the estuaries they visit and what they value in these areas is an important part of preparing the coastal management program.

The community will continue to be involved as the program progresses. Stages 2 – 4 of the program will run through to 2023, with Stage five, the 10 year implementation program, commencing in 2024.

Our southern lakes and rivers are some of our greatest natural assets and an important part of our community's way of life. Through the Coastal Management Program, we're planning to sustain the health of these waterways into the future.

For more information you can visit  
[www.midcoast.nsw.gov.au/oursouthernestuaries](http://www.midcoast.nsw.gov.au/oursouthernestuaries)

Figure 19: The Southern Estuaries CMP will identify and protect the social, economic and environmental values of our estuaries.



# Management Actions occurring across the Local Government Area



## **Marine Estate Management Strategy: reducing the impacts from sediment and erosion on our marine estate**

The NSW Marine Estate Management Strategy (MEMS) is a 10-year program of works to coordinate and streamline the management of the 1750 kilometres of coastline, 826 beaches and 185 estuaries in New South Wales. In the MidCoast Council region, Hunter Local Land Services (HLLS) is implementing a large proportion of works on behalf of the NSW Government.

In 2019 MidCoast Council partnered with Hunter Local Land Services to implement Stage 1 of the MEMS in our region. This included a specific focus on protecting eroding riverbanks and reducing sediment and erosion from unsealed roads. Due to the success of this project Council is currently implementing the works associated with Stage 2 funding and negotiating to extend this work into Stage 3.

In Stage 1 \$866,000 from Hunter Local Land Services was matched with funding from MidCoast Council to create a \$2,000,000 project targeting 16 hotspots and upgrading some 5 kilometres of gravel road, creek approaches and drainage to reduce the impact of sediment from gravel roads on key oyster and commercial fishery areas in Wallis Lake and Port Stephens.

In The Branch River sub-catchment of the Karuah River, works were targeted on The Branch Lane, a 14-kilometre unsealed road which crosses the Branch River and its minor tributaries in multiple locations and regularly erodes during rain events, shedding sediment into the waterway. Sealing and upgrading of adjacent drainage on three significant crossings were targeted with this funding to mitigate these issues. Sealing of a 2-kilometre strip of this road all the way to the major crossing of The Branch River was also funded independently by Council to coincide and value-add to these works.

These works also value-added to the Karuah Catchment Grants Management Project which had also been undertaken in partnership with Hunter Local Land Services through the Marine Estate Management Program and targeted The Branch Sub-catchment. Together these projects provided a good model of tackling impacts on water quality in a sub-catchment by targeting both public and private land, as well as utilising multiple funding sources.

The Marine Estate Management Strategy also provided funding to address eroding riverbanks through this program, which contribute significant sediment and nutrients to the waterway. \$305,000 was provided through MEMS which in turn was matched by \$82,000 from MidCoast Council. Over 1150 metres of riverbank were rehabilitated in two key locations: Lower Wallamba River and the Lansdowne River. Not only have these projects reduced sediment from eroding riverbanks entering the waterways, they will also provide additional fish habitat and increase mangrove growth, while re-establishing the adjacent riparian corridor. The funding from MEMS also included a study of Pampoolah to identify sites at risk from future-erosion and develop actions to address this.

With works on these properties now complete, Council is managing follow-up weed control and planting on many of the participating properties on behalf of HLLS and the MEMS. As well as targeting key weeds, this project will give landholders the opportunity to learn from professional bush regenerators an increase their own capacity to sustainably manage weeds on their property into the future.

Stage 2 MEMS projects are focusing on reducing the impact of sediment and erosion from unsealed roads on the Marine Estate. Sites being improved through this stage of funding include North Arm Cove, as well as sites in the Wallis and Manning catchments. Unfortunately, consistent wet weather over the last 2 years combined with the impact of flooding on Council's Road Maintenance Program has significantly slowed down the delivery of these projects.

To address this limitation, Stage 3 projects – targeting upper Lansdowne and Manning River sites- are being undertaken by an external contractor and are expected to be completed towards the end of 2022.

# Management Actions occurring across the Local Government Area



## Management of Weeds throughout the Local Government area (LGA)

The weed biosecurity team manages weeds across the MidCoast LGA in line with State, regional and local management plans. These plans help dictate the importance of weed control dependent upon a weed's distribution and presence within a specified area. All regional priority aquatic species will be covered under the Hunter Regional Aquatic Eradication Strategy and the management plans of these aquatic species will follow the guidelines and recommendations under this Strategy.

The MidCoast LGA falls within the Biosecurity zone for alligator weed (*Alternanthera philoxoides*) so this species continues as a priority for weed biosecurity team. As a requirement for the zone all landowners and occupiers of the land are required to notify the local control authority (MidCoast Council) and implement effective management plans.

MidCoast Council continues to implement control and monitoring programs on Council assets and private land and work with landholders to ensure they meet the requirements of the biosecurity zone.

Long-leaf willow primrose (*Ludwigia longifolia*) has continued to be targeted throughout the MidCoast, with a focus on Rainbow Flat, Darawank, Failford, Tea Gardens and Cundletown. This species has been funded through a Local Land Services agreement to control weeds in fire impacted areas and reduce and minimise impacts on biodiversity by this plant in priority locations. The approach has been non-tenure based with an inspection program implemented on private landholders' properties. Education, assistance in treatment and capacity building to further manage this species was implemented throughout the inspection program. This will continue in the future with a focus on high priority areas.

Water lettuce (*Pistia stratiotes*) is also a weed species that has a high priority species and eradication goal. Current known sites in the MidCoast region that are undergoing treatment and monitoring are located at Old Bar, Wallabi Point and Oxley Island.



Figure 20: Long-leaf willow primrose (*Ludwigia longifolia*) is an ongoing target weed in the MidCoast



## Protecting and managing biodiversity

MidCoast Council's Biodiversity Framework is a roadmap for conserving natural heritage across the MidCoast region. It is a toolkit of Council actions and activities to maintain and enhance the condition and function of strategic assets and community priorities within the natural environment. By protecting and restoring biodiversity, we contribute to the quality of life of residents and visitors to our region and support the economy by enhancing nature-based tourism and primary production systems.

Biodiversity is a term used to describe the variety of living things in the environment. The MidCoast Region contains important biodiversity and natural assets and values.

The MidCoast community values our natural environment. "Our environment" is one of five (5) core values in the MidCoast Community Strategic Plan. Biodiversity is also of cultural value to local Aboriginal people through their enduring connection to Country.

Local government plays an important role in positive biodiversity protection and management. Council is a land use planning authority, a regulatory authority acting in the public interest and a land manager responsible for natural area reserves. It operates within a framework that recognises the principles of ecologically sustainable development.

# Management Actions occurring across the Local Government Area

The MidCoast Council Biodiversity Framework 2021-2030 was adopted in 2021 and identifies seventy-four (74) actions across themes of: Engagement and Partnerships, Reserves and Conservation Agreements, Land Management, Science and Knowledge, Strategic Planning and Policies and Land Use Planning and Development. It identifies a range of native plants and animals and threatened ecological communities that are a Council focus. This includes the koala, Manning River helmeted turtle, grey-crowned babbler, endemic ground orchids and littoral rainforest.

MidCoast Council has commenced the implementation of the Biodiversity Framework. Key projects that are being progressed include:

- Council has, together with the NSW Biodiversity Conservation Trust and Mid Coast 2 Tops Landcare Inc, supported the engagement of a Private Lands Conservation Officer. The Officer has delivered a series of biodiversity-related workshops, supported existing private land conservation agreement holders and facilitated new Land for Wildlife and conservation agreements.
- Council has continued to compile detailed vegetation community mapping for priority areas. Native vegetation maps are valuable for koala habitat and corridor mapping. At least 70,000-hectares of new vegetation mapping in priority areas during the reporting period.
- A Local Area Conservation Action Plan is nearing completion for the Hallidays Point locality. The Plan will contribute to the development of a Place Strategy for this fast-growing but environmentally significant locality.
- A program to map and describe regional priority wildlife corridors is being developed. The methodologies used in this mapping are being advised by expert researchers and government agency stakeholders.
- Council has established a Regional Partnership with the NSW Government to assist deliver outcomes of the NSW Koala Strategy. The project involves the funding of a Koala Project Officer and substantial funding support for actions such as habitat protection, habitat restoration, vehicle strike avoidance, community education and habitat mapping.



Figure 21: The Biodiversity Framework will assist in protecting the MidCoast environment, home to many threatened species including glossy black-cockatoos. Photo Peter Goonan



# Management Actions occurring across the Local Government Area



## Connecting water use with waterways

The majority of initiatives that have been implemented during the first year of MidCoast Council's Water Education Plan 2022-2026 have focused on raising community awareness and appreciation of the natural water sources that supply homes, businesses and public spaces across the region. This was identified as a key strategy for improving water literacy in the MidCoast after a 2021 Council survey revealed around 70 per cent of respondents couldn't accurately identify where their drinking water came from.

To address this lack of knowledge, a permanent graphic has been introduced at the top of customer water accounts that identifies which natural water source their water is derived from. These water accounts are distributed to more than 40,000 properties across the region and are potentially seen by a much larger number of people, as most properties in the MidCoast have more than one inhabitant.

Stainless steel plaques have also been installed on outdoor showers at beaches across the MidCoast. These plaques identify the natural water source the shower is connected to and encourage users to only use what they need.

Fridge magnets and 'dunny door' posters have also been handed out at water-related events and engagements to further raise awareness of where people's water comes from.

By connecting the water that flows from taps and showers with the rivers and aquifers that feed them, the seemingly abstract and intangible concept of water becomes tied to a physical location that is recognised and valued. This is likely to lead to more conscious water use and inspire a greater sense of responsibility for preserving the health and functionality of our natural water sources.

Figure 22: Bootawa Dam provides drinking water for many residents in the MidCoast.





# Management Actions occurring across the Local Government Area



## MidCoast citizen scientists on the hunt for aquatic fauna

Citizen scientists in the MidCoast region participated in two eDNA projects to celebrate National Science Week, held this year from 13th – 21st August.

National Science Week is Australia's annual celebration of science and technology. It promotes science pursuits among the general public, and encourages younger people to become fascinated by the world we live in.

eDNA is a new technology which is revolutionising how we learn about our natural environment. Water samples collected from rivers and streams are analysed to identify strands of DNA left behind by animals in the water, which can then be identified using sophisticated analysis.

In the Manning River catchment, citizen scientists from local schools, scouts, community groups and Aboriginal Rangers collected eDNA samples, which were sent to the University of Canberra for analysis.

Leading eDNA researchers, Dr. Elise Furlan and Dr. Jessica Tout-Lyon, presented the eDNA results at a Science Week webinar held on Tuesday 16th August, which was attended by over 50 participants. The surveys provided valuable data on animal diversity in local creeks and rivers, with 40 native animal species detected. Freshwater eels were detected across many sites along with freshwater fish such as gudgeons, gobies, perchlets and mullet. The surveys detected the Lesueur's frog, many species of birds and mammals such as brushtail possums, gliders, bandicoots and the bentwing bat. Platypus were found in Moorall Creek, Bulga Creek, Gloucester River and Dingo Creek. There is a strong history of platypus within the Manning region, however community and scientists alike have had concern for the impacts of the drought and bushfires on local populations. It is fantastic that this community program has revealed a snapshot of the platypus' distribution. Two pest animal species were identified, the feral pig and feral deer.

This project was the result of a partnership between the Manning River Turtle Group and MidCoast Council, with funding assistance from an Australian Government National Science Week Grant. You can find out more by watching the Webinar [here](#).

On Wednesday 18th August, another group of budding young scientists from Booral, Stroud and Stroud Road public schools had an exciting day at Riverwood Downs to learn about the wildlife that uses the Karuah River Catchment.

Students collected eDNA for future analysis and used dipnets to catch waterbugs, which are indicators of water quality and ecosystem health. They found that the water in the Karuah River was of good quality and supported a diversity of waterbugs including species that are sensitive to pollution.

These projects enabled the MidCoast community to participate in eDNA monitoring and interact with scientists at the leading edge of their profession. The results will be used to inform future management and engagement activities. They will form a baseline so that Council can work with the community to detect changes in the condition of our rivers and streams and take action to protect and enhance local biodiversity.

