

# Estuarine Vegetation Survey

## Wharekawa Harbour

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# 1 Introduction

A 1997 pilot study of Whangamata, Wharekawa, and Otahu estuaries determined that it is feasible to map vascular estuarine vegetation from aerial photography together with field surveys. The success of this work encouraged Environment Waikato to continue with this method. The estuarine vegetation of Tairua, Coromandel, Te Kouma, Manaia, Whitianga, Port Waikato, Raglan, Aotea, Kawhia harbours and the inner Firth of Thames have since been surveyed and mapped. Of these harbours, Whangamata and Otahu have recently been re-surveyed to determine changes in vegetation communities over time.

The mapped vegetation is in the Coastal Marine Area (CMA) and includes the spatial cover of mangrove, seagrass, sea meadow, and saltmarsh communities. The results of the surveys are included in Environment Waikato's Global Information System (GIS) database, and are used for State of the Environment investigations and assessing consent applications that may affect estuarine vegetation.

This report details the results from a re-survey of estuarine vegetation in Wharekawa Harbour. Comments are included on the threats to estuarine vegetation, and other field notes of interest. This report is accompanied by aerial maps of the survey site with digitised vegetation community overlays.

## 2 Methodology

The field survey was undertaken over 3 days on the 22<sup>nd</sup>, 23<sup>rd</sup> and 24<sup>th</sup> April 2008. The survey was undertaken using a combination of boating, kayaking and walking. The same methodology for mapping saltmarsh, mangrove, seagrass and weed communities was followed as that previously used to map earlier surveyed estuaries (see Graeme, 1997, 1998a, 1998b, 1999), except that a personal digital assistant (PDA) loaded with 2006 aerial photographs of the survey site was used as the primary mapping device. The PDA replaced the use of colour pen notations on hard copy aerial photographs, although hard copy aerials were used as a backup for when the PDA battery ran out or lighting made it too difficult to see the PDA screen clearly in the field. Colour-coded lines were drawn directly onto the PDA aerial photographs to define the spatial extent of wetland vegetation types as they were being ground-truthed in the field.

The upper saltwater influence is usually indicated by the upstream limit of the native sedge oioi, however in this case the vegetation of the riparian margins of the lower reaches of the rivers were significantly altered by farming activities. In these instances the upper estuarine limit was generally indicated by the extent of the introduced grass saltwater paspalum.

Areas where there was evidence of mangrove clearance were also mapped. This however does not indicate the full extent of mangrove clearance over the last 10 years, which would need to be determined from comparisons with the 1997 survey map.

Field notes were made of estuarine wetland vegetation characteristics and their vulnerability to particular threats.

### 2.1 Wetland vegetation classification

Estuarine wetland vegetation is split into four groups: saltmarsh, mangrove, seagrass and weed communities.

1. **Saltmarsh** - a multi-species community in which three sub-communities are distinguishable. They are:

- a) **'Rush/sedge community'** – This is generally sea rush (*Juncus maritimus* var. *australiensis*), oioi (*Apodasmia similis*), and on the west coast, three-square sedge (*Schoenoplectus pungens*). Marsh clubrush (*Bolboschoenus fluviatilis*) is commonly found up streams and rivers at the upper estuarine limit in some harbours, although it is not mapped within this survey as it is a species of brackish-fresh water.
  - b) **'Saltmarsh ribbonwood community'** - Saltmarsh ribbonwood (*Plagianthus divaricatus*) dominates this zone, although rushes are often common giving a patchy appearance compared with the uniformity of the 'rush/sedge community'. Small areas of sea primrose (*Samolus repens*), remuremu (*Selliera radicans*), the coastal spear grass (*Stipa stipoides*), and glasswort (*Sarcocornia quinqueflora*) can also be present.
  - c) **'Sea meadow community'** - this is devoid of tall plants such as rushes and saltmarsh ribbonwood, with the exception of coastal spear grass. The sea meadow community can include sea primrose, remuremu, glasswort, and in more brackish areas bachelor's button (*Cotula coronopifolia*), leptinella (*Leptinella dioica*), sharp spike-sedge (*Eleocharis acuta*), slender clubrush (*Isolepis cernua*), and arrow grass (*Triglochin striata*).
2. **Mangrove** (*Avicennia marina* subsp. *australasica*) – This is usually a monospecific mangrove community although seagrass, spartina, saltwater paspalum and sea meadow beds can sometimes be found below mature mangrove stands.
  3. **Seagrass** (*Zostera capricorni*) – This is usually a monospecific seagrass community.
  4. **'Weed community'** - In the Waikato Region the most significant estuarine weeds are saltwater paspalum (*Paspalum vaginatum*) and cord grass (*Spartina* spp.). Both of these grasses generally grow in the open estuary and trap sediment, greatly increasing the harbour's infilling rate. These weeds also compete with the native wetland communities, particularly saltwater paspalum which vigorously competes with all estuarine vegetation types, except seagrass.

