HEALTHY WATERS PARTNERSHIP dry tropics

Townsville Dry Tropics
Waterways Report Card 2025

TECHNICAL REPORT

PART 4: Estuarine Results

Reporting on data collected 2023 - 2024

JULY 2025 | Written by Adam Shand, Healthy Waters Partnership (HWP)

5 Estuarine Environment

Within the estuarine environment, water quality, and habitat are the two indices scored. Each of these indices are made up of indicator categories and indicators which are updated on varying time scales from annually to every three to four years. All indicator categories use data provided by multiple partners of the Partnership. In the Townsville Dry Tropics region, the water quality index is updated annually, with the most recent data from the 2023-2024 financial year. The habitat index is updated approximately every four years with the most recent update (2021 data) occurring for the 2022-2023 technical report.

Index scores are calculated for the Ross Estuarine Basin and the Black Estuarine Basin. The extent of each basin is shown in Figure 16 (below), and the results are presented below.

5.1 Water Quality

The water quality index for the estuarine environment of the Townsville Dry Tropics regions consists of two indicators categories: Nutrients, and Physical-Chemical Properties. These are divided into five indicators and for each indicator the parameters used to calculate the scores were the:

- Water Quality Objectives (WQOs),
- Scaling Factors,
- Annual medians, calculated from the monthly medians,
- 80th percentile (and 20th percentile for DO), calculated from the monthly median, and,
- The weighted basin scores include the proportion of each individual estuary area of the total basin estuary area.

The Townsville Dry Tropics Methods Document (2025) provides definition of the WQOs, and SFs used for each watercourse, and the conversion of raw data to standardised scores using the annual medians, percentiles, and sub basin weights. Values can also be found in Appendix FF and Appendix HH.

The nutrients indicator category is comprised of two indicators, Dissolved Inorganic Nitrogen (DIN), and Total Phosphorus (TP) and the scores for nutrients are averaged from the scores of the two indicators. The physical-chemical properties indicator category is comprised of three indicators, Turbidity, High DO, and Low DO. The score is calculated as the average of Turbidity and the minimum score from High DO and Low DO.

5.1.1 Monitoring Sites

Data for the two estuarine indicator categories are collected from the same sites. There are 22 sites (codes) spread across 12 estuaries within the two basins. These are divided into seven (7) sub basins in line with the WQIP (Townsville City Council, Queensland Government, Australian Government 2010) (Table 47, and Figure 16).

