

Cleveland Bay - A Naturally Dynamic Ecosystem

Cleveland Bay is constantly changing.

Natural processes cause beaches to erode and rebuild, seagrass meadows to expand and contract, and coral reefs to experience periods of growth and decline. These changes are part of the Bay's natural cycle and reflect the highly variable tropical environment in which these ecosystems have evolved.

Research has shown that Cleveland Bay's ecosystems are influenced by both local conditions and regional processes, including flood plumes originating from the Burdekin River catchment nearly 90 km away.

RECENT CLIMATE PRESSURES

Over recent years, Cleveland Bay has experienced a series of climate-driven disturbances with limited recovery time between events, including:

Increased Rainfall and Flood Events

- Record flooding in 2019 and major river discharge events in 2025.
- Increased freshwater inflows and sediment delivery.
- Reduced water clarity and light penetration.

Marine Heatwaves and High Temperatures

- Australia's hottest year on record in 2019.
- Record-high sea surface temperatures in 2020.
- Elevated summer temperatures during 2021/22 and 2023/24.
- Increased thermal stress on marine ecosystems.



Water movement in Cleveland Bay, (NASA Ocean Colour Data, Landsat 8)

Prolonged Low-Light Conditions

- Repeated years of reduced sunlight reaching the seabed.
- Lower photosynthetic productivity in corals and seagrass.
- Reduced growth and recovery potential.

Cyclones and Severe Storms

- Tropical Cyclones Jasper (2023) and Kirrily (2024).
- Significant wave action, sediment resuspension and habitat disturbance from a tropical low (2025).
- Increased coastal erosion and shoreline change.

CLEVELAND BAY ECOSYSTEMS RESILIENCE

Inshore coral reefs and seagrass meadows have evolved under naturally variable and often challenging conditions. They can recover from disturbance events when sufficient recovery time is available.

However, repeated floods, storms, heatwaves and poor water clarity are making recovery more difficult. For example, while seagrasses recovered rapidly after Tropical Cyclone Yasi in 2011, recovery following Cyclone Jasper has been delayed by subsequent extreme weather events.

This highlights an important principle: ecosystems can often recover from individual disturbances, but recovery becomes more difficult when major events occur in rapid succession.

LOOKING FORWARD

Maintaining the health of Cleveland Bay requires an understanding of the strong connections between catchments, waterways, coastal habitats and the Great Barrier Reef. Long-term monitoring and research help identify trends, improve management and support ecosystem resilience.

Continued monitoring by scientists, government agencies, industry and community partners helps track environmental change and support informed management decisions.

Learn More - Healthy Waters Partnership for the Dry Tropics

- Waterways Report Card:
<https://www.healthywaterspartnership.org>
- Interactive StoryMaps:
<https://www.healthywaterspartnership.org/learn>
 - Seagrass of Cleveland Bay
 - Corals of the Townsville Region
 - Hydrology and Hydrodynamics of Cleveland Bay

Cleveland Bay's ecosystems have evolved to cope with natural environmental variability and have demonstrated resilience over time. However, increasing pressures from floods, cyclones, marine heatwaves and changing climate conditions are reducing recovery opportunities and placing greater stress on these ecosystems. Understanding these changes requires long-term monitoring.

photo credit: James Cook University, Tropwater



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