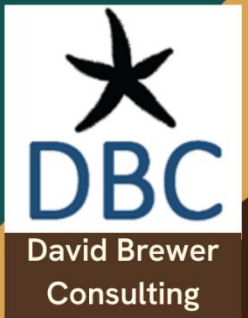


Sedimentation impacts in Moreton Bay: a priority knowledge synthesis

EXECUTIVE SUMMARY



The Moreton Bay
Foundation

This impact statement is drawn from

Sedimentation Impacts in Moreton Bay, a priority knowledge-synthesis

The report was commissioned by The Moreton Bay Foundation in 2025 to summarise key evidence on how sedimentation affects Moreton Bay’s coastal and marine ecosystems, and the ecological and cultural values they support. The report brings together published and grey literature, conceptual models, and expert review to provide a clear, high-level understanding of sedimentation pressures, their impacts, and remaining knowledge gaps.

This standalone document can be found in the full report. Where references are made to other sections, these are indicated by this symbol: †. A full list of external citations, data sources, and methods used in this document is included in the complete report, available at **moretonbayfoundation.org**

David Brewer Consulting (DBC) has prepared this report for The Moreton Bay Foundation under the contract titled ‘TMBF Priority Knowledge Synthesis: Sedimentation Impacts in Moreton Bay’. Information about the Moreton Bay Foundation can be found at: <https://moretonbayfoundation.org/>

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Executive Summary

This report was commissioned by The Moreton Bay Foundation (TMBF) to develop a summary ‘evidence pack’ of key knowledge regarding the impacts of sedimentation on the coastal and marine ecosystems of Moreton Bay and the values they support. It stemmed from the TMBF *Blueprint for a Sustainable Moreton Bay for People and Nature (2025-2035)*, or the ‘TMBF Blueprint’, which identifies catchment-derived sediment as one of the main threats to the ecological and other values of the Bay.

The project’s objectives are to:

1. Conduct a high-level review and synthesis of key existing knowledge concerning impacts of sedimentation on coastal and marine ecosystems, and the ecological and traditional cultural heritage values they support, in the Bay
2. Provide a register of key knowledge sources to impacts of sedimentation on coastal and marine ecosystems, and the ecological and traditional cultural heritage values they support, in the Bay
3. Develop high-level conceptual models of sedimentation impacts in Moreton Bay.

To develop the knowledge synthesis, a set of key representative values was identified to review. The TMBF Blueprint guided these efforts. The TMBF Blueprint guided these. ‘Sedimentation impact statements’ were then developed for each selected Moreton Bay value through a written review of published information. Additional sections that summarise (i) sedimentation sources and the processes associated with sedimentation delivery into Moreton Bay and (ii) catchment management were also developed. The sedimentation impact statements and other sections were separately reviewed by subject matter experts to provide validation of the information. A knowledge register (Excel database) has also been established for all referenced information.

Moreton Bay

Moreton Bay’s unique natural environment, high biodiversity and spectacular land and seascapes are of international importance, contributing to the lifestyles and livelihoods of communities across South-East Queensland. However, its proximity to one of Australia’s most densely populated regions presents a substantial challenge: to preserve the Bay’s unique values amid the relentless pressures of urban development and human activity.

Since European settlement, Moreton Bay has been subject to a range of ecological changes, including the mining of substantial areas of coral reef (>30 million tonnes of coral around Mud Island, St Helena Island and the other regions); the harvesting of >90% of its shellfish reefs; substantial benthic habitat modification from prawn trawling; and high recreational fishing effort. Some ecological communities that range more widely than the Bay are also vulnerable due to external impacts, including declines in migratory birds declines resulting from habitat loss on their international flyways and declines in sea turtle, shark, and ray populations due to international fishing and other harvesting mortalities.

These impacts have reduced the Bay's capacity to maintain its unique ecological habitats and, consequently, its biodiversity, productivity, and resilience.

Most sedimentation occurs below the water surface. The impacts of catchment-based sedimentation in the Bay represent a relatively hidden but significant impact that has widespread effects on most ecological values, as well as Indigenous cultural values, fisheries and amenity values.

Sedimentation processes

Sedimentation poses a significant and increasing threat to the ecological systems of Moreton Bay, primarily driven by extensive land clearing and development in its large catchment since European settlement. Current sediment export rates are estimated to be approximately 100 times (and may be up to 1000 times) greater than pre-European levels, stemming dominantly from channel and gully erosion upstream.