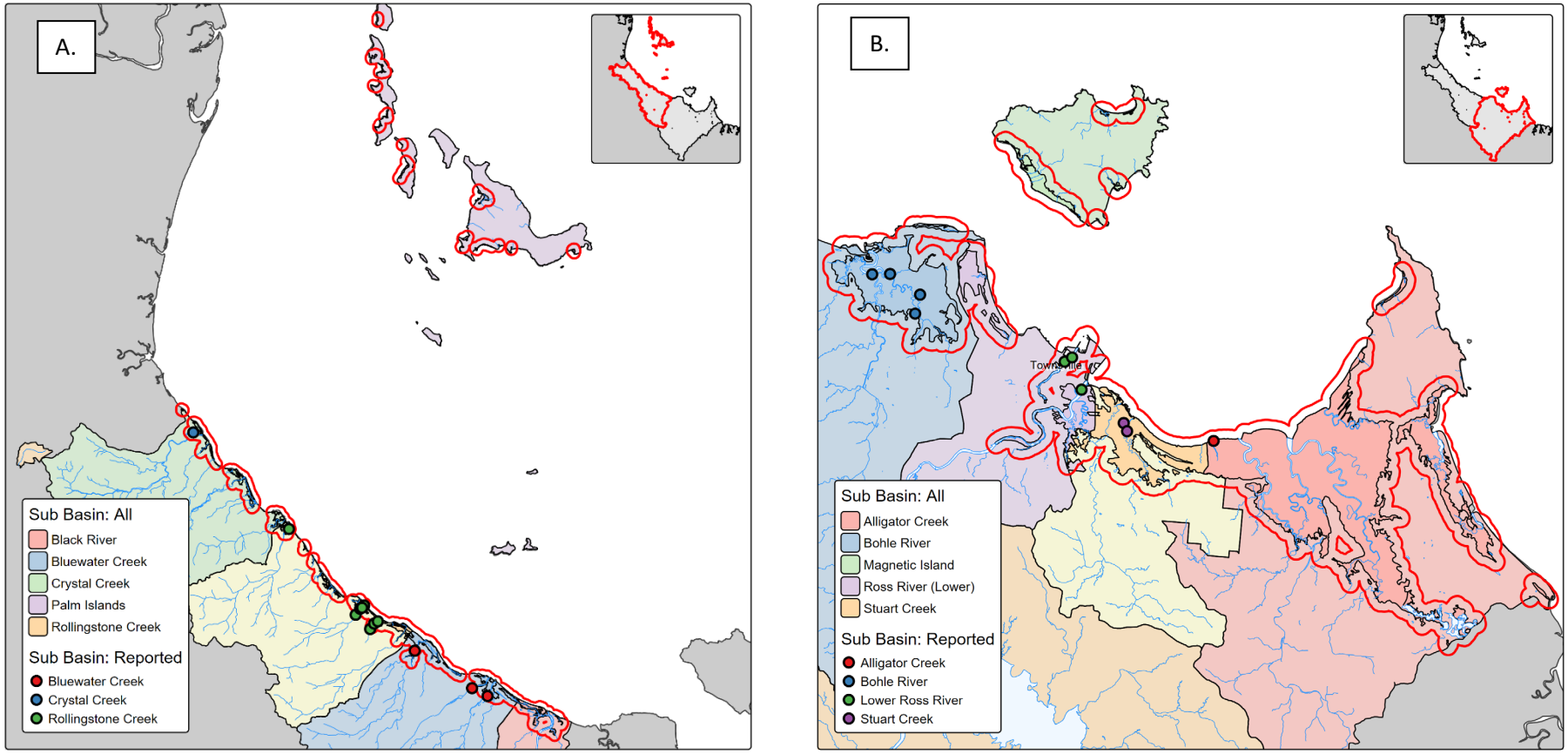

Figure 1. Estuarine Basins (A.= Black, B. = Ross) and Sub Basins (see legend). Red lines are added to highlight hard to see areas.

Table 1. Townsville Dry Tropics estuarine water quality site summary.

Basin	Sub Basin	Watercourse	Number of Sites
Ross Estuarine	Bohle	Bohle River	1
		Louisa Ck	3
	Lower Ross	Ross Ck	2
		Ross River	1
	Stuart	Sandfly Ck	2
	Alligator	Pearce's Ck	1
Black Estuarine	Bluewater	Althaus Ck	1
		Bluewater Ck	1
		Sleeper Log Ck	1[1]
	Rollingstone	Camp Oven Ck	3
		Saltwater Ck	3
		Rollingstone Ck	1
	Crystal	Crystal Ck	1

5.1.2 Overall Summary: Estuarine Water Quality

The water quality index was graded as "good" in both the Ross and Black Estuarine Basins, receiving the same grade as the previous report, however decreased in scores in both basins (79 to 69 for Ross, 68 to 61 for Black) (Table 48, Table 49). A reduction in both the nutrient and physical chemical properties indicator categories across both of the basins contributed to the reduction in overall water quality.

Table 2. Current and previous water quality scores and grades for the Townsville Dry Tropics Estuarine Basins.

Basin	Nutrients	Phys-Chem Properties	Water Quality					
			23-24	22-23	21–22	20–21	19–20	18–19
Ross Estuarine	75	62	69	79	83	88	88	39
Black Estuarine	64	59	61	68	64	66	47	52

Standardised scoring range: ■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

[1] This decreased from 2 sites to 1 site during the 2023-2024 sampling regime.

Table 3. A comparison of nutrient and physical chemical properties indicator category scores, and the water quality index scores, for estuarine sub basins and basins between years.

