



Ahuriri Estuary

Cultural Values



E mihi ki te Matua ki a Ranginui

Ki Rangiroa, Tawirangi Te Hauwhakaora

E mihi atu ki a Papatuanuku ki a Papatuarangi

Te Papa i takatakahia e nga matua Tupuna

Te Papa I waihotia e ratou ma

Te Papa e maroro ki te opunga

Te Papa e maroro ki te itinga

Te Papaawhi e awhi ana I a tatou o tena o tena o tena

O nga whakatapuranga e tupu ake nei

Te Ukaipo

Te Ukaipo – mo tatou katoa

Greetings to the Sky father, the great heavens, the expansive heavens, the heavenly winds the life giving winds.

Greetings to the Earth mother extending beyond the visible land the Earth mother trampled by our ancestors.

The Earth mother left in heritage by them

The Earth mother that stretches unto the sunrise that stretches unto the sunset

The embracing Earth mother that embraces each of us from all generations

She that sustains us in the night

She that sustains us in the day

Our beginnings

IO Matua

|

Te Kore

The Nothingness

Te Po

The Night – Ranginui and Papatuanuku

(Te wehenga)

Te Wai

Following the separation of Ranginui and Papatuanuku

Te Ao Marama

The Light

The first statement value is: “ko te wai ko nga roimata o Ranginui mo Papatuanuku”.

Te aroha o Ranginui ki a Papatuanuku

(The wai were the tears of Ranginui for Papatuanuku – The aroha of Ranginui for Papatuanuku)

Ko te kohu ko nga roimata o Papatuanuku mo Ranginui.

Te Aroha o Papatuanuku ki a Ranginui

(The mist were the tears of Papatuanuku for Ranginui – The aroha of Papatuanuku for Ranginui)

NGA TIKANGA - Values **NGA TAONGA** – Natural Resources

Tangata and Papatuanuku

Why Tangata?

“Me ka ui mai koe he aha te mea nui o te ao, maku e

Kii atu ki a koe, he tangata, he tangata, he tangata”.

In the evolution of the human race according to Maori

And at the creation of Hineahuone the first human being

the value and priority of people survived in this

Proverb.

Why Papatuanuku? “Ko te whenua te wai u mo nga uri Whakatipu”

“Mother earth, through her placenta, provides nourishment, sustenance and support for her off spring”.

This is a classical proverbial saying which expresses the Maori belief that Papatuanuku (mother earth) is **The Foundation** of indigenous people. She is the **well** of their spirituality the, **encyclopedia** of their knowledge, the **cradle** of their history and the **source** of their sustenance.

Our Whaea (mother). In the evolution of the human race according to Maori Hineahuone (the first human being) was created from the clay (te oneone o Papatuanuku) and from the breath of Tane (our first hongiri). Our special relationship to Papatuanuku is based upon:

- Humanity was created from Papatuanuku our Whaea
- During our lifetime we are responsible for her care and development
- Papatuanuku in turn acknowledges responsibility to nourish and nurture us during our lifetime

- At death Papatuanuku assumes her final role to care for our "koiwi" for eternity – "te oneone ki te oneone"(dust to dust).

TAPU is the relationship between the **Atua** and their chosen medium. The role of the medium is to carry out the revealed will of their **Atua**, through the talisman of the **Mauri**.

The Significance, acknowledgement and value of "Tapu" as part of the creation of the human race according to Maori at the moment a mother conceives, our creator implants his Wairua in the womb of the mother. This enactment is captured and has survived in two proverbs(whakatauki)

- Te whare tapu o te Tangata (the sacred birth place of generations)
- Te tapu o te Tangata (the sanctity of people)

The core element of our tikanga is the spiritual significance of tapu and the need to acknowledge and value that tapu through the practice of **RESPECT**.



