Hibiscus and Bays Local Board
Auckland Council

Orewa Estuary Te Ara Tahuna Community Restoration Plan

For Auckland Council – Hibiscus and Bays Local Board
TE MAHERE A TE POARI A-ROHE

July 2017

REPORT INFORMATION AND QUALITY CONTROL

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1 INTRODUCTION

The Orewa Estuary (Te Ara Tahuna) has an extensive Maori and European history, and is a tāonga (precious treasure) once replete with native flora and fauna. Since Maori and European Settlement, the majority of surrounding area of Orewa Estuary has been significantly modified from its once dominant pohutukawa, puriri, broadleaved coastal forest to a variety of modified vegetation communities. The area now comprises plant communities ranging in ecological value. These include the endangered mature broadleaved forest adjacent to Arran Drive Bridge; a unique remnant stand of ti kouka by Kath Hopper Drive; the seral broadleaved scrub/forest riparian lining the West Hoe stream outlet, to the many native plantings of pohutukawa and harakeke. These areas hold intrinsic value for local residents and provide food and shelter for 39 native birds, 13 of which are endemic, and two native skinks (copper skink *Oligosoma aeneum* and ornate skink *Cyclodina ornate*). The estuary also provides value for the local economy, cultural heritage, amenity and recreation. However, ongoing pressure from urbanisation around the estuary has resulted in the introduction of numerous environmental weeds, predators and decreased the water quality, resulting in an overall decline in the health of the estuary (Auckland Council Technical report 2015/010).

1.1 Purpose

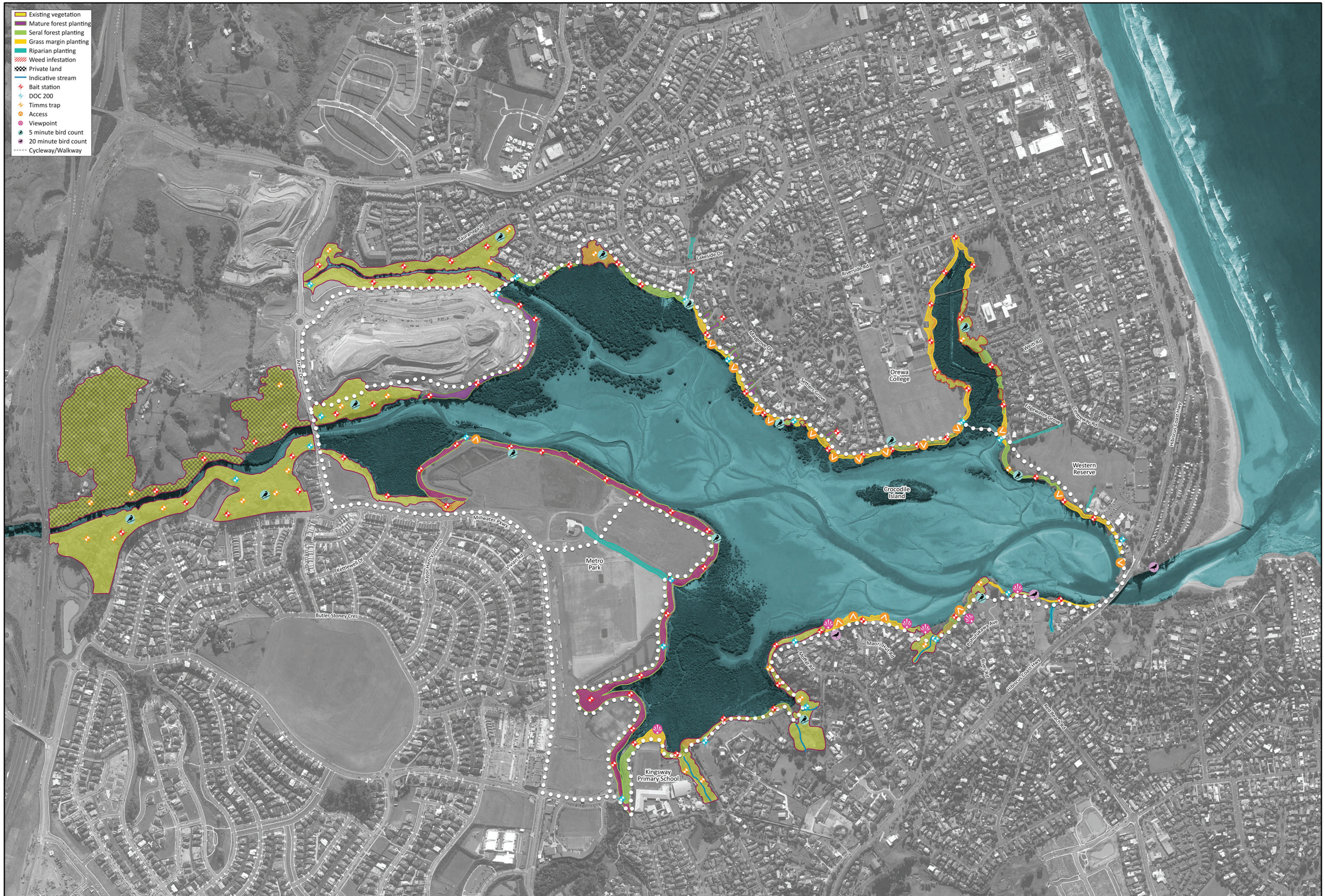
The purpose of this plan is to provide guidance to local stakeholders to enable a collaborative, coordinated and strategic approach to restoration and enhancement activities around the Orewa Estuary. This plan incorporates the collective vision of the Hibiscus and Bays Local Board, Auckland Council's Biodiversity and Parks and Recreation Teams, Forest and Bird – Hibiscus Coast Branch, Ngāti Whātua o Kaipara, Hilltop Residents Association, Millwater and Totara Views Residents and a variety of local individuals. 4Sight Consulting Ltd. (4Sight) was commissioned by the Hibiscus and Bays Local Board to develop this plan in March 2017.

This plan aims to build on the success of current small-scale restoration initiatives by balancing the needs of the land, people and water. It has been designed to form lasting interactions between groups by providing the tools and means to implement long-term restoration solutions such as native planting, pest animal control, environmental weed control, and enhance the habitats and physical environmental linkages around the estuary.

1.2 Context

This plan plays an important part of the wider restoration projects along the Hibiscus Coast. It builds on the Forest and Bird Pest Free Peninsula initiative at Whangaparaoa, and the overall North-West Wildlink, by creating more safe, connected and healthy habitats for native wildlife across Auckland.

With all restoration projects, it's important to understand the areas of priority and the boundaries of your scope. For the purpose of this plan, the area in focus includes the margin surrounding the Orewa Estuary, between the bridges of State Highway 1 to the west and Hibiscus Coast Highway to the east. This also includes the tidal outlets of the Orewa River, Waterloo Creek and the West Hoe Stream. The vast majority of this area is on public reserve, meaning that **before** any restoration activities are undertaken you **must** first liaise with Auckland Council.



Aerial imagery sourced from Google Earth Pro

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AA2506 - Orewa Estuary Restoration Plan

Overarching Restoration Map

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 27/06/2016
Version: 1.0
Drawn: Sam Hendrikse
Checked: Tony Payne
Approved: Tony Payne

Hibiscus and Bays Local Board
Auckland Council

4SIGHT CONSULTING

1.3 Objectives

Prior to development of the plan, 4Sight met with various local groups with an interest in the estuary to understand what is important to local residents, and what restoration aspirations they have for the estuary. Overall,the community would like to see more native planting, more habitat for local fauna, better water quality, access areas into the estuary and a reduction in the spread of mangroves. In particular, providing a safe haven for native birds around the estuary was identified as a key objective for this plan. Community discussions also revealed that people would like to see more collaboration between interest groups, local schools and Auckland Council and know who to contact to start restoring the Orewa Estuary.