Sub Basin	Nutrients					Phys-Chem					Water Quality				
	23-24	22-23	21-22	20-21	19-20	23-24	22-23	21-22	20-21	19-20	23-24	22-23	21-22	20-21	19-20
Bohle River	37	61	63	[2]ND	ND	49	55	55	ND	ND	43	58	59	ND	ND
Lower Ross	90	90	90	ND	ND	68	86	85	ND	ND	79	88	87	ND	ND
Stuart Ck	80	90	81	ND	ND	55	62	77	ND	ND	67	76	79	ND	ND
Alligator Ck	82	90	90	ND	ND	61	69	90	ND	ND	72	79	90	ND	ND
Ross Basin (Weighted)	75	82	88	88	89	69	77	78	86	90	69	79	83	88	88
Bluewater Ck	66	68	85	ND	ND	55	61	58	ND	ND	61	64	71	ND	ND
Rollingstone Ck	68	77	82	ND	ND	66	69	73	ND	ND	67	73	77	ND	ND
Crystal Ck	53	73	77	ND	ND	61	66	48	ND	ND	57	69	63	ND	ND
Black Basin (Weighted)	64	71	74	66	77	59	64	55	66	49	61	68	64	66	64

Standardised scoring range: ■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | - = Not Applicable (data available but not usable) | X = Data was not updated this year.

[2] These scores cannot be back calculated due to changes in the method of grouping data.

5.1.2.1 *Key Messages*

- The Ross Estuarine Basin overall water quality grade remained “good”, however the score decreased from 79 to 69.
    - Most influential was the decline in the score for DIN in the Louisa Creek watercourse, which saw a decrease in grade from “good” (67) to “very poor" (0). This decline is the first notable decrease in DIN scores in five years of reporting. The cause(s) of this decline have not been determined, however could have results from increasing land use impacts, weather conditions and/or the sample timing in relation to environmental events. Additional, years of sampling are required to establish trends.
    - Louisa Creek showed ongoing low scores and grades for the Low DO and Nutrients indicators, along with recent low scores for the DIN indicator. Further investigation would be required to isolate specific drivers.
- The Black Estuarine Basin overall water quality grade remained “good”, however the score decreased from 68 to 61.
    - Most influential was the decrease in score for the Low DO indicator in Camp Oven Creek (42 to 2), Turbidity in Bluewater Creek (63 to 28) and Sleeper Log Creek (59 to 35), and DIN in Bluewater Creek (65 to 50). However, minor improvements that occurred across several indicators in several watercourses “muted” the effect of this decline on the overall basin grade.
    - Althaus Creek showed ongoing low scores and grades for the turbidity indicator, and further investigation would be required to isolate specific drivers. An increase in grade has been noted, however continued improvement is needed.
    - Over several years Sleeper Log Creek has shown a consistent decline in Turbidity for both score and grade. It is recommended that further investigation is conducted to isolate specific drivers.
    - Scores and grades decreased in Crystal Creek for DIN, TP, and Turbidity. Ongoing monitoring is essential to determine if this continues.
- Across all estuaries in the Dry Tropics Region, 10 of 13 watercourses received a grade of “good” or “very good” for nutrients, and 8 of 13 received a grade of "good” or “very good” for physical-chemical properties.

5.1.3 Nutrients

For the 2023–2024 technical report the nutrients indicator category is comprised of two indicators, Dissolved Inorganic Nitrogen (DIN), and Total Phosphorus (TP). The scores and grades for the Ross and Black Estuarine Basins, and their associated sub basin estuaries are presented in Table 50. Annual medians, samples collected, months sampled, WQOs, and SFs are presented in Appendix FF. Historical scores are presented in Appendix GG.

5.1.3.1 *Results: Estuarine Nutrients*

The Ross Estuarine Basin received a nutrient indicator category score of 75 (good). Within the basin, five of six watercourses received nutrient indicator category grades of “good” or “very good”, with scores ranging from 75 to 90. The Louisa Creek watercourse was the only location to receive a grade of “very poor” (score of 0), which was driven by both the TP and DIN indicators. Other than in the Louisa Creek watercourse, both the TP and DIN indicators received grades of “very good” or “good” (Table 50).

The low scores for the TP indicator at Louisa Creek have consistently occurred across multiple years of reporting. Low scores have been identified to be driven by concentration rather than differences in water quality objective, sampling methodology, or scaling factors (Appendix FF), and the creek is considered “urbanised” in nature. The distribution of sites along the Louisa Creek watercourse, and their associated scores, also suggests a diluting effect, with scores generally increasing further downstream (Table 50). These consistent spatial and temporal trends suggest an ongoing source of increased TP upstream of the sampling location that is unique to the Louisa Creek watercourse, such as its proximity to the outflow of the Mount St Johns Wastewater Treatment Plant, industrial areas, and residential developments, particularly those with septic systems.