AHURIRI ESTUARY

Introduction

Prior to the Napier Earthquake of 1931, the Ahuriri Lagoon (Te Whanganui o Orotu), at the mouth of the Tutaekuri River, occupied the coastal area immediately to the north of Napier. The earthquake raised the level of the coast by as much as 2.7 m, largely draining the lagoon in the process. The diversion of the Tutaekuri, in 1935, to flow out through the Waitangi estuary, coupled with an extensive system of drainage and stopbanks, finally reduced the area of estuarine and saline wetland to around 450 ha (Ahuriri Estuary Management Plan, 1992) from the lagoon's original area of 3,840 ha. Despite this, and the proximity of both the Napier Airport and the Pandora industrial area, the estuary remains one of the most important wildlife habitats on the North Islands south-east coast (Rook & Parrish, 1985; Adams, 1995; White, 2004). In recognition of this, the site was listed in *A Directory of Wetlands in New Zealand* (Adams, 1995), the national aspect of a world-wide wetland inventory sponsored by the International Union for Conservation of Nature and Natural Resources (IUCN).

The estuary is divided into four main areas, with two transport corridors bridging the waterway. The mouth of the estuary (the Inner Harbour), below the Pandora Bridge, is extensively modified with concrete reinforced banks, and is the site of the Napier Marina and the commercial fishing fleet base. The lower estuary (Pandora Lagoon), between the Pandora Bridge and the Embankment road/rail corridor, is broad and shallow, with several areas of salt-marsh scattered throughout. The area is bordered on three sides by roads, while the southern bank is occupied by the Pandora industrial estate. A narrow band of parkland acts as a buffer zone around most of the area. The middle estuary (the Main Outfall) extends from the Embankment Bridge due west to the confluence of the Taipo Stream; most of this stretch is confined between stopbanks. Two areas of relatively intact wetland flank this area; the Westshore Lagoon to the north, and the Southern Marsh to the south. The Westshore Lagoon is connected to the Main Outfall by a culvert, although the integrity of this is doubtful (Hans Rook, pers.com.). A low level ford bisects the main channel upstream of the Southern Marsh. Finally, the upper estuary turns northwards at the Taipo Stream and follows the base of the Poraiti Hills for around five kilometres, getting progressively shallower. Again, a stopbank confines this area on the eastern side, separating it from the low-lying Landcorp farm. There are several significant areas of salt-marsh along the foot of the hills, and around the upper tidal limit. In addition to these four main areas, there are also five other areas of wetland, as well as numerous man-made channels and ponds, within the historic boundaries of the original Ahuriri Lagoon that, while not directly affected by the tide, are still saline in nature and contain significant areas of salt-marsh habitat.

Due to the constricted entrance at the Pandora Bridge, the tidal flow is delayed and muted (Adams, 1995). Consequently, the tidal ebb and flow in the estuary is considerably less than that observed on the coast. Combined with the low levels of freshwater input and the salinity of groundwater in the reclaimed area, this results in an average saltwater: freshwater ratio of 10:1 (Adams, 1995). This creates an environment highly unusual in New Zealand, where estuaries are generally fed by large rivers, and the ratio is therefore lower.

Site name	Ahuriri Estuary
Location	Napier
Grid reference (central location)	NZTopo50 BJ39 340225
Area	450 ha
Department of Conservation Area	Hawke's Bay
Tenure	Department of Conservation, Napier City Council, private
Council	Napier City Council
Existing Rankings	DoC Wildlife Refuge Napier City Council Wildlife Refuge SSWI - high
Ecological District	

Habitat

The estuary contains a diversity of habitats associated with a range of water depths, substrates, and salinity levels. In the lower and middle reaches of the estuary, the tidal areas are dominated by *Salicornia quinqueflora* (glasswort) herbfields, while the fringes are lined with patches of *Plagianthus divaricatus* (salt marsh ribbonwood) and *Myoporum laetum* (ngaio) shrubland amongst *Festuca arundinacea* (tall fescue) grassland. In the adjacent lagoons and wetlands, *Juncus kraussii* (sea-rush) rushland dominates. In the upper estuary, *Bolboschoenus medianus* and *B. fluviatilis* (puruā grass) sedgeland becomes common, although the herbfields and rushland areas are still significant for some distance. Salt marsh ribbonwood shrubland also continues to be found in pockets. Finally, at the limits of the tidal area, *Typha orientalis* (raupo) reedland dominates. Throughout the estuary, the fringe of the tidal area is thick with exotic grasses and a mosaic of adventive weeds.

