Sedimentation impacts in Moreton Bay: a priority knowledge synthesis

# IMPACTS:

# Shorebirds

DBC
David Brewer Consulting

THE MORETON BAY FOUNDATION

moretonbayfoundation.org

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/

| | |
|---|---|
| Authors: | David Brewer, Alex Milward |
| Approved: | David Brewer (Director, Upwelling Pty Ltd trading as David Brewer Consulting) |
| Version: | Final Report |
| Date issued: | 2026 |
| Issued to: | The Moreton Bay Foundation |
| Citation: | Brewer, D. T. and Milward, A. S. E. (2026) 'Sedimentation Impacts in Moreton Bay: a Priority Knowledge Synthesis for The Moreton Bay Foundation'. TMBF, Brisbane, Australia. 244 pp. |

# Shorebirds: Sedimentation Impact Statement

*Vulnerable Bar-tailed godwits at Oyster Point, Cleveland*
*Photo credit: C. Walker*

## Status and trend summary

Moreton Bay remains a globally important site for migratory shorebirds, but its populations face complex challenges from both flyway-wide habitat loss and increasing local pressures. Table 1 provides a qualitative assessment of shorebird communities in Moreton Bay, highlighting their current condition, future trajectory and the impacts of sedimentation. The overall current condition of shorebirds in the Bay is rated as 'Fair', with 'High' confidence. This reflects studies that have indicated nine species are listed on the International Union for Conservation of Nature (IUCN) Red List as either Critically Endangered, Endangered, Vulnerable, or Near Threatened.

The condition trend is noted as 'Declining', with 'High' confidence. This mainly reflects local studies which note that 12 of 22 migratory shorebird species are in decline, mainly due to habitat loss and degradation, especially of intertidal mudflats in other regions of their international flyways. It is also important to note that resident coastal shorebird species have shown stable or increasing populations in the past. However, the underpinning analysis requires updating.

While sedimentation events (floods) are hypothesised to negatively impact prey availability, the observed short-term effects of sedimentation on shorebird numbers have been described as weak and/or of very short duration. A more widespread negative impact of sedimentation in Moreton Bay appears to be its role in mangrove encroachment and smothering of intertidal benthos, which reduces crucial open roosting and foraging habitats. However, managing material from shipping channel maintenance dredging has led to the creation of important artificial roosting habitats and the reuse of spoil, which has positively contributed to shorebird conservation by providing vital artificial roosting habitats at the Port of Brisbane. Hence, the contribution of sediment to the general declining trend for shorebirds is rated as 'Minor' with 'Medium' confidence.

*Table 1. Qualitative assessment of the overall status and trend in condition, and of the likely severity and direction of sedimentation-specific impacts, on shorebird populations in Moreton Bay.*

| Value condition assessment | Assessment | Confidence |
|---|---|---|
| Current condition | Fair | High |
| Contribution of sedimentation to the current condition | Minor | Medium |
| Condition trend | Declining | High |
| Contribution of sedimentation to trend | Minor | Medium |

## Overview

Moreton Bay is an internationally important Ramsar wetland located at the terminus of the East Asian–Australasian Flyway (Clemens *et al.*, 2012; Fuller *et al.*, 2021), stretching from the Alaskan and Siberian breeding grounds down to Australia and New Zealand (Fuller *et al.*, 2021). The Bay hosts a diverse range of shorebirds, with at least 32 species of migratory shorebirds observed during monitoring by the Queensland Wader Study Group (Fuller *et al.*, 2021) (Figure 1). Another 15 species of resident shorebirds have also been recorded from studies in the Bay (Table 2).

The Bay supports approximately 35,000 migratory shorebirds during the non-breeding season and has historically supported up to 50,000 migratory shorebirds (Lloyd *et al.*, 2024). Thousands of young shorebirds also use it as a year-round nursery (Fuller *et al.*, 2021). The Bay holds internationally important numbers (over 1% of the total flyway population) of nine migratory shorebird species, with a tenth species having exceeded this threshold at least once (Clemens *et al.*, 2012; Fuller *et al.*, 2021; Lloyd *et al.*, 2024). Additionally, five species regularly occur in nationally important numbers (at least 0.1% of the population), and five more have exceeded this threshold at least once (Fuller *et al.*, 2021).

## Population status

Despite its global importance, the shorebird populations of Moreton Bay have declined rapidly in recent decades (Wilson *et al.*, 2011). Global declines are attributed mainly to habitat loss and degradation, especially of intertidal mudflats in the Yellow Sea region, where over 50% loss has occurred (Murray *et al.*, 2014; Studds *et al.*, 2017). The IUCN Red Listings for 34 species that occur in the Bay also highlights the declining status for about two-thirds (23) of the species (Table 3, Table 4).

