2010 Ohiwa Harbour marshbird survey

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Bay of Plenty Regional Council
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Cover Photo: Mangroves at Burma Road (Site 10) at dawn.
Photographer: Annabel Beattie

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Tim Senior and Nancy Willems assisted with logistical arrangements and site advice, John Douglas provided advice on site access arrangements, Stephen Park provided digitised spatial data, Glenn Ellery and the Environmental Data Services team provided logistical support. Simon Stokes and Nancy Willems provided the impetus for this work in response to the Ōhiwa Harbour Strategy. Keith Owen, Heather Mackenzie, Stephen Park and Tim Senior provided comments on the draft of the report.

This survey is based on the Ohiwa Harbour marshbird survey of 1990 carried out by Keith Owen (Department of Conservation, Rotorua). Keith is greatly thanked for conducting an initial training day at the start of the survey, and providing technical advice, logistical help and spatial data.

Executive summary

A survey of marshbird populations and habitat in Ōhiwa Harbour was conducted between November 2010 and January 2011 as part of ecological work involved with the Ōhiwa Harbour Strategy. This work aimed to compare results on the abundance and distribution of marshbird species, as well as the overall health of the Harbour estuarine margin habitat, with a survey conducted by the Department of Conservation in 1990.

This survey used similar methodology to the 1990 survey in order to allow comparison of results. Forty-four sites identified as valuable to marshbirds were surveyed by Bay of Plenty Regional Council staff and volunteers between November 2010 and January 2011. Data on birds, threats and impacts, and habitat quality were collected.

Three marshbird species (Australasian bittern, banded rail, North Island fernbird) increased in abundance and distribution between 1990 and 2010, while one species (spotless crake) decreased in abundance. Marsh crake were not observed during either survey. The total number of recorded bird species increased, but this is suspected to be largely due to increased recording of non-target species. One difference between the two surveys was the presence of North Island weka in 2010, which is likely to affect marshbird habitat should this species increase in number around the Harbour. A similar range of threats and impacts was reported between the two surveys, and there was a slight increase in surveyed habitat quality.

The snapshot nature of this survey and the cryptic behaviour of the surveyed marshbirds limit interpretation of these results. However, this survey still demonstrates the Harbour is of national significance for Australasian bittern and banded rail, and regional significance for North Island fernbird. The work of care groups within the Harbour in recent years has greatly increased the value of many habitat areas for marshbird species, and support for these groups should be continued. Maintaining habitat diversity, and addressing the threats and impacts described in this report are essential for ensuring the long-term viability of marshbird populations at the Harbour.

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Part 1: Introduction

Ōhiwa Harbour (Figure 1) is a large estuary, covering approximately 2400 ha, located in the eastern Bay of Plenty. The Harbour is recognised as having outstanding natural feature and landscape values, is valued as an area of ecological importance, and is of significant cultural importance to iwi and hapū within and external to the area.

Figure 1 Ōhiwa Harbour, as viewed from Onekawa Pa

In 2002, the Bay of Plenty Regional Council, in association with iwi and interested agencies, launched the Ōhiwa Harbour Strategy to set a vision for the Harbour. The Strategy (Environment Bay of Plenty, 2008) identifies issues and key community values and aspirations, and recommends actions to achieve these. One of the actions included was Action 12.3.3: Assess Ecological Quality of Ōhiwa Harbour. In order to address this action, a literature search (Beattie, 2010) was undertaken to review existing information and identify any gaps in knowledge. This report presents the results from a marshbird survey undertaken to address one of the identified knowledge gaps.

1.1 Previous work

Previous studies have identified Ōhiwa Harbour as being important bird habitat. It is highly valued due to the number and rarity of birds it supports (Forbes and Bridgewater, 1990). The Harbour has been ranked as an Outstanding Site of Special Wildlife Interest (Rasch, 1989a and 1989b) and a wetland of international importance for wading birds (Owen, 1994a).

Data is collected on shorebird species within the Harbour twice annually by the Ornithological Society (Owen *et al*., 2006). Aside from a few site-specific surveys (e.g. Owen, 1994b; Collins, 2006), the only comprehensive survey of marshbird species across the Harbour is based on fieldwork undertaken in 1990 (Owen, 1994a). The current survey follows the same objectives and methodology to enable comparisons between the two surveys.

1.2 Objectives

The main aim of this survey was to compare results on marshbird abundance and distribution with results from 1990 described in Owen (1994a). Marshbirds are good indicators of estuarine margin vegetation condition as they are highly sensitive to the loss of this habitat and predation (Froude, 1998), so results from this survey will also increase our understanding of the ecological health of this habitat type at Ōhiwa Harbour.

This survey was undertaken with the following objectives:

(i) To survey marshbird habitats identified by Owen (1994a) within the Harbour to gain information on the distribution and abundance of bird species.

(ii) To assess the existing human, animal and natural threats and impacts on marshbird populations and their habitats.

(iii) To recommend management actions necessary to reduce threats and impacts to the long term ecological welfare of all populations and habitats.

(iv) To summarise the data in a report outlining the results of the survey, and make copies available to the different partners of the Ohiwa Harbour Strategy, and other interested organisations.

All birdlife encountered during the survey was recorded, but the work focussed on the following five marshbird species specifically identified by Owen (1994a):

- Australasian bittern (matuku) *Botaurus poiciloptilus*
- Banded rail (mohu-pereru) *Gallirallus philippensis assimilis*
- Spotless crake (puweto) *Porzana tabuensis tabuensis*
- Marsh crake (koitareke) *Porzana pusilla affinis*
- North Island fernbird (matata) *Bowdleria punctata vealeae*

These species were originally chosen because they are all wetland dwelling birds that rely heavily on marshlands for their habitat (Owen, 1994a). They were focussed on again to enable comparison between the two surveys, but also because all five are listed as either Threatened or At Risk in the latest publication of the Conservation Status of New Zealand Birds (Miskelly *et al*., 2008), and are therefore targets for protection.

Part 2: Methodology

2.1 Survey coverage

An area of about 380 ha of estuarine and freshwater vegetation in Ōhiwa Harbour has been identified as marshbird habitat (Owen, 1994a). This habitat is largely composed of mangrove (*Avicennia marina* subsp. *australasica*) scrub and shrublands, rushlands and sedgelands, flaxlands, scrub, shrublands and freshwater wetlands located around the Harbour margins. All 42 sites identified as significant by Owen (1994a) were resurveyed during the current study, as well as an additional two sites considered potentially important for marshbird populations. Site 43 (Stuart's Bittern Spot) was considered significant due to reports of bittern from the wetland, and Site 44 (Ōhiwa Domain) was considered significant because the site is composed of a large freshwater wetland in close proximity to the Harbour. The survey coverage is illustrated in Figure 2.

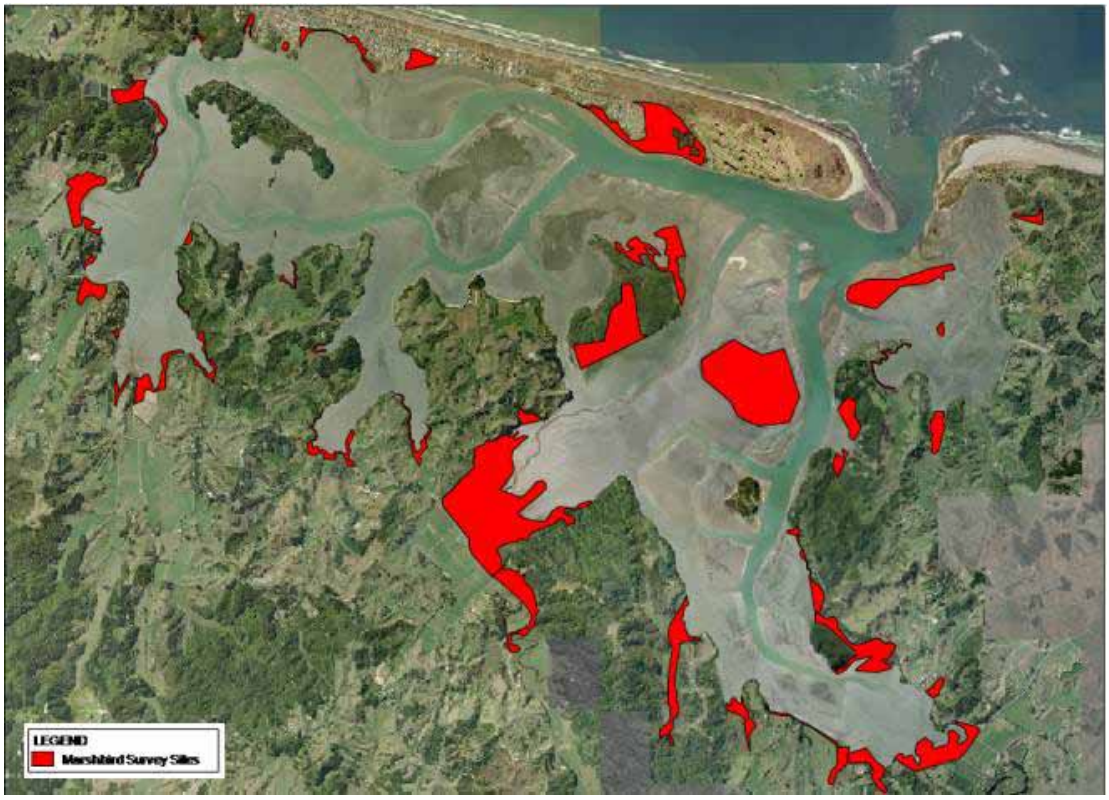

Figure 2 Marshbird habitat sites surveyed during the current study

2.2 Survey techniques

This survey was planned for November 2010 to coincide with the marshbird breeding season when the birds are most conspicuous. Most sites were surveyed between 1 November and 9 December, but one (Hiwarau Wetlands, Site 25) was not surveyed until January 2011 due to delays negotiating access. Ideally this survey would have been carried out over a shorter time period to minimise seasonal effects or the chance of recording the same bird multiple times, but this was not possible due to personnel and tidal constraints. All sites were surveyed early in the morning, as previous work has shown the birds to be most active at dawn (Owen, 1994a; Heather and Robertson, 1996; O'Donnell, 2009a, 2009b, 2009c, 2009d). Surveys were also ideally carried out close to low tide, to allow larger parts of the

site to be accessed. The number of sites meant it was impossible to visit them all at identical stages of the tidal cycle, which may have influenced the number of birds recorded, particularly banded rail, due to varying times for footprints to accumulate. However, as rail are most active after high tide in response to increased food availability (Elliott, 1987), and the only site surveyed at high tide was Motuotu Island (Site 40), it is thought this effect was minimal.

The identified sites were surveyed by Bay of Plenty Regional Council staff members, and interested volunteers. For health and safety reasons, as well as increased observational power, volunteers never worked alone. However, in order to ensure the survey was completed, several sites were surveyed by Council staff working alone.

At each of the 44 sites, a detailed walk-through survey was conducted. An initial training day was held with Keith Owen to ensure consistent methodology was used between the two surveys. The walk-through survey consisted of walking through all or a large part of the area (depending on time and ease of access), playing tape recordings of the target species and recording a number of data. Different areas at each site were targeted for different species, as the target species have been shown to differ significantly in their habitat requirements (e.g.: Anderson and Ogden, 2003). For example, banded rail prints were most commonly observed in the interface between mangroves and reeds shown in Figure 3, as well as beneath mangroves and on their margins, so these areas were specifically targeted when searching for rail. Varying amounts of time were spent at each site, some smaller sites were comprehensively surveyed in less than half an hour, while some larger sites were surveyed for several hours and only a small proportion of the site actually walked through.

Figure 3 Banded rail habitat at Pataua Island Scientific Reserve (Site 32)

Data for each site were recorded on the survey sheet shown in Appendix 1. This sheet was based on one developed by Owen (1994a) to ensure consistency between the surveys. Data recorded were date, site number, time spent in area, observer names, habitat quality ranking and justification, species of birds recorded, numbers seen or heard, bird sign observed and whether tapes were played. Site and vegetation descriptions, and data on threats and disturbances, were also recorded for each site. Botanical knowledge and descriptions provided varied significantly between different team members, and the resulting vegetation descriptions are intended as an indication rather than a comprehensive description of vegetation types. For more specific vegetation descriptions, refer to Beadel (1993) or
Owen (1994a). The location of birds either seen or heard and the location where tape recordings were played were also recorded onto aerial photographs at most sites. Data for each site were later collated into a format more suitable for inclusion within a report and these sheets, as well as the aerial photographs with bird locations, are presented in Appendix 2.

At the end of each site visit, a habitat quality ranking was assigned to that area of marshbird habitat. The ranking uses the same system as Owen (1994a) to enable comparison between the two surveys. This system uses a three tier ranking system of outstanding, high or moderate, reflecting the overall value of the site as habitat for marshbird populations and is based on the following broad criteria:

- Rarity of marshbird species recorded.
- Relative number of individuals of a species recorded.
- Distribution of species through the wetland.
- Size and shape of the wetland.
- Vegetation type and communities within the wetland.
- Habitat diversity.
- Quality of habitat.
- Long-term viability of populations and habitat.
- Representativeness and naturalness of wetland.
- Availability of corridors and buffers to wetland.
- Level of human, animal, plant and natural disturbances to the site.

A justification of the assigned habitat quality ranking was provided for each site to allow a better explanation of conditions at that site. This system was used to ensure consistency with the original survey, but most team members considered it too coarse and very subjective, and the results are therefore intended to be used solely an indication of habitat quality.

The results from this work are summarised in the following section.

Part 3: Results

3.1 Recorded marshbird species

Five marshbird species (Australasian bittern, banded rail, spotless crake, marsh crake and North Island fernbird) were specifically targeted by this survey. Results on their distribution and abundance, as well as other birds observed during the course of the survey, are discussed below.

3.1.1 Australasian bittern (matuku)

Australasian bittern are a relatively large, rare, native marshbird widely distributed throughout New Zealand, and also found in Australia, Tasmania, New Caledonia and the Loyalty Islands (Heather and Robertson, 1996). Bittern normally live in tall, dense beds of raupo (*Typha orientalis*) and reeds in freshwater wetlands, wet habitats with a mixture of water purslane (*Ludwigia palustris*) and willow weed (*Epilobium angustifolium*), and damp pasture with large clumps of rush or tall fescue (*Schedonorus phoenix*) (Heather and Robertson, 1996). Numbers have declined due to habitat loss as wetlands are drained and reclaimed, and breeding cover is damaged by grazing, but they are potentially more common than estimated because they are cryptic and can live in small swamps not included in national surveys (Heather and Robertson, 1996). They are currently classified as Threatened (Nationally Endangered) (Miskelly *et al*., 2008), and are the only taxa of the five bird species focussed on by this survey to have decreased in national distribution between 1985 and 2004 (Robertson *et al*., 2007).

In 2010, bittern were observed at six sites, and reported from another six (Figure 4). A bittern was observed at Site 7 standing disguised in vegetation, and flew away when approached. Bittern were observed flying at Sites 9 and 22. A bittern was flushed at Site 23, prints were observed at Site 36, and a bittern was observed several hundred metres southwest of Site 43. Bittern were also reported from Site 12 (Matt Bloxham/Stuart Slade *pers. comm.*), Site 13 (Stuart Slade, *pers. comm.*), Site 20 (Maurice Walker, *pers. comm.*), Site 25 (Lance Reha *pers. comm.*), Site 38 (Anastacia Kirk/Victoria Radley *pers. comm.*) and Site 44 (Stuart Slade, *pers. comm.*). The only site where more than one bittern was observed was Reeves Road Inlet (Site 38), where a local landowner reported regularly seeing two bittern in the marshland. Bittern are known to fly substantial distances (Heather and Robertson, 1996), and as the sightings are on separate days and within close proximity it is possible that the increased number of records from this survey was caused by the same bird being sighted repetitively. However, due to their cryptic nature, it is considered far more likely that the bittern population at the Harbour would have been under-recorded during this survey.

These results represent an increase in abundance and distribution from 1990. In 1990, a total of four bittern were recorded at four of the 42 sites surveyed, and the population at the Harbour was estimated to be less than 10 birds (Owen, 1994a). Bittern were not recorded from the relatively small, fragmented marsh habitats around the Harbour (Figure 5). This contrasts with the present survey where bittern were recorded from several smaller sites (Figure 4). These were often in close proximity to larger sites with known populations, particularly Nukuhou River Marshes (Site 23), and this expanded distribution is probably a result of increased abundance at these larger sites. Bittern were also recorded during this survey at sites near Ruatuna Road, where they had previously not been reported. No bittern were recorded from sites near Port Ōhope or Kutarere, which are the most densely populated areas.

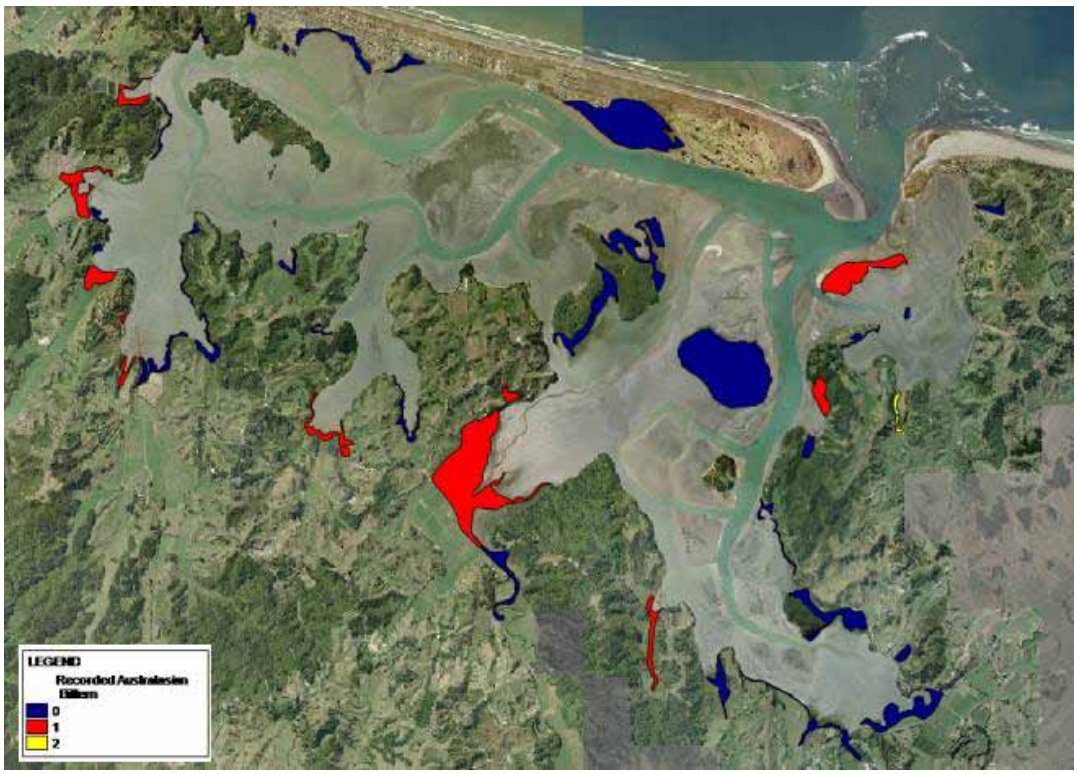

Figure 4 *Distribution of Australasian bittern at Ōhiwa Harbour in 2010 (12 sites)*

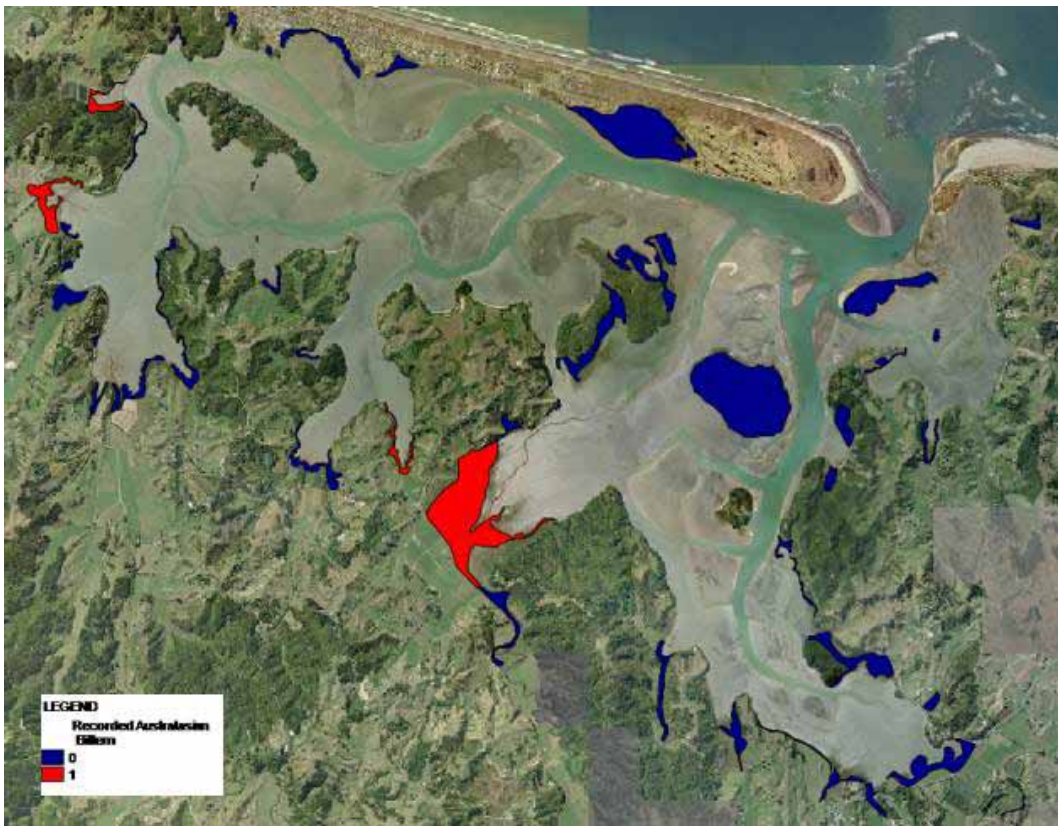

Figure 5 *Distribution of Australasian bittern at Ōhiwa Harbour in 1990 (4 sites) (Owen, 1994a)*

3.1.2 **Banded rail (mohu-pereru)**

Banded rail (*Gallirallus philippensis assimilis*) is a native New Zealand marshbird, with an unusual discontinuous distribution (Heather and Robertson, 1996). In the North Island they are not found south of a line from Taranaki to Ōpōtiki, except for one population at Mahia (Robertson *et al*., 2007). In the South Island they are only present around the northern coastline and on Stewart Island (Robertson *et al*., 2007). Banded rail live in freshwater swamps and estuarine mangroves and reedbeds (Heather and Robertson, 1996). They were once common throughout New Zealand but populations have decreased due to habitat modification and predation (Heather and Robertson, 1996). Their main habitat of rushes, sedges and marsh ribbonwood (*Plagianthus divaricatus*) occurs at the upper margins of saltmarshes, which are under continual threat in New Zealand from saltmarsh reclamation associated with coastal development (Botha, 2011). Banded rail are currently classified as At Risk (Naturally Uncommon) (Miskelly *et al*., 2008).

In 2010, a total of 57 birds were recorded at 35 sites in Ōhiwa Harbour (Figure 7). The most common form of observation was footprints (as shown in Figure 6). Four birds were seen, one bird was observed flying at Sites 9, 12 and 30, and one was flushed and flew 20 metres in the Nukuhou River Marshes (Site 23). Six birds were heard calling, one bird at Site 5 was heard and then responded to tape recordings, one bird at Site 9 made an alarm call, one bird at Site 20 responded to tapes, and two birds were heard calling at Sites 22 and 23. A hatched egg was found at Site 10.

Figure 6: Banded rail footprints at Site 9 (Tunanui Stream Inlet)

In 1990, 45 birds were recorded at 19 different sites (Figure 8). The Harbour population, based on the mapped available habitat, was estimated to be as high as 150 birds (Owen, 1994a). The increase in abundance and distribution between the two surveys is likely to be greater than what was recorded during this survey. Rail numbers were most likely under-recorded as some sites had areas of dense prints unlikely to have been caused by one bird, but as it was impossible to accurately estimate how many birds had caused them, only one bird was recorded. Rail prints were not well preserved in firmer substrates, which would further add to under recording. These factors have probably contributed to lower numbers being recorded during this survey at several sites where multiple rail were recorded in 1990.

