

Estuarine vegetation survey – Colville Bay Estuary

Prepared by:
Meg Graeme,
Natural Solutions – Marine and Terrestrial Ecologists Ltd

For:
Waikato Regional Council
Private Bag 3038
Waikato Mail Centre
HAMILTON 3240

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Peter Singleton

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Estuarine Vegetation Survey – Colville Bay Estuary

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Report prepared for:

Resource Information Group
Waikato Regional Council
401 Grey Street, Private Bag 3038, Waikato Mail Centre, HAMILTON 3240

Report prepared by:

Meg Graeme M.Sc (Marine Science)
Natural Solutions – Marine and Terrestrial Ecologists Ltd
8b Margaret Road, Bellevue, TAURANGA 3110
Ph: (07) 576 0770
Email: meg@ecologist.co.nz

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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 Waikato Regional Council to continue with this method. The estuarine vegetation of Tairua, Coromandel, Te Kouma, Manaia, Whitianga, Port Waikato, Raglan, Aotea, Kawhia and Whangapoua harbours; and the inner Firth of Thames, Purangi and Otama estuaries and Kennedy Bay have since been surveyed and mapped. Of these, Whangamata, Wharekawa, Otahu, Tairua, Coromandel, Te Kouma, Manaia, Whitianga, Port Waikato, Raglan, Aotea and Kawhia have been re-surveyed to determine changes in vegetation communities over time.

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

This report details the results from the survey of estuarine vegetation in Colville Bay, including Otautu and Whangahehi Bays. Comments are included about the estuarine vegetation present, the threats to native estuarine vegetation communities, and other field notes of interest. This report accompanies the estuarine vegetation community GIS layers of the survey site.

2. Methodology

The field survey was undertaken over 3 separate days between the 24th October 2012 and the 11th January 2013. The survey was undertaken by walking access. The same methodology for mapping saltmarsh, mangrove, seagrass and weed communities was followed as that previously used to map other Waikato Region estuaries (e.g. see Graeme, 2010b), using a personal digital assistant (PDA) loaded with 2007 aerial photographs (WRAPS2007) of the survey area. Coded polygons were drawn directly onto the PDA aerial photographs to define the spatial extent of wetland vegetation types as they were ground-truthed in the field. The use of colour pen notations on hard copy aerial photographs was reserved (but not used) as a backup for when there were instrument problems or the weather made using the PDA difficult (e.g. sun exposure made it too difficult to see the PDA screen clearly in the field).

The upper saltwater influence is usually indicated by the upstream limit of oioi, saltwater paspalum or saltmarsh ribbonwood in the estuary. The limit of these plants determined the inland/upstream extent of the survey.

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

2.1. Wetland vegetation classification

The estuarine wetland vegetation of the Waikato Region is split into four groups for these surveys:

1. **Saltmarsh** - a multi-species community in which three sub-communities are distinguishable in the Waikato Region. They are:
 - a) **'Rush/sedge community'** – This is generally sea rush (*Juncus kraussii* subsp. *australiensis*), oioi (*Apodasmia similis*), and generally only common 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 generally mapped¹ within this survey as it is a species of brackish-freshwater.
 - 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 coast spear grass (*Austrostipa stipoides*) and glasswort (*Sarcocornia quinqueflora*) can also be present.

¹ Except where marsh clubrush is intermingled with oioi and is too difficult to separate out for mapping.

- c) **'Sea meadow community'** - This is devoid of tall plants such as rushes and saltmarsh ribbonwood, with the exception of coast spear grass. The sea meadow community can include sea primrose, remuremu, glasswort, slender clubrush (*Isolepis cernua*), and arrow grass (*Triglochin striata*), and in more brackish areas bachelor's button (*Cotula coronopifolia*), leptinella (*Leptinella doica*) and sharp spike-sedge (*Eleocharis acuta*).
2. **Mangrove** (*Avicennia marina* subsp. *australasica*) – This is usually a monospecific community although seagrass, spartina (*Spartina* spp.), saltwater paspalum (*Paspalum vaginatum*) and sea meadow beds can sometimes be found underneath mature mangrove stands.
3. **Seagrass** (*Zostera capricorni*) – This is usually a monospecific community, and is the vegetation which occurs at the lowest level in the tide.
4. **'Weed community'** - In the Waikato Region the most significant estuarine weeds are saltwater paspalum and spartina. 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 and wading bird feeding habitat.