Flood events are the dominant mechanism delivering vast amounts of fine sediment (mud) to the Bay. Recent major flood events, such as those in January 2011, January 2013, and February 2022, have deposited millions of tonnes of sediment, leading to widespread fine sediment deposition across the entire Bay. This has resulted in a dramatic increase in mud distribution, doubling mud cover between 1970 and 2015, and decreasing the area of clean sand substrate from 442 km² to 30 km² over 50 years.

Suspended sediments reduce water clarity (turbidity) and restrict sunlight penetration, which smothers and inhibits the reproduction and growth of key benthic habitats such as seagrass and corals. This reduced light availability causes benthic primary production to decline, leading to a larger ecological shift from benthic to pelagic (open-water or upper layers of a water body) productivity.

The influx of fine sediments results in severe physical and biological degradation throughout the Bay. The benthic zone is dramatically altered as the surface area of clean sand has been reduced by approximately 93% (from 442 km² to 30 km²) over the last 50 years. Furthermore, benthic communities in over 98% of the Bay's benthic habitats have been altered and impacted.

Given that the Bay is functioning as a sink for terrestrial sediment inputs and hypothesised to be receiving sediment at a rate that far exceeds its natural capacity to move material offshore, the adverse effects — such as more frequent resuspension events and long-term water clarity issues — are likely to increase. Continued population growth will place the system under even greater pressure, given the ongoing development and land clearing in the Bay's catchment that is required to support this growth.

Impacts of sedimentation on Moreton Bay values

Of the 13 ecological values assessed, four are currently in 'poor' condition (saltmarshes, benthic macrofauna, epibenthic bivalves and sea turtles), with another six in 'fair' condition (Table I) due mainly to the relatively recent impacts of sedimentation. No values were assessed as being in 'excellent' condition. Only mangroves and marine mammals are currently in 'good' condition. Fisheries and visual amenity of the bay are also considered to currently be in 'fair' condition, also mainly due to the impacts of sedimentation.

However, the condition trend for these selected ecological values is more concerning than their current condition. The condition trend is assessed as declining for ten of the 13 ecological values, as well as for fisheries and visual amenity. The majority of those are assessed as being in decline due to the contribution of sedimentation. Only mangroves, phytoplankton and marine mammals are thought to have a stable condition trend.

Of the 16 culturally important Moreton Bay values to Traditional Custodians, six are considered to be in 'good' condition, four in 'fair' or 'variable' condition and six in 'poor' condition (Table II). Of those in 'poor' condition, the degradation of seagrasses can be attributed to sedimentation impacts. At the same time, the role of sedimentation may also be partly attributed to relatively recent sedimentation impacts for oyster and shellfish reefs, sea turtles, and beche-de-mer.

The decline in Moreton Bay's ecological, cultural, socio-economic, and amenity values due to the direct or indirect effects of sedimentation is of considerable concern, given the decades of previous environmental impacts and the prediction of large-scale perturbations to the marine environment. The effects of climate change (such as a warming climate and rising sea levels) are likely to exacerbate sedimentation issues in the Bay.

An increasing trend in the frequency of major floods in coastal catchments has been demonstrated for an area spanning from Brisbane (SE Qld) to Eden (NSW), since the late 19th century. Climate change is also predicted to drive an increase in the frequency of extreme rainfall events and associated flows from catchments to receiving waters along Australia's eastern seaboard, including for south-east Queensland. Without large reductions in sediment retention in the Moreton Bay catchment, future large floods will exacerbate the current impacts of sedimentation on the Bay's ecological values. Furthermore, the impacts of increasing plastic pollution and recreational fishing effort are likely to put additional pressure on the populations of many taxa.

If sedimentation into the Bay can be substantially reduced, it would reduce smothering of benthic communities and improve water clarity. This would lead to increased resilience and survival of photosynthetic communities (e.g., phytoplankton, seagrasses, algae, and hard corals) and reduce the frequency of toxic algal blooms. Furthermore, there would be a range of beneficial ecological cascading effects for other species (e.g. zooplankton, fish, marine mammals and sea turtles) that rely on those communities more directly impacted by sedimentation. Most fisheries and other socio-economic interests would also benefit from healthier and more abundant ecological communities.