Figure 23: eDNA workshop at Knorrit Flat as part of Science Week celebrations.



# Management Actions occurring across the Local Government Area



## Protecting endangered Shorebirds

During the summer, beaches in our area, particularly at Winda Woppa, Harrington and Farquhar, are visited by shorebirds looking for suitable sites to nest and raise their chicks.

These include three endangered shorebirds, the red-capped plover, Australian pied oystercatcher and little tern.

They lay their eggs above the high tide line on open expanses of beach. A number of other shorebirds migrate from the northern hemisphere with the express purpose of putting on weight. An example is the critically endangered eastern curlew.

The Aleutian tern migrates from the subarctic region and was first recorded at Farquhar in 2018. Since then avid birdwatchers have travelled to see Aleutian terns in an area where they had never been seen before. This visitor spending helps to boost our local economy.

Threats to beach nesting shorebirds include illegal four-wheel drive (4WD) activity, uncontrolled domestic dogs and people walking through nesting areas. Foxes are a major threat able to destroy multiple nests per evening.

Management activities consist of fox control, installing temporary fencing and signage around nesting sites, public education and restricting 4WDs and dogs within fenced nesting areas.

The 2021-22 nesting season saw minimal success with a small number of pied oystercatcher chicks fledged. The numbers of little terns fledged was zero. While threats such as 4WDs and interference by people have largely been addressed via education and enforcement, bait shy foxes and natural avian predation account for the high mortality rates.

Council is working with project partners including TIDE (Taree Indigenous Development and Employment), Hunter Local Lands Services, Crown Lands, volunteers, BirdLife, NPWS and Department of Planning and Environment as well as researchers at the University of Newcastle and the University of Sydney to develop innovative solutions to protect these endangered bird species. Other measures include improving coastal saltmarsh habitat by controlling weeds. Targeted weeding of affected sites within the Manning estuary includes Oyster Creek, Charlies Island, Harrington Wetlands, and Cabbage Tree Island. Forster sites include Goodwin and Cockatoo Islands.



Figure 24: Endangered shorebird nests need to be protected during the summer, as they lay on the open sand. This nest belongs to a pied oystercatcher.

# Management Actions occurring across the Local Government Area



## Greening Strategy

Council has adopted a Greening Strategy to manage and enhance tree canopy cover and green spaces across the region with a focus on urban areas. The strategy sets out a forward-thinking plan of action that prioritises specific locations according to what is needed.

To get the most effective outcomes over the large MidCoast area, the strategy focuses on five key principles and actions. These are:

- Cooling our urban areas
- Keeping what we have
- Building partnerships
- Right trees in the right place
- Planning for the future

Work has begun around the LGA to implement the actions laid out in the strategy.

As part of developing the Greening Strategy, the need for targeted vegetation management was identified and a Vegetation Management Policy was adopted. This will contribute to:

- Conserving significant ecological values by maintaining key habitats and linking corridors to enable fauna movement
- Preserving landscape character e.g. the 'leafy' character that some locations are renowned for.
- Mapping was done to identify the target areas, and a simple three step application process was developed and included in the Vegetation Management Policy.



Figure 25: MidCoast Council's Greening Strategy aims to manage and enhance tree canopy cover and green spaces across the region, with a focus on urban areas.



## Drinking water education in schools

COVID-19 restrictions limited MidCoast Council's ability to visit schools over the last few years, with Whizzy unable to do his usual tour of the region's preschools and primary schools during National Water Week.

He was however able to perform his first visit in nearly two years in March 2022 when he entertained and educated the children at Big Childcare Pacific Palms. We also conducted a one-off presentation at St Joseph's Primary School, Gloucester, where members of our water and education teams taught the students about the water cycle, water resilience, and smart meter technology, which had just been installed at the school.

Also, in June 2022, a Year 12 chemistry class from St Clare's High School, Taree visited the Bootawa Water Treatment Plant for an excursion which received very positive feedback from the accompanying teacher.



Figure 26: Whizzy is back visiting local schools post COVID.



# Management Actions - Manning Catchment



## Strategic plans in place to protect the Manning River and its estuary

The Manning River (Djarri Bila) is the lifeblood of our community. From the mountains to the sea, (Balgarr-abirang-Gurrwa-gu), freshwater to saltwater (Bathu-garibang-Girambit-gu) - the river connects our landscape and our community.

In July 2021, Council adopted the Manning River Estuary and Catchment Management Program, a 10-year, whole-of catchment program to protect water quality and ecosystem health in this mighty river. The program contains 36 actions to promote stewardship, restore coastal wetlands and riverbank habitats, remediate acid sulfate soils, prepare for climate change, conserve biodiversity and engage the Aboriginal community in custodianship of the river.

The plan was developed by Council's Natural Systems team with strong collaboration from a Community Reference group and a Technical Advisory Group, as well as input from farmers, the Biripi community, special interest groups and delivery partners.

Implementation of 24 of the 36 actions has commenced, helping to protect and enhance the environmental, social and economic values of the river and its tributaries.

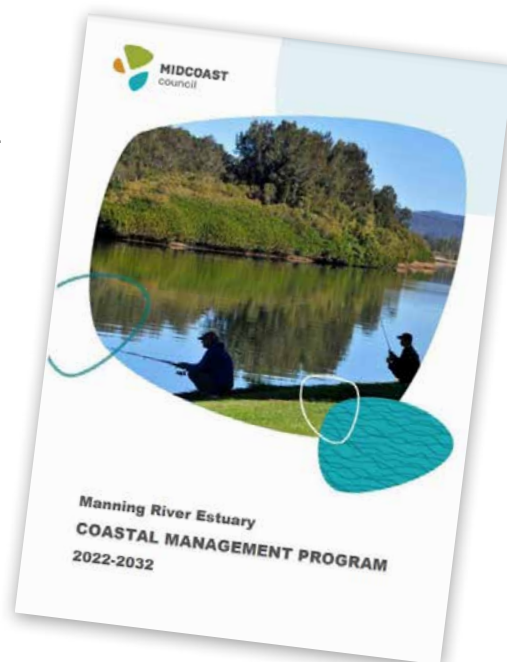


Figure 27: The Manning River CMP will set the strategic direction for management and protection of the waterway for the next 10 years.



## River Revival restoring refuge pools for Manning River wildlife

In the Manning catchment, freshwater aquatic species include the Manning River helmeted turtle, spiny crayfish, and platypus. Streams and their freshwater refuge pools play a key role in supporting biodiversity.

Council's Natural Systems team received two grants to improve the resilience of these precious habitats. The NSW Environmental Trust provided \$169,340 to restore fauna refuge pools and the Australian Government contributed \$143,500 to assist Manning River turtle habitat recovery after the Black Summer fires. Council's co-contribution of \$69,860 from the Environmental Rate helped secure the grants.

The projects were coordinated concurrently under the banner "River Revival" and aimed to protect and restore a network of refuge pools and associated riparian zones in the Nowendoc, Barnard and Dingo River catchments working in partnership with landholders. To date the projects have delivered 6 community workshops attended by 69 participants and a RiverWatch program involving 9 volunteers to monitor water quality. Council has partnered with landholders at 6 properties with agreements in place to restore 4.6 km of riverbank covering 15 hectares. The restored network of refuge pools and riparian habitat will enhance the resilience of aquatic fauna to climate change stressors.

The success of the grant applications depended on strong collaboration and support from the Manning River Turtle Steering Group – a committee of agencies and community groups including the Manning River Turtle Group, Hunter Local Land Services and MidCoast 2 Tops Landcare that meet regularly to conserve this much-loved icon of the Manning River.

The project was identified during development of the Manning River Estuary and Catchment Management Program in response to community concern about the impact of drought and fire on aquatic wildlife in the river.

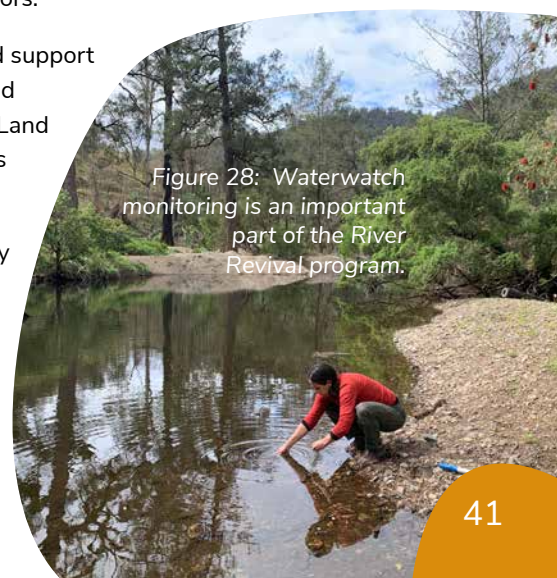


Figure 28: Waterwatch monitoring is an important part of the River Revival program.

# Management Actions - Manning Catchment



## Prioritising Coastal Wetlands on the Manning River

The Manning River is the only dual entrance river system in the Southern Hemisphere. It divides into two creating multiple entrances; one at the coastal town of Harrington and the second 8 kilometres south at the township of Old Bar.

The environment in both estuaries are characterised by large sandbars intersected by channels and islands surrounded by mudflats covered with saltmarsh and mangroves. These coastal wetland areas are unique and support a variety of endangered shorebirds, including internationally significant populations of Eastern curlew, sanderling, Pacific golden plover and double-banded plover.

Council in partnership with Local Land Services recently received grant funding to undertake remediation works to maintain and improve coastal saltmarsh habitat through targeted bush regeneration to benefit eastern curlews and other wildlife. The bush regeneration work also aims to minimise the impact of vegetation encroachment from weeds like spiny rush and bitou bush which limit the availability of roosting and feeding habitat for migratory shorebirds and other species.

Work is being undertaken at identified priority sites including 7.4 hectares of saltmarsh in Oyster Creek and 0.7 hectares at Charles Island.

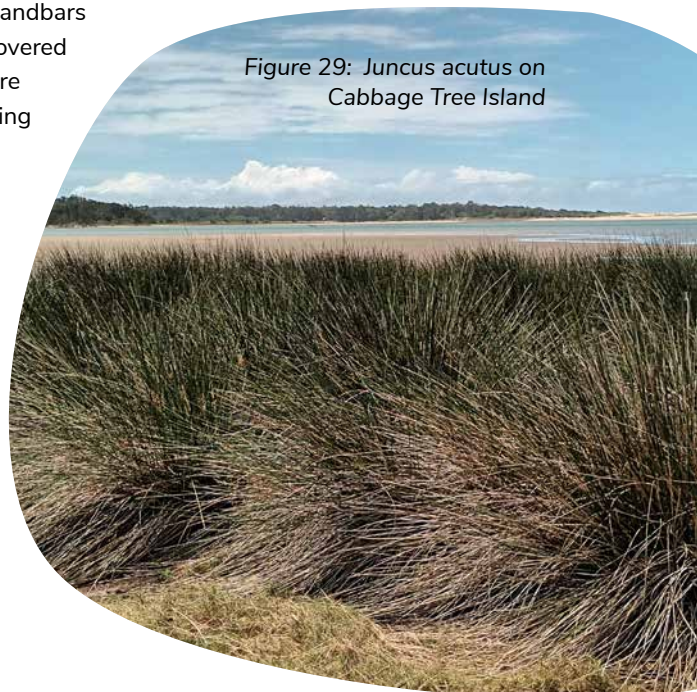


Figure 29: *Juncus acutus* on Cabbage Tree Island



## Restoring our bush reserves

MidCoast Council is responsible for the management of a large and diverse range of natural areas including public reserves along the Manning. These reserves provide an array of ecosystem services and contain large assemblages of flora and fauna, including threatened species and endangered ecological communities.

Natural Systems is currently implementing a comprehensive program of works with the assistance of government funding value adding to the Environmental Rate, specialised bush regeneration contractors, and Landcare volunteers to protect and restore the natural values and ecosystem functions of over 70 natural area reserves.

Works include:

- Primary, secondary and tertiary weeding
- Management of feral pest animals
- Flora and fauna surveys
- Threatened species management
- Planting of native species
- Litter and marine debris management
- Installation of nesting boxes

These works help to improve the condition of native vegetation across sensitive landscapes, increase the habitat for native wildlife and aid in the recovery of these important ecosystems.