Studies also confirm that local threats within Moreton Bay may also play a role (Dhanjal-Adams *et al.*, 2019). Some species may be impacted by long-term reduction in their primary food source: benthic macrofauna (Clemens *et al.*, 2012) (see **† Section 5.7**). For example, Far Eastern Curlew (*Numenius madagascariensis*), Grey Plover (*Pluvialis squatarola*), and Red-necked Stint (*Calidris ruficollis*) have shown significant declining trends in their average summer counts at the Port of Brisbane between 2002 and 2022 (Lloyd *et al.*, 2024). However, this trend is not consistent across all migratory species. For example, Whimbrels (*N. phaeopus*), which are not subject to habitat loss on the flyway, show stable populations in Moreton Bay (P. Lloyd, pers. comm.). Bar-tailed Godwit (*Limosa lapponica*), Great Knot (*C. tenuirostris*), and Broad-billed Sandpiper (*C. falcinellus*) have shown significant increasing trends at the Port during the same period (Lloyd *et al.*, 2024).


*Figure 1. (a) Near threatened Black-tailed Godwits, North Pine River. Photo credit: C. Walker; (b) Vulnerable Beach Thick-knee or Stone- curlew, Minjerribah. Photo credit: C. Walker; (c) Critically endangered Far Eastern or Eastern Curlews, Cleveland. Photo credit: C. Walker.*

*Table 2. List of shorebirds noted from studies in Moreton Bay*

| Migratory Shorebirds (28 of 32 species) | Resident Shorebirds (15 species) |
|---|---|
| Asian Dowitcher (*Limnodromus semipalmatus*) | Australian Painted Snipe (*Rostratula australis*) |
| Bar-tailed Godwit (*Limosa lapponica*) | Australian Pied Oystercatcher (*Haematopus longirostris*) |
| Black-tailed Godwit (*Limosa limosa*) | Banded Lapwing (*Vanellus tricolor*) |
| Broad-billed Sandpiper (*Calidris falcinellus*) | Banded Stilt (*Cladorhynchus leucocephalus*) |
| Buff-breasted Sandpiper (*Calidris subruficollis*) | Beach Thick-knee (*Esacus magnirostris*) |
| Common Greenshank (*Tringa nebularia*) | Black-fronted Dotterel (*Elseyornis melanops*) |
| Common Sandpiper (*Actitis hypoleucos*) | Black-winged Stilt (*Himantopus himantopus*) |
| Curlew Sandpiper (*Calidris ferruginea*) | Bush Stone-curlew (*Burhinus grallarius*) |
| Double-banded Plover (*Charadrius bicinctus*) | Hooded Plover (*Thinornis cucullatus*) |
| Far Eastern Curlew (*Numenius madagascariensis*) | Masked Lapwing (*Vanellus miles*) |
| Great Knot (Calidris tenuirostris) | Pied Stilt (*Himantopus leucocephalus*) |
| Greater Sand Plover (*Charadrius leschenaultii*) | Red-capped Plover (*Charadrius ruficapillus*) |
| Grey Plover (*Pluvialis squatarola*) | Red-kneed Dotterel (*Erythrogonys cinctus*) |
| Grey-tailed Tattler (*Tringa brevipes*) | Red-necked Avocet (*Recurvirostra novaehollandiae*) |
| Latham's Snipe (*Gallinago hardwickii*) | Sooty Oystercatcher (*Haematopus fuliginosus*) |
| Lesser Sand Plover (*Charadrius mongolus*) | |
| Marsh Sandpiper (*Tringa stagnatilis*) | |
| Pacific Golden Plover (*Pluvialis fulva*) | |
| Red Knot (*Calidris canutus*) | |
| Red-necked Stint (*Calidris ruficollis*) | |
| Ruddy Turnstone (*Arenaria interpres*) | |
| Ruff (*Calidris pugnax*) | |
| Sanderling (*Calidris alba*) | |
| Sharp-tailed Sandpiper (*Calidris acuminata*) | |
| Terek Sandpiper (*Xenus cinereus*) | |
| Wandering Tattler (*Tringa incana*) | |
| Whimbrel (*Numenius phaeopus*) | |
| Wood Sandpiper (*Tringa glareola*) | |

Moreton Bay supports critically endangered species such as the Far Eastern Curlew, Curlew Sandpiper (*C. ferruginea*), and Great Knot (Wilson *et al.*, 2022). The Bay is one of the most critical non-breeding areas globally for the Far Eastern Curlew, regularly hosting just under 10% of the remaining world population (over 3,000 individuals) (Fuller *et al.*, 2021).

