



Dry Tropics Partnership for Healthy Waters
Waterways Report Card 2023

TECHNICAL REPORT

PART 7: Litter Results

Reporting on data collected 2021 - 2022



14 Litter

The litter index is comprised of a single indicator to assess the “pressure” that the amount of litter present in a location may be having on that environment. The data used to derive the scores and grades for the litter index is from Tangaroa Blue Foundation's (TBF) Australian Marine Debris Initiative Database (AMDI). The data is collected by volunteers and partners through the Reef Clean program which is funded through the Australian Government's Reef Trust. A model has been developed for the combined regions of the Wet Tropics Waterways Partnership, Dry Tropics Partnership for Healthy Waters, Healthy Rivers to Reef Partnership, and the Gladstone Healthy Harbours Partnership from ‘baseline’ data from the period ~2009 to June 2019 available from the AMDI following the method developed by Venables and Whitehead (2019). The litter collected at sites each year is compared with this baseline to determine their score and grade.

The model developed by Venables and Whitehead (2019) was based on a smaller dataset of 2016–2019 data that had been pre-cleaned by TBF. As more data has now become available, the model has been re-fitted using a negative binomial distribution (rather than Gaussian) to take the additional data into account, so the results may be different from those previously reported. Further, as the model was also fitted to data for the Wet Tropics Waterways Partnership, the Healthy Rivers to Reef Partnership, and the Gladstone Healthy Harbours Partnership, the zones included in the model were redefined based on a combination of the location and the landuse category included within the AMDI data (refer Methods). The recalculated results for the model, and the 2019–2020, 2020–2021 years are provided in the Methods Appendix and in Section 14.2 below respectively.

14.1 Monitoring Sites

There were 20 litter collection sites for the 2021–2022 period, and these are shown in Figure 13,

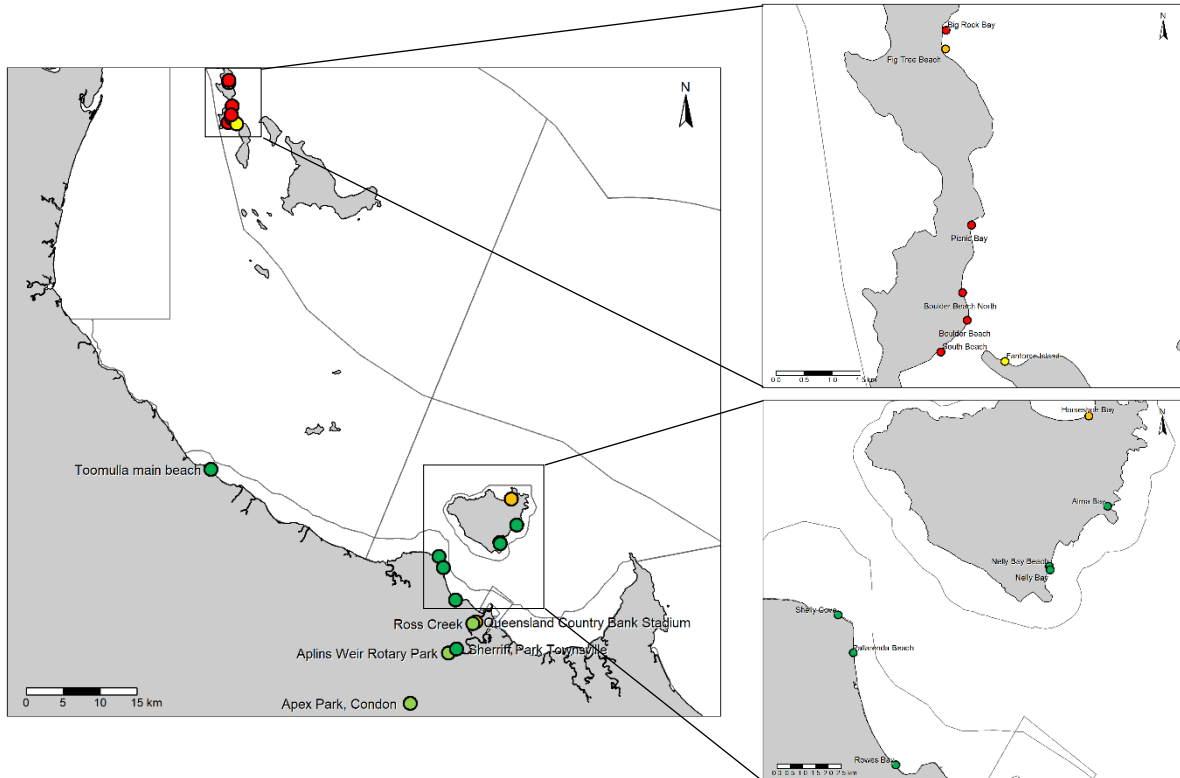


Figure 13: Litter Collection Locations for 2021-2022

where the colours indicate the grade. There were seven sites in Cleveland Bay, eight sites in the Halifax Bay, and five sites in the Ross Basin. There were no sites defined as the Black Basin. Beach sites are defined by the AMDI landuse category where the volunteers collecting the litter have indicated whether the litter is largely sourced from direct deposit onto the land or washed up from the sea. It was considered that this was the best proxy available to define the boundary between a freshwater basin and the adjacent estuarine or inshore zone.