This plan aims to achieve these goals by creating a full estuary riparian buffer with native planting and predator control. Over time, implementation of the plan will enhance and extend the existing habitats, protect wading birds and terrestrial fauna, reduce silt into the estuary, increase erosion control and improve the overall ecological function. The social needs of the area are balanced by preserving the defined access points and retaining the many viewpoints around the walkway, so the community can enjoy still enjoy the recreational values of the estuary.

Community Contacts:

Auckland Council – Community Ranger and Biosecurity Team:

(09) 3010101

anna.baine@aucklandcouncil.govt.nz

Forest and Bird – Hibiscus Coast Branch

hibiscuscoast.branch@forestandbird.org

Ngati Whatua o Kaipara:

businessservices@kaiparamoana.com

It is also important to recognise the wider context of the Orewa Estuary when considering the objectives for this plan, and that restoration is about kick-starting ecosystem processes rather than replicating historic environments. We must acknowledge the wider urban environment, and that this plan seeks to provide guidance to repair damaged habitats, rather than fully recreate the environment of the past.

This plan is intended to be a living document, as it is recognised that the community goals and aspirations may change over time, and will take many years to complete.

"a good mix of native vegetation to provide habitat for native birds, insects and reptiles."

"my daughter would love more skinks."

1.4 Plan Layout

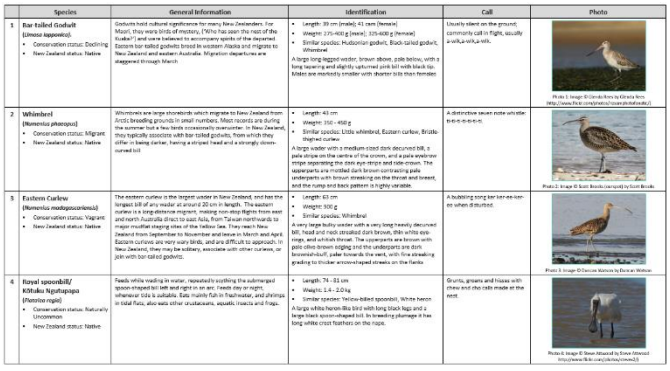
The plan is designed for the community to pick up, and understand what ecological restoration activities are needed around the Orewa Estuary, and how to go ahead with implementing them. It provides information, advice and tools for the following key topics:

- **Section 2: Restoration Guideline** - includes the key steps to take to ensure your project.
- **Section 3: Matauranga Maori** - includes a protocol for accidental discoveries;
- **Section 4: Animal pest control** - includes the methodologies for undertaking control and associated monitoring;
- **Section 5: Environmental weed control** - includes the process for controlling weeds (supplemented by a reference guide);
- **Section 6: Restoration planting** - includes a maintenance timeline, kauri dieback and myrtle rust information, ecosourcing guidance and how to propagate rushes;
- **Section 7: Bird monitoring** - includes monitoring methodologies (supplemented by a reference guide); and
- **Section 8: Mangroves and sediment** - includes information on mangrove management, and sediment monitoring.

Restoration guidance map – Appendix A

There are also four appendices that provide additional information to help with restoring the estuary, these include:

- **Appendix A - Orewa Estuary Te Ara Tahuna Restoration Guidance Maps** - includes the recommended locations for planting, animal pest control and bird monitoring. They also show where existing streams, vegetation and weed infestations occur;
- **Appendix B - Orewa Estuary Te Ara Tahuna Planting Plans** - includes the different planting schemes with recommended species, layout and provides information about each plants ecology;
- **Appendix C - Orewa Estuary Te Ara Tahuna Weed Reference Guide** - includes information, recommended control methodologies and a visual reference guide for 38 of the worst environmental weeds around the area; and
- **Appendix D - Orewa Estuary Te Ara Tahuna Bird Reference Guide** - includes information and a visual reference guide for over 50 birds that have previously been recorded around the estuary.



	Species	General Information	Identification	Call	Photo
1	**Bar-tailed Godwit** (*Limosa lapponica*) • Conservation status: Declining • New Zealand status: Native	Godwits hold cultural significance for many New Zealanders. For Maori, they were birds of mystery. ("Who has seen the nest of the Kuaka?") and were believed to accompany spirits of the departed. Eastern bar-tailed godwits breed in western Alaska and migrate to New Zealand and eastern Australia. Migration departures are staggered through March	• Length: 39 cm (male); 41 cm (female) • Weight: 275-400 g (male); 325-600 g (female) • Similar species: Hudsonian godwit, Black-tailed godwit, Whimbrel A large long-legged wader, brown above, pale below, with a long tapering and slightly upturned pink bill with black tip. Males are markedly smaller with shorter bills than females	Usually silent on the ground; commonly call in flight, usually a-wik-a-wik-a-wik.	
2	**Whimbrel** (*Numenius phaeopus*) • Conservation status: Migrant • New Zealand status: Native	Whimbrels are large shorebirds which migrate to New Zealand from Arctic breeding grounds in small numbers. Most records are during the summer but a few birds occasionally overwinter. In New Zealand, they typically associate with bar-tailed godwits, from which they differ in being darker, having a striped head and a strongly down-curved bill	• Length: 43 cm • Weight: 350 – 450 g • Similar species: Little whimbrel, Eastern curlew, Bristle-thighed curlew A large wader with a medium-sized dark decurved bill, a pale stripe on the centre of the crown, and a pale eyebrow stripe separating the dark eye-stripe and side-crown. The upperparts are mottled dark brown contrasting pale underparts with brown streaking on the throat and breast, and the rump and back pattern is highly variable.	A distinctive seven note whistle ti-ti-ti-ti-ti-ti-ti.	
3	**Eastern Curlew** (*Numenius madagascariensis*) • Conservation status: Vagrant • New Zealand status: Native	The eastern curlew is the largest wader in New Zealand, and has the longest bill of any wader at around 20 cm in length. The eastern curlew is a long-distance migrant, making non-stop flights from east and north Australia direct to east Asia, from Taiwan northwards to major mudflat staging sites of the Yellow Sea. They reach New Zealand from September to November and leave in March and April. Eastern curlews are very wary birds, and are difficult to approach. In New Zealand, they may be solitary, associate with other curlews, or join with bar-tailed godwits.	• Length: 60 cm • Weight: 500 g • Similar species: Whimbrel A very large bulky wader with a very long heavily decurved bill, head and neck streaked dark brown, thin white eye-rings, and whitish throat. The upperparts are brown with pale olive-brown edging and the underparts are dark brown/mottled, paler towards the vent, with fine streaking grading to thicker arrow-shaped streaks on the flanks	A bubbling song ker-ker-ker-ker when disturbed.	
4	**Royal spoonbill/ Kōtuku ngutupapa** (*Platalea regia*) • Conservation status: Naturally Uncommon • New Zealand status: Native	Feeds while wading in water, repeatedly scything the submerged spoon-shaped bill left and right in an arc. Feeds day or night, whenever tide is suitable. Eats mainly fish in freshwater, and shrimps in tidal flats, also eats other crustaceans, aquatic insects and frogs.	• Length: 74 – 81 cm • Weight: 1.4 – 2.0 kg • Similar species: Yellow-billed spoonbill, White heron A large white heron-like bird with long black legs and a large black spoon-shaped bill. In breeding plumage it has long white crest feathers on the nape.	Grunts, groans and hisses with chew and cha-cha made at the nest.	