# Management Actions - Manning Catchment



## Threatened species and visitors return to Cattai Wetlands

Once a farming property, the restoration of Cattai Wetlands began in 2004 after Council acquired the land to address acid sulfate runoff polluting the Manning River estuary and impacting estuarine flora and fauna, oyster production and fishery productivity. The site was officially opened to the public in 2013 following the construction of visitor facilities.

Today Cattai provides a sanctuary for local wildlife including kangaroos and threatened species such as the koala and giant dragonfly. It is also home to over 180 bird species including the comb-crested jacana, a threatened waterbird. Cattai Wetlands is their southernmost breeding site in New South Wales. After several tough years for the wetland which included an extended drought and the 2019 bushfires which devastated the site, the wetlands are showing signs of recovery including the return of the jacana.

During January 2022 at least two clutches of jacanas were successful, with a juvenile fledgling recorded at the site in mid-January and hatchlings observed at the end of January.

In addition, a barking owl was seen at the site for only the second time during 2022, a threatened species it is an important visitor to Cattai. These are great outcomes and highlights the importance of protecting wetland sites for wildlife.

Cattai Wetlands are open every day for the public to enjoy and hosts a number of marked walking trails, boardwalks and viewing platforms including a state-of-the-art bird hide. It is the return of bird species like the jacana and barking owl that has seen Cattai recognised internationally as a birdwatching hotspot with both local and international tourists visiting regularly. A total of 7,589 people visited the site in 2021, with a noticeable drop in regular numbers due to the flooding in March. However, with the removal of COVID restrictions numbers are increasing again with over 1,100 visiting the wetlands in January 2022 alone.

**With the influx of visitors to the site it is important that ongoing weed management and bush regeneration takes place. This is even more important as the site was heavily burned during the 2019/20 fires.**

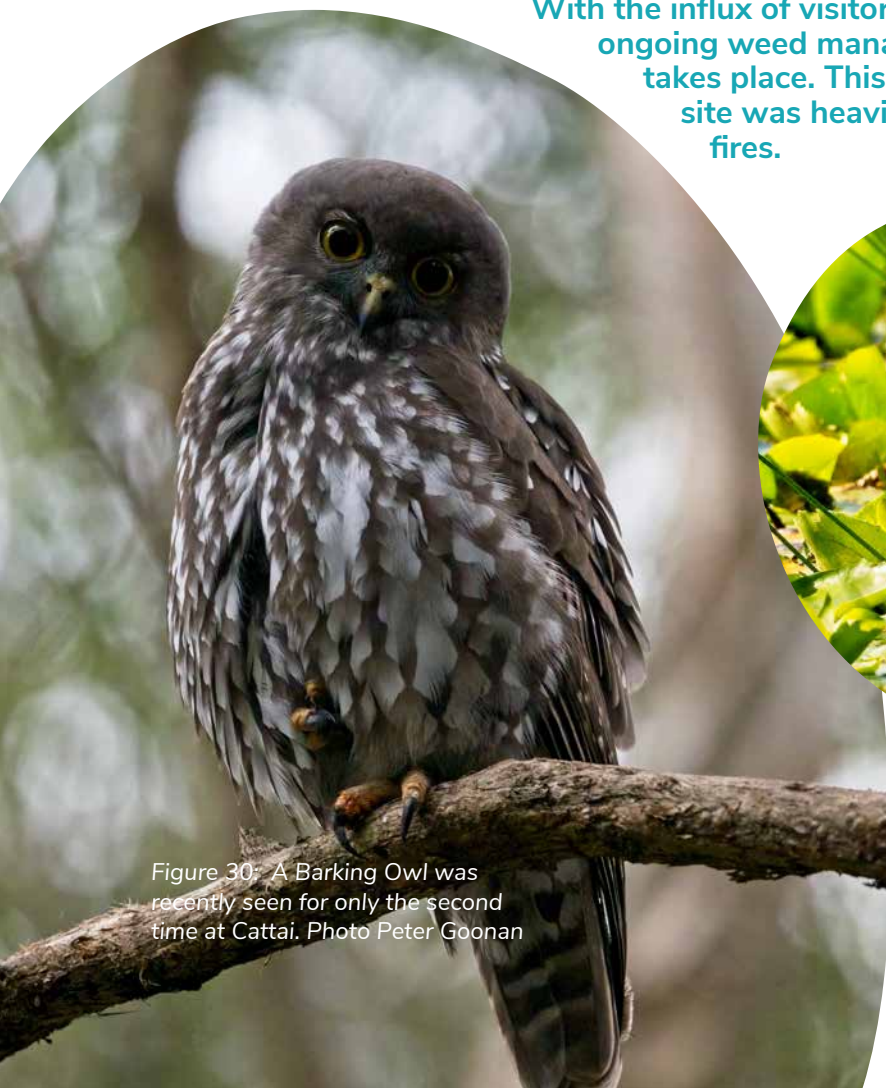


Figure 30: A Barking Owl was recently seen for only the second time at Cattai. Photo Peter Goonan



Figure 31: Male Jacana and his eggs which successfully hatched in 2022. Photo Erin Masters

## Management Actions - Manning Catchment

Some of the canopy cover of trees survived the initial fire, however it has been greatly reduced in the period since. As such weed species have flourished in the areas that were severely burnt, particularly vine weeds such as coastal morning glory along the fringes of the lagoon as well as the banks of Cooperbrook Creek.

In response to the weed explosion, contractors have been assisting Council staff in removing the vine weeds from the canopy as well as those strangling native regeneration from creating a canopy. Seedling regrowth of camphor laurels and groundsel bush has also been targeted by staff and contractors during the recent wet weather in which weed density has flourished.

In response to the habitat loss caused by the 2019 bushfire event, watering stations were temporarily installed post fire and more recently nest boxes have been strategically placed to provide nesting and roosting habitat for birds, mammals and bats.

Cattai Wetlands is supported by the Environmental Rate and is a great example of the fantastic work Council is doing to conserve and rehabilitate our natural areas for the benefit of both the community and the environment!



### The importance of Oyster Reef Restoration

Over the last few years, the Natural Systems team have been working with Hunter Local Land Services and researchers from the University of Sunshine Coast to investigate oyster reefs, their importance to fish populations and potential locations for oyster reef restoration in the Wallis Lake and Manning River estuaries.

Shellfish or oyster reefs occur naturally in estuaries and they create important habitat for fish and other species, and also help prevent erosion. The Wallis Lake and Manning River estuaries are systems where declines in shellfish reef extent and condition have been previously documented as contributing towards the decline in fisheries. Oyster reef restoration has been identified as an important part of estuarine management not only in MidCoast systems but throughout NSW.

Researcher Ben Gilby and his team have spent several years studying our local systems. They began by undertaking mapping of remnant shellfish reefs in the region and identified a good abundance of sites in both Wallis Lake and the Manning River. Following the mapping exercise, field surveys were undertaken, and region wide and habitat specific analysis was completed.

Restoration models were created utilising the data from the surveys to look at areas where habitat restoration would be most beneficial as well as to prioritise works in the Wallis Lake system. This information will be utilised by MidCoast Council and Local Land Services to plan and implement management actions and create the best environmental outcomes for our local estuaries.

Figure 32: Mangrove regenerating amongst the newly installed oyster reef





# Management Actions - Manning Catchment



## Connecting kids across catchments, exploring our freshwater streams

During 2022 the Natural Systems team brought together students from Harrington and Bobin Public Schools to undertake macroinvertebrate studies in Dingo Creek. The Manning Catchment Management Program identified stewardship and creating a culture of custodianship as important for the health of the Manning River. Instilling a love for the environment with our youngest generations through excursions like this assist in this goal.

Macroinvertebrates or water bugs can be found in freshwater streams. They are an indicator of waterway health and an important form of sustenance for platypus, the Manning River helmeted turtle and other species.

Over 50 students were treated to a presentation about catchments, the importance of protecting water quality in the upper catchment, upper catchment effects on estuaries and threatened species in our waterways. Following this they travelled down to Millers Crossing and undertook a macroinvertebrate dip-netting exercise, where they found species such as stonefly nymph, mayfly nymph and whirligig beetles indicating high quality water in Dingo Creek.

Students from Harrington Public School travelled to Bobin allowing them a great opportunity to see an area in the upper catchment away from the coast and experience a vastly different environment to what they are used to. While for the Bobin students it was an opportunity to meet students from a larger school and see how different it is.

This excursion is part of Natural Systems ongoing program to engage with schools on water quality and biodiversity issues. The program aims to build knowledge and excitement in the children and provide materials and support for teachers for ongoing class work in the coming years.

Figure 34: Students searching for bugs by Dingo Creek



Figure 33: Environmental Officer Erin Masters talking with the kids about platypus and Manning River turtle



# Management Actions - Manning Catchment



## Going Wild in Gloucester

The inaugural Gloucester Wild festival, a celebration of the amazing environment, biodiversity and threatened species that call the Gloucester region home, saw the community turning out in large numbers to attend events.

Australia is home to more than 500,000 animal and plant species, many of which are found nowhere else in the world. In NSW there are close to 1000 species at risk of extinction, 116 of which are located in the Gloucester region.

MidCoast Council partnered with a number of government organisations and community groups to create a festival full of fun events, to allow the community to learn more about the local environment and participate in a variety of fun hands-on activities. They were able to hear from scientific experts working in the region, plant trees for habitat and undertake field investigations to look for threatened species. The event was a way to celebrate the passionate conservationists, researchers, volunteers, and experts in the Gloucester community and their work to protect the biodiversity of the area.

The festival involved a number of community events including Copeland Tops Twilight Tours, Creating Koala Habitat workshop, Frog ID workshop, Rainforest Regeneration event, Habitat Planting Day, Bushwalking Basics, Birds and their habitats workshop, Wildlife Activity Trail, Koala Capers tour, Manning River Turtle Nest ID workshop and concluded with a family friendly festival in Billabong Park.

The festival was hosted to coincide with National Biodiversity Month and National Threatened Species Day.

Over the period of the festival more than 500 people were directly engaged through attendance at events, with many more seeing the connections in the township of Gloucester itself. With such great success from all our events we hope to continue to grow the festival and find new opportunities to engage with the Gloucester community in 2023.

The project was a joint initiative between MidCoast Council and NSW National Parks and Wildlife Service, in collaboration with Aus Eco Solutions, Aussie Ark, Australian Museum, Birdlife Australia, Gloucester Business Chamber, Gloucester Environment Group, Hunter Local Land Services, Manning River Turtle Group and Mid Coast 2 Tops Landcare.



Figure 35: Testing out the FrogID app along Copeland Creek at the Frog ID Workshop



Figure 36: Community members getting their hands dirty at the habitat tree planting day



# Management Actions - Manning Catchment



## Littoral Rainforests – Manning

Littoral rainforests are rainforest stands which occur near the sea and are subject to maritime influence. An estimated 60 to 90 per cent of littoral rainforest has been lost in NSW since European settlement. Urban development and past coastal sandmining are major contributors to that loss. Current threats include continued clearing, coastal development, weeds, fragmentation effects and visitor disturbance.

Disturbance to, or loss of littoral rainforest is likely to increase due to climate change and associated sea level rise. For these reasons littoral rainforest is listed as a Critically Endangered Ecological Community under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and an Endangered Ecological Community under the NSW Biodiversity Conservation Act 2016.

Council currently supports bush regeneration projects being undertaken by volunteer groups on public land such as the Manning Coast Care groups, being Harrington Coast Care, Manning Point Dune Care, Old Bar Dune Care, Wallabi Coast Care, Diamond Beach Dune Care and the Hallidays Point groups. Sites that don't have community groups looking after them such as Crowdy Head, are cared for by specialist rainforest regenerators and spray contractors. These contractors also assist with the technical and 'heavy lifting' of weed control works, or rope access works on the sea cliffs at Redhead and Blackhead, which are beyond the scope of the volunteers.

In prioritising stands of littoral rainforest for restoration planning purposes, the following criteria are applied:

- Parts of stand are in low or moderate condition
- Restoration works are feasible, e.g. where previous works have been successfully undertaken
- Dunecare / Landcare groups are active and ongoing support is required
- Stand not at risk of loss due to sea level rise, or stand is within an area targeted for sea level rise mitigation works



Figure 37: Littoral Rainforest area following primary weed removal.