One of the most significant changes to marshbird habitat between the two surveys has been significant expansion of mangroves within the Harbour (Park, 2005). Work in Ōhiwa Harbour has shown mangrove cover greatly increases banded rail foraging distances (Botha, 2011). Banded rail increased significantly in both abundance and distribution between the two surveys, with rail recorded at almost double the number of sites in 2010. The increased habitat area available due to mangrove expansion is likely to be a significant factor in this increased abundance and distribution.

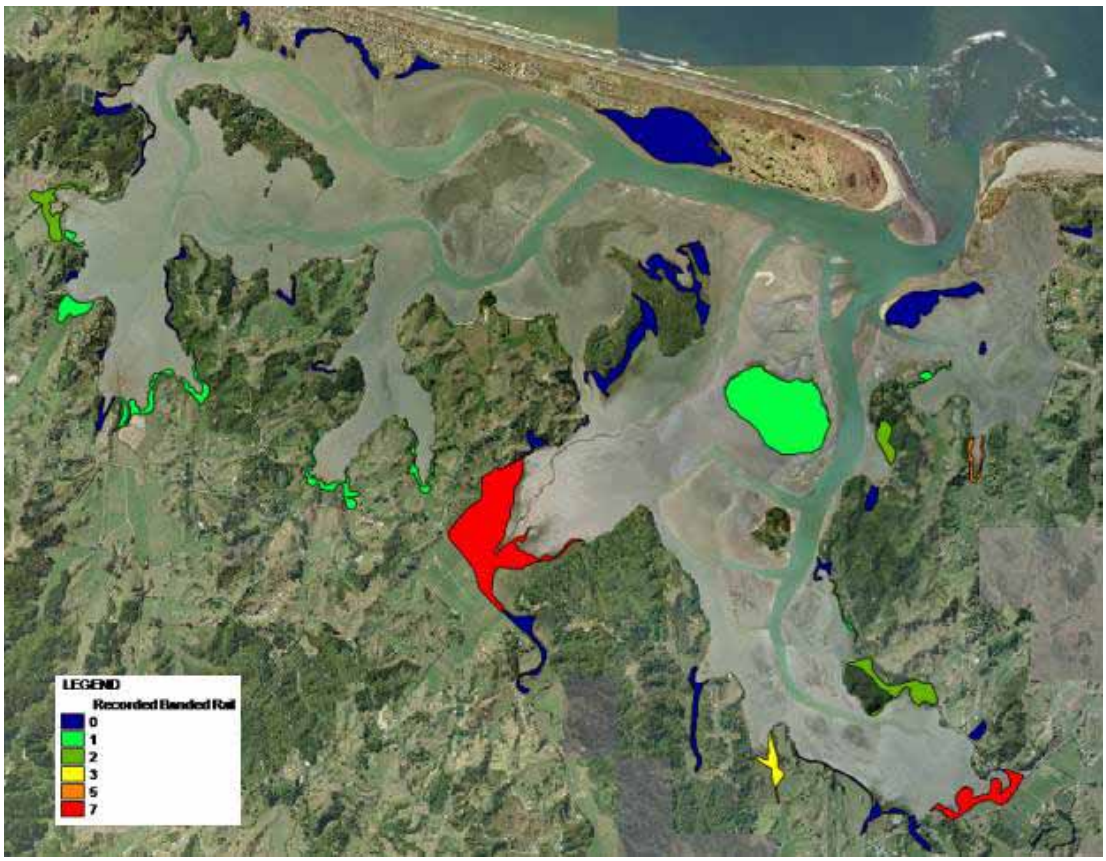

Figure 7 Banded rail distribution in Ōhiwa Harbour in 2010 (35 sites)

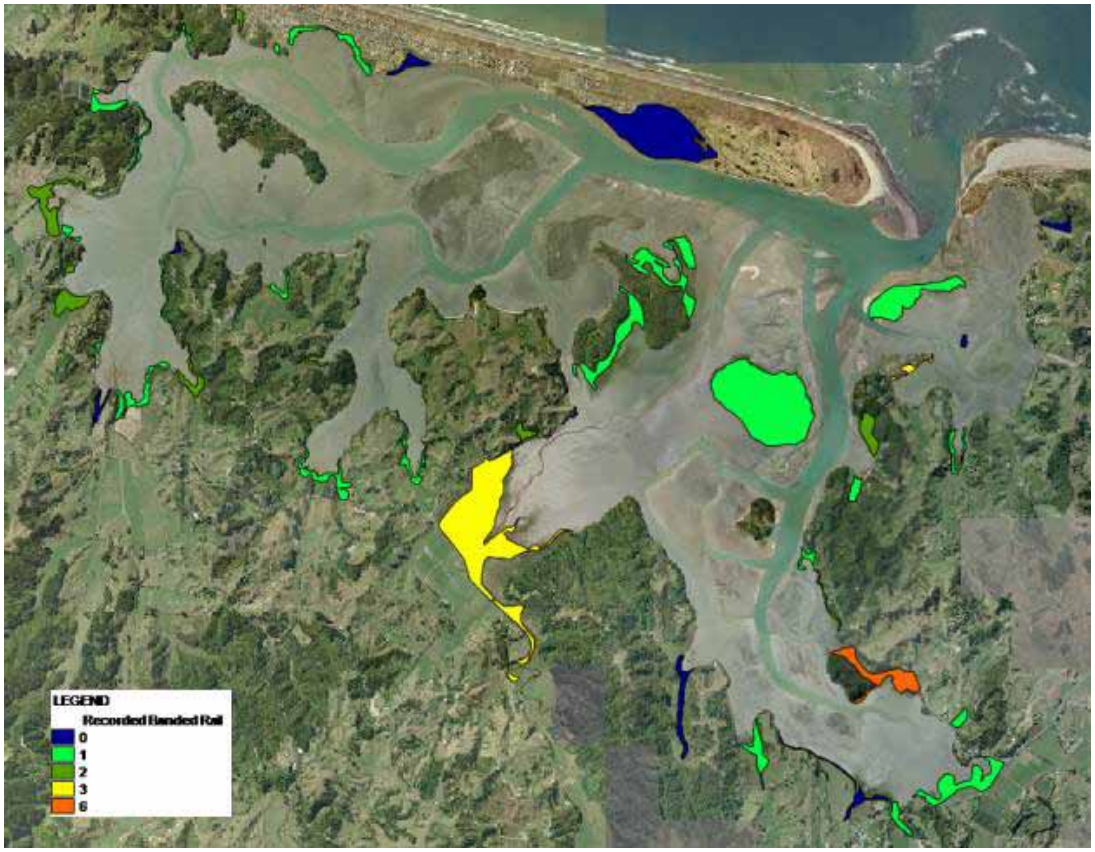

Figure 8 Banded rail distribution in Ōhiwa Harbour in 1990 (19 sites) (Owen, 1994a)

3.1.3 Spotless crake

Spotless crake, a native rail, are secretive and not often seen, rarely coming out into the open (Heather and Robertson, 1996). Spotless crake are present in the South Pacific, Australia and New Zealand. Within New Zealand, they are found in raupo and sedge dominated swamps throughout the North Island, but are only sparsely distributed in raupo swamps and reedbeds in the South Island and Stewart Island (Heather and Robertson, 1996). They are seldom found in flax-dominated wetlands. Lowland wetland drainage and introduction of mammalian predators have had a major impact on spotless crake, but because of their very secretive nature, they are probably more common than records suggest (Heather and Robertson, 1996). Their current threat ranking is At Risk (Relict) (Miskelly *et al*., 2008).

In 2010, a total of three spotless crake were recorded at two sites, and birds were reported from a further two sites (Figure 9). One bird was heard calling in response to tapes from raupo wetland at Wainui Stream (Site 20). Two birds were heard calling from a fairly small area of raupo at Toritori Point (Site 22) unsolicited. No birds were observed at Nukuhou River Marshes (Site 23) despite being recorded there recently in raupo (Keith Owen/Stuart Slade *pers. comm.*). Tapes were played repetitively in a large area of raupo wetland on Uretara Island Scenic Reserve (Site 39) where spotless crake are normally found (Stuart Slade, *pers. comm.*), but there was no response. The raupo wetlands around the Harbour where crake were located represent only a small area of Harbour vegetation and are vulnerable to disturbance.

In 1990, eight birds were recorded at three sites (Figure 10) - Wainui Wetland (Site 20), Nukuhou River Marshes (Site 23) and Hiwarau Road Wetlands (Site 25) (Owen, 1994a). Six of the birds were recorded replying to tape recordings in dense raupo reedlands at Hiwarau, and this site was concluded to contain the only viable population at the Harbour (Owen, 1994a). No birds were found there during the current survey. Spotless crake move seasonally in response to water levels (Moore *et al*., 1984 in Owen, 1994a), and as this site was only visited in January due to delays negotiating access, it is possible the site is still used by spotless crake. However, the wetland was observed to be in bad condition with stock grazing, contrasting with 1990, when the wetland was largely intact except for minor stock grazing around the margins, and was considered prime spotless crake habitat (Keith Owen, *pers. comm.*). Therefore, it is likely spotless crake no longer use this area, but if confirmation of absence was required, resurveying in November is recommended.

3.1.4 Marsh crake

The marsh crake is New Zealand's smallest rail, and is native to New Zealand (Owen, 1994a). Marsh crake are scattered sparsely in raupo swamps throughout New Zealand, and are also found in saltmarsh habitats and high-altitude wetlands in the South Island (Heather and Robertson, 1996). Their nests are usually made beside *Carex*, and generally not in raupo, unlike spotless crake (Heather and Robertson, 1996). Like spotless crake, their secretive nature means they are probably more common than records suggest (Heather and Robertson, 1996). Their current threat classification is At Risk (Sparse) (Miskelly *et al*., 2008).

No marsh crake were recorded in either the 2010 or 1990 survey. Marsh crake are extremely shy and cryptic, live in dense vegetation and seldom respond to taped calls (Heather and Robertson, 1996), so they are notoriously hard to survey for. It is possible that marsh crake are present at Ōhiwa Harbour, especially as tapes were

only very rarely played during this survey in areas of likely habitat due to time limitations, but their presence has never been confirmed.

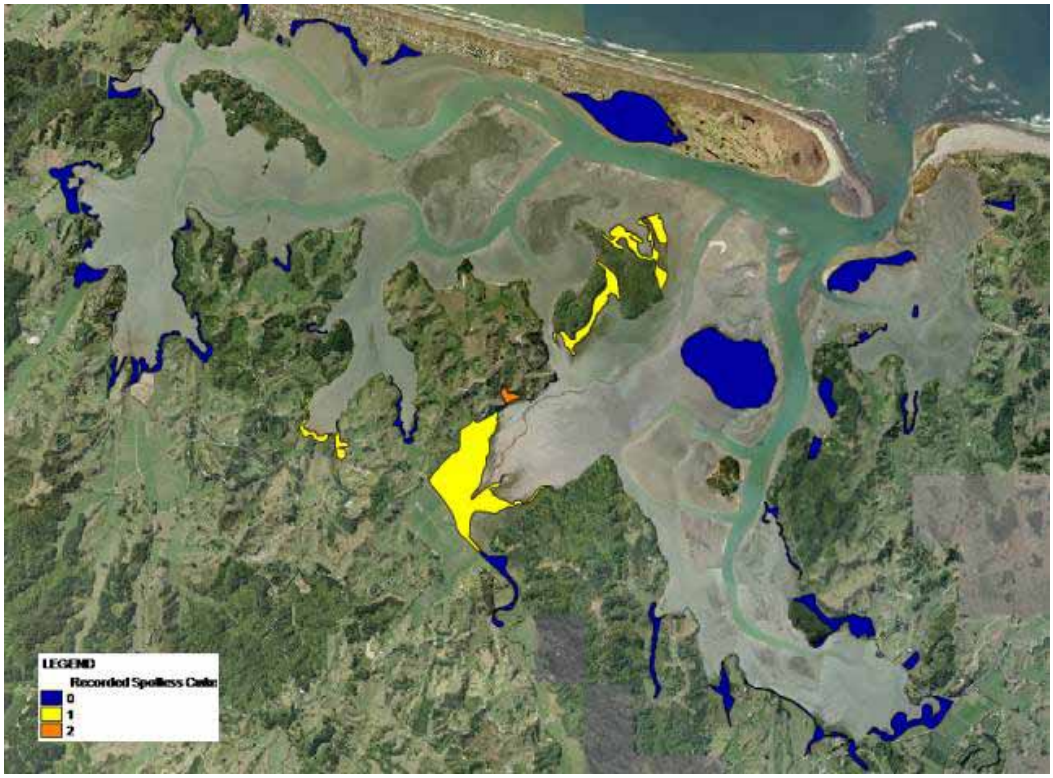

Figure 9 Spotless crake distribution in Ōhiwa Harbour in 2010 (4 sites)

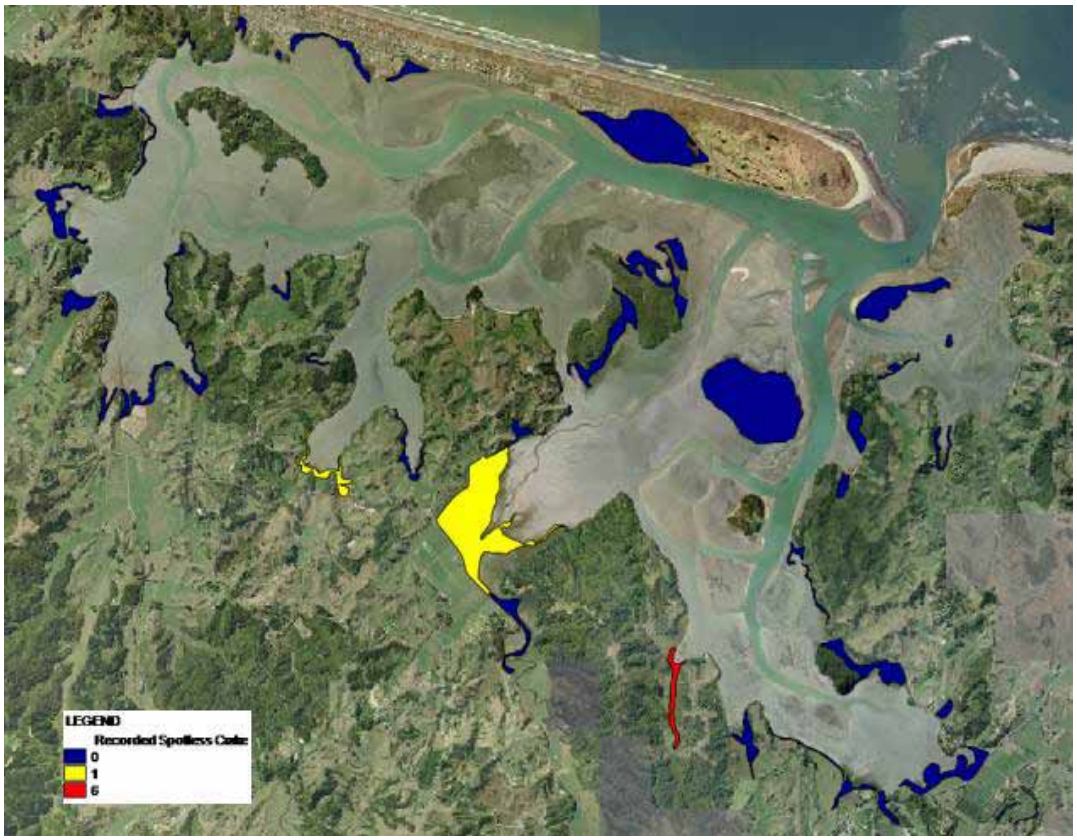

Figure 10 Spotless crake distribution in Ōhiwa Harbour in 1990 (3 sites) (Owen, 1994a)

3.1.5 North Island fernbird

Fernbird is an endemic genus with the North Island subspecies population centred on Northland, Coromandel and the Central Plateau (Robertson *et al*., 2007). Their main habitats are low, dense ground vegetation interspersed with emergent shrubs in drier swamps, pakihi, rush and tussock-covered frost flats and saltmarsh, low manuka (*Leptospermum scoparium*) scrub and some young pine plantations (Heather and Robertson, 1996). Fernbird were once abundant in extensive pre-European wetlands and scrublands, but have declined due to habitat loss, the introduction of mammalian predators, and periodic burning of wetland and scrub habitats (Heather and Robertson, 1996). They are currently classified as At Risk (Declining) (Miskelly *et al*., 2008), and it is likely a decline in populations would most likely go undetected due to their cryptic behaviour and preference for habitats rarely visited by people (Parker, 2002).

Figure 11 Two-tiered vegetation structure dominated by marsh ribbonwood and rushlands at Waiotane Stream (Site 12) where fernbird were observed nest-building

383 fernbird were recorded at 35 sites during the 2010 Ōhiwa Harbour marshbird survey (Figure 12). Fifty-five of these birds were seen, including three involved in nest building at Waiotane Stream (Site 12), 38 were both seen and heard, and 290 were heard. Eighty percent of sites had at least one fernbird present (Figure 12), with the greatest number (108) recorded at Site 23 (Nukuhou River Marshes). The sites where fernbird were not recorded were generally small and fragmented and in close proximity to residential settlement, such as along Ōhope Spit. Fernbird are most commonly located in habitat with a two-tiered vegetation structure such as that shown in Figure 11, usually areas with low dense ground vegetation and emergent shrubs (Barlow, 1983). This is explained by Best (1979) as a preference for areas with suitable calling posts due to the birds' territorial nature. During this survey, sites which contained large areas of this habitat typically supported the largest fernbird populations.

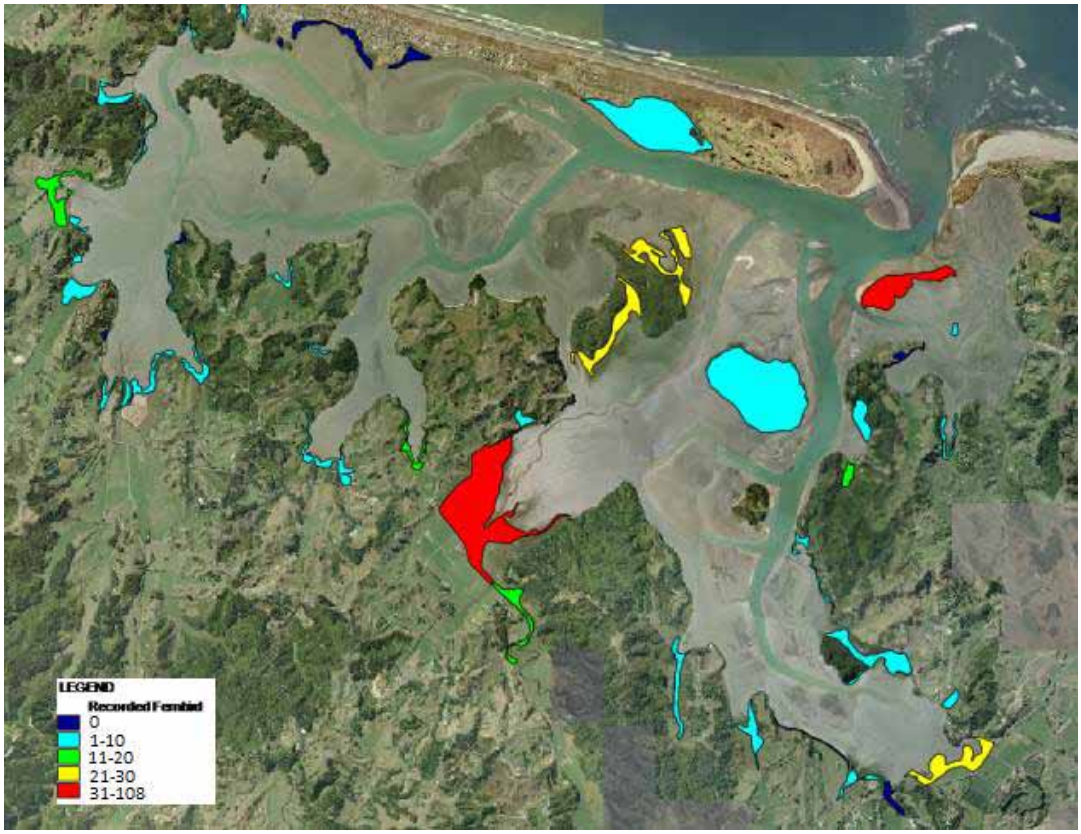

Figure 12 Fernbird distribution in Ohiwa Harbour in 2010 (35 sites)

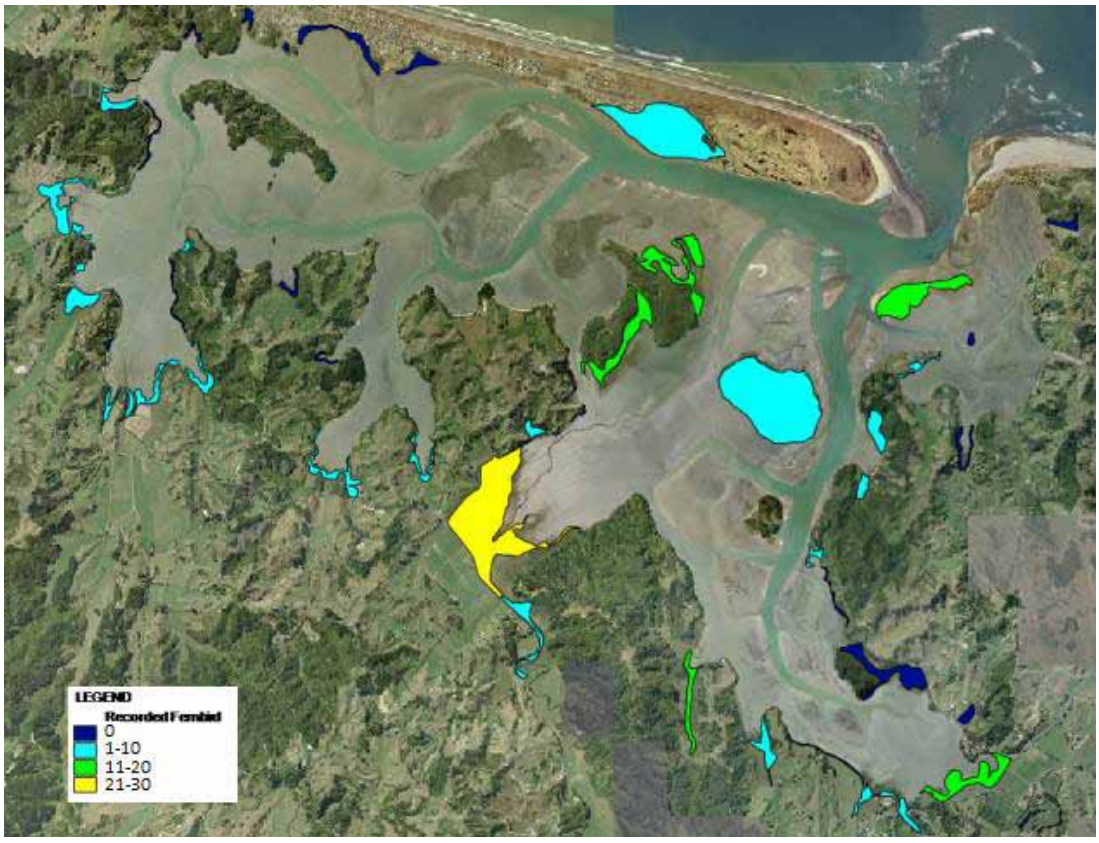

Figure 13 Fernbird distribution in Ohiwa Harbour in 1990 (25 sites) (Owen, 1994a)

The number of fernbird recorded in 2010 is significantly higher than the 145 fernbird heard at 60% of sites in 1990 (Owen, 1994a) (Figure 13). A large proportion of this increase (Figures 12 and 13) is represented by Nukuhou River Marshes (Site 23), Uretara Island Scenic Reserve (Site 39) and Whangakopikopiko Wildlife Refuge (Site 41). Pest control operations are undertaken at these sites, and they all have active care group involvement. For example, the Nukuhou Saltmarsh Care Group have been doing revegetation, weed control, pest tracking and control and regular monitoring of bird numbers since 2003, and they recorded an increase in fernbird numbers from 25 in 2003 to 91 in 2008 (Botha, 2011). Ongoing pest animal control and support for these care groups is important in increasing fernbird abundance at these sites, contributing to increased distribution around the Harbour.

