Theme: Habitats

The Gippsland Lakes supports a wide range of different vegetation types, which are described under the theme “habitats” for consistency with the State of the Bays reporting. Four indicators of condition have been selected:

- Seagrass – three species of seagrass occur in Lakes Victoria and King: *Zostera nigricaulis* in deeper areas, and *Zostera mulleri* in shallower, often intertidal, areas where the seagrass may be exposed at low tide, and *Ruppia spiralis*.
- Coastal saltmarsh – EPBC listed vulnerable community that occurs across many of the fringing wetlands as well as across the hypersaline Lake Reeve. Coastal saltmarsh includes a wide variety of plants differing greatly in their taxonomic, structure and life histories. In general, though, they occur in consistently saline environments and are generally dominated by low succulent chenopods (e.g. *Sarcocornia* spp.).
- Freshwater wetland vegetation – in Sale Common and MacLeod Morass. Includes a variety of emergent reeds, and sedges such as Common Reed (*Phragmites australis*), *Baumea* spp., *Bolboschoenus* spp., *Carex* spp., *Cyperus* spp., *Juncus* spp., *Schoenoplectus* spp.
- Variably saline wetland vegetation – which includes woody communities such as Swamp Paperbarks (*Melaleuca ericifolia*) as well as a variety of emergent salt tolerant rushes and sedges.

The vegetation of the Gippsland Lakes plays a critical role in the lakes' ecology including:

- primary production, via photosynthesis, supplying energy to the system and food for a range of fauna
- provision of the habitat used by animals for shelter
- contributions to nutrient cycles via take-up and release nutrients such as nitrogen and phosphorus
- stabilisation of shorelines, protecting them from erosion
- contributions to biodiversity and other intrinsic values (Batavia and Nelson 2017).

The vegetation of the Gippsland Lakes also provides social and economic values. Some types of plants, for example. seagrass, are especially valued for anglers for their contribution to productive and sustainable fisheries. Other types, for example, the fringing vegetation of freshwater and variably saline wetlands, are valued by birdwatchers for the waterbirds they support. Although perhaps not as widely recognised is the value that fringing vegetation including paperbark swamps, reed beds and coastal *Banksia* woodlands have in preventing shoreline degradation and in maintaining the aesthetics of the Gippsland Lakes.

Saltmarsh

Indicators and thresholds

There are Limits of Acceptable Change (LAC) and Resource Condition Targets (RCT) for saltmarsh extent:

LAC = The total mapped area of salt flat, saltpan and salt meadow habitat at Lake Reeve Reserve will not decline by greater than 50 percent of the baseline value outlined in VMCS for 1980 (that is, 50 percent of 5035 hectares = 2517 hectares) in two successive decades.

RCT = Maintain the extent, diversity and condition of saltmarsh communities.

The LAC for saltmarsh covers Lake Reeve only and also includes unvegetated salt flats, rather than the vegetation community that is of value. A benchmark for saltmarsh extent across the Gippsland Lakes was established by Boon et al. (2011) and thresholds based on a deviation from this benchmark have been derived for the GLER as follows:

- Good > 4000 hectares
- Fair = 4000-3000 hectares
- Poor < 3000 hectares

Vegetation composition and structure was used to assess the condition of vegetation in coastal saltmarsh, specifically in terms of conformity with EVC benchmarks according to the

method recommended by Boon et al (2011). Condition is reported on a five-point scale, which has been translated into the three categories for the State of the Gippsland Lakes as follows:

- Good = score > 85
- Fair = score 66 to 84
- Poor = score < 65

Locations

Saltmarsh occurs in intertidal zones across the main lakes and in many of the variably saline wetlands that fringe Lake Wellington. There is also a large expanse of saltmarsh across Lake Reeve. Mapping of saltmarsh extent has been completed in 2021 from satellite imagery and condition assessment undertaken at a total of 42 locations around the main lakes and fringing wetlands from 2019 (Greening Australia 2019) and 2021 (Brooks and Hale 2021).