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

Table 1 lists common estuarine plant species (and their associated 'estuarine vegetation community') mapped during the survey.

Mixed mapping categories are used to indicate the occurrence of 'mixed' vegetation communities. Saltwater paspalum in particular is spreading and mixing with rush/sedge, sea meadow and saltmarsh ribbonwood communities. Where vegetation was found under the canopy of mangroves (e.g. seagrass or saltwater paspalum under mangroves) this was mapped as a 'mixed' community.

Saltwater paspalum is known to co-exist with spinifex (*Spinifex sericeus*) however mapping of saltwater paspalum stops once spinifex is present as it is then determined to be an 'open coastal' rather than 'estuarine' environment.

Table 1: Estuarine plant species found in Colville Bay.

Common/Maori name	Scientific name	Estuarine Vegetation Community
arrow grass	<i>Triglochin striata</i>	sea meadow
coast spear grass	<i>Austrostipa stipoides</i>	sea meadow
Bachelors button	<i>Cotula coronopifolia</i>	sea meadow
glasswort	<i>Sarcocornia quinqueflora</i>	sea meadow
mangrove	<i>Avicennia marina</i> subsp. <i>australasica</i>	mangrove
native celery	<i>Apium prostratum</i> var. <i>filiforme</i>	sea meadow
oioi	<i>Apodasmia similis</i>	rush/sedge
remuremu	<i>Selliera radicans</i>	sea meadow
saltmarsh ribbonwood	<i>Plagianthus divaricatus</i>	saltmarsh ribbonwood
saltwater paspalum *	<i>Paspalum vaginatum</i>	weed
sea blite	<i>Suaeda novae-zelandiae</i>	sea meadow
seagrass	<i>Zostera capricorni</i>	seagrass
sea primrose	<i>Samolus repens</i>	sea meadow
sea rush	<i>Juncus krausii</i> subsp. <i>australiensis</i>	rush/sedge
slender clubrush	<i>Isolepis cernua</i>	sea meadow

* denotes an exotic species

3. Results

Site locations within the estuary are shown in Figure 1 as well as the position of the photos that are referred to in the site descriptions below.

3.1. Site Descriptions

The estuarine vegetation in Colville Bay is described clockwise from the northern mouth of the bay.

Otautu Bay had a small area of mangroves with sea meadow (coast spear grass, glasswort and some sea primrose) around the tidal edges and on some of the open flats (Figure 2). Areas of rushland and saltmarsh ribbonwood extended up towards the northern short arm of the inlet which was grazed at its upper reaches. Figure 3 shows the lower southern arm toward the culvert. Mangroves and saltmarsh ribbonwood lined the straightened southern arm upstream of the camp/farm road culvert.

Around the point at the southern end of Otautu Bay there was a gravel ridge which provided shelter for a mixed freshwater/estuarine wetland including marsh clubrush, sea rush, a few mangroves, saltwater paspalum, glasswort, sea blite, bachelor's button and arrow grass. There was also some flax on the gravel ridge. The area was disturbed by vehicle tracks and a drain.

Scattered mangroves were growing on a couple of rocky promontories further into the bay where the rocks provided shelter for them to establish.

At the beginning of **Whangahehi Bay** there is a mixed gravel and shell spit that curves out into the harbour flats providing shelter for estuarine vegetation. At the end of the spit where it joins the mainland there was pohuehue, flax and coastal shrubs on the land grading into coastal herbs and shrubs on the gravel/shell ridge with mangroves in the swale behind (Figure 4). Coastal plants on the ridge top include pohuehue, knobby clubrush and scattered saltmarsh ribbonwood as well as pohuehue, some arrow grass and a thick patch of healthy native celery plants under the edge of the mangrove canopy where the mangroves were being subsumed by the shell ridge (Figure 5). There was also the small native shore groundsel daisy growing on the gravel spit (Figure 6). The outer end of the spit had a few flax and exotic weed species including saltwater paspalum along the ridge crest, and some sea blite on the more exposed seaward side of the spit. A pair of New Zealand dotterel and variable oystercatcher were nesting at the tip of the spit. The more sheltered landward side of the outer spit supported a patch of saltmarsh ribbonwood mixed with knobby rush and exotic grasses and flat weeds. Below this there was a zone of coast spear grass which graded down into glasswort on the mud flats and then into mangroves. Back along the mainland edge there was a large patch of saltwater paspalum on the landward edge of mangroves (Figure 8). There were stock footprints along the harbour edge here.