*Table 3. A summary of 34 migratory shorebirds noted in Moreton Bay summarising: (i) the current listing status on the IUCN Red List (www.iucnredlist.org) and (ii) their population trend, where it is noted according to the recent literature (based on Clemens et al., 2016; Fuller et al.,2021). See Table 4 for species-specific detail.*

| IUCN Listing | No. of Shorebird species | Population trend | No. of Shorebird species |
|---|---|---|---|
| Critically endangered | 3 | Decreasing | 23 |
| Endangered | 2 | Stable | 5 |
| Vulnerable | 2 | Increasing | 4 |
| Near threatened | 5 | | |
| Least concern | 22 | | |

The Bar-tailed Godwit is the most abundant migratory shorebird in Moreton Bay, with counts regularly exceeding 10,000 individuals in summer (Fuller *et al.*, 2021). Curlew Sandpipers (*C. ferruginea*) are often observed in internationally important numbers at the Port of Brisbane, and Moreton Bay may be acting as a 'safe haven' for this nationally declining species (Fuller *et al.*, 2021).

Lesser Sand Plovers (*Charadrius mongolus*) occur in internationally important numbers (regularly exceeding 1,900 birds) in Moreton Bay, particularly relying on the Port of Brisbane (Fuller *et al.*, 2021). Red-necked Stints regularly occur in internationally important numbers (around 5,000 annually), with the Port of Brisbane being a frequent site for this species (Fuller *et al.*, 2021). Terek Sandpipers (*Xenus cinereus*) and Whimbrels are also found in internationally important numbers, though often in less accessible mangrove habitats, which can make accurate counting challenging (Fuller *et al.*, 2021).

Resident coastal shorebird species in Australia, such as the Australian Pied Oystercatcher (*Haematopus longirostris*) and the Sooty Oystercatcher (*H. fuliginosus*), have shown stable or increasing populations, unlike the declining migratory species (Wilson *et al.*, 2011; Clemens *et al.*, 2016). However, the underpinning analysis requires updating (R. Fuller, pers. comm., August 2025). In comparison, resident species that rely on inland wetlands, like Red-necked Avocet (*Recurvirostra novaehollandiae*), Black-winged Stilt (*Himantopus Himantopus*), Red-kneed Dotterel (*Erythrogonys cinctus*), and Black-fronted Dotterel (*Elseyornis melanops*) have shown significant declines (Clemens *et al.*, 2016).

*Table 4. List of 34 migratory or resident shorebirds of Moreton Bay noting their trend categories where published (1993-2008, Clemens et al., 2016) and listings under the IUCN Red List (taken from www.iucnredlist.org).*

| Shorebird Species | Trend | IUCN Red List Listing |
|---|---|---|
| Asian Dowitcher (*Limnodromus semipalmatus*) | Decreasing | Near Threatened |
| Bar-tailed Godwit (*Limosa lapponica*) | Increasing | Near Threatened |
| Bar-tailed Godwit (subspp *L. lapponica baueri)* | Decreasing | Vulnerable |
| Beach thick-knee (*Esacus magnirostris*) | Decreasing | Near Threatened |
| Black-tailed Godwit (*Limosa limosa*) | Decreasing | Near Threatened |
| Broad-billed Sandpiper (*Limicola falcinellus*) | Increasing | Least Concerned |
| Buff-breasted Sandpiper (*Calidris subruficollis*) | Decreasing | Vulnerable |
| Common Greenshank (*Tringa nebularia*) | Decreasing | Least Concerned |
| Common Sandpiper (*Actitis hypoleucos*) | Decreasing | Least Concerned |
| Curlew Sandpiper (*Calidris ferruginea*) | Decreasing | Critically Endangered |
| Double-banded Plover (*Charadrius bicinctus*) | Stable | Least Concerned |
| Far Eastern Curlew (*Numenius madagascariensis*) | Decreasing | Critically Endangered |
| Great Knot (*Calidris tenuirostris*) | Increasing | Critically Endangered |
| Greater Sand Plover (*Charadrius leschenaultii*) | Decreasing | Least Concerned |
| Grey Plover (*Pluvialis squatarola*) | Decreasing | Least Concerned |
| Grey-tailed Tattler (*Tringa brevipes*) | Increasing | Least Concerned |
| Latham's Snipe (*Gallinago hardwickii*) | Decreasing | Least Concerned |
| Lesser Sand Plover (*Charadrius mongolus*) | Decreasing | Endangered |
| Little Curlew (*Numenius minutus*) | Decreasing | Least Concerned |
| Long-toed Stint (*Calidris subminuta*) | Decreasing | Least Concerned |
| Marsh Sandpiper (*Tringa stagnatilis*) | Stable | Least Concerned |
| Oriental Plover (*Charadrius veredus*) | Stable | Least Concerned |
| Pacific Golden Plover (*Pluvialis fulva*) | Decreasing | Least Concerned |
| Pectoral Sandpiper (*Calidris melanotos*) | Unknown | Least Concerned |
| Red Knot (*Calidris canutus*) | Decreasing | Endangered |
| Red-necked Stint (*Calidris ruficollis*) | Decreasing | Near Threatened |
| Ruddy Turnstone (*Arenaria interpres*) | Decreasing | Least Concerned |
| Ruff (*Calidris pugnax*) | Decreasing | Least Concerned |
| Sanderling (*Calidris alba*) | Stable | Least Concerned |
| Sharp-tailed Sandpiper (*Calidris acuminata*) | Decreasing | Least Concerned |
| Terek Sandpiper (*Xenus cinereus*) | Decreasing | Least Concerned |
| Wandering Tattler (*Tringa incana*) | Unknown | Least Concerned |
| Whimbrel (*Numenius phaeopus*) | Decreasing | Least Concerned |
| Wood Sandpiper (*Tringa glareola*) | Stable | Least Concerned |