Results

Indicator	Status and trends	Summary
	Unknown Poor Fair Good	
Saltmarsh extent	 **Data quality:**  Good **Data custodian:** East Gippsland CMA	Total extent of saltmarsh in 2021 was 4058 hectares, of which 1261 hectares was within Lake Reeve. This represents achievement of the RCT and indicates that the extent of saltmarsh within the Gippsland Lakes Ramsar Site has been maintained, indicating good condition. While the extent of saltmarsh within the Ramsar site boundary remains comparable to that in 2011; there is some evidence of an expansion of saltmarsh in some areas adjacent to the Gippsland Lakes, but outside the Ramsar site boundary.
Saltmarsh condition	 **Data quality:**  Fair **Data custodian:** East Gippsland CMA	Assessments of 42 areas of saltmarsh indicated that 60% were in “good condition”, four in “fair” condition and 14 in poor condition. The average score across all sites was 77, indicating fair condition. Repeat assessments of condition over time will be required to assess trend in condition of saltmarsh.

There are extensive areas of saltmarsh around the Gippsland Lakes, lining the shores of the main lakes, covering many of the fringing wetlands, and across Lake Reeve. Coastal saltmarsh communities are generally species poor compared to other wetland vegetation communities, but there are several distinct types. The most common saltmarsh communities in the Gippsland Lakes are the intertidal Wet Saltmarsh Herbland (most often dominated by beaded glasswort (*Sarcocornia quinqueflora*) and the rarely inundated Coastal Dry Saltmarsh. Comprehensive mapping of saltmarsh across the Gippsland Lakes was completed in 2011 (Boon et al. 2011) estimated a total of over 10,000 hectares of coastal saltmarsh around the Gippsland Lakes, 4300 hectares of which was within the Ramsar site Boundary.

Recent (January 2021) mapping of saltmarsh within the Ramsar Site Boundary indicated that there was 1261 hectares of saltmarsh in Lake Reeve and 3405 hectares in other locations, resulting in a total of 4666 hectares of saltmarsh. The extent of saltmarsh within the Ramsar Site has been maintained, indicating achievement of the RCT, and indicative of “good” condition.

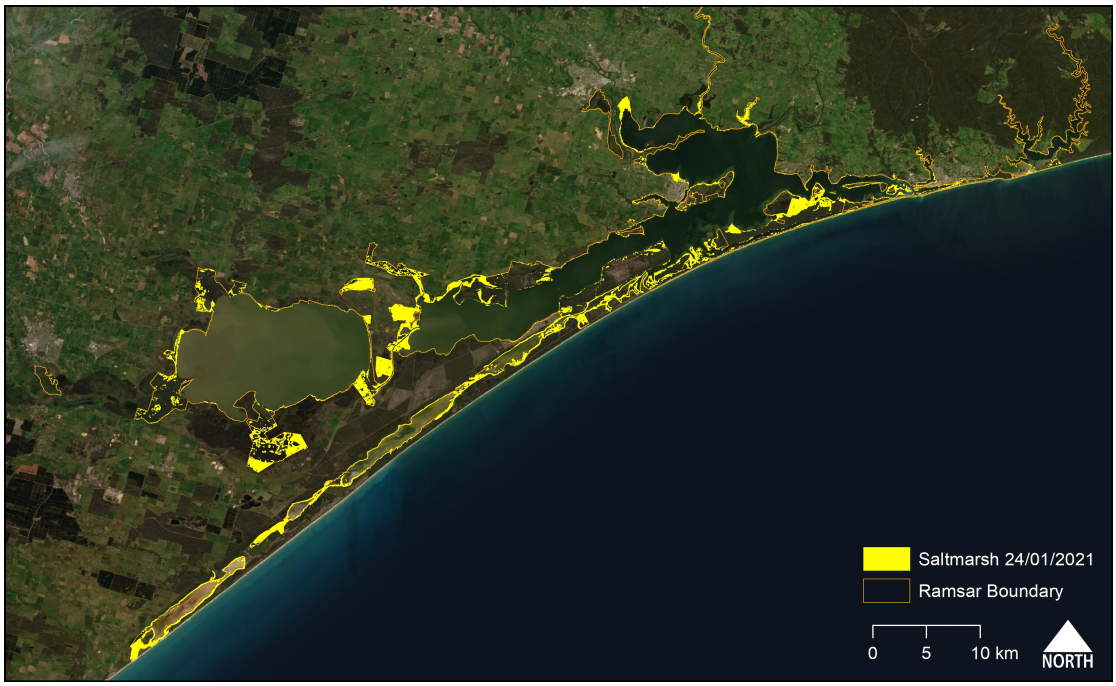

Figure 1: Distribution of saltmarsh in the Gippsland lakes Ramsar site (Brooks and Hale 2021b).

