

Gladstone Healthy Harbour Partnership 2025 Report Card Summary, ISP011: Seagrass

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Executive Summary

Gladstone Harbour seagrass meadows were in good overall condition in the 2025 reporting year (monitored in November 2024) for the second consecutive year. Seagrass biomass and area were one of the highest ever recorded since monitoring commenced in 2002 for meadows in Rodds Bay and the Narrows, driving improvements in condition since the previous survey. At the zone level, seagrass was in good or very good condition in all except the Inner Harbour which was in a satisfactory condition, an improvement on last year when it was in a poor condition.

Background

Seagrass monitoring in Port Curtis and Rodds Bay commenced in 2002 and has been conducted annually since 2004 as part of a long-term partnership between Gladstone Ports Corporation (GPC) and James Cook University's Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER). Fourteen monitoring meadows representing the range of different seagrass community types in Port Curtis and Rodds Bay are assessed each October/November. Three indicators of seagrass condition are assessed: biomass, area and species composition. Each meadow is graded from A (very good) to E (very poor) relative to baseline conditions and scored on a 0–1 scale, allowing for average scores to be calculated (Table 1). The lowest of the three indicator scores dictates the overall meadow score and grade (Table 1). Where species composition is the lowest of the three indicator scores, it contributes 50% of the overall meadow score, with the remaining 50% coming from the lowest of either biomass or area scores (see Carter et al. 2023 for more details). Seagrass condition for the 2025 reporting year comes from data collected in October/November 2024. A detailed description of methods and approaches can be found in Reason et al. (2025 – go to <https://www.tropwater.com/reports-and-publications>) and is summarised for the Gladstone Healthy Harbour Partnership in this report.

Overall Seagrass Condition

Half of the fourteen individual monitoring meadows were rated as being in a very good condition in 2025 with 13 meadows rated as good or very good (Table 1, Figure 1, 2). Seagrass at Pelican Banks was in good condition for the first time in 14 years due to increases in biomass, the highest level since 2010. The Western Basin and meadows north up to the Narrows, all had seagrass in good or very good condition. Seagrass meadows in the Mid Harbour, South Trees Inlet and south to Rodds Bay were also in a good to very good condition improving on the previous year. Only one meadow was rated below good condition, the Inner Harbour Meadow 58, rated as satisfactory due to the species composition being dominated by less persistent species *Halophila ovalis*. This meadow has however improved from very poor in 2023, poor in 2024 to the current rating of satisfactory. Improvements in seagrass condition were driven by increases in biomass particularly in Rodds Bay where biomass was some of the highest recorded across 20 years of surveys (Figure 2).

Table 1. Grades and scores for seagrass sub-indicators (biomass, area and species composition), overall meadow, zone, and Gladstone Harbour scores for the GHHP 2025 reporting year (2024 survey). Scores are on 0 – 1 scale; cells are coloured according to grade, where dark green = very good, light green = good, yellow = satisfactory, orange = poor, red = very poor. Note, 2025 scores may differ slightly to those reported by Reason et al. (2025) due to bootstrapping used to calculate GHHP report card and scores. * rounded score shown but actual value lower than grade threshold.

Zone	Meadow	Biomass	Area	Species composition	Overall meadow	2025 (2024 survey)	2024 (2023 survey)	2023 (2022 survey)
1. The Narrows	21	1	1	0.98	0.99	0.99	0.89	0.93
3. Western Basin	4	0.9	1	0.86	0.88	0.78	0.70	0.72
	5	0.88	0.99	0.85*	0.87			
	6	0.9	0.95	0.51	0.71			
	7	0.71	0.85*	1	0.71			
	8	0.89	0.87	0.46	0.67			
	52–57	0.86	1	1	0.86			
5. Inner Harbour	58	0.75	0.84	0.49	0.62	0.62	0.43	0.10
8. Mid Harbour	43	0.68	0.92	0.79	0.68	0.70	0.49	0.57
	48	0.81	0.92	0.61	0.71			
9. South Trees Inlet	60	0.88	1	0.96	0.88	0.88	0.81	0.81
13. Rodds Bay	94	1	0.9	0.98	0.90	0.89	0.74	0.38
	96	1	1	0.89	0.96			
	104	0.88	0.86	0.77	0.82			
Harbour score						0.81	0.68	0.58

#Meadow 52-57 consists of a number of small meadows surrounding the Passage Islands in the Western Basin Zone (see Figure 1). These meadows are grouped for reporting purposes.

