Environment and Planning Committee

Ruataniwha Estuary Survey

February 2003

Background

The Sustainable Management Fund and 11 regional and district councils have funded a program to develop a standardised assessment and monitoring method for estuaries in New Zealand. This process for monitoring the estuaries is intended to lead to the establishment of a number of Environmental Performance Indicators (EPI) by MfE. This Council was involved in the program initially only using the Waimea estuary, with Cawthron gaining some funding and information from the TDC as our contribution. Two years into the study we saw there were potential gains in having the Ruataniwha estuary added to the existing national program thus maintaining our regular program of estuarine monitoring, while continuing our involvement in the national program. This enabled us to get consistency in our monitoring approach without having to wait for the study to finish.

As we have two estuaries in the study we are in a good position already to report on our estuaries when the indicators are introduced.

Status of the Ruataniwha study

The Cawthron led SMF program is in its final year (02/03) so we only have access to the draft report for both the Ruataniwha and the Waimea Estuaries. I have extracted the various components to the Ruataniwha study and included them in the report appended to the end of this. We will in due course be issued with the final report covering the two in our district and the other estuaries involved in the program. As well as this we will receive GIS layers and photo's covering both estuaries that will be used to establish a basis for detecting future change in the estuaries. To assist us in this process we have requested historical aerial photo's for the two estuaries (1950/72 Ruataniwha & 1946/85 Waimea) be included in the work to allow some historical patterns to be established. These are being completed now and will be available in the near future.

Conclusion

A lot of interest was generated within the different regional councils in attendance at a recent field day (September 2002) into the process being

established. This was held to provide information and demonstrate the different methods used. The methods chosen for the estuary monitoring are able to be relatively easily followed allowing the establishment of standard national reporting. The information generated, particularly the GIS layers will be easily merged with our GIS system to allow a much greater ability to detect change within the estuaries.

The specific results from the Ruataniwha study are detailed in the draft report that follows. The results of the fine scale monitoring indicate that the estuary is in good condition. This result while being good should not be used to allow us to rest on our loral's but rather used as a starting point to make sure there is no regression. While being beneficial to the TDC for SEM and planning purposes, the information, especially the habitat layers, will also be of use to School's, researches, and other interest groups (e.g. Ornithological society) within our community.

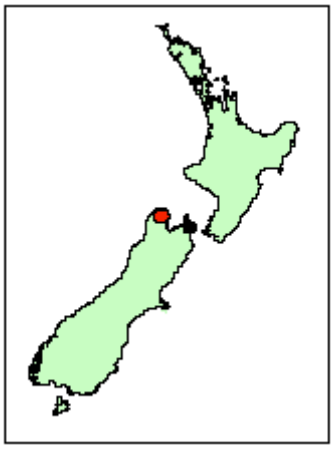
Recommendation

- When resources are available, the GIS habitat and substrate layers should be made available from the external TDC website for use by the wider public.

- The E & P Committee endorse the monitoring methods being used to survey the regions estuaries.

- The committee accept the draft report (attached).

Rob Smith
Resource Scientist



Ruataniwha Estuary

Location, size and estuary type
The Ruataniwha Estuary is located approximately 83 km northwest of Nelson, in Golden Bay. The estuary covers an area of ~860 ha (mainly saltmarsh, mudflat and wetland). Ruataniwha estuary is a fluvial erosion, barrier-enclosed estuary. It comprises four large barrier spits projecting southwards which creates a relatively extensive stable area within the northern area of the estuary.

