

Fact sheet

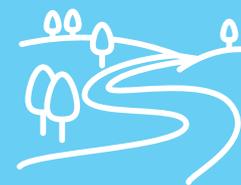
Should an estuary be opened or closed?

Under low catchment inflows and low water level conditions



Many of Victoria's estuaries close from time to time as part of a natural process. This is important for supporting estuary ecosystems, plants and animals. Under some conditions, artificial estuary openings are considered to manage the risk of flooding to built infrastructure.

During periods of low catchment inflows and low water levels, artificially opening an estuary can lead to poor water quality, fish deaths and changes in vegetation. These changes can also impact the way that people can use and experience the estuary. Therefore, artificial estuary openings are not a standard management option under these circumstances.



Around

85%

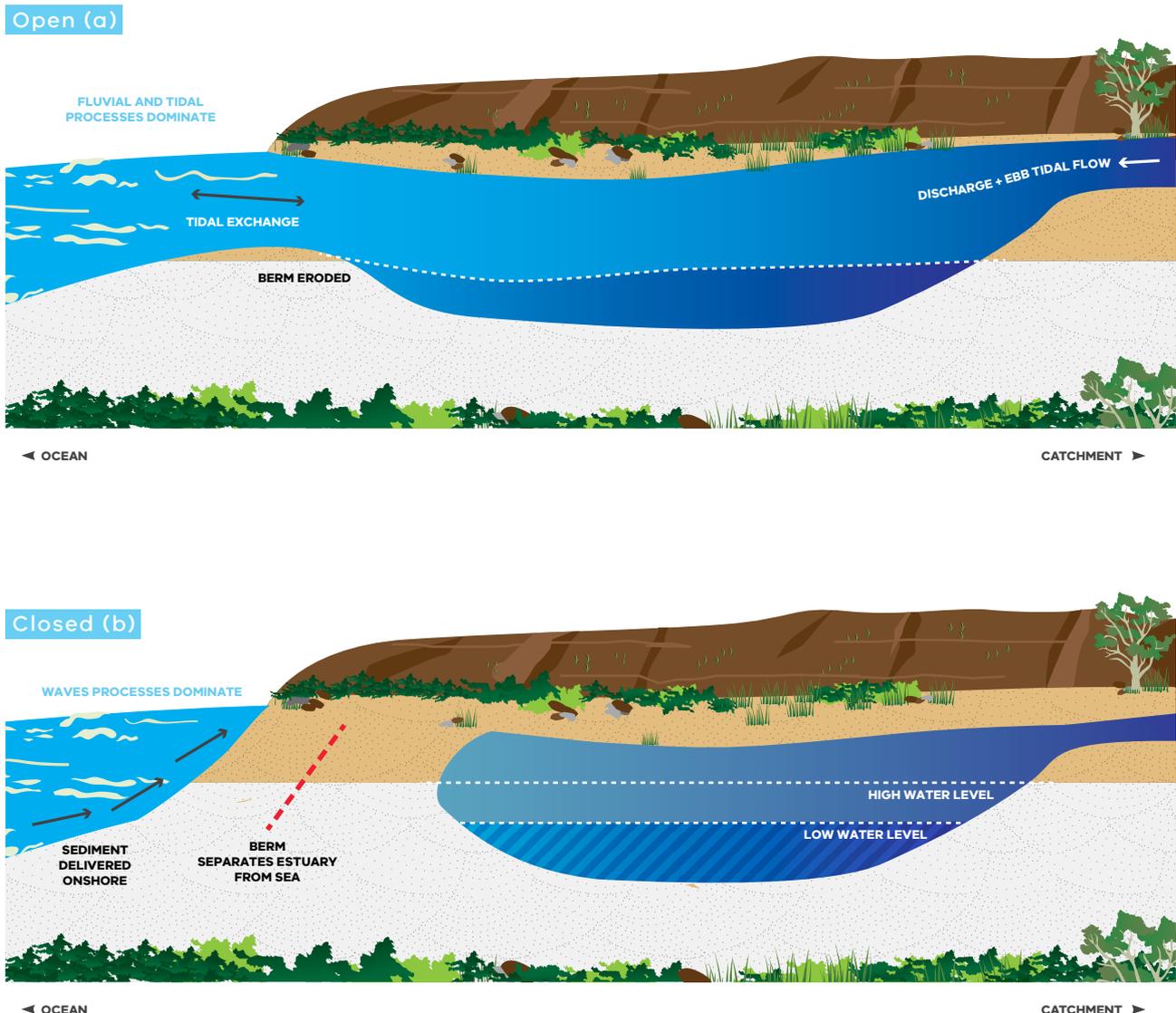
of Victorian estuaries naturally close to the sea

HOW DO ESTUARIES OPEN AND CLOSE?

An estuary closes when waves transport sand across the mouth of an estuary, forming a sandbar. Closures most often occur during summer months when flows into the estuary are at their lowest.

