

## Factsheet

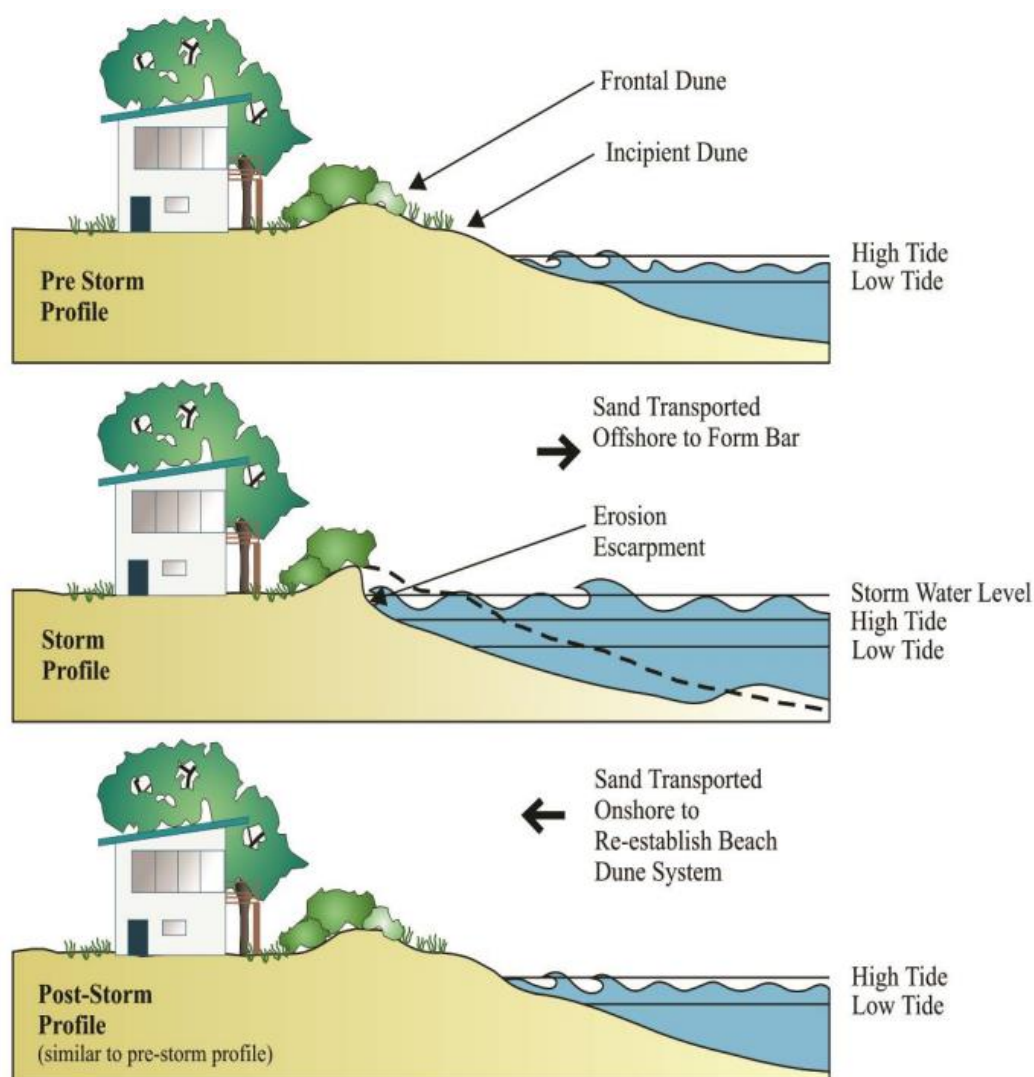
# The Basics of Coastal Hazards

Coastal Hazards are natural processes which can expose coastal areas to certain risks such as potential property damage and environmental degradation. Coastal Hazards include the following.

## Beach erosion

Beaches provide an interface between the ocean and the land. Some of our beaches are sometimes prone to beach erosion, wave over-topping and coastal inundation.