Morphology and hydrology
The estuary is dominated by the influence of the sea and to a smaller extent by its major river input, the Aorere River (mean annual flow is 73 m^3/s). The River is known to rise rapidly, causing channels to overflow and damage farmland. The Aorere flows at 15 m^3/s or less for about 90% of the time, indicating that flood events may have considerable influence on estuarine characteristics. Marine water enters from the relatively sheltered coastal embayment of Golden Bay with each tide. The maximum tidal range is 4.2 m during spring tides (with a minimum during neap tides of 2.4 m) resulting in extensive intertidal flats. Although the depths were not measured, it is anticipated that the mean depth at high water is in the 1-3 m range. The estuary is very well-flushed and drains almost completely at low water giving it a likely flushing time of less than one day. Wave energy is relatively slight due to the small fetch in the area.
Although the estuary is marine dominated, the river input is relatively high compared with many other estuaries in New Zealand of similar shapes and origins. This is depicted in the estuary area (ha) to mean freshwater inflow (m^3/s) ratio (*i.e.* the size of the river inflow in relation to the area which it can spread over). For the Ruataniwha, the ratio is approximately 19. For the other estuaries in the study the ratio ranged from 19 to 900.

Human occupation
Maori settlement in the area dates back several hundred years at least. The area once had a strongly fortified pa and a small Maori settlement existed on the tip of the southern sandspit. Europeans settled in the area from the 1840s and gold was discovered in the Aorere valley in 1857. Current human occupation within the Ruataniwha catchment is small, approximately 120 inhabitants.

Catchment characteristics

Area

The area of the Ruataniwha catchment is 767 km^2 with 92% of that comprising the Aorere River catchment.

Geology and soils

The catchment is dominated by steep forested regions of the block-faulted Haupiri and
Wakamarama Ranges and a broad terraced valley. Major rock types include:
1. Older rocks (Cambrian 500,000 years) which have been pushed over younger rocks and in the process were overturned.
• Buller terrane rocks, which along with Takaka terrane rocks are the oldest structural units in New Zealand. They lie to the west of the Anatoki Fault and are predominantly made up of basal Ordovician, continent-driven, quartz-rich turbidites of the Greenland Group and overlying black shale, siltstone and quartz sandstone.
• Takaka terrane rocks containing a wide variety of structurally complex rock types (including sedimentary, metamorphic and volcanic).
2. Miocene-Cretaceous deposits of marine mudstone.
3. Recent (late Pleistocene) alluvium and terrace gravels in the main valley.
The lower Aorere valley consists of recent alluvial soils. Further up the valley the soils are gley podzols while, the upland areas are dominated by steepland podzolized yellow-brown earths, subalpine gley soils and gley podzols.

Land use

The catchment covers the mountainous area draining into the Aorere River and is dominated by native forest and scrub (Table A3). Approximately 10% of the catchment area is pastoral. There are 57 dairy farms within the catchment. Stock numbers in the valley as determined using Agribase (2000) are 13229 dairy cattle, 6429 sheep, 1704 beef cattle and 150 deer. The Tasman District Council is responsible for environmental management of the catchment and estuary under the RMA (1991).
The major freshwater input is from the Aorere River, having a catchment of 702 km2 with a large percentage of the catchment area draining mountainous, native forest-covered land.

Table A3: Ruataniwha Estuary catchment land use

Land use	Area (ha)	Cover (%)
Indigenous Forest	50334	65.6
Scrub	11296	14.7
Prime Pastoral	8679	11.3
Tussock	5358	7.0
Bare Ground	537	0.7
Inland Water	405	0.5
Planted Forest	50	0.1
Urban	15	0.0
Prime Horticultural	5	0.0
Coastal Wetlands	4	0.0
Total	**76681**	

Source: LCDB1 (2001).

Estuary use
The estuary has been classified as nationally important due to the presence of threatened birds such as banded rail and bittern (DOC 1990). The estuary also has an extensive shellfish resource and is used for commercial cockle harvesting. Because the estuary empties during each tidal cycle, it does not have a significant resident fish population (except perhaps in some permanently flooded wetland areas) but it is expected to serve as an important migratory and nursery area for a variety of fish. The estuary is important for whitebait species (DOC 1990).
The majority of the land around the estuary is farmed and the small commercial port of
Collingwood is located at the southern end. The estuary is popular as a focal point for water-based recreation, particularly fishing. Significant modification of estuary margins poses threats to wetlands.