Previous studies establishing territory size have made estimating total population size possible. The total fernbird population at Ohiwa Harbour was estimated to be 150 pairs in 1990 based on the area of available habitat (Owen, 1994a). This was based on an estimated territory area of 1.1578 ha for South Island fernbird (Bowdleria punctata punctate) in Southland by Barlow (1983). More recent work, specifically based on North Island fernbird, found an average territory size of 0.522 ha (Parker, 2002). This is less than half the size Owen (1994a) based population estimates on, which is suggested to be the result of productivity differences, or invasive species altering ecological dynamics, particularly through competition for resources (Parker, 2002). This estimate suggests that in the absence of significant change to available habitat, the population at the Harbour could be about 480 pairs. The presence of predators and areas of poor habitat quality means this number would be significantly less, but is still likely to be more than the 383 individuals recorded during this survey, particularly as both surveys are likely to be an under representation of the number of birds present. Antiphonal singing between fernbird pairs makes it easy for a pair to be recorded as an individual (Owen, 1994a). Furthermore, while Nukuhou River Marshes (Site 23) represents a large proportion of recorded birds in both surveys, only part of the site was surveyed during either study so numbers would have been higher had a full assessment been made of fernbird in all areas of the marshes (Keith Owen, *pers. comm.*).

3.1.6 Other wetland birds of interest

Swamp harrier (*Circus approximans*) (also known as Australasian harrier), pukeko (*Porphyrio melanotus melanotus*) and New Zealand kingfisher (*Todiramphus sanctus vagans*) are not regarded as threatened species, but as regular inhabitants of wetlands they are still of interest to marshbird surveys in the Harbour. Unlike the other more threatened marshbird species, they have benefited from the conversion of forest to farmland since European settlement (Heather and Robertson, 1996). As these species were not the focus of this survey, it is likely greater numbers were present, but simply not recorded by observers.

Swamp harrier are the second most commonly seen native taxon throughout New Zealand (Robertson *et al*., 2007), and one of only two birds of prey native to New Zealand (Heather and Robertson, 1996). In 2010, 21 harriers were recorded at 17 of the sites surveyed. They were most commonly observed flying overhead, particularly in sites along Wainui Road near farmland. Two birds observed at Nukuhou River Riparian Margins (Site 24) were suspected to be nesting in an area of raupo wetland. A predated banded rail found at Ōhiwa Scenic Reserve Inlet (Site 36) was suspected to have been due to a harrier. In 1990, harrier were only recorded at six sites (Owen, 1994a). A communal harrier roost recorded in 1990 at State Highway 2 (Overflow Bridge) (Site 30) was not relocated in 2010. The current survey supports the findings of Owen (1994a) that Ohiwa Harbour provides

important habitat for harriers, particularly the extensive indented shoreline and wetlands of the Harbour where prey densities are high (Owen, 1994a).

The distinctive appearance of the native pukeko, with its blue plumage and bright red beak, make it one of the more well-known wetland species. About 15 subspecies have been described, with the form *melanotus* also found in Australia, Tasmania and Norfolk Island (Heather and Robertson, 1996). Pukeko are considered likely to have only become established in New Zealand within the past 1,000 years and abundant only several hundred years ago as forest was cleared to pasture, because few are known from sub fossil material or middens (Heather and Robertson, 1996). They are considered a pest in some areas due to their grazing and damage to crops (Heather and Robertson, 1996), and one resident adjacent to Wainui Stream (Site 20) is reported to be sporadically controlling them. This requires a Fish and Game license during the hunting season, and a permit outside the season, or is otherwise illegal. In 2010, 71 pukeko were recorded at 30 sites around the Harbour and the only area where they were not common was the residential area along Ōhope Spit. Large flocks were present at several sites and extensive grazing sign was evident in several wetlands, as shown in Figure 14. In 1990, pukeko were recorded at 16 sites, and the results indicated a resident population was established at the Harbour (Owen, 1994a). Territories were considered likely to centre on the saltmarsh sedgelands but also extend onto adjacent farmland (Owen, 1994a). The current survey supports these findings, and shows the resident population is increasing in abundance and distribution.

Figure 14 Large area of pūkeko sign at Ouaki Creek (Site 21)

The New Zealand kingfisher is a native New Zealand sub-species widespread throughout the country (Owen, 1994a). It has an almost complete occupation of all parts of the North Island (Robertson *et al*., 2007), and occupies many habitats, particularly bush patches near the coast, tidal estuaries and mangrove swamps (Heather and Robertson, 1996). Forty-one kingfisher were recorded at 35 sites in

the 2010 survey, compared to only 12 in 1990 (Owen, 1994a). Owen (1994a) surmised that the Harbour was an important seasonal habitat for large numbers of kingfisher from the surrounding district over the autumn and winter months, with a much smaller resident population sustained throughout the year. The current survey shows this smaller resident population may be increasing.

3.2 Other recorded bird species

During this survey 45 different bird species were recorded around the Harbour. More detail on the different species recorded at each site is provided on the site sheets in Appendix 2, and a comprehensive species list is provided in Appendix 3.

Only 35 different species were recorded in 1990 (Owen, 1994a), although it is likely that several of the species were present during both surveys but simply not recorded as they were not the focus of the work. Goose (*Anser anser*), European greenfinch (*Carduelis chloris*) and house sparrow (*Passer domesticus*) were the only three species not recorded in 2010 that were present in 1990. These species are considered highly likely to still be present, especially as several survey forms included 'finches' or 'sparrows', but as they were not the focus of the survey attention was not given to recording them. Thirteen species were observed in 2010 that were not recorded in 1990, most of which are considered likely to have still been present in 1990. Significant changes in distribution are suspected for several species. An expanding distribution of royal spoonbill (*Platalea regia*) between 1985 and 2004 is reported in (Robertson *et al*., 2007), so it is likely this species was not present in 1990. A significant spread and increase of peafowl (*Pavo cristatus*) have been recorded in the Harbour catchment (Hall, 1997), with a number of localities where peafowl are now of real concern to landowners due to grazing damage to pasture. The presence of North Island weka (*Gallirallus australis greyi*) in 2010 is one of the most significant changes between the two surveys.

Figure 15 Overview of Ōhiwa Scenic Reserve Inlet (Site 36), where weka were recorded

North Island weka were not recorded at Ohiwa Harbour in 1990 (Owen, 1994a), but were recorded at Ohiwa Scenic Reserve Inlet (Site 36) in 2010 (Figure 15). North Island weka were once present over much of the North Island, but had declined to extinction in all but Poverty Bay and Northland by the 1930s (Beauchamp *et al*., 1999). Weka remained very common on the east coast, into the Raukumara foothills and urban Gisborne (Beauchamp *et al*., 1999) until the 1980s, when they disappeared almost overnight, with one tiny remnant population remaining near Motu (Tim Senior, *pers. comm.*). This decline and lack of ability to recover is not well understood, particularly as weka are omnivorous, prolific and capable of reaching high densities in much-modified landscapes (Bramley, 1996). There are some suggestions that severe droughts and an associated lack of invertebrates in leaf litter on forest floors may be factors in this decline (Keith Owen, *pers. comm.*). The remnant population suddenly started expanding about 10 years ago, with birds now extremely common in many areas to the east of Ōpōtiki, and the population moving quite rapidly west along the coast (Tim Senior, *pers. comm.*). Sightings around the eastern side of Ōhiwa Harbour have occurred over the last year, with two birds caught in possum traps (Hemi Barsdell, *pers. comm.*).

Weka are currently classified as Threatened (Nationally Vulnerable) in (Miskelly *et al*., 2008) and have assorted benefits to biodiversity. They are one of the few remaining large birds that distribute seeds, making them important facilitators of forest regeneration and important for increasing diversity in farmland habitats (Beauchamp *et al*., 1999). However, there are several issues associated with their conservation. Weka were used by Māori and early European settlers for food, oil and feathers (Heather and Robinson, 1996), and their availability for mahinga kai (sustainable harvest) remains an issue for some iwi (Beauchamp *et al*., 1999). They can become serious pests by feeding on newly sown crops, and come into conflict with conservation programmes by killing invertebrates, reptiles and seabirds, and eating eggs of ground-nesting birds (Heather and Robinson, 1996). Around the Harbour, weka have implications for rodent and possum control programmes owing to their inquisitiveness and willingness to try eating almost anything (Tim Senior, *pers. comm.*). Several residents around Ohiwa have voiced concerns about their arrival at the Harbour, and they may have an impact on ground-nesting birds. It is recommended they are focussed on in any future marshbird surveys at the Harbour.

3.3 Threats and impacts

Wetlands have been greatly reduced in extent throughout New Zealand and presently occupy less than 1% of their former area in the Bay of Plenty (Cromarty, 1996). Remaining wetlands, which the marshbird species described in the previous section are heavily reliant upon, are subject to a range of threats and disturbances. Data were collected throughout this survey on threats and impacts to marshbird habitat in Ohiwa Harbour, and these results are summarised below. The results are similar to those reported in Owen (1994a), with most differences probably associated with threats not being recorded rather than significant changes. For more detailed site-specific explanations, refer to the site summaries in Appendix 2.

3.3.1 Reclamation

Reclamation involves infilling of an area previously inundated by the tide to allow land to be converted for agricultural, urban and industrial uses. Reclamation occurs either directly as wetlands are contained and drained, or indirectly, through such activities as dumping of farm and household rubbish. It results in direct loss of habitat, as well as a reduction in the ecological integrity and water quality of the Harbour (Owen, 1994a). Reclamation also alters salinity gradients, which can affect

spawning locations and vegetation zonation (Clarkson *et al*., 2003), impacting on food and habitat availability for marshbirds. In some places (e.g.: Wainui Stream (Site 14)) reclamation means sites bear little resemblance to what they looked like previously and marshbird habitat is completely lost. The different types of reclamation observed around the Harbour are discussed more fully in (Owen, 1994a).

Various types of reclamation were observed during the 2010 survey. Only 13 sites were recorded as affected by reclamation, compared to 19 in 1990, but this is thought to be due to inconsistencies in recording between observers. A large number of the sites are impacted by reclamation for road causeways around the Harbour edge (Figure 16). These road causeways impact on tidal flows, destroy habitat area, promote adventives and the associated traffic poses a direct threat to birdlife. In areas where the berm is not covered in boulders for erosion protection, these are normally the weediest parts of the wetland. Although these road causeways impact on a large area of marshbird habitat, it is unlikely a politically acceptable alternative can be provided, but it remains important to ensure sufficient tidal flow into these areas.

Figure 16 Reclamation for road construction and drain construction to reduce upstream flooding risk have significantly lowered water levels at Waiotane Stream (Site 12). Restricted tidal flows appear to be limiting marshbird food availability.

Other types of reclamation observed during the survey, which are discussed in more detail in the Site Sheets in Appendix 1 are:

- Upper areas of sites being drained and reclaimed for farmland, with a large stopbank often present (Site 9, 12, 14, 15, 21, 23, 26, 27, 38). These areas were frequently observed being used by pūkeko (e.g.: Sites 14, 21) so are still of value to certain marshbird species.

- Erosion protection to protect residential properties, using rock rip rap or other forms of debris (Site 3, 37).
- Spoil banks being deposited alongside channelised streams (Site 29).
- Construction of a raised and well-defined footpath through Ōhiwa Domain (Site 44).

3.3.2 Drainage

Altered water levels in a wetland affect marshbird food availability and can promote increased abundance of adventives, reducing suitable habitat area. The drainage of a site can be affected either directly, as drains are constructed to drain and reclaim the wetland, or indirectly, as drains from adjacent areas discharge into the wetland (Owen, 1994a). Drain maintenance is also of concern, as vegetation can be damaged and adventive plants proliferate on the associated embankments (Owen, 1994a). Drainage activities can considerably reduce the value of a wetland to marshbird species. For example, lowering of the water table through drain construction at Waiotane Stream (Site 16), as shown in Figure 12, has resulted in the wetland drying out. This leads to deteriorating vegetation, causing the fauna to become impoverished, as well as higher predation levels with easier access for predators, and marshbird populations suffering through habitat degradation and fragmentation (Owen, 1994a). 24 sites were recorded as affected by drainage activities in 2010, which is almost identical to the number recorded in 1990.

Various drainage activities were impacting on the sites surveyed in 2010:

- Drains discharging into wetlands, which as well as impacting on water levels within a wetland, increase the likelihood of sediment and contaminants arriving in a wetland (Site 4, 6, 7, 19, 23, 26, 31, 32, 38). Wandering jew (*Tradescantia flumienensis*), a pest plant, is present in a roadside drain discharging into Site 6.
- Stormwater or farmland drains being routed through wetlands (Site 1, 2, 3, 10, 11, 13, 28, 30, 35).
- Streams being channelised, or in some cases piped, which as well as restricting water availability for the rest of the wetland and in some cases restricting native fish passage and other food availability, normally have significant adventive plant cover associated with the riparian margins (Site 9, 12, 14, 17, 26).
- Evidence for direct drainage: pump houses (Site 16, 21).

3.3.3 Rubbish

Most incidences of rubbish observed during this survey were relatively minor, such as the shoes abandoned at several sites near Kutarere. However, in some cases, rubbish can have a more serious ecological effect by contributing to infilling of the Harbour, the spread of adventive species and an increase in pests such as rodents and wild cats which prey on marshbird species. As would be expected, more commonly frequented sites had more significant rubbish problems. For example, Harbour Quarry Shoreline (Site 8) is situated adjacent to a popular pull-over spot along Wainui Road, and was unsurprisingly heavily impacted by rubbish. The number of sites affected by rubbish increased slightly between 1990 and 2010, but this may be due to more litter being recorded in the current survey. Different types of rubbish observed during this survey were:

- Litter, particularly in sites close to the road. Severity ranged from a few food wrappings to piles of old cars. Litter was recorded at 57% of survey sites, and is strongly likely to be present at other sites, just simply not recorded.
- Flotsam was especially obvious on the island sites. Large numbers of bait bags had washed up on Uretara Island Scenic Reserve (Site 39) and Motuotu Island Nature Reserve (Site 40), and a storm debris line was evident along McCoy Shoreline (Site 16). The severity of this problem for individual sites would be linked to different currents within the Harbour.
- Decaying farm machinery or building supplies were at Sites 9, 13, 14, 30 and 32.
- Tree cuttings were present at Harbour Quarry Shoreline (Site 8). Several cases of organic rubbish dumps were reported in 1990 and although it is possible these simply were not recorded during this survey, it is hoped that the reduced number observed in 2010 may be due to increased knowledge of the impact of this activity.
- Firework debris was visible at Harbour Quarry Shoreline (Site 8), which is a cause for concern as a potential fire would have serious effects on the marshbird habitat.
- A disintegrating oyster barge is present at Wainui Stream (Site 20).

3.3.4 Public utilities

Public utilities impact on several of the sites, with varying degrees of impact. Immediately upstream of Awarapatuna Stream Inlet (Site 7) there is a sewage treatment plant, that would have potential to increase harmful discharges to that site. High-voltage power lines are present across several sites (e.g.: Sites 7, 9, 26) which increase fire hazard to these sites, as well as bird strikes. Tracks cross several sites, particularly ones close to residential settlements, which would increase the risk of adventive species invasion. Fewer sites were recorded as impacted on by public utilities in 2010, but this is potentially due to power lines not being recorded at several sites.

3.3.5 Livestock grazing and fencing impacts

Inadequate fencing in some areas around the Harbour is allowing stock access to marshbird habitat sites. Grazing and trampling by livestock affects the structure, diversity, productivity, succession and nutrient dynamics of plant communities (Tanner, 1992), which reduces the value of these sites to marshbird populations. Marginal vegetation and water quality is also affected by pugging and erosion, nutrient addition, bacterial contamination and increased weed invasion (Tanner, 1992).

Twenty-seven percent of sites surveyed in 2010 had clear evidence of stock impact, with varying degrees of severity. Tracks were present at several sites (Site 9, 18, 29, 31). The occasional presence of stock at Wainui Stream (Site 20) and when feed is short in winter at Nukuhou River Marshes (Site 23) were reported by neighbouring residents during the survey. Horses (*Equus caballus*) were observed at Hiwarau Wetlands (Site 25), as shown in Figure 17, cattle (*Bos taurus*) were present in State Highway 2 (Overflow Bridge) (Site 30), and goats (*Capra hircus*) were observed in Reeves Road Inlet (Site 38). Poor fencing means stock have potential access to parts of Te Awawairoa Stream (Site 26) and Kutarere Stream Mouth (Site 28). Pukeko grazing damage was observed at several sites, as shown in Figure 14 at Ouaki Creek (Site 21). Large areas of saltmarsh were grazed at State Highway 2 (Overflow Bridge) (Site 30), and there were stock tracks in other areas of the wetland.

The ability of stock to penetrate into Harbour areas was often linked to inappropriate placement of fence lines. Several sites had no fencing, but these were normally located next to residential areas or on islands, so at little risk from stock access. Old fence lines were present at many sites, and the wire could pose a hazard to birdlife (Sites 7, 9, 13, 14, 15, 16, 22, 31). In some places (Site 19) sites were well fenced with a combination of barbed wire and electric fencing, but former parts of the wetland were still included in paddock areas.

Figure 17 Horses heavily grazing raupo wetland vegetation at Hiwarau (Site 25)

In 1990, 67% of sites had clearly been damaged by domestic livestock grazing, with the only un-grazed sites being either on islands or reserves, or adjacent to residential or reserve areas (Owen, 1994a). In almost every case, the sites were inadequately fenced, with fence lines often placed in inappropriate positions that incorporated estuarine vegetation into farms (Owen, 1994a). Several of the sites described as intensively grazed appear to be in better condition during this survey, but as the focus of this survey was on the marshbird populations themselves, this is not intended as a complete assessment, and confusion with site boundaries during fieldwork may have affected results.

3.3.6 Adventive plants

Adventive plants were present at every site visited during this survey, although sites were affected to varying degrees of severity. Many plants pose a very limited threat to marshbird habitat, but some adventive species threaten the survival of selected indigenous communities and individual species of flora and fauna (Beadel, 1990). This report is intended only as a brief overview of adventive plants, as the focus of this survey was on marshbird populations and botanical knowledge varied between team members. The dominant species at each site are recorded on the site sheets in Appendix 2.

Ninety-three percent of the 28 species of adventive plants identified during this survey are found in terrestrial environments. It is likely that this proportion is a result of freshwater and adventive plants not being recognised. Ten species were observed at more than five sites: wattle (*Acacia* spp.) (26 sites), blackberry (*Rubus fruiticosus* agg.) (23 sites), pampas (*Cortaderia selloana*) (23 sites), gorse (*Ulex europaeus*) (22 sites), pine (*Pinus* spp.) (17 sites), grasses (12 sites), wild ginger (*Hedychium gardnerianum*) (7 sites), privet (*Ligustrum lucidum*) (7 sites), lupin (*Lupinus arboreus*) (6 sites) and bindweed (*Calystegia soldanella*) (6 sites). These proportions appear similar to what was recorded by Owen (1994a), and once again a large percentage of the terrestrial adventives recorded had colonised stopbanks, spoil embankments, reclamations, or disturbed areas, especially along the margins of wetlands where livestock grazing had impacted. Species for priority attention (Beadel, 1990) are: wattle, blackberry, pampas, gorse, pine, wild ginger, privet, lupin, honeysuckle (*Lonicera japonica*), bamboo, moth plant (*Araujia sericifera*), montbretia (*Crocosmia x crocosmiiflora*) and wandering jew.

Willows were the only freshwater adventive plant recorded during this survey, recorded at 18 (41%) of the sites. The different species of willow were often not differentiated on the survey sheets, but grey willow (*Salix cinerea*) and crack willow (*Salix fragilis*) were the dominant species recorded. Both are regarded as problem plants (Beadel, 1990) and are known to have significant effects on freshwater wetland areas, and attention should be given to their control.

Sea couch (*Elytrigia pycnantha*) and saltwater paspalum (*Paspalum vaginatum*) were the only two estuarine adventive plants recorded during this survey, although the other species listed in Owen (1994a) are potentially still present, but simply not recognised by observers on this survey. Sea couch was recorded at 28 (64%) of the sites in the Harbour, an identical distribution to that recorded in Owen (1994a). As discussed in Owen (1994a), although it is not formally listed as a problem plant, its widespread distribution at the Harbour is a concern as it is encroaching into native stands of saltmarsh, modifying wildlife habitats and reducing their value to marshbird species. Saltwater paspalum was only recorded from 3 (7%) of sites during this survey, but as its identity was only confirmed at the end of the study, it is almost certainly more widely distributed but simply not recognised during the survey. Saltwater paspalum should also be a priority for control, because it alters the composition of the indigenous vegetation, reduces habitat for birds and fish, and changes sediment accumulation and estuarine hydrology (Shaw and Allen, 2003). The presence of *Spatina alterniflora*, observed near Kutarere in Owen (1994a) was not confirmed during this survey. If this species is rediscovered, it should be removed as it is a major problem, completely excluding native vegetation from sites and also invading non-vegetated substrates, increasing silt accumulations and causing loss of wading bird habitat (Beadel, 1990).

3.3.7 Adventive animal species

Evidence for various adventive animal species was present at 14 marshbird habitat sites around the Harbour, an identical number to that recorded in Owen (1994a). These species can impact significantly on marshbird species directly through predation and indirectly through competition for resources. As previously discussed, areas where predator control is being undertaken were associated with healthier marshbird populations.

Domestic animals pose a problem in sites located close to residential areas. Dogs (*Canis familiaris*), or dog prints, were observed in sites along Ōhope Spit (Sites 1, 2, 3, 4 and 5), and barking adjacent to Burma Road (Site 10) and Hiwarau Wetlands (Site 25). Cat prints were observed in Site 4, and a cat was viewed on the hillside above Site 19. While surveying at Port Ōhope (Site 1) a cat was reported as lost by a resident, which apparently commonly used the area for hunting.

A range of other adventive species was observed around the Harbour. Rat (*Rattus* spp.) prints were found at Munro subdivision (Site 2), Pukehoko (Site 11), Waiotane Stream (Site 12), Ouaki Creek (Site 21), State Highway 2 (Overflow Bridge) (Site 30), Pataua Island Scientific Reserve (Site 32), Ruatuna Road Inlet (Site 34), Pukeruru Point Inlet (Site 35), Ohiwa Loop Road Spit (Site 37) and Reeves Road Inlet (Site 38). A dead rat was also observed on the road adjacent to this site. These were the only recorded observations, but rats are likely to be present at more sites around the Harbour. A large neighbouring chicken (*Gallus* domesticus) population was present at Te Kooti Inlet (Site 13); meaning rats are highly likely to be present at this site. A possum (*Trichosurus vulpecula*) skeleton was observed at Paparoa Road Peninsula Inlet (Site 19), and possum damage was observed at Ohiwa Scenic Reserve Inlet (Site 36). Hedgehog (*Erinaceus europaeus*) prints were observed at Waiotane Stream (Site 12).

3.3.8 Residential and recreational impacts

A number of sites are used extensively by neighbouring residents and recreational users. While recreation is an effective way of increasing people's appreciation for the environment, it can also compromise ecological values through trampling, increased adventive plant spread and easier access for predators.

Human tracks were present at 12 (27%) of sites, and vehicle tracks at 4 (9%) of sites, but were probably not recorded at several other sites. Oyster collectors use several sites for Harbour access, as evidenced by piles of empty shells (Sites 7, 8, 27, 29, 30), and whitebaiters also use several sites (Sites 20, 23). Sites along Ōhope Spit (Sites 1, 2, 3, 4 and 5), with residential houses in close proximity, are used recreationally by neighbouring residents for activities including fishing, walking, dog exercise and Harbour access. Recreational use still impacts on some of the more remote sites, as evidenced by adventure race signage at McCoy Shoreline (Site 16). Large areas of dead or damaged mangroves were present at several sites. Although most are linked to a hail storm event several years ago, it is suspected several are the result of illegal clearance by local residents.

3.3.9 Harmful water discharges

Assorted harmful water discharges were observed during the course of this survey, most of which were probably unlikely to impact directly on the marshbird populations, but could have an impact on the invertebrate species they prey on. An oily sheen was present on surface water in many of the wetland sites, which although initially suspected to be a harmful water discharge was later shown to be naturally occurring algae. Whakatāne District Council's sewage plant is present upstream of Awarapatuna Stream Inlet (Site 7) so there are potential associated harmful water discharges. All the sites surveyed, aside from the islands, are likely to be subject to harmful runoff from farmland, roading or residential areas but direct evidence was only seen at three sites. A stream flowing into Paparoa Road Inlet (Site 18) had a distinct green tinge, frothy, dark and smelly water was present at Papanui Road (Site 29) and there was evidence of oil run-off from the road in State Highway 2 (Overflow Bridge) (Site 30).