# Management Actions - Manning Catchment



## Hidden Gem, Bungay Reserve-Wingham

Restoration works have commenced recently within a forgotten 'hidden gem' at Bungay Reserve in Wingham.

Tucked away at the end of Rosella Drive with frontage to Bungay Road and Finch Close, it is roughly 15 hectares in size and forms the north arm of Cemetery Gully.

Council, along with two local bush regenerators, have joined forces to tackle the weed infestation that has festered on this site for many years. The usual perpetrators of lantana, small-leaved privet and all forms of asparagus weed prevail, especially along the creek line, and extremely large Indian hawthorn are also scattered throughout the landscape. Camphor laurel appears to be have been treated in the past with dead stumps lining the current treatment area and the occasional re-suckering stumps.

Local residents regularly report observing koalas and wallabies free ranging within the reserve. Council deployed a number of motion sensing cameras earlier in the year which detected numerous swamp and red-necked wallabies, koalas, echidnas, bandicoots and unfortunately foxes.

Once primary weeding of the site has been completed, koala food trees will be planted with the assistance of Koalas in Care in some of the open areas created from weed control along the banks of the creek line.

Funding for these restoration works is currently provided by Council's Environmental Rate.

Figure 38: Small leaf Fig (*Ficus obliqua*) battles through the understorey sea of lantana at Bungay Reserve.

Figure 39: Large koala moving between food trees in Bungay Reserve.





# Management Actions - Manning Catchment



## Managing Weeds in the Manning

Ongoing weed management and control is constantly in place in the Manning Catchment to help protect the natural environment.

Cats claw creeper (*Dolichandra unguis-cati*), African olive (*Olea europea subsp. cuspidata*) and green cestrum (*Cestrum parqui*) are target species in the Manning Catchment with control of these species being funded through a Local Land Services agreement to control weeds in fire impacted areas and reduce and minimise impacts on biodiversity.

Currently there is one known historic infestation of kidney leaf mud plantain (*Heteranthera reniformis*) in the MidCoast LGA located at Berrico Creek. MidCoast has continued inspections on the entirety of Berrico Creek, across private properties to assess its distribution and perform control works. During the inspection program, a dramatic reduction of kidney leaf mud plantain has been observed.

Tropical soda apple (TSA) (*Solanum viarum*) continues to be one of MidCoast Council's main priority weeds. TSA is under a Control Order that has recently been renewed, effective until 2027 where it will be reevaluated based on the weed's abundance across the State. This Control Order allows for eradication works to continue as effectively from our LGA. This year several landowners and managers have entered into an agreement with Council to further the eradication efforts of TSA. Due to unfavourable weather conditions, inspection and treatment programs continue to be affected.

Further to all of this, DPI have provided information to Council regarding cattle sales from properties with known infestations of TSA dating back to over 10 years. These traceback inspections help to identify potential risks of TSA moving between properties as a result of cattle movements and as a result, have helped the Weeds Biosecurity team to locate a new infestation on a property with had traded cattle from a property that had been identified as having TSA present. These inspections and monitoring and control works will continue until landowners and managers can effectively eradicate TSA from the land.

MidCoast Council's annual Senegal tea plant (*Gymnocoronis spilanthoides*) control program has been severely impacted due to weather conditions, such as flooding events, high river levels and inaccessibility. However, the control program is scheduled for continuation in Spring 2022 weather permitting and recommencing the biannual weed control program in 2023.



## Looking after the locals

It has been another big year of collaborative efforts in the realms of research and habitat management for the iconic Manning River turtle. This species has an ancient lineage dating back tens of millions of years and is found only in the mid to upper sections of the Manning River catchment.



Figure 40: MidCoast Council is working with partners and community to help protect the Manning River helmeted turtle. Photo Gary Stephenson

# Management Actions - Manning Catchment



## Nest protection

Representatives of Hunter Local Land Services, Forestry Corporation, MidCoast Council, Aus Eco Solutions and the Manning River Turtle Group participated in a workshop delivered by Canines for Wildlife on strategies for identifying and protecting turtle nest sites. Canines for Wildlife have extensive experience in nest surveys and protection operations for the closely related Bells turtle, which occurs on the NSW Northern Tablelands. Increasing the knowledge of where nests are in the catchment will be a big step forward in protecting the Manning River turtle population. In November 2022, Council and partners ran a nest awareness event for the community and shared resources and videos on social media. An expert turtle ecologist will also be conducting Manning River turtle field surveys during this time and any nests detected will be protected and monitored.



Figure 41: Community is an important part of protecting Manning River Turtle nests. A number of workshops have been held and youtube video created to help the community get involved.



## Predator Control

Hunter Local Land Services, with the support of MidCoast Council, is delivering a sub-regional scale feral pig control initiative throughout parts of the Manning River catchment. The program responds to observations of large, breeding populations of feral pigs in landscapes known to be important for Manning River turtles and recognises the agricultural and wider environmental impacts of these pest animals. The program has utilised a team of pest control experts to deliver strategic controls, based on pig observations and the results of camera monitoring. Nearly 300 animals have been removed from the treatment areas. Feral pigs damage the banks of turtle habitat and are expected to be significant predators of eggs in nests.



Figure 42: Foxes can destroy turtle nests, digging through the sand to eat the eggs.



## Habitat enhancement through the River Revival project

The River Revival program began in the Nowendoc River, Dingo Creek and Barnard River catchments in 2021-2022 in efforts to protect deep refuge pools in local rivers. These deeper pools are prime habitat for species such as Manning River turtle and the iconic platypus. It is these deeper pools that species retreat to during the drought to survive. The focus of this project is to improve water quality by using management techniques like stock exclusion fencing, riparian restoration and weed control. The aim is to build ecosystem function in and around refuge pools so that species like the turtle have a better chance of long-term survival. Council has partnered with landholders at six (6) properties, with agreements in place to restore 4.6-kilometres of riverbank covering 15 hectares. The restored network of refuge pools and riparian habitat will enhance the resilience of aquatic fauna to climate change stress. This project is funded by the NSW Environmental Trust and an Australian Government bushfire grant.



# Management Actions - Manning Catchment



## eDNA primer developed

Researchers from Charles Sturt University and the University of Canberra have worked with the support of Aussie Ark and the One Million Turtles program to develop a primer so that the presence of the Manning River turtle can be detected using eDNA water sampling. Council, using funding from an Australian Government bushfire grant, commissioned the work. Ecologists are scheduled to begin the latest round of surveying for turtles in November 2022. Their work will primarily involve snorkelling surveys. At the same time, eDNA sampling methods will be deployed to measure how effectively eDNA surveys are for detecting Manning River turtle presence.



## RiverWatch

The RiverWatch water monitoring program is in its second year after a successful pilot in the Nowendoc River sub catchment. The program has been expanded to the Dingo Creek and Barnard River systems. Aus Eco Solutions have been engaged to coordinate the program under a NSW Environmental Trust grant. There have been 7 community volunteers and 18 participants trained at workshops in Bobin and Upper Lansdowne. This has been a great opportunity for citizens to contribute directly to science and be involved in a long-term health check of our waterways while also enjoying and benefiting from being in nature.



Figure 43: Cells River in the Nowendoc Catchment is an important part of the Riverwatch program.



## Using drones to plant trees for koalas

Almost 80% of the Crowdy Bay 'Area of Regional Koala Significance' (ARKS) was affected by the 2019 bushfires including 1,700 hectares of land contained within the Cattai and Big Swamp Wetlands. The wetland provides important habitat for the local koala population. Despite the obvious loss of koala habitat, surveys using specialist detection dogs in October 2020 revealed that koalas still persisted in isolated pockets of the reserve and along reserve boundaries.

With a grant secured through the Australian Government's Bushfire Recovery for Wildlife and their Habitats Program, together with funding from Council's Environmental Rate, an innovative project was commenced to help koala recovery and their ability to move across the landscape.

After the fires, Council's nursery staff started collecting seed from the local Swamp Mahogany (*Eucalyptus robusta*) which is a preferred koala feed tree. Contractors were engaged to use aerial drone technology to reseed the fire affected wetlands with the Swamp Mahogany.

The seeds are put into special pods designed to give them the best chance of growth by accounting for local soil conditions such as soil acidity. The applicator pods are dispersed when the drones fly over the targeted areas. Using more traditional planting techniques in these areas is currently impossible due to the excessive amount of tree fall following the bushfires which has impeded access to the site.



Figure 44: Utilising new technologies is increasing habitat for a number of threatened species including koalas



# Management Actions - Khappinghat Catchment



## Eradicating Plume Poppy

The new and emerging species plume poppy has been detected in peri-urban rural residential land, as well as adjacent high-value conservation assets including National Park and Council bushland reserve.

In response to a customer request in January 2021, a specimen of the potentially invasive plume poppy (*Bocconia frutescens*) was detected at Rainbow flat near Taree. The incursion appears to be the result of seed bank dispersed from a horticultural plant from private property, that has germinated after a significant bushfire disturbance in 2019.

The infestations are the first recorded occurrence of the species in NSW. Plume poppy has been recorded as being a highly invasive weed of disturbed areas in tropical and subtropical regions throughout the world, most notably in Hawaii and Jamaica, and is the catalyst to the rapid response in the MidCoast area.

The project is strongly aligned to the Australian Weed Strategy, NSW invasive species plan 2018-2021, New South Wales Weed Action Program 2020-2025, Hunter Regional Weeds Committees' 'New Weed Incursion and Rapid Response Plan (2017-2022)', and the various plans and strategies of MidCoast Council including community strategic plan and DPOP. Effective response to new and emerging species is the highest priority and the main objective to weed biosecurity management in the present day.

Councils rapid response to the management of this weed has been an outstanding success and has resulted in the project being accepted for presentation to national and international delegates at the 22nd Australasian Weeds Conference in Adelaide in September 2022 and further nominated for LGNSW Excellence in the Environment Awards 2022 for December 2022.

This project demonstrates the response of the local control authority (MidCoast Council) in carrying out an effective identification, eradication and education program in the area where an incursion of a novel weed species to NSW was detected.

A cross-tenure collaborative management approach was undertaken, involving cooperation with stakeholders including local community landholders, National Parks and Wildlife Services and volunteer groups working on Council land. The implementation of a rapid response process was recorded in the context of managing the plume poppy incursions, and the efficacy of the initial control is documented through ongoing monitoring of the distribution of the target species.

This case study illustrates the importance of community engagement in enhancing the early detection capabilities of biosecurity agencies, as well as the importance of community cooperation in the ongoing detection and control of an invasive species during an eradication program.



Figure 45: Eradicating plume poppy in the MidCoast is important for protecting the biodiversity of the region.



# Management Actions - Khappinghat Catchment



## Khappinghat Kiwarrak Reserve

Located in the Khappinghat Catchment, the Kiwarrak Wilderness Reserve is a 26-hectare parcel of Council land, which adjoins Khappinghat Nature Reserve at Rainbow Flat. The Nature Reserve is of ecological significance and contains five threatened flora species as well as 15 threatened fauna species. Because of this it is imperative that the reserve be maintained in a stable ecological state to allow for movement and additional habitat not only for these species but also other native flora and fauna.

The reserve was first surveyed for weed species in November of 2012 and at that time only lantana was recorded to be of concern. Weed management was undertaken on site however surveys in 2019 revealed an extensive infestation of asparagus fern had made its way onto the site (possibly spread by birds from neighbouring gardens). Council subsequently undertook additional weed control on both lantana and asparagus with a special focus on control measures for asparagus fern. Since those control measures were implemented the entire reserve system was intensely burnt during the 2019 bush fires. As the site recovers, ongoing management of the reserve will continue to provide habitat for wildlife and ecosystem services such as water quality protection within the catchment. Since the 2019 wildfire, regeneration of both weed and native species has been extremely slow, previous infestations of ground asparagus have not regrown and show no visible signs of life. Due to the open nature of the riparian zones, following the fires, the recent flood in March 2021 has shifted the focus of weed control to controlling a notorious riparian weed known as Blue Billygoat Weed.