Water and sediment quality
The upper reaches of the Aorere River are characterised by clean waters with low nutrients and coliforms, high clarity and oxygen. During low flows the composition is similar in the lower reaches, but at times of flood flows, faecal coliforms, suspended solids, and most nutrients are elevated (Nottage 2001). Water quality in the estuary has not been monitored but it is expected to also be relatively high, particularly in times of low flow. Specific yields of various key contaminants discharged to the estuary from the Aorere catchment are given in Table A4.

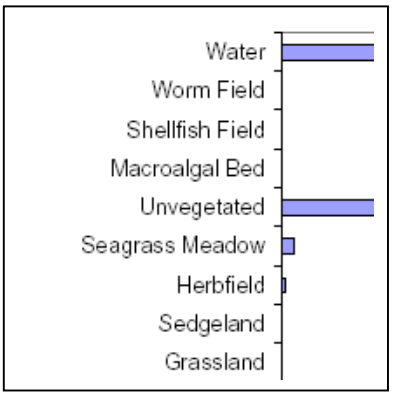
Table A4: Specific yields (kg/ha/yr) for the Aorere River (Nottage 2001)

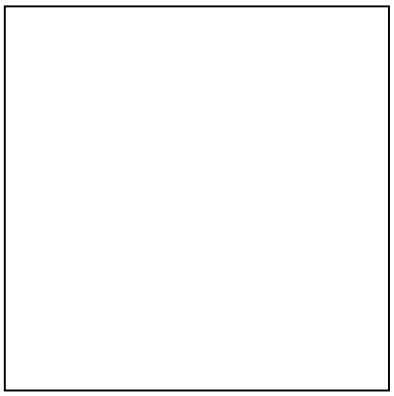
Parameter	
Total N	16.7
Nitrate-N	11.1
Ammonia-N	0.8
TP	2.5
DRP	0.5
SS	667.8

Exotic plant and animal species
Pacific oysters have colonised areas along the main channels of the estuary (Davidson *et al.* 1990). *(Section to be expanded)*

B.1.4. Ruataniwha Estuary

The broad-scale survey of intertidal habitats in the Ruataniwha estuary (see summary Figure A12 and detailed results in Table A15) indicated that the area was dominated by unvegetated habitat (69% of the total estuary area, covering 593 ha), a similar pattern to the other reference estuaries. Most of the unvegetated habitat was firm sand and firm mud/sand, both covering around 24% of the total estuary area. The vegetated habitats were dominated by rushland (13% of the total estuary), mostly searush, *Juncus krausii* and jointed wirerush, *Leptocarpus similes*, beds. Scrubland (mostly gorse, *Ulex europaeus*) and seagrass (*Zostera novazelandica*) covered 13.5 ha and 12.0 ha of intertidal estuary, respectively. There were minor areas of herbfield, and a very small amount of grass and tussock cover. The structural class habitat map generated for the Ruataniwha Estuary is presented in Figure A13 and the dominant cover details are in Figure A14.





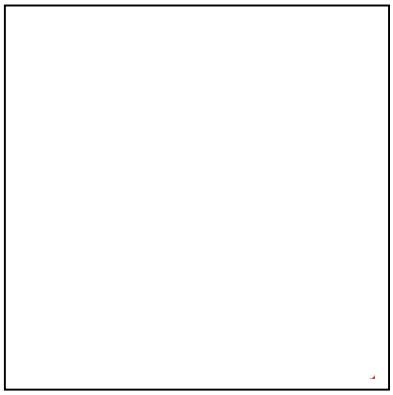


Table A15: The broad-s

Habitat Groupings
Scrubland
Ulex europaeus
Plagianthus divaricatus
Plagianthus divaricatus -
Plagianthus divaricatus -
Ulex europaeus - *Plagian*
Rushland

Summary of the analytical results for the estuary

Physical and chemical characteristics

The physical and chemical properties of the Ruataniwha estuary sediments are summarised in Table A32 and Table A33. Sediments were dominated by sand-sized particles (approximately 86%). Organic content and nutrients were relatively low, reflecting the low mud component of the sediments. Sediment trace metal contaminants were also low, and were all well below ANZECC ISQG-Low trigger values for the parameters measured.

