

# Algae affects recovery of aquatic plants

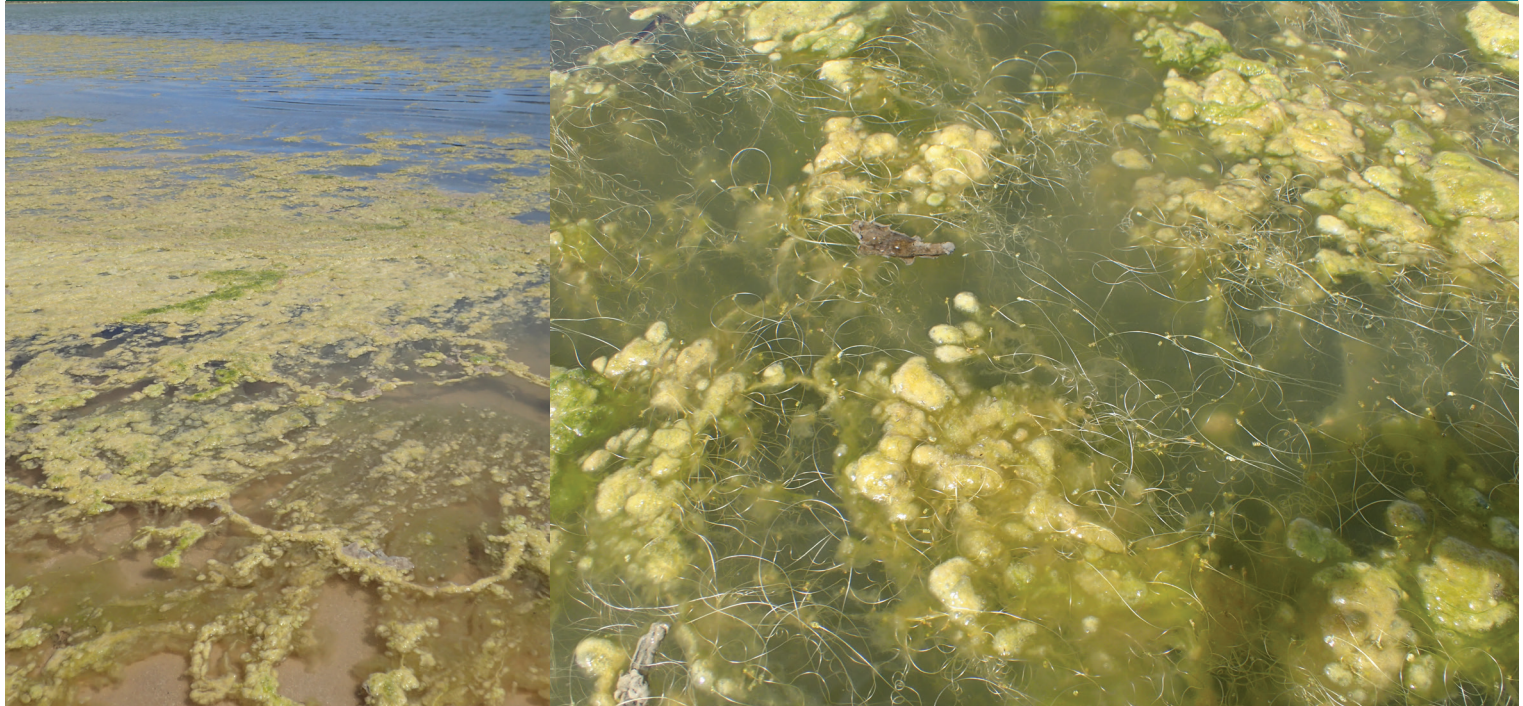


Image - Left: Filamentous algal mats in the Coorong (Photo: Michelle Waycott)  
Right: Filamentous algae attaches to aquatic plants in the Coorong (Photo: Michelle Waycott)

Algal blooms can interrupt the life-cycle of aquatic plants in the Southern Coorong.