- Natural estuary openings and closures are driven through a combination of rainfall, river flows, tides, wave energy and the shape of the estuary
- Catchment inflows and tides move in and out to help create and maintain estuary openings
- Low catchment inflows and large wave patterns that transport sand contribute to estuary closure

Figure 1. Conceptual diagram of (a) closed and (b) open entrance states



ARE ESTUARY CLOSURES NORMAL?

There is no preferred state for an estuary, as both open and closed features are a part of the estuary cycle.

- Estuaries are dynamic systems which naturally experience closed and open periods, and a range of catchment inflows and water levels
- These conditions can influence food and habitat availability, water quality, and the estuary appearance (e.g. stagnant water) and odour (e.g. rotting plants)
- Plants and animals, and ecosystem processes respond differently to open and closed conditions: some thrive while others decline



WHEN SHOULD WE INTERVENE?

Artificial estuary openings are considered as a management option when high water levels have a significant impact on the environmental, social and economic values of the estuary

- For example, when floodplain inundation threatens human assets (e.g. boardwalks, roads, private property) and productive use of the surrounding land
- An artificial estuary opening involves creating an opening through the sand berm (between the estuary and the ocean)
- We often use earth moving equipment to create this opening
- We rely on the energy from water movement in and out of the estuary to keep the estuary open
- Managers use the Estuary Entrance Management Support System (EEMSS) to assess the likely impact to the social, economic and environmental values of the estuary

Artificial estuary openings are not considered a standard management option when the estuary has low catchment inflows and low water level conditions

- In a closed estuary with low catchment inflow and low water level conditions, the water can separate into two layers: freshwater on the top and saline water on the bottom. The top layer will generally have high dissolved oxygen, while the bottom layer will be low in dissolved oxygen.
- If the estuary is opened under these conditions, the oxygen-rich surface layer of freshwater flows out first, leaving behind water with critically low oxygen levels. If catchment inflows to the estuary are low, there is little opportunity to replenish the freshwater.
- Attempting to artificially open an estuary under low catchment inflows and low water level conditions can increase the likelihood of further decline in water quality and negatively affect estuary values (including fish, vegetation, and amenity).
- Even if an artificial estuary opening were attempted under low water level and low catchment inflow conditions, there is generally not enough energy to keep the estuary open

ARTIFICIAL OPENINGS CAN NEGATIVELY IMPACT ESTUARY VALUES

The risks of artificially opening an estuary under low inflow and low water level conditions include fish deaths, changes to vegetation communities, and decreased amenity.

Fish

- Fish deaths in estuaries occur occasionally as part of the natural estuary cycle
- Opening an estuary during periods of low catchment inflows and low water level conditions can result in the loss of oxygenated surface water which is critical for fish survival.
- The remaining water with critically low dissolved oxygen levels can lead to fish deaths.



Vegetation

- Vegetation communities are complex and will adjust and adapt to the range of flow and water quality conditions experienced in an estuary
- Any interference with natural processes may impact on the type and extent of vegetation communities



Amenity

- Opening an estuary during periods of low catchment inflows and low water level conditions can result in poor water quality, fish deaths, strong odours and changes in vegetation
- This can make the estuary a less pleasant recreational environment and can impact the way people use and experience an estuary



LONG-TERM ESTUARY MANAGEMENT REQUIRES A WHOLE OF CATCHMENT APPROACH

Estuary managers will carefully consider the risks associated with artificial estuary openings.

It is also important to manage the catchment to minimise risks to estuary values in the long term.

Many factors influence:

- How often estuary closures occur
- How often periods of low catchment inflows and low water level conditions occur
- How long these conditions persist
- Water quantity and quality in estuaries

These factors include:

- Quantity and quality of water draining from rural and urban areas to the estuary
- Climate change impacts (sea level rise, reduced rainfall, increased storm intensity)

Management activities may include:

- Minimising flow regulation and extractions during dry periods
- Improving water quality runoff from our rural and urban catchments



Definitions:

Amenity in this context refers to the way that people experience or enjoy the natural environment.

Dissolved oxygen is the amount of oxygen contained within the water. Fish and other aquatic life are dependent on dissolved oxygen levels for survival.

Low catchment inflows are when there is very little freshwater flowing to the estuary from rivers and creeks due to low rainfall, usually in summer and autumn months.

Low water level conditions are when the water surface in the estuary drops below the low tide mark, and mud flats are exposed. This can occur at many different times of the year.

Photos:

Front cover:

Painkalac Creek under low flow conditions (Corangamite CMA)

Inside left page:

Saltwater Creek, Phillip Island (provided by Fiona Warry, DEWLP)

Inside centre page:

Fish death at Anglesea River in 2013 (Corangamite CMA)

Gellibrand River estuary (Alluvium)

Sailing at Anglesea River (Jane Shennan, Anglesea River EstuaryWatch)

Inside right page,

bottom: Unfenced cattle by the Aire River (Department of Environment, Land, Water and Planning)

More Information:

Can be found at:

www.ccmaknowledgebase.vic.gov.au

Search for 'Should it be open or closed? - Estuary management during prolonged periods of low catchment inflows and low water level conditions' for the full report.

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