There are other weed species (such as tall fescue) which can tolerate a degree of salt influence but for clarity of mapping they have not been included in the survey due to their presence above the spring high tide mark.

## 3 Field notes

### 3.1 Summary

The following observations give a general overview of estuarine vegetation in the Wharekawa Harbour following the field visit for this report.

- Extensive seagrass beds occur throughout the lower middle reaches of the harbour.
- Extensive mangrove forests (mangals) dominate the upper middle harbour.
- Large oioi and sea rush beds are found behind the mangals and around stream mouths.
- Sea meadow communities are limited. Sea meadow species present include sea primrose, remuremu, glasswort, arrow grass, slender clubrush and coastal spear grass.
- No spartina was found.
- Saltwater paspalum is scattered throughout the harbour. The largest infestations are amongst sea rush communities at the upper tidal reaches of the Wharekawa River and Tawatawa Stream.
- Sea meadow and rush/sedge communities are the communities most threatened by the expansion of saltwater paspalum.
- There has been a lot of un-consented clearance of mangroves.
- Wetland vegetation extending out into the harbour between the mouths of the Wharekawa River and Tawatawa Stream forms a diverse mosaic of wetland communities.
- Freshwater back-swamp communities (coastal swamp daisy, manuka, flax, cabbage tree) are found along the lower reaches of the Wahitapu and Kapakapa Streams and the south-eastern side of the harbour.
- The only significant remnants of coastal floodplain forest exist on a couple of lower bends of the Wharekawa River.
- The predominant land uses around the harbour margin are pine forestry and farming.
- Elevated sediment run-off from land activities needs to be addressed through appropriate land management, including the establishment of permanently vegetated riparian margins.
- Poorly fenced farmland is likely resulting in elevated nutrient and pathogen levels in the harbour as well as generally degrading wetland community health.

Table 1 lists common plant species found during the surveys. The 'estuarine vegetation community' category for each estuarine species corresponds to the colour-coded vegetation boundaries of the aerial map, or are otherwise terrestrial or freshwater species.

Figure 1 provides a map showing the site names and figure numbers used in this report.

**Table 1: Plant species found in Wharekawa Harbour.**

(\* denotes an exotic species)

<b>Common/Maori name</b>	<b>Scientific name</b>	<b>Estuarine Vegetation Community</b>
arrow grass	<i>Triglochin striata</i>	sea meadow
blue-green sedge	<i>Baumea juncea</i>	
buffalo grass *	<i>Stenotaphrum secundatum</i>	
cabbage tree	<i>Cordyline australis</i>	
swamp oak *	<i>Casuarina glauca</i>	
coastal spear grass	<i>Stipa stipoides</i>	sea meadow
coastal five finger	<i>Pseudopanax lessonii</i>	
coastal shrub daisy	<i>Olearia solandri</i>	saltmarsh ribbonwood
elaeanthus	<i>Elaeagnus x reflexa</i>	
flax	<i>Phormium tenax</i>	
glasswort	<i>Sarcocornia quinqueflora</i>	sea meadow
knobby clubrush	<i>Ficinia nodosa</i>	
koromiko	<i>Hebe stricta</i>	
mangrove	<i>Avicennia marina</i> subsp. <i>australasica</i>	mangrove
manuka	<i>Leptospermum scoparium</i>	
mapou	<i>Myrsine australis</i>	
Mercer grass *	<i>Paspalum distichum</i>	
oioi	<i>Apodasmia similis</i>	rush/sedge
pampas *	<i>Cortaderia selloana</i> , <i>C. jubata</i>	
pohutukawa	<i>Metrosideros excelsa</i>	
prickly mingimingi	<i>Leucopogon fascicularis</i>	
raupo	<i>Typha orientalis</i>	
remuremu	<i>Selliera radicans</i>	sea meadow
saltmarsh ribbonwood	<i>Plagianthus divaricatus</i>	saltmarsh ribbonwood
saltwater paspalum *	<i>Paspalum vaginatum</i>	weed
sea primrose	<i>Samolus repens</i>	sea meadow
sea rush	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	rush/sedge
seagrass	<i>Zostera capricorni</i>	seagrass
slender clubrush	<i>Isolepis cernua</i>	sea meadow
spinifex	<i>Spinifex sericeus</i>	
tall fescue *	<i>Schedonorus phoenix</i>	
wattle - green	<i>Racosperma decurrens</i>	
wattle - brush	<i>Paraserienthes lophantha</i>	
wilding pine	<i>Pinus pinaster</i> , <i>P. radiata</i>	

