



Superb Blue Wren



Seagrass *Zostera capricorni*



Macroalgae



Saltmarsh

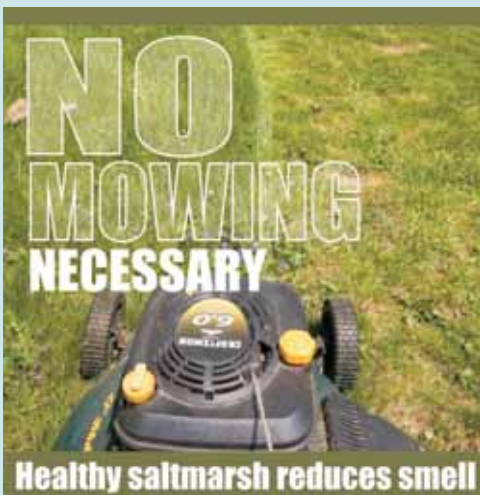
Estuaries are now recognised as some of the most biologically productive habitats on the planet, rivalling rainforests. The major habitats of Tuggerah Lakes Estuary are the shoreline, the lake waters and the lake sediments. These habitats support a range of terrestrial, semi-aquatic and aquatic plant and animal communities. Organisms occupying these habitats have adapted to a way of life that may be considered "harsh" from a biological point of view. Fluctuations in salinity require plants and animals to adapt readily.

Saltmarshes and fringing wetlands - are important in the nutrient cycling process in coastal estuaries and as feeding and nursery habitats for many birds, fish and invertebrates. Around fifty percent of these habitats have been destroyed in NSW through the direct results of development and the indirect effects of pollution. Saltmarsh habitats are generally high up on the shore of estuarine intertidal mudflats, often located behind mangrove forests. They are usually comprised of salt-tolerant species of plants.

Mowing to the foreshore prevents saltmarsh from regenerating. Saltmarsh is low growing, with most plants growing to only 30cm. Some varieties can grow to 50cm.

Seagrasses - are aquatic flowering plants. They are important biological components of estuaries, providing nursery grounds and food for commercially important prawns, fish and wading birds and structural habitat for a variety of other animals. There are three main species of seagrasses in Tuggerah Lakes, *Zostera capricorni*, *Ruppia megacarpa* and *Halophila ovalis*. Seagrasses help stabilise sediments and shorelines and act as a natural water filter. Declines of up to 85 per cent in seagrass meadows have been recorded within NSW estuaries. Light penetration is the primary environmental factor influencing the growth and distribution of seagrasses. Water clarity is therefore the primary water quality variable that can affect seagrasses, although salinity will limit them.

A haven of diversity



Macroalgae - means 'large algae'. Its common name is seaweed. Macroalgae provide food and protection for marine invertebrates such as prawns, crabs and fish. Many of these algae float unattached, drifting with the currents and wind. Unlike seagrasses, macroalgae obtain their nutrients directly from the lake water and can rapidly increase in response to nutrient enrichment (eutrophication). The excessive growth of macroalgae in estuaries is thought to be a result of eutrophication, which then leads to a chain reaction of other effects. In extreme cases, large 'blooms' of macroalgae can reduce the light available for slower growing seagrasses and cause a reduction in their diversity and abundance. The effects of their breakdown can create low oxygen conditions on the lake floor, which may increase the amount of nutrients being recycled back into the water column, encouraging increased macroalgae growth and a repeat of the cycle. Severe loss of oxygen (anoxia) and the production of toxic sulphide gas (rotten egg gas) can cause the death of animals that live in the sediments.

Phytoplankton - are the microscopic free-floating algae which are a primary source of food for many organisms including zooplankton (small floating animals), invertebrates (e.g. oysters) and fishes. Phytoplankton populations respond quickly to changes in temperature, salinity, light and nutrients. River discharges, tidal inflows and wind-induced currents can cause localised differences in these factors, leading to patchiness in the distribution of phytoplankton. Overall, the greatest variety in species is found in the centre of Tuggerah Lake and in the tidal flush zone close to The Entrance.

Zooplankton - are the very small, floating and swimming animals of the water column, and are considered an important source of food for fish and macrobenthos. Some zooplankton have limited tolerances to particular environmental conditions (e.g. salinity, temperature) and thus may be used as indicator species of changes in the chemical and/or physical environment. The abundance of zooplankton in Tuggerah Lakes estuary is no different between seagrass meadows and open water habitats.

Fish, Prawns and Crabs – are found in abundance in the estuary. The Tuggerah Lakes estuary provides significant commercial and recreational fisheries of bream, flathead, luderick, mullet, prawns and crabs. Commercial fish production from the estuary is the fifth largest in NSW with the recreational fishers generally targeting the same species. Commercial fishing has been underway in the estuary for many decades. Recreational fishing and prawning are popular recreational activities in and around the estuary. Several special species of fish live in Tuggerah Lakes. Pipefishes and the seahorse Whites Seahorse can be found in seagrass beds in the estuary. These species as of July 2004, became protected species under the NSW Fisheries Management Act 1994.

Benthos - are a range of animals that live on and in the sediments (the 'benthos'). The feeding and burrowing activity of these animals play a vital role in the storage, transformation and release of nutrients in an estuary. In shallow coastal lagoons, benthic activities can determine the physical, chemical and biological structure of the entire system. Benthos range in size from the minute bacteria and protozoans to larger colonial animals. The larger of these animals, those that are visible to the naked eye, are called 'macrobenthos' and include snails, worms, sponges, oysters, mussels, prawns and crabs. As well as having a major role in nutrient cycling processes, benthic organisms are an important source of food for a variety of organisms, such as fish and birds. Many commercially important species of fishes, crabs and prawns rely directly on these smaller invertebrates. Benthic species are also highly sensitive to pollution, which can make them an ideal indicator of the effects of catchment management.

Macrofauna – are the larger species of animals that live around the estuary. The fringing vegetation habitats of the estuary are home to a range of mammals, birds, reptiles and amphibians. These animals have different home ranges and some live their entire life around the estuary. Development of lake foreshores has caused the loss of large areas of their habitat. Animals such as small and large mammals (e.g. bandicoots, swamp wallabies, kangaroos, echidnas, and koalas), reptiles and amphibians can be found around the estuary and in its catchment. The birds are typical of forest, woodland and grassland habitats throughout the Central Coast region. Larger birds included the kookaburra, eastern rosella and Australian magpie. Smaller birds preferring the small shrubs and longer grass for foraging include the Willy Wagtail, Thornbill, and the Superb Blue Fairywren. Fringing vegetation around the Tuggerah Lakes estuary ranges from saltmarsh to woodland swamp forests, and provides excellent foraging and nesting places for a number of aquatic and terrestrial birds. The estuary also has a range of open muddy habitats that support many species of invertebrates, which are important as a food source for birds.



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