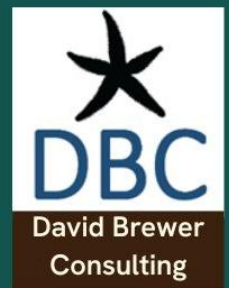




Sedimentation impacts in Moreton Bay: a priority knowledge synthesis

IMPACTS:

Sea Turtles



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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Sea Turtles: Sedimentation Impact Statement

Status and trend summary

Moreton Bay is an important habitat for six sea turtle species, with most using the Bay as a feeding area.

Table 1 provides a combined qualitative assessment of sea turtle populations in the Bay, highlighting their current condition, trend and the impacts of sedimentation. However, most of the species have broad migratory ranges and are subject to many significant threats throughout their ranges. These include interactions with fishing gear, starvation from the ingestion of plastic debris, parasitism (leading to immunosuppression and disease), loss of nesting and feeding habitats due to coastal development and sea level rise, impacts on sex ratios, and other factors. The International Union rates most species for Conservation of Nature (IUCN) as having some level of risk from extinction from one or more of these factors. Hence, their current condition is rated as 'Poor' with 'High' confidence. Sedimentation and other impacts vary between species. The contribution of sedimentation to turtles' current condition in the Bay is primarily related to its impacts on seagrass, which Green turtles rely on. This contribution is considered to be 'Moderate', with 'Medium' confidence.

Although Green turtles show a recent increase in numbers in Moreton Bay, most turtle species in the Bay are in decline or poorly understood. Most threats, such as plastic ingestion, coastal development and sedimentation, exposure to toxic pollutants, sea level rise, and temperature increase, are likely to worsen in the decades ahead - including in Moreton Bay. Hence, the 'Condition trend' for sea turtles is rated as 'Declining' with 'High' confidence. There is also a substantial risk to the condition trend for Moreton Bay turtles from sedimentation and toxic pollutant impacts. This is due to (i) the large-scale coastal development surrounding the Bay and turtles' dependence on benthic communities for food. These impacts were evidenced after the 2011, 2012 and 2021/22 floods, which led to large sediment load inputs, followed by substantial seagrass loss and major impacts on the epifaunal and infaunal communities on which sea turtle species rely. Hence, the contribution of sedimentation to this condition trend is likely to be 'Moderate' within the Bay, diluted to an extent by the broader suite of other significant impacting factors.



Endangered Green turtle (Chelonia mydas) in Moreton Bay
Photo credit: S. Rabbitt

Table 1. Qualitative assessment of the overall status and trend in condition, and of the likely severity and direction of sedimentation-specific impacts, on six species of sea turtles that occur in Moreton Bay.

Value condition assessment	Assessment	Confidence
Current condition	Poor	Medium
Contribution of sedimentation to the current condition	Minor	Medium
Condition trend	Declining	High
Contribution of sedimentation to trend	Moderate	Medium

Overview

Moreton Bay is a vitally important habitat for six sea turtle species, with two of these, loggerhead and green turtles, maintaining significant resident populations (Limpus and Coffee, 2019). Moreton Bay is an important feeding habitat for sea turtles. The Green turtle (*Chelonia mydas*), Loggerhead turtle (*Caretta caretta*), Hawksbill turtle (*Eretmochelys imbricata*), Olive ridley turtle (*Lepidochelys olivacea*), and Flatback turtle (*Natator depressus*) are year-round foraging residents in the Bay (Limpus and Coffee, 2019). Leatherback turtles (*Dermochelys coriacea*) are migratory visitors to Moreton Bay, typically present during the autumn and winter months, but are not permanent residents (Limpus and Coffee, 2019).

Both Green and Loggerhead turtles in Moreton Bay are part of substantial foraging populations that contribute annually to nesting populations in the southern Great Barrier Reef (sGBR) and the South Pacific Ocean, respectively (Limpus and Coffee, 2019). While Moreton Bay itself is not a major breeding site for sea turtles, Limpus and Coffee (2019) note that Green and Loggerhead turtles migrate into Moreton Bay waters and nest annually at low density on the ocean beaches of the Bay Islands.

Extensive seagrass meadows are a dominant feature in Moreton Bay, particularly on the eastern side, and serve as crucial habitats for sea turtles (Maxwell *et al.*, 2019; Cross *et al.*, 2024). Sea turtles are most frequently encountered on the shallow, seagrass-dominated Eastern Banks, adjacent to Dunwich on Minjerribah, and extending northwards along the western face of Moreton Island (Limpus and Coffee, 2019). They also inhabit areas with fringing mangroves and shallow muddy flats in the southern part of the Bay, and throughout Deception Bay in the north-west (Limpus and Coffee, 2019).

Sea turtles generally undergo an ontogenetic (developmental) diet shift from a predominantly carnivorous, open-ocean phase as post-hatchlings to a benthic foraging strategy in coastal waters (Limpus and Coffee, 2019). The habitat and diet preferences of the post-hatchling phase of their life cycles are summarised below.

Green turtles

Green turtles exhibit long-term fidelity to specific foraging sites within Moreton Bay (Limpus and Coffee, 2019). Satellite telemetry indicates home ranges of 128.8 km² in the east, 23.7 km² in the south, and 121.8 km² in the northwest of Moreton Bay (Limpus and Coffee, 2019). Their feeding areas are highly conserved and localised, typically a few kilometres in diameter (Hermanussen *et al.*, 2004). These habitats include the shallow, seagrass-dominated Eastern Banks, where they are most commonly encountered (Limpus and Coffee, 2019), as well as the fringing mangroves and shallow, muddy flats at the southern extent of the Bay and in Deception Bay (Limpus and Coffee, 2019).