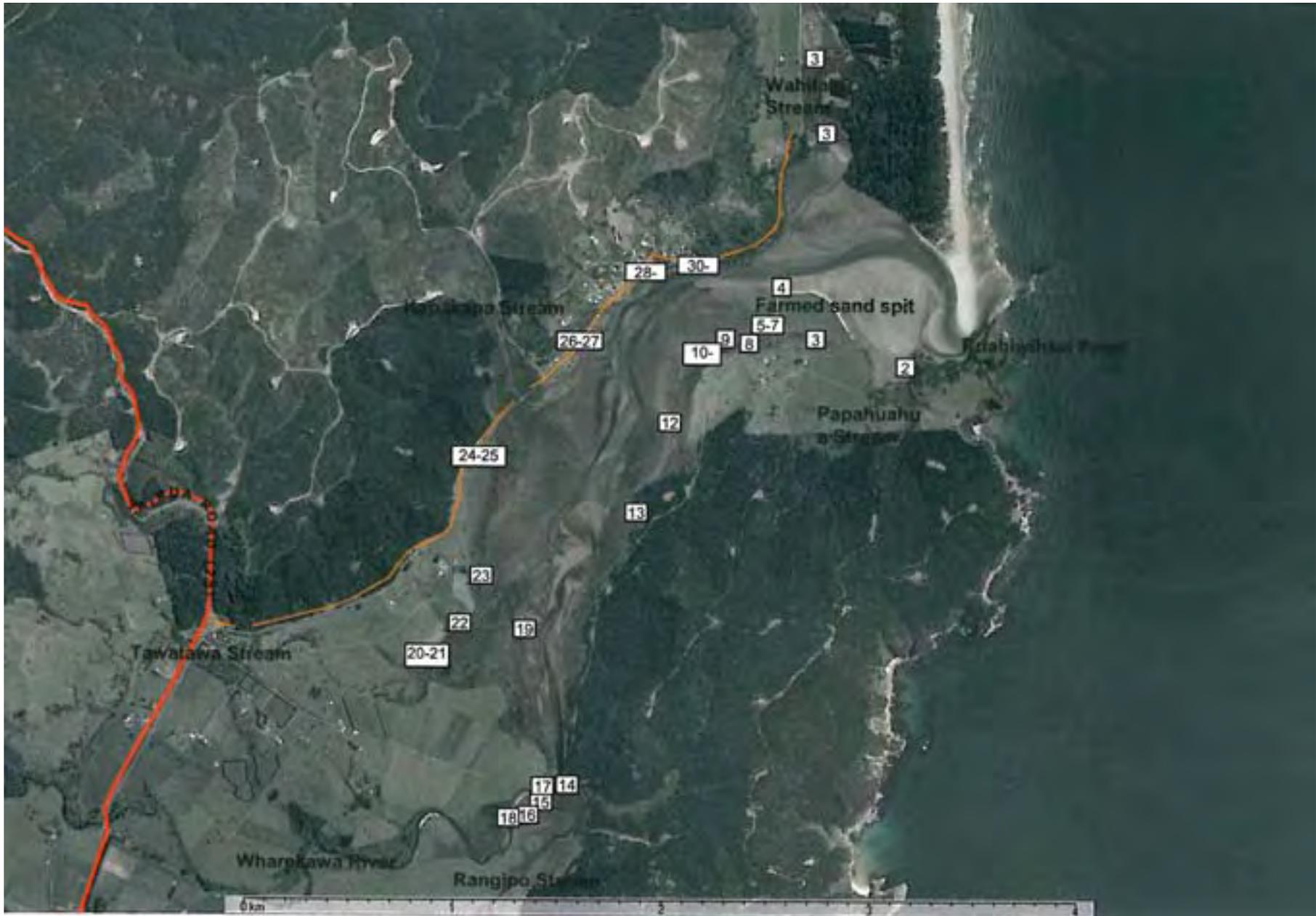


Figure 1: Wharekawa Harbour site localities mentioned in this report. The numbers refer to the location of the following figures.

## 3.2 Site descriptions

Wharekawa Harbour is described clockwise from the south side of the harbour entrance at Ruahiwiwi Point opposite the wildlife sandspit. See Figure 1 for a map showing the site names and figure numbers mentioned below. Many of the figures are repeat photos of sites shown in the 1997 survey report.

The farm land on the southern side of the harbour near the harbour entrance and **Ruahiwiwi Point** has had some steep banks retired from grazing since the last harbour survey in 1997 (see Figure 2), and tidal embayments are now also fenced from stock (see Figure 3). Wilding pine removal has also been undertaken along this estuarine margin (e.g. see Figures 4, 7, 9, 10). These actions have improved the harbour values by reducing elevated sediments, nutrient and faecal runoff into the harbour and enhancing the native vegetation and wildlife habitat values of the estuarine edge by removing competing weed species. Bait stations for animal pest control were also noted which will help protect estuarine wildlife and their habitat. Saltwater paspalum (referred to as 'coastal mercer grass' in the 1997 report) is still dominant in many places along the coastal margin. Much of the **farmed sand spit** is also edged with knobby clubrush and buffalo grass (Figure 4). The narrow finger of the spit still supports coastal spear grass and remuremu mixed with saltwater paspalum (Figures 5, 6 and 7).

The seagrass bed east of the main channel still reaches its seaward limit within the lee of the farmed sand spit (Figure 7). It is still extensive although it has increased in area where mangroves have been removed, but decreased in area further upstream. A wide rush/sedge community extends upstream from the embayment protected by the sand spit (Figures 8 and 10). This is often backed by a band of saltmarsh ribbonwood which thickens to the south and grades into a freshwater manuka swamp. There seems to be indications that the complete removal of mangroves from this shoreline is exposing the rushland to erosion (Figure 9). Figure 11 replicates photo [37] from 1997. The shoreline has changed dramatically with the removal of mangroves and Figure 11 shows a shoreline dominated by low-growing saltwater paspalum. It seems that the removal of the protective mangrove belt has resulted in the exposure of the saltwater paspalum and seaward rush/sedge edge to increased erosion. Further upstream saltmarsh ribbonwood mixes with rushes edging the open harbour (Figure 12). Further upstream again, a small pocket of mangroves has been left undisturbed. Near these mangroves is a gap in the seagrass bed that extends almost to the main channel.

The largest remaining mangrove community (mangal) on the eastern side of the harbour extends upstream from the next small embayment. Figure 13 is a repeat of 1997 photo [39] of a native riparian strip left between the harbour and pine forest in this small embayment. Further upstream, saltmarsh ribbonwood and rushland begins to dominate with dense saltwater paspalum islands frequently forming the seaward vegetated edge.

Wilding pines continue to be a problem on the higher areas of the saltmarsh community in the upper harbour.

Broad rush/sedge communities are found around the **Rangipo Stream** and **Wharekawa River** mouths (Figure 14) and tidally influenced stream bends. The health of the rush/sedge communities at the top of the salt influence are compromised by the dominance of saltwater paspalum and continuing stock grazing (Figures 15 and 16). The saltmarsh ribbonwood zone has been severely limited in extent by farming activities. Despite this loss of the natural extent of native vegetation fernbird are still present in these areas.