Beach erosion is the loss of beach and dune material because of changing wave and water conditions. This is commonly caused by increased wave height and energy, higher than usual tides, a storm surge (or elevated water levels because of barometric pressure and wind), or a combination of all three. Sometimes these factors do not need to be particularly intense to cause beach erosion which can occur over a period of days, weeks, or months.



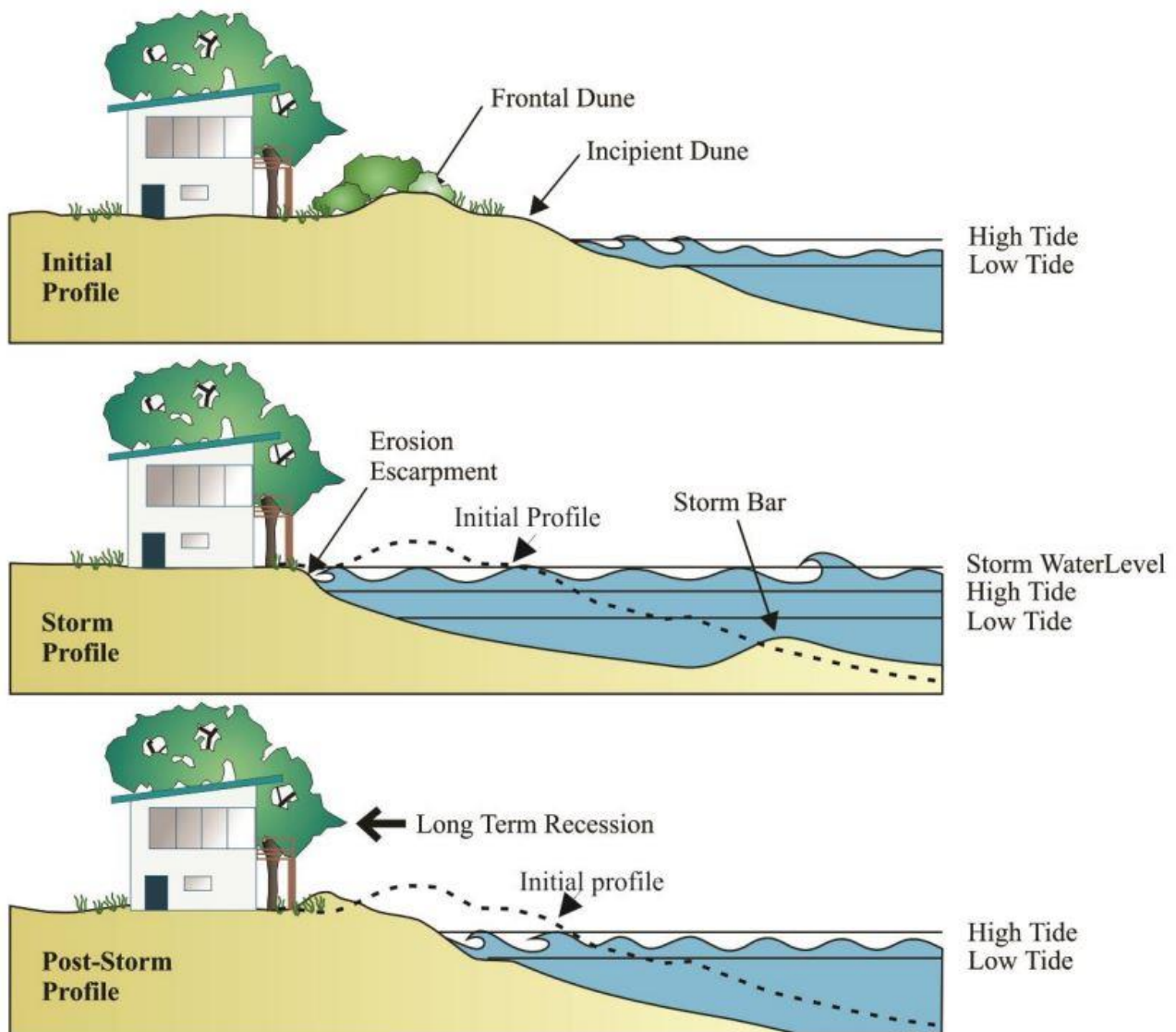
**Image Source:** NSW Government - NSW Coastal Management Manual Part B: Stage 2 – Determine risks, vulnerabilities and opportunities.