Green turtles are the only primarily herbivorous sea turtle species (Forbes, 1996). In Moreton Bay, Green turtles are documented as year-round foraging residents (Limpus and Coffee, 2019), grazing mainly on seagrass (*Zostera capricorni* and *Halophila ovalis*) with the less abundant algae also consumed (mainly *Gracilaria sp.* and *Hypnea sp.*)

(Limpus and Coffee, 2019; D. Booth, pers. comm.). The consumption of seagrass by green turtles can influence seagrass meadows, with grazing leading to increased leaf regrowth of their preferred species, *Halophila ovalis* (Maxwell *et al.*, 2019). They also opportunistically consume mangrove leaves and propagules (mainly *Avicennia marina*) as well as some gelatinous animal material (e.g. jellyfish) (Limpus and Coffee, 2019). However, after widespread flooding events, when seagrass beds are greatly reduced in abundance, the proportion of mangrove material in diets increases greatly (D. Booth, pers. comm.).

Loggerhead turtles

The Moreton Bay population of Loggerhead turtles is considered one of the most significant in the southern Pacific Ocean (Lanyon, 2019). This is, in part, because Loggerhead turtles are recognised as year-round foraging residents in Moreton Bay and the Bay is one of the most important feeding grounds for the Australian east coast population (Lanyon, 2019).

They use a range of habitats, including intertidal and subtidal seagrass meadows, coral and rocky reefs, and soft-bottom, deeper, subtidal habitats (Limpus and Coffee, 2019). Loggerhead turtles have been observed primarily feeding on portunid crabs, and benthic gastropod and bivalve molluscs (Limpus and Coffee, 2019). They also mine the substrate for infauna (invertebrates buried in the sediment) and consume gelatinous-bodied prey from the mid-water column and surface (Limpus and Coffee, 2019). Their diet can include over 100 different taxa (Limpus and Coffee, 2019).

Hawksbill turtles

Hawksbill turtles are year-round foraging residents in the waters of Moreton Bay, although only in small numbers (Dudgeon *et al.*, 2019; Limpus and Coffee, 2019; D. Booth, pers. comm.). Despite a paucity of specific studies on their foraging ecology, adult Hawksbill turtles are recognised as primarily spongivores but are also known to eat algae, soft corals and other sessile invertebrates (Berube *et al.*, 2012; Goatley *et al.*, 2012; Limpus and Coffee, 2019). In Moreton Bay, they have been observed selectively feeding on large sea anemones on subtidal rocky reefs (Limpus and Coffee, 2019).

Flatback turtles

Flatback turtles forgo a pelagic developmental period and spend their post-hatchling stages through to adulthood in neritic (coastal) foraging environments (Limpus and Coffee, 2019). They are year-round foraging residents in Moreton Bay (Limpus and Coffee, 2019). However, only occur in small numbers in the Bay (D. Booth, pers. comm.). While observations are limited, they are believed to have carnivorous diets, mainly consisting of soft-bodied invertebrates such as sea pens, soft corals, holothurians, and jellyfish (Limpus and Coffee, 2019).

Olive ridley turtles

Olive ridley turtles prefer tropical and subtropical open ocean areas and are characterised as nomadic opportunistic omnivores (Peavey *et al.*, 2017). Hence, they also only occur in small numbers in the Bay (D. Booth, pers. comm.). They do not

undergo ontogenetic habitat shifts and may forage in both benthic and pelagic habitats (Peavey *et al.*, 2017; Limpus and Coffee, 2019). Their oceanic diet primarily consists of planktonic items or organisms found on or near flotsam, such as algae, crustaceans, and salps, and they often forage through passive drifting (Peavey *et al.*, 2017). They are also known to eat gastropods, cnidarians and benthic crustaceans (Peavey *et al.*, 2017; Limpus and Coffee, 2019).

Although they are recorded as year-round foraging residents in the waters of Moreton Bay (Limpus and Coffee, 2019), there is no published information about their diet or preferred habitat in the Bay.

Leatherback turtles

Leatherback turtles also only occur in small numbers in the Bay (D. Booth, pers. comm.). They primarily consume a diet of gelatinous macro-zooplankton such as sea pens, jellyfish, soft corals, tunicates, holothurians and siphonophores (Frick *et al.*, 2009; Dodge *et al.*, 2011; Limpus and Coffee, 2019). They are year-round foraging residents in Moreton Bay and have been regularly reported to feed on the Blue blubber jellyfish (*Catostylus mosaicus*) (Limpus and Coffee, 2019).

Population status

Since the commencement of systematic capture-mark-recapture (CMR) studies in 1990, specific population trends have been observed for key species. Populations have been subject to a range of pressures globally, including the following:

- Entanglement and drowning mortality in fisheries bycatch (Hart *et al.*, 2018; Fuentes *et al.*, 2023; Mestre *et al.*, 2025). However, in Moreton Bay, all otter trawl nets and some beam trawl nets must have an approved Turtle Excluder Device installed (*Queensland Fishery [General] Regulation 2019*), which can exclude most medium and large turtles from drowning within the nets while they are deployed (Brewer *et al.*, 2006).
- Starvation mortality due to ingestion of plastic debris (Howell and Shaver, 2021; Fuentes *et al.*, 2023; Glen *et al.*, 2024; Yenney *et al.*, 2024). A survey in Moreton Bay found that 33% of all deceased sea turtles between 2006 and 2011 had ingested marine debris.
- Existing and emerging diseases associated with pathogens and parasites are a growing concern. Historical analysis of stranding data indicates a steady increase in green turtles over the past 20 years, with disease being the primary cause (J. Bowtell, pers. comm.). The most recent comprehensive investigation, conducted by Flint *et al.* (2010), found that 41.8% of green turtle deaths were attributed to parasitism, likely reflecting the influence of external environmental stressors.
- Coastal development and habitat loss. This impacts both nesting and foraging grounds (Hart *et al.*, 2018; Howell and Shaver, 2021; Martinez-Estevéz *et al.*, 2022; Fuentes *et al.*, 2023; Glen *et al.*, 2024; Read *et al.*, 2024) and includes impacts of dredging, aquaculture, and vessel traffic (Fuentes *et al.*, 2023).