Figure 17 is a repeat of the 1997 photo [42] showing eleagnus dominating part of the Wharekawa River bank. The eleagnus provides some erosion protection for the bank but smothers the native riparian vegetation.

Of particular note are the uncommon and attractive remnant coastal wetland-forest communities along two of the lower TLB bends of the Wharekawa River. These lie within public land as well as on private land owned by the Palmers. Figure 18 shows an oioi bed grading into saltmarsh ribbonwood, backed by a remnant freshwater cabbage tree swamp with flax, kanuka and totara along the river edge.

Saltwater paspalum lines all of the tidally-influenced stream banks, although there was no clear delineation of where the similar looking freshwater equivalent Mercer grass became the dominant stream edge vegetation. Therefore the upstream extent of saltwater could be overestimated.

**North of the Wharekawa River mouth** the estuarine vegetation forms a mosaic of rush/sedgeland, saltmarsh ribbonwood, mangroves and saltwater paspalum, with small raised islands of flax and manuka (Figure 19). Small patches of sea meadow (glasswort and sea primrose) occur along the Wharekawa River side of this mosaic community. However the sea meadow species are struggling to survive amongst the aggressive and taller growing saltwater paspalum which is dominant along this side of the mosaic community. Mangroves are dominant on the **Tawatawa Stream** side of the mosaic, with rush/sedgeland generally found sheltered between the land edge and mangrove or saltwater paspalum communities. Saltwater paspalum is dominant along the upper tidally influences reaches of Tawatawa Stream (Figures 20 and 21). Mangroves have been illegally removed from the banks on the TLB of Tawatawa Stream (downstream of Figure 20) as shown in Figure 22. Further illegal mangrove removal has also occurred further downstream (Figure 23). A wide swath has been cut through the thick mangrove band to the open harbour flats. The thick mangrove band extends downstream to the **Kapakapa Stream**. Behind the mangroves is an extensive saltmarsh that extends up to the causeway and which is still open to cattle grazing and pugging from the adjacent farmland (Figures 24 and 25). Saltwater paspalum is uncommon but present in some open or disturbed tracked areas in the rush/sedgeland. There are small patches of saltmarsh ribbonwood and a number of fernbird are present in these areas.

Mangroves and rush/sedgeland extend upstream of the causeway to the mouth of the Kapakapa Stream.

**North of the causeway**, mangroves form a thin, intermittent band along the coastline. Figures 26 and 27 show the extent of the seagrass beds in the middle harbour. Figure 28 gives a comparative view with the 1997 photo [63] (which showed the extent of mangroves either side of the main channel before they were illegally removed, and the pines on the farmed spit that have now been removed). Similarly Figure 29 shows a comparative view with the 1997 photo [64] of the mangroves now removed on either side of the harbour. The seagrass alongside the pohutukawa-lined road edge north of the settlement is still present (Figures 30 and 31).

The seagrass beds widen out into **Wahitapu Stream bay**. Mangroves fringe the western side of the bay with rush/sedgeland dominant either side of the walking bridge. Saltwater paspalum is present all around the bay and up the stream to the upper tidal influence. Figure 32 shows the view upstream of the walking bridge to the wildlife refuge. The mangroves along the stream edge immediately upstream of the bridge seem to have grown in height more than in area. Figure 33 repeats the view from the 1997 photo [69] looking up the Wahitapu Stream from the entrance to the campground.

No further estuarine vegetation was found past the seagrass at the mouth of Wahitapu bay towards the wildlife sand spit.



**Figure 2:** This photo is a repeat of the 1997 photo [28]. Note the large pohutukawa leaning into the harbour, the green figs, the saltmarsh ribbonwood dominated by saltwater paspalum and hillside regeneration. The Papahuahua Stream mouth is in the background behind the left hand pohutukawa.