Bird reference guide - Appendix C

Planting cross section - Appendix B

2 RESTORATION PLANNING

2.1 Step by step

The restoration guideline below provides the typical steps involved in restoration projects around estuary margins, and will help make sure your next project is a success!

1: Identifying the issue

An environmental issue has been identified by yourself or someone in the community, or you may have decided that you would like to be involved with restoration around the area.

2: Find support

Find out who else may be interested. Discuss your intentions with Auckland Council's Community Ranger and other groups identified in this document.

3: Hold a meeting

Organise a meeting with the interested groups and decide on the long-term goals. Choose the activities and locations to focus efforts on.

Remember: If it's on public land (e.g. reserves, estuary margin or tidal flats) then you must first liaise with Auckland Council Community Ranger. If it's on private land you must first have permission from the landowner, and Auckland Council Biosecurity Team may be able to assist.

5: Plan your activity

Consider what resources are needed, and allocate responsibility for actions. Develop a timetable for one year of actions.

6: Animal and Plant Pest Control

Thorough site preparation is a key first step to implementing restoration. Begin your project with removing all the unwanted pests. This may also help encourage native flora and fauna to naturally recolonise the area. Consider the size of the project, duration of control, and what resources will be needed for maintenance.

7: Restoration Planting

The weeds are gone, and all the pesky pests are out of the way. Time to get into planting. Consider where you'll source your plants, how many you'll need, the different species, the time of year and what resources are needed for maintenance.

8: Monitoring

Monitoring is a crucial component to understanding if you're on the right track.

Be willing to adapt your approach, learn from mistakes, then repeat Steps 6 and 7.

Contact:

Public Reserve: Council Community Ranger

(09) 3010101

anna.baine@aucklandcouncil.govt.nz

Private land: Council Biosecurity Team

(09) 3010101

2.2 Restoration Calendar

Timing is everything. Planning in advance when to get ready for various activities will ensure you're well equipped to get stuck in. The table below summarises the key times of year to undertake restoration activities around the estuary.

Table 1: Orewa Estuary Restoration Calendar

Season	Month	Bird Monitoring	Planting	Weed Control	Pest Control
Summer	Jan	Summer monitoring		Summer spraying	Pulse control
	Feb		Key eco-sourcing collection time. (some species all year round)		
Autumn	Mar	Autumn monitoring			
	Apr				Pulse control
	May				
Winter	Jun	Winter monitoring	Planting season		
	Jul				
	Aug				Pulse control
Spring	Sep	Spring monitoring		Spring Spraying	
	Oct				
	Nov				Pulse control
Summer	Dec	Summer monitoring	Plant success monitoring	Summer Spraying	

3 MATAURANGA MAORI

3.1 Cultural values- Ngāti Whātua o Kaipara

Ngāti Whātua signed the Treaty at Waitangi and also at Manukau on 20 March 1840, thus beginning a long tradition of Ngāti Whātua commitment to and support for the Crown. Apihai Te Kawau the paramount chief of Ngāti Whātua sent an envoy north to Kororareka to offer land to Hobson to build his new capital in Tamaki Makaurau (Auckland).

Ngāti Whātua o Kaipara refers to the uri (descendants) from ancestors of each of the five marae of South Kaipara; namely Reweti (Whiti te Ra) to the South and Haranui (Nga Tai i Turia ki te Maro Whara) to the North west, and Kakanui (Te Kia Ora) and Araparera (Te Aroha Pa) to the East and Puatahi (Te Manawanui) to the North.

It is the land and water's integrity, the mauri, (the life force) which Ngāti Whātua o Kaipara has a responsibility to protect and uphold. The loss of cultural wellbeing by the degradation of the mauri of the land and waterways will have devastating implications for the cultural interests of Ngāti Whātua o Kaipara.

Waahi Tapu sites are special and unique to Ngāti Whātua o Kaipara. These sites are evidence of Ngāti Whātua o Kaipara occupation and association to the landscape. Waahi Tapu represents; burial sites, these often marked by specific trees, sacred or ritual sites, significant waka landing, and battle grounds. Waahi Tupuna signs of occupation, pa, kainga, kumara pits and middens Across the Rohe there are a number of sites which have not been disclosed to the general public due to the sensitive nature of these areas.

The Harbours and estuaries are a taonga (precious treasure), and are part of Ngāti Whātua o Kaipara cultural identity, sustaining the people with its abundance of kai moana (sea food) and nourishes Ngāti Whātua o Kaipara spiritual wellbeing.

Ngāti Whātua o Kaipara continues to welcome settlers to live amongst them, and uphold the approach, "that we work together to develop according to our tikanga (customs) the land so that we may all benefit and provide a future for our generations to come."

Ngāti Whātua o Kaipara has a cultural connection with the land and seeks to uphold its kaitiakitanga (guardianship) within its rohe (area), with regard to the Orewa Estuary.

3.2 Ngāti Whātua o Kaipara Accidental Discovery Protocol

There are sites of significance and sites of value across South Kaipara, including Orewa which are at risk of being lost or invisible, therefore Nga Maunga Whakahii o Kaipara Development Trust, provide the following Accidental Discovery Protocol to be followed and maintained:

- If koiwi (bones), taonga (treasures) or archaeological features are exposed during development, works must cease immediately;
- Should any skeletal remains or artefacts be found, it is important that Nga Maunga Whakahii o Kaipara Development Trust be contacted immediately to perform a release blessing prior to releasing to authorities;
- The Project Manager will also notify NZ Police (if koiwi [bones] are found) and Heritage NZ.
- The area should be secured so that koiwi or taonga remain untouched and site access is restricted;
- The "Discoverer" will ensure that kaumatua have the opportunity to undertake karakia (prayer) and other cultural ceremonies and activities at the site as may be considered appropriate in accordance with tikanga (cultural practices).

Te Ara Tahuna's pouwhenua

Ngati Whatua o Kaipara contact details. Tel: 09 420 8410 admin@kaiparamoana.com

4 ANIMAL PEST CONTROL

The Auckland region has ten animal species that are declared pests; mice, ship rats, Norway rats, weasels, stoats, ferrets, cats, possums, hedgehogs, rabbits, hares, goats, deer, magpies and mynas. These animals prey on native birds and eggs, destroy native vegetation and degrade our natural environments.

This plan aims to provide a safe buffer for native birds and plants around the Orewa Estuary. This plan provides the recommended locations for pest control (refer to Appendix A), types of bait stations and traps, and associated monitoring for controlling the key pests impacting the area. These are rats, mustelids (e.g. stoats), and possums. By controlling animal pests around the perimeter of the Orewa Estuary, we can help to provide a safe refuge for native birds within the estuary, increase the success of native plantings, and help existing vegetation to flourish.

The detailed methods for the safe use of traps, trap maintenance, trap placement, bait handling and bait storage can be provided by your local Community Ranger or Forest and Bird member.

Further reading and information is provided in Section 10.5 below.

QUICK TIP

Dirty Pests

Always wear gloves when handling trapped animals. Many target species carry leptospirosis and other diseases.