Catchment details

The estuary backs on to the Poraiti Hills, and is fed by several streams from that area, along with drainage from the reclaimed parts of the historic lagoon, and from the urban northern suburbs of Napier. Altogether, the area drained by the estuary covers 13,128 ha. (White, 2004), around 80% of which is pastoral farmland with some horticulture and cropping (Adams, 1995). White (2004) noted 'elevated' levels of nutrients were present in water from the rural streams, but that water quality was still 'relatively good'.

A significant portion of the stormwater runoff from Napier and Taradale is discharged into the estuary via drains in the Pandora industrial estate and the Taipo Stream. This, along with any boat discharge and road runoff pollution from the Inner Harbour, is carried up the estuary by the incoming tide (White, 2004), and therefore has an influence on water quality throughout the tidal area. White (2004) made particular note of ammonia levels coming from these sources, although concluding that ammonia toxicity was 'unlikely to become a problem'.

Conservation Values

Flora

Many of the habitats described above, particularly the glasswort herbfields, the sea-rush rushlands, and the puruā sedgelands, represent some of the largest areas of intact wetland of their type in the Hawke's Bay.

In addition to the dominant species, there are a number of significant plants found throughout the estuary. *Selliera radicans* (halfstar, remuremu) and *Samolus repens* (sea

primrose) are commonly associated with the glasswort herbfields, while *Mimulus repens* (native musk) grows amongst the purua and sea-rush, particularly in the upper reaches. Patches of *Schoenoplectus pungens* (three-square) are also associated with the sea-rush. *Stuckenia pectinata* (fennel-leaved pondweed) occurs in the pools at the mouths of several of the streams that flow into the Main Outfall (including Saltwater Creek and Taipo Stream) (Froude, 2003) while *Ruppia polycarpa* (horses mane) can be found in the Westshore Lagoon. White (2004) noted that *R. megacarpa*, while not currently known in the estuary, has been collected historically. *Zostera muelleri* (sea-grass) is known to have been present in the mid-tidal sediments of the Main Outfall (Adams, 1995); although it was not seen during this survey. The current status of the population is uncertain and requires further investigation. Other native species in the system include *Isolepis cernua* (slender clubrush), *Ficinia nodosa* (knobby clubrush), *Cotula coronopifolia* (bachelors buttons), and *Triglochin striatum* (arrow-grass).

Although tall fescue is prevalent around the estuary fringes, other significant exotic grasses on the tidal limit include *Cynodon dactylon* (Indian doab), *Pennisetum clandestinum* (kikuyu), *Parapholis incurve* (sickle-grass), and *Anthoxanthum odoratum* (sweet vernal), although this list is by no means exhaustive. *Puccinellia fasciculata* (salt-grass) is common on the salt pans throughout the lower and middle reaches. The stop-banks that line much of the estuary support many patches of shrubby and semi-woody adventitious exotics, particularly *Foeniculum vulgare* (fennel), *Rubus fruticosus* (blackberry), *Lycium ferocissimum* (box-thorn), and *Chrysanthemoides monilifera monilifera* (boneseed). Finally, the gravel and sand flats associated with the Pandora and Westshore Lagoons support populations of weedy herbs, including *Rumex obtusifolius* (broad-leaved dock), *Plantago coronopus* (bucks-horn plantain), *Beta vulgaris* (silver-beet), and *Aster subulatus* (sea aster) (although again, many other species are also present). *Limonium companyonis* (sea lavender) is also present around the Pandora Lagoon, but only in very low numbers following a sustained control program.