**Figure 3:** This small sea rush arm has been fenced from stock since the 1997 survey.



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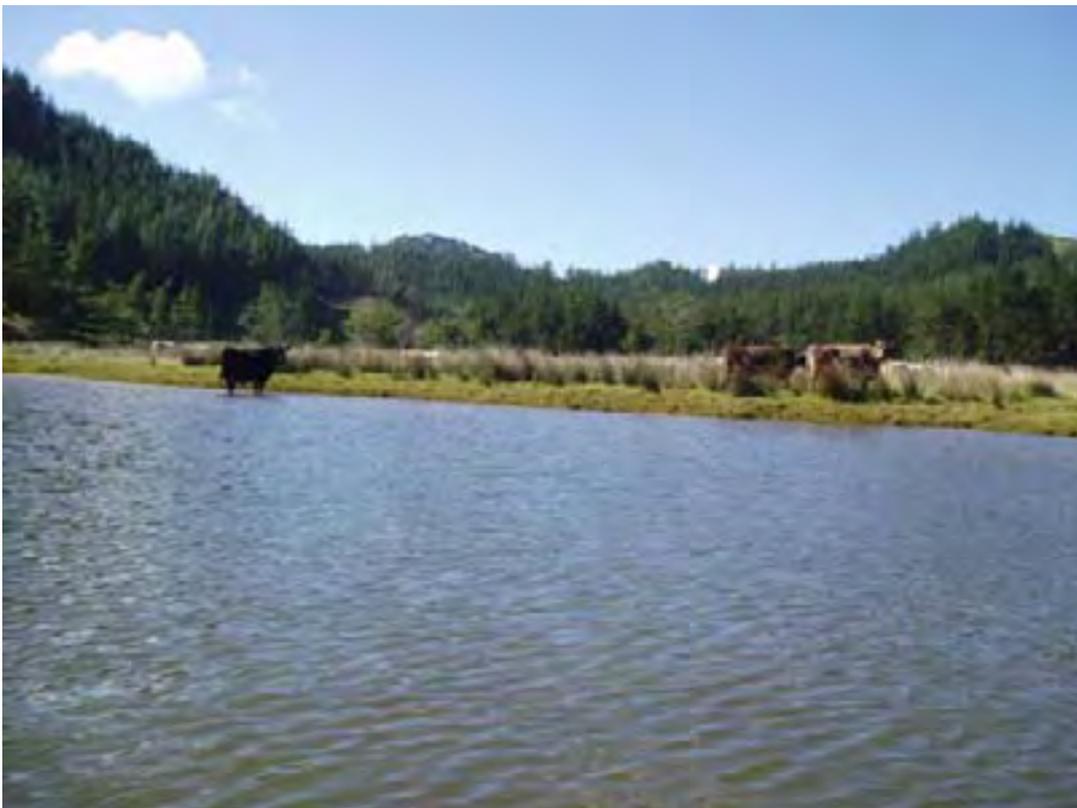
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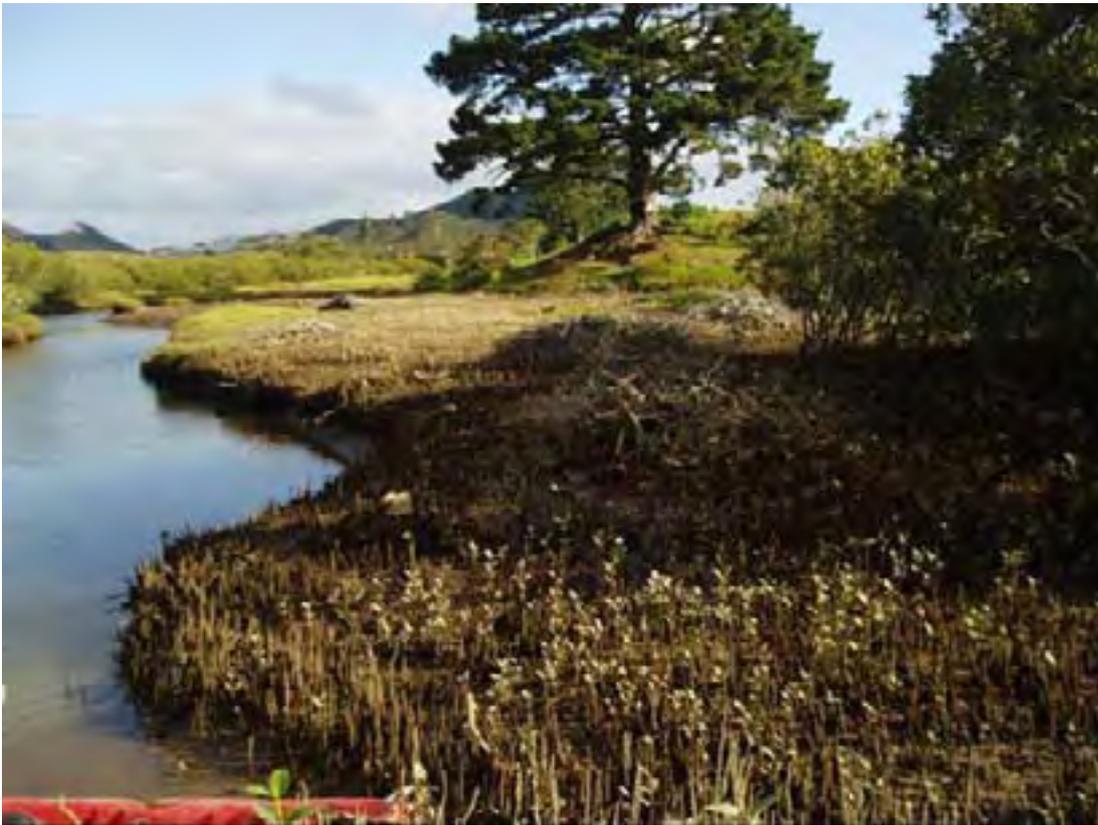
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**Figure 30:** This photo is a repeat of the 1997 photo [66] looking west along the wooden jetty railings. Seagrass is still present along the rocky edges, although reduced in places.