Filamentous algae forming dense blooms has become a common occurrence in the Southern Coorong. In the late stages of the algal bloom, it forms rafts at the water surface. These algal rafts entangle and damage long flowering stalks, which prevents seeds from maturing. Mature seeds are needed to form a seed bank so that aquatic plant seedlings can germinate and grow the following year.

Rafts of algae also shade the aquatic plant communities. Sunlight is needed by aquatic plants for photosynthesis and growth, but when shaded by algae they cannot get enough light. As a result, they grow and spread more slowly.

The organic-rich deposits that form when the algal blooms decay lead to the formation of monosulfidic black oozes. Aquatic plant communities and seedlings cannot survive in these anoxic (no oxygen) and sulfide-rich sediments. Therefore, algal blooms are making some areas of the Southern Coorong unsuitable for aquatic plants.

Algal blooms have formed in the Southern Coorong because it has reached a high nutrient state and is hyper-eutrophic. Nutrients remain trapped in the Southern Coorong because there are limited inflows and 'flushing'

of nutrients out of it to the North Lagoon. The excess nutrients promote the growth of filamentous algal blooms.

The extent of aquatic plants declined during the Millennium Drought, affecting the animals that depend on them in the Southern Coorong. That loss was caused by very low water levels and high salt levels. Recovery of aquatic plants is being hampered by the hyper-eutrophic conditions and filamentous algae.

It is anticipated that aquatic plants will naturally recover in the Southern Coorong if water level is maintained through spring with low amounts of algae.

## Further reading:

Asanopoulos, C., and M. Waycott. 2020. The growth of aquatic macrophytes (*Ruppia tuberosa* spp and *Althenia cylindrocarpa*) and the filamentous algal community in the southern Coorong. Goyder Institute for Water Research, Adelaide.

## Acknowledgements

The Healthy Coorong, Healthy Basin Action Plan is part of the South Australian Government's overarching Project Coorong initiative.

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The Goyder Institute for Water Research is the delivery partner for research components of Healthy Coorong, Healthy Basin, providing independent research to inform future management decisions for the region.

# Glossary

**Ammonium** — A dissolved form of nitrogen readily taken up by algae and aquatic plants.

**Anoxic** — Lacking oxygen.

**Aquatic plants** — A phrase used to describe the mixed submerged aquatic plant community that includes *Ruppia tuberosa*, *Ruppia megacarpa* and *Althenia cylindrocarpa*. Where otherwise stated, the phrasing will be referring to either species independently or the genus.

**Bacteria** — A unicellular microorganism with simple internal structures.

**Bioturbation** — The reworking of sediments by animal activities including burrowing, ingestion, and defecation of sediment grains. It has a profound effect on sediment condition and the environment.

**Connectivity** — A mechanism that allows for the movement of water, materials and animals between areas, including between the north and south lagoons of the Coorong, between the sea and the Coorong through the Murray Mouth, and from the River Murray or south east flows to the Coorong (but not typically vice versa). It is an important element of hydrodynamics, has a strong influence on water quality (through exchange of salt and nutrients) and is essential for some ecological processes, such as migration of fish at different times of year and for the transport of zooplankton from freshwater inflows to support food webs of the Coorong.

**Detritivore** — An animal that feeds on dead material, especially plant parts.

**Denitrification** — The process by which nitrate is converted to nitrogen gas bubbles, which are released to the atmosphere. If the sediment is anoxic, then nitrification-denitrification cannot occur and the nitrogen remains in the nutrient cycle.

**Eutrophication** — The process of nutrient enrichment and the increase in the supply of organic matter. Eutrophic systems typically have excessive plant and algal growth, which become internally produced organic matter loads as they decay. They grow excessively in response to nutrient enrichment such as nitrogen and phosphorus inputs. Eutrophication has cascading effects for the entire ecosystem. The hyper-eutrophic state in the Southern Coorong is characterised by high concentrations of chlorophyll-a (>50 mg/L), total nitrogen (>4 mg/L) and total phosphorus (>0.2 mg/L) in the water.

**Evapo-concentration** — The concentration of solutes such as salt and contaminants as water evaporates. The effects of evapo-concentration increase with increasing water residence time, and at higher temperatures in summer.

