

What makes a healthy estuary?



EDMUNDS BAY



What makes a healthy estuary?

Healthy estuaries come in multiple shapes and sizes and with different scenic qualities. Within any one healthy estuary system, there will be a range of habitats that contribute to the diversity and robustness of the whole system.

Around Lake Macquarie, for instance, there are cliffs and rocky shorelines, muddy shorelines, deep open water with high wave energy, areas with a strong marine influence, areas with limited tidal circulation, areas of bare bed, densely vegetated seagrass meadows, mangroves, saltmarsh and creek deltas. The shallow protected waters of Edmunds Bay are one part of this diverse system.

Underlying ecosystem diversity, there are some fundamental characteristics that make a habitat ecologically healthy. Water quality that is suitable for natural ecosystems to function is particularly important, but other factors, including shading, competition from pest species, substrate erosion or deposition etc are also important. A healthy natural system is not static; rather it is able to adjust to a range of impacts, whilst still maintaining the capacity to return to a balanced condition.



Edmunds Bay
as viewed from
Blackalls Park

Indicators of a healthy estuary

WATERWAY HEALTH CRITERIA	Stable, well vegetated shorelines: mangrove, melaleuca and casuarina protect and shade the shoreline	Fish habitat and recreational fishing opportunities
HOW IS THIS DEMONSTRATED?	The roots of larger trees help to bind and stabilize the banks and the canopy provides shade to shallow nearshore waters, helping to moderate water temperature and diversify habitat. Mangrove pneumatophores (aerial roots) help to trap and stabilize sediment and also help to lift and aerate wrack that drifts onto the shore.	Many residents report that there was good fishing and prawning in Edmunds Bay and out into Fennell Bay and Lake Macquarie around forty years ago, but that for a long time the Bay has provided poor fish habitat.
WHAT'S THE TREND?	Residents report that mangroves were rare in Edmunds Bay forty years ago, but they now occupy most of the shoreline, on both the eastern and western sides of the Bay.	There are abundant juvenile fish living in the seagrass beds of Edmunds Bay. They flourish in dense seagrass meadows, provided the shallow water does not isolate them or lead to very high water temperatures (and therefore low dissolved oxygen).

The Office of the Lake Macquarie & Catchment Coordinator has been conducting monitoring of various indicators of a healthy estuary in Edmunds Bay and Fennell Bay for about five years and will shortly publish full details of the results. Keep a look out for more details about the trends that have been reported here.

Edmunds Bay seems to be on the improve in terms of most indicators of a healthy estuary. However it is important to remember that the long term future of the Bay, like other shallow and sheltered bays around the margins of Lake Macquarie, is one of gradual infilling and shallowing. Significant sea level rise could reverse that trend by changing water depth and current patterns.

Indicators of a healthy estuary

WATERWAY HEALTH CRITERIA	Saltmarsh communities	Seagrass
HOW IS THIS DEMONSTRATED?	Saltmarsh has recently been recognized as an Endangered Ecological Community (EEC) in NSW. Apart from providing habitat for shellfish and wading birds, saltmarsh helps estuaries process organic matter quickly.	Seagrass is fundamental for estuarine fish habitat. Whilst the area of seagrass can fluctuate quite a lot in the short term, there has been a declining trend in seagrass area in many estuaries due to the combined impacts of excessive nutrients, sediments, dredging and macroalgae.
WHAT'S THE TREND?	There are small areas of saltmarsh along the residential shoreline of Edmunds Bay and in Blackalls Park Reserve. Whether they are increasing or just holding their own is not known, but it is known that mowing right down to the water's edge destroys saltmarsh habitat.	Air photo evidence, field survey and community information all suggest that seagrass area and density in Edmunds Bay declined during the 1970s to 1990s, and was partly replaced by macroalgae. Recent studies indicate a recovery in area and density of seagrass, but with it, residents believe there is now more wrack than they experienced for many years.

How does Edmunds Bay shape up?

Are things improving, or is the deterioration that was visible ten years ago still the dominant characteristic of the Edmunds Bay?

Indicators of a healthy estuary

WATERWAY HEALTH CRITERIA	Water quality for protection of aquatic ecosystems: Clarity/turbidity	Water quality for protection of aquatic ecosystems: Nutrients
HOW IS THIS DEMONSTRATED?	An abundance of fine sediment that is not secured by ground cover vegetation, combined with even small amounts of energy from waves or tidal currents, is the main cause of poor water clarity. A dense cover of seagrass with closely matted roots, will help improve water clarity by reducing the resuspension of fine sediment by wind waves or tidal currents.	Nutrients in estuarine waters come from marine waters (tides) and from catchment runoff or discharges such as Waste Water Treatment Plants (WWTPs). Some nutrients can also be recirculated from bed sediments. Available nutrients are those that can be used by plants growing in the water.
WHAT'S THE TREND?	The return of relatively dense seagrass meadows across the bed of Edmunds Bay is helping to improve water clarity, by reducing the potential for resuspension of fine sediment. Reduced catchment sediment loads and nutrient loads also contribute to improved water clarity.	Dissolved nutrient concentrations in Edmunds Bay were high when the WWTP discharged to Mud Creek, but have now declined.

Indicators of a healthy estuary

WATERWAY HEALTH CRITERIA	Water quality for protection of aquatic ecosystems: Macroalgae	Water quality for protection of aquatic ecosystems: Light and dissolved oxygen
HOW IS THIS DEMONSTRATED?	Abundant blooms of macroalgae (green and filamentous or like cotton wool) are often a sign that the estuary systems cannot deal with the available nutrients.	When there is excessive macroalgae, it also reduces the light and oxygen available to other aquatic habitat, impacting on habitat viability (for plants, fish and shellfish). Light is also reduced by persistent poor water clarity. Temperature and dissolved oxygen levels are affected by shallow water and dark surfaces.
WHAT'S THE TREND?	Algal blooms were very common in Edmunds Bay for about fifteen years, but are now quite rare. Previous large blooms of macroalgae were a major contributor to the black oozy mud observed by residents.	Dissolved nutrient concentrations in Edmunds Bay were high when the WWTP discharged to Mud Creek, but have now declined.

Indicators of a healthy estuary

WATERWAY HEALTH CRITERIA	Water quality for protection of aquatic ecosystems: pH	Tidal and catchment flows to support aquatic ecosystems
HOW IS THIS DEMONSTRATED?	The main driver of low estuary pH is the exposure of potential acid sulfate sediments to the air. This can occur with drainage, excavation below the water table or dredging.	Aquatic ecosystems need both good water quality and water flows from both tidal current circulation and catchment runoff. Flows bring in and disperse nutrients, organic matter and sediment.
WHAT'S THE TREND?	pH does not appear to be an issue in Edmunds Bay unless the bed sediments are disturbed, such as by dredging. Previous dredging programs in Mud Creek and Edmunds Bay have required extensive specialist treatment of acid generating dredge spoil.	For forty years or so, Mud Creek and Edmunds Bay were cut off from Stony Creek, but received flows from the Toronto WWTP. Recently more natural flows have been reestablished. Tidal flows have gradually been restricted by extension of the Stony Creek delta (a natural long term process) and possibly by road and bridge works.