14.2 Comparison with previous years

Table 71 presents a comparison of the 2021–2022 year for the litter index with previous years.

Table 71: Comparison of Litter Index for 2021–2022 with previous years

Zone	Site	Scores and Grades		
		2019–2020	2020–2021	2021–2022
Halifax Bay	North West Beach, Pelorus Island	88 (VLP)	NA	NA
	West Beach, Pelorus Island	75 (LP)	NA	NA
	North Beach, Orpheus Island	5 (VHP)	NA	NA
	Big Rock Bay, Orpheus Island	24 (HP)	9 (VHP)	11 (VHP)
	Fig Tree Beach, Orpheus Island	NA	19 (VHP)	21 (HP)
	Picnic Bay, Orpheus Island	1 (VHP)	14 (VHP)	3 (VHP)

Zone	Site	Scores and Grades		
		2019–2020	2020–2021	2021–2022
	Boulder Beach North, Orpheus Island	NA	NA	16 (VHP)
	Yanks Jetty, Orpheus Island	69 (LP)	80 (VLP)	NA
	Boulder Beach, Orpheus Island	NA	NA	2 (VHP)
	South Beach, Orpheus Island	42 (MP)	NA	11 (VHP)
	Fantome Island, Northern End	NA	14 (VHP)	36 (HP)
	Ollera Beach	40 (MP)	NA	NA
	Rollingstone Beach	50 (MP)	NA	NA
	Toomulla Beach	52 (MP)	NA	NA
	Toomulla main beach	NA	NA	78 (LP)
	Saunders Beach	66 (LP)	NA	NA
	Bushland Beach, Townsville	NA	65 (LP)	NA
Cleveland Bay	Myrmidon Reef	NA	95 (VLP)	NA
	Horseshoe Bay, Magnetic Island	NA	NA	34 (HP)
	Arthur Bay, Magnetic Island	NA	43 (MP)	NA
	Alma Bay, Magnetic Island	46 (MP)	61 (LP)	68 (LP)
	Alma Bay, Magnetic Island UW	93 (VLP)	96 (VLP)	NA
	Geoffrey Bay, Magnetic Island	NA	77 (LP)	NA
	Geoffrey Bay Reef, Magnetic Island UW	88 (VLP)	NA	NA
	Nelly Bay Beach, Magnetic Island	52 (MP)	73 (LP)	69 (LP)
	Nelly Bay, Magnetic Island UW	99 (VLP)	98 (VLP)	97 (VLP)
	Shelly Beach, Pallarenda	61 (LP)	31 (HP)	NA
	Shelly Cove, Cape Pallarenda Conservation Park	65 (LP)	68 (LP)	87 (VLP)
	Pallarenda Beach	NA	NA	69 (LP)
	Kissing Point, Townsville	NA	75 (LP)	NA
	Rowes Bay	71 (LP)	72 (LP)	83 (VLP)
	Strand Park, Townsville	60 (LP)	71 (LP)	NA
	Strand Waterpark Beach	NA	81 (VLP)	NA
Ross	Three Mile Creek, Pallarenda	NA	36 (HP)	NA
	Strand Rock Pool, Townsville	NA	46 (MP)	NA
	Queensland Country Bank Stadium	NA	25 (HP)	22 (HP)
	Ross Creek, Townsville	NA	NA	45 (MP)
	South Townsville Recreational Boat Park	NA	33 (HP)	NA
	Anderson Park, Townsville	NA	NA	87 (VLP)
	Sherriff Park Townsville	NA	NA	69 (LP)
	Aplins Weir Rotary Park	41 (MP)	35 (HP)	66 (LP)
	Apex Park, Condon	NA	NA	60 (LP)

Standardised scoring range: ■ = Very High Pressure: 0 to <20 | ■ = High Pressure: 20 to <40 | ■ = Moderate Pressure: 40 to <60 | ■ = Low Pressure: 60 to <80 | ■ = Very Low Pressure: 80 to 100.

As there are a small number of sites where litter collections occur each year, it is difficult to obtain a picture of whether improvement is occurring or not. There are a number of factors that are not included in the metric that could have a bearing on the amount of litter collected at sites, particularly land based sites, such as, the frequency of TCC emptying bins, the location of bins (ease of use to main trafficked areas), the number of people using the area on a daily, weekly, or monthly basis, proximity of the collection to a public holiday, or regional event. The variance associated with Zone, Site and Year accounted for a proportion of the total variance, however, the residual variance of the model indicates that there are potentially several variables that have not been identified.

14.3 Key Messages

- The east coast of Orpheus Island continues to have the highest litter pressure in the region.
- The northern beaches of Townsville have had low litter pressure on the occasion's collections have occurred there.
- Queensland Country Bank Stadium (high pressure) during events continues to have the highest litter pressure in the Ross litter zone, whilst Ross Creek has moderate pressure.
- Horseshoe Bay has the highest litter pressure on Magnetic Island.