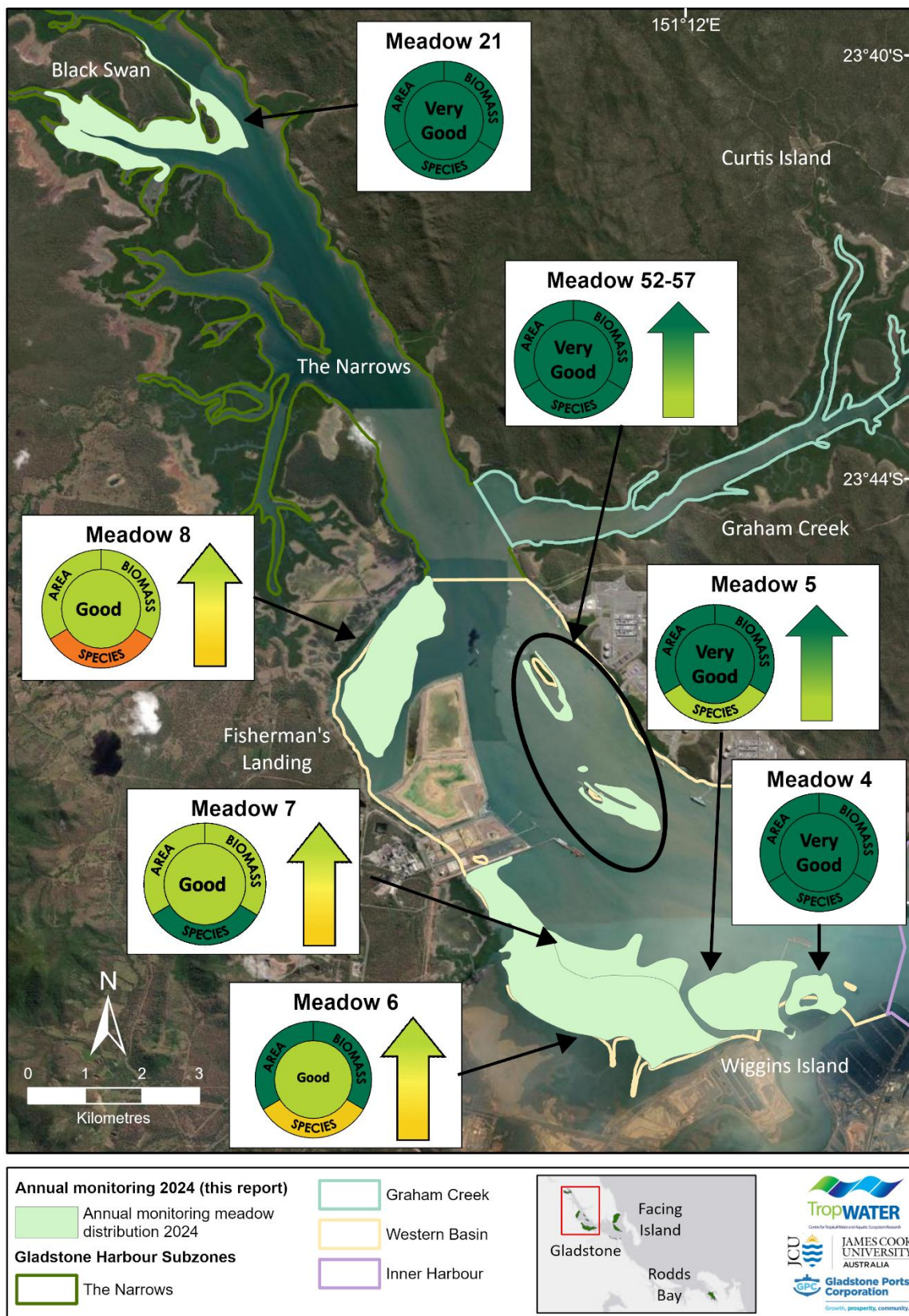


Figure 1. Seagrass distribution and meadow condition in The Narrows and Western Basin Zones (A) in Gladstone Harbour in November 2024 (this report card). Arrows indicate an overall grade change from the previous year.