## Shoreline recession

Shoreline recession refers to continuing landward movement of the shoreline or a net landward movement of the shoreline over a specified time.

Recession is a natural process which occurs whenever the transport of material away from the shoreline is not balanced by new material being deposited onto the shoreline.

Shoreline recession can be in response to or increase due to rising sea levels.

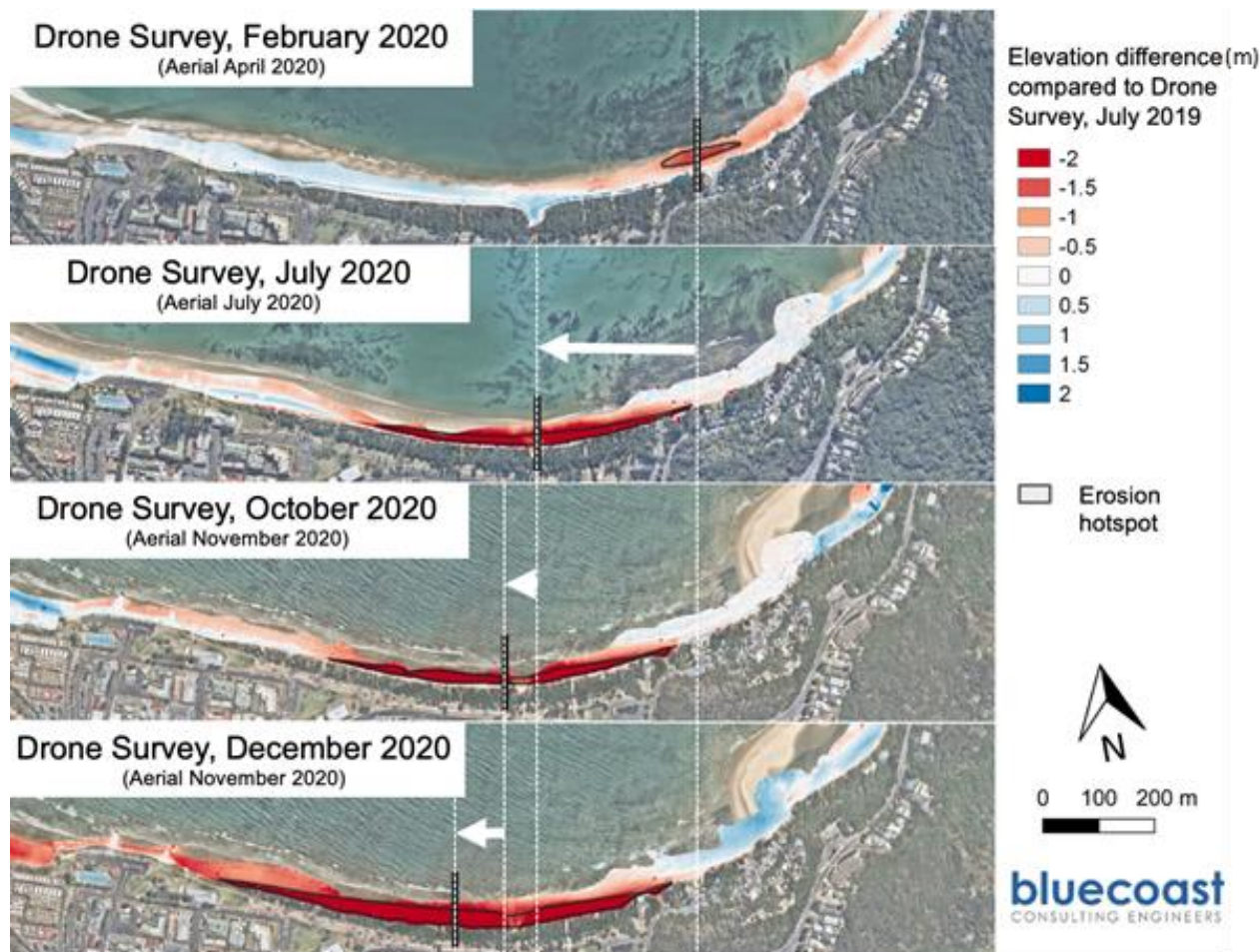


**Image:** NSW Government - NSW Coastal Management Manual Part B: Stage 2 – Determine risks, vulnerabilities and opportunities.