White (2004) observed that many of the trees in the ngaio shelter plantings around the Pandora and Westshore Lagoons are in fact *Myoporum insulare* (boobialla, Australian ngaio), and suggests that hybridisation with native ngaio would be common. This requires further investigation.

Threatened Species	Status
<i>Mimulus repens</i>	Regionally threatened
<i>Stuckenia pectinata</i>	Declining

Fauna

The estuary is regarded as one of the most important habitats for coastal birds and waders on the south-eastern coast of the North Island. Over 55 species (excluding exotic passerines) are known to be residents or regular visitors (Adams, 1995). Not only does it support valuable feeding, roosting, or nesting grounds for common species such as *Larus bulleri* (black-backed gull), *Himantopus himantopus* (pied stilt), *Haemotopus unicolor* (variable oystercatcher), and *Phalacrocorax varius* (pied shag) and many others, but provides crucial habitat for at least three nationally threatened species; *Botaurus poiciloptilus* (Australasian bittern) (a breeding resident), *Poliiocephalus rufpectus* (New Zealand dabchick), and *Anarhynchus frontalis* (wrybill) (both regular visitors). The site is deemed of national importance as wintering grounds for *Platalea regia* (royal spoonbill) and *Egretta alba* (white heron); a royal spoonbill flock of 98 birds was photographed during this survey. Migratory wading birds from the northern hemisphere that spend the summer in the

estuary include *Limosa lapponica* (bar-tailed godwit), *Calidris canutus* (red knot), and *Pluvialis fulva* (Pacific golden plover). Other significant species known to utilise the estuary include *Charadrius bicinctus* (banded dotterel) (breeding resident), *Sterna caspia* (Caspian tern), *Anas gracilis* (grey teal) and *Porzana pusilla affinis* (marsh crane).

Several species of introduced water-fowl are resident in the estuary in large numbers.

The estuary is a regionally important habitat as a nursery for coastal and freshwater fish. At least 29 species are known to utilise the lagoons and Main Outfall (Adams, 1995); the dominant species being *Anguilla australis* (short-fin eel), *Rhombosolea leporine* (yellow-bellied flounder), *R. plebeian* (sand flounder), and *Aldrichetta forsteri* (yellow-eyed mullet). Other native coastal species found in the estuary include *Arripis trutta* (kahawai), *Mugil cephalus* (grey mullet), and *Girella tricuspidata* (parore), while migratory freshwater species in the catchment include *Anguilla dieffenbachii* (long-fin eel), *Cheimarrichthys fosteri* (torrentfish) *Gobiomorphus cotidianus* (common bully) and *G. gobioides* (giant bully) (NIWA). Of these, long-fin eels are rated as threatened. It should be noted that galaxiids, represented by *Galaxias maculatus* (inanga), are only occasionally found in the estuary, despite the identification of potential spawning sites by Rook (1993). At least two pest fish species are known to be in the catchment; *Gambusia affinis* (gambusia, mosquito fish) and *Cyprinus carpio* (koi carp). A significant population of *Carassius auratus* (goldfish) is also present (NIWA).

Although several surveys of the estuaries invertebrate fauna have been conducted over the last three decades (White, 2004, and refs therein), White (2004) notes that the results are contradictory, and that the status of the invertebrate population is uncertain. It is noted, however, that generally taxa diversity and abundance are lower than would be expected in an estuary of this size. *Austrovenus sutchburyi* (cockle), *Cominella glandiformis* (whelk), *Helice crassa* (tunnelling mudcrab), *Zeacumantus lutulentus* (horn shell), and *Amphibola crenata* (mudsnails) are all common in different areas throughout the estuary. White (2004) notes that the only remaining cockle bed of any significant size is found in the vicinity of Westshore Lagoon. Other species seen during this survey include *Melagraphia aethiops* (topshell) and *Pomatoceros* sp. (tubeworms). In total, thirty-three invertebrate species have been identified in the estuary sediments (Adams, 1995), although some of these are found only in low numbers (including *Paphies australe* (pipi)).