3.4 Habitat quality rankings

A habitat quality was assigned at the end of each site visit to represent the value of that area to marshbird populations. Some results were altered after the field survey as survey members gained a broader perspective on sites around the Harbour. The same system described in Owen (1994a) was used to enable comparison between the two surveys. This system was based on a three-tier ranking of outstanding, high or moderate, and used the criteria described in the methodology section. This system was felt to be too coarse and subjective by many team members, and the results are intended to be used solely as indicative.

In both surveys, the only site ranked as 'Outstanding' was Nukuhou River Marshes (Site 23), pictured in Figure 18. This ranking reflects almost all the criteria being met, but particularly the importance of the site in terms of size, number of different species, and relative number of individuals of several of the rare species. This site also appears to be acting as a source of marshbirds for several neighbouring smaller sites, such as Toritori Point (Site 22).

Twelve (27%) of sites were ranked as 'High' in 2010, compared to only nine (21%) in 1990. This increase is most likely due to care group work increasing the biodiversity values of several sites, notably Nukuhou River Riparian Margins (Site 24), as well as an increased distribution of some of the rarer marshbird species raising the value of some of the smaller sites such as Toritori Point (Site 22). This increase will also at least partially have been affected by the subjective nature of the ranking system. For example, the ranking of Pataua Island Scientific Reserve (Site 32) was debated as a large part of the area is comprised of mangroves where no marshbirds were observed, but eventually it was decided this area provided a buffer for the reedlands and rushlands where birds were observed, and as banded rail are known to inhabit this area (Keith Owen, *pers. comm.*), the site was ranked as 'High.' This site was only ranked as 'Moderate' in 1990.

Figure 18 Nukuhou River Marshes (Site 23), the only surveyed site ranked as of 'Outstanding' value to marshbirds in 1990 and 2010

Two sites ranked as ‘High’ in 1990 were considered to be of only ‘Moderate’ value in 2010. Waiotane Stream (Site 12) contained bittern, banded rail and fernbird but was considered to have been highly modified through drainage and reclamation, greatly decreasing the value of the site to marshbird populations. Hiwarau Wetlands (Site 25) was also considered to only have ‘Moderate’ value- habitat diversity was present, but grazing was severely impacting on most of the wetland, and no spotless crake were found. Removing grazing from this wetland and prohibiting stock would see spotless crake return (Keith Owen, *pers. comm*.), and the habitat quality improve significantly.

Part 4: Discussion

Interpretation of the results in the previous section is limited by the snapshot nature of this survey and the cryptic behaviour of the target species. These limitations, and the significance of the results, are discussed in the following section.

4.1 Limitations of the survey

The snapshot nature of the survey means results may be affected by temporal variation in bird distribution and inconsistencies between surveyors. Temporal variation in marshbird distribution occurs as birds move in response to factors like water availability (Moore *et al*. in Owen, 1994a), and may have affected results on bird abundance and distribution. Inconsistencies between surveyors occur as a result of increased time observing, increased knowledge or more detailed recording, and as previously discussed will have affected results on vegetation descriptions and some threat and impact data. In order to establish a true scientific baseline, monitoring protocol for Australasian bittern from the Department of Conservation recommend 780 counts per sampling season, with each count a length of 15-20 minutes (O'Donnell, 2009a). This type of monitoring was beyond the resources available for this survey, and the snapshot nature means it is intended as presence/absence information rather than a detailed census of marshbird species.

Interpretation of these results is further limited by the cryptic nature of the target marshbird species. As previously discussed, this survey is likely to have under recorded these species, particularly those that were hardest to target. For example, some work has shown playing recorded bittern calls to be counterproductive (O'Donnell, 2009a), so no tape recordings were played during the survey, which made bittern especially hard to target. Any interpretation of the results should therefore consider that they under represent marshbird species at the Harbour.

4.2 Significance of the survey

Despite the limitations associated with the snapshot nature of this survey and the cryptic behaviour of many of the surveyed species, these results still show Ōhiwa Harbour consists of important habitat for marshbird species, with strong populations of several different species. This was further demonstrated in subsequent surveys of Whakatāne Harbour in January 2011, where albeit there is less suitable habitat area, significantly less birdlife than would be expected based on the results of this survey was found (Hemi Barsell, *pers. comm.*).

Australasian bittern were observed at six sites in 2010, and reported from another six. This population is still smaller than that in Tauranga Harbour, where 25 bittern were observed in a survey (Owen, 1993). But ased on a nationwide population estimate of less than 1,000 birds (Ogle and Cheyne, 1981 in Owen, 1994a), the Ohiwa population represents over 1% of the national population and is thus considered nationally significant.

A total of 57 banded rail were recorded at 35 different sites around Ohiwa Harbour in 2010, and as previously discussed is likely an under-recording of total abundance. The population in Tauranga Harbour is significantly larger, estimated to be up to 640 birds (Owen, 1993). However, the results from the survey support the finding in Owen (1994a) that Ohiwa Harbour supports one of the few long-term viable populations in the region, and the discontinuous nature of banded rail distribution in New Zealand makes the Ohiwa Harbour population nationally significant.

Only three spotless crake were recorded in 2010, meaning this population is not likely to be regionally or nationally significant. The raupo wetlands where all the crake were located only represent a small area of the Harbour vegetation and are vulnerable to disturbance, and their retention is essential for any viable spotless crake population to be present at the Harbour. Removing stock from Hiwarau Wetlands (Site 25) should also be a priority.

383 fernbird were recorded at Ohiwa Harbour in 2010, which is significantly less than the 1,036 birds recorded at Tauranga Harbour (Owen, 1993), but higher than the 150 pairs estimated at Ōhiwa Harbour in 1990 (Owen, 1994a). The Ohiwa population remains the second-largest population in the region and is therefore regionally significant. The protection of these populations is important, because although their distribution is relatively widespread, a large proportion of populations are small and on isolated remnants of habitat (Parker, 2002).

North Island weka were recorded at one site in 2010, reflecting the expansion of this species over the last few years. The restricted nature of their distribution would make any sustainable population at the Harbour nationally significant. Their threatened status, and the impact weka are likely to have on marshbird habitat mean they should be included in any future marshbird surveys.

Part 5: Conclusions and recommendations

Areas of estuarine vegetation around Ohiwa Harbour identified as marshbird habitat in (Owen, 1994a) were surveyed for marshbird populations between November 2010 and January 2011.

The main conclusions reached by this survey were:

- Three marshbird species (Australasian bittern, banded rail, North Island fernbird) increased in abundance and distribution between 1990 and 2010, while one species (spotless crake) decreased in abundance. Predator control by care groups and increased habitat availability for banded rail due to mangrove expansion, as well as better species observational skills by volunteers, are factors likely to have contributed to increased abundance in these three species.
- The total number of recorded bird species increased between the two surveys, although this is suspected to be largely due to increased recording of non-target species.
- North Island weka were recorded during this survey, but were not present in 1990. Their presence at the Harbour is likely to impact on marshbird habitat.
- Different marshbird species have very specific and very different habitat requirements. Sites with varying habitat types had the highest species diversity.
- This survey demonstrates Ohiwa Harbour is considered of national significance for Australasian bittern and banded rail, and regional significance for North Island fernbird.
- All the sites were subject to some form of modification, with varying degrees of severity. At some sites human influence was limited to shoes left behind in the mud, while others had large areas drained and reclaimed for pasture.
- Habitat quality was largely the same between the surveys, but the ranking system used was felt to be too coarse and subjective to offer meaningful results. Overall habitat quality is considered to have improved marginally since 1990.
- The snapshot nature of this survey and the cryptic behaviour of the surveyed marshbirds limit interpretation of these results, and the survey is intended to be used more as presence/absence data.

Based on these conclusions, it is recommended that:

- Sites identified as marshbird habitat around Ōhiwa Harbour are protected from future development in order to maintain viable populations.
- Work is conducted to increase knowledge of the significance of marshbird populations around the Harbour amongst local residents and visitors.
- Support for care group activities is continued, particularly predator control and habitat enhancement, as this is considered to be a large factor in the increased abundance and distribution of several species.
- Habitat diversity is maintained to enhance species diversity, as different marshbird species have very different habitat requirements.
- The survey is repeated in 2015 (at the latest) to demonstrate any change in marshbird populations, or the estuarine habitat they are reliant on.

Specific management recommendations for each site are presented on the site sheets in Appendix 2.

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Appendices

Appendix 1 – 2010 Ōhiwa Harbour marshbird survey sheet

OHIWA HARBOUR 2010 MARSHBIRD SURVEY SHEET

Site Name:_____ Habitat Quality: _____
Date: _____ Site No: _____
Time Spent in Area: _____ Observers: _____

Species	Number of birds seen	Number of birds heard	Bird sign observed	Recordings played?	Recording sequence
Australasian bittern					
Banded rail					
Spotless crake					
Marsh crake					
North Island fernbird					

Site and Vegetation Description (height, tiers and dominant species/communities):

_____
_____
_____

Threats/Disturbances (including reclamation, drainage, rubbish, public utilities, fencing, stock, adventive plants, residential, recreation, harmful water discharges, fire, introduced mammals, others):

_____
_____
_____

Additional comments:

_____
_____
_____

Other bird species:

_____
_____
_____

Brief description of site and justification of habitat quality (including recommended management actions):

_____
_____

Appendix 2 – Site sheets

Site name: Port Ohope
Site number: 1
Area: 24.5 ha
Survey date: 11/11/10

This site consists of a large area of vegetated sand dunes. The central area of the site is mostly bracken fernland with areas of blackberry, sea couch grassland and isolated cabbage trees (*Cordyline australis*) and manuka. Some small areas of reedlands and raupo are present. An area at the eastern end of the site is being revegetated with natives (cabbage tree, flax (*Phormium tenax*), karo (*Pittosporum crassifolium*), hebe (*Hebe* spp.), manuka, kanuka (*Kunzea ericoides*)). The Harbour edge is dominated by adventives (rank exotic grasses, lupin, iceplant (*Carpobrotus edulis*)) and grass is encroaching on most of the site, but there are some areas of rushlands adjacent to the Harbour.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
North Island fernbird	7	Six heard, and one came in response to tapes.
Other observed bird species		
Kingfisher	1	At least one heard.
Other indigenous species		At least 20 waxeyes, 3 black-backed gulls, tui, yellowhammer, grey warbler, Australasian gannet, white-faced heron, 11 variable oystercatchers.
Exotic species		Pheasant, blackbird, finches, thrush, sparrow.

Existing Threats and Impacts	
Reclamation/drainage	Drain present across western end.
Rubbish	Spoil has been piled up across the western entry to the site from Motutere Place in an attempt to stop vehicle entry.
Public utilities	Road immediately adjacent to site. Picnicking area with boat ramp and toilets at eastern end.
Adventive plants	Lupin, pine, blackberry, gorse, sea couch, wattles, fennel.
Adventive animals	Dogs regularly exercised in the area, dog prints throughout.
Residential	Western end borders large subdivision, neighbouring cats and dogs frequently visit the site (despite district council signs saying dogs not permitted), and gardens are a source of weeds.
Recreation	Area heavily used for recreation by local residents - fishing, walking etc. Walking tracks crisscross the site (used for access to Harbour) and a vehicle track is present beside the Harbour. Dinghy storage at western end.
Other	Erosion of grassland by Harbour edge.

Habitat quality: Moderate
Large size but adventives dominate most areas, domestic animals frequent the area and there is extensive tracking. Low habitat diversity.

Recommended management actions:

- Enforce regulations excluding dogs.
- Educate residents on the ecological significance of the area to reduce impacts associated with domestic animals and recreation.

Survey results for Port Ōhope (Site 1).

Sand dune vegetation in eastern site.

Saltmarsh vegetation in western site.

Site name: Munro Subdivision
Site number: 2
Area: 3.5 ha
Survey date: 1/11/10

The vegetation at this site mainly consists of manuka scrubland with some scattered karo. There is a thin band of rushland vegetation fringed by low stature mangroves on the Harbour edge.

Other observed bird species		
Other indigenous species		Black-backed gull.
Exotic species		Magpie, pheasant, mynah, chaffinch, thrush.

Existing threats and impacts	
Reclamation/drainage	Stormwater drains are present.
Rubbish	Litter.
Public utilities	This site is bordered by Harbour Road.
Fencing	Not fenced, but no stock in area.
Adventive plants	Gorse, blackberry, bindweed, ginger and others.
Adventive animals	Dog prints (likely to be exercised through this area), lots of rat sign and prints.
Residential	This site is in very close proximity to residential areas.
Recreation	Human and vehicle tracks are present throughout.

Habitat quality: Moderate
Small area with multiple disturbances and almost entirely adventive birdlife.

Recommended management actions:

- This area is not recommended as a priority for management actions.

Survey results for Munro Subdivision (Site 2) - no target species were present at this site.

Site name: Harbour Road
Site number: 3
Area: 2.9 ha
Survey date: 1/11/10

A narrow, fragmented and discontinuous band of rushland vegetation with some scattered mangrove individuals and some areas of flax.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1	One set of prints.
Other observed bird species		
Kingfisher	1	One seen and heard.
Other indigenous species		Pied stilt, white-faced heron.
Exotic species		Pheasant, blackbird, gulls, thrush, chaffinch.

Existing threats and impacts	
Reclamation/drainage	Stormwater drains through site, with associated rock rip rap.
Rubbish	Rubbish washed up.
Fencing	Not fenced, but no stock in area.
Adventive plants	Bamboo, gorse.
Adventive animals	Dog prints. Pohutukawa in the area have good aerial roots which is a sign of low rat densities.
Residential	Site is bordered by residential areas; large gaps in the reeds with mangrove seedlings suggest clearance by residents.
Recreation	Quad bike tracks, human tracks throughout, golf ball, jetty and boat launching tracks.

Habitat Quality: Moderate
Very fragmented and thin area subject to multiple disturbances.

Recommended management actions:
This site is not recommended as a priority for management actions.

Harbour Road (Site 3) - survey results were not recorded on an aerial photo for this site.

Site name: Ohakana
Site number: 4
Area: 0.4 ha
Survey date: 2/11/10

An area of rushland and manuka being invaded by grass. Restoration plantings have been undertaken around the outside, with planted species including *Coprosma* sp., kawakawa (*Macropiper excelsum*), *Euphorbia glauca*, cabbage trees and toitoi (*Cortaderia toetoe*).

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed.
Other observed bird species		
Kingfisher		Numbers not recorded.
Other indigenous species		Bellbird, black-backed gull, tui, grey warbler, stilt (unconfirmed: prints not identified).
Exotic species		Thrush, blackbird, yellowhammer, gulls.

Existing threats and impacts	
Reclamation/drainage	Drain running down western side.
Rubbish	Litter.
Adventive plants	Sea couch, convolvulus, wattle, rank grasses encroaching into wetland.
Adventive animals	Cat prints, area used for exercising dogs.

Habitat quality: Moderate
Site is small in size, has grass encroaching and domestic pets frequent the area.

Recommended management actions:
- This site is not recommended as a priority for management actions.

Ohakana (Site 4) - survey results were not recorded on an aerial photo for this site.

Site name: Harbour Reach
Site number: 5
Area: 0.9 ha
Survey date: 2/11/10

This site comprises a narrow inlet with regenerating native vegetation on the surrounding hill slopes. Searush (*Juncus krausii* subsp. *australiensis*) rushlands dominate the estuarine vegetation, with scattered flax, manuka, shrubs and adventives, and mangroves along the Harbour fringe.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	2+	Prints of at least two individuals, one bird responded to tape.
North Island fernbird	1	One heard.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Other indigenous species		White-faced heron, tui, bellbird, oystercatcher.
Exotic species		Californian quail, thrush, gulls, pheasant, blackbird, mynah.

Existing threats and impacts	
Rubbish	Litter.
Adventive plants	Lupin, wattle, blackberry, rank exotic grasses, privet, ginger.
Adventive animals	Dog barking.
Residential	Bordered by residential properties on one edge.

Habitat quality: Moderate
Low community diversity and numerous adventives are present.

Recommended management actions:
- Control adventive plants.

Harbour Reach (Site 5) - survey results were not recorded on an aerial photo for this site.

Site name: Wainui Road Inlet
Site number: 6
Area: 0.4 ha
Survey date: 2/11/10

A small inlet full of mangroves surrounded by a narrow band of rushes. Mangroves have expanded significantly since the 2003 aerial photos were taken. A small area of raupo reedland is present at the northern end. The roadside berm down the southern end of the wetland is covered in adventives. Surrounding vegetation is mostly secondary regrowth with some established pohutukawa (*Metrosideros excelsa*).

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed (incorrectly identified as crake in field).
North Island fernbird	1	
Other observed bird species		
Kingfisher		Numbers not recorded.
Other indigenous species		Grey warbler, gulls, yellowhammer.
Exotic species		Thrush, blackbird, sparrows.

Existing threats and impacts	
Rubbish	Litter, especially close to road.
Adventive plants	Wattles, pine, ginger, montbretia (especially on roadside berm).
Harmful Water discharges	Roadside drain flows into the wetland, with wandering jew present.

Habitat quality: Moderate
Variety of habitat types but dominance of adventives.

Recommended management actions:
Control adventive plants.

Wainui Road Inlet (Site 6) - survey results were not recorded on an aerial photo for this site.

Site name: Awarapatuna Stream
Site number: 7
Area: 4.8 ha
Survey date: 12/11/10

Tidal inlet separated from Harbour by Wainui Road causeway with tidal access through a bridge under the road. Inlet is bordered by a thin band of rushland vegetation and sea couch grassland with a mangrove fringe. This estuarine vegetation becomes wider in extent at the head of the inlet. On the south-eastern side of the inlet head there is a small freshwater wetland bordered by tree ferns and pines. The site is bordered by farmland and the Whakatane District Council sewage treatment plant with pines and tree ferns around the slopes.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One flushed from saltmarsh vegetation at head of inlet.
Banded rail	1+	Low density of prints.
North Island fernbird	3	One heard, one heard and seen, one only seen.
Other observed bird species		
Kingfisher	1	One heard.
Pūkeko	1+	One heard, multiple sets of prints so likely to be several more.
Swamp harrier	1	One seen.
Other indigenous species		Waxeyes, tui, grey warbler, yellowhammer, 2 white-faced herons, 2 variable oystercatchers.
Exotic species		Finches, duck prints, 2 mynahs.

Existing threats and impacts	
Rubbish	Rubbish dumped by road, old fence line by raupo area.
Public utilities	Sewage plant present from head of inlet, power lines running down western side.
Adventive plants	Wattle, pampas, pine, sea couch, blackberry.
Adventive animals	Dog barking from surrounding farmland.
Harmful water discharges	Drains from neighbouring wetland.
Other	Rock rip rap round base of causeway (erosion protection).

Habitat quality: High
Fairly thin band of vegetation and a number of adventives and disturbances but good species and habitat diversity.

Recommended management actions:
- Seek protection for this area which is of high value to marshbird populations.
- Monitor water quality downstream of sewage ponds to maintain water quality of inlet.
- Control adventive plant species.

Area of site where bittern was seen

Site from road

Survey results for Awarapatuna Stream (Site 7).

Site name: Harbour Quarry Shoreline
Site number: 8
Area: 2.3 ha
Survey date: 11/11/10

A very thin (about 3 metre) band of searush and oioi (*Apodasmia similis*) rushlands with isolated mangroves and three-square (*Schoenoplectus tabernaemontani*) sedgelands. Bordered by regenerating vegetation with tree ferns, flax and many adventive species alongside the road.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	?	Prints observed.
N Island fernbird	3	Three heard (one also seen).
Other observed bird species		
Kingfisher	2	Two seen.
Other indigenous species		Tui, yellowhammer, 2 white-faced herons, 2 variable oystercatchers, 3 black-backed gulls, shining cuckoo, 3 paradise ducks, 2 pied stilts, grey warbler, fantail.
Exotic species		Chaffinch.

Existing threats and impacts	
Rubbish	Rubbish being dumped, empty shells (oysters, cockles etc. dumped from gatherers), tree cuttings, fireworks debris.
Adventive plants	Gorse, wattle, pampas, pine, ginger, sea couch.
Residential	Building supplies being stored.
Recreation	Human tracks (probably shellfish gatherers), launching point for island (boat, tractor, vehicle tracks present). Borders roadside pullover (popular place to stop).

Habitat quality: Moderate
Very thin based vegetation with a large number of adventives and multiple disturbances.

Recommended management actions:

- Control pest plant species.

Survey results for Harbour Quarry Shoreline (Site 8).

Site name: Tunanui Stream Inlet
Site number: 9
Area: 9.4 ha
Survey date: 22/11/10

A large inlet blocked from the Harbour by the road, with a bridge over the stream allowing tidal access. The road causeway is covered in adventives and rock rip rap. The inlet consists of areas of oioi and searush rushlands with some three-square sedgelands and manuka shrublands. A channelled stream runs through the centre of the site with gorse and willows growing alongside. The site is bordered by pampas and drains.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One flushed from vegetation.
Banded rail	3	One bird heard and seen, at least two sets of tracks (in same area where bird was observed). Another bird heard on opposite side of wetland.
North Island fernbird	16	Sixteen birds were heard calling throughout the site, three of which were also seen. One of the birds came in response to a tape being played.
Other observed bird species		
Pūkeko	1	One heard and seen, prints.
Swamp harrier	2	Two seen.
Other indigenous species		24 white-faced herons, 9 paradise ducks.
Exotic species		5 mynahs, chaffinch, magpies.

Existing threats and impacts	
Reclamation/drainage	Drainage has been altered, and Tunanui stream, which runs down the centre, has been channelised. Farmland inland has been reclaimed.
Rubbish	Litter, lots of old fencing wire and some farm machinery present.
Public utilities	The road causeway separates this site from the Harbour and is covered in adventive plant species and rip rap to prevent erosion. Power lines run across the farmland inland from the site.
Fencing	Appears fenced.
Stock	Stock tracks were observed.
Adventive plants	Gorse, pampas, sea couch, convolvulus, willow, blackberry, wattle, pine.
Recreation	Tracks throughout area.
Harmful water discharges	Pipes draining into the wetland, run-off likely from surrounding farms.

Habitat quality: High
Good birdlife and plenty of suitable habitat, but a number of threats are present, particularly the altered drainage.

Recommended management actions:
- Seek formal protection of this wetland which is of high value to marshbird populations.
- Remove stopbanks to restore drainage to a more natural state.
- Ensure fencing is adequate to stop stock access.
- Control adventive plants

Roadside drain and wetland vegetation.

Survey results for Tunanui Stream Inlet (Site 9).

Site name: Burma Road
Site number: 10
Area: 1.1 ha
Survey date: 29/10/10 and 4/11/10

A small area of rushland vegetation with a very small area of flax and raupo. The roadside edges are dominated by scrublands. The rushlands are separated from the Harbour by a thick fringe of mangroves with some areas of three-square sedgelands.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	3+	Prints were observed, as well as a hatched egg, meaning a family must be present.
North Island fernbird	6	Six were heard, of which four were also seen.
Other observed bird species		
Swamp harrier	2	Two seen.
Other indigenous species		Grey warbler, shining cuckoo.
Exotic species		Chaffinch, sparrows.

Existing Threats and Impacts	
Public utilities	Site bordered by Wainui Road.
Fencing	Fencing is present between site and neighbouring dwelling.
Adventive animals	Willows, pampas, pine, poplars.
Residential	There is an adjacent residential property with a barking dog.

Habitat quality: Moderate
This site is small in size and close to the road, although there is relatively good habitat diversity.

Recommended management actions:
- Seek protection of this site which is of good value to marshbird populations.

Survey results for Burma Road (Site 10).

Site name: Pukehoko
Site number: 11
Area: 0.6 ha
Survey date: 4/11/10

Small area of rushland vegetation beside Wainui Road, which is being encroached upon by grasses. Wattles are present on the fringe, and willows on the landward edge. Scattered mangroves are growing along the Harbour edge.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	2+	At least two sets of prints.
N Island fernbird	3	Three birds heard.
Other observed bird species		
Exotic species		Finches.