Bait station
DOC 200
Timms trap

Look for these symbols on the restoration guidance maps

4.1 Bait Stations and Trapping

4.1.1 Controlling Stoats – DOC 200s

Stoats have a wide home range of up to 200 ha (1.4 km), are good climbers and swimmers, and are more abundant in the summer months when young stoats disperse many kilometres from their birth site.

DOC 200

DOC200 kill traps can be used for stoat control (and hedgehog/ rats), and should be spaced every 200m around the estuary margin. When selecting a site to place a DOC 200, choose an area where predators are likely to hunt. These can include stream edges, scrub margins, fence lines, crossings over watercourses (e.g. fallen trees). Where possible, select sites that are beneath tree canopy cover as mustelids are likely to be less concerned about overhead predators, and therefore more likely to enter the trap.

These should be placed on as level ground as possible with a clear view through both ends of the trap. Eggs and/or dried rabbit meat can be used as bait. Traps need to be checked, re-set and re-baited at least monthly over summer. These can be difficult to set so persons checking these traps will need to be confident in their use, asthey have the potential risk of breaking fingers/hands if not used correctly.

4.1.2 Controlling Rats - Bait Stations

When using bait stations in an urban environment it's essential to consider the sensitivities of the surrounding environment. Bait Stations used for rats should be lockable and tamperproof with the bait able to be secured inside the station. 'Protecta Ambush' stations, a product from Key industries, or similar are suitable and are being used in similar pest control projects around Auckland.

To effectively control rats, bait stations would need to be placed at approximately 50m spacings around the entire perimeter of the estuary. From these locations, additional bait stations would be placed on a line at 100m spacings away from the estuary margin edge, creating a 'halo effect'. This would require several hundred stations to fully implement, so to get started priority 'hot-spot' locations are marked on the restoration maps.

Bait Shyness

QUICK TIP

Rats are very intelligent and canny rodents. Sometimes when rats ingest a first-generation bait, them may learn to avoid ingesting that substance again. It's best to rotate the type of baits to avoid bait shyness.

Most animals prefer to move along fence lines, under trees and around edges of streams, making all of these places suitable for trapping and monitoring.

It is recommended that a combination of the two main types of anticoagulants are used:

- **First generation rodenticides** (eg. Ditrac, diphacinone). These are slower acting and require the rat to consume multiple feeds of the bait and it takes up to 5 days for a lethal dose to accumulated by multiple feeds; and
- **Second generation baits** (eg. Contrac, bromadialone). These generally only require a single feed to be lethal but due to the strength and persistence of the rodenticide they have a higher risk of secondary poisoning.
  - For 2nd generation baits, the toxin only needs to be pulsed 4 times a year (August, November, January and April);
  - In this pulse you fill the bait station; Day 1, refill Day 5 & Day 14. Remove bait end of week 4;
  - When ending the pulse make sure to remove all abit in stations and dispose of it correctly, degraded bait can make animals bait shy as it is not effective; and
  - As it is a single feed toxin, it has a higher chance of a lethal dose. The Antidore is vitamin K1.

Poisoning symptoms in pets can take several days to appear, these may include lack of appetite, lethargy, bleeding from the nose or mouth and pale gums. Vitamin K is an effective antidote and any suspected poisoning cases should be taken to a vet immediately.

Bromadilone baiting programme for Rats

Month	August				September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bait Fill D 1, & D 5	■												■								■												■			
Bait Refill D 14			■												■								■												■		
Remove				■												■								■													■

4.1.3 Controlling Possums – Timms Traps

Possums live in trees, but also move across open country to graze on pasture. They have an average home range of 200m in forests, but can travel much further for seasonal food resources. Possums favoured trees are extensively marked with scratches, and the canopy is often heavily defoliated by browsing. Possums are very curious, and will investigate new objects in their territory. Use this to your advantage!

Timms Trap

Timms Traps are a safe and easy to use method for controlling possums. Possum control is recommended within areas of existing native forest, with traps spaced approximately 100m apart. As a starting point, the key locations for Timms Traps locations are indicated on the restoration maps.

Traps should only be baited with fresh apple when they are unset, and should be kept clear of debris to allow correct function and not discourage pests from entering the trap. Setting off your trap when re-baiting also allows you to check is actually functional. These should be checked regularly (every 3-5 days) and traps set in a pulsed manner. Trapping should be pulsed over a period of three weeks, four times per year. There should also be a particular focus prior and over the main bird breeding season (September to January).

Key points:

- Traps should be checked 2x in the first two weeks and 1x in the third week as a minimum;
- Traps should be secured so that when sprung will remain in position;
- Possum specific lure should be used e.g apple with cinnamon, icing sugar & flour. No meat or fish due to risks for non-target animals;
- Traps can be elevated on a wooden stand to reduce risks to non-target species & interference with children;
- Reducing Risks;
- Placing traps out of view if possible in parks will reduce tampering risks; and
- If you are worried about children or pets around Timms traps you can place the traps on a platform approximately 2 meters off the ground.

A Timms Trap set on a platform to prevent children and pets tampering with it.

Trap Pulsing Programme for Possums

Month	August				Sept/October				November				January				Feb/march				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Check 2x																								
Check 1x																								

All volunteers need to be aware of their health and safety obligations

Before undertaking any pest control on public-reserves, you must liaise with your local Auckland Council Community Ranger. All volunteers involved in pest control on public land will require initial training by suitably qualified individuals in the safe use of traps and baits. Your local Community Ranger can also provide the required signage, and assist with supplying baits and traps for this project. Supplementary animal control that requires qualified and experienced contractors may also be available to help with the effort.

Contact:

Public Reserve: Council Community Ranger

(09) 3010101

anna.baine@aucklandcouncil.govt.nz

Private land: Council Biosecurity Team

(09) 3010101

Forest and Bird – H

hibiscuscoast.branch@forestandbird.org.nz

4.2 Animal Pest Control Monitoring

Monitoring will help identify the relative abundance of pest animals in areas around the Orewa Estuary and inform future decisions to ensure pest control is effective and efficient. Two methods, wax chew blocks (for possums) and tracking tunnels (mustelids and rodents) are great for monitoring small mammals, and can provide trends in relative numbers and determine the success of the control effort over time.

Monitoring is recommended on the first weekend in September, December and April during fine weather conditions. This enables a pre-baiting assessment of pest populations and a measure of effectiveness during and at the end of the season. It also gives an indication of the base number likely to be present at the time of bird breeding.

Monitoring your target pest animals over time will help you understand if you are making the difference you intend to, and can help guide your control work.

Key tips for monitoring:

- Try and use the same method of monitoring each monitoring round, ideally in the same locations. This will allow you to compare monitoring results over time. As many things need to be kept constant between monitoring rounds as possible (method, location, time of year, number of nights monitored) so that the main variable is the pest animal numbers you are monitoring.
- Ensure that you monitor a representative proportion of your control area. For example, if your control area is 1/3 wetland, 1/3 bush and 1/3 pasture, place 1/3 of your monitoring tools in each habitat.
- With most monitoring you are measuring relative abundance. This is not all the pests in your control area, but a representative sample.
- Try and avoid biases in the placement of your monitoring tools. Do not locate them right next to trap or bait lines, or only along one form of landscape feature.
- The spacing of monitoring tools and lines is important. This is to ensure the tools are placed within the target animals home range, and that lines do not double count animals. Placing of monitoring lines too close to your project edge will not reflect the work inside your project area.

Links to detailed field instructions and field forms are provided in the Recommended Reading Section 10.5 below.