- Climate change. The primary impact of climate change on sea turtles is through temperature-dependent sex determination, where rising sand temperatures at nesting sites skew sex ratios towards females, threatening reproductive viability (Goatley *et al.*, 2012; Fuentes *et al.*, 2023; Nguyen, 2025). Climate change also leads to sea-level rise, which impacts nesting beaches and can affect foraging habitats through events like marine heatwaves and storms (Goatley *et al.*, 2012; Hart *et al.*, 2018; Fuentes *et al.*, 2023; Nguyen, 2025).
- Direct harvesting of eggs and meat. This remains a threat, although it has reduced from historical levels (Hart *et al.*, 2018; Siegwalt *et al.*, 2020; Howell and Shaver, 2021; Fuentes *et al.*, 2023; Read *et al.*, 2024). There is only a small indigenous take of sea turtles within Moreton Bay, and the nesting beaches for green and loggerhead turtles are protected from egg harvesting (D. Booth, pers. comm.).

As many sea turtle species have very wide global distributions, most of the pressures listed above will be occurring across their distribution range. These will have some impact on the population status of each species in Moreton Bay. The global vulnerability of sea turtles is reflected in Table 2, showing that five of the six species found in the Bay are listed as either Critically Endangered, Endangered or Vulnerable to extinction on the International Union for Conservation of Nature (IUCN) Red List. Hence, the population status of the six species found in the Bay is likely to be influenced by both the broader issues affecting sea turtles globally and local factors. Sea turtles mainly use Moreton Bay as an important feeding ground (see Overview section above) (Limpus and Coffee, 2019) and the quality of those habitats is a focus of this report.

Green turtles

Globally, Green turtles are listed as Endangered by the IUCN (IUCN, 2025) (Table 2), though subpopulation assessments can range more widely (Glen *et al.*, 2024; Read *et al.*, 2024). The foraging population of green turtles on the eastern banks of Moreton Bay has approximately tripled during the 25 years of CMR studies from 1990 to 2014 (Limpus and Coffee, 2019). This success is linked to a consistently increasing Green turtle nesting population in the southern GBR since strong protections began in 1950, resulting in regular recruitment of new immature sea turtles into Moreton Bay residency (Limpus and Coffee, 2019). Green turtle post-hatchlings are also at known risk of excessive mortality from blockage and compaction of the digestive tract (Howell and Shaver, due to ingestion of plastic debris (Limpus and Coffee, 2019). This aligns with an increase in post-hatchling strandings due to ingestion of plastics noted in the past 5 years (J. Bowtell, pers. comm.).

Loggerhead turtles

Globally, Loggerhead turtles are listed as Vulnerable by the IUCN (IUCN, 2025) (Table 2). Their populations have been declining in Moreton Bay (Limpus and Coffee, 2019), mainly attributed to excessive mortality of small post-hatchlings. Main impacting factors include ingesting plastic debris while travelling in the East Australian Current

(Limpus and Coffee, 2019), along with additional mortality from fisheries bycatch (Brewer *et al.*, 2006), and particularly on the west coast of South America, where many juveniles forage (D. Booth, pers. comm.). These mortalities have led to a severely depleted recruitment of young loggerheads into Moreton Bay residency since the early 1990s (Limpus and Coffee, 2019). Additionally, the primary food sources of Loggerhead turtles (e.g. portunid crabs and bivalve molluscs) are also harvested and managed as fishery resources, which may be adding further pressure on their food source (J. Bowtell, pers. comm.).

Hawksbill turtles

Globally, Hawksbill turtles are listed as Critically Endangered (Table 2) and their numbers and habitat continue to decline worldwide (IUCN, 2025; Berube *et al.*, 2012; Ferreira *et al.*, 2018). Their populations are a fraction of their historical sizes, due mainly to excessive hunting because of the high value of their shell for craftwork and from mortality through encounters with fishing gear (Martinez-Estevéz *et al.*, 2022; Fuentes *et al.*, 2023). However, they have been identified as one of the most abundant species in the Bay in systematic studies that began in 1990 (Limpus and Coffee, 2019).

Flatback turtles

Globally, Flatback turtles are listed as Data Deficient (IUCN, 2025) (Table 2). Although little is known about the population dynamics of Flatback turtles, they occur in areas with large trawling fleets and are known to be caught as trawl bycatch (Brewer *et al.*, 2006). They are also known to incur mortality through interactions with ghost nets (discarded fishing gear) (Fuentes *et al.*, 2023). Although they are year-round residents in Moreton Bay, they are not among the most abundant marine turtle species in the Bay (Limpus and Coffee, 2019).

Olive ridley turtles

Globally, Olive Ridley turtles are listed as Vulnerable (IUCN, 2025) (Table 2). One of the main impacts on their populations is through interactions with prawn trawl nets (e.g. Brewer *et al.*, 2006). Although they are year-round residents in Moreton Bay, they are not among the most abundant marine turtle species in the Bay (Limpus and Coffee, 2019).

Leatherback turtles

Globally, Leatherback turtles are listed as Vulnerable (IUCN, 2025) (Table 2). However, their populations in the Pacific are critically endangered and continue to decline (Hays, 2008; Fuentes *et al.*, 2023, J. Bowtell, pers. comm.). They have suffered 'heavy declines' due to interactions with fishing gear (Fuentes *et al.*, 2023), but also due to prey limitation in the Pacific Ocean (Hays, 2008) and from a decrease in hatching success due to toxic pollutants (Martins *et al.*, 2020; Fuentes *et al.*, 2023).

They are migratory visitors to Moreton Bay, primarily during autumn and winter (Limpus and Coffee, 2019), and are therefore not considered abundant in the Bay. However, the

frequency of encounters with leatherback turtles in the Moreton Bay region has substantially declined in recent decades (Limpus and Coffee, 2019).

Table 2. List of the six resident or regularly visiting sea turtles of Moreton Bay, noting their trend and categorisation under the IUCN Red List (IUCN listings are taken from www.iucnredlist.org). Colours used are based on the IUCN Red List.

