

HALDANE ESTUARY: SEDIMENTATION RATE MONITORING SUMMARY, JANUARY 2012

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Figure 1. Location of the Haldane Estuary sediment rate monitoring site.

Background

Soil erosion is a major issue in New Zealand and the resulting suspended sediment impacts are of particular concern in estuaries because they act as a sink for fine sediments or muds. If fine sediment inputs exceed the assimilative capacity of an estuary, it will infill (often rapidly), displacing high value habitat (e.g. seagrass, saltmarsh). Excess mud will also commonly result in adverse conditions including reduced sediment oxygenation, production of toxic sulphides, increased nuisance macroalgal growth, and a shift towards a degraded invertebrate and plant community. Such changes greatly reduce its value for fish, birdlife and humans.

Four sedimentation plates were deployed in Haldane Estuary in February 2009 (Figure 1) to enable long term monitoring of sedimentation rates, and have been monitored annually since that time.

Site averages are used to estimate mean annual sedimentation rates for the estuary to account for spatial and temporal variation in sedimentation rates from natural processes such as wind generated waves, tidal flows, and river inputs.

2012 Sedimentation Rate

Table 1 presents the 2012 sedimentation rate results for the 4 plates buried in Haldane Estuary, with summary data from 2009-2012 presented in Figure 2.

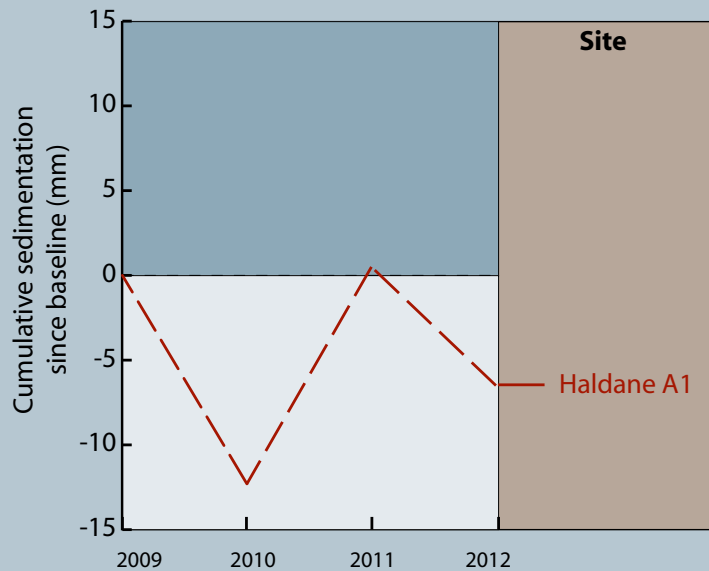
The mean annual rate of sedimentation indicates a slight overall loss of sediment at Site A1 since 2009 (-2.2mm/yr), a condition rating of "Very Low". This has been punctuated by relatively large and variable increases and decreases within this period (Figure 2) which appear to be related to a combination of flood scouring, and redistribution of sediments by wind generated wave action across the upper estuary.

Table 1. Sediment monitoring results for Haldane Estuary, February 2009 - January 2012.

SITE	Sediment Depth (mm)				Change (mm)			Site Mean (mm/yr)			Overall Rate (mm/yr)	2009-2012 SEDIMENTATION RATE CONDITION RATING
	14-2-09	18-2-10	11-2-11	20-1-12	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012	2009-2012	
Site A1	235	225	237	225	-10	12	-12	-12.3	12.8	-7.0	-2.2	VERY LOW
Site A1	223	215	219	220	-8	4	1					
Site A1	218	195	214	202	-23	19	-12					
Site A1	274	266	282	277	-8	16	-5					



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SEDIMENTATION RATE CONDITION RATING	
RATING	DEFINITION
Very Low	<1mm/yr
Low	1-2mm/yr
Moderate	2-5mm/yr
High	5-10mm/yr
Very High	>10mm/yr
Early Warning Trigger	Rate increasing

Figure 2. Cumulative change in sediment levels over buried plates in Haldane Estuary, 2009 to 2012.

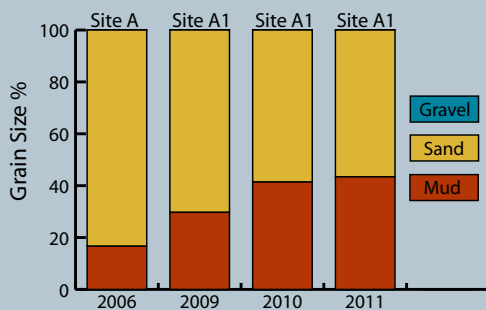


Figure 3. Grain size, 2006 to 2011.



Despite low cumulative deposition over the past 3 years, there has been a steady increase in the mud content of sediments from 2006-2011 (Figure 3). As a consequence of fine mud infilling interstitial spaces, the RPD is relatively shallow (<3cm), and the macroinvertebrate community is dominated by mud tolerant species (Robertson and Stevens 2011). The source of the muds settling in the upper estuary is almost certainly from the surrounding catchment. Because of the decline in sediment quality measured by the fine scale monitoring, management of fine sediment inputs is recommended to prevent further estuary deterioration (see below).

Conclusion

The mean annual sedimentation rate over the past 3 years falls within the "Very Low" condition rating, but excessive inputs of fine mud from the catchment are evident by the significant increase in sediment mud content since 2006.

Recommended Monitoring

Continue to measure sediment plate depths annually.

Deploy additional plates in the upper estuary to better characterise sedimentation rate.

Recommended Management

- Develop and assign catchment sediment load guideline criteria to Haldane Estuary based on available catchment load/estuary response information from other relevant estuaries.
- Estimate catchment suspended sediment loads using available catchment models and stream monitoring data.
- Determine the extent to which the estuary meets guideline catchment load criteria.
- Develop estuary management and restoration plans as appropriate.

Reference

Robertson, B.M. and Stevens, L.M. 2011. Haldane Estuary. Fine Scale Monitoring 2010/2011. Report prepared by Wriggle Coastal Management for Environment Southland. 25p.