IEC Physical Form sub-index

Index of Estuary Condition

The Index of Estuary Condition (IEC) integrates information for five key aspects of estuary condition: Physical Form, Hydrology, Water Quality, Flora and Fish. These sub-indices are aggregated to provide an overall 'snapshot' measure of environmental condition at the time of monitoring.

Estuaries are characterised by the movement of plants, animals, nutrients, sediment, and water both longitudinally (i.e. between freshwater, estuarine, and marine environments) and laterally (i.e. into fringing habitats). Anthropogenic changes to the physical form of estuaries and their shorelines can compromise longitudinal and lateral movements, which in turn can affect estuary condition.

The IEC Physical Form sub-index has two measures:

1. Artificial Barriers
2. Artificial Shorelines

Artificial Barriers

Artificial barriers can threaten flora and fauna within estuaries by interrupting their movement and/or reducing the extent of estuarine habitats. Common artificial barriers in estuaries are weirs, causeways and culverts. Some barriers completely impede the movement of biota in estuaries, whilst other barriers partially impede movement.

The metric for Artificial Barriers in the IEC is the percentage of the natural length of the estuary that has been affected by an artificial barrier. Whether it is a partial or complete barrier is also considered.

Table 1: Scoring criteria for Artificial Barriers

% of estuary length affected	Score if partial barrier	Score if complete barrier
0	5	5
>0 - 5	5	4
>5 - 25	4	3
>25 – 50	3	2
>50	2	1

Artificial Shorelines

Artificial shorelines can alter the hydrodynamics of estuaries and limit their migration in response to sea-level rise or reduced inflows induced by climate change. They often impede or prevent the movement of plants, animals, sediment, nutrients and water between estuaries and their fringing habitats, affecting important processes, such as organic matter breakdown. Hardened or armoured estuary shorelines may reduce subtidal and intertidal habitat availability. Also, artificial shorelines are often more readily colonised by introduced species than their native counterparts, enhancing the spread and establishment of introduced species in estuaries.

Artificial shorelines along Elwood Canal estuary (DELWP)

The metric for the Artificial Shorelines measure in the IEC is the percentage of an estuary's perimeter consisting of artificial (i.e. built) structures.

Table 2: Scoring criteria for Artificial Shorelines

% of estuary shoreline covered by artificial structures	Score
0 – 0.1	5
>0.1 - 1	4
>1 - 10	3
>10 – 50	2
>50	1

Calculation of the Physical Form sub-index

The Physical Form sub-index score was calculated by combining the Artificial Barriers and Artificial Shorelines measures. The scores for each measure were added together and converted to a scale of 1 to 10, using the equation:

Physical Form score = (((Artificial Barriers score + Artificial Shorelines score) – 2) x 9)/8 + 1

State-wide condition assessment programs provide information about the overall environmental condition of Victoria's waterways and are vital for guiding state and regional planning. The current approach is to rotate these assessments among estuaries, wetlands, and rivers at the long time-frames (10 years or more) expected for changes in condition at the broad spatial scales assessed, and in response to changes in threats, management regimes or environmental contexts. In the intervening periods, planning and management will be informed by targeted monitoring of key aquatic values and threats at specific waterway assets, evaluations of the effectiveness of management interventions, and strategic research to fill critical knowledge gaps.

For further details for IEC methods see:
DELWP (2021). Assessment of Victoria's estuaries using the Index of Estuary Condition: Background and Methods 2021.

Natural shorelines at the mouth of Wingan River estuary (Sean Phillipson, EGCMA)

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