

Index of Estuary Condition

Project overview – May 2017

The Index of Estuary Condition is being applied across Victoria's estuaries to measure the health of these valuable coastal assets

Background

Estuaries are semi-enclosed waterbodies with open or intermittently open connections with the ocean. They are the interface between freshwater from streams and rivers and saltwater from the ocean. Estuaries have many important ecological functions – they have unique vegetation, provide habitat for waterbirds and are nursery grounds for many fish species.

The Victorian government invests significant resources in waterway and estuary management, and recognises protecting and improving the health (condition) of these waterways is a long-term commitment. The Department of Environment, Land, Water and Planning has well-established condition assessment methods and monitoring for rivers, streams and wetlands (e.g. the Indices of Stream and Wetland Condition). Recently, it has developed a method to measure and report on the condition of Victorian Estuaries – this method is known as the Index of Estuary Condition.

What is the Index of Estuary Condition?

The Index of Estuary Condition (IEC) provides a consistent condition assessment method that can be applied state-wide. There are five themes that make up the Index: fauna, flora, water quality, physical form and hydrology. Each of these contains multiple measures and standard methods have been developed for these.

The IEC assessment program aims to:

- **report on the condition** of estuaries across Victoria
- **assist the prioritisation** of management investment among estuaries
- **provide a baseline** for assessing long-term and large-magnitude changes in resource condition.



Figure 1. Powlett River estuary (Photo: Adrian Kitchingman, DELWP).

IEC themes

Fauna (fish)

The fauna theme consists of several measures that are calculated from fish assemblage data. Fish have been included as a measure because they:

- respond to environmental, ecological, physical and hydrological factors,
- are large enough to sample with relative ease, and
- are of interest to the public.

Fish are surveyed in late summer and autumn using a variety of netting methods.



Figure 2: Estuary Perch capture from the Merri River Estuary, southwest Victoria (Photo: Andrew Pickworth, DELWP).

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Figure 3. Hauling a seine net to capture estuarine fish species (Photo: Fiona Warry, DELWP).

Flora (submerged and fringing vegetation and phytoplankton)

The flora theme includes both submerged and fringing vegetation.

Submerged vegetation includes seagrasses and macroalgae. The ratio of macroalgae to total submerged aquatic vegetation is used in the IEC. This ratio provides a measure of the relative dominance of macroalgae; an established nutrient load response in estuaries.

Fringing vegetation includes saltmarsh, mangroves and *Phragmites*. The IEC will measure several aspects fringing vegetation, including the amount of native vegetation cover and weediness.

Submerged and fringing vegetation are surveyed in the summers months.



Figure 4. A camera, submerged beneath the water, is used to determine the condition of submerged vegetation (Photo: Di Crowther, DELWP).

Phytoplankton are photosynthesizing microscopic organisms that inhabit the upper sunlit layer of oceans, estuaries and freshwater systems. They are agents for primary production and can provide food for aquatic animals. The IEC measures the chlorophyll a concentration in the water as a proxy for phytoplankton.

Chlorophyll a is measured during spring, summer and autumn using a fluorescence probe and filtration of water samples.

Water quality (water clarity and dissolved oxygen saturation)

Two measures are included in the water quality theme – water clarity and dissolved oxygen saturation.

Water clarity is an important characteristic of the water column in estuaries because the depth of light penetration is a critical factor influencing the type and extent of submerged vegetation.

Dissolved oxygen saturation is a critical factor in determining the suitability of an area for estuarine animals. Dissolved oxygen also influences the identity and rate of biological and chemical processes that are important for estuarine health.

Water quality is measured in spring, summer and autumn.



Figure 5: The Merri River Estuary in southwest Victoria is fringed with dense stands of emergent macrophytes (Photo: Di Crowther, DELWP).

Physical form

Two measures are included in this theme – upstream barriers and lateral connectivity.

Upstream barriers is a measure based on the presence/absence of permanent or intermittent barriers. It assesses the ability of estuaries to function as a movement corridor for water or biota traveling between estuaries and the marine or upstream fluvial environment.

Lateral connectivity measures are a proxy for measuring intertidal habitat suitability and connectivity. The primary measure is the percentage of estuary perimeter that is considered artificial.

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Figure 6: Barriers can restrict water or biota movement between estuaries and upstream environments (Photo: Di Crowther, DELWP).

Hydrology

Two measures are included in this theme – marine exchange and freshwater flow.

Marine exchange considers artificial openings of intermittently open estuaries and human disturbance. Artificial estuary opening can alter the exchange of nutrients, biota, or water masses between estuaries and the adjacent coastal ocean.

Freshwater flow is a measure of the naturalness of the flow regime of rivers and stream in the estuary catchment.



Figure 6: Tom Creek estuary (foreground) where it meets the Gippsland Lakes (Photo: Adrian Kitchingman).

Hydrology and physical form were largely addressed during the IEC implementation trial between 2010 and 2013 and this work will be used for the current IEC assessment.

What's currently happening?

The first year of IEC assessment for fish, submerged vegetation and water quality has commenced at a subset of estuaries along the Victorian coastline. Fringing vegetation surveys will commence in 2018. By 2019, most estuaries will have been assessed using the IEC and a report on the health of each estuary will be produced in 2020.

This project is part of a \$222 million investment by the Victorian Government announced in the Water Plan, *Water for Victoria*, to improve the health of waterways and catchments. The IEC will play an important role in supporting the government's commitment to improving knowledge and information about waterways and providing better reporting back to communities.

Project delivery partners

The IEC assessment is being delivered by several partner agencies. The Arthur Rylah Institute for Environmental Research (DELWP) is leading delivery of the fish and flora themes. DELWP is working with Victoria's coastal Catchment Management Authorities and Citizen Scientists to deliver the water quality theme.

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