Figure 9 shows a patch of sea meadow which included slender clubrush, glasswort, sea primrose, and a few native celery plants. Mangroves seedlings and saltwater paspalum were present along the water's edge (at the forefront of the photo).

Pateke (brown teal) were using the flats beneath tall mangroves immediately upstream of the **Ahirau/Maurea Streams** road bridge. About sixty pateke were roosting under the mangroves and in the stream above and below the bridge (Figure 10). The weedy plant smilax was noted in the saltmarsh ribbon on the TRB immediately upstream of the road bridge and a bit further upstream there was a patch of the weed eleagnus on a bund. The mangroves in the Ahirau/Maurea Stream inlet (upstream of the Port Jackson/Port Charles road intersection) graded into rushland with mixed zones in places. Dense bands of saltmarsh ribbonwood lined stream edges and higher ground around the wetland edges. Banded rail were present amongst the rushland and mangroves. Scattered sea meadow communities had a few small areas of saltwater paspalum within them. Figure 11 shows a view looking north along a band of sea rush and sea primrose with a saltmarsh ribbonwood zone behind. Mangroves, oioi, sea rush and saltmarsh ribbon extend up along a number of drains through in-filled farm land, and bachelor's button and sea rush occurred in a number of low-lying paddock areas. Figure 12 shows a good example of fencing along a drain with saltmarsh ribbonwood still present as it is not grazed.

Towards the **Port Jackson/Port Charles road intersection**, sea meadow and rushland line the road edge above the mangrove band (Figure 13). Sea meadow on the gravelly edge of the creek included glasswort, sea primrose, slender clubrush, remuremu, sea blite and coast spear grass. There was no saltwater paspalum within this higher community compared with the lower sea primrose community which had some saltwater paspalum establishing amongst it. Saltmarsh ribbonwood and some mangroves occurred along the creek below the road and upstream into the grazed paddock. More glasswort, sea primrose, coast spear grass and slender clubrush occurred along the upper tidal edge of the road south towards Colville Village, with patches of sea rush and saltmarsh ribbonwood above and mangroves seaward. Figure 14 shows a close up of sea blite with glasswort behind and mangroves on the outwash ridge downstream of the bridge near the quarry. The main mangal stops at this stream channel.

Moving out around **Tokawhero Point** there were patches of mature mangroves (~2m tall) that had established in the shelter of rocky outcrops. Healthy patches of native celery were found along the high tide line mixed in with the edge of flax or other coastal forest species (Figure 15). Saltwater paspalum occurred behind one patch of mangroves. Further out toward the head of the Point there were scattered small patches of glasswort on intertidal rocky platforms. The tidal flats were quite firm and exposed with wave ripples. No seagrass was seen. No further estuarine vegetation was found until just around the point where some coast spear grass was growing on a rocky edge.

Further in along the southern coastal edge of Tokawhero Point, a patch of the weed eleagnus was noted in coastal forest edge. No estuarine vegetation was observed further into the bay until a rocky outcrop on the tidal flats which provided shelter for mangroves, and further shoreward sea rush and ribbonwood. Saltwater paspalum was found mixed with glasswort

along the coastal edge. Figure 16 shows a view looking over a bedrock edge with some mangroves and bits of glasswort, remuremu and sea primrose amongst the rocks, and with coast spear grass on higher land. Another small population of saltwater paspalum was found within the sea meadow (Figure 17). The coastal edge becomes armoured as the road abuts the harbour edge with mangroves immediately seaward.

Upstream of the one-lane road bridge in the **northern corner of inner Colville Bay** there was saltmarsh ribbonwood lining the tidal edge up to a remnant cabbage tree swamp forest. On the true left bank there had been animals fenced within the ribbonwood zone resulting in pugged bare sediment beneath the saltmarsh ribbonwood (Figure 18).

