

# Waikanae River Estuary

## Intertidal Macroalgal Monitoring 2010/11



Prepared  
for  
**Greater  
Wellington  
Regional  
Council**  
April  
2011

# **Waikanae River Estuary**

## **Intertidal Macroalgal Monitoring 2010/11**

**Prepared for  
Greater Wellington Regional Council**

**By**

**Leigh Stevens and Barry Robertson**

# Contents

1. Introduction and Methods . . . . . 1  
2. Results, Rating and Management . . . . . 3

## Figures and Tables

Figure 1. Map of macroalgal cover - Waikanae River Estuary, January 2011. . . . . 2  
Table 1. Summary of macroalgal cover results, 16 January 2011. . . . . 3  
Table 2. Summary of condition rating and results, 2010-11. . . . . 3

Accumulations of rotting macroalgae adjacent to the flapgate, lower Waikanae River Estuary.





# 1. INTRODUCTION AND METHODS

## INTRODUCTION

Macroalgae is an important feature of estuaries, contributing to their high productivity and biodiversity. However, when high nutrient inputs combine with suitable growing conditions, nuisance blooms of rapidly growing algae (e.g. *Ulva* (sea lettuce), *Gracilaria*) can occur. At nuisance levels such growths can deprive seagrass of light causing its eventual decline, while decaying macroalgae can accumulate on shorelines causing localised depletion of sediment oxygen, and nuisance odours.

This brief report summarises the results of the second annual survey of intertidal macroalgal cover in Waikanae River Estuary, undertaken in January 2011. The report describes intertidal macroalgal cover - a broad scale indicator of estuary eutrophication - using a macroalgal coefficient (described below) developed for Wellington's estuaries to rate the condition of the estuary, and recommend monitoring and management actions. These actions need to be considered in conjunction with the fine scale monitoring presented in Robertson and Stevens (2010, 2011).

## METHODS

Broad scale mapping of the percentage cover of macroalgae throughout all the intertidal habitat of Waikanae River Estuary was undertaken in January 2011 using a combination of aerial photography, ground-truthing, and ArcMap 9.3 GIS-based digital mapping. The procedure, originally described for use in NZ estuaries by Robertson et al. (2002), has subsequently been modified and successfully applied to various estuaries to develop a separate GIS macroalgal layer (e.g. Stevens and Robertson 2010).

Rectified aerial photographs of the estuary (2007 Kapiti Coast District Council ~0.15 metre per pixel) were used as base maps. Experienced coastal scientists then recorded the percentage cover of macroalgae directly onto laminated photos during field assessment of macroalgal cover. The field maps were then used to create a GIS layer from which the percentage cover information was subsequently calculated.

The report outputs are used to both identify and classify macroalgal cover, and to show changes in macroalgal cover over time by comparisons with previous surveys (annually if a problem estuary, or 5 yearly if not). The current report presents the 2011 percentage cover of macroalgae within the estuary as a GIS-based map (Figure 1), and a summary table of the dominant species and percentage cover classes (Table 1).

## WELLINGTON ESTUARIES: MACROALGAE CONDITION RATING

A continuous index (the macroalgae coefficient - MC) has been developed to rate macroalgal condition based on the percentage cover of macroalgae in defined categories using the following equation:  $MC = ((0 \times \% \text{macroalgal cover} < 1\%) + (0.5 \times \% \text{cover } 1-5\%) + (1 \times \% \text{cover } 5-10\%) + (3 \times \% \text{cover } 10-20\%) + (4.5 \times \% \text{cover } 20-50\%) + (6 \times \% \text{cover } 50-80\%) + (7.5 \times \% \text{cover } > 80\%)) / 100$ . Overriding the MC is the presence of either nuisance conditions within the estuary, or where >5% of the intertidal area has macroalgal cover >50%. In these situations the estuary is given a minimum rating of FAIR and should be monitored annually with an Evaluation & Response Plan initiated.