Rodents are at their peak in March and their lowest in September

4.2.1 Wax Chew Blocks – Bite Mark Index (BMI) Method

Wax chew blocks are small pieces of plain wax with a scented lure that records possums by observing teeth marks. They are easy to make, and can be set up in the field readily. They are typically placed along a transect, and can be set at 20m intervals for 1km (50 in total). They require two fine evenings to deploy.

Each monitoring line is 200 metres long, with 10 wax tags placed every 20 metres along the line. These need to be left out for three fine nights.

4.2.2 Tracking Tunnels – Rodents and Stoats

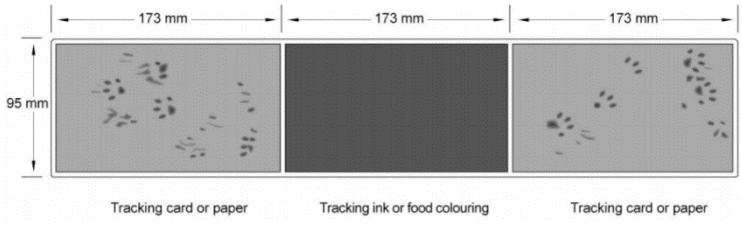
Tracking tunnels are used for monitoring rodents and musteleds. They use a 'run through' tunnel containing two pieces of paper either side of a sponge soaked with a dye (food colouring). As an animal passes through the tunnel it picks up the dye on its feet, then as it leaves the tunnel it leaves a set of foot prints on the paper. They do not provide a direct measure of the population density, rather provide a coarse index of relative abundance by measuring the activity of animals.

Rodents

Tracking tunnels with inked tracking cards placed in them, left out for one fine night. Each tracking tunnel line is 450 metres long, with 10 tunnels located every 50 metres along the line. Each line must be a minimum of 200 metres apart. Baited with peanut butter.

Stoats

Tracking tunnels with inked tracking cards placed in them, left out for three fine nights. Each tracking tunnel line is 400 metres long, with 5 tunnels located every 100 metres along the line. Each line must be a minimum of 1000 metres apart. Baited with rabbit meat, or ERAZE rabbit paste.



Data Entry

A single repository for information is provided at the Forest and Bird Hibiscus Coast Branch website.

hibiscuscoast.branch@forestandbird.org.nz

Forest and Bird will provide guidance for monitoring and data entry as part of the initial pest management training.

QUICK TIP

Who likes what?

Mustelids enjoy a section of chicken neck, or rabbit.

Rats mice, hedgehogs enjoy peanut butter

Lizards enjoy bananas, pear and honey

5 ENVIRONMENTAL WEEDS 'PEST PLANTS'

Controlling environmental weeds is a major component of any restoration project, and they need to be eradicated before planting, and monitored to ensure they don't recolonise an area. It is recommended that all planted areas are monitored for environmental weeds twice a year, in Autumn and Spring. This is also a great opportunity to take a photo of your plants, and document their growth and progress.

Auckland-wide, the weed problem is controlled by the Auckland Council, through its 'Regional Pest Management Strategy'. (RPMS). The strategy provides a statutory framework for the management of plant and animal pests to minimise the effects of targeted pests.

Weed infestations are marked with red hatching on the restoration maps

5.1 What are Environmental Weeds?

Environment weeds or "Pest Plants" are plants that will outgrow those newly planted areas, as well species that invade native ecosystems, such as the plant communities on the estuary margin, stream sides and in areas of native bush. There are several hundred environmentally damaging weeds in the Auckland Region. They include plants such as kikuyu grass, wild ginger, pampas, privet, as well as climbing weeds that smoother other plants, like jasmine, climbing asparagus, moth plant and Japanese honeysuckle.

5.2 Environmental Weed Control

Weed control may involve a range of methods depending on the species, surrounding environment (e.g. sensitive waterways), the scale and density of the infestation, and what resources are available. Understanding what pest plants are present in an area before planting will help with planning. For example, large thickets of blackberry may need around four months of treatment with agrichemicals prior to planting.

Agrichemical use must consider the target of the use, application rate/dosage, method, weather conditions and sensitive areas. Due to the social and environmental sensitivity of the area, it is recommended that agrichemicals are only be used when necessary, and choosing the least toxic and least persistent products. Wherever practical, agrichemical use should avoid aquatic areas, leave a buffer zone between bodies of water, and avoid spraying vegetation overhanging streams and the estuarine environment. All persons involved in the application, handling or storage of agrichemicals on public reserve must be suitably trained, and hold the appropriate GROWSAFE®.

All volunteers who would like to be involved with controlling weed infestations on public-reserves **must** liaise with the local Auckland Council Community Ranger first. Auckland Council can assist with getting a GROWSAFE® certificate, and/ or supply herbicides and pesticides for this project. Supplementary weed management that requires qualified and experienced contractors may be available to be provided where large infestations/ exotic tree stands are not manageable.

A photo reference guide and recommended control methods for the key environmental weeds around the Orewa Estuary is provided in Appendix C.

Pampas grass

Pampas Grass is commonly mistaken for the native toetoe, but this has drooping and yellowish flower heads whereas pampas flowers are erect and white or slightly purple. Also the live leaves of pampas are easily pulled off (don't cut yourself – it's also known as cutty grass) and dead leaves curl into spirals, whereas toetoe leaves don't do either.

A clump of Pampas Grass within the Orewa Estuary margin.

Contact:

Public Reserve: Council Community Ranger

(09) 3010101

anna.baine@aucklandcouncil.govt.nz

Private land: Council Biosecurity Team

(09) 3010101

6 RESTORATION PLANTING

The health of estuaries are inextricably linked to what happens on the land particularly water quality which is dominated by runoff from urbanised areas. There is not a lot you can actually do inside the estuary to fix the impacts of these pressures. Thus, if you look after the land, the estuary will look after itself.

Ecosystem connectivity

Ecosystem connectivity enables the drift of individuals within a species through an environment in order to provide for different aspects of their life cycle or to populate (reproduce) in other areas.

QUICK TIP

6.1 Estuary Plant Communities

The pattern and distribution of plants in New Zealand estuaries follows a transition over the vertical gradient from eel grass in the lower mudflats, to salt-loving salt marsh and mangrove communities in the tidal zone, finally grading to terrestrial coastal plant communities. This revegetation plan provides guidance to replant a protective terrestrial plant community buffer to protect the lower tidal environment. This will enhance the succession of the adjacent saltmarsh communities, and provide numerous ecological benefits throughout the natural vegetation sequence to land. It involves connecting the existing native plant communities by revegetating the gaps in the immediate margin on the estuary edge, and providing buffers around the various inlets.

The planting schemes in Appendix B: provides recommendations for the main communities for restoration plantings. The locations for these plantings is provided in Appendix A:. The planting schemes include:

1) **TOP PRIORITY Stage 1 Salt marsh boundary** of low growing coastal grasses, rushes, sedges and shrubs. The benefits of this community include increased bank stability, a dense filter for pollutants (improved water quality), skink and terrestrial invertebrate habitat, protection of wading birds (screening dogs), preservation of the views of the estuary.

2) **Stage 2 Seral Coastal Scrub** boundary of small trees and tall sedges. This community comprises a host of 'nurse plants', inducing environmental conditions that introduce native flora and fauna, and will guide natural succession. The benefits will include increased habitat for native birds, skinks, arboreal geckos and terrestrial invertebrates, while also increasing bank stability and filtration. In particular, it will help keep out invasive weeds and improve the overall visual aesthetics around the estuary.