## Cyclic variability

Rotation of embayed beaches is a cyclic phenomenon that can be observed along the Australian east coast and causes temporary changes in beach widths that range from a few metres to more than 10s of metres.

Headland bypassing refers to the movement of sand around (or over) a headland from the updrift to the downdrift beach compartments. The importance of understanding the nuance of headland bypassing is highlighted by the erosion at Clarkes Beach and Main Beach during 2020.



**Image:** Bluecoast Consulting Engineers – Drone Survey, February 2020.



## Coastal lake or water course entrance stability

Both natural and trained entrances of estuaries and coastal lakes present a variety of potential hazards and risks. The entrance dynamics and the condition of the entrance also affect flood hazards, water quality and ecological health in the estuary or coastal lake.



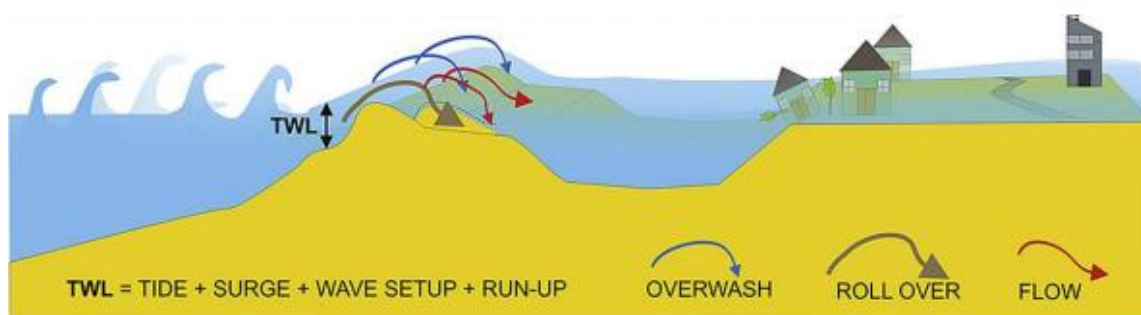
**Image:** Bluecoast Consulting Engineers – Aerial photographs showing the dynamic behavior of the Tallow Creek entrance area

## Coastal inundation

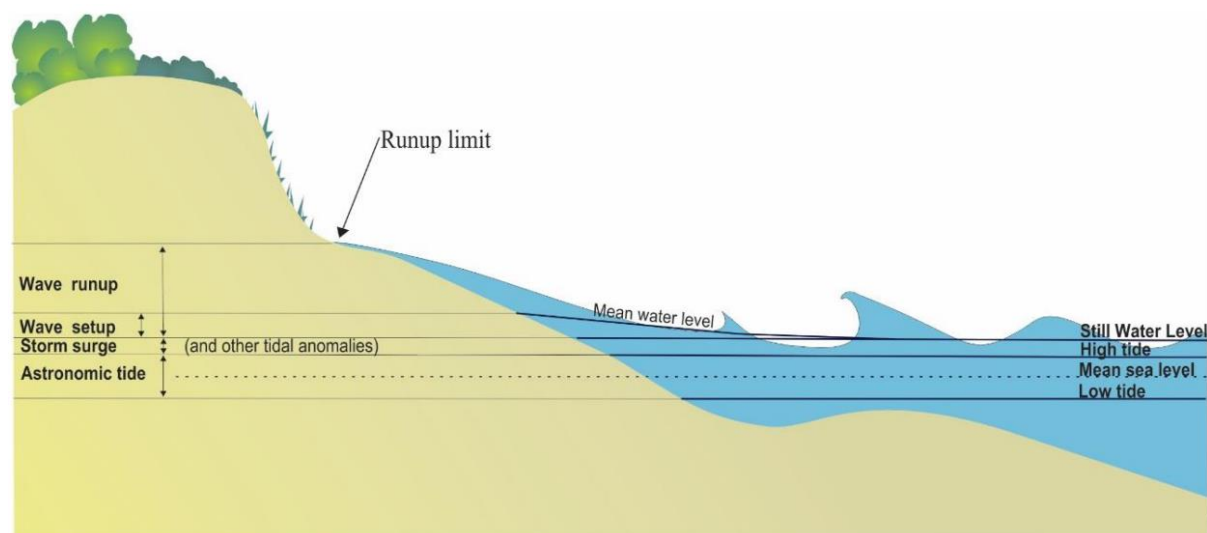
Coastal inundation is the temporary flooding of a portion of land within the coastal zone. It is desirable to distinguish between:

- coastal inundation, which is generally related to storm events and
- tidal inundation, which is generally related to elevated tidal water levels under average meteorological conditions.

Coastal inundation occurs when a combination of marine and atmospheric processes raise ocean water levels above normal elevations and inundate low-lying areas or overtop dunes, structures, and barriers. It is often associated with coastal storms resulting in elevated water levels (storm surge) and waves.



**Image:** Fernandez-Montblanc et al., 2020 – illustration outlining coastal inundation.

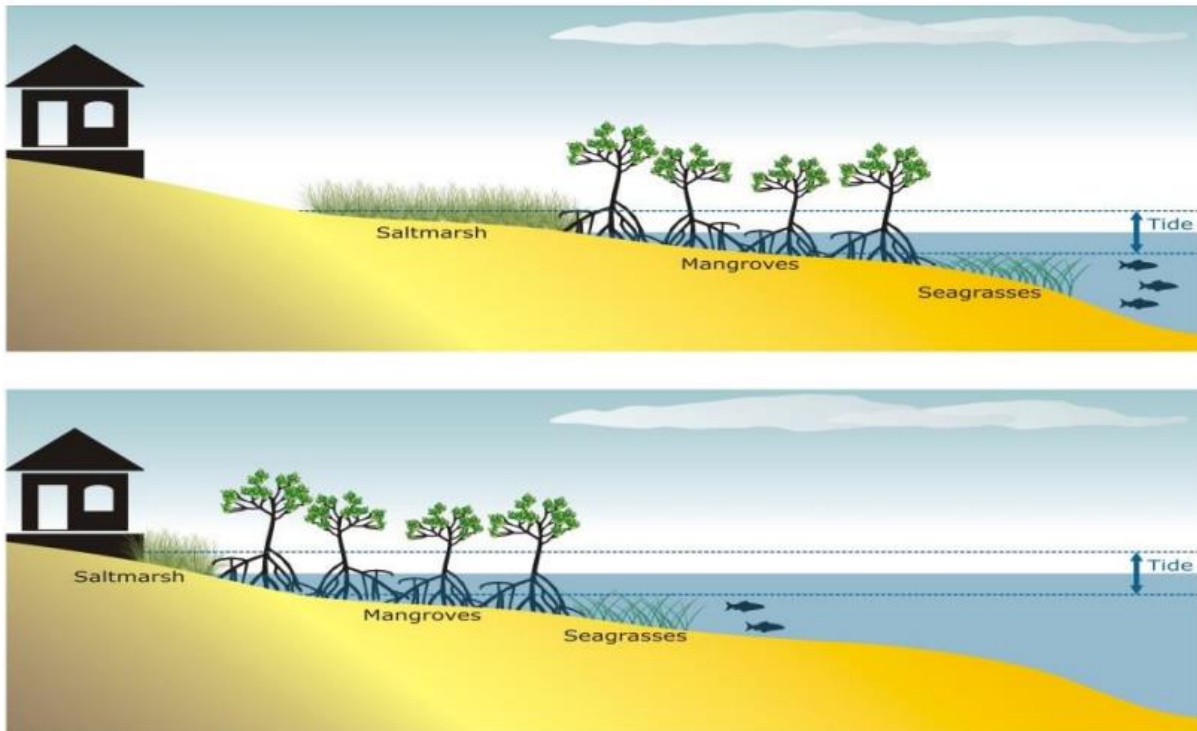


**Image:** NSW Government - NSW Coastal Management Manual Part B: Stage 2 – Determine risks, vulnerabilities and opportunities.