MACROALGAE CONDITION RATING		
RATING	DEFINITION (+Macroalgae Coefficient)	RECOMMENDED RESPONSE
Over-riding rating: Fair	Nuisance conditions exist, or >50% cover over >5% of estuary	Monitor yearly. Initiate Evaluation & Response Plan
Very Good	Very Low (0.0 - 0.2)	Monitor at 5 year intervals after baseline established
Good	Low (0.2 - 0.8)	Monitor at 5 year intervals after baseline established
	Low Low-Moderate (0.8 - 1.5)	Monitor at 5 year intervals after baseline established
Fair	Low-Moderate (1.5 - 2.2)	Monitor yearly. Initiate Evaluation & Response Plan
	Moderate (2.2 - 4.5)	Monitor yearly. Initiate Evaluation & Response Plan
Poor	High (4.5 - 7.0)	Monitor yearly. Initiate Evaluation & Response Plan
	Very High (>7.0)	Monitor yearly. Initiate Evaluation & Response Plan
Early Warning Trigger	Trend of increasing Macroalgae Coefficient	Initiate Evaluation and Response Plan

FIGURE 1. MAP OF INTERTIDAL MACROALGAL COVER - WAIKANAĒ ESTUARY, JAN. 2011



## 2. RESULTS, RATING AND MANAGEMENT

### RESULTS

#### 2011 MACROALGAL COVER CONDITION RATING

VERY GOOD



Figure 1 and Table 1 summarise the results of intertidal macroalgal mapping within Waikanae River Estuary. Overall, the vast majority of the intertidal area (95.6%) had no macroalgae growth. The only place macroalgae was observed was a sparse growth (1-5% cover) of *Ulva intestinalis* on boulders along the lower true left bank of the Waikanae Estuary, and accumulations of *U. intestinalis* in the embayment near the flapgate. In this embayment, localised nuisance conditions were present due to rotting macroalgae.

**Table 1. Summary of macroalgal cover results, 16 January 2011.**

MACROALGAE	Waikanae River Estuary		
Percentage Cover	Ha	%	Dominant species
<1%	5.4	95.9	
1-5%	0.1	1.8	<i>Ulva intestinalis</i> *
5-10%	0	0	
10-20%	0	0	
20-50%	0	0	
50-80%	0	0	
>80%	0.13	2.3	<i>Ulva intestinalis</i> *
<b>TOTAL</b>	<b>5.6</b>	<b>100.0</b>	

\* Note, *Ulva intestinalis* is synonymous with *Enteromorpha intestinalis* (reported as *Enteromorpha* in Stevens and Robertson 2010).

The Macroalgae Coefficient (MC) for the estuary was 0.2, a condition rating of “very good”.

This has increased slightly from 2010 (see Stevens and Robertson 2010) due to increased cover and nuisance conditions (e.g. rotting macroalgae and poorly oxygenated and sulphide rich sediments) in the poorly flushed embayment next to the flapgate (see photo on page iv).

The condition rating does not trigger annual monitoring. However, it is recommended that macroalgae be assessed over the same period as the fine scale monitoring baseline is established (scheduled annually for the next 1-2 years).

**Table 2. Summary of condition rating and results, 2010-11.**

Year	Rating	MC	Result
2010	VERY GOOD	0.05	Macroalgae absent from the vast majority of the estuary. Very low cover of <i>Ulva intestinalis</i> along the lower true left bank.
2011	VERY GOOD	0.2	Macroalgae absent from the vast majority of the estuary. Very low cover of <i>Ulva intestinalis</i> along the lower true left bank. Increase in nuisance conditions near flapgate.

### CONCLUSION

Macroalgal cover had a condition rating of “very good”. Minor localised nuisance conditions (rotting macroalgae, poorly oxygenated and sulphide rich sediments) were present in one small part of the estuary.

### RECOMMENDED MONITORING AND MANAGEMENT

Macroalgal growth should be quickly assessed at the same time fine scale monitoring is undertaken to ensure growths or nuisance conditions have not increased. The latest available aerial photographs from the estuary should be used where appropriate. The next monitoring in Waikanae River Estuary is due in January 2012.

### REFERENCES

- Robertson, B.M., Gillespie, P.A., Asher, R.A., Frisk, S., Keeley, N.B., Hopkins, G.A., Thompson, S.J., Tuckey, B.J. 2002. *Estuarine Environmental Assessment and Monitoring: A National Protocol. Part A. Development, Part B. Appendices, and Part C. Application. Prepared for supporting Councils and the Ministry for the Environment, Sustainable Management Fund Contract No. 5096. Part A. 93p. Part B. 159p. Part C. 40p plus field sheets.*
- Robertson, B.M. and Stevens, L. 2010. *Waikanae River Estuary; Fine Scale Monitoring 2009/10. Prepared for Greater Wellington Regional Council. 19p.*
- Robertson, B.M. and Stevens, L. 2011. *Waikanae River Estuary; Fine Scale Monitoring 2010/11. Prepared for Greater Wellington Regional Council.*
- Stevens, L. and Robertson, B.M. 2010. *Waikanae River Estuary; Intertidal Macroalgal Monitoring 2009/10. Prepared for Greater Wellington Regional Council. 3p.*