**Filamentous algae** — The green filamentous algal community which occurs in the Coorong, consisting of *Ulva paradoxa*, *Rhizoclonium sp.* and *Cladophora sp.*

**Herbivore** — An animal that eats plants.

**Hyper-eutrophic** — An extremely high-nutrient state due to eutrophication.

**Hyper-saline** — Salinities that are greater than that of normal seawater.

**Macroinvertebrate** — Invertebrate fauna that are greater than 0.5 mm.

**Mesotrophic** — Intermediate levels of nutrients, common in healthy estuaries. A mesotrophic Coorong would be fairly productive (with plant and animal life), but could be at risk of having water quality problems.

**Millennium Drought** — An Australian drought which impacted the Murray-Darling Basin over the period 1996–2010, and substantially impacted the Coorong over the period 2001–2010. The period from 2007–2010 was particularly extreme with extended periods of no flow through the barrages to the Coorong.

**Monosulfidic black oozes** — Monosulfidic black oozes (MBOs) form when there is an excess of organic matter, and sediments become anoxic as the bacteria consume all the oxygen to decompose the organic matter. Iron (III) and sulfate are converted by bacteria to iron (II) and hydrogen sulfide, because there is no oxygen. The iron typically comes from iron oxide minerals in the sediment that are reduced, whereas sulfate comes from water (it is plentiful in seawater and saline groundwaters)

**Nitrogen** — A nutrient that is essential to plants and animals and forms compounds such as amino acids and proteins. Nitrogen can be found in aquatic environments in dissolved, particulate, inorganic, organic and gaseous forms. Too much nitrogen can be associated with eutrophication.

**Nitrate** — A dissolved form of nitrogen.

# Glossary

**Nitrification** — Nitrification is the process by which ammonium is converted to nitrite and then nitrate. It can also take place in the sediment and requires oxygen. Denitrification is the process by which nitrate is converted to nitrogen gas bubbles, which are released to the atmosphere. If the sediment is anoxic, then nitrification-denitrification cannot occur and the nitrogen remains in the nutrient cycle.

**Nutrient cycle** — The movement or exchange of nutrients, such as nitrogen, from inorganic and organic forms into organic matter, including plants and animals, and back again.

**Oxygenate** — Supply or enrich with oxygen. Sediments in aquatic systems need to be oxygenated in order for healthy nutrient cycling and nutrient exchange from sediment to water and to the atmosphere to occur. Oxygenation of sediments can occur through biological processes (e.g. animal movement, pumping through plant roots), or physical processes such as water turbulence and currents moving sediments around.

**Phosphorus** — A nutrient essential to life and strongly influencing water and sediment quality in the Coorong. Phosphate is the dissolved form of phosphorus, which is uptaken by plants and algae.

**Photosynthesis(e)** — The conversion of light energy to organic compounds, can be referred to as carbon fixation.

**Phytoplankton** — Small plankton algae that is essential to aquatic food webs.

**Respiration** — Respiration is a chemical reaction which takes place in all living cells and releases energy from glucose. Anaerobic respiration occurs without oxygen and releases less energy but more quickly than aerobic respiration.

**Ruppia** — A genus of aquatic plant, referring to the species *Ruppia tuberosa* in the Southern Coorong.

**Salinity** — Salinity can be defined as the concentration of dissolved mineral salts present in waters and soils on a unit volume or weight basis.

**Southern Coorong** - The Southern Coorong is defined here as the area ranging from Parnka Point in the north and south to 42 Mile Crossing, approximately 65 to 105 km from the Murray Mouth that connects the estuary to the sea.

**Turion** — Reproductive structure of *Ruppia tuberosa* (Type I and Type II) and *R. polycarpa* (Type I) produced underground that is capable of forming into a new plant

**Water quality** — The condition of water or some water-related resource as measured by biological surveys, habitat-quality assessments, chemical-specific analyses of pollutants in water bodies, and toxicity tests.

**Zooplankton** — Animals (often microscopic) that either move by water currents or are weak swimmers in the water column.

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