The Black Estuarine Basin received a nutrient indicator category score of 64 (good). Within the basin, five of seven watercourses received a nutrient indicator category grade of “good” or “very good”, with scores of 61 or greater. The Rollingstone Creek and Crystal Creek watercourses were the only locations to receive grades of “moderate” (58 and 53), which was driven predominately by “poor” scores in the DIN indicator. This is the second year a “poor” score has occurred in the Rollingstone Creek watercourse. Although these scores are not yet consistently low across multiple reporting periods possible drivers include groundwater, soil type, landuse, and timing relative to tides and rainfall (Appendix GG). This trend has been noted in some previous reports and may require further investigation of aspects such as runoff and the surrounding land use (Table 50).

Table 4. Weighted and unweighted standardised scores and grades for the nutrient indicator category and indicators in the Townsville Dry Tropics Estuarine Environment.

Basin	Sub Basin Estuary	Watercourse	Unweighted Score and Grade					Weighted Score and Grade	
			DIN	TP	Nutrients	Weighting (proportion)	Area (km2)	Sub Basin	Basin
Ross Estuarine	Bohle	Bohle River	90	61	75	-	-	-	75
		Louisa Ck	0	0	0	-	-	-	
			45	30	37	0.28	348	17.3	
	Lower Ross	Ross Ck	90	90	90	-	-	-	
		Ross River	90	90	90	-	-	-	
			90	90	90	0.69	864	62.5	
	Stuart	Sandfly Ck	90	70	80	0.02	28	2.0	
	Alligator	Pearce's Ck	90	74	82	0	5	0.4	
			75	64	69	1	1245		
Black Estuarine	Bluewater Ck	Althaus Ck	62	74	68	-	-	-	64
		Bluewater Ck	50	72	61	-	-	-	
		Sleeper Log Ck	62	77	69	-	-	-	
			58	74	66	0.52	277	45.9	
	Rollingstone Ck	Camp Oven Ck	62	90	76	-	-	-	
		Saltwater Ck	52	90	71	-	-	-	
		Rollingstone Ck	27	90	58	-	-	-	
			47	90	68	0.25	135	19.6	
	Crystal Ck	Crystal Ck	36	71	53	0.22	118	16.3	
			50	80	65	1	531		

Standardised scoring range: ■ = Very Poor: 0 to <21 | ■ = Poor: 21 to <41 | ■ = Moderate: 41 to <61 | ■ = Good: 61 to <81 | ■ = Very Good: 81 to 90. (Scores are capped at 90) | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

5.1.4 Physical-Chemical Properties

For the 2023–2024 technical report the physical-chemical properties indicator category is comprised of three indicators, Turbidity (NTU), High DO, and Low DO. The scores and grades for the Ross and Black Estuarine Basins, and their associated sub basins are presented in Table 51. Annual medians, samples collected, months sampled, WQOs, and SFs are presented in Appendix HH. Historical scores are presented in Appendix II.

5.1.4.1 *Results: Estuarine Physical-Chemical Properties*

The Ross Estuarine Basin received a physical-chemical properties score of 62 (good). Four of six watercourses received physical-chemical indicator category grades of “very good” or “good”, with scores of 61 or greater. The Sandfly Creek watercourse received a grade of “moderate” due to a “moderate” Turbidity score, however the Louisa Creek watercourse was the only location to receive a grade of “poor” (score of 33), which was driven by the Low DO indicator (Table 51). The watercourse also received a “very poor” grade for TP and DIN (Results: Estuarine Nutrients). The relationship between DO and nutrients is well established, and the “very poor” Low DO score is likely due to increased TP upstream of the sampling location. Sources of increased nutrients may include the outflow of the Mount St Johns Wastewater Treatment Plant, industrial areas, and residential developments.