Figure 46: Blue billygoat weed is a target species in Kiwarrak Wilderness Reserve

# Management Actions - Wallis Lake



## Stabilising banks for waterway protection

MidCoast Council have continued to partner with Local Land Services to implement actions to improve water quality and fish habitat in the lower Wallamba River. New areas of oyster shell and hardwood timber restoration works have continued, protecting the riverbanks from erosion. This year, works have been hampered significantly by the continual wet weather impacting on access to sites.

The restoration works have been focussed on Gereeba Island in the Wallamba River and Council are partnering with the oyster industry to use discarded shell from their production process. Works have utilised a combination of logs, oysters and mangroves to stabilise eroding foreshore areas.



Figure 47: Riverbank restoration works on the Wallamba River.



## Water sensitive urban design

Healthy waterways protect the biodiversity of our aquatic ecosystems, and the health of our waterways also impacts on our community and our economy, for example, fishing, oyster growing and tourism.

Preventing pollutants such as sediments, nutrients, petrochemicals and heavy metals from being washed into our rivers and lakes is important. Managing the impacts of development is one of the ways we do this.

All new developments with the potential to impact the quality of stormwater are required to install water quality treatments such as raingardens, water tanks and swales to help filter nutrients and sediment out of stormwater. For large developments like subdivisions, there must be no new impacts on our waterways.

Since 2015, 35 large subdivisions have achieved the 'no new impact' target. Last year, 24 large developments including subdivisions, commercial, industrial and multi dwellings were assessed.

Small scale, infill developments, such as single dwellings located in the southern region, must include water sensitive design controls that protect our sensitive lake systems from nutrients and sediments.

Since 2015, 947 new houses were required to include water sensitive design controls. As a result of managing the impacts of development, an estimated 304 kilograms of total nitrogen, 33 kilograms of total phosphorous and 15 tonnes of sediment is prevented from being washed into our waterways each year.



Figure 48: Applying water sensitive urban design to new development



# Management Actions - Wallis Lake



## Oyster Restoration

Over the last few years, the Natural Systems team have been working with Hunter Local Land Services and researchers from the University of Sunshine Coast to investigate oyster reefs, their importance to fish populations and potential locations for oyster reef restoration in the Wallis Lake and Manning River estuaries.

Shellfish or oyster reefs occur naturally in estuaries and they create important habitat for fish and other species, they can also help prevent erosion. Wallis Lake and Manning River estuaries are systems where declines in shellfish reef extent and condition have previously been documented. These declines in reef extent and condition have been implicated as contributing towards fisheries declines and oyster reef restoration has been identified as an important part of estuarine management not only in MidCoast systems but throughout NSW.

Researchers from the University of Sunshine Coast have spent several years studying our local systems, they began by undertaking mapping of remnant shellfish reefs in the region and identified a good abundance of sites in both Wallis Lake and Manning River. Following the mapping exercise field surveys were undertaken and region wide and habitat specific analysis was completed.

Utilising the data from the surveys restoration models were created to look at areas where habitat restoration would be most beneficial as well as to prioritise works in the Wallis Lake system. This information will be utilised by MidCoast Council and Local Land Services to plan and implement management actions and create the best environmental outcomes for our local estuaries.



Figure 49: Restored Oyster Reef on the Wallamba River.



## Little Street Gross Pollutant Trap upgrade

Wallis Lake is a nationally significant estuary with high ecological values, a thriving tourism industry and productive fishery and oyster industries.

In order to protect the lake from litter and other pollutants a Gross Pollutant Trap (GPT) has been installed on the Foreshore in Little Street. An audit of our devices in 2019 showed that increased population and tourism pressures means that the current GPT is no longer operating at the necessary capacity. Work is currently underway to upgrade the GPT to ensure that more gross pollutants and sediments are being effectively trapped within the device.

During 2021/22 an Aboriginal Heritage Assessment was undertaken on the site, to ensure that the heritage of the area is protected and the upgrade to the GPT will not have an impact.

This assessment is now complete, and the upgraded device will be installed during 2023, protecting our lake for years to come.



Figure 50: Aboriginal Heritage Assessment at Little Street, Forster.



# Management Actions - Wallis Lake



## Restoring bushland on Wallis Lake Foreshore

MidCoast Council is responsible for the management of a large and diverse array of natural areas within the Wallis Lake Catchment that provide important water quality functions and habitat for many native species, including numerous threatened species. These lands are all impacted to some extent through the invasion of weeds that compete with and degrade native vegetation.

The purpose of MidCoast Council's Wallis Foreshore Bush Regeneration Program is to:

- Maintain and improve bushland condition on Wallis Lake Foreshore reserves at Coomba Aquatic Gardens, Coomba Foreshore, Burraneer Road area and at Pacific Palms through targeted weed control (for priority species) and bush regeneration activities; and
- Provide Bushland Volunteers with mentoring, on-ground training and education in the areas of best practice bush regeneration techniques and ecological restoration methodologies at these sites:

### Palms Wetland, Elizabeth Beach

Since 2015, bush regeneration contractors have assisted the local Landcare group to restore bushland around the Palms Wetland in Elizabeth Beach, methodically treating weeds in the forest as well as along the foreshore to Talanbar Point. Restoring the natural vegetation in this wetland provides a filter pollutants washing off of urban landscapes protecting some of the most pristine parts of Wallis Lake. Unfortunately, recent wet weather has favoured an explosion in vine weeds such as Coastal Morning Glory along the foreshore strip.

Bush regeneration contractors have been battling dense infestations of Madeira vine at Gogerley Hill for several years and have made significant progress managing this outbreak.

Along the foreshore bush regenerators have been focusing their efforts on controlling Asparagus Fern, vine weeds and 'garden escapees' from garden dumping and exotic plantings.

### Coomba Foreshore

Bush regeneration works to support the Landcare group at Coomba Aquatic Gardens commenced in 2011. The works have progressed along the foreshore at Coomba, extending up into Burraneer Wetlands.

Weeds encountered include Asparagus Fern, Morning Glory, Madeira Vine, Japanese Honeysuckle, Senna as well as Lantana, Bitou Bush, Camphour Laurel and Privet.

### Burraneer Complex

In 2014, the Burraneer Complex, including Wendys Forest site was added to the bush restoration program to:

- Improve bushland resilience and saltmarsh condition through bush regeneration methods.
- Improve foreshore stability and vegetation health and function via restoration of ecosystems in the project area, with the overall aim to protect water quality in Wallis Lake.
- To reduce the density and cover of target weed species in this area, with particular attention on the 'vines and scramblers' group of weeds that dominated this area.

This important works program has been predominately funded from MidCoast Council's Environmental Rate and supported by the NSW Government through its Environmental Trust.



Figure 51: Community and contractors have been involved in regeneration works at the Pacific Palms Wetland.



Figure 52: Removing morning glory in Coomba reserves.

# Management Actions - Wallis Lake



## Managing Feral Species

Feral species such as foxes compete with native species for food and resources. Native wildlife in the Lower Wallamba area has benefitted from multiple fox control programs run in 2022.

The program targeted areas in Darawank as well as the Halliday's Point Wastewater Treatment Plant and Council lands on the Nabiac Borefield. A targeted fox trapping program around Aerodrome Road, Nabiac and the Halliday's Point Wastewater Treatment saw a major decrease in fox activity based on the results and observations in 2021.

Fox activity was low and only 1 adult fox was controlled during the 2-week program. On-going control actions are necessary to ensure predator numbers remain low for the benefit of the many native fauna species found in these areas, including threatened species such as the long-nosed potoroo and the eastern-chestnut mouse.



Figure 53: Monitoring fox dens is an important part of feral animal control.



## Protecting wildlife habitat in Forster Reserves

Forster's southern urban area, including Council Reserves and bushland on private land, are important for a wide variety of endangered species including squirrel gliders, masked and powerful owls. A number of these reserves were affected by bushfires in 2019 and the project aims to connect these areas with other suitable habitat to aid in the conservation of local biodiversity.

Maintenance bush regeneration works have continued within the Forster reserves with the aim to improve the condition of 53-hectares of important bushland reserves stretching from Golden Ponds, The Southern Parkway and through to the Karloo Street Reserve.

These reserves were heavily impacted by the 2019 bushfires and as such the germination of weeds species very high across all sites. Intensive on-ground works are being undertaken to try to manage these weeds and allow regeneration of native species to occur.

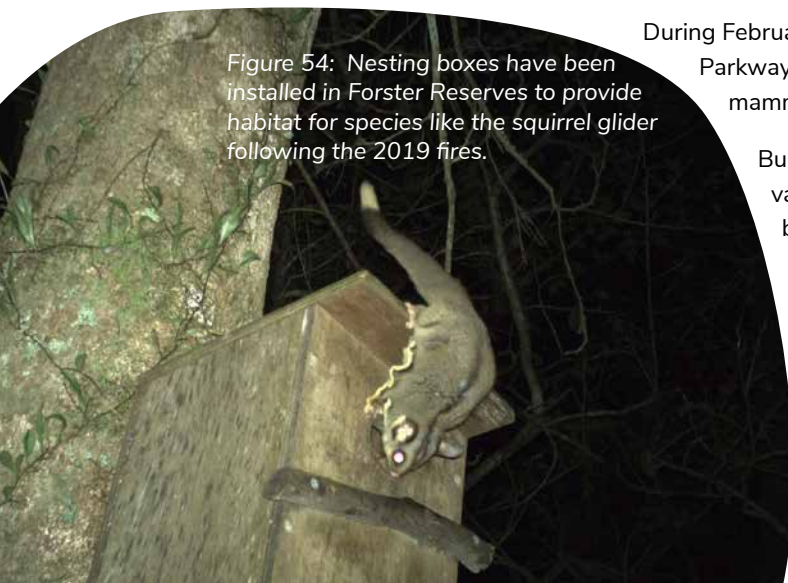
Unfortunately access to some of the reserves has been significantly hampered in 2021-22 with the on-going wet weather in the period waterlogging many low-lying areas, restricting access and also bringing in weed propagules from surrounding areas. Despite the setbacks, restoration actions are generally positive and natural regeneration of native species has been promising.

On-going maintenance bush regeneration works funded through MidCoast Council's Environment Rate continue to improve the quality and habitat values of these bushland reserves and the surrounding catchment.

During February 2022, glider poles were installed on the Southern Parkway to help threatened squirrel gliders and other gliding mammals cross between the Forster Reserves.

Bushland in Zamia Place and Hesper Drive is home to a variety of gliding mammals. Sadly, the 2019 bushfires badly affected these reserves, forcing some animals to increase their movement between patches of habitat and putting them in danger from roads and other urban threats. Fauna crossings give gliders a safer way to move between areas of bushland.

Figure 54: Nesting boxes have been installed in Forster Reserves to provide habitat for species like the squirrel glider following the 2019 fires.





# Management Actions - Wallis Lake

The crossing is especially important for squirrel gliders, which are threatened with extinction and listed as a vulnerable species in NSW. They travel between 300 to 500 metres from their nest looking for food.

Squirrel gliders usually occur in small family groups, comprising of a male, one or two females and their dependent offspring.

The fauna crossing was funded thanks to a NSW State Government grant, under the Bushfire Affected Coastal Waterways Program.

Engaging the community to help protect these reserves is important and during May a tree planting day was held with a focus on improving habitat connectivity for local species with over 300 trees and shrubs suited to the local environment to be planted. These plants can be utilised as an important foraging and nesting resource for native wildlife as they mature.

During the morning approximately 25 children from Great Lakes Childcare attended to learn more about the endangered species and get their hands dirty planting and mulching trees.

In the afternoon 10 community members attended to complete the planting, and six months on the trees are well established and growing well.



## Community Engagement on the Lake

The Marine and Catchment Discovery Series are free and informative events designed to give the community an insight into our unique waterways, the animals that live there and great tips on what you can do to protect these beautiful natural resources.

During May 2022, a Lake Cruise was held as part of the Marine Discovery Program.

Traveling on local boat “Free Spirit” attendees were introduced to several current research and history programs being operated on the lake. Industry locals including retired commercial fisherman Jim Elliott, oyster farmer Steve Verdich and tourism operator Peter Mannow provided oral histories of their time on the lake, changes over time and effects of environmental changes.