3) **Stage 2 Stream Riparian Boundary**. This plant community primarily aims to improve the water quality of the streams entering the estuary. **NOTE – stream enhancement works such as stream channel realignment may be required prior to planting.**

4) **Stage 3 Mature Coastal Forest Enrichment** community comprising noble coastal forest trees. This community includes the large native tree species that once dominated the surrounding area. These species can be used to 'enrich' existing vegetation and the seral forests after several years. The benefits include increased habitat for native birds and arboreal geckos, a seed source for the surrounding area, and an intrinsic value that is only gained from people experiencing forest communities.

5) **Possible enrichment areas and existing native vegetation**

Look for these colours on the restoration guidance maps

All volunteers who are keen to start planting around the estuary on public-reserves must liaise with the local Auckland Council community ranger first. They can provide advice, and support for planting days, including supplying some native plants for your project.

Contact:

Public Reserve: Council Community Ranger

(09) 3010101

anna.baine@aucklandcouncil.govt.nz

Restoring Orewa Estuaries' Margin

Restoring the current grass estuary margin back to a natural estuarine plant community will provide numerous ecological benefits

6.2 Planting

The key to successful planting is to **Plan, Prepare, Plant, Maintain**. Careful planning followed by regular maintenance are essential to ensure that your plants become established. Sourcing plants well in advance will ensure the numbers, and variety are available when you need them. Plants can be sourced from local nurseries, or eco-sourced from the local area. The best planting season is from April to August, and you can plant throughout autumn, winter and spring.

Key points:

- Stage your planting and don't try to do too much at once;
- Ensure plants are appropriately spaced (refer to planting plans Appendix);
- Leave adequate space to maintain existing access points and view-points around the estuary edge;
- Each planting area will require ongoing maintenance, especially weed control;
- Grow some of your own plants from seeds;
- Stake plants when planting to make them easier to locate later; and
- Use the recommended planting plans, source your plants and prepare to dig!

Look for these symbols on the restoration guidance maps for access and view points

A great spot to enjoy the views below Maori Hut Road

Maintenance Timeline	
Year One	
1. Eradicate environmentally damaging plants.	*Spring & Summer*
2. Cut back grass and broadleaf weeds to reduce competition.	*Spring & Summer*
3. Plant grass margin and/ or seral coastal scrub treatments	*Autumn & Winter*
Year Two	
4. Weed around plants. Cut back grass and broadleaf weeds to reduce competition.	*Spring & Summer*
5. Weed around plants. Remove any environmental weeds that have appeared.	*Autumn & ongoing*
6. Replace any dead plants. If certain plant species are not doing well, document this, and try alternatives for future plantings in similar areas.	*Autumn & Winter*
Year Three and Onwards	
7. Remove any invasive weeds.	*Year round*
8. Where appropriate, enrich native nurse cover with Stage 2 and 3 forest canopy species.	*Autumn & Winter*

6.2.1 Photopoint monitoring

How often have you said or heard, "This area looks so much better than it was back when..." Photopoint monitoring involves what you may think, taking a photo in the exact position and repeating it year after year. It is a particularly effective way of monitoring plant growth, and by monitoring your progress with photos you can clearly demonstrate any changes over time. A photomonitoring form is provided in Section 10.2 below.

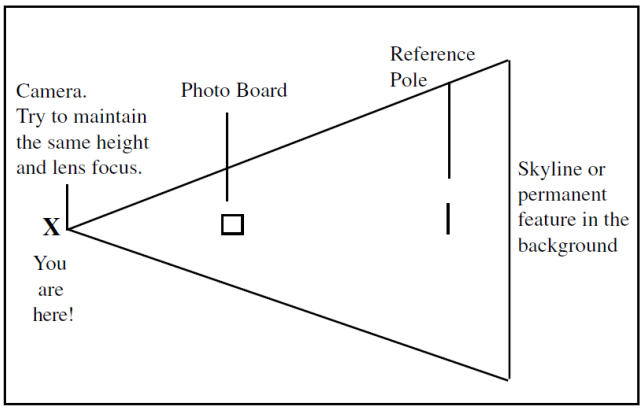
Location

To make the most of your repeat photopoint monitoring, make sure a good location is selected that represents the area you are managing and incorporates the likely indicators of change that may be taking place (e.g. a vegetation sequence profile of your plants and the adjacent tidal flat area). A good spot should be easy to visit and monitor, and is representative of a larger area. It's important to select enough key areas to adequately represent the area you manage, in case circumstances change and so you do not misrepresent conditions in the larger area.

Taking the picture

The way you take your picture is particularly important, and with all monitoring, **consistency is key**. Be sure it includes the following:

- Skyline or permanent features for easy relocation (e.g. recognisable landmark);
- Preferably, a reference pole placed the same distance from the origin point to show plant growth height; and
- Photo board with date and location written on it.



Setting up the Picture

Example of photopoint monitoring. Source Utah Satate University, 2001.

6.2.2 Ecosourcing

Ecosourcing is the process of propagating native plants from local areas, and planting them back within the same region. This helps maintain the genetic diversity of local plants, and keep the unique character of a landscape. The idea originally came from observations that plants of the same species but from different regions have a variety of different characteristics in their growth and tolerance to environmental conditions. Thus, when using ecosourced plants, it is thought that the survival rate will be higher because these species are often better adapted to local conditions.

Orewa is part of the **Rodney Ecological District**. When buying plants from local nurserys, or sourcing plants from volunteer groups for this project, it's important to make sure they are from the Rodney Ecological District. It's a very cheap and efficient method for restoration plantings, and is easier than you think.

6.2.3 Wild Sourcing

Ecosourcing includes collecting stock from 'wild or natural sources' – the natural environment the plant originally grew in. This includes collecting cuttings, seeds or splitting plants such as rushes. This is a cheap and efficient method for restoration plantings and is easier than you think. When ecosourcing from wild sources, be sure to ask permission from the landowner before collecting seed. Protect the wild source and enhance biodiversity by observing the following rules of thumb:

- Collect seed rather than cuttings;
- When collecting seed from wild plants be careful not to cause damage by breaking off large branches;
- Avoid harvesting too many seeds from any one plant. The most seeds that should be harvested is 10% of the entire seed crop for a plant;
- Collect small amounts from many individuals to increase biodiversity;
- Avoid having 'favourite' plants that you go back to every year as this decreases biodiversity;
- Ensure seeds are ripe - the colour of fruit will often indicate if it is ripe and ready for collection; and
- Collect seed capsules shortly before they open.

Orewa's manuka in bloom © Tony Payne by Tony Payne

QUICK TIP

Manuka

Place the capsules in paper bag in a warm dry place until the fine red seed is released. Sift out the seed and lightly sprinkle over a firm smooth bed of seed raising mix. Do not cover but water well. The seedlings will come up in one to four weeks depending on the temperature.

The table below includes the time of year for collecting seeds for some of our native trees and shrubs.

