



Trials and Investigations

The *Healthy Coorong, Healthy Basin* program recognises that collaboration between science, traditional owners and the community is critical to the continued restoration of the breathtaking Coorong landscape. The scientific Trials and Investigations project is working to fill critical knowledge gaps and provide the scientific evidence-base to inform management actions to improve the long-term health of the Coorong.

Activities:



Coorong **research partnerships** in Trials and Investigations.



Unprecedented **\$10.9 million investment** in scientific research to **inform restoration** and future management of the Coorong.



Significant collaboration across scientific disciplines and 13 organisations.



More than **70 researchers and 20 government scientists**.



Interdisciplinary expertise across hydrology, biogeochemistry, aquatic ecology, quantitative modelling, First Peoples knowledge and social science.



Strong focus on early career researchers to **build capacity in SA**.



Goyder Institute for Water Research partnership including CSIRO, Flinders University, The University of Adelaide, the University of South Australia and SARDI.



Ngarrindjeri Aboriginal Corporation leading a cultural knowledge project.



Encourage and facilitate **innovative science** to help solve complex problems.



Managers and policy-makers embedded within the research.



Trials and Investigations Components:



Nutrient dynamics



Aquatic plants & algae



Food webs



Waterbirds



Ngarrindjeri knowledge



Climate adaptation

Integration

Bring together past and new scientific knowledge and translate it into management decisions



Trials and Investigations



Nutrient dynamics

Reduce nutrient loads (levels) and algae abundance in the Coorong.

Extensive water and sediment quality surveys, and experiments assessing nutrient flux and cycling found that:

- The Southern Coorong is in a hyper-eutrophic (nutrient enriched) state, with high levels of plankton, nitrogen, phosphorus and algae.
- Nitrogen and total phosphorus are concentrated in surface sediments, with up to 50 times more nutrients in the top 5 cm of sediment compared to the whole water column in the Coorong Lagoon. High nutrient and low oxygen levels in sediments led to the formation of sulfidic black oozes in the Coorong.
- High salinities are further reinforcing eutrophication by impacting plants and macroinvertebrates that cycle nutrients.
- Improving lagoon flushing and connectivity will dilute and export salt and nutrients, which will help to reinstate healthier nutrient cycling processes.



Aquatic plants & algae

Switch the Coorong South Lagoon back to an aquatic plant dominated system rather than algal dominated.

Flow, water quality and sediment conditions are impacting primary producers (algae, plankton and aquatic plants):

- Hypereutrophic conditions in the Southern Coorong are fuelling algal blooms.
- Algal blooms reduce growth and reproductive success of aquatic plants by inhibiting light availability and seed set.
- Organic-rich deposits that form when algal blooms decay lead to the formation of sulfidic black oozes, which are inhospitable for aquatic plants and macroinvertebrates.
- Results of a 100 site survey found the Coorong aquatic plant community to be widespread but in poor health.
- The aquatic plant seed bank is patchily distributed and was often completely absent at survey sites, meaning the plants' resilience to future stressors is limited.



Waterbirds, fish and macroinvertebrates

Provide food resources and habitat required to support waterbird and fish populations.

An updated understanding of the ecological drivers of foodweb interactions and waterbird movement includes:

- Salinity is the main driver of macroinvertebrate diversity and abundance in the Coorong. The South Lagoon supports fewer macroinvertebrate species and is dominated by chironomid (midge fly) larvae that can tolerate high salinities.
- Salinity in the South Lagoon was close to the upper limit for the most salt tolerant fish, smallmouth hardyhead – the main food available for fish-eating birds.
- DNA analysis of scats deposited by migratory and resident shorebirds indicates that these species consume an abundance of chironomids in the South Lagoon.
- Evidence of waterbird movement within the Coorong and across a regional and national wetland network through use of GPS tracking units.



Ngarrindjeri knowledge

Incorporate Ngarrindjeri cultural knowledge and values into decision making.

A Ngarrindjeri led project bringing together contemporary and older Ngarrindjeri knowledge through Yarlurwar Ruwe (Sea Country) assessments, On-Country workshops and archival research:

- The research is focused on Ngarrindjeri knowledge about the Kurangk with specific questions to highlight the importance of:
 - freshwater soaks and wells
 - No:ri (pelican) breeding islands
 - Salt Creek/Southern Lagoon ngartji (totems) breeding cycles including jumping mullet.
- A database has been developed as a storage place for Ngarrindjeri cultural knowledge. This will be used by current and future Ngarrindjeri to store their knowledge and use it to influence management and decision making.
- The Yarlurwar Ruwe assessment has been further developed as a tool to assess the cultural health of an area and takes into account ngartjis, surrounding environments and ecological health.



Climate adaptation

Begin identifying adaptation pathways required to ensure the Coorong's ecological values are maintained into the future under a changing climate.

A climate change adaptation project for the Coorong, Lower Lakes and Murray Mouth region:

- A review of past and current change in the region, recognising values for the Coorong have evolved over time and the region has continued to support multiple values through a long history of change.
- Synthesis of anticipated ecological impacts of climate change on the Coorong, which highlight the breadth and magnitude of future ecological changes that may be experienced.
- 'Theory of Change' developed to clarify how current management and research activities are anticipated to lead to behavioural and physical changes that lead to desired outcomes for the Coorong.
- Trajectories of ecological change developed, including key scenarios of climate change impacts and drivers of change.
- A preliminary vulnerability analysis to assess the vulnerability of the Coorong to climate change.

Integration

Bring together past and new scientific knowledge and translate it into management decisions

Achievements

Findings from the T&I project components have improved the accuracy of the Coorong Dynamics Model, which simulates water quantity and quality and habitat conditions for *Ruppia* and fish. These improvements have helped the Coorong Dynamics Model become a trusted tool for management decision making.

Emerging findings from the Trials and Investigations project were synthesised in 'The desired state of the Southern Coorong' paper to build a shared understanding of the scientific knowledge of the Southern Coorong. The paper can be viewed at www.environment.sa.gov.au/topics/coorong/publications.

INFORMING IMPROVED WAYS TO:

ACHIEVEMENTS AND NEW FINDINGS