## Tidal inundation

Tidal inundation or 'blue sky' flooding is the inundation of land by tidal action under average meteorological conditions. This may include shorter-term incursion of seawater onto low-lying land during an elevated water level event such as a king tide or more permanent inundation due to land subsidence, changes in tidal range or sea level rise.

In some scenarios, the risk associated with tidal inundation may be exacerbated when a king tide coincides with coastal inundation or catchment flooding.



**Image:** Water Research Laboratory, 2016 – diagram showing tidal inundation



## Coastal cliff or slope instability

Cliff or slope instability hazard occurs on the headlands and bluffs.

These hazards present risks both to property and to life, such as rock falling from headlands and cliff faces, collapse of unconsolidated materials (such as high dune escarpments), reduced foundation capacity, and the collapse of cliffs under houses and development.



**Image:** Bluecoast Consulting Engineers – areas of potential cliff/slope instability at Broken Head.



## Erosion and inundation of estuary foreshores caused by tidal waters and wave action

The erosion of estuary foreshores may be associated with the long-term evolution of the estuary due to geomorphic processes.

Erosion and inundation of estuary foreshores can also be influenced by entrance training works, dredging and entrance management practices that may change tidal ranges, allow the incursion of oceanic waves, and change current velocities and sediment dynamics.

Inundation around estuaries may occur due to coastal or catchment flooding, operating independently or due to a combination of both, derived from the same meteorological event (a coincident event).

The interaction of catchment flooding and coastal processes is an important consideration in determining overall flood and inundation risk in coastal waterways.



**Image:** Bluecoast Consulting Engineers – aerial photograph showing foreshore erosion during open entrance at Belongil Creek.



**Image:** Bluecoast Consulting Engineers – photograph showing foreshore erosion at Belongil Creek.



## Erosion and inundation of estuary foreshores caused by tidal waters and wave action (continued)

There are a number of weather events which can cause these Coastal Hazards to occur. The most common weather events include:

### East coast low

An east coast low is an intense low-pressure system which commonly occurs several times a year off the eastern coast of Australia. These Coastal Hazards are said to generate the strongest winds, heaviest rainfall, and largest waves off the NSW coast. They tend to generate waves from south to south-east directions and can occur at any time but are most prevalent during autumn and winter months.

### Tropical cyclone

Tropical cyclones are intense low-pressure storms that develop over warm ocean waters with sustained gale force winds of at least 63 km/h. Generally, they last for several days and may track southwards offshore from Queensland. They may generate large east-north-east to east waves and are most prevalent from November to May.

### Large swells

Offshore swell generated over the Tasman Sea at a distance may impact the coastline and can create damaging surf potentially leading to large-scale erosion

## For more information

- [Coastal Hazards - Byron Shire Council \(nsw.gov.au\)](https://www.nsw.gov.au/coastal-hazards-byron-shire-council)
- [Coastal Management Program Northern Coastline - Byron Shire Council \(nsw.gov.au\)](https://www.nsw.gov.au/coastal-management-program-northern-coastline-byron-shire-council)
- [Coastal Management Program Southern Coastline including Estuaries - Byron Shire Council \(nsw.gov.au\)](https://www.nsw.gov.au/coastal-management-program-southern-coastline-including-estuaries-byron-shire-council)
- [Coastal Management Act 2016 - Coastal Management Act 2016 No 20 - NSW Legislation](https://www.nsw.gov.au/coastal-management-act-2016)
- [Coastal management | NSW Environment and Heritage \(nsw.gov.au\)](https://www.nsw.gov.au/coastal-management)
- [Coastal Erosion in New South Wales Statewide Exposure Assessment report.PDF \(nsw.gov.au\)](https://www.nsw.gov.au/coastal-erosion-new-south-wales-statewide-exposure-assessment-report)
- [NSW Coastal Management Manual Part B, Stage 2 – Determine risks, vulnerabilities and opportunities \(nsw.gov.au\)](https://www.nsw.gov.au/nsw-coastal-management-manual-part-b-stage-2-determine-risks-vulnerabilities-and-opportunities)