14.4 Results

Litter pressure results are presented in Table 72. In the Ross Freshwater Basin Anderson Park had the lowest pressure and Queensland Country Bank Stadium had the highest pressure. Bins are provided by the Townsville City Council at all of the locations where litter collection occurs within the Ross Freshwater Basin. Queensland Country Bank Stadium litter collections occur during events, in the area external to the entrance gates surrounding the stadium (pers. com. K-M Coulter-Atkins, previously TBF now DTPHW, 2023).

For the Magnetic Island sites within Cleveland Bay, Horseshoe Bay had the highest pressure (HP) and Nelly Bay had the lowest pressure, with the underwater site better than the shore zone. For the Townsville sites within Cleveland Bay, Shelly Cove and Rowes Bay had very low pressure, while Pallarenda Beach had low pressure.

Fantome Island had high pressure but was the lowest pressure of the sites within the Palm Island group of Halifax Bay. All of the Orpheus Island sites (Table 72) had very high pressure except Fig Tree Beach which had high pressure. Discussion with K-M Coulter-Atkins (TBF, 2022) found that the litter at Orpheus Island is largely sourced from the sea and was found to be washing onto the beach whilst the litter collection was occurring. This is reflected in the proportion of litter that is sea sourced provided by the AMDI Land Sea Source Index (LSSI). The only main land site in Halifax Bay for the Dry Tropics region was Toomulla main beach, which had low pressure.

Table 72: Litter Index Results for 2021–2022

Zone	Site	Score and Grade	Land sourced (%)	Sea sourced (%)
Halifax Bay	Big Rock Bay, Orpheus Island	11 (VHP)	13	87
	Fig Tree Beach, Orpheus Island	21 (HP)	16	84
	Picnic Bay, Orpheus Island	3 (VHP)	15	85
	Boulder Beach North, Orpheus Island	16 (VHP)	16	84
	Boulder Beach, Orpheus Island	2 (VHP)	12	88
	South Beach, Orpheus Island	12 (VHP)	18	82
	Fantome Island, Northern End	36 (HP)	13	87
	Toomulla main beach	78 (LP)	31	69
Cleveland Bay	Horseshoe Bay, Magnetic Island	34 (HP)	38	62
	Alma Bay, Magnetic Island	68 (LP)	49	51
	Nelly Bay Beach, Magnetic Island	69 (LP)	22	78
	Nelly Bay, Magnetic Island UW	97 (VLP)	0	100
	Shelly Cove, Cape Pallarenda Conservation Park	87 (VLP)	71	30
	Pallarenda Beach	69 (LP)	79	21
	Rowes Bay	83 (VLP)	79	21
Ross	Queensland Country Bank Stadium	22 (HP)	100	0
	Ross Creek, Townsville	45 (MP)	100	0
	Anderson Park, Townsville	87 (VLP)	100	0
	Sherriff Park Townsville	69 (LP)	100	0
	Aplins Weir Rotary Park	66 (LP)	100	0
	Apex Park, Condon	60 (LP)	100	0

Standardised scoring range: ■ = Very High Pressure: 0 to <20 | ■ = High Pressure: 20 to <40 | ■ = Moderate Pressure: 40 to <60 | ■ = Low Pressure: 60 to <80 | ■ = Very Low Pressure: 80 to 100.

Confidence Scores

The overall confidence score for the litter index was low with a score of 2 out of 5, this is an improvement on the previous score of 1 following the further development of the litter index method. The maturity is scored at 2, as a negative binomial mixed model for data across a much larger region than solely the Dry Tropics has been developed. This has improved the robustness of the metric applying a distribution appropriate to the data and using a much larger dataset from which to derive the model. Validation is scored as 1 as modelling is used to derive an estimate of the amount of litter one might expect to collect in a one-hour period at each location at any time that location might be visited. This expected value considers the variability of the data available. Representativeness is scored at 1 as there is variation in the frequency of the data collection at each site, and variation in the way the data is reported. For example, some sites are cleaned up four times per year, whilst others may be cleaned up once every few years. Whilst the model can consider the frequency of the collection by volunteers contributing to the AMDI in an individual year, it does not consider the last time litter was collected at each location (by anyone). It is not possible to do so as

this information is not available. Some collectors may include the time they spend sorting the litter, whilst others may not. This brings variation into the data that is difficult to account for within the model. The measured error has been scored at 2 as the model provides estimates based on the variability of the data, however, there is also error associated with the transformation of the data to score and grade.

Table 73: Confidence scores for the Litter Index

Indicator Category	Maturity (x0.36)	Validation (x0.71)	Representativeness (x2)	Directness (x0.71)	Measured error (x0.71)	Score (Rank)
Litter	2	1	1	3	2	2 (low)

Rank based on score: 1 (very low) = 4.5 to 6.3; | 2 (low) = >6.3 to 8.1; | 3 (moderate) = >8.1 to 9.9; | 4 (high) = >9.9 to 11.7; | 5 (very high) = >11.7 to 13.5.

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