Existing threats and impacts	
Reclamation/drainage	Drain present along landward edge of wetland.
Rubbish	Litter.
Fencing	The landward fence has been moved back at some stage.
Adventive plants	Wattles, willows, poplars, pines, sea couch, pampas.
Adventive animals	Rat prints.

Habitat quality: Moderate
Very small in size and the vegetation is dominated by adventives.

Recommended management actions:
- Control adventive animal species.

Survey results for Pukehoko (Site 11).

Site name: Waiotane Stream
Site number: 12
Area: 4.5 ha
Survey date: 4/11/10

An enclosed tidal embayment separated from the Harbour by the road. Large central tidal flat areas are bordered by rushland and manuka scrubland. Drains run along the edges of the wetland, and through it on the eastern side with gorse, pampas and grasses growing alongside.

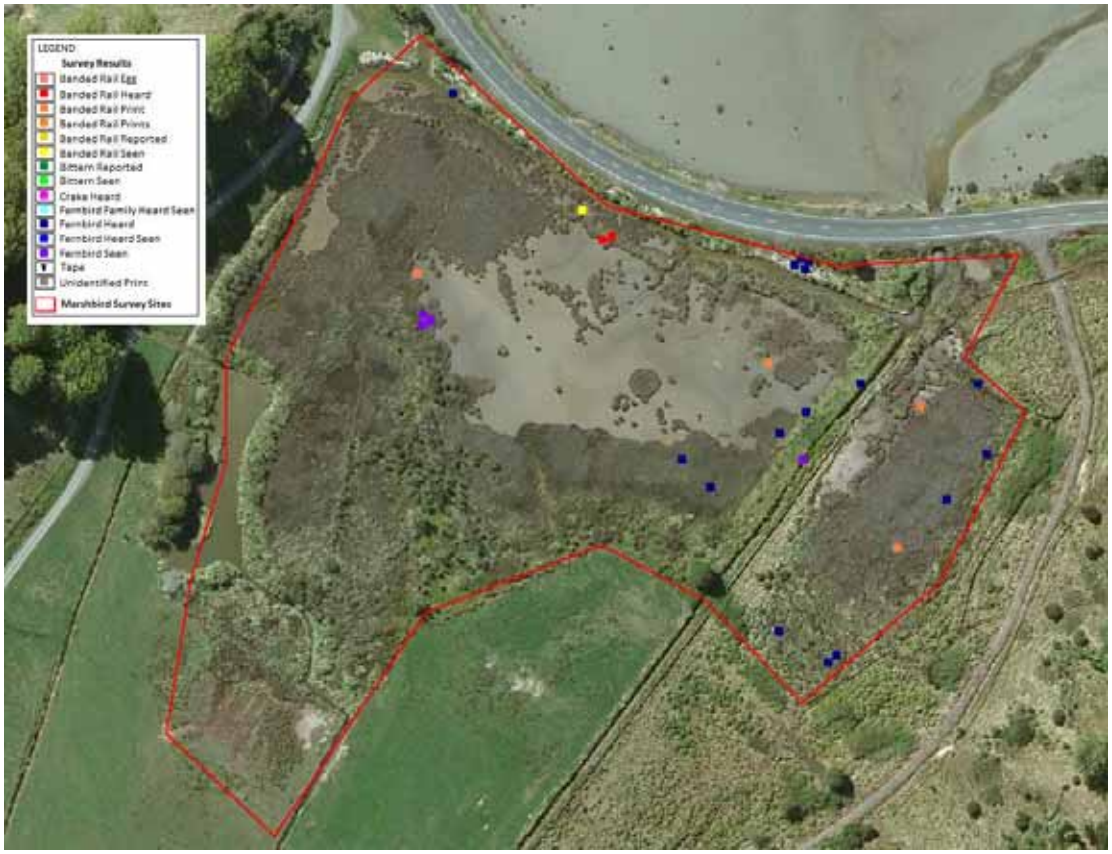
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One reported by a local resident - the bittern stood to attention for a while then slowly shank down into the rush area. The day before a motorist had stopped for one crossing the road, holding up traffic.
Banded rail	3+	Two heard and one seen, prints observed in several areas throughout wetland.
North Island fernbird	20	Sixteen heard, and a further four seen, three of which were busy nest-building.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Swamp harrier		Numbers not recorded.
Other indigenous species		Welcome swallow.

Existing threats and impacts	
Reclamation/drainage	Tidal access is restricted by the size of culvert pipes under the road. The area inland from the wetland has been drained and reclaimed and drains constructed which limits water inflows to the wetland.
Fencing	Appears well fenced (did not confirm this along inland edge).
Adventive plants	Gorse, pampas, grasses, wattle, pampas, especially on roadside and drain edges.
Adventive animals	Rat and hedgehog prints observed.
Other	Limited food supply, only some crabs observed (limited tidal access).

Habitat quality: Moderate
Large areas of good fernbird habitat and high numbers, but drainage has been extensively modified and site is subject to several disturbances.

Recommended management actions:
- Ask Whakatane District Council to put up “Bittern Crossing” signs.
- Work with landowner to ensure sufficient water inflow to address drainage modifications.
- Control adventive plant and animal species.

Stuart Slade and Hemi Barsdell listening for fernbird.



Survey results for Waiotane Stream (Site 12).

Site name: Te Kooti Inlet
Site number: 13
Area: 1.2 ha
Survey date: 8/11/10

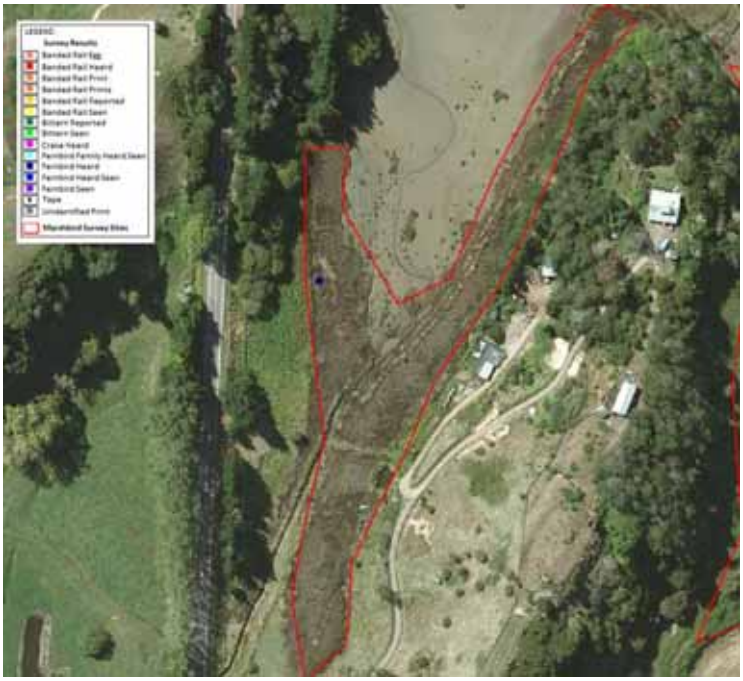
A small tidal inlet with scattered mangroves and an area of rushland at the head of the inlet. Adventives are growing around the margins, and a narrow stream runs through the middle of the inlet. A small area of raupo is present at the head of the inlet.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One reported by local resident.
North Island fernbird	1	One heard.
Other observed bird species		
Kingfisher	1	One heard.
Pūkeko	1+	Prints observed.
Other indigenous species		Fantail, grey warbler, paradise ducks.
Exotic species		Mallards, finches, chickens, blackbirds.

Existing threats and impacts	
Rubbish	Litter.
Fencing	Old fence line with loose wire runs through wetland.
Adventive plants	Wattle thriving on margins, gorse, pampas.
Adventive animals	Large neighbouring chicken population means rats likely.

Habitat quality: Moderate
Small inlet with a large proportion of adventive cover and rubbish.

Recommended management actions:
- Control adventive plant species.



Survey results for Te Kooti Inlet (Site 13).

Site name: Wainui Stream
Site number: 14
Area: 5.4 ha
Survey date: 8/11/10

A large area of searush rushlands with scattered mangrove individuals. The inland edge of the wetland is backed by a stopbank covered in adventive plant species. The channelled Wainui Stream runs through the western side of the site and large areas of grass have encroached on this area. A band of mangroves runs down the eastern side of the site.

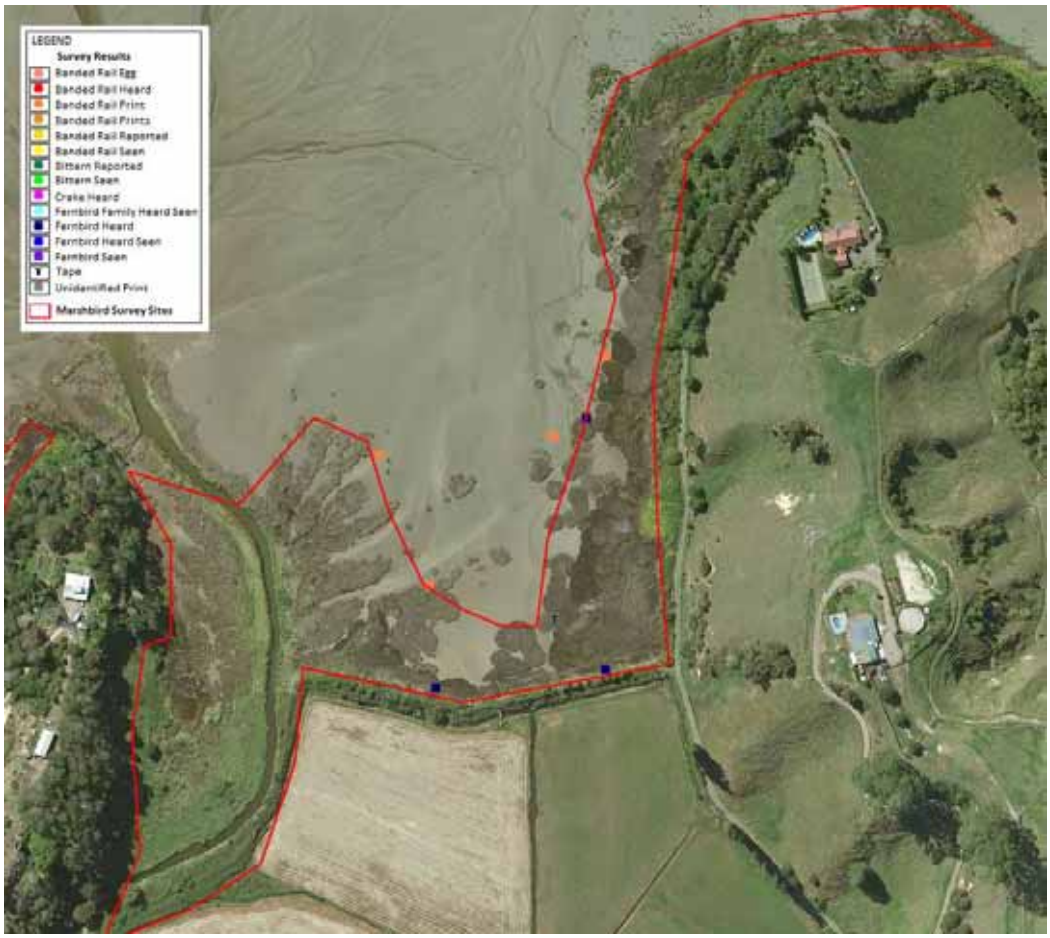
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed.
North Island fernbird	4	Three heard and another seen.
Other observed bird species		
Pūkeko	20+	Dozens of pukeko observed in wetland, and especially the paddocks behind.
Other indigenous species		Grey warbler, tui, fantail, black-backed gull, 3 paradise ducks, 3 welcome swallows, white-faced heron, stilts, godwits, black shag.
Exotic species		Pheasant, peacock, sparrow.

Existing threats and impacts	
Reclamation/drainage	Drainage has been extensively modified, with a stopbank constructed to reclaim an area for pasture that was formerly part of the wetland. A floodgate is present through the stopbank.
Rubbish	Old wood and building materials have been dumped.
Fencing	An old fence line runs through the wetland.
Adventive plants	Blackberry, wattle, pampas, pines, gorse, sea couch.
Recreation	Vehicle track.
Other	Young eels observed in channels.

Habitat quality: Moderate
Large area but low habitat diversity and drainage has been extensively modified.

Recommended management actions:
- Work with landowners to remedy drainage modification issues.
- Control adventive plant species.

Site looking north.



Survey results for Wainui Stream (Site 14).

Site name: Paparoa Road Inlet
Site number: 15
Area: 2.5 ha
Survey date: 12/11/10

Tidal inlet with a wide (about 10 metres) fringe of oioi rushlands. Small areas of pampas/flax/raupo freshwater wetlands are present on the inland edge. The inlet is bordered on the western side by willows and farmland, but the eastern side has a fringe of manuka scrub then regenerating rewarewa (*Knightia excelsa*) forest with a bait station network. A freshwater stream flows through the wetland centre. There is an also an area of raupo reedland on the eastern side.

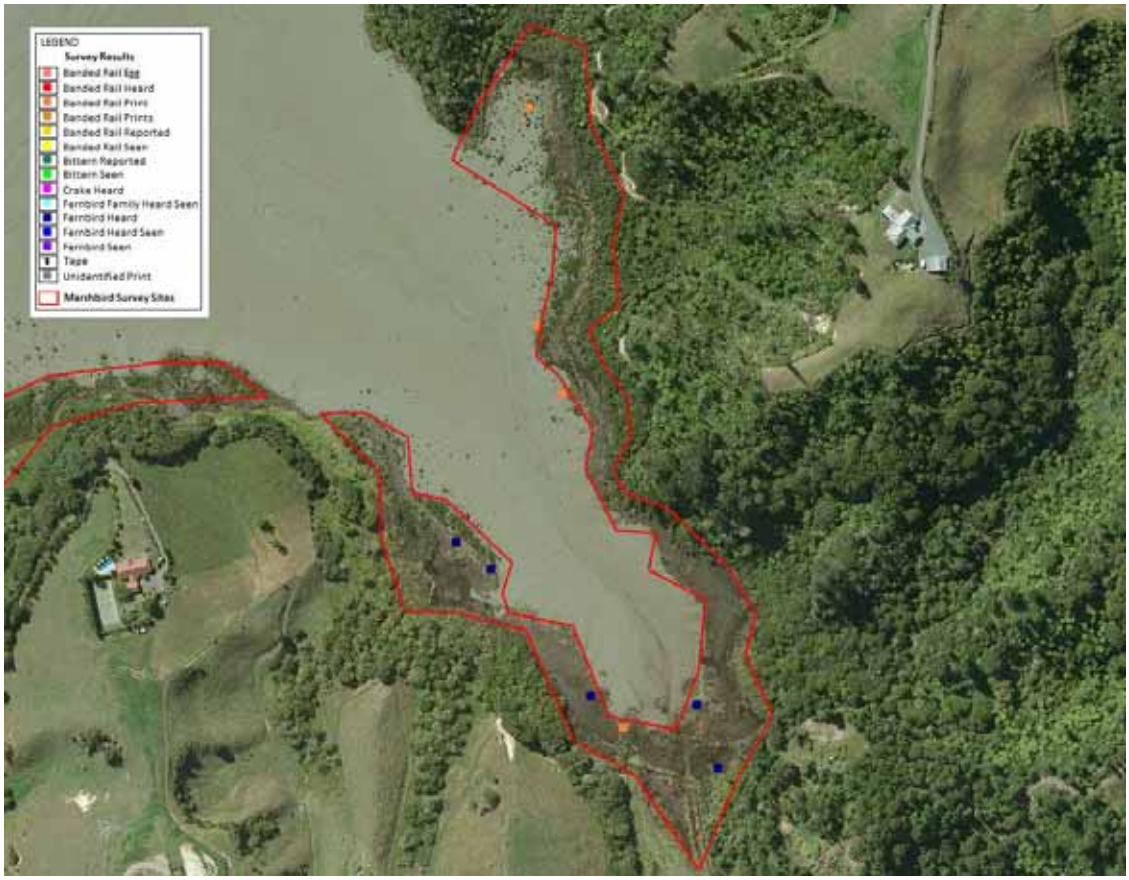
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail		Prints.
Spotless crake		Raupo area is likely habitat but no responses to tapes.
North Island fernbird	5	Five heard.
Other observed bird species		
Kingfisher	1	One heard.
Pūkeko	?	None observed, at least two sets of tracks, but as area is dominated by pukeko tracks suspect they are much more numerous.
Other indigenous species		Grey warbler, 2 tuis, shining cuckoo, 3 fantails, waxeyes.
Exotic species		Californian quail, pheasant, blackbird, finches, thrush.

Existing threats and impacts	
Reclamation/drainage	The head of the inlet has been stopbanked and reclaimed.
Rubbish	Some rubbish present, and old fence posts.
Fencing	An old fence is present on the eastern side.
Adventive plants	Pines, willows, blackberry, pampas.
Recreation	Some tracks present (probably used for Harbour access).
Harmful water discharges	Run-off is likely from surrounding farmland, oily sheen observed in wetland later found to be algae.

Habitat quality: High
Low densities of birds but relatively large area with diverse habitat and low human impacts as the site has restricted access.

Recommended management actions:
- Remove old fence line on eastern side of inlet.
- Continue bait station operation for pest animal control.

Vegetation in western portion of site.



Survey results for Paparoa Road Inlet (Site 15).

Site name: McCoy Shoreline
Site number: 16
Area: 0.6 ha
Survey date: 12/11/10

A very thin and discontinuous band (mostly about 3 metres) of oioi rushlands with some sea couch grasslands and three-square sedgelands. Isolated manuka and marsh ribbonwood individuals are found in between. This site runs alongside steep slopes edging the Harbour covered in regenerating native bush with rewarewa and tree fern. Scattered mangrove individuals are found on the Harbour edge. There is also a small wetland of raupo with bracken (*Pteridium esculentum*), flax and marsh ribbonwood present.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	?	Prints observed.
North Island fernbird	1	Two heard.
Other observed bird species		
Kingfisher	2	Two heard, and one seen and heard.
Pūkeko	1	One seen, several prints.
Swamp harrier	1	One seen.
Other indigenous species		Fantail, black-backed gull, 10 white-faced herons, 4 paradise ducks, grey warbler, yellowhammer, tui.
Exotic species		Mallard, Californian quail.

Existing threats and impacts	
Reclamation/drainage	Shed with water tank and pump/pipe system with associated gear.
Rubbish	Old fencepost, old barbed wire fence. Storm debris line across mud flats with beer cans etc.
Fencing	The steep surrounding native forest should prevent stock access.
Adventive plants	Sea couch, pines.
Recreation	Area used for adventure racing- directional signs still present.

Habitat quality: Moderate
Very thin and discontinuous with limited area available for habitat, although is still being used. Not much cover or gradation between vegetation types.

Recommended management actions:
This site is not recommended as a priority for management actions.

Site overview.

Survey results from McCoy Shoreline (Site 16).

Site name: Whitiwhiti Point
Site number: 17
Area: 0.7 ha
Survey date: 12/11/10

A small bay with rank exotic grasses and sea couch grasslands and some scattered oioi. A drained area of freshwater wetland covered in grass is present, with a channelled stream and some planted flax. Regenerating native vegetation with manuka and tree ferns is present on the surrounding slopes.

Other observed bird species		
Kingfisher	2	Two heard.
Pūkeko	1	One seen and heard.
Other indigenous species		Shining cuckoo, bellbird, tui, two white-faced herons offshore, grey warbler, 2 black-backed gulls.
Exotic species		Pheasant, magpie, finches, duck prints.

Existing threats and impacts	
Reclamation/drainage	Piped stream.
Rubbish	Concrete blocks, washed up buoy.
Adventive plants	Pine, pampas, gorse, sea couch, wattles, blackberry.
Residential	Small grassed area on private property at southern end of the bay is all set up with brick stove (fire risk), couch and table.
Recreation	Boat storage.

Habitat quality: Moderate
Small and highly modified.

Recommended management actions:
- This site is not recommended as a priority for management actions.

Survey results for Whitiwhiti Point (Site 17) - no target species were present at this site.

Site name: Paparoa Point Inlet
Site number: 18
Area: 0.9 ha
Survey date: 25/11/10

Very narrow band of rushlands surrounding a small inlet. Sea couch is encroaching across much of the area. Isolated manuka is present with lots of adventives and a large area of gorse.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1	One set of prints was observed.
North Island fernbird	5	Five birds heard, one also seen.
Other observed bird species		
Kingfisher	2	One seen and one heard.
Pūkeko	5	Five seen.
Other indigenous species		Tui, paradise duck, grey warbler.

Existing threats and impacts	
Rubbish	Litter present.
Fencing	Appears to be well-fenced with barbed wire.
Stock	Evidence of cows in the wetland.
Adventive plants	Gorse, sea couch, rosehip, pine.
Residential	The absence of mangroves in the inlet may be the result of intervention by local residents.
Recreation	Tracks and lots of footprints, horse tracks also observed.
Harmful water discharges	Stream from farmland has green tinge in some areas.

Habitat quality: Moderate
Some significant marshbird species present but the area is obviously well-frequented by humans and subject to multiple disturbances.

Recommended management actions:
- Ensure fencing is complete to stop stock access to the wetland.
- Control adventive plants.
- Investigate water quality of stream.

Western half of site viewed from above.

Survey results for Paparoa Road Inlet (Site 18).

Site name: Paparoa Road Peninsula Inlet
Site number: 19
Area: 0.5 ha
Survey date: 25/11/10

This site is situated in a small bay on the eastern side of Paparoa Road peninsula. The inlet is filled with mangroves fringed by a narrow and intermittent band of searush and oioi and backed by a large area of sea couch and willows, but with some areas of regenerating bush present. A stream enters the inlet on the southern side. A large area of pines is present at the southern Harbour end of the inlet.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	2+	Several sets of prints were observed.
North Island fernbird	6	Six birds were heard.
Other observed bird species		
Kingfisher	2	Two kingfisher were both seen and heard.
Pūkeko	4	Four seen, one of which was also heard.
Other indigenous species		Tui, fantail, variable oystercatcher.
Exotic species		Blackbird.

Existing threats and impacts	
Reclamation/drainage	The stream has been channelled in some parts.
Fencing	Well fenced with barbed wire and electric fence.
Adventive plants	Many different weeds at head of inlet, sea couch.
Adventive animals	Possum skeleton, cat observed on hillside above.
Residential	Old shed on southern side, mangroves appear to be managed.
Recreation	Footprints present.
Harmful water discharges	Drains flowing into inlet from farmland.

Habitat quality: Moderate
Very small area and estuarine vegetation is confined to a very narrow band. Numerous adventive species present.

Recommended management actions:
- Control adventive plants.
- Control pest animal species.

Victoria Radley surveying for marshbirds at Paparoa Road Peninsula Inlet (Site 19).

Survey results for Paparoa Road Peninsula Inlet (Site 19).