Saltmarsh condition varied considerably spatially and between saltmarsh community types. Assessments in 2021 indicated that, Coastal Dry Saltmarsh, Coastal Hypersaline Saltmarsh, Saline Aquatic Meadow and Wet Saltmarsh Herbland were all in good condition. Estuarine Scrub, however, was consistently assessed as being in very poor condition (Table 1).

Table 1: Condition of saltmarsh assessed in 2021.

Location	EVC	Condition score	Condition category
Lake Reeve	Coastal Dry Saltmarsh	95	Good
Lake Reeve site	Coastal Dry Saltmarsh	100	Good
Victoria Lagoon	Coastal Dry Saltmarsh	95	Good
Lake Reeve	Coastal Hypersaline Saltmarsh	100	Good
Lake Reeve	Coastal Hypersaline Saltmarsh	95	Good
Lake Reeve	Coastal Tussock Saltmarsh	95	Good
Clydebank Morass	Estuarine Reedbed	85	Good
Flannagan Island	Estuarine Scrub	36	Very Poor
Lake Coleman	Estuarine Scrub	41	Very Poor
South-east corner of Lake Wellington	Estuarine Scrub	36	Very Poor
McLennan Strait	Estuarine Scrub	36	Very Poor
West of Spoon Bay	Estuarine Scrub	36	Very Poor
Lake Coleman	Estuarine Wetland	43	Very Poor
Lake Coleman	Estuarine Wetland	85	Good
Morley Swamp	Estuarine Wetland	100	Good
South-east corner of Lake Wellington	Estuarine Wetland	60	Poor
Trouser Swamp, Sperm Whale Head	Estuarine Wetland	95	Good
Lake Reeve	Saline Aquatic Meadow	100	Good
Victoria Lagoon	Saline Aquatic Meadow	100	Good
Boole Poole (east)	Wet Saltmarsh Herbland	100	Good
Boole Poole (west)	Wet Saltmarsh Herbland	100	Good

Trend

Some consideration has been given to the change in extent of saltmarsh at the lakes since European colonisation (Boon *et al*. 2016). For Lake Reeve it appears that 85% of pre-European coastal saltmarsh has been retained (Sinclair and Boon 2012). The same study could not draw any consistent conclusions about changes in extent at Lakes Victoria, King or Wellington.

Recent, large scale mapping of vegetation communities across Victoria provides some evidence of trend in saltmarsh extent around the lakes. This indicates small increases in extent from 1985 to 2015 then a return to 1985 benchmark conditions (Figure 2). Given the coarse nature of this mapping, however, it is possible that the small changes detected are within the error of outputs. A comparison of saltmarsh extent from 2011 with 2021, indicates no clear change in extent, although there are some areas where landward migration of saltmarsh may be occurring, such as along the eastern shoreline of Lake Coleman (Figure 2). By and large, however, all evidence suggests there has been no substantive change in saltmarsh extent over the past decade.

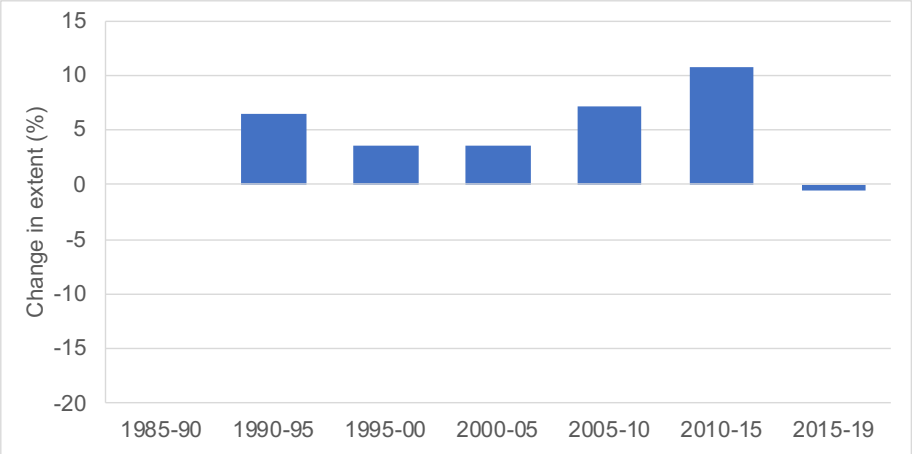

Figure 2: Change in saltmarsh extent (%) in the Gippsland Lakes from 1985 to 2019 (calculated from White et al. 2020).