**Figure 31:** This photo is a repeat of the 1997 photo [67] looking back at the wooden jetty and harbour mouth. Compared to 1997 there is no *Entromorpha* alga, but the Neptune's necklace and sea grass is still present.



**Figure 32:** This photo is a repeat of the 1997 photo [68]. The stream side mangroves have grown up, blocking the view of the saltwater paspalum and saltmarsh behind.



**Figure 33:** This photo is a repeat of the 1997 photo [69] showing the Wahitapu Stream edge vegetation from the entrance to the camping ground. Note the saltwater paspalum dominating the channel edge.

### 3.3 Threats

There are four significant threats to the native vegetation communities of Wharekawa Harbour.

**Stock** – Where cattle have access to the estuarine vegetation they damage it directly. Also, stock degrades riparian vegetation and cause increased sedimentation from pugging and stream bank erosion. The trampling and pugging of estuarine vegetation encourages and spreads saltwater paspalum. Pugging also creates micro habitat suitable for the Southern saltmarsh mosquito, for which there is currently an eradication programme on the Coromandel Peninsula.

Any area that is vulnerable to damage from stock should be permanently fenced. Sites noted on the field survey include:

- the tidally influenced floodplains of the lower Wharekawa River and Rangipo Stream (Figures 15 & 16).
- the saltmarsh near Opoutere Road south of the causeway bridge (Figure 24 & 25).

**Sedimentation** – Un-natural levels of sediment run-off from forestry clear-felling activities and stock access to stream banks elevates sedimentation levels in the harbour. This can result in changes to estuary bed heights, affecting the vegetation communities which grow there. In particular, it may be increasing the amount of habitat suitable for mangrove colonisation.

**Illegal mangrove removal** – Strict controls are required for any further removal of mangroves. Illegal mangrove destruction often occurs where mangroves 'block' individual's views of open water. Some mangrove clearance has potentially exposed the seaward edge of saltmarsh and back swamp communities to erosion. The extensive mangals in the middle of the harbour provide important habitat for marsh birds and fish feeding at high tide. These communities should not be compromised unless a clear ecological benefit can be demonstrated. Situations where mangrove control may be deemed appropriate could include restricting the expansion of the outer mangrove edge where it is expanding into seagrass. The un-natural rate of estuary 'infilling' due to elevated sediment run-off from the catchment is likely to be expanding the zone suitable for mangrove colonisation. This is occurring more rapidly than normal due to poor land management practises. Sheltered situations are predisposed to sediment accumulation. Other areas can also accumulate sediment during years without major storm events. Removing mangroves from these situations will not necessarily cause the long-term dispersal of the sediment nor the restoration of macro-invertebrate communities that are characteristic of open sandy flats. For this to occur, the ongoing sediment input would need to reduce significantly and the fine sediment already present in the harbour would need to be washed out of the system.