The Port of Brisbane's Fisherman Islands is the single most important roosting area in Moreton Bay, regularly supporting about 20% and up to 39% of the bay's migratory shorebirds, including internationally significant numbers of six species (Lloyd *et al.*, 2024). The dredge reclamation ponds at Fisherman Islands have consistently supported 79-94% of the migratory shorebirds roosting at the port, highlighting the crucial role of artificially created sites in shorebird conservation (Lloyd *et al.*, 2024). Studies on foraging distribution in northern Moreton Bay show marked spatial variation in bird density, with some areas experiencing significant overlap between foraging birds and human recreational disturbance, particularly from off-leash dogs (Stigner *et al.*, 2016).

The most widespread threats to roosting sites are human disturbance (67 of 218 sites studied), development (43 sites), and mangrove encroachment, reducing visibility and space (25 sites) (Fuller *et al.*, 2021). Sea-level rise is an ultimate threat that exacerbates proximate threats like inundation of claypans, overgrowth of roost sites with mangroves, and loss of saltmarsh habitats (Fuller *et al.*, 2021). Off-leash dogs are a significant disturbance to foraging shorebirds at low tide, reducing bird numbers at a site by about 20% (Dhanjal-Adams *et al.*, 2015). Local losses of tidal flats to development have occurred, particularly around the Port of Brisbane, although the overall extent of tidal flats in Moreton Bay has remained relatively stable (Fuller *et al.*, 2021).

Benthic prey densities are also variable across the bay's intertidal flats, which influences shorebird foraging success (Fuller *et al.*, 2021). For example, Nudgee had a high density of polychaetes, consistent with the presence of large numbers of feeding shorebirds, while Sandgate had low densities (Fuller *et al.*, 2021).

Moreton Bay remains a globally important site for migratory shorebirds. Still, its populations face complex challenges from both flyway-wide habitat loss and increasing local pressures, necessitating continued monitoring and active management (Fuller *et al.*, 2021).

## Value

### *Ecological value*

Shorebirds in Moreton Bay hold significant ecological value primarily through their multifaceted impacts on intertidal mudflat ecosystems (Booty *et al.*, 2020). Shorebirds act as ecosystem engineers, directly influencing crucial ecosystem functions on intertidal mudflats, such as erosion protection, nutrient cycling, and carbon sequestration (Booty *et al.*, 2020). Their foraging activities, including bioturbation (physical disturbance from walking and feeding) and/or grazing of microphytobenthic biofilms, can lower the sediment's critical erosion threshold, making the mudflats less stable and more susceptible to erosion (Booty *et al.*, 2020). They significantly alter nutrient fluxes (e.g., nitrate, nitrite, phosphate and dissolved organic carbon) between the sediment and the water column (Booty *et al.*, 2020).

As primary consumers, shorebirds forage extensively on soft-sediment macroinvertebrates, including crustaceans, polychaetes, bivalves, and gastropods (Fuller *et al.*, 2021). This predation can exert significant top-down effects on the functioning of mudflat ecosystems (Booty *et al.*, 2020). Shorebirds and their population trends can serve as important integrators and indicators of the health and changing environmental conditions of mudflat ecosystems (Booty *et al.*, 2020).

### *Cultural value*

Shorebirds in Moreton Bay hold significant cultural value, particularly for the Quandamooka People (Fuller *et al.*, 2021). Their ecological value is interwoven with the Bay's broader 'outstanding environmental and cultural values' (Dean *et al.,* 2019; Nasplezes *et al.,* 2019). While specific shorebird species are not explicitly named as

sacred Aboriginal totems, place names often reflect cultural ties to abundant local fauna, indicating a deep cultural connection to the Bay's wildlife (Pinner *et al.*, 2019).

### *Economic value*

The economic value of shorebirds in Moreton Bay is primarily indirect, stemming from their crucial role in maintaining healthy intertidal ecosystems that underpin various services and activities (Booty *et al.*, 2020). Shorebirds contribute to vital ecosystem functions on intertidal mudflats, including erosion protection, nutrient cycling, and carbon sequestration (Booty *et al.*, 2020). These functions help sustain the overall health and resilience of the Bay, which in turn supports other economically valuable activities.