Site name: Wainui Wetland
Site number: 20
Area: 4.1 ha
Survey date: 10/11/10

Estuarine vegetation at the head of a tidal inlet. In the south-eastern corner of the inlet there is an area of grassland with oioi and some flax plantings. One side of this area is bordered by gorse and bracken, and the other side is bordered by native vegetation. Seaward there is an area of oioi rushland with a manuka fringe. A thin band of rushland and scattered mangroves are present on the eastern side, and this vegetation is bordered by manuka, gorse and blackberry scrub with farmland behind. Areas of three-square sedgelands are also present. There is a large area of raupo on the western side. The estuarine vegetation on this side consists of a thin band of rushes with gorse and willows within, and areas of pines and pasture behind. At the head of the inlet a large area of rushlands is present which is bordered by wattles, some regenerating bush, and lots of gorse.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One reported by local resident.
Banded rail	>1	One called in response to tapes, prints observed in and out of many places throughout the site, indicating a healthy population.
Spotless crake	1	One called in response to tapes from the raupo area on the western side.
N Island fernbird	8	Eight birds heard, three of which were also seen.
Other observed bird species		
Kingfisher	1	One seen and heard. Prints observed throughout inlet.
Pūkeko	3	Three seen. Neighbouring landowner reported to be sporadically controlling them.
Swamp harrier	1	One seen
Other indigenous species		Fantail, tui, grey warbler, shining cuckoo, white-faced heron, waxeye, paradise duck, pied stilt, swallows, spur-winged plovers
Exotic species		Californian quail, mallards, blackbird, pheasant, dense duck prints

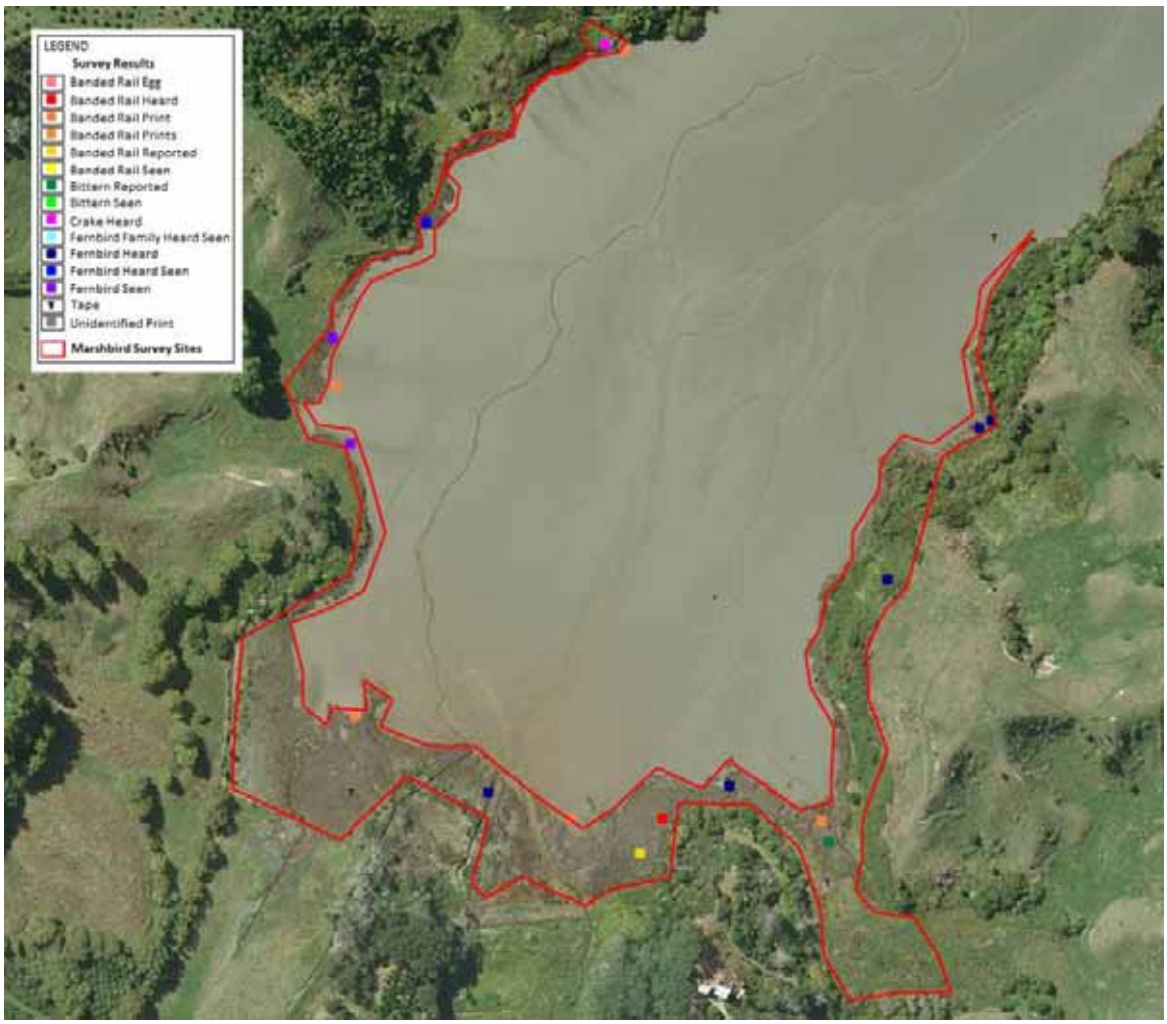
Existing threats and impacts	
Reclamation/drainage	The stream draining into the head of the inlet has been channelled.
Rubbish	An old barge from the oyster farm is lying in one area of the site.
Fencing	Eastern side appears well fenced. An old fence line down to the Harbour is present in one area.
Stock	Stock still have access into the Harbour from one area on the western side.
Adventive plants	Gorse, blackberry, pines, willow, wattles, sea couch, gums. Gorse by the raupo on the western side has been sprayed.
Adventive animals	A local resident has a bait station network and is trapping stoats and rats.
Residential	Neighbouring residents are controlling the pukeko population.
Recreation	The stream draining into the head of the inlet is used for whitebaiting. The eastern side of the inlet used to have a large oyster population but this has been stripped out.

Existing threats and impacts	
Other	Rushland vegetation is damaged in some areas - cause uncertain but potentially pukeko. Baby eel observed on mudflats, and good insect life by streams.

Habitat quality: High
Large size of site, and relatively limited human access. Local residents actively involved in revegetation and pest control. Good habitat diversity and healthy populations of many species, but some adventive cover present.

Recommended management actions:

- Support efforts of local residents in revegetation and pest control.
- Remove decaying oyster barge.
- Seek protection of this wetland which is of high value to marshbird populations.
- Explain legal requirements associated with pukeko control to neighbouring landowner.
- Ensure site is adequately fenced to restrict access.



Survey results for Wainui Wetland (Site 20).

Site name: Ouaki Creek
Site number: 21
Area: 2.7 ha
Survey date: 9/11/10

Tidal inlet, with the upper end of wetland separated from the Harbour by a stopbank. The inlet is bordered by farmland with some pampas in the upper reaches and regenerating natives in the lower area. Small areas of raupo are present on the western side. In the upper area behind the stopbank there are oioi rushlands with isolated areas of mangroves and three-square sedgelands. The band of rushes is probably too thin to be good marshbird habitat. The stopbank itself is covered in rank exotic grasses, gorse, bracken and manuka. On the seaward side of the stopbank there are large areas of mangroves, with rushlands around the side grading to manuka scrub or flaxland.

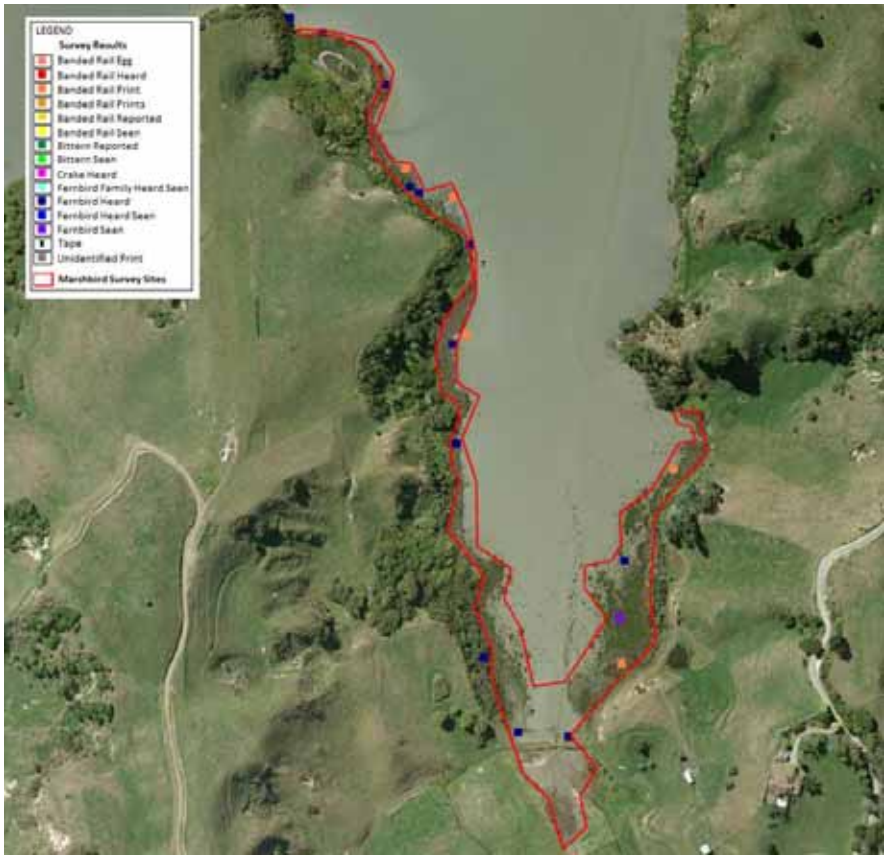
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Several sets of prints observed, particularly dense along the rush/mangrove interface and a few under dense mangroves on the eastern side.
North Island fernbird	11	Ten fernbird were heard, of which two were seen (including one of a duetting pair). A further bird was seen.
Other observed bird species		
Kingfisher	1	One heard.
Pūkeko	2	Two seen, and prints observed, but many more likely to be present based on scale of damage to rushland vegetation.
Other indigenous species		Black-backed gull, grey warbler, pied stilt, paradise duck, silvereyes, heron, fantails.
Exotic species		Mallard, pheasant, blackbird.

Existing threats and impacts	
Reclamation/drainage	Drainage has been modified, with an old pump house present on the eastern side of the wetland. A small culvert through the centre of the stopbank is the only means of tidal access to the upper inlet.
Rubbish	Some rubbish has been dumped in the area.
Fencing	Appears well fenced. Old fence lines are present in the wetland.
Adventive plants	Gorse, pampas, willows, sea couch, blackberry. Stopbank is particularly weedy.
Adventive animals	At least 25 rabbits observed on hill west of inlet. Rat prints observed.
Harmful water discharges	Run-off is likely from the surrounding farmland.
Other	Extensive pukeko damage to vegetation was observed.

Habitat quality: High
The inland area has been highly modified, but the rest of the inlet appears well fenced, is a decent size, and human access is limited. There is also good habitat diversity with areas of flax and raupo present.

Recommended management actions:
- Investigate options for restoring drainage to a more natural state.
- Control adventive plants.
- Control rabbits on neighbouring properties.
- Control rats.

Hemi Barsdell in banded rail habitat at Ouaki Creek (Site 21).



Survey results from Ouaki Creek (Site 21).

Site name: Toritori Point
Site number: 22
Area: 2.0 ha
Survey date: 17/11/10

A small inlet north of Nukuhou saltmarsh. Mangroves form a dense cover within the inlet and a fringe of oioi rushlands is present around the edge. Small areas of flax and raupo are found in several places. The site is surrounded by adventives in some areas and secondary forest in others with farmland behind. Small areas of three-square sedgelands are present, which look to be impacted upon by pukeko. A large area of saltwater paspalum appears to be increasing in extent in the north-western corner.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One bird observed on Harbour edge of inlet.
Banded rail	2	Two birds heard.
Spotless crake	2	Two birds heard in raupo area on northern side.
North Island fernbird	1	One heard.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko	4+	Four seen, several heard, several sets of prints, evidence of grazing at several sites.
Other indigenous species		Grey warbler, shining cuckoo, white-faced heron, spur-winged plovers, tui.
Exotic species		Pheasant, chaffinches, thrushes, blackbirds, magpies.

Existing threats and impacts	
Rubbish	Old fence in one area.
Fencing	Well fenced.
Adventive plants	Saltwater paspalum, sea couch, crack willow, pampas, blackberry, bindweed.
Residential	Fringe of damaged mangroves at the head of inlet may be linked to neighbouring properties.
Harmful water discharges	Run-off likely from surrounding farmland.
Other	Landslide in one area has transported sediment into the saltmarsh.

Habitat quality: High
Lots of birdlife, good variety of habitat and difficult access means limited human impacts, although relatively small size and weeds encroaching in some areas.

Recommended management actions:
- Control adventive plants, particularly saltwater paspalum.
- Continue support for the Nukuhou saltmarsh care group, as increased marshbird abundance at this site is most likely due to overflow from that site. Potentially look to expand pest control activities to this site.

Saltwater paspalum is encroaching on the margins of this site

Survey results from Toritori Point (Site 22).

Site name: Nukuhou River Marshes
Site number: 23
Area: 74.0 ha
Survey date: 3/10/10 and 29/10/10

This site consists of estuarine vegetation at the mouth of the Nukuhou River. A local care group is very active in the area and there have been subsequent significant changes since the vegetation was described by (Owen, 1994a), including several of the recommended conservation actions being carried out. Farm fences on the western side have been moved out of the marsh and a lookout and interpretation point has been established. Wilding pines, gorse, blackberry and pampas have been removed from saltmarsh areas on the true left of the River. A hedge of natives have been planted along the south side of Wainui Road to reduce road kill. The old stopbank on the Hiwarau block has been established as the eastern edge of the saltmarsh, with blackberry, pampas and gorse removed and manuka and kanuka planted. Predator control lines have been in place for the last four years on the marsh edges and across the neighbouring dairy farm. Blackberry is being progressively sprayed along the northwest side of the marsh, and it is planned to drill and poison the crack willows along this marsh fringe.

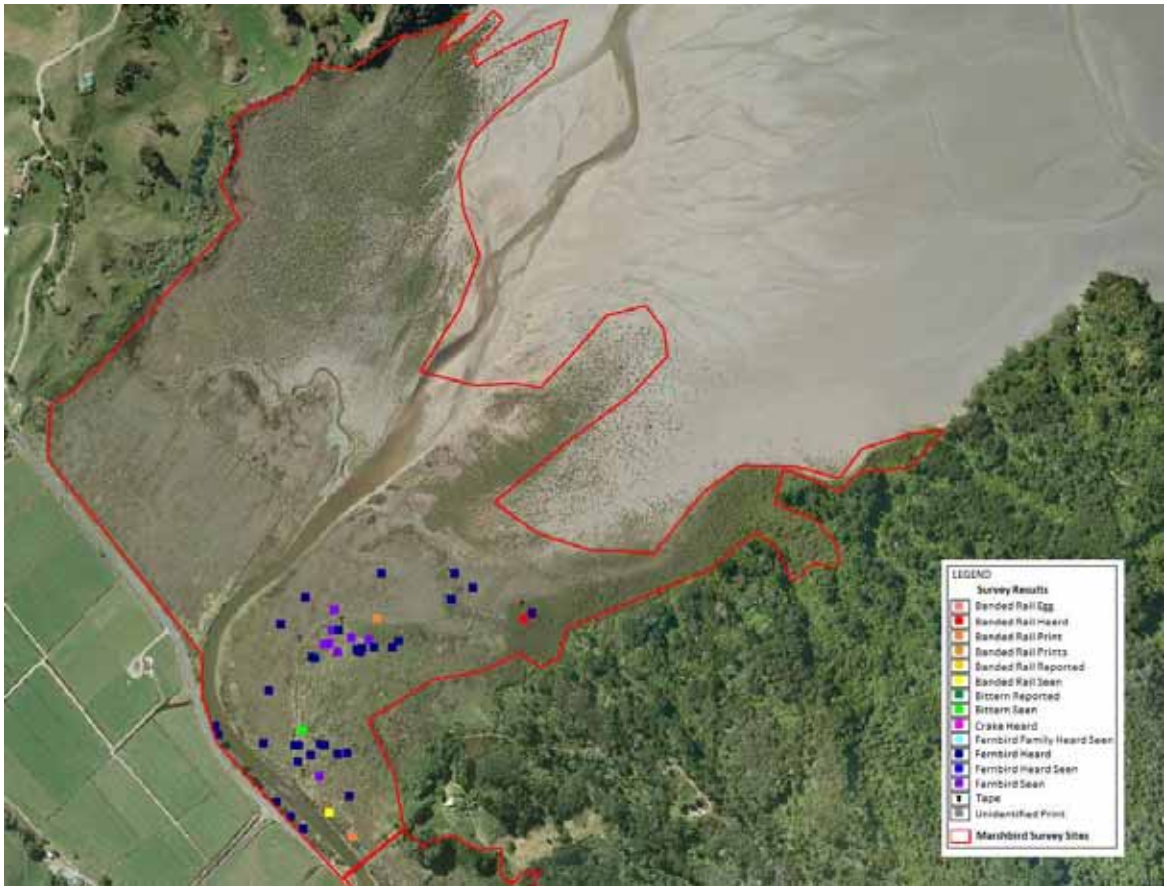
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One was flushed on the Hiwarau side.
Banded rail	3	One flushed and flew 20 metres and two were heard on the Hiwarau side. Prints of varying sizes were present indicating a population of birds is spread out through the area.
Spotless crake		None recorded, but have been reported there very recently.
North Island fernbird	108	28 seen, 80 heard. Many were in family groups with young.
Other observed bird species		
Pūkeko	4	Two adults and two tiny chicks on farmland edge.
Swamp harrier	2	Seen working the marsh.
Other indigenous species		1 black shag, 2 white-faced herons overhead, 1 pair welcome swallows, 1 shining cuckoo, 1 pair of fantails, 1 pair of grey warblers, black-backed gulls.
Exotic species		2 mallard ducks, 6 Californian quails, at least 6 pairs of chaffinches, 2 pheasants.

Existing threats and impacts	
Stock	Cattle from the Hiwarau Block wade around the edge of the Harbour on the eastern side of the River in winter when feed is short.
Adventive plants	Pampas, gorse, wattle.

Habitat quality: Outstanding
Significant populations of marshbirds indicate this site is of high habitat quality. The local care group have been very active with pest control and revegetation activities, further enhancing the ecological significance of this area.

Recommended management actions:
- Continue to support the excellent work the local care group are doing.
- Control adventive plants.
- Construct adequate fencing to prevent stock access from the Hiwarau block.
- Seek protection for unprotected areas of this wetland which is of very high value to marshbird populations.

Overview of Nukuhou River Marshes (Site 23).



Survey results for Nukuhou River Marshes (Site 23)- note large area of site not surveyed.

Site name: Nukuhou River Riparian Margins
Site number: 24
Area: 11.3 ha
Survey date: 29/10/10

This site consists of estuarine vegetation adjacent to the Nukuhou River. A local care group is very active in the area and large areas of adventives have been cleared and replanted since this area was described by (Owen, 1994a). Brair rose, blackberry, pampas and crack willow have been removed from the true left bank in the TeRu Reserve area. A large area of this reserve has been cleared of blackberry and replanted with suitable natives. Beyond this revegetated area, weed removal is continuing right around the S bends, with Japanese walnuts, willows and a large area of blackberry having been removed. A whitebait spawning pond area has recently been constructed in the River margin strip.

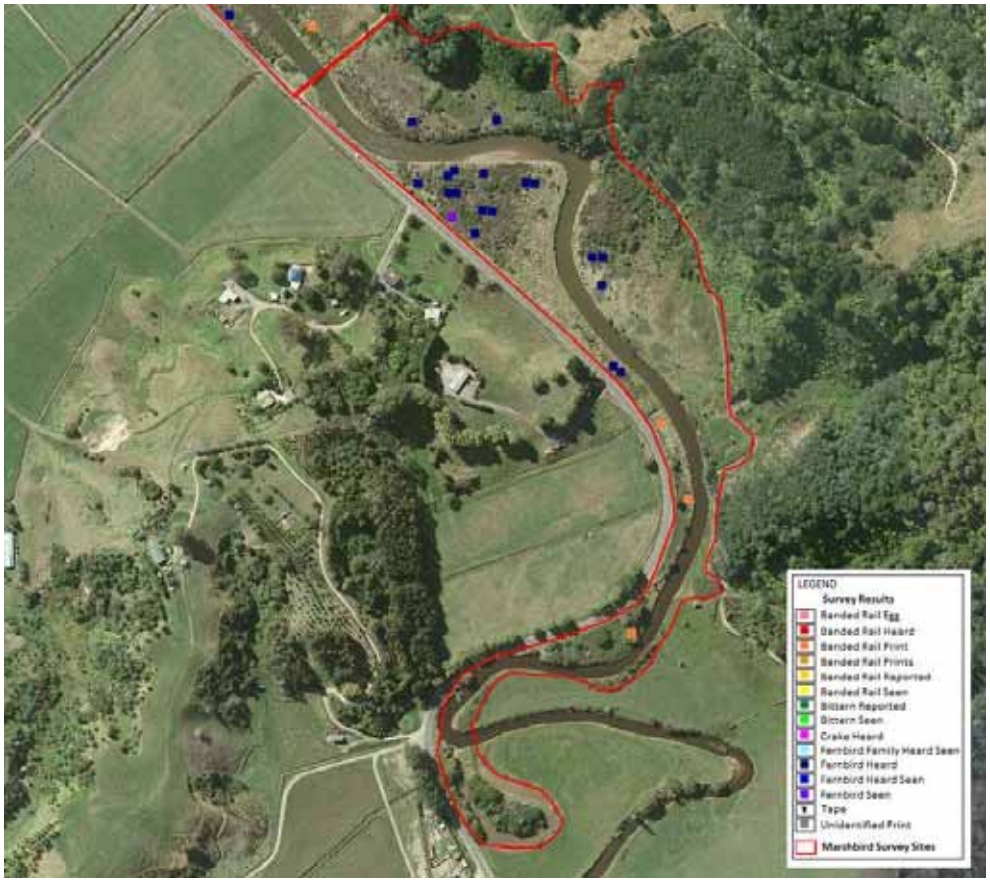
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	3+	Prints were found from the bridge right up to the S bend. The different sizes suggest three or more birds.
North Island fernbird	18	One seen and 17 heard, mainly on true left of stream.
Other observed bird species		
Kingfisher	1	One on bank above River.
Pūkeko	3	Along exposed mud edges of stream.
Swamp harrier	2	One pair, possibly nesting in raupo area on true right of stream.
Other indigenous species		One pair grey warblers, one pair welcome swallow, 1 fantail, 1 black shag, bellbird, tui, yellowhammer, shining cuckoo, spur-winged plover, black-backed gulls.
Exotic species		4 mallard ducks on water, pheasant, chaffinch, blackbird, thrushes, sparrows, goldfinch, skylark, mynah, starlings.

Existing threats and impacts	
Adventive plants	Gorse and blackberry.

Habitat quality: High
Large bird population and ecological values have been greatly enhanced through work by the local care group.

Recommended management actions:
- Continue to support the excellent work the local care group are doing.
- Seek protection of this site which is of high value to marshbird populations.

Banded Rail Prints.



Survey results from Nukuhou River Riparian Margins (Site 24).

Site name: Hiwarau Wetlands
Site number: 25
Area: 13.1 ha
Survey date: 26/1/11

This site is made up of a tidal inlet with estuarine vegetation and a stream with freshwater wetland vegetation on either side of Hiwarau Road. The estuarine vegetation consists of searush and oioi rushlands, with low stature mangroves forming a dense cover on the eastern side of the inlet and scattered individuals present on the western side. The road causeway is dominated by manuka and gorse scrub with regenerating native vegetation present between the road and the eastern side of the inlet. Inland from the road, there is a small area of rushlands then a large area of grassy wetland. Sizeable areas of raupo are found next to the stream, with willows alongside and the surrounding hillsides covered in regenerating bush.

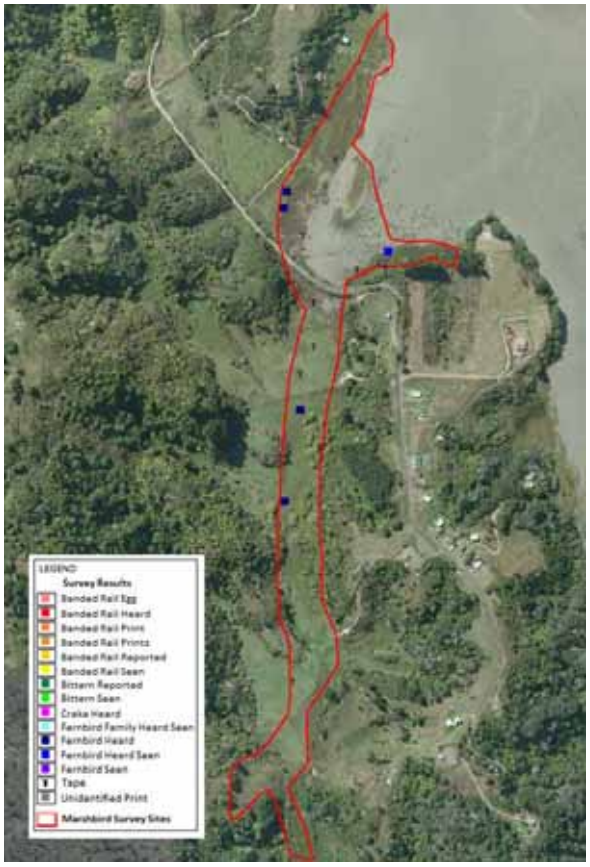
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern		Recent reports of bittern from local resident.
Spotless crake		None found despite tapes being played repetitively in raupo areas.
North Island fernbird	6	Five heard, another one came in response to tapes and was both seen and heard.
Other observed bird species		
Kingfisher		One heard.
Pūkeko	At least 3	Three seen, several heard.
Other indigenous species		Spur-winged plover, welcome swallow, white-faced heron, fantail, grey warbler, bellbird, shining cuckoo, paradise ducks.