Sea turtle species	IUCN Trend	IUCN Listing
Loggerhead turtle (<i>Caretta caretta</i>)	Decreasing	Vulnerable
Green turtle (<i>Chelonia mydas</i>)	Increasing	Endangered
Hawksbill turtle (<i>Eretmochelys imbricata</i>)	Decreasing	Critically endangered
Flatback turtle (<i>Natator depressus</i>)	Unknown	Data deficient
Olive ridley turtle (<i>Lepidochelys olivacea</i>)	Unknown	Vulnerable
Leatherback turtle (<i>Dermochelys coriacea</i>)	Declining	Vulnerable

Value

Ecological value

Sea turtles in Moreton Bay hold significant ecological value through their interactions with various habitats. Green turtles are important herbivores, grazing on algae and seagrass within the Bay (Limpus and Coffee, 2019; Maxwell *et al.*, 2019; Sanchez *et al.*, 2024). This grazing can influence the primary producer community structure and dynamics, and has been shown to increase leaf regrowth of preferred seagrass species, such as *Halophila ovalis* (Goatley *et al.*, 2012; Maxwell *et al.*, 2019; Sanchez *et al.*, 2024).

Other species, such as Loggerheads, Hawksbills, Flatbacks and Olive ridleys, are carnivores that feed on various invertebrates and gelatinous prey (Limpus and Coffee, 2019; Glen *et al.*, 2024). Hawksbill turtles, for example, help maintain healthy reef systems by consuming sessile invertebrates (like sponges) that compete with corals (Goatley *et al.*, 2012; Martins *et al.*, 2020; Sanchez *et al.*, 2024).

Collectively, sea turtles contribute to the health and maintenance of seagrass beds and coral reefs, acting as biological transporters that introduce marine nutrients and energy to coastal ecosystems (Martins *et al.*, 2020; Fuentes *et al.*, 2023; Cross *et al.*, 2024). They are considered essential for maintaining ecosystem functions and specific diversity within marine environments, such as Moreton Bay (Martins *et al.*, 2020; Siegwalt *et al.*, 2020; Cross *et al.*, 2024).

Cultural value

Sea turtles hold significant cultural value for Indigenous people in Moreton Bay. They are considered sacred Aboriginal totems for saltwater people in coastal areas (Ross *et al.*, 2019a), as demonstrated by their presence in Quandamooka Dreaming stories (Delaney, 2013). Historically, sea turtles were hunted for food by local Indigenous people in Moreton Bay, a practice that continued following European settlement until 1950 (Limpus and Coffee, 2019). For the Quandamooka people of Moreton Bay, traditional hunting and fishing practices, including the use of seafood, are

an important affirmation of cultural identity and continue to be an essential aspect of their lives (Townsend *et al.*, 2019).

Economic value

Sea turtles in Moreton Bay have historically held economic value primarily through commercial hunting and as a traditional food source (see Cultural value section above). Following the arrival of European settlers, sea turtles were hunted commercially in Moreton Bay from 1824 to 1950 (Limpus and Coffee, 2019). Prior to European colonisation and continuing after, sea turtles were also a traditional food source for the local Indigenous people in Moreton Bay (Limpus and Coffee, 2019).

Sea turtles contribute significantly to the biodiversity of Moreton Bay, particularly to the visible megafauna community, which supports the growing ecotourism activity in the Bay.

History

The shallow coastal waters of Moreton Bay have continuously supported marine turtle populations since sea levels rose after the last ice age (Limpus and Coffee, 2019). In recent history, sea turtles in Moreton Bay were hunted for food by local Indigenous people, then subject to commercial hunting by European settlers from 1824 to 1950 (Limpus and Coffee, 2019). Populations of sea turtles have been impacted differently in recent decades, as described above (see Population status and Value sections). Green turtles have increased in numbers since strong protections were introduced in the southern GBR (Limpus and Coffee, 2019). However, three species – Loggerhead, Hawksbill and Leatherback turtles – are all in decline (see Population status section above).

Impacts of sedimentation

The impacts of sedimentation on sea turtles in Moreton Bay are broadly described in the conceptual model (Figure 1). Sedimentation is a local stressor in Moreton Bay that interacts synergistically with other factors like coral bleaching, acidification and diseases, contributing to the decline in the extent and health of reef, seagrass and other benthic habitats that sea turtle species are reliant on (Berube *et al.*, 2012; Bjorndal *et al.*, 2017). Smothering of these habitats by terrestrial mud deposits following major flood events in the Bay can ultimately affect sea turtles and other marine species (Grinham *et al.*, 2024). Elevated nitrogen from these deposits can also support toxic algal blooms, which can further lead to the smothering of seagrass (Grinham *et al.*, 2024).

Sedimentation can suppress herbivory (grazing) by herbivorous turtles on algal turfs and seagrass beds. It reduces the accessibility of these food resources and hence, the energy uptake per bite for Hawksbill and Green turtles (Goatley *et al.*, 2012; Bjorndal *et al.*, 2017).

Hawksbill turtles rely on sponges and other sessile invertebrates found on coral reefs (Berube *et al.*, 2012; Martins *et al.*, 2020; Martinez-Estevéz *et al.*, 2022; Sanchez *et al.*,

2024). The degradation of coral reefs due to sedimentation (see † **Section 5.8**) directly diminishes the health and extent of these essential food resources (Berube *et al.*, 2012; Bjorndal *et al.*, 2017).

Loggerhead turtles rely on benthic epifauna and infauna, including filter and suspension feeders (see Overview section above), as part of their diet. Most of these benthic groups are impacted by sedimentation through smothering or burying the organisms, or through excess exposure to suspended sediments (Saeck *et al.*, 2019a; see † **Section 5.7**). Suspended sediments can impact water clarity and hence, seagrass and algal photosynthesis, and can affect the feeding success for filter and suspension feeders. The change in the bay from predominantly sandy to muddy bottoms across Moreton Bay increased from approximately 30% in 1998 to 70% in 2011 (Saeck *et al.*, 2019a). This alteration of the substrate can permanently change habitats, making them unsuitable for species, including filter and suspension feeders, that are adapted to sandy environments (Saeck *et al.*, 2019a).