**Saltwater paspalum** – This grass is extremely efficient at stabilising sediments and building up bed levels. It can colonise vegetated and non-vegetated estuarine flats. It competes for space with saltmarsh communities, often smothering sea meadow and rush/sedgeland to form dense mono-specific mats. Observations indicate that saltwater paspalum may affect the health of landward mature mangroves. However, saltwater paspalum mats on open mudflats may also enhance mangrove seedling settlement.

## 3.4 Birds

Birds seen or heard during the survey include -

White faced heron, variable oyster catcher, pied stilt, black backed gull, red billed gull, spur-winged plover, kingfisher, fernbird, pukeko, pied shag, paradise duck, mallard duck.

# Recommended action points / discussion

Comparison of this survey's results with the 1997 survey results will highlight any increases or decreases in the extent of the different vegetation communities. However, no notable changes were immediately apparent in the field except for the illegal removal of mangroves and the loss of seagrass in a few areas.

The following are recommended actions to manage the native estuarine vegetation communities of Wharekawa Harbour, including suggestions for restoration projects.

1. Finalise a harbour catchment plan that identifies where mangrove control is desirable based on specific ecological values (e.g. interface between mangrove and seagrass beds) and where public access is required. Restrict and monitor mangrove removal where it may result in the erosion of saltmarsh due to increased exposure. Climate change is predicted to result in an increased number and severity of storm events. Mangroves are effective buffers against erosion. Ensure that all riparian margins of waterways are protected and permanently vegetated to reduce sediment run-off from the catchment.
2. Continue the pine control and pest control which has been initiated around parts of the harbour margins, and encourage the extension of this work to other areas. Include wattle and pampas in the weed control work.
3. Undertake a feasibility study to control saltwater paspalum in the harbour.
4. Aim to exclude all farming activities from the CMA and river margins. The landowner/s on the south-eastern side of the harbour near the harbour mouth have fenced their stock from the CMA since the last survey in 1998. They have also fenced freshwater seepages on the property, allowed some steep land to naturally revegetate (see Figures 2 and 3) and removed planted and wilding pines from the coastal edge. This property is now a model example for others surrounding the harbour.

Attention now needs to focus on the following farmland:

- a. Explore options with the landowners of the farmland at the intersection of the Wharekawa River and Rangipo Stream to restore the upper estuarine vegetation here. The coastal swamp sequences on the TRB of the Wharekawa River have high biodiversity and aesthetic value for the area and provide an example of what could be restored along other stream banks.
  - i. The grazed 3.9ha Crown forestry licence block (DPS 55988 Lot 3) could be fenced from grazing and maybe included in the forestry company's 'protected areas'.
  - ii. Where fencing of private land can be undertaken more simply by not following boundaries, local or central government could assist to offset the loss of privately owned grazing land (which could be restored to coastal forest). E.g. Instead of fencing the wetland between the Rangipo Stream and Wharekawa River on DPS 31119 – Lots 4 and 7, an agreement with the landowner could involve council or DOC funding the fencing costs to protect a larger area of the lower river bend flats in return for the subsequent loss of some non-wetland grazing.
  - iii. Other estuarine wetland margins parallel to the water course should be fenced by the landowner.

- b. Ensure the Crown-owned farmland between Opoutere Road and the saltmarsh (SOP 59417 Section 1, 76239) is fenced to keep stock out of the wetland. Stock disturbance in this saltmarsh will only be increasing the likelihood of saltwater paspalum spreading as well as degrading the habitat value and water quality. Explore the option of retiring the area of farmland and encouraging native coastal forest regeneration to re-create an estuarine to coastal forest sequence.
5. If not already protected, encourage the landowner of the coastal floodplain swamp forest along the Wharekawa River to covenant this rare and attractive remnant.
6. Public education is needed regarding the dumping of garden waste along the harbour edge. There is an obvious proliferation of garden weeds along the coastal margin associated with the main area of housing. Weed control is needed to restore the coastal edge vegetation.
7. Illegal mangrove destruction often occurs where mangroves 'block' views of open water. Effective enforcement action against illegal mangrove removal is required as well as careful planning of housing near mangrove habitat.

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