Table 2: Calendar for Seed Collection

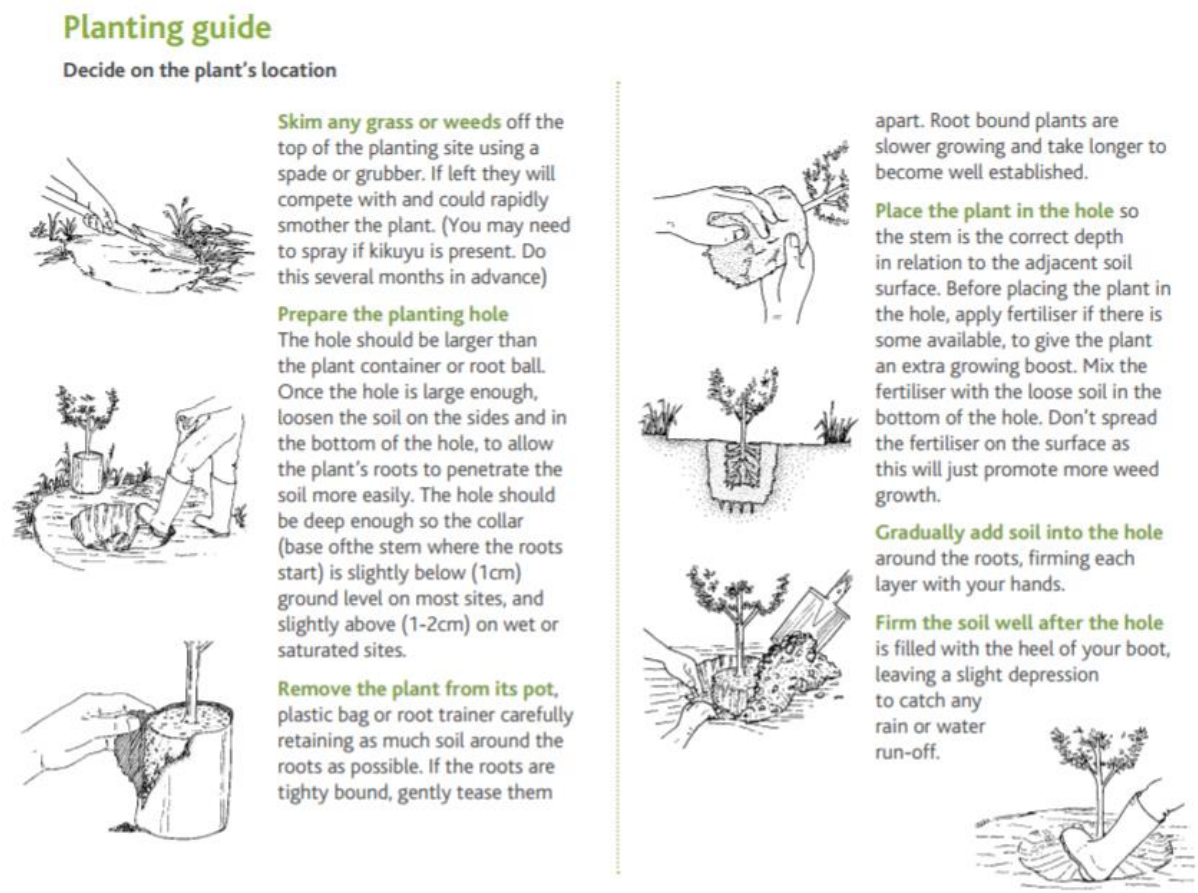
Maori name / Common name	Species	Colour of ripe fruit/seed case	Time of year				
			Feb	Mar April	May Jun	July – Oct	Nov – Jan
Kauri	*Agathus australis*	Brown cone	•				
Titoki	*Alectryon excelus*	Red-black fruit	•				
Karamu	*Coprosma robusta*	Orange fruit	•	•	•		
Ti Kouka / cabbage tree	*Cordyline australis*	Cream fruit	•	•			
Kohekohe	*Dysoxylum spectabile*	Orange fruit			•		
Hangehange	*Geniostema ligustrifolium*	Dry brown capsule		•			
Koromiko	*Veronica stricta*	Brown capsule		•	•		
Manuka	*Leptospermum scoparium*	Brown capsule	•	•	•	•	•
Mahoe	*Melicytus ramiflorus*	White-purple fruit	•	•			
Whauwhaupaku / fivefinger	*Pseudopanax arboreus*	Black fruit		•	•		
Kowhai	*Sophora microphylla*	Dry brown pod	•	•	•		
Puriri	*Vitex lucens*	Pink or black fruit	•	•			

Wiwi (*Ficinia nodosa*)

Propagating Rushes

1) Cut back the older foliage so that you can work more easily among the rush stems.
2) Dig under the soil and locate the individual rhizomes from which the stem clumps grow.
3) Use a small saw or spade to cut through the rhizome to divide the clump into sections.
4) Dig under the rhizome to lift the roots from the soil.
5) Continue this process until a number of rhizomes are removed from the clump of rushes.
6) Dig a wide but not deep bed for the new plants. Loosen the soil by turning it over with the shovel.
7) Set the divided rhizomes into the soil of the new bed, spreading the roots outward.
8) Add soil around the rhizomes until the tops are level with the surrounding ground.
9) Water the plants well.

QUICK TIP



Source: Auckland Council - Streamside planting guide

6.2.4 Biosecurity

When undertaking restoration plantings there is a risk of spreading invasive pests and diseases. Invasive pests such as Rainbow skinks and Argentine ants can spread when using contaminated mulch, soil and plant material, so before using this material check for eggs and live animals. In the Auckland Region, there are two major threats to our native plants, Kauri Dieback Disease and Myrtle rust. The sections below provide further information on these topics.

Kauri Dieback Disease

There is a high risk of spreading kauri dieback (the deadly kauri disease caused by *Phytophthora agathidicida*) around the Auckland region in contaminated soil and plant material. The Auckland Council recommends extreme caution when using kauri in restoration plantings. Kauri seedlings should be sourced from healthy disease free adult plants. Check that your nursery sources their plants and seeds from areas free of kauri dieback. Don't remove soil or plants from areas known to be infected with kauri dieback. Kauri seed can be tested for kauri dieback disease, free of charge, please contact the Auckland Council biosecurity team **09 301 0101**. For more information visit www.kauridieback.co.nz.

Myrtle Rust

Myrtle rust (*Austropuccinia psidii*) is a fungus that can have serious effects on a number of New Zealand's native trees, including pohutukawa, manuka, rata, ramarama and swamp maire, as well as some production trees such as feijoa and eucalyptus (gum).

The Ministry for Primary Industries (MPI) is the lead agency responsible for the response to myrtle rust. If you think you've spotted myrtle rust, phone MPI's hotline **0800 80 99 66**. Further information on the disease, including how to recognise it and what to do if it is suspected, is available in Section 10.2 below.

Myrtyle rust on pohutukawa

7 OREWA'S BIRDS

The Orewa Estuary Te Ara Tahuna hosts over fifty different species of birds, including native waders, a variety of migratory birds and numerous forest species. Orewa Estuary Te Ara Tahuna is an important pit-stop for migratory birds such as the Far-Eastern Curlew and Eastern Bar-tailed Godwit. By enhancing the area through predator control, and native plantings we can help assure they return for many generations to come.

A key objective for this plan is to enhance the habitats for birds. To understand if restoration initiatives are on the right track, consistent monitoring is required, and birds are sensitive environmental indicators, often heralding key changes in environmental processes or ecosystem health.

By undertaking consistent monitoring, we can start to understand the current condition of the area and begin to observe the broad trends in the relative abundance of groups of birds for years to come.

Consistency is key when it comes to monitoring birds.

A large amount of variation occurs with time of year, weather, time of day, tides and observers. For this reason, it is important to keep as many factors as possible constant between counts. A series of recommended bird count locations are marked on the restoration maps, and two monitoring methods – 5-minute bird counts for terrestrial birds, and 20-minute visual scan counts for waders and migratory birds are recommended. The majority of birds are most conspicuous from early September to late November, and assessments need to be done on calm fine days.