The accumulation of pollutants in seagrass beds, which have been trapped in terrigenous sediments, exposes herbivorous Green turtles to pollutants such as dioxins (Hermanussen *et al.*, 2004). Elevated concentrations of dioxins, comparable to those found in highly polluted areas in the Northern Hemisphere, have been observed in Moreton Bay's Green turtles (Hermanussen *et al.*, 2004). This exposure is a concern, as a higher incidence of poor health, including fibropapilloma (tumour growth), has been observed in Green turtles from the more riverine-influenced southwestern feeding grounds. This is particularly evident when compared to less-impacted northeastern populations in the Bay, which may be correlated with these contaminant patterns (Hermanussen *et al.*, 2004). This seagrass degradation can often lead to stress or alteration of the natural diet for prolonged periods of time, leading to immunosuppression and susceptibility to disease processes (J. Bowtell, pers. comm.).

Recommendations

1. Reduce marine debris at its source across all levels of government (local, state, national). This is critically important, as sea turtles frequenting the Bay and its surroundings experience significant impacts from debris ingestion (Townsend *et al.*, 2019).
2. Continue to implement and enforce Moreton Bay Marine Park green zones and mandatory 'go slow' areas for recreational and commercial vessels, as these areas are designated high-use foraging sites for sea turtles (Limpus and Coffee, 2019; Pascoe *et al.*, 2025).
3. Prioritise continued research and careful management of seagrass communities, which are critical for sea turtles and face ongoing threats (Maxwell *et al.*, 2019).
4. Reduce sediment loads which impact seagrass beds, algae and other benthic food sources. This will directly benefit sea turtles by increasing the quality of their food sources (Goatley *et al.*, 2012).

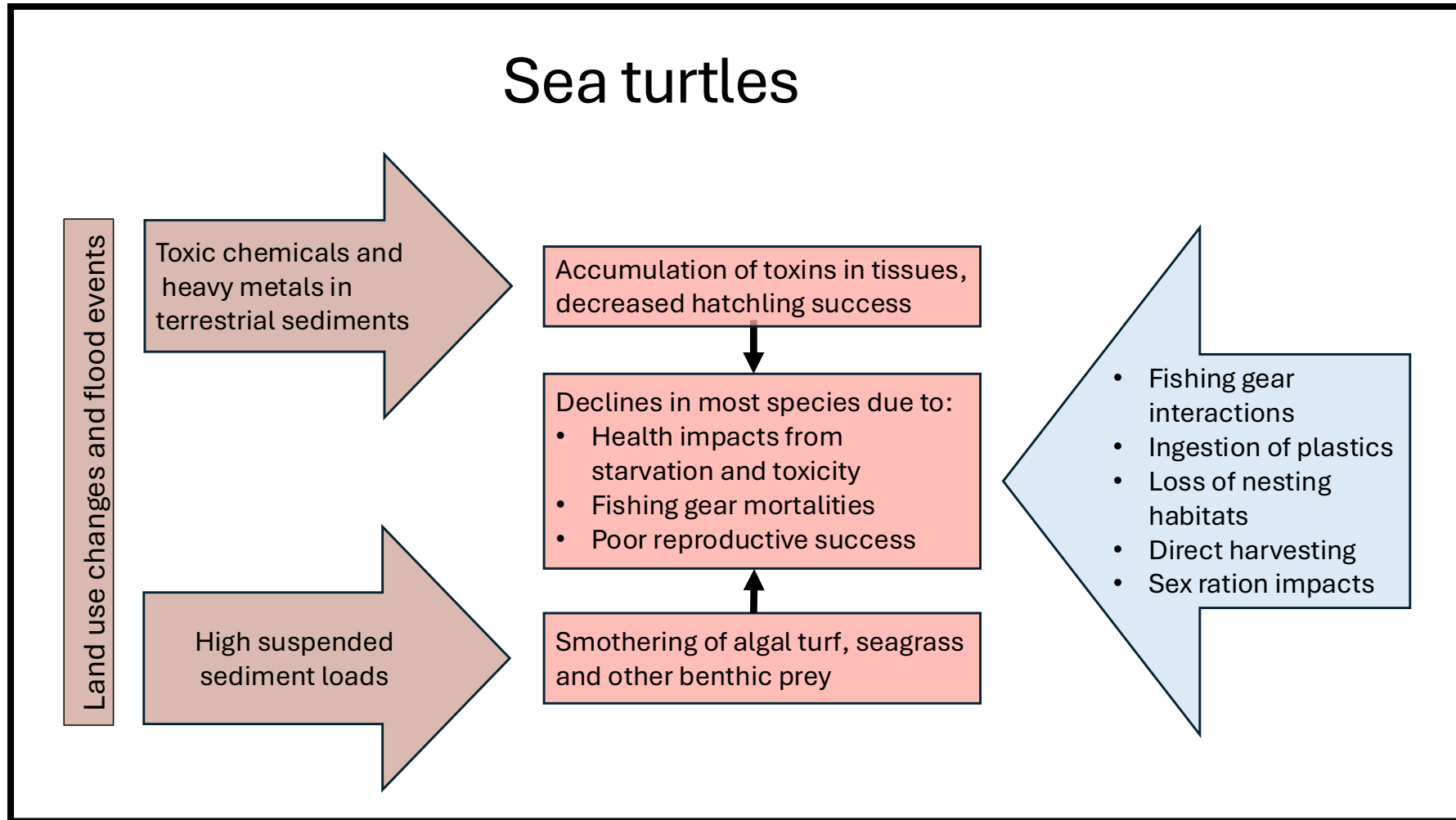
5. Evaluate spatial relationships between dioxin exposure and the health status of Green turtles to identify 'hotspots' for prioritised evaluations (Hermanussen *et al.*, 2004).
6. Develop and implement new strategies to reduce persistent pollutants (such as organic pollutants, trace elements, dioxins and perfluoroalkyl substances) entering Moreton Bay (Townsend *et al.*, 2019).
7. Increase biomonitoring of trace elements and other chemicals in sea turtles, using established baselines, and conduct further species-specific toxicological research to understand health risks and inform water quality guidelines (Townsend *et al.*, 2019).
8. Continue systematic capture-mark-recapture (CMR) studies and other research to gain further insights into the diet, habitat use, physiology, toxicology, genetics, and population dynamics of resident turtle populations (Limpus and Coffee, 2019).
9. Address primary sources of anthropogenic mortality, including boat strikes, entanglement in crab pots and fishing gear, and ingestion of synthetic debris (Limpus and Coffee, 2019).
10. Ongoing assessments of sea turtle food availability and nutritional quality and metabolic demands, coupled with gut microbiome analysis to improve understanding of how such changes can impact health.