Existing threats and impacts	
Reclamation/drainage	Road causeway has reclaimed a small area of wetland.
Rubbish	Old fence line and fence posts, some rubbish washed up or dumped (old shoes etc), old car.
Fencing	Gaps in fences allow stock access.
Stock	Cows and horses grazing in freshwater wetland. Evidence of stock in estuarine vegetation.
Adventive plants	Gorse, pines, convolvulus, blackberry, willow, pampas.
Residential	Neighbouring dwellings. Dog barking in distance.
Recreation	Human tracks in estuarine vegetation (probably shellfish gatherers).

Habitat quality: Moderate
Diverse habitat present but recorded bird numbers lower than expected and stock are having a significant impact.

Recommended management actions:
- Ensure stock are excluded from all areas of wetland to allow habitat use by spotless crake.
- Control adventive plants, especially gorse and willows which are widespread through the area.

Inland half of wetland from road.



Survey results from Hiwarau wetlands (Site 25).

Site name: Te Awawairoa Stream
Site number: 26
Area: 4.3 ha
Survey date: 3/12/10

Estuarine wetland surrounding lower reaches of Te Awawairoa Stream. The upper end of the wetland consists of poorly drained swamp with some young mangroves, bordered by rushes and reeds and surrounded by pasture. The rushes are being encroached upon by sea couch. Te Awawairoa Stream flows down the eastern side. A stopbank is present across the centre of the wetland which restricts the tidal influence. On the Harbour side of the stopbank dense mangroves are present surrounded by oioi and searush rushlands being invaded by rank exotic grasses. Regenerating native bush and manuka scrub are present on the western and eastern edges.

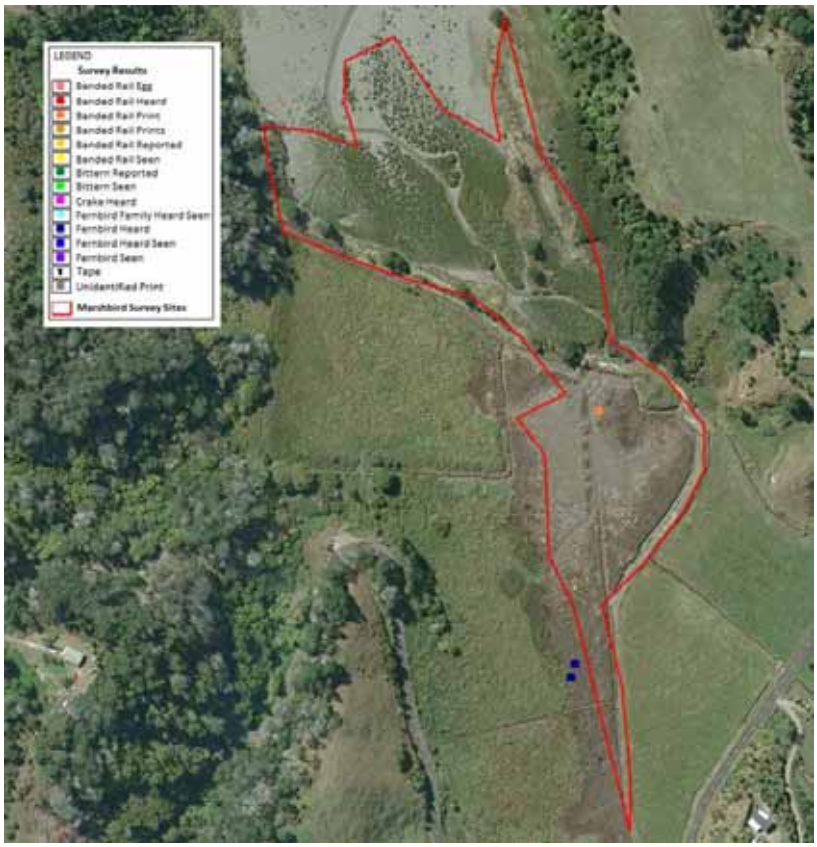
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1	One set of prints, which may have been misinterpreted heron prints.
North Island fernbird	2	Two heard, one of which was also seen.
Other observed bird species		
Kingfisher	1	One seen.
Pūkeko	1	One heard and seen.
Swamp harrier	1	One seen.
Other indigenous species		5 white-faced heron, black-backed gull, 2 paradise ducks, 2 Caspian terns, grey warbler.
Exotic species		Skylark, magpies, mallards, pheasant, sparrow, blackbirds, goldfinch.

Existing threats and impacts	
Reclamation/drainage	Drains present throughout wetland.
Rubbish	Old fence posts, litter.
Public utilities	Power lines run across site.
Fencing	Poorly fenced in upper wetland.
Stock	Stock have access to the upper wetland.
Adventive plants	Wattles, willow, rank grasses, blackberry, thistles, sea couch, gorse, rosehip.
Residential	Neighbouring farms.
Recreation	Track along stopbank and footprints.
Harmful water discharges	Drains run directly into wetland and run-off likely from surrounding farmland.

Habitat quality: Moderate
Area has potential but is currently in poor condition with modified drainage, grazing and litter.

Recommended management actions:
- Restore drainage to a more natural state.
- Fence wetland adequately to prevent stock access.
- Control adventive plants.

Looking inland from centre of wetland.



Survey results from Te Awawairoa Stream (Site 26).

Site name: Kutarere Wharf Road shoreline
Site number: 27
Area: 1.5 ha
Survey date: 2/12/10

Very narrow band (0.5-5 metres wide) of searush, oioi and sea couch vegetation with three-square sedgelands at the southern end. The inland edge is bordered by a stopbank covered in pampas, blackberry and other exotics with occasional manuka. Isolated mangroves are present at the northern end with a dense area at the southern end. Large pohutukawa are present on the hill above the northern end.

Other observed bird species		
Kingfisher	1	One seen.
Swamp harrier	1	One seen.
Other indigenous species		Tui, yellowhammer, 1 white-faced heron, fantail.
Exotic species		Magpies, pheasant, mynah.

Existing threats and impacts	
Rubbish	Litter. Landslide debris observed being dumped into wetland during road clearance operation.
Adventive plants	Sea couch, blackberry, pampas, willows, ginger, wattle, bamboo. Especially present along the roadside berm.
Recreation	Oyster shell piles present (area used by collectors) and footprints along most of edge.

Habitat quality: Moderate
Very narrow band - limited area of habitat available. No significant species recorded.

Recommended management actions:
- Monitor this site for *Spartina*, which has been recorded here in the past.

Survey results from Kutarere Wharf shoreline (Site 27) – no target species were present at this site.

Site name: Kutarere Stream mouth
Site number: 28
Area: 3.2 ha
Survey date: 2/12/10

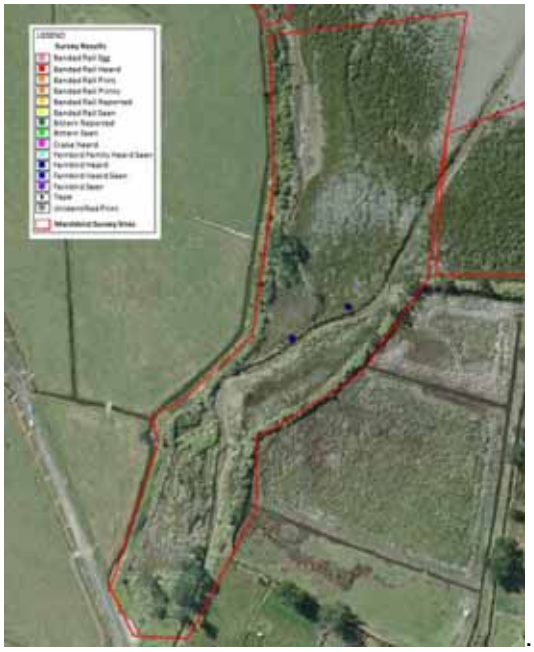
This site consists of vegetation growing around the Kutarere Stream mouth and the lower reaches of the Stream. A dense area of mangroves is present at the Stream mouth, bordered by rushlands and sea couch grasslands with occasional manuka and large wattle. The Stream is edged by stopbanks covered in adventives (especially pampas) with some manuka and bracken. Upstream towards the road the vegetation becomes dominated by grasslands with some reedland areas, a lot of gorse and isolated manuka and marsh ribbonwood.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
N Island fernbird	2	Two fernbird heard.
Other observed bird species		
Pūkeko	1	One heard and seen.
Swamp harrier	1	One seen overhead.
Other indigenous species		Yellowhammer, 7 paradise ducks.
Exotic species		Blackbirds, sparrows, starlings, thrush, mallard.

Existing threats and impacts	
Rubbish	Litter in several areas.
Stock	Area by road has been grazed and is not fenced.
Adventive plants	Gorse, sea couch, pampas, wattle, convolvulus, rose, pines, blackberry.
Recreation	Footprints and well-trodden track.
Other	Bank erosion in several areas.

Habitat quality: Moderate
Most of the area is dominated by sea couch and modified, low number of indigenous species.

Recommended management actions:
- Restrict stock access to wetland

 .*Survey results for Kutarere Stream mouth (Site 28).*

Site name: Papanui Road
Site number: 29
Area: 5.7 ha
Survey date: 2/12/10

Wetland area consisting of both estuarine and freshwater vegetation. A stream runs down the western edge of the wetland. Small fairly dry and weed-invaded raupo is present at the inland edge and then there is a gradient of sea couch grassland through rushland to mangroves by the stream edge. Exotic grasslands are present on the roadside edge with pampas and some three-square sedgelands. On the Harbour side of the road is an inlet filled with dense mangroves, with grass and algae growing through large areas. A large area of grass and reedlands is present on the western edge, and a small area of reedlands north of the school.

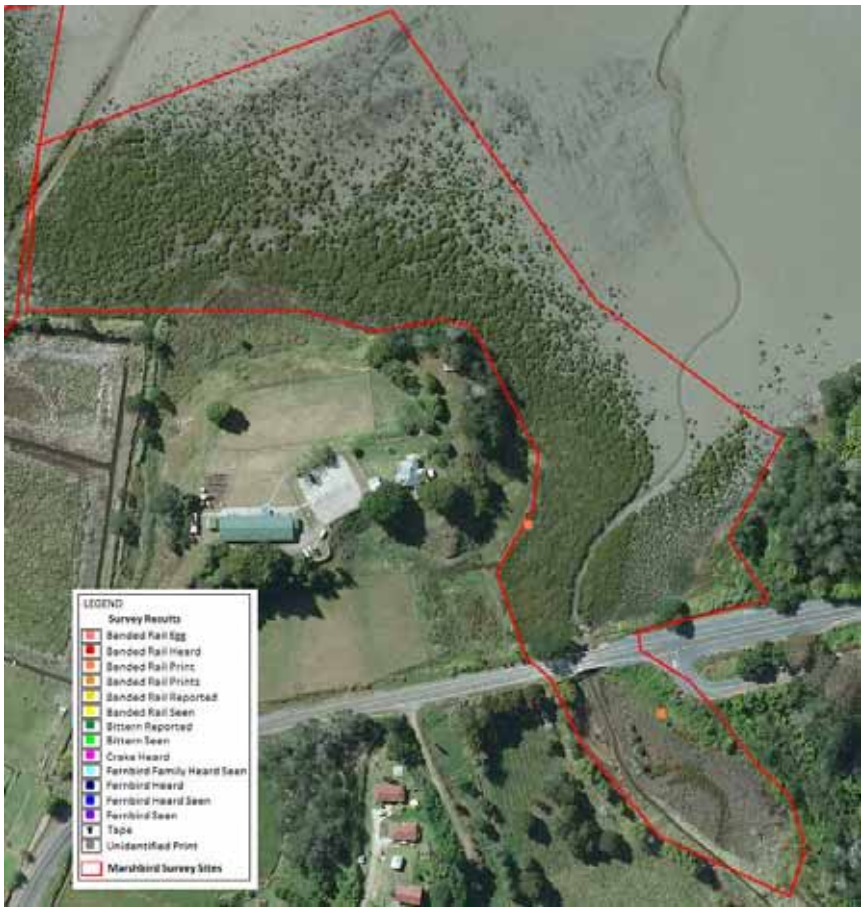
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1	Low density of prints.
Other observed bird species		
Other indigenous species		Fantail, shining cuckoo, white-faced heron, black-backed gull, 2 paradise ducks.
Exotic species		Blackbirds, sparrows, starlings, mallard, chaffinch, skylarks.

Existing threats and impacts	
Reclamation/drainage	Culvert on Harbour edge from old road bridge is affecting fish passage.
Rubbish	Old posts and old wooden wall (probably from an old road bridge), litter (especially shoes) by road.
Fencing	Appears mostly well-fenced.
Stock	Stock tracks by school.
Adventive plants	Pampas, rose, columbine, willow, wattle, gorse, mint, pines, convolvulus (especially on roadside berms), sea couch, blackberry, bindweed.
Residential	Human tracks and footprints present throughout.
Recreation	Oyster shells (area used by collectors).
Harmful water discharges	Questionable water quality (farm run-off, frothy dark and smelly water present). Oily sheen also present, later found caused by algae.

Habitat quality: Moderate
Dense mangroves dominate most of the site with little evidence of birdlife. The other habitat areas are small and often full of weeds and rubbish.

Recommended management actions:
- Control adventive plants.
- Investigate water quality issues.
- Restrict stock access to the wetland.
- Investigate options to remove the old road bridge to allow fish passage (and thereby increase marshbird food availability).

Dense mangroves are present over much of the site.



Survey results from Papanui Road (Site 29).

Site name: State Highway 2 (Overflow Bridge)
Site number: 30
Area: 15.0 ha
Survey date: 24/11/10

A large area of searush and oioi rushlands with sea couch interspersed throughout. A large area of the wetland is covered in exotic grasses and grazed by cows. A fringe of mangroves is present on the Harbour edge. Near the road by the wetland edges adventive species are present. Some small areas of three-square sedgelands and other vegetation types are found throughout the wetland. Several small streams drain into the Harbour through the site.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	One bird seen, multiple sets of prints observed.
North Island fernbird	20	Approximately 20 birds heard.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Other indigenous species		White-faced heron, black-backed gull, pied shag, fantail, welcome swallow.
Exotic species		Geese, skylark, sparrows, goldfinch.

Existing threats and impacts	
Reclamation/drainage	Road causeway will affect drainage.
Rubbish	Litter by road, old pipes and wood.
Public utilities	Road runs alongside site, with heavy traffic.
Fencing	Unfenced in south-west corner (well fenced north-east area).
Stock	Large area of saltmarsh grazed and stock tracks in wetland.
Adventive plants	Sea couch.
Adventive animals	Rat prints.
Recreation	Oyster collectors use area (piles of shells left behind), footprints.
Harmful water discharges	Evidence of oil run-off from road.

Habitat quality: Moderate
Large area and good amount of rail sign and fernbird numbers but stock are impacting seriously and a number of other disturbances are present.

Recommended management actions:
- Carry out pest control for rats.
- Repair fences to prevent stock access.
- Continue work with landowners to stop large area of wetland being used for grazing.

Site looking towards Kutarere School.

Survey results for State Highway 2 (Overflow Bridge) (Site 30).

Site name: Ruatuna Road embayment
Site number: 31
Area: 1.8 ha
Survey date: 3/11/10

Small wetland with estuarine vegetation separated by Harbour from Ruatuna Road. The central area of rushlands is being encroached upon by exotic grasses, which are very dense in places. Interspersed in between are some mossy and algal areas, and some small exposed mud areas. Several drains run through the area.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed in one muddy area.
North Island fernbird	4	Two birds were seen, and another two heard.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko	3	Three birds seen.
Other indigenous species		White-faced heron, black shag, swallow, spur-winged plover, grey warbler, paradise shelduck, shining cuckoos. Weka reported.
Exotic species		Magpie, pheasant, mynah, finches, hedge sparrow, thrush.

Existing threats and impacts	
Reclamation/drainage	Tidal entry is restricted to a culvert under the road. A farm drain runs down the centre of the wetland, which appears to have oil in it in places.
Fencing	Old fence posts and fencing wire are present. Site looks well fenced, with an electric fence surrounding most of it.
Stock	Cattle marks and horse droppings were observed in some of the wetland, although they appeared fairly old.
Adventive plants	Sea couch, grasses, wattles, privet.
Adventive animals	Rat and hedgehog marks.
Residential	Pets are likely from neighbouring residential properties, one dog was heard barking.
Harmful water discharges	A dairy shed is present on adjacent land, so there is potential run-off.

Habitat quality: Moderate
Small, low habitat diversity, dairy shed in close proximity, tidal access limited, prone to edge effect and impacted on by pests, but numerous birds recorded, well fenced and large areas of rushland vegetation in good condition.

Recommended management actions:
- Investigate water quality of farm drain.
- Control adventive plants.
- Control pest animal species.

Overview of site from road.

Survey results for Ruatuna Road embayment (Site 31).

Site name: Pataua Island Scientific Reserve
Site number: 32
Area: 14.2 ha
Survey date: 3/11/10

A large area of dead mangroves (with live individuals interspersed throughout) covering the tidal flats between the Island and the mainland. The mangroves are surrounded by oioi dominated rushland on the inland side, which is bordered by the roadside berm covered in secondary vegetation and adventives. On the Harbour edge there is a fringe of live mangroves. The Island itself is covered in good quality native forest. Good marshbird habitat is present by the Island with a healthy forest through scrub, reeds and then mangroves gradation.

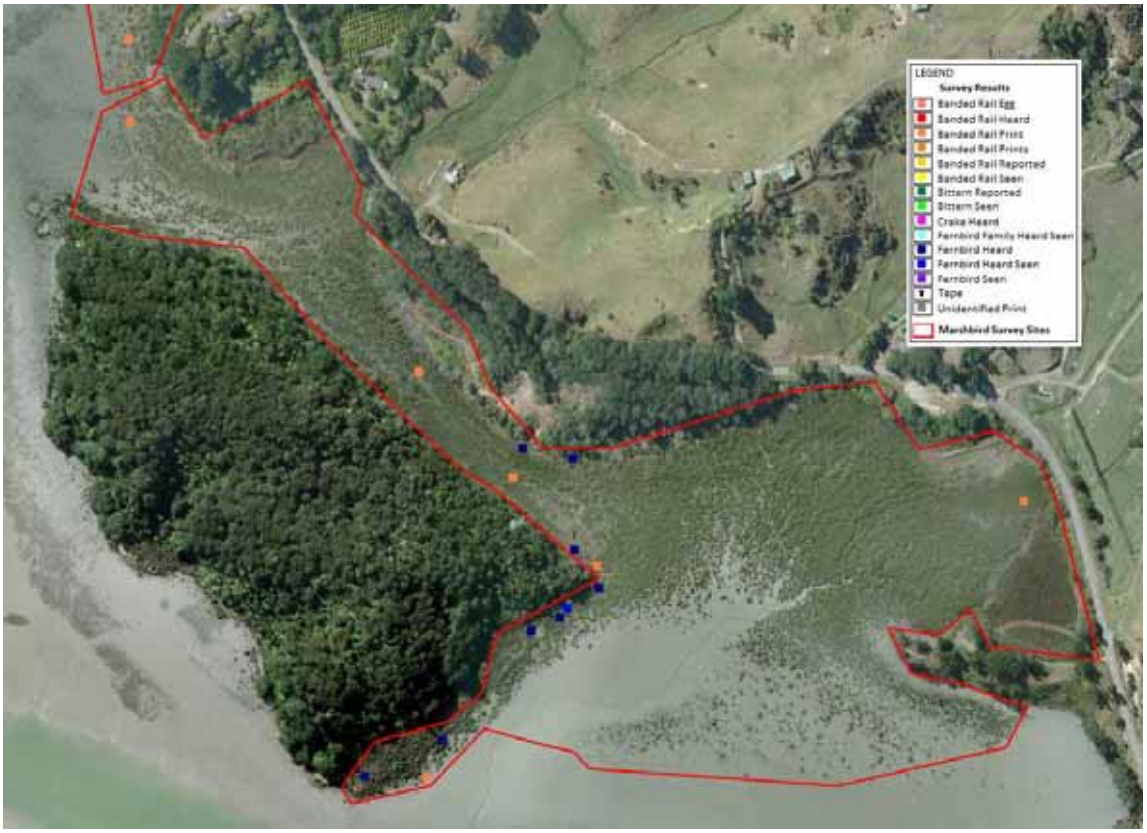
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	6+	At least two sets of individual prints, and one family.
North Island fernbird		Lots.
Other observed bird species		
Kingfisher	2	Heard and seen.
Pūkeko	1	Seen.
Swamp harrier	1	In mangroves.
Other indigenous species		Fantail, grey warbler, pukeko, white-faced heron, welcome swallow, bellbird, oystercatchers, shining cuckoo, tui.
Exotic species		Finches, blackbird, pheasant, sparrow, chaffinch.

Existing threats and impacts	
Rubbish	Some rubbish, old concrete and building materials dumped, old shells from oyster collectors.
Stock	Bordered by farmland.
Adventive plants	Willow, poplar, wattle, sea couch, rank exotic grasses, lupins, privet, rose, wilding fruit trees, montbretia, honeysuckle - all mainly on roadside berm.
Adventive animals	Rat prints, horses.
Residential	Cats and dogs likely from neighbouring properties.
Recreation	Human tracks (likely to be shellfish gatherers).
Other	Evidence of recent fire on southern end.

Habitat quality: High
Outstanding area of habitat by islands with high number of birds, plant community diversity and good plant cover but the remainder of the site mainly consists of dead mangroves with very little shellfish life which would be poor habitat, although still used by banded rail. This area would also act as a buffer for pests and weeds.

Recommended management actions:
- Control adventive plants.
- Control pest animal species.

Pataua Island harbour edge vegetation.



Survey results for Pataua Island Scientific Reserve (Site 32).

Site name: Ruatuna Road
Site number: 33
Area: 3.8 ha
Survey date: 3/11/10

A mangrove fringe is situated beside rushland and reedland vegetation, grading into residential gardens, with some areas of manuka, cabbage tree and ponga. Numerous adventives are present. There is an area of cleared oioi, and a small patch of raupo.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	2+	At least two sets of prints observed.
N Island fernbird	7	Four heard, and three seen.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Other indigenous species		Kereru, grey warbler, shining cuckoo.
Exotic species		Mallard, sparrow, chaffinch, goldfinch.

Existing threats and impacts	
Rubbish	Litter.
Adventive plants	Bindweed, buttercup, privet, wattle, blackberry, pampas, ginger, bamboo.
Adventive animals	Dogs.
Residential	Dwellings beside area.
Recreation	Recreational use, people looking for oysters, dinghy.

Habitat quality: Moderate
A thin strip between Harbour and dwellings, most of which is constantly inhabited.

Recommended management actions:

- Raise awareness of local residents of the marshbird populations present, and the potential effect of domestic animals on these populations.
- Control pest plant species.

Survey results for Ruatuna Road (Site 33).

Site name: Ruatuna Road Inlet
Site number: 34
Area: 0.6 ha
Survey date: 3/11/10

The vegetation at this site consists of mangroves, manuka, reeds and sea couch with some adventives.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed.
North Island fernbird	1	One heard.
Other observed bird species		
Pūkeko		Numbers not specified.
Other indigenous species		White-faced heron, oystercatchers, fantail, waxeye.
Exotic species		Blackbird, sparrow, pheasant, mallard, domestic chickens.

Existing threats and impacts	
Reclamation/drainage	Stormwater drains present.
Rubbish	Litter.
Adventive plants	Sea couch, pampas, wattle, willow, gorse, privet.
Adventive animals	Dogs, rats.
Residential	Dwellings nearby.
Recreation	Dinghy ramps, holiday bach and campsites in vicinity.

Habitat quality: Moderate
A number of modifications present.

Recommended management actions:

- Raise awareness of local residents of the marshbird populations present, and the potential effect of domestic animals on these populations.

Survey results for Ruatuna Road Inlet (Site 34).