While there is an abundance of suitable habitats for lizards in the vicinity of the estuary, there are few recorded sightings. Only *Oligosoma nigriplantare polychrome* (common skink) is known to have been found on the fringes of Westshore Lagoon (Jewell, in Bioweb).

Group	Species (m =migratory, * denotes threatened species)
Birds	Asiatic whimbrel
	Banded dotterel
	Bar-tailed godwit (m)
	Bittern*
	Black shag
	Black swan
	Black-backed gull
	Black-fronted dotterel
	Canada goose
	Caspian tern

	Curlew sandpiper (m)
	Dabchick*
	Far Eastern curlew
	Gannet
	Golden plover (m)
	Grey duck
	Grey teal*
	Grey-tailed tattler (m)
	Kingfisher
	Little black shag
	Little shag
	Little tern
	Mallard
	Marsh crike
	Pacific reef egret
	Paradise shelduck
	Pied shag
	Pied stilt
	Pukeko
	Red-billed gull
	Red-necked stint (m)
	Royal spoonbill
	Scaup
	Sharp-tailed sandpiper (m)
	Shoveler
	South Island pied oystercatcher
	Spur-winged plover
	Variable oystercatcher
	White heron
	White-faced heron
	White-fronted tern
	Wrybill*
Fish	Common bully
	Gambusia
	Goldfish
	Grey mullet
	Inanga (m)
	Kahawai
	Koi carp
	Long-fin eel (m)*
	Parore
	Sand flounder
	Short-fin eel (m)
	Torrentfish (m)
	Yellow-bellied flounder
	Yellow-eyed mullet

Herpetofauna	Common skink
Invertebrates	Cockle
	Horn shell
	Mudsnail
	Pipi
	Topshell
	Tubeworm
	Tunnelling mudcrab
	Whelk

Historical, cultural, and recreational

As Te Whanganui o Orotu, the great lagoon at the mouth of the Tutaekuri River, Ahuriri has long been an area of huge cultural, spiritual and practical value to Ngati Kahungunu, represented locally by seven hapu (Parsons, 1995). At least three major pa (Otetara, Heipipi, and Te Pakake) and several lesser pa sites overlook the area, along with many kainga. The lagoon was a source of eels, shellfish, coastal fish, birds, flax, and raupo, as well as providing a safe haven for launching waka for fishing and longer voyages. The estuary and surrounds are currently the subject of a Waitangi Claim by seven hapu (Ngati Hinepare, Ngati Mahu, Ngati Matepu, Ngai Tawhao, Ngati Paarau, Ngati Tu and Ngai Te Ruruku) represented by Mana Ahuriri.

In 1824, Te Pakake pa (situated close to the location of the Inner Harbour today) was the site of a massacre inflicted upon the inhabitants (Ngati Kahungunu and representatives of allied iwi) by a much larger war party from the Waikato; an alliance of Ngati Tuwharetoa, Ngati Maniopoto, Ngati Raukawa, and possibly Nga Puhī (Parsons, 1995). The war party struck at dawn, having rafted across the lagoon to Petane (Bethany), and also down the Ngaruroro River to Awatoto, so that the pa might be attacked along the coast from both north and south. According to Parsons (1995), men, women, and children of all ranks were slaughtered, including several chiefs. Following the massacre, Ngati Kahungunu sued for peace with the Waikato tribes.

Since the rebuilding of Napier, following the 1931 earthquake, the area surrounding the lower estuary has been developed, and the Pandora Lagoon come to be regarded as a recreational facility. The lagoon, sheltered and safe, is a favoured site with children for swimming, sailing, and kayaking. Windsurfers often use the area, and canoe polo is a regular event during the summer. The banks of the lagoon have long been favoured by joggers, walkers, and cyclists, often with dogs at heel, and the development of the Ahuriri Estuary Walkway around the lagoon and Inner Harbour has allowed greater ease of access. The diversity of birds in the Main Outfall and Westshore Lagoon attracts bird-watchers, while recreational fishing takes also takes place in the main channel. Duck-shooting is a very popular activity, during the duck season, in the wetlands of the upper estuary.