The Black Estuarine Basin received a physical-chemical properties indicator category score of 59 (moderate). Four of seven watercourses received a physical-chemical properties indicator category grade of “good” or “very good”, with scores of 61 or greater. The Althaus Creek, Bluewater Creek, and Camp Oven Creek watercourses received grades of “moderate” (54, 49, 46), which were driven by either the Turbidity or Low DO indicator. Althaus Creek has received “very poor” grades for the Turbidity indicator for several years and should be investigated for probable causes (Appendix II).

High turbidity can be caused by silt, mud, algae, plant detritus, ash, or chemicals. Given the sandy clay nature of the stratigraphy of the Althaus Creek alluvium, it is possible that the turbidity is naturally occurring, with high readings occurring either during or following rainfall events. Investigation of the turbidity data with rainfall suggests that the baseline (no rainfall for an extended period) turbidity in the creek is very close to the WQO. Analysis of the suspended solids within water samples for mineral and organic content would assist in determining the cause of the turbidity.

Table 5. Weighted and unweighted standardised scores and grades for the physical-chemical indicator category and indicators in the Townsville Dry Tropics Estuarine Environment.

Basin	Sub Basin Estuary	Watercourse	Unweighted Score and Grade				Weighting (proportion)	Area (km2)	Weighted Score and Grade	
			Turbidity	High DO	Low DO	Phys-Chem			Sub Basin	Basin
Ross Estuarine	Bohle	Bohle River	62	90	66	64				62
		Louisa Ck	67	90	0	33				
			64	90	33	49	0.28	348	15.6	
	Lower Ross	Ross Ck	90	90	61	75				
		Ross River	90	90	33	61				
			90	90	47	68	0.69	864	60.0	
	Stuart	Sandfly Ck	42	90	68	55	0.02	28	1.4	
	Alligator	Pearce's Ck	58	90	65	61	0	5	0.3	
			68	90	49	58	1	1245		
Black Estuarine	Bluewater Ck	Althaus Ck	18	90	90	54				59
		Bluewater Ck	28	90	70	49				
		Sleeper Log Ck	35	90	90	62				
			27	90	83	55	0.52	277	31.9	
	Rollingstone Ck	Camp Oven Ck	90	90	2	46				
		Saltwater Ck	75	90	90	82				
		Rollingstone Ck	62	76	90	69				
			75	85	60	66	0.25	135	17.6	
	Crystal Ck	Crystal Ck	32	90	90	61	0.22	118	14.9	
			48	88	74	60	1	531		

Standardised scoring range: ■ = Very Poor: 0 to <21 | ■ = Poor: 21 to <41 | ■ = Moderate: 41 to <61 | ■ = Good: 61 to <81 | ■ = Very Good: 81 to 90. (Scores are capped at 90) | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

5.1.5 Confidence Scores

Overall, there was moderate confidence in the results due to limited ability to define the measured error, however, all other criterion received a score of 2 or greater (Table 52).

Table 6. Confidence scores for the nutrients, and physical-chemical properties indicator categories.

Indicator Category	Maturity (x0.36)	Validation (x0.71)	Representativeness (x2)	Directness (x0.71)	Measured error (x0.71)	Score (Rank)
Nutrients	2	3	2	3	1	9.6 (3)
Phys-Chem	2	3	2	3	1	9.6 (3)

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.

5.2 Habitat

In the estuarine environment the habitat index is comprised of two indicator categories: Mangrove and Saltmarsh Extent, and Estuarine Riparian Extent. There is no update for the 2023-2024 Technical Report; data for these indicator categories is updated approximately every four years with the most recent update occurring in 2023.

5.2.1 Overall Summary: Estuarine Habitat

The scores and grades for the estuary habitat indicator categories and habitat index for 2023–2024, and the indices for previous reporting years are presented in Table 53. Scores in the Ross Basin Estuarine Basin have increased over reporting years, however scores in the Black Estuarine Basin have decreased. In the Ross Estuarine Basin, the habitat index received a score of 74 (good) and in the Black Estuarine Basin, the habitat index received a score of 50 (moderate) (Table 53).

Table 7. Standardised score for the estuarine habitat index.