Site name: Pukeruru Point Inlet
Site number: 35
Area: 1.9 ha
Survey date: 2/11/10

Small tidal inlet separated from the Harbour by Ohiwa Loop Road. Estuarine vegetation comprises undamaged mangroves forming a sparse cover, reeds, and areas of saltwater paspalum, bracken, blackberry, pampas, mixed natives. There is a large area of grey willow at the top end, as well as an area of dense flax that would be likely bittern habitat.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1+	Prints observed.
N Island fernbird	31	18 birds heard, and a further 13 seen.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko	>1	Numbers not recorded.
Other indigenous species		Swallows, silvereyes, heron, grey warbler, shining cuckoo, tui, fantail.
Exotic species		Chaffinch, goldfinch, magpies, gulls, ducks.

Existing threats and impacts	
Adventive plants	Saltwater paspalum, blackberry, pampas, grey willow, wattles, privet, sea couch (these plants are mainly on the periphery).
Adventive animals	Rat prints.
Other	Lots of whitebait and insect life noted.

Habitat quality: High
Very healthy fernbird population (based on the number of sightings and no surrounding dwellings. The rail population is likely to be restricted due to limited food availability (few snails were observed) and limited habitat availability (there is a limited range of marginal scrub and mangroves are not present in several areas where oioi grades straight to water).

Recommended management actions:
- Control adventive plants.
- Control pest animal species

Pukeruru Point Inlet (Site 35) - survey results were not recorded on an aerial photo for this site.

Site name: Ohiwa Scenic Reserve Inlet
Site number: 36
Area: 5.3 ha
Survey date: 2/11/10

Tidal inlet separated from Harbour by Ohiwa Loop Road. The estuarine vegetation comprises of mangroves (two thirds of which have been hail damaged), reeds, sea couch and bindweed. This vegetation is edged by various planted natives, blackberry, lupin and wattle with a healthy native succession on the inland edge from saltmarsh to pohutukawa forest.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	Print observed.
Banded rail	4+	Dense prints observed, and prints of a family observed in one area. A predated banded rail was also found (suspected to have been by a hawk).
North Island fernbird	2	Two seen.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Swamp harrier		None observed, but suspected to have predated on banded rail.
Other indigenous species		Weka, tui, bellbird, plover, oystercatcher, kereru, heron, grey warbler, paradise duck.
Exotic species		Sparrow, chaffinch, blackbird, pheasant, gulls, quail.

Existing threats and impacts	
Rubbish	Litter.
Adventive plants	Acacia, sea couch, bindweed, blackberry, lupin, wattle.
Adventive animals	Possum damage.
Residential	Residential dwellings nearby.
Recreation	Picnic area.
Other	Sulphurous smell of decaying mangrove root.

Habitat quality: Moderate
Dwellings, picnic area and road are impacting on area, and hail damage has reduced mangrove cover for rail. Drainage has been modified by road construction. This site was the only location where North Island weka were observed during the survey.

Recommended management actions:
- Control adventive plant species.
- Undertake possum control.

Pukeko prints at Ōhiwa Scenic Reserve Inlet (Site 36).

Ōhiwa Scenic Reserve Inlet (Site 36) - survey results were not recorded on an aerial photo for this site.

Site name: Ohiwa Loop Road Spit
Site number: 37
Area: 1.4 ha
Survey date: 9/11/10

This site consists of a very narrow band of rushes between the Harbour and residential area. Mangroves were formerly extensive, but 80% of the ones observed were frost or hail damaged and now dead. Sea rushes and couch are present around the margin and there is an area of *Baumea juncea* at the tip of the spit.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	3	Three sets of tracks.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Other indigenous species		Tui, spur-winged plover, black-backed gull, yellowhammer, welcome swallow, white-faced heron, long-tailed cuckoo.
Exotic species		Magpie, rooster, chaffinch.

Existing threats and impacts	
Rubbish	Litter.
Stock	Cattle grazing nearby, stock fence across the marsh means there is no buffer between farmland and the Harbour in a quarter of the area.
Adventive plants	Gorse, pampas, sea couch.
Adventive animals	Rat prints.

Habitat quality: Moderate
Very narrow margin of rushes between Harbour and residential area. Very little mangroves remaining after hail storm in 2009.

Recommended management actions:

- Complete fencing to restrict stock access to the Harbour.

Survey results for Ōhiwa Loop Road Spit (Site 37).

Site name: Reeves Road Inlet
Site number: 38
Area: 4.4 ha
Survey date: 9/11/10

This site is a narrow tidal inlet with a small margin of rushes around the edge. Mangroves were formerly extensive on the tidal flats but 75% are dead after a hail storm in 2009. There are also areas of flax and manuka with the occasional cabbage tree and 5 metre high pohutukawa.

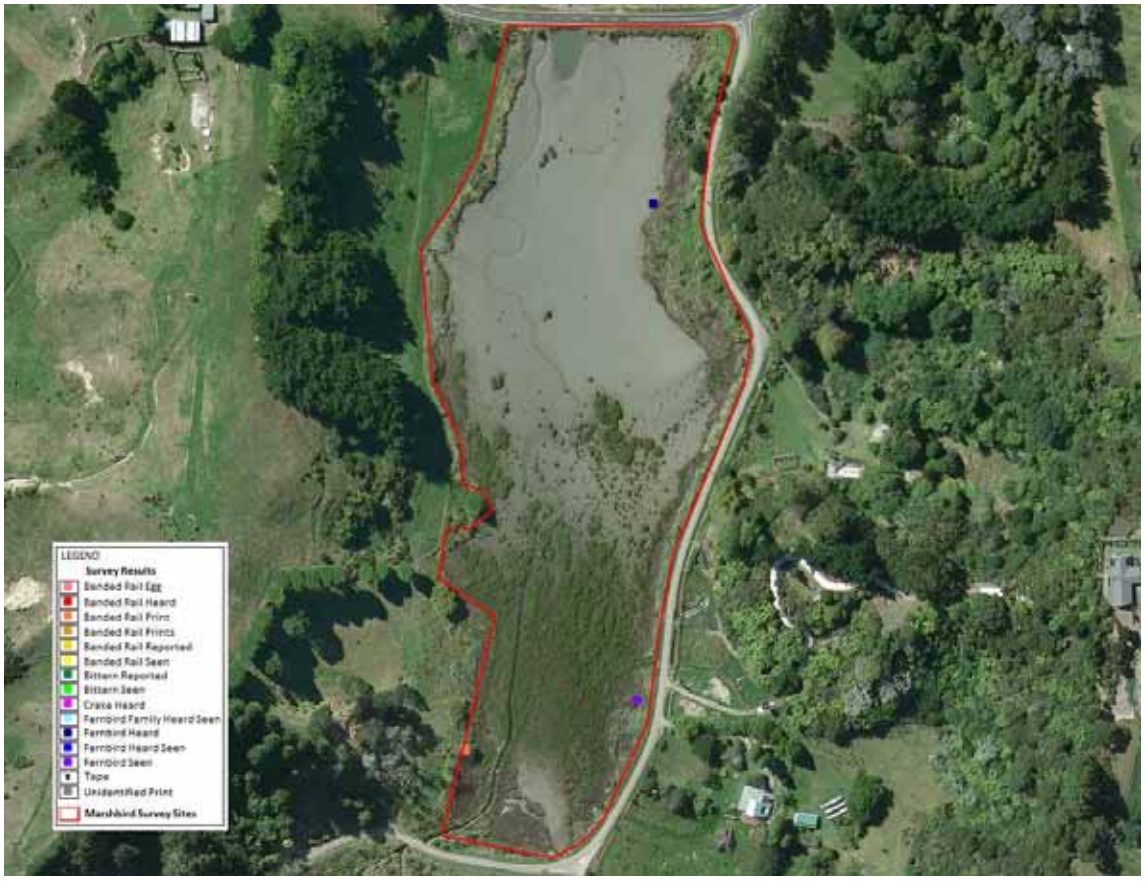
Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern		Local landowner has seen two bittern in marshland via drain in neighbouring paddock regularly.
Banded rail		Local landowner has observed less rail since hail damage of mangroves occurred.
Other observed bird species		
Kingfisher		Numbers not recorded.
Pūkeko		Numbers not recorded.
Australasian harrier		Numbers not recorded.
Other indigenous species		Tui, white-faced heron, fantail, yellowhammer, long-tailed cuckoo, paradise duck.
Exotic species		Mallard, magpie, thrush, blackbird, Californian quail, sparrow.

Existing threats and impacts	
Fencing	Fences not secure.
Stock	Goats in marshland coming through neighbouring property's fence.
Adventive plants	Privet, pampas, blackberry, wattle, bindweed, gorse, willow, macrocarpa, honeysuckle.
Adventive animals	Rat prints. A dead rat was also observed on the road when passing by the site several weeks later.
Harmful water discharges	Freshwater stream through wetland showing signs of nitrate runoff (green patches in stream).
Other	Mangrove dieback.

Habitat quality: Moderate
This site is highly modified around edges with only a small margin of rushes and two sides bordered by roads.

Recommended management actions:
- Repair fences to prevent stock and goat access.
- Control adventive plants.
- Control pest animal species.
- Investigate water quality of stream.

Overview of site from Reeves Road.



Survey results from Reeves Road Inlet (Site 38).

Site name: Uretara Island Scenic Reserve
Site number: 39
Area: 36.6 ha
Survey date: 30/11/10

The Island is covered in regenerating (largely kanuka with areas of rewarewa) forest with large areas of wattles. Some large pohutukawa remain on cliffs. Mangroves are found in inlets and bordering the Island sides. Small areas of rushland (more extensive on northern side) are found between mangroves and forest. Sea couch is encroaching in several areas. Areas of raupo are also present, with one large area in the centre of the Island.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	4+	Several sets of prints, with tracks from a family with chicks observed in central area. Number of birds appears to be restricted by low observed crab abundance.
Spotless crake		Reported from large raupo area by local care group members. Would not respond to tapes played during this survey.
North Island fernbird	30	One seen and a further 29 heard.
Other observed bird species		
Kingfisher		Numbers not recorded.
Swamp harrier		Numbers not recorded.
Other indigenous species		Bellbirds, 2 white-faced herons, waxeyes, variable oystercatchers, black-backed gull, grey warbler, fantails, shining cuckoo, long-tailed cuckoo, tuis.
Exotic species		Pheasants (evidence of digging in several areas), Californian quail.

Existing threats and impacts	
Rubbish	Litter especially bait bags and golf balls on the northern side.
Adventive plants	Gorse, wattles, pampas, sea couch, moth plant, wild ginger.
Recreation	Tracks observed through rushlands.
Other	Large fire 50 years ago has altered vegetation on the island. Proposal from a local care group to establish a bait station network on the Island.

Habitat quality: High
Good habitat diversity and a large number of fernbirds, but a number of adventives are present.

Recommended management actions:
- Control adventive plants.
- Support local care group in proposal to establish bait station network on the Island.
- Seek protection of the unprotected areas of the island, which have been identified by the Bay of Plenty Regional Council as a high value ecological site.

Stuart Slade, Ron Russell and Margaret Slade surveying the northern half of Uretara Island.

Uretara Island Scenic Reserve (Site 39) - survey results were not recorded on an aerial photo for this site.

Site name: Motuotu Island Nature Reserve
Site number: 40
Area: 56.4 ha
Survey date: 6/12/10

This site consists of isolated islets with regenerating vegetation (mainly kanuka and isolated large pohutukawas) connected by an extensive area of mangroves. Small areas or reeds and rushes are present between the vegetation and mangroves, with gorse and sea couch encroaching.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Banded rail	1	Prints observed in central area.
N Island fernbird	5	Five heard calling on northwest side.
Other observed bird species		
Kingfisher	1	One heard.
Pūkeko		Prints observed.
Other indigenous species		Black-backed gull (19 seen, known to nest on the island), 15 white-faced heron, 2 fairy terns, grey warbler, fantail.
Exotic species		Finches.

Existing threats and impacts	
Rubbish	Bait bags have been washed up on many areas around the Island.
Adventive plants	Gorse, sea couch.
Other	A large area of dead mangroves is present on the northern side, probably due to hail damage.

Habitat quality: High
The area is isolated and the dense surrounding mangroves mean human influence is minimal.

Recommended management actions:
- Control gorse and sea couch.

Survey results for Motuotu Island Nature Reserve (Site 40).

Site name: Whangakopikopiko Wildlife Refuge Reserve
Site number: 41
Area: 16.6 ha
Survey date: 8/11/10

Low lying island covered mostly by introduced grasses, with some native ground cover (bracken, muehlenbeckia (*Muehlenbeckia complexa*) and rushes). An area of the threatened Thornton kanuka (*Kunzea* 'Thornton') is situated at the western end. Lupins and other exotics are present to low levels.

Surveyed birds		
Species	***Numbers***	***Notes/Comments***
Australasian bittern	1	One heard south of the Island. Heard while standing on southern side at western end.
Banded rail	1+	Prints observed. All likely habitat is on the southern side of the Island where the soil make-up is very hard and not conducive to leaving prints. There are probably more banded rail present than were observed.
North Island fernbird	46	46 birds were heard, 20 were also seen.
Other observed bird species		
Kingfisher		Number not recorded.
Pūkeko		Numbers not recorded.
Swamp harrier		Numbers not recorded.
Other indigenous species		Black-backed gulls, red-billed gulls, New Zealand dotterel, variable oystercatchers, royal spoonbill, godwit, swallow, fantail, white-faced heron, pied stilt, harrier hawks, pukeko.
Exotic species		Sparrows, chaffinch.

Existing threats and impacts	
Adventive plants	Lupin, blackberry, introduced grasses, pampas, wattle regrowth, briar rose.
Adventive animals	Occasional vertebrate pests, rabbits, dogs. Pest control is in place.
Recreation	People often visit the Island.
Other	Erosion, fire.

Habitat quality: High
A unique conservation area that holds a good population of fernbird and provides breeding habitat for New Zealand dotterel and other shorebirds. A dedicated care group looks after the island, there is commitment from DoC and the island is isolated to pests and people. A rare stand of Thornton kanuka is present, and the site is large in size, legally protected and isolated from many potential threats.

Recommended management actions:
- Continue to work with the Department of Conservation and the care group active at this site.

Ōhiwa Spit, Whangakopikopiko and Motuotu Islands viewed from Onekawa.

Survey results from Whangakopikopiko Wildlife Reserve (Site 41).

Site name: Ohiwa Loop Road Unnamed Island
Site number: 42
Area: 0.6 ha
Survey date: 11/12/10

This site consists of a small vegetated island in the eastern area of the Harbour. In the centre of the Island there is an area of gorse with some manuka and pohutukawa. This area is surrounded by oioi and searush rushlands, with some sea couch and scattered mangroves. An area of dead mangroves is present on the western side.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
North Island fernbird	4	Four heard.
Other observed bird species		
Kingfisher		No numbers recorded.
Other indigenous species		Variable oystercatchers, black-backed gulls (overhead and nearby).

Existing threats and impacts	
Rubbish	Some debris (wood, tyres) washed up around margin.
Adventive plants	Gorse, pampas, sea couch, lupin, convolvulus.

Habitat quality: Moderate
Very small in size and dominated by adventives.

Recommended management actions:
- Control pest plants.

Ōhiwa Harbour Road Unnamed Island (Site 42) - survey results were not recorded on an aerial photo for this site.

Site name: Stuart's bittern spot
Site number: 43
Area: 0.3 ha
Survey date: 3/12/10

A small mud embayment isolated from the Harbour by road causeway but with some tidal access. Areas of searush rushlands and three-square sedgelands are present around the sides with manuka behind and sea couch grasslands found in between. Isolated mangrove individuals and small areas of raupo are distributed through the site. The site is bordered by farmland.

Surveyed birds		
Species	***Numbers***	***Notes/comments***
Australasian bittern	1	One has been reported by a local resident. Stood for a while before flying across the road.
Banded rail	1+	Several sets of prints were observed.
Other observed bird species		
Kingfisher	1	One seen and heard.
Swamp harrier	1	One seen overhead.
Other indigenous species		Yellowhammer, long-tailed cuckoo.
Exotic species		Sparrows

Existing threats and impacts	
Reclamation/drainage	Small culvert under road only tidal access.
Rubbish	Litter, old fence line.
Public utilities	Rock rip-rap present along road causeway for erosion protection.
Adventive plants	Present on road causeway, sea couch.
Recreation	Footprints in several areas.
Other	Wetland was fenced and planted by local residents.

Habitat quality: Moderate
Small in size and isolated from Harbour.

Recommended management actions:

- Ask Whakatane District Council to install "Bittern Crossing" signs, as bitterns have been reported on both sides of the road in this area.

Stuart's bittern spot (Site 43) – survey results were not recorded on an aerial photo for this site.

Site name: Ohiwa Domain
Site number: 44
Area: 1.8 ha
Survey date: 1/12/10

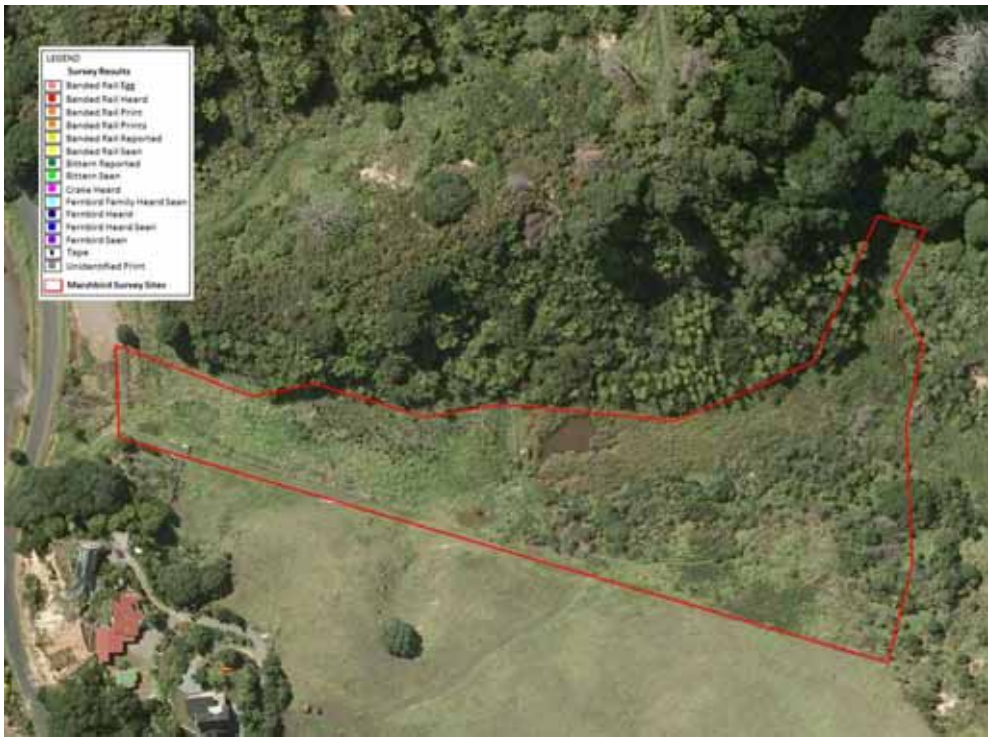
Wetland area adjacent to Ohiwa Harbour Domain. Site consists of a large area of raupo surrounding an area of clear water draining under a raised track into the Harbour over the road. An unidentified coarse sharp grass is smothering raupo at the top end. Surrounded by regenerating native vegetation. Very small area of reed before drain under the road with some mangroves establishing. Along the Harbour edge some reeds and mangroves are present.

Other observed bird species		
Kingfisher		Numbers not recorded.
Other indigenous species		Tui, white-faced heron, welcome swallow, fantail, pigeon.
Exotic species		Californian quail, pheasant, blackbird, magpie, peacock.

Existing threats and impacts	
Reclamation/drainage	Drainage has been modified.
Public utilities	A raised and well-defined footpath has been constructed which has altered drainage.
Adventive plants	Bindweed, willow, blackberry, gorse, pine, wattle, privet, buttercup, wild rose, coarse sharp grass which is smothering raupo at top end.

Habitat quality: Moderate
Very little diversity of habitat is present in the wetland area and altered drainage.

Recommended management actions:
- Control adventive plants.



Survey results for Ōhiwa Domain (Site 44)- no target species were recorded at this site.

Appendix 3 – Bird species recorded in Ōhiwa Harbour

Common name	Scientific name	Threat status (based on Miskelly *et al*., 2008)	Present in 1990	Present in 2010
Australasian bittern	*Botaurus poiciloptilus*	Nationally Endangered	Y	Y
Australasian gannet	*Morus serrator*	Not Threatened	N	Y
Australian magpie	*Gymnorhina tibicen*	Introduced and Naturalised	N	Y
Banded rail	*Gallirallus philippensis assimilis*	Relict	Y	Y
Bellbird	*Anthornis melanura melanura*	Not Threatened	Y	Y
Black shag	*Phalacrocorax carbo novaehollandiae*	Naturally Uncommon	Y	Y
California quail	*Callipepla californica*	Introduced and Naturalised	Y	Y
Caspian tern	*Hydroprogne caspia*	Nationally Vulnerable	N	Y
Chaffinch	*Fringilla coelebs*	Introduced and Naturalised	Y	Y
Chicken	*Gallus domesticus*	-	N	Y
Common myna	*Acridotheres tristis*	Introduced and Naturalised	N	Y
Common pheasant	*Phasianus colchicus*	Introduced and Naturalised	Y	Y
Common starling	*Sturnus vulgaris*	Introduced and Naturalised	Y	Y
Eastern bar-tailed godwit	*Limosa lapponica baueri*	Migrant	Y	Y
Eurasian blackbird	*Turdus merula*	Introduced and Naturalised	Y	Y
European goldfinch	*Carduelis carduelis britannica*	Introduced and Naturalised	Y	Y
European greenfinch	*Carduelis chloris*	Introduced and Naturalised	Y	N
Feral goose	*Anser anser*	Introduced and Naturalised	Y	N
Grey warbler	*Gerygone igata*	Not Threatened	Y	Y
Hedge sparrow	*Prunella modularis*	Introduced and Naturalised	Y	Y
House sparrow	*Passer domesticus*	Introduced and Naturalised	Y	N
Long-tailed cuckoo	*Eudynamys taitensis*	Naturally Uncommon	N	Y

Common name	Scientific name	Threat status (based on Miskelly *et al*., 2008)	Present in 1990	Present in 2010
Mallard	*Anas platyrhynchos*	Introduced and Naturalised	Y	Y
New Zealand kingfisher	*Todiramphus sanctus vagans*	Not Threatened	Y	Y
New Zealand pigeon (kereru)	*Hemiphaga novaeseelandiae*	Not Threatened	N	Y
North Island fantail	*Rhipidura fuliginosa placabilis*	Not Threatened	Y	Y
North Island fernbird	*Bowdleria punctata vealeae*	Declining	Y	Y
North Island weka	*Gallirallus australis greyi*	Nationally Vulnerable	N	Y
Northern New Zealand dotterel	*Charadrius obscurus aquilonius*	Nationally Vulnerable	Y	Y
Paradise shelduck	*Tadorna variegata*	Not Threatened	Y	Y
Peafowl	*Pavo cristatus*	Introduced and Naturalised	N	Y
Pied stilt	*Himantopus himantopus leucocephalus*	Declining	Y	Y
Pūkeko	*Porphyrio melanotus melanotus*	Not Threatened	Y	Y
Red-billed gull	*Larus novaehollandiae scopulinus*	Nationally Vulnerable	N	Y
Royal spoonbill	*Platalea regia*	Naturally Uncommon	N	Y
Shining cuckoo	*Chrysococcyx lucidus lucidus*	Not Threatened	N	Y
Silvereye	*Zosterops lateralis lateralis*	Not Threatened	Y	Y
Skylark	*Alauda arvensis*	Introduced and Naturalised	N	Y
Song thrush	*Turdus philomelos*	Introduced and Naturalised	Y	Y
Southern black-backed gull	*Larus dominicanus dominicanus*	Not Threatened	Y	Y
Spotless crake	*Porzana tabuensis plumbea*	Relict	Y	Y
Spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened	Y	Y
Swamp harrier	*Circus approximans*	Not Threatened	Y	Y
Tui	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	Y	Y
Variable oystercatcher	*Haematopus unicolor*	Recovering	Y	Y
Welcome swallow	*Hirundo tahitica neoxena*	Not Threatened	Y	Y
White-faced heron	*Ardea novaehollandiae*	Not Threatened	Y	Y
Yellowhammer	*Emberiza citronella*	Introduced and Naturalised	Y	Y