When the data were normalised for mud content (Table A33), the results were similar (*i.e.* the mud fraction at all the sites had relatively low levels of organic matter, phosphorus, nitrogen and heavy metals). This was consistent with the expected relatively low level of contaminant entry to the Ruataniwha Estuary. Periodic major flood events within the Aorere catchment may also result in an efficient flushing and dispersal of fine sediments and associated components/contaminants into Golden Bay.

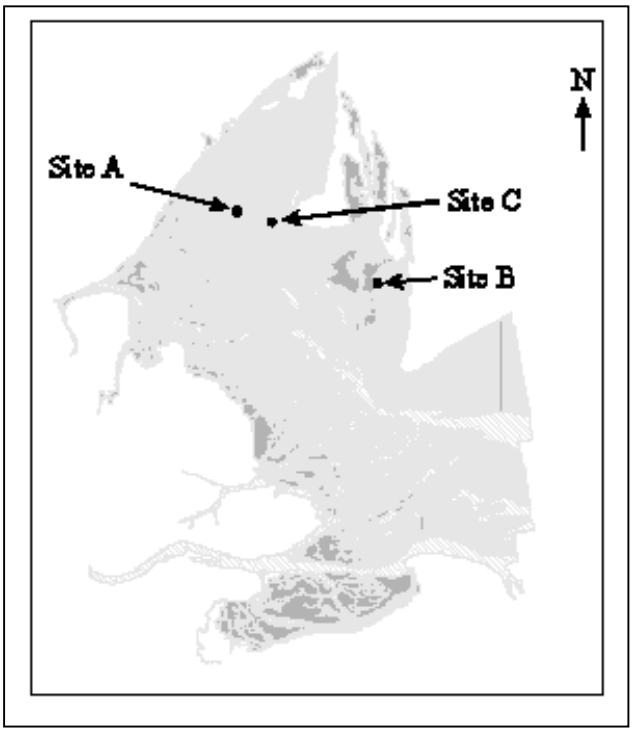


Table A33: Physical and chemical sediment properties determined in the present study at the Ruataniwha Estuary (standardised to 100% mud)

Parameter	Site A	Site B	Site C	Estuary mean (±1SD)	Estuary range (min - max)
Ash free dry weight %w/w	13.4	11.0	17.0	13.8 ± 3	5.43 - 23.44
Total Nitrogen mg/kg (dry)	2567.1	3051.7	3661.8	3093.5 ± 548.6	1404.5 - 12280.7
TP mg/kg (dry)	5560.5	4831.7	5185.2	5192.5 ± 364.5	2589.89 - 8078.13
Cadmium mg/kg (dry)	1.0	1.5	1.8	1.4 ± 0.4	0.21 - 3.45
Chromium mg/kg (dry)	275.3	247.7	297.4	273.5 ± 24.9	110.23 - 473.68
Copper mg/kg (dry)	89.4	62.5	88.1	80 ± 15.2	41.57 - 126.56
Lead mg/kg (dry)	76.8	58.0	23.4	52.7 ± 27.1	2.81 - 118.97
Nickel mg/kg (dry)	158.5	153.0	157.1	156.2 ± 2.9	67.42 - 245.61
Zinc mg/kg (dry)	420.2	447.3	417.7	428.4 ± 16.4	213.48 - 656.25

TN = total nitrogen; TP = total phosphorus

Macro-invertebrates

Infauna abundance and diversity at the Ruataniwha sampling sites were dominated by polychaetes and, to a lesser extent, bivalves (Table A34). The spectrum of feeding groups recorded at these sites was typical of those generally encountered within New Zealand estuarine sediments. Epifauna were dominated by gastropod species, both in terms of abundance and species diversity (Table A35), however, a high abundance of barnacles (Cirripedia) was also observed. The latter require hard substrate for attachment (*e.g.* bivalve shells, rocks or wood).