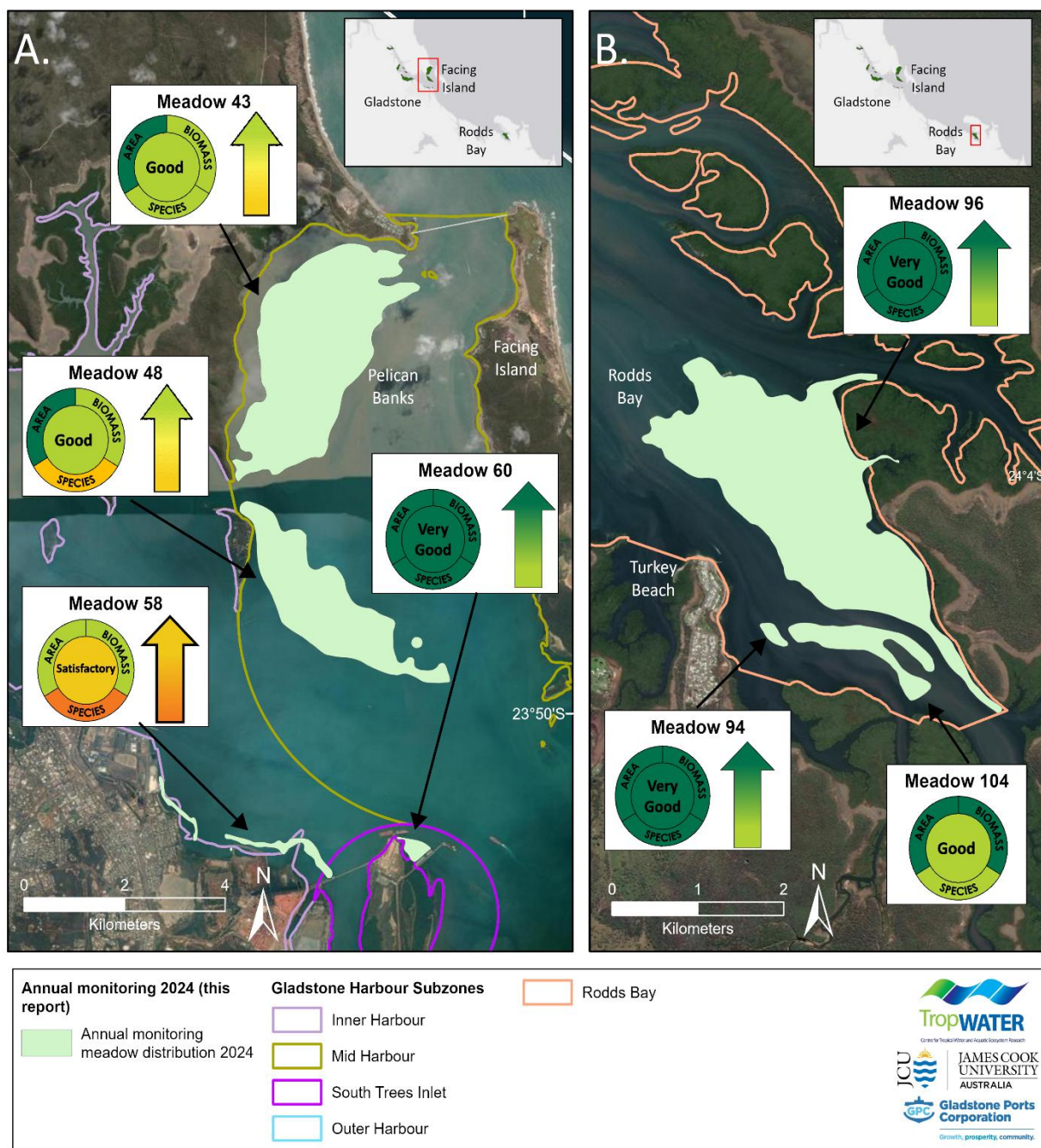


Figure 2. Seagrass distribution and meadow condition in the (A) Inner and Mid Harbour, and South Trees Inlet Zones of Gladstone Harbour and (B) Rodds Bay in November 2024 (this report card). Arrows indicate an overall grade change from the previous year.