Expert reviews

Dr David Booth (University of Queensland) and Dr Jacob Bowtell (University of the Sunshine Coast) kindly provided an expert review of the Sea Turtles: Sedimentation Impact Statement.

Conceptual model - impacts of sedimentation on sea turtles

Figure 1. Conceptual model that qualitatively describes the major impacts of sedimentation on sea turtle populations and health in Moreton Bay. Brown boxes signify sedimentation-related processes; blue boxes signify other relevant and interacting consequential inputs or impacts; red boxes signify adverse impacts/outcomes.



References

- Berube, M.D., Dunbar, S.G., Rützler, K. and Hayes, W.K. (2012) 'Home Range and Foraging Ecology of Juvenile Hawksbill Sea Turtles (*Eretmochelys imbricata*) on Inshore Reefs of Honduras'. *Chelonian Conservation and Biology*, 11, pp. 33–43. doi:10.2744/CCB-0898.1.
- Bjorndal, K.A., Bolten, A.B., Chaloupka, M., Saba, V.S., Bellini, C., Marcovaldi, M.A., Santos, A.J., Bortolon, L.F.W., Meylan, A.B., Meylan, P.A. and Gray, J. (2017) 'Ecological regime shift drives declining growth rates of sea turtles throughout the West Atlantic'. *Global Change Biology*, 23 (11), pp. 4556-4568. doi: 10.1111/gcb.13712.
- Brewer D., Heales, D., Milton, D., Dell, Q., Fry, G., Venables, B. and Jones, P. (2006) 'The impact of Turtle Excluder Devices and Bycatch Reduction Devices on diverse tropical marine communities in Australia's Northern Prawn Trawl Fishery'. *Fisheries Research* 81, pp. 176-188. doi:10.1016/j.fishres.2006.07.009.
- Cross, M. C., Mitchell, J. D., Dudgeon, C. L., Townsend, K. A., Scott-Holland, T. B. and Holmes, B. J. (2024) 'Spatial and temporal variation of marine megafauna off coastal beaches of south-eastern Queensland, Australia', *Marine and Freshwater Research*, 75, p. MF24094. doi:10.1071/MF24094.
- Delaney, S. (2013) *Dreaming stories and totems about bays habitats, animals and plants*. Brisbane: Boolarong Press. 51pp.
- Dodge, K.L., Logan, J.M. and Lutcavage, M.E. (2011) 'Foraging ecology of leatherback sea turtles in the Western North Atlantic determined through multi-tissue stable isotope analyses'. *Marine Biology*, 158(12), pp. 2813–2824. doi:10.1007/s00227-011-1780-x.
- Dudgeon, C.L., Kilpatrick, C., Armstrong, A., Armstrong, A., Bennett, M. B., Bowden, D., Richardson, A.J., Townsend, K.A., and Hawkins, E. (2019) 'Citizen science photographic identification of marine megafauna populations in the Moreton Bay Marine Park'. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T. and Arthington, A.H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane, pp. 475-490. Brisbane: The Moreton Bay Foundation. doi: 10.6084/m9.figshare.8085668.
- Ferreira, R.L., Ceia, F.R., Borges, T.C., Ramos, J.A., and Bolten, A.B. (2018) 'Foraging niche segregation between juvenile and adult hawksbill turtles (*Eretmochelys imbricata*) at Príncipe island, West Africa'. *Journal of Experimental Marine Biology and Ecology*, 498, pp. 1–7. doi:10.1016/j.jembe.2017.10.005.
- Flint, M., Patterson-Kane, J. C., Limpus, C. J., & Mills, P. C. (2010) 'Health surveillance of stranded green turtles in Southern Queensland, Australia (2006–2009): An epidemiological analysis of causes of disease and mortality'. *EcoHealth*, 7(1), pp. 135-145. doi: doi.org/10.1007/s10393-010-0300-7.