The Napier City Council is keen to extend the network of cycle-ways around the city to include Ahuriri Estuary, potentially linking to other routes at Bayview and Poraiti.

Threats

Despite the relative intactness of the salt-marsh vegetation, the estuary contains very large areas given over to exotic plant species, particularly along the high tide limits. Many

of these species are highly invasive, including several of those already mentioned above. Chronic infestation of the salt-marsh by an exotic weed not only degrades the plant community, but also potentially compromises the valuable roosting and breeding habitat available to vulnerable bird species, particularly in the case of the bittern, grey teal and dabchick populations.

The presence of pest fish (*Gambusia* and koi carp) in the estuary is of concern. *Gambusia* (commonly known as mosquito fish in the mistaken belief that it controls mosquito larvae) is a particularly prolific and aggressive species that frequently attacks native fish, eats their eggs, and generally competes for resources. Galaxiids (whitebait) are particularly vulnerable to this species. Koi carp are destructive benthic omnivores, eating not just vegetation, but also juvenile fish, insects, and small crustaceans, and can significantly destabilise the structure of the ecosystem.

Being so close to a major urban centre presents several issues that could have major effects on the environment. The most immediate issue is that of recreational value versus conservation value: while the estuary is a wonderful environment for water sports and recreation, sustained human intrusion, whether it be physical, visual, or audible, is known to have significant long-term effects upon key aspects of wildlife success (Steidl & Powell, 2006, and refs therein). In the case of wetland birds, this would mean displacement from preferred environments, reduced habitat for feeding and nesting, reduced migration fitness, and ultimately reduced breeding success. **Birdlife activity in the Pandora and Westshore lagoons has already been seen to be undergoing a sustained decline (Hans Rook, pens.com)** as recreational activity has been facilitated by improved access in these areas. Any increase in human activity elsewhere in the estuary, particularly if accompanied by intrusion by dogs, has the potential to push threatened bird populations to a critical point, leading either to their desertion of the environment, or local extinction.

The background level of feral predators, already high on the fringes of an urban area, is exacerbated by the presence of domestic pets in the environment, either wandering uncontrolled, or in the presence of their owner. Dogs, cats, mustelids, and rats are all known to prey on birds, particularly when nesting, or their eggs.

Another issue related to urban proximity is that of pollution; while White (2004) maintains that the current levels of water contamination are within acceptable limits, there is always the possibility of accidental pollution occurring from sources such as the port, marina, or discharge from the industrial estate. Sudden heavy metal contamination could raise toxicity levels over critical limits in the vegetation and invertebrate fauna, which would have direct flow-on effects into the remainder of the eco-system, including recreational fishing. Correspondingly, increased levels of organic pollution from rural runoff could lead to algal blooms in the waterway, which in turn leads to anoxic sediments and eutrophication.

An extension to the runway of Napier Airport is under consideration (Hawkes Bay Airport Ltd, 2009), in order to allow the use of jet aircraft on domestic routes in and out of the region. In the short term, this would mean a major construction project on the fringes of Westshore Lagoon and the Main Outfall, with associated elevated levels of pollution and sedimentation in the waterway, and modification of the landscape. In the longer term, this could mean further contamination of the waterway with airport runoff (including jet fuel), greater disturbance of wildlife by large aircraft taking off and landing

directly over the estuary, and also a high possibility of bird strike (Sodhi, 2002 and refs therein). While this is unlikely to effect threatened bird populations further up the estuary, it may require further modification of the immediate environment in order to actively discourage the presence of migratory or coastal waterfowl, the species types identified by Sodhi (2002) as those most likely to be involved in bird strike incidents.