Drivers of Seagrass Condition

Local environmental conditions are a key factor in determining seagrass distribution, biomass and health in the Gladstone region. Seagrass has specific light requirements for photosynthesis and growth (Chartrand et al. 2016; 2018). Turbidity associated with rainfall and river outflow reduces benthic light conditions inhibiting seagrass growth and can ultimately lead to plant death whereas low rainfall and river flow generally lead to high benthic light and increases in seagrass growth. Long-term trends in seagrass condition over the past 20 years of annual monitoring reveal a strong relationship with river flow and rainfall in the region. In 2024, below average rainfall in Gladstone and below average river flow from the Calliope River were likely to have led to favourable seagrass growing conditions and high biomass recorded in 2024 (2025 reporting year). If favourable conditions continue, seagrass biomass and condition may continue to increase and improve building their resilience and ability to resist and recover from future disturbances.

For the first time in over a decade, the Pelican Banks monitoring meadow (Meadow 43) in the Mid Harbour has returned to a good overall condition, with notable improvements in biomass and species composition. Historically, this meadow was among the largest and highest-biomass seagrass meadows in Port Curtis, being located in an area characterised by good water clarity and favourable light conditions. This meadow was in a good to satisfactory condition from 2002 to 2014. However, between 2015 and 2023, the meadow's condition has predominantly been in poor or very poor condition, due to reduced biomass and shifts in species composition from the larger foundational species *Z. muelleri* to the smaller less persistent species *H. uninervis* and *H. ovalis*. Overgrazing by turtles and dugongs may have contributed to the decline in seagrass condition at Pelican Banks as they target areas with traditionally high seagrass biomass and have been the cause of seagrass losses in other regions around the world (Christianen et al. 2014, Rasheed et al. 2017, Scott et al. 2021a). The optimal growing conditions over the past twelve months, characterised by below-average rainfall and river flow leading to improved benthic light conditions, may have allowed seagrass growth to be greater than grazing pressure from megaherbivores. Alternatively, increases in seagrass biomass throughout the survey area and in nearby locations such as Clairview and Hervey Bay may have allowed turtles and dugongs to move to other grazing areas reducing the number of megaherbivores at Pelican Banks allowing seagrass biomass to increase. Continued favourable environmental conditions may further enhance the resilience of the Pelican Banks meadow, enabling it to better withstand potential future disturbances.

In 2024 (2025 reporting year), biomass in Rodds Bay was the highest ever recorded in two of the three monitoring meadows. In fact, all three monitoring meadows in this out of port reference area had significant improvements in biomass. Historically, large declines were observed in the Rodds Bay meadows from 2009 to 2010 with a complete loss of seagrass in the monitoring meadows between 2011 and 2013. Biomass remained in a poor condition for eight years from 2010 to 2017, with improvements occurring between 2018 and 2019 and have fluctuated since then. The improvement in all meadows across all condition indicators are most likely related to favourable climate conditions. High biomass and area of these meadows holds them in good stead to be resilient to disturbances in the future.

Conclusion

The overall good condition of seagrasses (combined across all zones) in the 2025 reporting year indicates a healthy marine environment for Port Curtis and Rodds Bay. The seagrass dynamics observed in Port Curtis and Rodds Bay over the past year are consistent with the major climate drivers of seagrass change seen elsewhere in Queensland and the continued use of the meadows by dugongs and green turtles are signs of a healthy functioning seagrass ecosystem. The improvements

in biomass and area and the maintenance of foundation species over the previous sampling years across Port Curtis and Rodds Bay meadows will provide resilience to disturbance such as severe climatic events in the future. Sustained periods of high biomass can lead to increased reproductive effort and replenish seed banks in the region, particularly for *Z. muelleri*. Larger seed banks further increase seagrass meadow resilience to impacts by increasing their capacity for recovery (Reason et al. 2017).

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