Basin	Mangrove and Saltmarsh Extent	Riparian Extent	Habitat Index				
			23-24	22-23	21-22	20-21	19-20
Ross Estuarine	68	81	X	74	X	X	73
Black Estuarine	81	20	X	50	X	X	71

Standardised scoring range: Very Poor (E) = 0 to <21 | Poor (D) = 21 to <41 | Moderate (C) = 41 to <61 | Good (B) = 61 to <81 | Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

5.2.1.1 *Key Messages*

- There is no new data available for the estuarine habitat section, thus scores have not changed since the previous report. Historic key messages are presented below:
  - Sub Basins scores have been calculated and presented for the first time. This allowed for several new observations such as:
    - Identifying the Bohle River and Crystal Creek sub basins as the main areas of mangrove and saltmarsh loss and all other sub basins either undergoing no change or receiving small increases in mangrove and saltmarsh vegetation.
    - Identifying the Black River, Bluewater Creek and Rollingstone Creek sub basins as key drivers of riparian vegetation loss and several sub basins as the main areas of gain of riparian vegetation.
  - The Black Estuarine Basin recorded its first increase (11.7ha) in mangrove and saltmarsh vegetation since the beginning of the Dry Tropics Technical Report.
  - The Black Estuarine Basin also recorded its first ever loss in riparian vegetation (-9.8ha) since the beginning of the Dry Tropics Technical Report.
    - This may be connected to the ongoing urban development throughout the basin.
  - In the Ross Estuarine Basin mangrove and saltmarshes decreased (-8.5ha) and riparian vegetation increased (0.2ha).

5.2.2 Mangrove and Saltmarsh Extent

The mangrove and saltmarsh extent indicator category provides a measure of the total area of mangrove and saltmarsh and the amount of change (loss or gain) of this vegetation relative to the last time it was measured. Detailed methods can be found in 2025 Methods document (Healthy Waters Partnership for the Dry Tropics 2025). Data is scored based on the amount of mangrove and saltmarsh coverage in comparison to the most recent previous dataset. For this report 2021 mangrove and saltmarsh data (published in late 2023) is compared against 2019 data. The objective of this index is to record zero loss in vegetation between datasets.

5.2.2.1 *Monitoring Sites*

The area assessed for this indicator category is provided in Appendix LL and Appendix MM.

5.2.2.2 *Results: Estuarine Mangrove and Saltmarsh*

The standardised score and grade for the mangrove and saltmarsh extent indicator category is calculated as a percentage lost/gained from 2019 to 2021. For the 2023–2024 reporting period the total area of mangrove and saltmarsh extent was 13,633.4ha in the Ross Estuarine Basin, and 1,197.9ha in the Black Estuarine Basin. This represents a loss of 8.5ha (0.06%) in the Ross Estuarine Basin, and a gain of 11.7ha (0.99%) in the Black Estuarine Basin (Table 55). The loss was primarily driven by the loss of saltmarsh in the Ross River (Lower) and the Bohle River, and the loss of mangroves in the Crystal Creek and Bluewater Creek estuaries. The Ross Estuarine Basin received a final standardised score of 68 (B) and the Black Estuarine Basin received a standardised score of 81 (A) (Table 55). Several factors may have contributed to these changes in vegetation extent, including saltwater intrusion, coastal squeeze, and sea level rise. Historic analysis of mangrove and saltmarsh extent is provided in Appendix NN and Appendix OO.

Table 8. Historic standardised score for the Estuarine mangrove and saltmarsh extent indicator category.

Basin	Estuarine Mangrove and Saltmarsh Extent Standardised Scores					
	23-24	22-23	21-22	20-21	19-20	18-19
Ross Estuarine	X	68	X	X	X	67
Black Estuarine	X	81	X	X	X	63

Mangrove and Saltmarsh scoring range: ■ = Very Poor: >3% loss | ■ = Poor: 0.51 – 3% loss | ■ = Moderate: 0.11 – 0.5% loss | ■ = Good: 0 – 0.1% loss | ■ = Very Good: increase in mangrove of saltmarsh area.

Standardised scoring range: ■ = Very Poor: 0 to <21 | ■ = Poor: 21 to <41 | ■ = Moderate: 41 to <61 | ■ = Good: 61 to <81 | ■ = Very Good: 81 to 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Table 9. Mangrove and saltmarsh area, loss, and standardised score in the Townsville Dry Tropics estuarine basins and sub basins.