Shorebirds contribute to the Bay's 'outstanding environmental and cultural values' (Dean *et al.,* 2019), which attract recreational users and tourists (Ross *et al.*, 2019b; Pascoe *et al.*, 2025). The presence of diverse and unique species, including shorebirds, provides 'important opportunities for scientific research and education' (Ross *et al.*, 2019a). For instance, artificial shorebird habitats at the Port of Brisbane double as an 'educational facility visited by around 300 school children every year' (Lloyd *et al.*, 2024). Birdwatching is also a recreational activity valued in the Bay (Ross *et al.*, 2019b).

Significant economic resources are invested in the conservation and management of shorebirds, including the creation and ongoing maintenance of artificial roosting habitats like those at the Port of Brisbane and Manly Harbour (Fuller *et al.*, 2021; Lloyd *et al.*, 2024). These sites accommodate a substantial proportion of Moreton Bay's migratory shorebird population (up to 39% at the Port of Brisbane alone) (Fuller *et al.*, 2021), demonstrating the value of committed financial allocations to enhance habitat options for shorebirds.

## History

The population dynamics of shorebirds in Moreton Bay reveal a complex picture, generally characterised by declines in migratory species but with some localised increases and a more stable population trend for resident species (Clemens *et al.*, 2016). Historically, many migratory shorebird populations in the East Asian-Australasian Flyway, of which Moreton Bay is a crucial part, have been rapidly declining. Australian citizen-science data from 1973 to 2014 indicated continental decreases in 12 of 19 migratory shorebird species, and in 17 of 19 species in southern Australia over the past 15 years (Clemens *et al.*, 2016).

This declining trend is consistent with the general reduction in migratory shorebirds returning to Moreton Bay each year from their breeding grounds (Fuller *et al.*, 2021). While habitat loss along migration routes, particularly in the Yellow Sea, is a major driver of these declines, local threats within Moreton Bay have also played a role (Fuller *et al.*, 2021).

Long-term monitoring data from 2002 to 2023 at the Port of Brisbane, a significant roosting site for shorebirds in Moreton Bay, provide more specific insights into the changes in population dynamics described above for a range of species (Lloyd *et al.*, 2024). The data indicate some species have shown significant decreasing trends and others have significant increasing trends. The four most common resident shorebird species (Pied Oystercatcher, Pied Stilt [*H. leucocephalus*], Red-capped Plover [*C. ruficapillus*], Red-necked Avocet) at the Port of Brisbane showed no significant long-term trend in their average annual counts from 2002 to 2022 (Lloyd *et al.*, 2024).

## Impacts of sedimentation

The impacts of sedimentation on shorebird communities in Moreton Bay are broadly described in the conceptual model (see Figure 2). Moreton Bay is a dynamic environment where shorebird communities and populations are influenced by various factors as discussed above (see History and Population status sections), including the impacts of sedimentation. However, literature detailing the direct impact of sedimentation on seabirds and shorebirds is scant (Lukies *et al.*, 2021).

Shorebirds primarily forage on soft-sediment macroinvertebrates on intertidal mudflats during low tide to meet high energy demands, especially during migration (Athira *et al.*, 2022). It is hypothesised that sedimentation associated with major river flooding could have an immediate adverse effect on benthic invertebrate food availability for shorebirds on tidal flats (Clemens *et al.*, 2012). It reduces light penetration, smothers the seafloor and changes the composition of marine ecosystems (Lukies *et al.*, 2021). Sediments can clog the filters of filter-feeding macroinvertebrates, leading to reduced body condition, growth rates, or even direct mortality. Consequently, sediment-impacted areas are likely to support fewer shorebirds (Lukies *et al.*, 2021).

There is some evidence of a long-term decline in invertebrate densities along the mainland coast of Moreton Bay between 1997 and 2012, with a particularly rapid decline observed at Nudgee (Clemens *et al.*, 2012). A steady decline in the numbers of invertebrate animals was observed in the mid-intertidal and intertidal fringe sediments at three western Moreton Bay locations (Burpengary Creek, Nudgee Beach, and Tingalpa Creek), with a 7-8 fold reduction over 15 years in some areas (Clemens *et al.,* 2012). Indicative benthic sampling in northern Moreton Bay revealed spatially variable densities of potential prey, which in turn influenced shorebird abundance and diversity. For instance, Nudgee had a very high density of polychaetes, consistent with the presence of large numbers of feeding shorebirds, while Sandgate had low densities (Fuller *et al.*, 2021). Such declines in benthic invertebrates might have substantially reduced the carrying capacity of Moreton Bay over time. Still, it is possible that the effect on shorebirds could have been masked to some extent because they are also declining due to habitat loss in the Yellow Sea (R. Fuller, pers. comm., August 2025).

