Manawatāū Estuary Sediment Monitoring Short Report

March 2021

horizons
REGIONAL COUNCIL

Prepared for:

Abby Matthews
Science & Innovation Manager

12/03/2021
Report No. 2021/EXT/1728
ISBN: 978-1-99-000959-4

Prepared by:

Keryn Roberts
SALT Ecology
Nelson
New Zealand

MANAWATU ESTUARY: INTERTIDAL SEDIMENT MONITORING SUMMARY

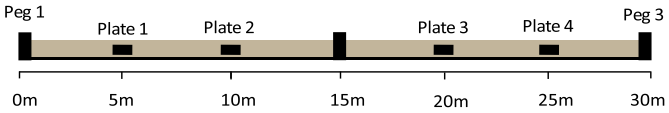
Salt Ecology Short Report 003. Prepared by Keryn Roberts for Horizons Regional Council, February 2021.

OVERVIEW

Since 2017, Horizons Regional Council has undertaken annual State of the Environment (SoE) monitoring in Manawatu 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 2020/2021 annual summer monitoring (undertaken in December 2020) summarised here.

METHODS

Estuary sedimentation was measured using the 'sediment plate' method, as described in Robertson & Stevens (2017). The approach involves measuring the sediment depth from the surface to the top of each of four buried concrete plates at each of the two sites. 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, the annual mean sedimentation rate is calculated for a 5-year time period, where sufficient data are available (only 4 years 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, another key measure of biological health, is visually assessed 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) depth. Results are compared to condition bands (Table 1) developed as part of the NZ Estuary Trophic Index (ETI) to indicate ecological state.

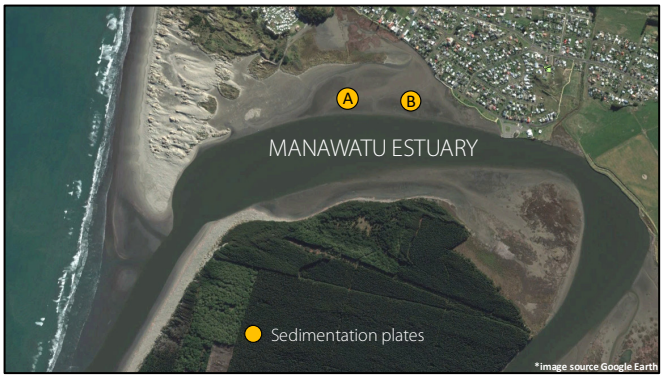


Figure 1: Location of sediment monitoring sites in Manawatu Estuary

RESULTS

Sedimentation rate

While too early to calculate the 5-year mean sedimentation rate, erosion has been observed at both sites since Jan-2019. The depth change from baseline (since Jan-2017) is -64mm (SE=9) and -35mm (SE=4.5), for Site A and B respectively (Fig. 2). This recorded erosion is supported by field observations, where previously buried shell debris is now visible on the sediment surface (see photos below).

INDICATOR (Dec-2020)	Site A[1]	Site B[1]
Sedimentation rate (last 5 years)	NA	NA
Mud content (%)	POOR	POOR
aRPD (mm)	GOOD	GOOD

NA = not applicable. [1]Plates installed Jan-2017, hence there are not enough data to calculate 5-year mean sedimentation rate.

Previously buried shells uncovered by recent scouring

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

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

The scouring and erosion observed across the tidal flats of Manawatu Estuary is likely owing to high river flows in the Manawatu River. SoE monitoring data from the Manawatu River show high flows have been frequent in the year prior to sampling (see https://www.horizons.govt.nz/environment-data).

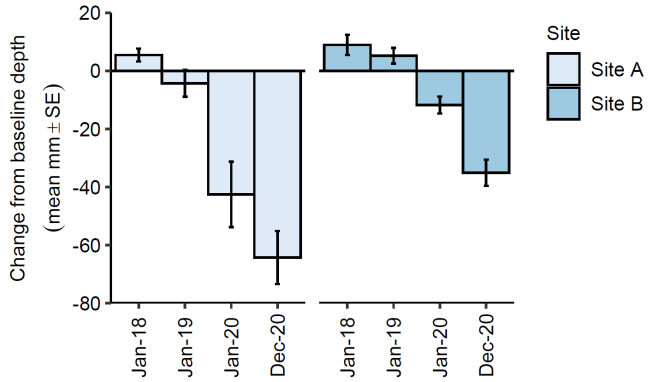


Figure 2. Change in mean sediment depth over buried plates (±SE) relative to the Jan-2017 baseline, Manawatu Estuary.

Sediment mud content

Table 2 presents the sediment grain size data for Sites A and B. The highest mud content at both sites was recorded in Jan-2019, since then a period of erosion has been observed (Fig. 2). The erosion, and observed scouring, coincides with a decrease in the sediment mud content, since 2019. Despite these changes, Sites A and B remain in a condition banding of 'poor' with mud content still >25%.

Table 1: Grain size and aRPD (mm) results for the Manawatu Estuary sediment plate sites, Jan-2017 to Dec-2020.

Year	Site	aRPD	Mud (%)	Sand (%)	Gravel (%)
Jan-2017	A	20	19.0	80.8	0.2
Jan-2018	A	40	23.3	76.7	<0.1
Jan-2019	A	30	31.6	68.3	0.1
Jan-2020	A	30	28.8	71.2	<0.1
Dec-2020	A	25	25.3	74.7	<0.1
Jan-2017	B	20	22.9	76.9	0.3
Jan-2018	B	25	36.4	63.5	0.1
Jan-2019	B	18	37.3	62.4	0.3
Jan-2020	B	20	28.5	71.4	<0.1
Dec-2020	B	35	26.3	73.5	0.2

Note: Grain size results are based on a composite sample (Jan-2020 and Dec-2020) or replicates taken with the fine scale monitoring (2017-2019).

Sediment aRPD depth

The average aRPD depth (based on replicate measurements adjacent to each plate) ranged between 25 to 35mm at Sites A and B in Dec-2020, a condition rating of 'good' (Table 2). This level of oxygenation is 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.

CONCLUSION

There are not yet enough data to calculate a 5-year mean sedimentation rate (due in 2022), however the annual changes show an overall trend of erosion. 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 sediment impacts, with a macrofaunal community likely dominated by mud tolerant species - a common situation in NZ tidal river estuaries.

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.

REFERENCES

FGDC. (2012) Coastal and Marine Ecological Classification Standard Catalog of Units, Federal Geographic Data Committee FGDC-STD-018-2012. 343p.

Robertson, B.M. and Stevens, L.M. 2017. Manawatu Estuary: Fine Scale Monitoring 2016/17. Report prepared by Wriggle Coastal Management for Horizons Regional Council. 26p.

Robertson et al., (2016) NZ Estuary Trophic Index. Screening Tool 2. Screening Tool 2. Determining Monitoring Indicators and Assessing EstuaryTrophic State. Prepared for Envirolink Tools Project: Estuarine Trophic Index MBIE/NIWA Contract No: C01X1420. 68p.

Townsend M, Lohrer D. (2015) ANZECC Guidance for Estuary Sedimentation. NIWA client report number HAM2015-096, pre- pared for Ministry for the Environment. 45p.

horizons.govt.nz

24 hour freephone 0508 800 800
fax 06 952 2929 | **email** help@horizons.govt.nz
Private Bag 11025, Manawatu Mail Centre, Palmerston North 4442