Basin/Sub Basin	Mangroves						Saltmarsh						Total (Mangrove + Saltmarsh)						Standardised Score
	Area (ha)				Change (19-21)		Area (ha)				Change (19-21)		Area (ha)				Change (19-21)		
	Pre-Clear	...	2019	2021	ha	%	Pre-Clear	...	2019	2021	ha	%	Pre-Clear	...	2019	2021	ha	%	
Alligator Ck	2,406.0	...	2,442.0	2,441.4	-0.6	-0.03	6,085.6	...	5,998.2	6,008.7	+10.5	+0.18	8,491.5	...	8,440.2	8,450.1	+9.9	+0.12	81
Bohle River	525.6	...	588.8	591.9	+3.1	+0.53	1,819.5	...	1,692.5	1,677.9	-14.6	-0.86	2,345.1	...	2,281.3	2,269.9	-11.4	-0.5	40
Magnetic Island	181.2	...	179.6	179.6	0.0	0.0	79.2	...	78	78	0.0	0.0	260.4	...	257.6	257.6	0.0	0.0	80
Ross River (Lower)	487.9	...	400.4	401.8	+1.4	+0.35	658.9	...	572.6	560.5	-12.1	-2.12	1,146.7	...	973	962.3	-10.7	-1.1	36
Ross River (Upper)	ND	...	ND	ND	ND	ND	ND	...	ND	ND	ND	ND	ND	...	ND	ND	ND	ND	ND
Stuart Ck	454.1	...	473.1	476.3	+3.3	+0.69	1,343.3	...	1,216.7	1,217.3	+0.5	+0.04	1,797.5	...	1,689.8	1,693.6	+3.8	+0.22	81
Ross freshwater	4,0548.8	...	4,083.8	4,091	+7.2	+0.18	9,986.4	...	9,558	9,542.4	-15.6	-0.16	14,041.2	...	13,641.9	13,633.4	-8.5	-0.06	68
Black River	81.7	...	81.0	84.4	+3.3	+4.12	63.9	...	62.2	64.7	+2.4	+3.91	145.7	...	143.3	149.1	+5.8	+4.03	81
Bluewater Ck	282.1	...	280.0	273.4	-6.6	-2.36	138.1	...	131.4	138.1	+6.7	+5.13	420.2	...	411.4	411.5	+0.1	+0.03	81
Crystal Ck	234.3	...	224.0	219.3	-4.7	-2.11	19.4	...	16.7	16.9	+0.2	+1.34	253.7	...	240.7	236.2	-4.5	-1.87	29
Palm Islands	136.7	...	135.6	135.6	0.0	0.0	2.2	...	0.7	0.7	0.0	0.0	138.9	...	136.3	136.3	0.0	0.0	80
Paluma Lake	ND	...	ND	ND	ND	ND	ND	...	ND	ND	ND	ND	ND	...	ND	ND	ND	ND	ND
Rollingstone Ck	170.3	...	170.3	187.8	+17.4	+10.24	91.5	...	84.2	77.1	-7.1	-8.43	261.8	...	254.5	264.9	+10.3	+4.07	81
Black freshwater	905.2	...	890.9	900.4	+9.4	+1.06	315.1	...	295.3	297.6	+2.3	+0.78	1,220.3	...	1,186.2	1,197.9	+11.7	+0.99	81

Mangrove and Saltmarsh scoring range: = Very Poor: >3% loss | = Poor: 0.51 – 3% loss | = Moderate: 0.11 – 0.5% loss | = Good: 0 – 0.1% loss | = Very Good: increase in mangrove of saltmarsh area.

Standardised scoring range: = Very Poor: 0 to <21 | = Poor: 21 to <41 | = Moderate: 41 to <61 | = Good: 61 to <81 | = Very Good: 81 to 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

= increase in vegetation, = no change in vegetation, = decrease in vegetation.

5.2.3 Estuarine Riparian Extent

The Partnership uses methods sourced from the Reef Water Quality Report Card, however, presents results at an estuarine level. The most recent results from the Reef Water Quality Report Card are from 2017, however results presented in this report are from 2021.

5.2.3.1 *Monitoring Sites*

The area assessed for this indicator category is provided in Appendix PP and Appendix QQ.