The main open coast line of the bay generally had a thin salt-burnt and wave-rolled band of Indian doab grass. At the mouth of the **Kairaumati Stream** there were large patches of sea meadow (glasswort, sea blite and sea primrose), a small population of saltwater paspalum, and some scattered rush and saltmarsh ribbonwood. Further on there was another creek mouth entering the bay lined with saltmarsh ribbonwood, marsh clubrush and lake clubrush (*Schoenoplectus tabernaemontani*). Upstream of the road there was a band of saltmarsh ribbonwood along the roadside and bachelor's button in the paddock drain. At the next stream mouth, there was a patch of what appeared to be Mercer grass (*Paspalum distichum*) on the true left bank of the stream outwash but as the grass was mixed with slender clubrush and glasswort it was mapped as saltwater paspalum as a precaution.

Along at the mouth of the **Umangawha Stream** there was an extensive mangal that extended into the mouth of each embayment either side of the school and surrounded the outwash plains along the stream bank. The outwash plains were covered by extensive areas of sea meadow and saltwater paspalum, intermixed with mangroves (Figure 19). Sea primrose was the main sea meadow species but coast spear grass, remuremu, glasswort were also present. Coast spear grass and patches of sea rush were also found alongside the band of mangroves on the stream bank. Banded rail footprints were seen in the open mudflat areas. The predominance of saltwater paspalum varied greatly from sparse little plants here and there to a few areas of pure paspalum. However, the majority of the outwash plain had sea meadow communities predominating over the saltwater paspalum.

The embayment north of the school was lined with sea rush and oioi with *Baumea juncea* patches and saltmarsh ribbonwood around the edge. Fingers of mangroves extended up waterways into the rushland. Banded rail were heard here. Across the road was saltwater paspalum in a drainage swale and more rushland and saltmarsh ribbonwood.

The rushland thinned out towards the head of the school peninsula and mangroves grow right up to the land edge. The mangroves extended around into the embayment south of the school covering the lower tidal flats while rushland dominated the head of the embayment. The surface sediments within the mangroves towards the head of the embayment became a very dark orange colour with black anoxic sediments below. The rushland community here was bisected by Colville Road. The large expanse of rushland upstream of the road graded into freshwater wetland and then into coastal forest. The extent of the upper rushland and freshwater wetland was restricted by drains along the northern and southern boundaries.

Three pateke were disturbed in the roadside drain. The drain supported a few mangroves near the culvert, saltmarsh ribbonwood and sea rush.

Downstream of Colville Road, rushland edged by extensive saltmarsh ribbonwood communities lined the land edge from the road out to the banks of the Umangawha Stream and down to the sea meadow outwash plains of the stream. A banded rail was heard out in the mangroves lining the stream edge.

A mosaic of saltmarsh ribbonwood and rushland extended upstream from the confluence of the Umangawha and the mill streams along the TRB of the **mill stream** with mangroves lining the stream bank and side channels. The mangroves generally graded into marsh clubrush and then sea rush and oioi beds. There were a few casuarina trees on areas of higher ground associated with the saltmarsh ribbonwood. A spindly sapling that appeared to be a silver pine (*Lagarostrobos colensoi*) was also seen here. Figure 20 shows a section of the wetland beside Wharf Road that was fenced within a paddock. Saltmarsh ribbonwood was missing from the grazed area. Fernbird were heard in the saltmarsh ribbonwood community which graded into marsh clubrush and then into an expansive area of sea rush and oioi. Banded rail were heard closer to the stream and mangroves.

Upstream of Wharf Road there was an expanse of rushland within a paddock on the TRB of the mill stream while the TLB next to Wood Road had a relatively undisturbed saltmarsh ribbonwood community.

Extensive rushland with oioi and sea rush also covered the low flats on the western side at the intersection of Wood and Wharf roads (Figure 21). Patches of saltmarsh ribbonwood occurred on slightly higher areas of ground. The rushland became a mosaic with raupo in places and was backed by willow and/or young regenerating coastal forest (Figure 22). Mangroves and saltmarsh ribbonwood occurred along the waterway beside the road. Pukeko were present here. Some rushland extended past a driveway into a paddock.