- Forbes, G.A. (1996) *The diet and feeding ecology of the green sea turtle (Chelonia mydas) in an algal-based coral reef community*. Doctor of Philosophy (PhD) thesis. Townsville: James Cook University. Available at: <http://eprints.jcu.edu.au/27399/>. (Accessed: 16 August 2025).
- Frick, M.G., Williams, K.L., Bolten, A.B., Bjorndal, K.A. and Martins, H.R. (2009) 'Foraging ecology of oceanic-stage loggerhead turtles *Caretta caretta*'. *Endangered Species Research*, 9(2), pp. 91–97. doi: 10.3354/esr00227.
- Fuentes, M.M.P.B., McMichael, E., Kot, C.Y., Silver-Gorges, I., Wallace, B.P. and Godley, B.J. (2023) 'Key issues in assessing threats to sea turtles: knowledge gaps and future directions'. *Endangered Species Research*, 52, pp. 303–341. doi: doi.org/10.3354/esr01278.
- Glen, J.J., Buelow, C.A., Campbell, M.D., Day, J., Meagher, P.J.B., van de Merwe, J.P. and Pearson, R.M. (2024) 'Using stable-isotope analysis to assess recent diet and habitat use of stranded green turtles (*Chelonia mydas*)'. *Wildlife Research*, 51, WR24045. doi: 10.1071/WR24045.
- Goatley, C.H.R., Hoey, A.S. and Bellwood, D.R. (2012) 'The Role of Turtles as Coral Reef Macroherbivores'. *PLoS ONE*, 7(6): e39979. doi: 10.1371/journal.pone.0039979.
- Grinham, A., Costantini, T., Deering, N., Jackson, C., Klein, C., Lovelock, C., Pandolfi, J., Eyal, G., Linde, M., Dunbabin, M., Duncan, B., Hutley, N., Byrne, I., Wilson, C. and Albert, S. (2024) 'Nitrogen loading resulting from major floods and sediment resuspension to a large coastal embayment', *Science of the Total Environment*, 918, p. 170646. doi: 10.1016/j.scitotenv.2024.170646.
- Hart, K.M., Iverson, A.R., Fujisaki, I., Lamont, M.M., Bucklin, D. and Shaver, D.J. (2018) 'Marine Threats Overlap Key Foraging Habitat for Two Imperiled Sea Turtle Species in the Gulf of Mexico', *Frontiers in Marine Science*, 5, p.336. doi: 10.3389/fmars.2018.00336.
- Hays, G.C. (2008) 'Sea turtles: a review of some key recent discoveries and remaining questions'. *Journal of Experimental Marine Biology and Ecology*, 356, pp. 1–7. doi: 10.1016/j.jembe.2007.12.016.
- Hermanussen, S., Limpus, C. J., Papke, O., Blanchard, W., Connell, D., and Gaus, C. (2004) 'Evaluating spatial patterns of dioxins in sediments to aid determination of potential implications for marine reptiles'. *Organohalogen Compounds*, 66, pp.1837-1843.
- Howell, L.N. and Shaver, D.J. (2021) 'Foraging Habits of Green Sea Turtles (*Chelonia mydas*) in the Northwestern Gulf of Mexico'. *Frontiers in Marine Science*, 8, p. 658368. doi: 10.3389/fmars.2021.658368.

- IUCN. (2025) *The IUCN Red List of Threatened Species*. Version 2025-1. International Union for Conservation of Nature and Natural Resources (ICUN). Available at: <https://www.iucnredlist.org>. (Accessed: 4 July 2025).
- Lanyon, J. M. (2003) 'Distribution and abundance of dugongs in Moreton Bay, Queensland'. *Australian Wildlife Research*, 30, pp. 397–409. doi: doi.org/10.1071/WR98082.
- Lanyon, J. M. (2019) 'Management of megafauna in estuaries and coastal waters: Moreton Bay as a case study', in Wolanski, E., Day, J. W., Elliott, M. and Ramachandran, R. (eds.) *Coasts and Estuaries*. Burlington: Elsevier, pp. 87–101.
- Lanyon, J., Noad, M. and Meager, J. (2019) 'Ecology of the marine mammals of Moreton Bay', in Tibbetts, I. R., Rothlisberg, P. C., Neil, D. T., Homburg, T. A., Brewer, D. T. and Arthington, A. H. (eds) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane, Australia: The Moreton Bay Foundation, pp. 415–430. doi: [10.6084/m9.figshare.8074346](https://doi.org/10.6084/m9.figshare.8074346).
- Lanyon, J. M., Sneath, H. L., Long, T., Blanshard, W. H., Worthy, G. A. J., and Booth, D. T. (2025) 'How much seagrass does a dugong need? Metabolic rate of live wild dugongs, *Dugong dugon*, determined through indirect calorimetry (oxygen consumption)'. *Marine Mammal Science*, 41(2), e13190. doi: doi.org/10.1111/mms.13190.
- Limpus, C.J. and Coffee, O.I. (2019) 'Marine turtles in Moreton Bay'. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T. and Arthington, A.H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane, Australia: The Moreton Bay Foundation, pp. 415–430. doi: Available at: <https://moretonbayfoundation.org/>.
- Martínez-Estévez, L., Steller, D.L., Zilliacus, K.M., Cuevas Amador, J.P., Cuevas Amador, F., Szuta, D., Miller, S.D., Dayton, G.H., Tershy, B.R. and Croll, D.A. (2022) 'Foraging ecology of critically endangered Eastern Pacific hawksbill sea turtles (*Eretmochelys imbricata*) in the Gulf of California, Mexico', *Marine Environmental Research*, 174, p. 105532. doi: [10.1016/j.marenvres.2021.105532](https://doi.org/10.1016/j.marenvres.2021.105532).
- Martins, R.F., Andrades, R., Nagaoka, S.M., Martins, A.S., Longo, L.L., Ferreira, J.S., Bastos, K.V., Joyeux, J.-C. and Santos, R.G. (2020) 'Niche partitioning between sea turtles in waters of a protected tropical island'. *Regional Studies in Marine Science*, 39, p.101439. doi: [10.1016/j.rsma.2020.101439](https://doi.org/10.1016/j.rsma.2020.101439).