Despite the hypothesis of negative impacts, analyses of migratory shorebird numbers following three recent severe weather events (and associated sediment influxes) found no consistent changes in abundance directly attributable to these events across Moreton Bay (Clemens *et al*., 2012). The observed impacts were described as 'weak and/or of very short duration' (Fuller *et al*., 2021; Lloyd *et al*., 2024). After the January 2011 flood, an immediate displacement of about 2,000 shorebirds occurred in Moreton Bay, but numbers and distributions had returned to normal by the following summer (Clemens *et al*. 2012). Notably, after this flood, while some areas experienced a decline in bird numbers, the Port of Brisbane roosts saw an increase in migratory shorebirds, especially smaller species, suggesting a movement of birds to these alternative sites (Lloyd *et al*., 2024).

Mangrove growth poses a significant threat to shorebird roosting sites in Moreton Bay, particularly at 25 identified locations within the Bay (Fuller *et al*., 2021). Mangrove encroachment reduces the open space and visibility that shorebirds require for roosting (Fuller *et al*., 2021). Sedimentation plays a role in this process, as mangroves can trap sediment, which can dry out and potentially facilitate the movement of introduced predators (like cats and other pest mammals) into shorebird roost sites (Lukies *et al*., 2021). Regenerating mangroves, often enabled by sediment accumulation, can displace critical shorebird foraging and roosting habitats such as saltmarsh, seagrass beds, and bare sand/shell banks (Lukies *et al*., 2021). This displacement can alter the distribution and abundance of shorebirds (Lukies *et al*., 2021). The threat of mangrove expansion and saltmarsh decline is expected to be exacerbated by sea-level rise, which is predicted to lead to the 'overgrowth of roost sites with mangroves' (Fuller *et al*., 2021).

Conversely, human management of sediment has created important habitat for shorebirds in Moreton Bay. The Port of Brisbane reuses large volumes of dredged sediment to create new land, which has inadvertently or intentionally resulted in the creation of temporary and permanent shorebird habitats (Lloyd *et al*., 2024). The dredge reclamation ponds at the Port of Brisbane have consistently supported 79-94% of the migratory shorebirds roosting there, highlighting the significant role that artificially created sites can play in shorebird conservation (Lloyd *et al*., 2024). These ponds are attractive to smaller species like Curlew Sandpipers and Red-necked Stints because they provide shallow, nutrient-rich waters where birds can continue to feed on small invertebrates during high tide (Lloyd *et al*., 2024). This proximity to preferred foraging areas also contributes to the birds' preference for roosting at the Port, as does the limited disturbance due to restricted public access (Lloyd *et al*., 2024).

The Port of Brisbane has voluntarily created two large bird habitats, including a permanent artificial roost and a freshwater lake, on what would otherwise be industrial land (Lloyd *et al*., 2024). The management of these sites, including water levels and vegetation control, is crucial for their continued suitability for shorebirds (Fuller *et al*., 2021).