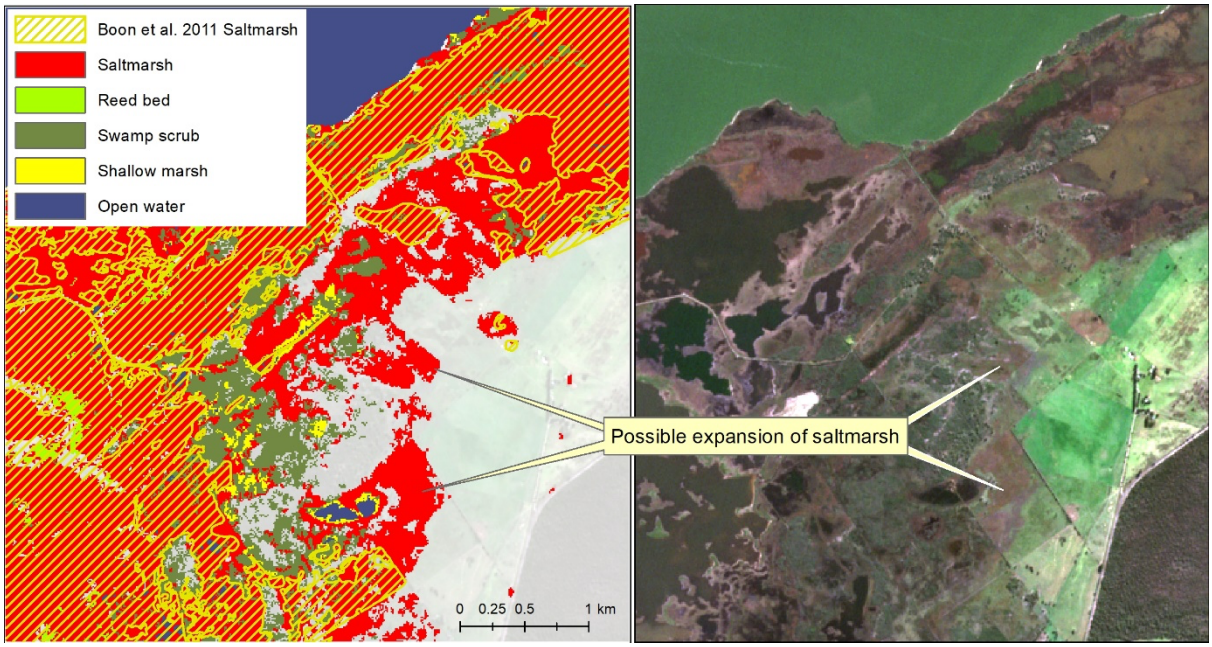

Figure 3. Eastern shore of Lake Coleman showing areas of potential saltmarsh expansion over the last decade beyond the limits mapped by Boon et al. (2011).

There is no information available to allow trends in the composition or structure of the coastal saltmarshes of the Gippsland Lakes to be determined. The condition assessments conducted

in 2019 and 2021 provide a benchmark against which future changes in condition can be assessed.

Influencing factors and threats

Coastal saltmarsh occurs in a very narrow elevational band between mean sea level and highest astronomical tide, commonly limited to the level of the highest spring tide. This means it is constrained along much of the south-east Australian coast between mangroves or seagrass on the low-water limit and more terrestrial vegetation (e.g. paperbark wetlands) on higher ground. As such, it is highly susceptible to changes in sea levels and to coastal erosion. Boon et al. (2015) described the range of factors that affected coastal saltmarsh in Victoria: these included changes in sea level, erosion caused by storm damage, grazing by feral and domestic animals (e.g. cattle, rabbits), invasion by weeds such as Tall Wheat Grass and Spartina, and inappropriate recreational activities, such as the driving of vehicles, in saltmarshes. Saltmarshes are also highly susceptible to pollution, including hydrocarbon pollution arising from boating activities and heavy-metal pollution (e.g. from CCA-treated pylons). Changes in freshwater inflows also affect saltmarshes, as these facilitate invasion by aquatic plants less tolerant of salinity, such as *Phragmites australis*. Finally, coastal saltmarsh may be invaded by mangroves, especially if sea levels continue to rise (Boon 2017).

Figure 4: Coastal saltmarsh at Trapper Point, Lake Reeve. Photograph by Paul I. Boon.

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