Conservation Management

Current

The estuary as a whole is currently managed under the principles outlined by the Ahuriri Estuary Management Plan (1992); a document drawn up by a committee representing the Napier City Council (NCC), Hastings District Council (HDC), Hawkes Bay Regional Council (HBRC), and the Department of Conservation. This plan recognises the biodiversity and conservation significance of the estuary, as well as the recreational value to the general public, and high cultural value to the local hapu of Ngati Kahungunu. It is designed to act as a guide for the four organisations in the general management of the estuary, as well as development and use of resources, in such a way that these values are preserved where-ever possible. The Plan relates not only to the estuary, but also covers all associated wetlands and contributing streams in the catchment.

There are two areas within the estuary designated as Wildlife Refuges; these were gazetted in 1956 as a single unit covering the lower estuary (Pandora Lagoon), Westshore Lagoon, and Southern Marsh. Currently, the Pandora Lagoon and Southern Marsh are administered by the Department of Conservation as the Ahuriri Wildlife Refuge, while the Westshore Lagoon is managed by the Napier City Council as the Westshore Wildlife Reserve, including a kiwi breeding facility. The NCC also manages Lagoon Farm, bordering the south bank of the Main Outfall and Southern Marsh, and road reserves around the lower estuary and Inner Harbour. The remainder of the estuary, including Taipo Stream and several of the associated wetlands, are managed by DOC as the Ahuriri Conservation Area. The large farm that occupies much of the uplifted area of the original lagoon, to the north of the estuary, is administered by Landcorp.

The private farmland to the west of the upper estuary falls within the administrative area of the HDC. The HBRC is responsible for water quality in the estuary, as well as overseeing marine traffic in the Inner Harbour. Fishing and duck-shooting regulations in the estuary, and their enforcement, are the responsibility of the Fish and Game Council.

While Pandora Lagoon is part of the Ahuriri Wildlife Refuge, it has long been regarded as a recreational environment by the people of Hawkes Bay (see above). The development of the Ahuriri Estuary Walkway, including several boardwalks across tidal areas, has facilitated access by the public into all areas of the lagoon, and recreational usage has increased correspondingly. Pastimes such as walking, jogging, and cycling in the area have always been popular, along with watersports and, more recently, organised canoe polo. Dogs are nominally only permitted in the refuge on a leash, and not at all in the tidal areas, but, despite efforts at public education and the placement of conspicuous signage by the DOC and the NCC, are frequently seen uncontrolled in the area. Recently, both DOC and the NCC have initiated more active dog control strategies, including fining negligent owners.

DOC, the Ahuriri Estuary Protection Society, and the Napier branch of the Royal Forest and Bird Society have also initiated a wetland restoration programme in the lagoon, planting native wetland species (including salt marsh ribbonwood and searush) and

coastal shrubs around the fringes of the tidal zone, as well as removing litter and graffiti, assisting with weed control, and carrying out track maintenance.

Elsewhere in the Conservation Area, particularly around the upper estuary, public access is passively discouraged by DOC in order to minimise disturbance to the birdlife, particularly the vulnerable population of bitterns in the rushland and sedgeland habitats, and the migratory visitors on the mudflats. This is facilitated by a lack of access across the Landcorp farm, and the thick growth of vegetation along significant portions of the stopbanks.

Weed control is undertaken throughout the estuary, particularly targeting aggressive species such as boxthorn and blackberry, along with a range of other species. A sustained programme implemented in 2005, aimed at sea lavender, has practically eradicated the species in the estuary (Lee, 2010), although the situation continues to be monitored.

Wading bird populations in the estuary are monitored regularly by the Hawkes Bay branch of the Ornithological Society. The population of bitterns in the upper estuary is also monitored by DOC rangers.