Downstream of Wharf Road the stream came close into the land edge and was fringed by a narrow band of mangroves. Six pateke were seen in the stream here. Around the corner rushland was found in behind the mangrove edge. A side stream had rushland and sea meadow up along its banks. Mangroves continued to line the mill stream bank with a stop-banked edge in front of farmland. Agapanthus, the daisy dimorphotheca and other garden weeds were noted growing in a tyre 'bank' beside a dinghy and shelter. Further on there was a tidal area that had been partially cut off from the estuary by a stop bank. Stock had access to the wetland vegetation landward of the stopbank and only a single tall mangrove was present along with patchy sea rush and some sea meadow around the wetland margins. A pied stilt was present during the survey. Some infilling over towards the farm buildings was noted as well as dumped rubble and tyres.

From the confluence of the mill stream and Umangawha Stream, mangroves lined the TLB backed with small patches of rushland. A black shag and lots of juvenile fish and yellow eyed mullet were observed in the stream. The rushland then widened out behind a small island with coastal shrubs as well as the weeds woolly nightshade and ginger. A thick growth of

saltmarsh ribbonwood lined the seaward side of the island and along the raised ridges either side. The eastern end of the island was also fringed with patches of rushland and sea meadow. A banded rail was seen here. The majority of the sheltered swale between the island and the shingle spit was filled with mangroves. A patch of rush lined the north-western land edge. The spit supported large bands of sea meadow (coast spear grass, glasswort, sea primrose, remuremu, sea celery and sea blite) on its sheltered landward edges with a few small patches of saltwater paspalum, and exotic weeds on the ridge tops.

There were scattered large mangrove trees out on the open flats in front of the spit and stream mouth. A few of these mangroves had been cut down.



Figure 1: Map of Colville Bay with points of interest and photo points



Figure 2: A view looking over the Otautu estuary towards the mouth. Coast spear grass is present on high ground by the road with sea primrose beds on the lower gravelly flats. In the middle background mangroves grow on flats between two channels, and sea rush and saltmarsh ribbonwood dominate the true right bank visible behind the pohutukawa.



Figure 3: Looking up the southern Otautu arm with mangroves backed by a pohutukawa edge and a mixed sea meadow/rushland and saltmarsh ribbonwood community on the right. Above the small bridge the estuarine arm becomes a straightened drain with a few mangroves and saltmarsh ribbonwood.



Figure 4: The end of a gravel/shell spit where it joins the mainland with pohuehue, flax and coastal shrubs on the land grading into coastal herbs and shrubs on the ridge with mangroves in the swale behind. Coastal plants on the ridge top include pohuehue, knobby clubbrush and scattered saltmarsh ribbonwood.



Figure 5: Native celery and flax along the edge of a mangrove canopy being subsumed by a gravel/shell ridge.



Figure 6: Shore groundsel daisy (*Senecio lautus* subsp. *lautus*) on a shelly gravel ridge within Colville Bay.



Figure 7: The end of the spit at the entrance to Whangaehu Bay provided protection for mangroves and sea meadow communities. The sea meadow was zoned with glasswort on the lower flats and coast spear grass higher up. A patch of saltmarsh ribbonwood in the background was mixed with knobby rush above the sea meadow. A mix of exotic grasses and flat weeds and sea blite dominated the top sheltered edge of the ridge, with the occasional flax, introduced weed species (including saltwater paspalum) and some sea blite along the very top of the spit. A pair of NZ dotterel and variable oystercatcher were present on the spit.



Figure 8: A large patch of saltwater paspalum (approx. 8x12m) found along the landward edge of a mangal. There were also stock footprints along the foreshore here.



Figure 9: This sea meadow community includes slender clubrush, glasswort, sea primrose, and a few native celery plants. A patch of saltwater paspalum is visible in the water in front of the small mangrove band.



Figure 10: Pateke (brown teal) use the flats beneath tall mangroves immediately upstream of the Jackson Road bridge at the Colville intersection. About sixty pateke were counted roosting under the mangroves and in the stream upstream and downstream of the bridge.



Figure 11: A view looking north along a band of mixed sea rush and sea primrose with a saltmarsh ribbonwood zone landward and mangroves seaward.



Figure 12: Saltmarsh ribbonwood is present along the drain edges where fencing provides protection from grazing. Freshwater rushes dominate the swampy paddocks behind.