Table A35: Summary of all epifaunal species sampled at the Ruataniwha Estuary. Data are presented as average species abundance per quadrat (0.25 m²)

Species	Taxanomic Group	Feeding Group	Abundance (mean number per 0.25 m²			
			Estuary	*Site A*	*Site B*	*Site C*
Amphibola crenata	Marine snail	Grazer on microalgae & detritus	22.64	12.08	47.75	8.08
Elminius modestus	Barnacle	Filter feeder	6.44	0.00	19.33	0.00
Zeacumantus lutulentus	Marine snail	Grazer on microalgae & detritus	5.61	0.00	16.75	0.08
Diloma subrostrata	Marine snail	Grazer on microalgae & detritus	5.08	3.33	9.25	2.67
Notoacmea helmsi	Marine snail	Grazer on microalgae & detritus	0.72	0.17	1.50	0.50
Cominella glandiformis	Marine snail	Carnivore & scavenger	0.56	0.00	0.92	0.75
Haminoea zelandiae	Nudibranch	Grazer on microalgae & detritus	0.50	0.00	0.00	1.50
Diloma zelandica	Marine snail	Grazer on microalgae & detritus	0.22	0.00	0.33	0.33
Austrovenus stutchburyi	Bivalve	Suspension feeder	0.17	0.08	0.00	0.42
Halicarcinus sp.	Crab	Omnivore	0.03	0.00	0.00	0.08
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nereidae	Polychaete worm	Omnivore	0.72	0.08	1.00	1.08
Polynoidae	Polychaete worm	Carnivore	0.39	0.00	1.17	0.00
Hexatomini sp.	Insect	Deposit feeder	0.36	0.58	0.33	0.17

TN = total nitrogen; TP = total phosphorus

Benthic algae

No significant macroalgal cover was observed at the Ruataniwha sites. Visual observations and concentrations of chlorophyll *a* and phaeophytin, indicated low density
benthic microalgal communities at sites A and B (no visible mat). Dense mat developments indicating highly enriched sediments were not observed, however phaeophytin concentrations were moderately high (185 ± 57 mg m^{-3}) at site C. This may have been an artifact due to inclusion of dead terrestrial plant material (detritus) in the sample. The microalgal species observed at Site C were typical of natural estuarine communities, containing a mixture of, primarily, pennate diatoms (*e.g.* *Pleurosigma* or *Gyrosigma* sp., *Nitschia* sp.) and euglenoids.

Summary

The three Ruataniwha sites were characterised by primarily sandy (76-91%) sediments. The sites appear to be in a relatively pristine condition according to the characteristics measured, and generally characteristic of soft-sediment habitats of the Inlet as a whole. They are therefore considered appropriate for long-term monitoring. However, a large proportion of the Inlet is comprised of hard substrate (*e.g.* cobble) thus restricting the area available for the fine-scale survey. As a result, Sites A and B are relatively close together and one of the two could probably be omitted with minimal loss of information.

Estuary site coordinates

The coordinates (New Zealand Map Grid) of the four corners of the sampling sites within the estuary.

	NZMG-E (m)	**NZMG-N (m)**
Site A	2481549.15192	6061885.40422
	2481578.81642	6061886.23948
	2481571.78504	6061825.97660
	2481544.32828	6061825.93246
Site B	2482719.14727	6061282.72335
	2482752.90495	6061232.99936
	2482692.87589	6061269.33770
	2482726.53206	6061219.74566
Site C	2481837.70411	6061799.79102
	2481876.69746	6061755.33232
	2481816.58230	6061778.44549
	2481856.06481	6061733.47783