Potential

The Ahuriri Estuary Management Plan (1992) is now at least eighteen years old, and requires revision. Several key considerations in managing the estuary have changed, or have the potential to, and the document needs to be updated to make provision for these changes. Firstly, the hapu of Mana Ahuriri should have direct input into the management of the estuary, rather than simply having provisions made for their concerns. In a purely practical sense, their role is likely to gain greater significance as the tidal areas of the estuary pass from Crown control under the clauses of the Foreshore and Seabed Act. Secondly, the Hawkes Bay Airport Company has been corporatized (Hawkes Bay Airport Ltd, 2009), lending traction to the long discussed plans to expand the Napier Airport. This is an issue that will have profound repercussions on the estuary management, particularly in Westshore Lagoon, and requires careful consideration. Finally, recreational and commercial pressures in the lower estuary have increased dramatically during the last decade, and may start to effect the mid and upper estuaries. The strategies outlined by the 1992 plan require reassessment to ensure that a balance between recreational and conservation values is maintained.

It would also be desirable if provision were made for such revisions of the Management Plan to occur at regular intervals, at least once every ten years.

Pandora Lagoon, despite receiving the highest degree of legal protection in the estuary as a Wildlife Refuge, is currently almost the least effective area of habitat for birds and fish due to the degree of modification by urban development adjacent to the area, and the high daily level of disturbance by recreational users. Although steps could be taken to mitigate the level of disturbance in this area (e.g. removal of the boardwalks from tidal areas, decibel limits placed on organised recreational events, stricter measures utilised to discourage dogs in the area), it is unlikely that these would significantly improve the habitat for birdlife, while almost certainly alienating the citizens of Napier, as usage of the lagoon area for recreation is currently entrenched as a right. Instead, the community must be encouraged to take ownership of the lagoon as a wildlife habitat through the continuing wetland restoration and public education programmes. Fining negligent dog-owners is unfortunately currently necessary, as changing attitudes through education

takes time, but this could be alleviated by fencing the reserve on the Meanee Quay boundary, including the strip along the Embankment. This would both exclude uncontrolled dogs and allow greater control of access points to the reserve, where the information regarding the effects of dog disturbance, the required levels of control, and the penalties for non-compliance would be effectively displayed. This measure would also give a degree of physical protection to restoration planting areas on the eastern shore of the lagoon.

Westshore Lagoon is currently only nominally tidal, while the South Marsh is completely cut off. Re-establishing the tidal flow in these areas through the re-installation of large culverts through the stopbanks would improve productivity in the mudflats in these areas, increasing their value as habitats and feeding areas for wildlife.

A higher degree of legal protection needs to be extended to the upper estuary, as this is the area where the greatest conservation value is to be found. This includes the large areas of rushland habitat for bitterns and other vulnerable species, and the feeding and roosting areas for migratory birds. The area remains relatively undisturbed, and isolated from the immediate vicinity by stopbanks. It would not be desirable for any course of action to be taken that might compromise this solitude, as this is one of very few such estuarine sites remaining in the southern North Island. An upgrade in legal status, possibly to a wildlife management area, would help ensure that it remains so.

The disturbance tolerance of many bird species is poorly understood, but it is certain that visual intrusion is the cause of greater stress than comparative levels of audible intrusion (i.e. a human silhouette is more likely to flush birds than a vehicle passing by unseen) (Steidl & Powell, 2006, and refs therein). It is therefore appropriate to assert that any increased frequency of human activity along the fringes of the upper estuary, or along the stopbanks, will have a cumulative effect on the birdlife found there, with results already mentioned (see 'Threats'); this includes the proposed cycle path. Should the construction of the cycle path go ahead, it would not be acceptable for the route to follow any continuous portion of the stopbanks along the upper estuary – this needs to be verified (JH). It would not be necessary, however, to introduce further access controls to duck-shooters (this too needs to be verified), as this level and type of disturbance is unlikely to have cumulative impact (marginal).

There is potential, in the long term, for the area of wetland to be expanded considerably. Much of the current Landcorp farm lies below sea level, and is maintained by pumping excess groundwater into the estuary. Breaching of the stopbanks would result in the declamation of approximately several hundred hectares, creating a much larger wetland habitat, with a correspondingly increased biodiversity and conservation value. Of course, such a strategy would require specific protection of infrastructure such as the airport and State Highway 2.

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