## Recommendations

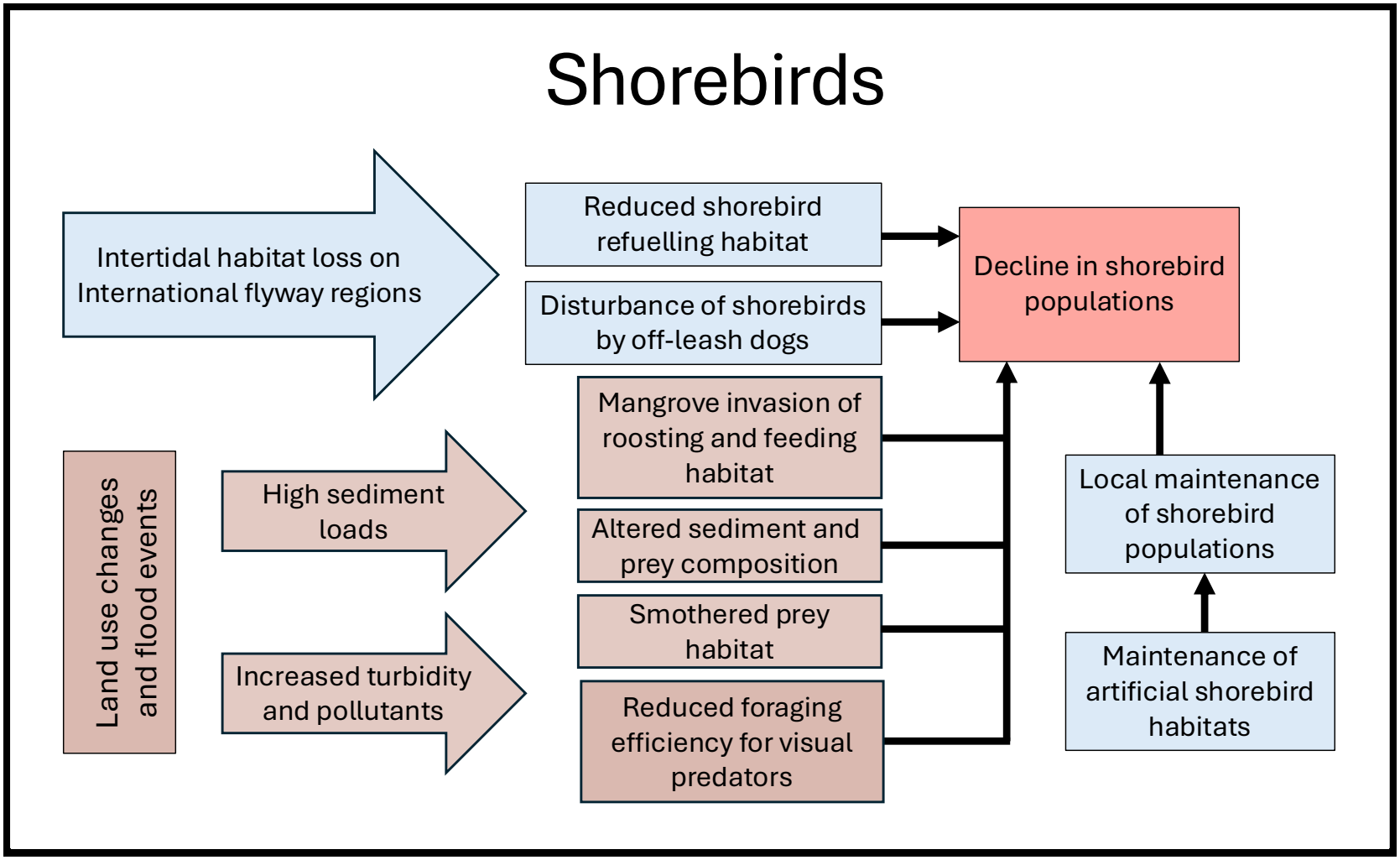
1. Minimise disturbance to foraging birds as the most urgent action (Fuller *et al.*, 2021).
2. Manage mangrove encroachment into shorebird habitats (e.g. saltmarshes)**.** Mangroves can trap sediment, promoting growth that threatens roosting sites in Moreton Bay. This encroachment alters shorebird habitat by reducing the open space and visibility needed by many shorebird species. (Fuller *et al.*, 2021; Lukies *et al.*, 2021).
3. Strategically plan for artificial roost sites. The Port of Brisbane has used dredge material to create reclamation ponds, which serve as crucial, though temporary, high-tide roosting habitat for up to one-third of Moreton Bay's migratory shorebirds. However, these temporary reclamation areas are expected to be filled in by 2044. Planning should explore options such as enhancing existing roosts, constructing additional artificial sites and managing the dredge rehandling area to constitute effective shorebird roosting habitat (Fuller *et al.*, 2021; Lloyd *et al.*, 2024).
4. Implement erosion control in high-tide roosting sites for shorebirds. Erosion was identified as a threat at 14 roost sites. These roosting sites are areas above the high tide mark where migratory shorebirds gather to rest when their intertidal feeding grounds are submerged (Fuller *et al.*, 2021).
5. Implement active management of water levels in artificial roosts (like those at the Port of Brisbane and Manly Harbour) and claypan roosts to enhance their suitability for foraging and roosting shorebirds (Fuller *et al.*, 2021).
6. Improve stormwater runoff to reduce sediment discharge into the Bay and improve water quality. This would benefit shorebirds by potentially improving their benthic prey base (Fuller *et al.*, 2021).
7. Enhance monitoring of threats, including erosion and vegetation encroachment (mangroves), to identify where and how to take conservation action. This includes quantitative assessment and monitoring of threat effectiveness (Fuller *et al.*, 2021).
8. Address local declines in benthic invertebrates. There is some evidence of a long-term decline in invertebrate densities in parts of Moreton Bay. These declines are likely to be linked to sedimentation (Fuller *et al.*, 2021; Lukies *et al.*, 2021).

## Expert reviews

Professor Richard Fuller (Centre for Biodiversity and Conservation Science, University of Queensland) and Dr Penn Lloyd (Senior Principal Ecologist, Biodiversity Assessment and Management PL) kindly provided expert review of the Shorebirds: Sedimentation Impact Statement.

## Conceptual model - impacts of sedimentation on shorebirds

*Figure 2. Conceptual model that qualitatively describes the major impacts of sedimentation on shorebird 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

Booty, J.M., Underwood, G.J., Parris, A., Davies, R.G., and Tolhurst T.J. (2020) 'Shorebirds Affect Ecosystem Functioning on an Intertidal Mudflat'. *Frontiers of Marine Science*, 7:685. doi: 10.3389/fmars.2020.00685.

Clemens, R.S., Skilleter, G.A., Bancala, F. and Fuller, R.A. (2012) *Impact of the January 2011 Flood on migratory shorebirds and their prey in Moreton Bay*. Report to the Healthy Waterways Partnership. Brisbane: University of Queensland.

