



Manawatū Estuary

2021/2022 intertidal sediment monitoring summary

April 2022

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Salt Ecology Short Report 011. Prepared by Leigh Stevens for Horizons Regional Council, April 2022.

OVERVIEW

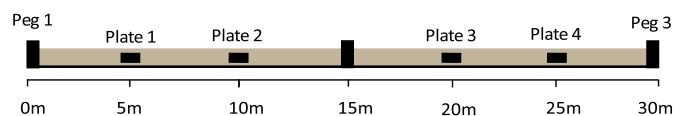
Since 2017, Horizons Regional Council has undertaken annual State of the Environment (SoE) monitoring in Manawātū Estuary to assess trends in the deposition rate, mud content, and oxygenation of intertidal sediments. Monitoring is conducted at two sites, (Sites A and B; Fig. 1) with the results of the 2021/2022 annual summer monitoring (undertaken in Jan-2022) summarised here.



Fig. 1. Location of Manawātū Estuary monitoring sites.

METHODS

Estuary sedimentation was measured using the 'sediment plate' method, as described in Robertson and Stevens (2017). The approach involves measuring the sediment depth from the surface to the top of each of four buried concrete plates at each site, configured as follows:



Measurements are averaged across each plate (n=3) and used to calculate a mean annual sedimentation rate for each site. As year-to-year sedimentation changes can be highly variable, a 5-year rolling mean sedimentation rate is reported where sufficient data are available.

A composite sample of the surface 20mm of sediment is simultaneously collected, and analysed for particle grain size (wet sieve, RJ Hill laboratories). This approach allows changes in sediment muddiness to be determined even where there are no changes in sediment depth.

Sediment oxygenation is an ancillary biological health variable that is visually assessed in the field by measuring the depth at which sediments show a change in colour to grey/black, commonly referred to as the apparent Redox Potential Discontinuity (aRPD). Results are compared to condition ratings of ecological state shown in Table 1.

RESULTS

Sedimentation rate

Annual sedimentation rates and 5-year mean values indicate erosion of the sediments at both sites (Table 2, Fig. 2). The magnitude of erosion was greatest at Site A, and at Site B was less pronounced over the last year.

Table 2. Annual and longer-term sedimentation rate (mm/yr) compared to Table 1 condition ratings.

Variable	Site A	Site B
Years since baseline	5	5
Annual sedimentation since last survey (mm/yr)	-17.6	-2.3
Mean annual sedimentation since baseline (mm/yr)	-16.9	-7.6

These findings are supported by field observations, showing shellfish beds that have been uncovered by scouring and are visible on the sediment surface (see photos below). The erosion observed across the tidal flats of Manawātū Estuary is likely a consequence of scouring during high river flows in the Manawātū River.

Table 1. Summary of condition ratings for sediment plate monitoring.

Indicator	Unit	Very Good	Good	Fair	Poor
Sedimentation rate ¹	mm/yr	< 0.5	≥ 0.5 to < 1	≥ 1 to < 2	≥ 2
Mud content ²	%	< 5	5 to < 10	10 to < 25	≥ 25
aRPD ³	mm	≥ 50	20 to < 50	10 to < 20	< 10

Condition ratings derived or modified from: ¹Townsend and Lohrer (2015), ²Robertson et al. (2016), ³FGDC (2012).



Previously buried shells uncovered by recent scouring at Site A.

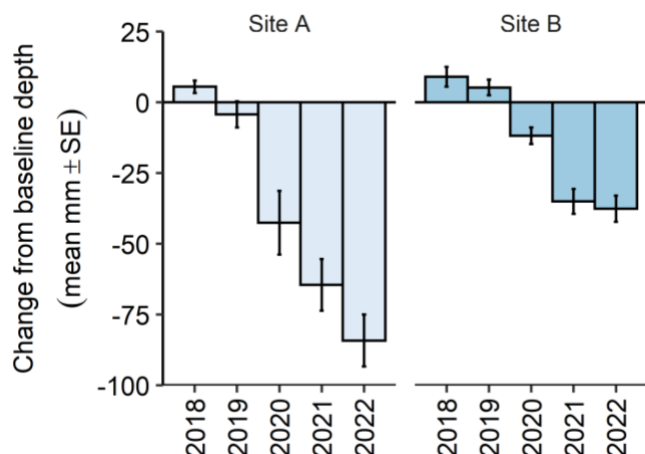


Fig. 2. Change in mean sediment depth over buried plates (±SE) relative to the Jan-2018 baseline.

Sediment mud content and oxygenation

Table 3 shows that the mud content of the sediments is high, and rated as 'poor' due to values exceeding the biologically relevant threshold of 25%. Values in 2022 were among the highest recorded since monitoring began, especially at Site B.

Table 3. Grain size (%) and aRPD (mm) results compared to Table 1 condition ratings.

Site	Year	Sed rate mm/yr	Gravel %	Sand %	Mud %	aRPD mm
A	2017	na	0.2	80.8	19.0	20
	2018	5.5	0.1	76.7	23.3	40
	2019	-9.7	0.1	68.3	31.6	30
	2020	-39.7	0.1	71.2	28.8	30
	2021	-24.5	0.1	74.7	25.3	25
	2022	-17.6	0.1	69.3	30.6	35
B	2017	na	0.3	76.9	22.9	20
	2018	9.0	0.1	63.5	36.4	25
	2019	-3.7	0.3	62.4	37.3	18
	2020	-17.6	0.1	71.4	28.5	20
	2021	-25.9	0.2	73.5	26.3	35
	2022	-2.3	0.1	51.4	48.5	20

Note: Grain size results are based on replicate composite samples (n=3) taken with the fine scale monitoring (2017-2019) or as a single composite sample

The aRPD depth was 35mm at Site A in Jan-2022, and 20mm at Site B (Table 2). These values correspond to a condition rating of 'good'. This level of oxygenation is likely to be partially maintained by the presence of crabs and burrowing organisms in the surface sediments, which turn over surface sediments and create voids that allow air and water to transfer oxygen to underlying sediments.



Example of well-oxygenated sediment at Site A.

CONCLUSIONS

The sedimentation rate data indicate an overall trend of sediment erosion, which is most pronounced at Site A. Despite aRPD depth being reasonably 'good', there is consistently elevated sediment mud content at both sites. Although erosion has been observed, the estuary remains under pressure from fine sediment impacts.

RECOMMENDED MONITORING

Continue annual monitoring of sediment rate, aRPD and grain size to measure sediment deposition and temporal change. Report results annually via a summary card report, with detailed reporting undertaken five yearly in conjunction with fine scale monitoring, due next in 2024.

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