- Maxwell, P., Connolly, R., Roelfsema, C., Burfeind, D., Udy, J., O'Brien, K., Saunders, M., Barnes, R., Olds, A., Henderson, C. and Gilby, B. (2019) 'The seagrasses of Moreton Bay *Quandamooka*: Diversity, ecology and resilience'. In Tibbetts, I. R., Rothlisberg, P. C., Neil, D. T., Homburg, T. A., Brewer, D. T. and Arthington, A. H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp 279-298. doi: 10.6084/m9.figshare.8074334.
- Mestre, J., Patrício, A.R., Sidina, E., Senhoury, C., El'bar, N., Beal, M., Regalla, A. and Catry, P. (2025) 'Movement patterns of green turtles at a key foraging site: the Banc d'Arguin, Mauritania'. *Marine Biology*, 172(1), pp. 1–17. doi: 10.1007/s00227-024-04558-4.
- Nguyen, S. (2025) 'Marine Reptiles in a Changing Ocean: Investigating the Impact of Climate Change and Marine Pollution on Sea Turtles and Marine Crocodiles', *Journal of Marine Science: Research & Development*, 15, p. 506. doi: 10.4172/2155-9910.1000506.
- Pascoe, S., Coglan, L., Roos, M., Cannard, T., Scheufele, G., Doshi, A. and Haro, I. (2025) 'Fisheries' Economic Impacts from the Rezoning of the Multi-Use Moreton Bay Marine Park'. *Fishes*, 10(5), p192. doi: 10.3390/fishes10050192.
- Peavey, L.E., Popp, B.N., Pitman, R.L., Gaines, S.D., Arthur, K.E., Kelez, S. and Seminoff, J.A. (2017) 'Opportunism on the High Seas: Foraging Ecology of Olive Ridley Turtles in the Eastern Pacific Ocean'. *Frontiers in Marine Science*, 4, p.348. doi: 10.3389/fmars.2017.00348.
- Pinner, B., Ross, H., Jones, N., Babidge, S., Shaw, S., Witt, K. and Rissik, D. (2019) 'A custodial ethic: Indigenous values towards water in Moreton Bay and Catchments'. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T. and Arthington, A.H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp. 29–44. doi: 10.6084/m9.figshare.6713312.
- Read, T.C., Wantiez, L., Keller, F., Werry, J.M., van de Merwe, J.P., Meager, J.J., Chateau, O., Farman, R. and Limpus, C.J. (2024) 'The foraging ecology of green turtles (*Chelonia mydas*) in New Caledonia'. *Marine Biology*, 171, p.81. doi:10.1007/s00227-023-04385-z.
- Ross, H., Jones, N., Witt, K., Pinner, B., Shaw, S., Rissik, D. and Udy, J. (2019a) 'Values towards Moreton Bay and catchments'. In Tibbetts, I. R., Rothlisberg, P. C., Neil, D. T., Homburg, T. A., Brewer, D. T. and Arthington, A. H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp 47-60. doi: 10.6084/m9.figshare.8072498.

- Saeck, E., Grinham, A., Coates-Marnane, J., McAlister, T. and Burford, M. (2019a) 'Primary producers in Moreton Bay: Phytoplankton, benthic microalgae and filamentous cyanobacteria'. In Tibbetts, I. R., Rothlisberg, P. C., Neil, D. T., Homburg, T. A., Brewer, D. T. and Arthington, A. H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp 259-278. doi: 10.6084/m9.figshare.8074355.
- Sanchez, C.L., Casale, P., Bunbury, N., A'Bear, L., Banane, V., Benstrong, F., Bielsa, M., Jones, C.W., Koester, A., Murasko, S., van Rooyen, M.C., Fleischer-Dogley, F. and Ceriani, S.A. (2024) 'Fine-scale foraging ecology and habitat use of sympatric green and hawksbill turtles in the Western Indian ocean', *Marine Environmental Research*, 198, p.106529. doi: 10.1016/j.marenvres.2024.106529.
- Siegwalt, F., Benhamou, S., Girondot, M., Jeantet, L., Martin, J., Bonola, M., Lelong, P., Grand, C., Chambault, P., Benhalilou, A., Murgale, C., Maillet, T., Andreani, L., Campistron, G., Jacaria, F., Hielard, G., Arqué, A., Etienne, D., Gresser, J., Régis, S., Lecerf, N., Frouin, C., Lefebvre, F., Aubert, N., Védie, F., Barnerias, C., Thieulle, L., Guimera, C., Bouaziz, M., Pinson, A., Flora, F., George, F., Eggenspieler, J., Woignier, T., Allenou, J.-P., Louis-Jean, L., Chanteur B., Béranger, C., Crillon, J., Brador, A., Habold C., Le Maho Y., Robin J.-P. and Chevallier D. (2020) 'High fidelity of sea turtles to their foraging grounds revealed by satellite tracking and capture-mark-recapture: new insights for the establishment of key marine conservation areas'. *Biological Conservation*, 250, p.108742. doi: 10.1016/j.biocon.2020.108742.
- Thurstan, R., Fraser, K., Brewer, D., Buckley, S., Dinesen, Z., Skewes, T., Courtney, T. and Pollock, B. (2019) 'Fishers and fisheries of Moreton Bay'. In Tibbetts, I. R., Rothlisberg, P. C., Neil, D. T., Homburg, T. A., Brewer, D. T., and Arthington, A. H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp. 521-536. doi: 10.6084/m9.figshare.8085695.
- Townsend, K., Baduel, C., Hall, V., Loder, J., Matthews, V., Mueller, J., Nasplezes, R., Schuyler, Q., Taylor, H., van de Merwe, J., Villa, C.A. and Weijs, L. (2019) 'The impact of marine pollutants and marine debris in Moreton Bay'. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T. and Arthington, A.H. (eds.) *Moreton Bay Quandamooka & Catchment: Past, present, and future*. Brisbane: The Moreton Bay Foundation, pp. 227-244. doi: 10.6084/m9.figshare.8073851.
- Yenney, E., Okoffo, E.D., Tschärke, B.J., Grinham, A., Bostock, H.C. and Thomas, K.V. (2024) Plastic Deposition in Sediments of Moreton Bay, Australia: A Historical Perspective and Potential Future Projections. *Acs Es&T Water*, 4(10), pp.4510-4520.

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 corresponds to **Section 5.12** 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



Cover Images:

(Top) Endangered Green turtle (*Chelonia mydas*) in Moreton Bay. Photo credit: S. Rabbitt

(Bottom) Moreton Bay seagrass, *Zostera capricorni*. Photo credit: T. Skewes



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