Clemens, R.S., Rogers, D.I., Hansen, B.D., Gosbell, K., Minton, C.D., Straw, P., Bamford, M., Woehler, E.J., Milton, D.A., Weston, M.A., Venables, B., Weller, D., Hassell, C., Rutherford, B., Onton, K., Herrod, A., Studds, C.E., Choi, C., Dhanjal-Adams, K.L., Murray, N.J., Skilleter, G.A. and Fuller, R.A. (2016) 'Continental-scale decreases in shorebird populations in Australia'. *Emu-Austral Ornithology,* 116: 119-135. doi: dx.doi.org/10.1071/MU15056.

Dean, A.J., Fielding, K.S., Newton, F. and Ross H. (2019) 'Community knowledge about water and engagement in waterway protection in south east Queensland'. 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. 61-72. doi: 10.6084/m9.figshare.8072528.

Dhanjal-Adams, K.L., Mustin, K., Possingham, H.P., and Fuller, R.A. (2015) 'Optimizing disturbance management for wildlife protection: the enforcement allocation problem'. *Journal of Applied Ecology*, 53, pp.1215-1224. doi: 10.1111/1365-2664.12606.

Dhanjal-Adams, K.L., Fuller, R.A., Murray, N.J., Studds, C.E., Wilson, H.B., Milton, D.A., and Kendall, B.E. (2019) 'Distinguishing local and global correlates of population change in migratory species'. *Diversity and Distributions*, 25(5), pp. 797-808. doi: 10.1111/ddi.12884.

Fuller, R.A., Clemens, R.S., Woodworth, B.K., Moffitt, D., Steven, R. and Simmons, B.A. (2021) *Managing Threats to Migratory Shorebirds in Moreton Bay*. Final report to Healthy Land and Water. Brisbane: School of Biological Sciences, University of Queensland.

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: 2 July 2025).

Lloyd, P., Driscoll, P.V., Coleman, J.T., Cross, L., Rothlisberg, P.C. and Linde, M. (2024) 'Shorebird use of the Port of Brisbane, Queensland: insights from 30 years of monitoring'. *Corella,* 48, pp 86-94.Lukies, K.A., Gaskin C.P., and Whitehead, E.A. (2021) *The effects of sediment on birds foraging in intertidal and nearshore habitats in Aotearoa New Zealand: A literature review and recommendations for future work*. Auckland: Department of Conservation.

Murray, N.J., Clemens, R.S., Phinn, S.R., Possingham, H.P. and Fuller, R.A. (2014) 'Tracking the rapid loss of tidal wetlands in the Yellow Sea'. *Frontiers in Ecology and the Environment*, 12 (5), pp. 267-272. doi:10.1890/130260.

Nasplezes, R., Bolzenius, J., Wood, A., Davis, R., Cleary, A., Maxwell, P., Rissik, D., and Ross, H. (2019) 'Stewardship as a driver for environmental improvement 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 73-88. doi:10.6084/m9.figshare.8072513.

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.

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.

Ross, H., Rissik, D., Jones, N., Witt, K., Pinner, B. and Shaw, S. (2019b) 'Managing for the multiple uses and values of Moreton Bay and its 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 563-578. doi: 10.6084/m9.figshare.8085710.

Stigner, M.G., Beyer, H.L., Klein, C.J. and Fuller, R.A. (2016) 'Reconciling recreational use and conservation values in a coastal protected area'. *Journal of Applied Ecology*, 53 (4), pp. 1206-1214. doi: doi.org/10.1111/1365-2664.12662.

Studds, C.E., Kendall, B.E., Murray, N.J., Wilson, H.B., Rogers, D.I., Clemens, R.S., Gosbell, K., Hassell, C.J., Jessop, R., Melville, D.S., Milton, D,A., Minton, C.D.T., Possingham, H.P., Riegen, A.C., Straw, P., Woehler, E.J. and Fuller, R.A. (2017) 'Rapid population decline in migratory shorebirds relying on Yellow Sea tidal mudflats as stopover sites'. *Nature Communications*, 8 (1), p.14895. doi: 10.1038/ncomms14895.

Wilson, H.B., Kendall, B.E., Fuller, R.A., Milton, D.A. and Possingham, H.P. (2011) 'Analyzing variability and the rate of decline of migratory shorebirds in Moreton Bay, Australia'. *Conservation Biology*, 25(4), pp.758-766.

Wilson, S., Curnock, M., Simmons, B., Moffitt, D., Coleman, J., Amano, T., and Fuller, R.A. (2022) *Using Drones to Survey Shorebirds in Moreton Bay, Australia*. University of Queensland Final Report for the Moreton Bay Foundation. Brisbane: 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 corresponds to **Section 5.13** 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) Critically endangered Eastern curlews, Cleveland. Photo credit: C. Walker.*
*(Bottom) Vulnerable Bar-tailed godwits at Oyster Point, Cleveland. Photo credit: C. Walker.*

The Moreton Bay Foundation

DBC
David Brewer Consulting