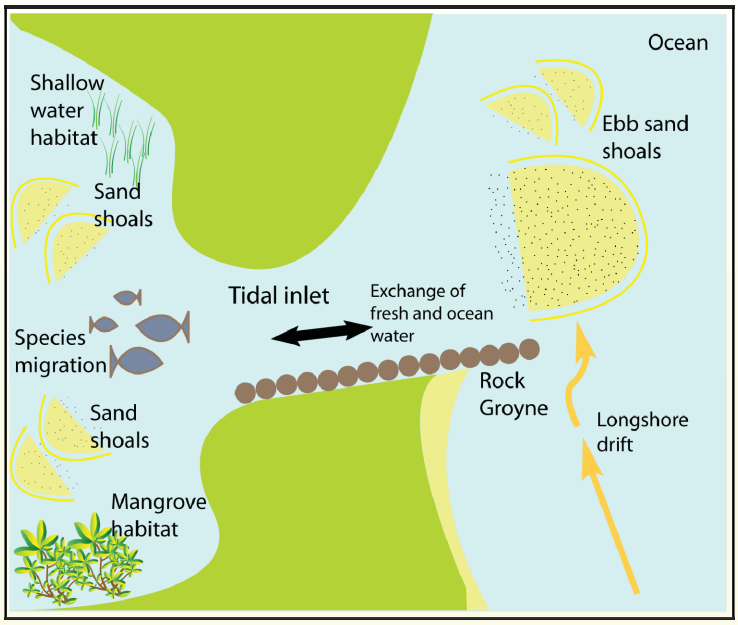
Tidal exchange on the Gold Coast

Tidal exchange occurs when water flows into a tidal inlet or estuary during the incoming tide and out during the outgoing (or ebb) tide. This volume of water is called the tidal prism.

Tidal exchange is the force that keeps the tidal inlet open to the sea, by transporting sediments (such as sand) from the catchment into the ocean. In contrast, the longshore drift moves ocean sand across the mouth of the inlet. Longshore drift is the northerly movement of sand along our coastline due to the dominant wave direction (see *Longshore drift: coastal processes on the Gold Coast* information sheet).

As sand is transported from upstream within the inlet, sand shoals (or sand banks) tend to form within the mouth of the inlet. Additionally, ebb shoals form offshore from the inlet due to the longshore sand transport (longshore drift) leading to the build-up of sand at the entrance. Tidal inlets can naturally close to the ocean during these periods of sediment deposition and then open again during flood conditions, when high flowing flood waters push through the sediment plug. A common management strategy to stabilise tidal inlets and ensure they remain open to the sea is the construction of groynes alongside the entrance known as training walls.



The key features of a tidal inlet.

If a tidal inlet becomes closed due to a variation in the tidal exchange, the waterway can act like a lake capturing all of the run-off (water, sediment, pollutants) from the entire catchment. This can result in poor water quality, due to an absence of the periodic flushing that occurs through tidal exchange. A further risk, in an urban setting, is the potential for localised flooding during heavy rainfall as the water cannot escape through the tidal inlet.

Tidal exchange is also important to the way in which treated recycled wastewater is managed. For example, treated recycled water can be released into tidal inlets during the outgoing (ebb) tide to ensure maximum mixing and dilution which occurs when the water reaches the ocean. This minimises the impact on our coastal environment.

How does tidal exchange affect the coastal environment?

Water quality

Tidal exchange ensures that water quality is maintained. This exchange of water brings in clean ocean waters and flushes out the inlet. This helps to maintain a high water quality in our waterways and dilute pollutants that may be present. The volume of water exchanged also affects the residence time of the waterway, which is the average amount of time that the water remains in the waterway. If the residence time is long there is a greater chance that the water will be become stagnant and poor water quality may result.

Habitat

The extent of the tidal exchange determines the distribution of ecosystems along our waterways. For example, mangroves prefer a habitat that is inundated by tidal waters daily and only grow within these specific areas (see *Mangroves of the Gold Coast* information sheet). If there is variation to tidal exchange their habitat may be impacted upon.

Reproduction and lifecycle migration

In order to successfully complete their lifecycles, many organisms need to migrate. If there is no tidal flow, there is no opportunity for the migration of many estuarine and ocean species. For example several species of prawns and fish have juvenile stages that inhabit mangrove forests before migrating out to sea. Also, for several species of sharks, such as bull sharks and hammerhead sharks, the female shark migrates into the estuary (sometimes far upstream) to have her offspring.

River Mangrove (Source: GCCM)

Red Mangrove (Source: GCCM)

Tidal inlets on the Gold Coast

The Gold Coast has several tidal inlets that experience various degrees of tidal exchange. At the larger end of the scale is the Gold Coast Seaway, which is the entrance to the Broadwater. Over 100 GL of water is exchanged through this inlet during each tide[1], with 84 per cent flowing from the northern rivers (Coomera and Pimpama Rivers) and the remainder from the Nerang River in the south[2]. Currumbin Creek and Tallebudgera Creek represent tidal inlets with a much smaller tidal exchange (see *Currumbin Creek Coastal Processes* information sheet). Both creeks are relatively small in size and are part of smaller catchments.

[1]Rasch, P.S., Khan, S., Davies, S., Capati, B., 2008. Assessing the assimilative capacity of an estuary using 2D and 3D modelling – Gold Coast Broadwater Capacity Study. Engineers Australia 9th National Conference on Hydraulics in Water Engineering, Darwin, September 2008.
[2]Mirfenderesk, H., Tomlinson, R., 2007. Numerical Modelling of Tidal Dynamic and Water Circulation at the Gold Coast Broadwater, Australia. J. Coast. Res. 50, 277–281

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