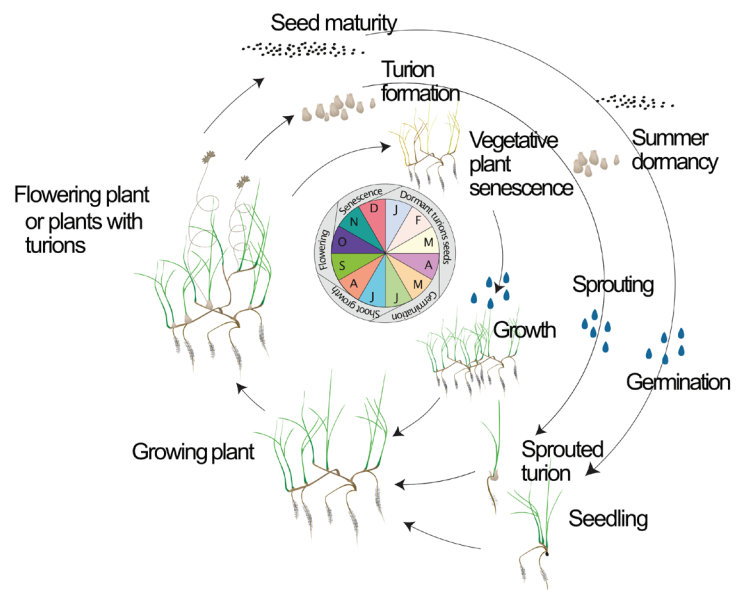


# Aquatic plant lifecycles in the Southern Coorong



Image: Flowering 'Ruppia tuberosa' plants in the Coorong (Photo: Michelle Waycott)



Aquatic plants, including *Ruppia tuberosa*, can grow by producing new shoots on runners like grass. They are also flowering plants and produce seeds that fall into the sand and germinate when the conditions are right.

Aquatic plants persist as adult plants throughout the year in some areas of the Southern Coorong where the conditions allow it. In other areas, the seeds or turions (shoot base) sprout in autumn, they grow in winter and the plant life cycle is completed by late spring.

Aquatic plants need just the right environmental conditions to thrive. Clear water allows sunlight to reach the leaves of aquatic plants so that the plants can photosynthesise and grow. This is needed throughout the growing and adult stages of the life cycle. Clear water and good water quality is therefore required most of the time.

Many of the needs change over the life cycle of the plants as they grow, spread and reproduce. Water is essential to support the growing and adult stage of the life cycle, but seeds and turions can survive in the sand in shallow areas that dry out. Therefore, it is important that the water level is high enough for plants to thrive in shallow areas over winter and spring but the water level can drop in late spring and summer.

The seedbank needs to be replenished each year so that this life cycle can continue. Seeds mature on long stalks after flowers reach the water surface where they are fertilised. Mature seeds can't form if the water level drops too early in spring or if the water becomes too salty. Seeds

germinate when the water level rises in spring if the water is not too salty.

The extent of aquatic plants in the Coorong was reduced during the Millennium Drought (2001–2010) because of persistently low water levels and extremely high salt concentrations. It hasn't recovered to historical levels. Eutrophication and algal blooms are hampering the long-term recovery of the Coorong despite initial successful aquatic plant translocation efforts.

Salt and nutrient levels need to be reduced to return thriving aquatic plant communities to the Southern Coorong. This can be achieved by increasing water levels and connectivity and reducing how long water stays in the lagoon.

## 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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