Recommendations

A series of recommendations has been summarised from the published literature and is presented below. They include six high-level recommendations and three categories of more specific recommendations for marine ecosystems and other values.

High-level recommendations are to:

1. Urgently reduce the overall diffuse sediment and nutrient loads entering Moreton Bay from its catchments, including urgent implementation of the explicit, quantifiable regional management target to achieve a 50% reduction in sediment loads to maintain the Bay's current condition and improve ecosystem health.
2. Prioritise the stabilisation and rehabilitation of land and channel networks.
3. Improve control of sediment and pollutants from urbanised areas and development sites.
4. Develop an integrated, multi-faceted, adaptive management and monitoring approach for sedimentation impact management, spanning the land and sea.
5. Actively weave Traditional Knowledge and traditional science with Western science to inform policy development.
6. Improve governance of water quality management by adopting a common-pool resource approach for water quality management, fostering cooperation between upstream landholders and downstream beneficiaries.

Specific recommendations for marine ecosystems and other values are to:

1. Enhance habitat restoration and protection for a range of at-risk ecological values, including seagrass, mangrove, saltmarsh, benthic macrofauna, epibenthic bivalve and fish communities.
2. Improve specialised spatial planning and ecological controls for a range of at-risk ecological values, including mangrove, seagrass, hard coral, fish, shark, ray, sea turtle, shorebird and mammal communities.
3. Implement monitoring and research to assess the health of all key ecological groups and disentangle the impacts on, and responses of, these ecological values to sediments, nutrients, microplastics and other pollutants.

Further details of these are provided in the recommendations (**† Section 7**) of the main report.

Table I. Qualitative assessment of the overall status and trend in condition for 16 key Moreton Bay values, including an assessment of the contribution of sedimentation to the current condition and condition trend.

Value	Current condition	Condition trend	Contribution of sedimentation to the trend
1. Traditional Custodian values	See separate table		
2. Seagrass	Fair*	Declining	Major
3. Mangroves	Good	Stable	Moderate
4. Saltmarsh	Poor	Declining	Major
5. Phytoplankton	Fair	Stable	Moderate
6. Zooplankton	Variable	Declining	Moderate
7. Benthic macrofauna	Poor	Declining	Major
8. Hard corals	Fair	Declining	Moderate
9. Epibenthic bivalves (shellfish reefs)	Poor	Declining	Major
10. Sharks and rays	Fair	Declining	Unknown
11. Teleost fish	Variable	Declining	Major
12. Sea turtles	Poor	Declining	Moderate
13. Shorebirds	Fair	Declining	Minor
14. Marine mammals	Good	Stable	Moderate
15. Fisheries	Fair	Stable	Unknown
16. Visual amenity	Fair	Declining	Major

* depending on the region in the Bay, as per the Healthy Land & Water report card (Healthy Land & Water, 2023).

Table II. Ecological groups with high cultural value to the Quandamooka people and the status and trend of these groups, as described in other Impact Statements within the report.

Culturally important group	Customary role	Current condition	Condition trend
Seagrass	Traditional harvesting and ceremony	Fair*	Declining
Mangrove-fringed coastlines	Spiritual and totemic importance	Good	Stable
Oyster and shellfish reefs	Supports culturally important food species	Poor	Declining
Coral reefs	Significant in Dreaming stories and totems	Fair	Declining
Crustaceans	Culturally important species	Variable	Stable
Mud crabs	Culturally important food species	Good	Stable
Beche-de-mer	Culturally important species	Poor	Declining
Shovel-nosed sharks	Totemic importance	Poor	Declining
Finfish	Culturally important group	Variable	Declining
Sea snakes	Significant in Dreaming stories and totems	Variable	Stable
Sea turtles	Spiritual and totemic importance	Poor	Declining
Sea eagles	Significant in Dreaming stories and totems	Good	Stable
Curlews	Significant in Dreaming stories and totems	Poor	Declining
Dugong	Spiritual and totemic importance	Good	Stable
Dolphins	Spiritual and totemic importance	Good	Stable
Whales	Spiritual and totemic importance	Good	Stable

* depending on the region in the Bay, as per the Healthy Land & Water report card (Healthy Land & Water, 2023).

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This standalone document corresponds to the **Executive Summary** of the full report. A full list of external citations, data sources, and methods used in this document is included in the complete report, available at

moretonbayfoundation.org



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