Local Land Services provided information on research and improvement programs currently being undertaken in partnership with Council. Additionally, Councils Natural Systems team provided a presentation on the Waterway and Catchment Report Card and the Southern Estuaries Coastal Management Program.

The day was incredibly well received with 50 community members attending.

These events were supported by the NSW Government through Local Land Services and its Coasts and Estuaries Program, MidCoast 2 Tops and Karuah Great Lakes Landcare and MidCoast Council's Environmental Rate.

Figure 56: Tree planting to improve habitat for threatened species.



Figure 55: Wallis Lake Cruise with the community.





# Management Actions - Wallis Lake



## Sponges

The seagrass and algal meadows of Wallis and Smiths Lakes are identified as a hotspot for a diversity of marine sponges. Very little is known about the sponges in coastal lakes and lagoons but recent studies suggest there are at least 20 species of sponges associated with seagrass and algal meadows in NSW coastal lakes and lagoons. 10 of which have been recorded in Wallis Lake over the years, and the majority likely to be new to science.

In partnership with scientists from the Universities of Wollongong and Western Australia, MidCoast Council has been involved in regularly monitoring the sponges of Wallis and Smiths Lake since 2009. This data adds to the previous research conducted by the Universities since 2002 and provides a valuable long-term data set to identify the diversity of sponges present in our waterways and possible impacts from development and environmental conditions such as drought, floods and fire.

A full report has been prepared following further monitoring during the summer of 2021/22. Since monitoring began in 2002 11 species of sponges have been recorded in Wallis Lake. The abundance and distribution of these species is variable and further detail can be found on our website in the report.

Figure 57: Sponges in Wallis Lake.



# Management Actions - Smiths Lake



## Threatened Species

The bushland reserves at Smiths Lake are important areas of habitat for a number of threatened fauna species. Recent surveys have detected the arboreal and NSW listed vulnerable species yellow-bellied and greater gliders. Both species require good quality vegetation and large hollow-bearing trees that are found within the local area. Other arboreal species known from Smiths Lake include the squirrel glider and brush-tailed phascogale. The reserves are also home to the powerful owl and masked owl which also require large hollows for nesting.

One of the key threats to these species is the loss of hollow bearing trees that provide shelter and nesting opportunities. They also provide habitat for a number of their preferred prey. This habitat is under threat due to loss, degradation and fragmentation of habitat and cumulative negative impacts associated with vegetation vandalism, urban encroachment, pest animals and invasive weeds. In order to protect these threatened species Council has acquired a number of reserves within Smiths Lake and are currently working on managing and protecting them.

To help protect threatened species in Smiths Lake, MidCoast Council has been successful in acquiring two Environmental Trust grants from the New South Wales Government.

The first project aims to support the yellow-bellied glider at Smiths Lake through the protection and enhancement of habitat for the species across 60 hectares of public reserves, this project will address the key threats through direct on-ground actions and community education.

To assist with the protection of yellow-bellied glider habitat a community engagement program titled 'Backyards for Biodiversity' will also be implemented. The program is designed to change understanding, attitudes and behaviour around the management of vegetation on private properties to minimise invasive weed spread into bushland and improve habitat connectivity for threatened species. Utilising behaviour change theory to assist in creating long term behaviour change, one-on-one education and citizen science projects will allow direct engagement with residents while community event days and educational materials will be targeted to the specific community to address their barriers to change and facilitate long lasting change for the local environment.

The projects will be run in tandem to improve habitat on both public and private land.



Figure 58: The project will restore habitat for the yellow-bellied glider.  
Photo - Peter Goonan



# Management Actions - Smiths Lake



## Smiths Lake Reserve Management

To protect the biodiversity in Smiths Lake reserves, bush regeneration contractors are undertaking targeted weed control works on a number of land parcels to reduce the density of environmentally damaging weeds within the reserves.

Additional works took place along with community education programs and access control works to protect the integrity of these important bushland reserves.

Since 2017, restoration works around Smiths Lake focussed on the foreshore reserve heading around to Tarbuck Bay in the south. The area from Patsys Flat to Debert Reserve was prioritised in order to support the bush regeneration efforts of the local Landcare group.

Since 2020, following the acquisition of the large areas of conservation land, work has continued along the foreshore strip and progressed to the Macwood Road and Paradise Road portions of these new reserves. These land parcels constitute significant habitat for threatened species such as yellow-bellied glider and masked owl that are known to reside in these reserves.

Lantana dominates the understorey within these land parcels and is being progressively controlled by MidCoast Council, whilst still maintaining habitat for birds and small mammals. Existing fire-trails are planned to be upgraded as funding becomes available as well as implementation of biodiversity and hazard reduction / controlled burns in the near future.



Figure 59: Smiths Lake reserves are home to a huge number of threatened species.



## Sponges

The seagrass and algal meadows of Wallis and Smiths Lakes are identified as a hotspot for a diversity of marine sponges. Very little is known about the sponges in coastal lakes and lagoons but recent studies suggest there are at least 20 species of sponges associated with seagrass and algal meadows in NSW coastal lakes and lagoons. 10 of which have been recorded in Wallis Lake over the years, and the majority likely to be new to science.

In partnership with scientists from the Universities of Wollongong and Western Australia, MidCoast Council has been involved in regularly monitoring the sponges of Wallis and Smiths Lake since 2009. This data adds to the previous research conducted by the Universities since 2002 and provides a valuable long-term data set to identify the diversity of sponges present in our waterways and possible impacts from development and environmental conditions such as drought, floods and fire.

A full report has been prepared following further monitoring during the summer of 2021/22. Since monitoring began in 2002, 4 species of sponges have been recorded in Smiths Lake, and 11 species of sponges have been recorded in Wallis Lake. The abundance and distribution of these species is variable and further detail can be found on our website in the report.

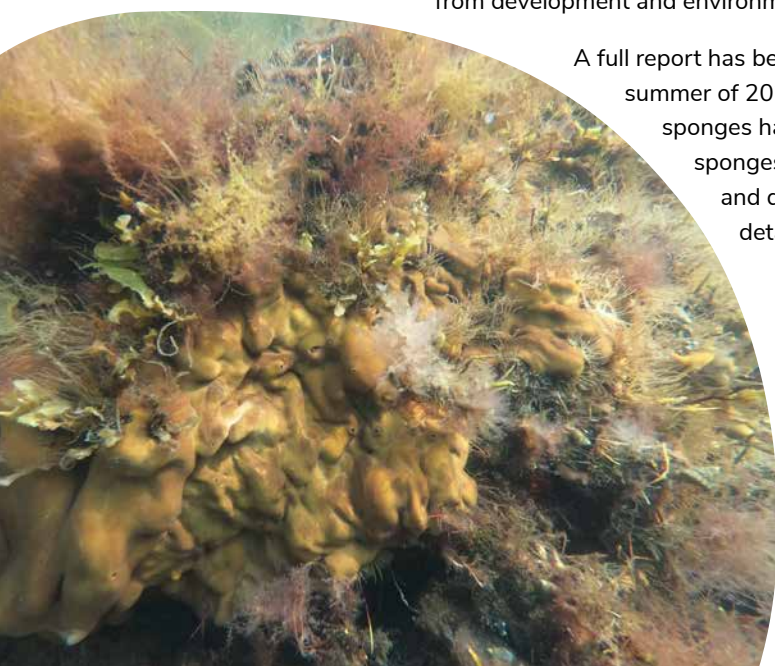


Figure 60: Sponge (*Chondrilla* cf. *australiensis*) found in Wallis Lake



# Management Actions - Myall Lakes



## Regenerating bushland in Myall Lakes and surrounds

MidCoast Council is responsible for the management of a large and diverse range of natural areas including significant areas of public reserves. These reserves provide an array of ecosystem services and contain large assemblages of flora and fauna, including threatened species and endangered ecological communities. The Natural Systems team is currently implementing a comprehensive program of on ground works involving bush regeneration contractors and Landcare volunteers. These works help to improve the condition of native vegetation across sensitive landscapes, increase the habitat for native wildlife and aid in the recovery of these important ecosystems. The aim is to protect and restore the natural values and ecosystem functions of natural area reserves in the Myall Lakes area. Works are being undertaken with the assistance of government funding, value adding to the environmental rate.

On ground works include:

- Primary, secondary and tertiary weeding
- Landcare/ Dune care assistance, mentoring and support.
- Management of feral pest animals
- Flora and fauna surveys
- Threatened species management
- Planting of native species
- Litter and marine debris management
- Installation of nesting boxes.

Active sites include Kore Kore Reserve, Viney Creek Road, Settlers Way Reserve, Jean Shaw Koala Reserve, Sanderling Avenue, Bennetts Beach, Jimmys Beach, Yaccaba Spit, The Boulevard, Winda Woppa Reserve and Esplanade Reserve North Arm Cove.



Figure 61: Kore Kore reserve has undergone intensive bush regeneration works over the last few years.



# Management Actions - Myall Lakes



## Conservation Partnerships – Myall River Catchment

Public conservation areas, such as National Parks and Nature Reserves, form the cornerstones of an effective natural area reserves system. However, protected and managed natural areas on private land also play very important supporting roles. Approximately 70% of the MidCoast region is privately-owned, and conservation across parts of these lands contributes significantly to ecosystem functions and important biodiversity conservation outcomes. Private land conservation also provides valuable social and economic contributions to the region.

There are several ways that landholders can participate in private land conservation. This can be through voluntary schemes such as Land for Wildlife or funded, in-perpetuity, binding schemes such as Conservation Agreements and Biodiversity Stewardship Agreements. MidCoast Council assists partnering agencies such as the NSW Biodiversity Conservation Trust and Mid Coast 2 Tops Landcare by encouraging new landholder participation in private land conservation schemes and supporting existing agreement holders with information, support and advice.

Private landholders often have a range of reasons for entering private land conservation agreements. These range from positive financial outcomes and support through to altruistic or legacy opportunities; that is, to make a positive contribution to the environment and / or to act as an active custodian or steward.

Across the MidCoast region, there are at least 96 Land for Wildlife properties and several thousand hectares of land that is permanently privately conserved.

The Myall River catchment has been a focus for Council engagement and encouragement of private land conservation. This is to improve the connectedness of the landscape, to safeguard the protection of ecosystem services functions, such as water quality protection for the Myall Lakes Ramsar Site and Crawford River domestic water supply, and to protect the habitat of focal species like the koala. Council is building on partnerships with Mid Coast 2 Tops Landcare Connection and the NSW Biodiversity Conservation Trust to improve the delivery and growth of Land for Wildlife and private land conservation schemes in the Myall River catchment.

One landholder has utilised the development incentive for conservation clause in the Great Lakes Local Environmental Plan to successfully establish a permanent conservation area on over 400-hectares of private land in the lower Myall. This conservation area complements and extends the area protected in Myall Lakes National Park and the Council Bulahdelah Plain Reserve. It contains known populations of threatened species such as the jabiru, long-nosed potoroo and squirrel glider.



Figure 62: Bulahdelah Plain Wetland is a biodiverse and important area in the Myall Catchment.



# Management Actions - Myall Lakes



## Myall Feral Species Control

Council's Bulahdelah Plain Wetland is home to a diverse range of fauna, a number of which are listed as threatened under NSW and Commonwealth legislation. Many of the ground dwelling species, particularly the long-nosed potoroo and New Holland mouse are under threat due to predation by the European red fox.

To reduce the pressure on threatened species, Council runs multiple fox control programs across the site and also on surrounding lands in collaboration with adjoining landholders. In 2022 one control program was implemented by an experienced contractor. The program utilised trapping methods and predator activity was extremely low compared to previous years, indicating that on-going control programs are starting to have an impact on the presence of feral animals at the wetland. Regular control of foxes when combined with habitat restoration and enhancement, is vital to protect local populations of native fauna in our natural bushland areas.



Figure 64: Feral animal control is undertaken in the Myall region to protect local wildlife



## Management of aquatic weeds – Myall Lakes

Salvinia (*Salvinia molesta*) is a historic problem within the MidCoast LGA and is now widespread and abundant. Salvinia forms thick mats that can quickly cover water bodies and infestations reduce water flow, degrade water quality, and affect native animals, stock, and recreational users.