5.2.3.2 *Results: Estuarine Riparian Extent*

The standardised score and grade for the estuarine riparian extent indicator category is calculated as a percentage lost/gained from 2019 to 2021. For the 2023–2024 reporting period the total area of estuarine remnant riparian vegetation was 4,627.7ha in the Ross Estuarine Basin, and 848.5ha in the Black Estuarine Basin. From 2019 to 2021, the Ross Estuarine Basin gained 0.2ha (0.0% due to rounding) of vegetation, and the Black Estuarine Basin lost 9.8ha (1.14%) of vegetation. No estuaries in the Ross Estuarine Basin lost vegetation. Estuaries in the Black Estuarine Basin varied from "very poor" (Black River, Bluewater Creek, Rollingstone Creek), to "very good" (Crystal Creek), which recorded a gain in vegetation (Table 57). Notably, the Ross Basin recorded an increase in estuarine riparian vegetation, however it is not clear if this is the result of growth of native vegetation or weed species. Further, it should be noted that because vegetation is compared to most recent previous assessment, a score of "good" simply means that there was no vegetation loss since the previous assessment, not since "pre-European times". The standardised score in the Ross Estuarine Basin was 81 (very good), and the standardised score in the Black Estuarine Basin was 20 (very poor) (Table 56). Historic vegetation trends for each basin are presented in Appendix RR and Appendix SS.

Table 10. Historic standardised score for the Estuarine riparian extent indicator category.

Basin	Estuarine Riparian Extent Standardised Scores			
	23-24	22-23	21-22	20-21
Ross Estuarine	X	81	80	ND
Black Estuarine	X	20	80	ND

Standardised scoring range: Very Poor (E) = 0 to <21 | Poor (D) = 21 to <41 | Moderate (C) = 41 to <61 | Good (B) = 61 to <81 | Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Table 11. Riparian Extent area, loss and standardised score in the estuarine basins and sub basins of the Townsville Dry Tropics.

Basin/Sub Basin	Estuarine Riparian Extent						
	Area (ha)				Extent Change (19-21)		Standardised Score
	Pre-Clear	…	2019	2021	ha	%	
Alligator Ck	2,324.8	…	2,320.2	2,320.3	+0.2	+0.01	81
Bohle River	884.9	…	867	867	0.0	0.0	80
Magnetic Island	90.5	…	88.3	88.3	0.0	0.0	80
Ross River (Lower)	564.7	…	530.4	530.4	0.0	0.0	80
Ross River (Upper)	ND	…	ND	ND	ND	ND	ND
Stuart Ck	824.4	…	821.7	821.7	0.0	0.0	80
Ross estuarine	4,689.3	…	4,627.5	4,627.7	+0.2	+0.0	81
Black River	151.2	…	151.1	149.3	-1.9	-1.24	20
Bluewater Ck	315.1	…	316.3	312.3	-4.0	-1.26	20
Crystal Ck	160.5	…	159.4	159.6	+0.2	+0.11	81
Palm Islands	50.4	…	50.1	50.1	0.0	0.0	80
Paluma Lake	ND	…	ND	ND	ND	ND	ND
Rollingstone Ck	178.3	…	181.4	177.3	-4.1	-2.25	20
Black estuarine	855.6	…	858.2	848.5	-9.8	-1.14	20

Riparian extent scoring range: ■ = Very Poor: >1% loss | ■ = Poor: 0.51 to 1% loss | ■ = Moderate: 0.11 to 0.5% loss | ■ = Good: 0 to 0.1% loss| ■ = Very Good: increase in vegetation.

Standardised scoring range: ■ = Very Poor: 0 to <21 | ■ = Poor: 21 to <41 | ■ = Moderate: 41 to <61 | ■ = Good: 61 to <81 | ■ = Very Good: 81 to 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

5.2.4 Confidence Scores

Overall, there was moderate confidence in the results due to a lack of ability to directly measure the environment, however, all other criterion received a score of 2 or greater (Table 58).

Table 12. Confidence scores for the mangrove and saltmarsh extent and riparian extent indicator categories.

Indicator Category	Maturity (x0.36)	Validation (x0.71)	Representativeness (x2)	Directness (x0.71)	Measured error (x0.71)	Score (Rank)
M. & S. Extent	2	2	2	1	2	8.2 (3)
R. Extent	2	2	2	1	2	8.2 (3)

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.