Figure 13: A view looking towards the Colville Bay intersection over scattered mangroves along the edge of a wide sea meadow band. The sea meadow is predominantly sea primrose except for small patches of glasswort and scattered plants of saltwater paspalum which seems to be just establishing. Oioi and sea rush are behind and a higher fringe of coast spear grass lines the creek edge (in the middle background).



Figure 14: Sea blite with glasswort and a mangrove behind on a stream outwash ridge.



Figure 15: Healthy native celery patches were found along the high tide line hard up against the coastal forest edge.



Figure 16: Scattered mangroves and patches of glasswort, remuremu and sea primrose were present amongst the lower bedrock, while coast spear grass grew on the higher bedrock.



Figure 17: Saltwater paspalum establishing amongst remuremu and sea primrose.



Figure 18: Montbretia and blackberry dominated the true right stream bank above the one-way bridge while saltmarsh ribbonwood dominated the lower true left bank. It appeared the understory of the saltmarsh ribbonwood had been completely cleared by animal grazing and pugging. Upstream the saltmarsh ribbonwood graded into a freshwater cabbage tree wetland.



Figure 19: A mixed community of sea meadow (sea primrose), mangroves and saltwater paspalum with scattered sea rush out from the main rushland band.



Figure 20: A view from Wharf Road looking towards the harbour along a fence line. There is sea rush in the grazed paddock to the right but saltmarsh ribbonwood is restricted to the un-grazed left side of the fence. Fernbird were heard in the saltmarsh ribbonwood.



Figure 21: A view looking along Wharf Road towards the intersection with Wood Road with expansive rushland either side and scattered mangroves along waterways.



Figure 22: A view from the northern end of the extensive rushland on the western side of Wharf and Wood roads. Willow and manuka wetland are visible in the background and regenerating coastal forest covers the higher land. Mangroves and saltmarsh ribbonwood line the stream banks in the foreground.

3.2. Birds

Birds seen or heard during the estuarine vegetation survey:

- Banded rail
- Black-backed gull
- Black shag
- Canada geese
- Fernbird
- Kingfisher
- Mallard duck
- New Zealand dotterel
- Paradise duck
- Pateke / brown teal
- Pied stilt
- Pukeko
- Red-billed gull
- Variable oystercatcher
- Welcome swallow

3.3. Threats

The main threat to the health of the Colville Bay estuarine vegetation communities is the further establishment of the invasive grass **saltwater paspalum**.

Saltwater paspalum can establish over a wide tidal range and so competes with all estuarine vegetation communities (except it only narrowly overlaps with the upper tidal range of seagrass). Field observations indicate that thick bands of undisturbed rushland can withstand the invasion of saltwater paspalum. These thick bands of rushland in turn usually protect saltmarsh ribbonwood and sea meadow communities in behind. However, thin or disjunct bands of rushland, exposed sea meadow and saltmarsh ribbonwood communities are all vulnerable to invasion by saltwater paspalum. Saltwater paspalum sends out long runners which climb through rushes or up saltmarsh ribbonwood. These runners then become so dense that they overwhelm the native vegetation.

Another common threat to estuarine vegetation is often **infilling and drainage**. While there has been relatively extensive loss of the inland range of estuarine vegetation at Colville Bay through historical infilling and/or drainage, there does not seem to be much of a current threat. The only active infilling noted during the survey was around the edges of a tidal embayment fenced within farmland on the TLB of the lower Umangawha Stream.

There is a localised problem with the **grazing** of animals within the CMA at the northern end of the inner Colville Bay. Here there is a relatively natural vegetation sequence from

regenerating coastal forest - freshwater cabbage tree swamp forest - estuarine wetland however there is localised but severe damage occurring to the saltmarsh ribbonwood community (see Figure 18).

A catchment-wide issue is the ongoing sediment run-off from steep unprotected land into the bay. Sedimentation has far-ranging effects on estuarine floral and faunal communities.

4. Discussion and Recommendations

The results from this GIS field survey provide an overview of the composition of estuarine vegetation within Colville Bay based on 2007 aerial photographs. This data will also provide a baseline for any future surveys to show changes in vegetation communities over time.

Estuarine vegetation within Colville Bay is restricted to the sheltered upper reaches around stream mouths. All the main vegetation communities were present including mangroves, rushland, sea meadow and saltmarsh ribbonwood, except for sea grass which was absent except for a few small populations found in waterways.