To reduce the effects of Salvinia ongoing weed management work targeting the species is undertaken to protect our assets.

Dunshea's Drainage reserve located within Tea Gardens is impacted by Salvinia. Control works were undertaken in April 2022, prior to the works the weed covered approximately 85% of the waterway. By October the pond had approximately 40% coverage, a significant improvement. However another treatment will be required, and ongoing maintenance of the site will continue to protect the estuary downstream.



Figure 63: Salvinia is a target species in the Myall Catchment.



# Management Actions - Karuah and The Branch Estuary



## Karuah Catchment Management Grants Program: the importance of partnerships to protect the health of the river

Through an innovative partnership between local farmers, MidCoast Council, Hunter Local Land Services, Landcare Australia and Karuah Great Lakes Landcare, the Karuah-Borland Landcare Program is beginning the journey to improve the health of the Karuah River .

The health of a river is generally the culmination of the surrounding impacts that occur throughout its catchment. Things like unsealed roads, or impacts from clearing or agriculture, allow nutrients and sediment to slowly make their way across the land and through creeks to the river – in the Karuah catchment this includes the Branch and Karuah Rivers, into Port Stephens.

Healthy wetlands and native vegetation are essential for healthy rivers. Wetlands and vegetation corridors along riverbanks operate like the river's kidneys, filtering out these nutrients and sediment from the land, while also providing habitat for native species and serving as connecting corridors for these species to move through. Protecting these remaining wetlands and riparian corridors is a key part of restoring the health of the overall river.

Combining forces, Council, State Government and non-government groups have contributed over \$500,000 to this project. This funding is being matched by eight landholders through their own labour and cash contributions, to protect these vital habitats on their properties. Altogether, over 270 hectares of wetlands and 50 hectares of riparian vegetation will be secured on The Branch and Karuah Rivers.

Works such as fencing to manage cattle impact on wetlands and riparian vegetation as well as fragile riverbanks are a key part of the project. Internal fencing and provision of new water points allows the farmer more control over stock movement, as well as being able to get the most out of good pasture or areas that historically haven't been utilised by the cattle.

This project is a great example of multiple public agencies, non-profit organisations and the community coming together to solve big complex problems. Water quality and associated catchment health is too big a problem for the farmers to solve by themselves – they're busy enough running their own farms and businesses after all. Likewise, being private land, there's only so much government agencies can do.

The only way to address these issues and develop landscape-scale projects is by working together and sharing resources. For instance, on this project Hunter Local Land Services is committing funding from the NSW State Government's Marine Estate Management Strategy (MEMS) to reduce impacts from land on our marine estate. The projects associated with these eight neighbouring properties were bigger than our available budget so rather than reducing the scope of our project, LLS partnered with MidCoast Council and through them Landcare Australia to really make a difference.

Additionally, Landcare Australia and MidCoast Council have formalised a partnership to undertake a largescale catchment management project in the Karuah River Catchment. This partnership is built on the success of a previous project undertaken between the two parties: The Durness Landcare Project. The Karuah-Borland Landcare Project will improve wildlife habitat, water quality and agricultural productivity while implementing Council's Tops to Lakes program, linking these works with the previous Durness Landcare project on the edge of Myall Lakes Ramsar wetlands, all the way up to the greater Barrington Tops.



Figure 65: Landholders working together with MCC and LLS to help protect wetlands along the Karuah River

# Management Actions - Karuah and The Branch Estuary

The final stage of this specific project is to complete a large demonstration project on one particular property. As the project will be undertaken directly in the creek line, the ongoing wet weather has significantly slowed completion of this project.

The 8 landholders involved in the original project continue to meet, referring to themselves as the 'G8' and are keen to expand the project to other neighbouring properties. MCC and HLLS staff regularly meet with these landholders to assist them in expanding this group and improving water quality in the Branch sub-catchment.



## Beyond the Shed: Poultry industry project

Poultry (eggs, meat and turkeys) is MidCoast Council's biggest agricultural commodity – bigger than dairy or beef. If managed incorrectly these farms present a significant environmental risk to receiving waters such as the Karuah River.

Natural Systems staff have partnered with Local Land Services (LLS) along with funding through the NSW Environmental Trust to work with Poultry farmers around the Karuah River catchment to reduce environmental impact through the *Beyond the Shed* project. A key component of this project is working with farmers to fund (at a rate of 2:1) best-practice on ground projects on their properties. Projects to date have included riparian fencing; off-stream water or diverting roof water from nutrient-rich ranges.

The final stage of the project has been focusing on key demonstration projects:

- Improving management of daily bird mortalities is an issue that the industry has raised with Council and LLS. This issue has clear environmental and water quality implications and Council and LLS (with support from DPI) have been keen to fund demonstration projects to address this issue. Composting of these birds on-farm in a custom-built structure is seen as industry best practice, however, on an intensive poultry farm this sort of structure can require a Development Application (DA).

To help poultry farmers address this issue we're running a pilot with one keen farmer who is keen to get on the front foot and build a best-practice compost shed. A planning consultant has been hired to develop and submit a Development Application for the property, and the farmer will apply for funding through our project to support building the compost shed.

The consultant will use the materials from the development application, and the subsequent results of Council's assessment to also produce materials such as standard designs, factsheets and checklists to help streamline this process and make it as easy as possible for other farmers in the region to do the right thing.

- Poultry litter can be a great fertiliser or soil ameliorant when used in the right place. With so many local poultry farms our region has an opportunity to really capitalise on the market and demand for this product. A second demonstration project has been investigating the benefits of composting litter prior to application – such as reducing its bulk and thereby concentrating the nutrient availability, as well as creating a product that is less dispersible in water and therefore less likely to make its way into the river.
- This trial is currently being run on a local organic dairy farm – a potential market for this product. Mapping of the paddocks by drone and tracking changes over time in terms of pasture growth rate and soil health are all part of the trial, which will in turn be presented back to local poultry farmers.



Figure 66: The poultry industry have been working closely with MCC and LLS to prevent nutrients entering the Karuah Catchment.

# Management Actions - Karuah and The Branch Estuary



## Protection of habitats – Karuah River Catchment

The Karuah River catchment is recognised for its productivity, natural assets and popularity for nature-based recreation. The catchment contains features such as the nationally-significant Port Stephens estuary, important cultural and biodiversity sites as well as the Port Stephens – Great Lakes Marine Park and the biodiversity and recreationally-significant Barrington Tops National Park and Chichester State Forest.

Because of the range of landscapes, including coastlines, coastal wetlands, river valleys and sub-alpine ranges, the habitats that occur support a very rich biodiversity. The catchment contains important areas of koala habitat and a site of international importance for migratory shorebirds.

Fortunately, in comparison with many other landscapes of the MidCoast region, the Karuah River catchment were not as impacted by the severe bushfires in 2019. As such, the natural areas of the catchment provide a substantial habitat refuge for broader landscape scale biodiversity recovery.

Over the past year, the following programs have been implemented to support the protection of wetlands and important natural landscapes and the conservation of biodiversity in the Karuah River catchment:

- The NSW National Parks and Wildlife Service, with MidCoast Council and other partners, including community volunteers, worked collaboratively to protect an important nesting site of the little tern and pied oystercatcher in the Port Stephens estuary, including around the sandspits and islands associated with Corrie Island and Winda Woppa.
- Several private landholders have entered into conservation agreements and biodiversity stewardship site agreements which permanently conserve several hundreds of hectares of native vegetation and wildlife habitats. These agreements are facilitated by the NSW Biodiversity Conservation Trust ([www.bct.nsw.gov.au](http://www.bct.nsw.gov.au)) and encouraged by MidCoast Council and Mid Coast 2 Tops Landcare Connections Inc.
- MidCoast Council is developing a program to refine and prioritise a map of the locations of connecting habitats and wildlife corridors in the Karuah River catchment. The work is providing an excellent spatial basis for conservation and restoration prioritisation and was the focus of a peer-reviewed scientific journal article.

Figure 67: Lower Karuah Catchment.







**MIDCOAST**  
council

**2022**

# **WATERWAY AND CATCHMENT REPORT CARD**

Reporting on data November 2021 to April 2022



This project is funded by MidCoast Council's Environmental Rate and supported by the New South Wales Government through its Coast and Estuary Program and Department of Planning, Industry and Environment.



# MANNING RIVER ESTUARY

The Mid and Lower Manning River Estuaries have remained in good ecological condition, while the Upper Manning Estuary improved from fair to good. There was a general decrease in water clarity across the entire system due to continuous inflow of sediments from the catchments.

Farquhar Inlet was open to the ocean all summer and while its grade remained good, there was a reduction in water clarity that was likely caused by resuspension of the sandy shoals due to wind and surf conditions.

The Dawson River Estuary saw a drop in grade from good to fair due to reduced water clarity and increased algal levels. Similar results were observed in Browns Creek which also scored a fair grade in its first summer of monitoring.

An additional two new sites were added in tributaries of the lower estuary, one in the upper Lansdowne River Estuary and one in Ghinni Ghinni Creek. The Lansdowne River Estuary scored an inaugural grade of fair due to issues with water clarity, while Ghinni Ghinni Creek was observed to be in good ecological condition with a comparatively clear water column.

## KHAPPINGHAT ESTUARY

The Khappinghat Estuary improved from fair to good condition this year due to a decrease in algal growth. Salinity levels in the estuary were very low reflecting another wet summer which resulted in water clarity remaining fair.

The estuary appears to be recovering from the impacts from the bushfires in 2019-20. Algal levels decreased possibly due to less nutrients in runoff from the catchment due to regrowth of vegetation.

## KARUAH RIVER ESTUARY

The grade for the Karuah River Estuary dropped to fair this year driven by a significant increase in algal growth. Large, localised algal blooms were recorded on most sampling occasions. The Branch Estuary retained its good grade as it didn't experience the same increase in algal growth as the main estuary. However, there was a decrease in water clarity due to frequent runoff.

## MYALL LAKES

The grade for Myall Lakes remained in excellent condition this year.

Bombah Broadwater remained in good ecological condition despite a significant decrease in water clarity due to considerable runoff from the Myall River catchment.

The salinity of both systems was close to freshwater as a result of another very wet summer. For the first time in over a decade of monitoring, the average salinity was higher in Myall Lake than the Broadwater. This reflects the unique hydrology of Myall Lakes which have no major tributaries, only receiving runoff from the surrounding catchment.

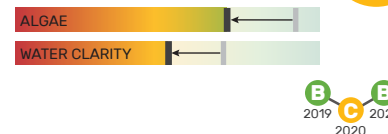
### Mid Manning Estuary



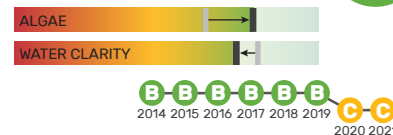
### Browns Creek



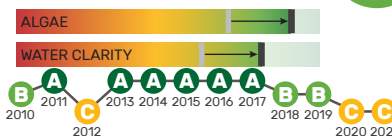
### Dawson River Estuary



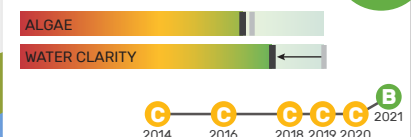
### Upper Manning Estuary



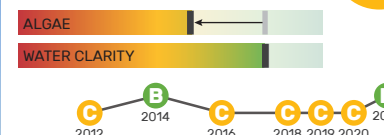
### Khappinghat Estuary



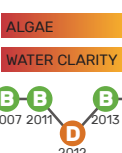
### The Branch Estuary

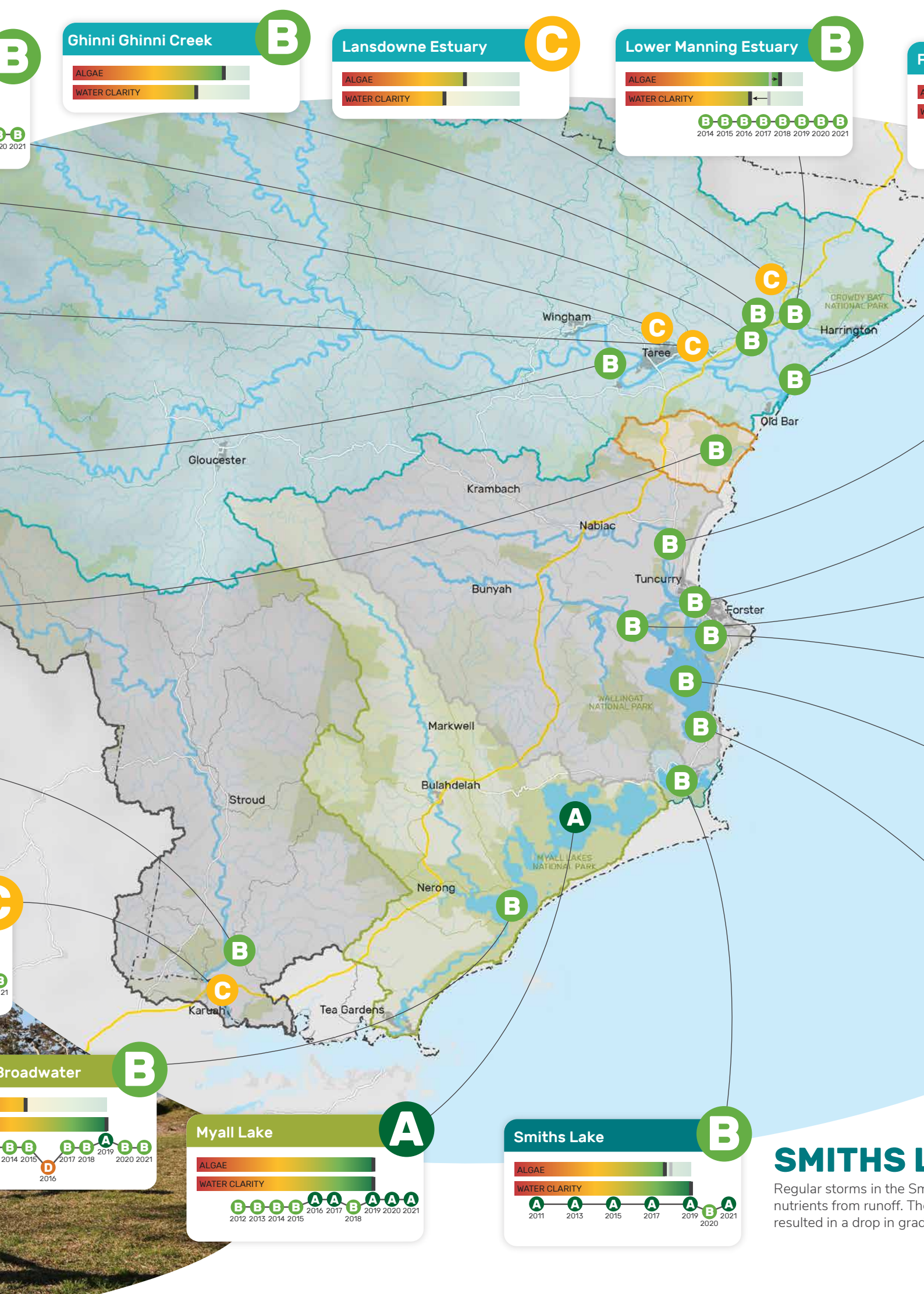


### Karuah Estuary



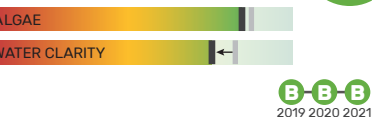
### Bombah Broadwater



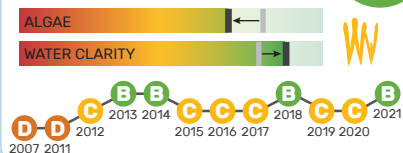




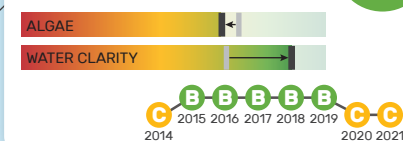
## Farquhar Inlet



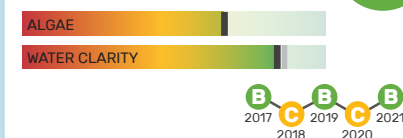
## Mid Wallamba Estuary



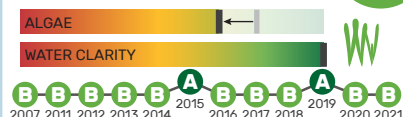
## Wallamba Cove



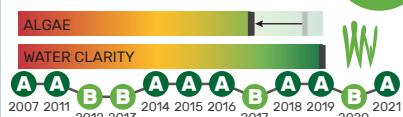
## Coolongolook Estuary



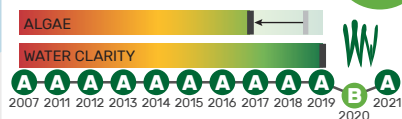
## Pipers Creek



## Wallis Lake



## Charlotte Bay



# WALLIS LAKE

Wallis Lake and Charlotte Bay both dropped to good this year due to higher algal growth during the summer. Pipers Creek retained its good grade.

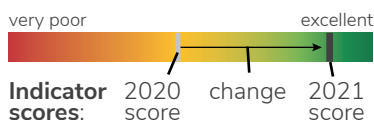
Mid Wallamba and Coolongolook Estuary retained their good grades. Water clarity was good but frequent runoff events delivered nutrients to the estuaries which fueled algal growth.

Wallamba Cove's grade improved from fair to good, despite frequent runoff over summer. Nutrient levels in runoff remain a problem driving algal growth in the estuary.

Seagrass depth range was reduced at all sites in Wallis Lake as runoff from frequent rainfall restricted the depth to which seagrass can grow.

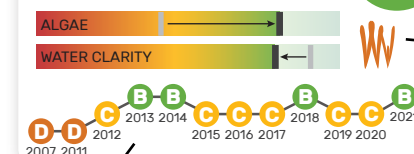


## ESTUARY SCORE KEY



**Overall grade:** This represents ecological condition, it is a combination of algae and water clarity scores.

## Estuary



## Seagrass depth range score:

The seagrass score indicates how deep the seagrass is growing and if the seagrass area is expanding or contracting. Where there are no seagrass results, no data was collected at these locations.

## Historical grades

For more details on the scientific methods and results contained in this Report Card (Waterway and Catchment Technical Report) [www.midcoast.nsw.gov.au/reportcard](http://www.midcoast.nsw.gov.au/reportcard)

# IMPACT OF CLIMATE ON 2022 WATER QUALITY RESULTS

Climate drivers influence our weather patterns and can cause extreme events, including floods, storms, droughts, high temperatures and bushfires. Rivers, wetlands and lakes are changing environments that are strongly influenced by local weather conditions and global climate cycles.

Rainfall along the NSW coast exhibits high variability and often fluctuates over two to five year timescales due to the influences of the El Niño–Southern Oscillation (ENSO) index.

In general, a sustained positive ENSO index (termed a La Niña event) results in above average winter–spring rainfall along the NSW coastline and higher likelihood of cyclone formation in the Coral Sea.

Increased rainfall means the water moving through the landscape will transport larger amounts of sediments and nutrients that can impact the water quality of our waterways.

## WHAT WERE THE CLIMATIC CONDITIONS IN 2022?

La Niña was in effect during the 2021–22 summer, which resulted in wetter than normal conditions. Rain events were recorded for approximately 58% of days during the sampling period, and total rainfall conditions saw 1100 mm in Whoota and 1276mm in Taree, both well above average. Similar trends were seen in rainfall data throughout the MidCoast Area.

## HOW DID WET CONDITIONS IMPACT THE RESULTS?

This year there were 20 monitoring sites, 17 of which had previously been sampled. The majority (9) of these maintained their grade from 2021, while five decreased their grade and just three improved their grade.

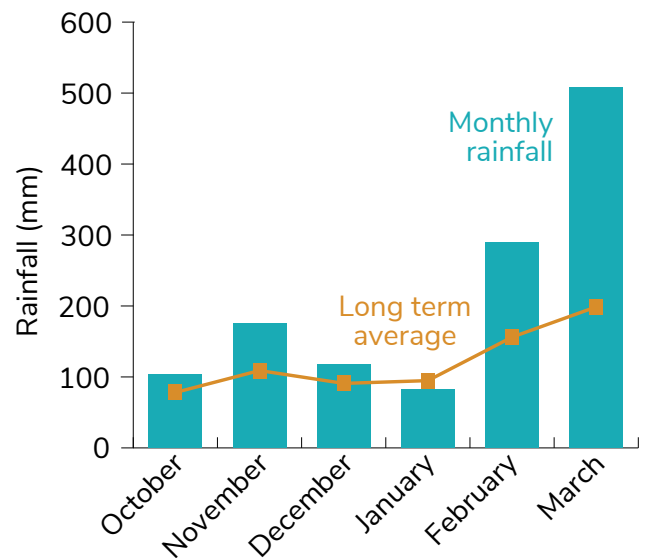
Algal growth amplified in response to more nutrients in the water brought by high rainfall, resulting in increased algal levels at 11 sites. High algae levels can have a detrimental impact on aquatic ecosystems particularly when algal blooms die and decay. Bacterial activity associated with this increased organic matter reduces oxygen levels in the water column, possibly leading to fish kills.

Water clarity decreased at many of the sample sites, impacted by increased sediment runoff due to high rainfall. Sediment in water reduces the light available to seagrass for growth and has the potential to smother seagrass, fish and other organisms.

While algal growth increased and water clarity decreased at many sites, the changes were small and therefore the majority of our estuaries were able to maintain their grade this year.

This shows the resilience of our estuaries and their ability to cope with extreme conditions over the short term. However, these results are also a reminder of how important it is to stay focused on the strategic priorities for managing our waterways. Especially as our climate continues to change and extreme events become more frequent.

Taree Airport monitoring station



Christine Price



# SETTING CLEAR DIRECTION FOR HEALTHY WATERWAYS

The waterways of the MidCoast connect our communities, they strengthen the MidCoast economy and provide social, cultural and recreational values that benefit the people that live, visit and work in the region.

Strategic management of our catchments and estuaries is important for protecting these values.



Mark Gutterson

## SOUTHERN ESTUARIES COASTAL MANAGEMENT PROGRAM

The Southern Estuaries of the MidCoast region include Wallis, Myall and Smiths Lakes, Karuah River, Black Head Lagoon, North Arm Cove and Khappinghat and Kore Kore Creeks. There has been a long history of planning, on ground action and review of strategic plans for these estuaries.

Building on this experience, Council are preparing a Coastal Management Program which will update the long-term strategy for the coordinated management of the Southern Estuaries. Stage one is complete, and the scope of the program has been set. Community input helped establish the values the program aims to protect and emerging issues and gaps in knowledge have been identified.

Council will continue to work with our community to prepare the program throughout 2023.

▶ To get involved with the project visit [www.midcoast.nsw.gov.au/oursouthernestuaries](http://www.midcoast.nsw.gov.au/oursouthernestuaries)

## MANNING RIVER ESTUARY AND CATCHMENT MANAGEMENT PROGRAM

The Manning River Estuary and Catchment Management Program (ECMP) aspires to protect and improve the ecological health of the Manning Estuary. The program was adopted by Council in July 2022 and takes a whole-of-catchment approach to address current and future risks.

The program contains 36 management actions grouped under 8 key objectives (see list below). High priorities include community engagement and education, supporting a transition to water resilient farming, restoring coastal wetlands and riverbank vegetation, and remediating acid sulfate soils.

An extract of the program relating to the coastal zone has been certified by the NSW Government under the Coastal Management Act 2016, giving the program legal weight and opportunities for funding. Implementation is now underway with 24 out of 36 actions in progress.

▶ To find out more about the Manning River CMP visit [www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

"The Manning River, its tributaries and the estuary give life to our community, connecting the mountains to the sea. Together we manage the catchment holistically and respond to a changing climate - safeguarding environmental, social, cultural and economic values."



### 1. STEWARDSHIP



### 2. WATER QUALITY AND ECOSYSTEM HEALTH



### 3. CLIMATE CHANGE



### 4. BIODIVERSITY



### 5. ABORIGINAL CUSTODIANSHIP



### 6. SOCIAL AND ECONOMIC VALUES



### 7. LAND USE PLANNING



### 8. GOVERNANCE