While the overall estuarine vegetation was restricted to the upper embayments, there was good diversity within these areas and notably large areas of rushland, saltmarsh ribbonwood and sea meadow.

Sea meadow communities within Colville Bay included the common species (glasswort, sea primrose, slender clubrush, remuremu, bachelor's button and coast spear grass) but also sea blite which is common along the Miranda foreshore but uncommon along the Coromandel coastline. Native celery was also a common localised feature along some of the Colville Bay coastline. The prevalence of relatively large areas of sea meadow was due primarily to good habitat being provided by chenier ridge complexes and stream outwash plains.

The rushland was composed of both sea rush and oioi. Also a few patches of the brackish *Baumea juncea* were mapped mixed in with the sea rush and oioi.

Grading inland onto slightly higher ground were large areas of saltmarsh ribbonwood which is often the first estuarine community to be devastated by land use encroachment e.g. infilling and drainage.

Large areas of mangroves were found seaward of the above estuarine communities but mangroves also formed mixed communities with the sea meadow beds along the TRB of the Umangawha Stream.

Saltwater paspalum is not yet prevalent throughout the estuary and will become more of a threat to the ongoing health and sustainability of the indigenous estuarine vegetation communities if its growth is left unchecked. There are currently only small infestations of saltwater paspalum around the bay and a more extensive saltwater paspalum community near the school. Control of these communities is recommended before saltwater paspalum becomes more widely spread. A positive aspect is that artificial disturbance from roading or stock tracking and pugging which exacerbates the spread of saltwater paspalum is not much of an issue in the bay.

A feature of Colville Bay is the number of banded rail and pateke present. A few fernbird were also noted during the survey. These threatened species in particular rely on estuarine vegetation as habitat. Saltmarsh ribbonwood is particularly important habitat for fernbird, while mangroves and rushland are important habitat of banded rail. Pateke use the

overhanging vegetation along the waterways for shelter and feed within the wetland. They also use tidal stream mouths as flocking sites. Interested landowners can work with the Department of Conservation's Hauraki Area Office to enhance habitat for pateke on their land. Animal pest control around the wetland would benefit all wetland birds and other wildlife.

There are a number of natural vegetation sequences from estuarine wetland inland into freshwater wetlands and/or coastal forest around Colville Bay. At Otautu the estuarine vegetation connects with a large freshwater wetland system upstream of the camping paddocks. In Whangaahei Bay around the road intersection there are a few areas of remaining freshwater wetland and a number of potential restoration sites surrounding the estuarine wetland. On the southern side of Tokawhero Point there is a sequence from a small area of estuarine wetland into coastal forest and in the corner of the bay into freshwater wetland and then regenerating coastal forest. South of the school is a significant sequence from a diverse estuarine wetland complex, into freshwater wetland and then into regenerating coastal forest. There is also a similar vegetation sequence at the intersection of Wharf and Wood roads.

There is good potential for restoration work around the fringes of the harbour where inland wet areas could be fenced from grazing. In particular, council could work with the landowners of the farmland along the lower TLB of the Umangawha Stream where grazing and infilling around the edges of a tidal embayment fenced was noted. The grazing of animals within the CMA at the northern end of the inner Colville Bay (south of Tokawhero Point) also needs to be addressed.

Restoration work within the wider catchment that would help minimise sediment input and therefore benefit the health of the bay includes the permanent re-vegetation of unstable hillslopes and fencing and planting of waterways and freshwater wetlands/seepages on the coastal flats.

5. Bibliography

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6. Appendix A – Photo waypoints

Photopoint number	Latitude	Longitude
2	-36.607578	175.439600
3	-36.607773	175.439373
4-5	-36.615862	175.458210
6	-36.615519	175.458596
7	-36.615440	175.458953
8	-36.615212	175.458616
9	-36.614120	175.460378
10	-36.610692	175.463104
11	-36.612343	175.463847
12	-36.611992	175.464332
13	-36.612360	175.464853
14	-36.613203	175.466411
15	-36.616300	175.466500
16-17	-36.618978	175.466811
18	-36.619512	175.471313
19	-36.629259	175.470962
20	-36.632164	175.472004
21	-36.631970	175.469266