MIGRATORY WADER

Eastern curlew. Adult (possibly immature). Miranda, June 2010. Image © Duncan Watson by Duncan Watson

The eastern curlew is a long-distance migrant, making non-stop flights from east and north Australia direct to east Asia, from Taiwan northwards to major mudflat staging sites of the Yellow Sea.

They reach New Zealand from September to November and leave in March and April.

A kotare enjoying a small crab, snatched from Orewa's tidal flats. © Tony Payne by Tony Payne

7.1 Bird Monitoring Methods

5-minute bird counts

This method involves staying still for 5 minutes recording all birds seen or heard. It is a simple way to understand the relative presence of birds, and could become part of your routine on your way to work or school. To undertake 5-minute bird counts you need good hearing and eyesight, and need to be able to identify most terrestrial birds by sight and sound. It is better to undertake a series of measurements of the count sites over a month, rather than intensively over a few days. Do not assess the same site twice in the same day because these assessments are not "independent". Ideally, try to assess sites between one hour after sunrise and midday, the dawn chorus is the best time to encounter our native forest birds! Wind should not exceed "1" on the scale on the 5-minute bird count field sheet (refer to Section 9 recommended reading list). Try survey between flowering periods of key species in the area. If you do strike a peak flowering period – record this and try to repeat conditions next time you measure.

QUICK TIP

Before you head out

- Check the weather forecast.
- Familiarise yourself with the 'Bird Reference Guide' in Appendix D.
- Share your results with other observers, and try find out w birds were present at last tim

Look for these symbols on the restoration guidance maps for monitoring locations

20-minute visual scan counts

20-minute visual scan counts involve systematically scanning the observable area from a single point for 20-minutes. Like 5-minute bird counts, the observer needs have a good understanding of the various birds in the area, and needs to be able to identify them by sight alone. Again, consistency will provide the best data, so try and undertake counts during the same time each year. Counts are best done at low-tide, in the morning, and during fine, calm conditions. Binoculars are essential.

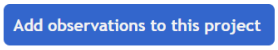
To pick up patterns in migratory species, and to allow for seasonal variation in food resources, it is recommended that both count methods are done each season, and preferably three times within a single month. For example:

- 3 days in January (Summer: Dec-Feb);
- 3 days in April (Autumn: Mar-May);
- 3 days July (Winter: Jun-Aug); and
- 3 days in October (Spring Sep-Nov).

Data Entry

A single repository for information is provided at naturewatch.org.nz. To enter your data you need to follow these steps:

1) Create an account or login with an existing account;
2) Join the Orewa Estuary Te Ara Tahuna Restoration Project;
3) Add an observation by clicking:



4) Add your bird records to the 'Batch' tab. Fill in the Description Field with the notes from your field form (Section 10.4 below).

QUICK TIP

Equipment Checklist:

Check the weather forecast.

- Bird count forms
- Wristwatch (or stopwatch on your phone)
- Binoculars
- Pencil & clipboard

8 MANGROVES AND SEDIMENTATION

8.1 Mangroves

New Zealand's native mangrove/ mānawa (*Avicennia marina subsp. australasica*) is distributed within coastal environments throughout the warmer temperatures of the upper half of the North Island. Mangroves offer a range of functions to the coastal environment including protection from storm surges, and providing habitat to numerous native coastal birds, fish and invertebrates. Over the past half century, mangrove expansion has been noted in most of the upper North Island estuary environments, and has been largely linked to an increase in sediment caused by runoff from the surrounding and upper catchment land uses.

QUICK TIP

Birds & Mangroves

Many of our native coastal birds like the reef heron, white-faced heron, pied shag and especially the banded rail, forage and roost in mangroves.

Over the past few decades, long-standing Orewa residents have observed a trend of mangrove expansion within the Orewa Estuary, invoking local groups to undertake mangrove management. The aim of this management is to preserve open water views, create space for swimming and kayaking, and restore sandy sediments for wading birds.

Recent studies suggest that a shift to a sand flat conditions is unlikely in areas with insufficient hydrodynamic flow, which is the case for most parts of the Orewa Estuary margin (NIWA 2017). If large scale mechanical or manual (i.e. chainsaw) removal of mangroves occur along the estuary margin, it could have long-term adverse impacts such as creating smelly, anoxic (lacking oxygen) sediments, whilst also losing the ecological benefits that the mangroves currently supply.

Accessing the Orewa Estuary through mangroves © Tony Payne by Tony Payne

8.1.1 Mangrove Removal

If mangrove management is undertaken within the Orewa Estuary, it is recommended that it is done in a manner that focuses on sustaining the ecological integrity of the area, and is in accordance with the legal requirements and obligations in the regions planning framework – the Auckland Unitary Plan. It is recommended that efforts are primarily focused on prevention by reporting sediment discharges into the estuary and planting riparian zones. If mangrove encroachment is manually controlled in the Orewa Estuary, it must only involve removing propagules (seed pods) and seedlings. Seedlings must be less then 60cm tall, have a single supple stem, show no reproductive capability (i.e. has no seed pods or flowers), and can only be undertaken subject to the following conditions:

Mangroves Seeds

Mangrove propagules (seed pods) are dropped into the ocean where they drift, sometimes for hundreds of kilometers.

QUICK TIP

Mangrove seed

- The removal does not take place in a Coastal Protection Area 1; other than those identifed as significant wading bird areas. The Orewa Estuary is a Coastal Protection Area 1, however a large portion has been recognised as a significant wading area.
- The removal does not take place under areas of mature mangrove vegetation;
- The removal will not disturb or damage saltmarsh and/ or sea grass;
- Auckland Council are notified of the proposed time and extent of removal where more than 30 m^2 of clearance is proposed, at least three working days prior to the work being undertaken;
- The removal and disposal activities do not involve any motorised vehicles, such as excavators, tractors etc., being taken onto the intertidal area;
- Seedlings are removed by hand or by hand held non-motorised tools (e.g. garden clippers);
- Seeds and seedlings are disposed of outside of the coastal marine area;
- The removal shall not involve the discharge of chemical herbicides in the coastal marine area; and
- The removal does not occur in areas where mangroves are serving to mitigate coastal erosion from wave action.

Rules may differ depending on the area where mangroves are being controlled. Larger scale mangrove removal would require application to Auckland Council for appropriate resource consent approval. Auckland Council's Healthy Waters Team are involved with managing mangroves, and can provide further advice around the rules and processes.

8.1.2 Mangrove Monitoring

It is recommended that any mangrove control is also accompanied by a monitoring programme. There are NIWA guidelines for monitoring mangroves in Section 10.6, which have been designed to enable community groups to increase the understanding of mangrove habitat in estuaries. The methods are relatively simple and include setting up transects, counting epifauna (animals living on the sediment surface), installing sediment height monitoring pegs, and photo monitoring (refer to Section 6.2.1). By undertaking monitoring, you'll begin to understand how the mangroves are changing over time, what is living in them, what the source of the sediment is, and where it ends up. This can then be used to demonstrate where the priorities for restoration interventions can be undertaken.

Mangroves hugging the Orewa Estuary margin, with their pneumatophores (aerial roots) protruding through the tidal flat.

8.2 Sediment Reporting

Sediment accumulation in estuaries happens naturally at rates of a few mm/year (NIWA, 2006). The sediment comes from the natural bedload of the upper catchment streams and rivers, and when rates are increased (from land uses) adverse effects can occur in estuaries.

There is no easy restorative solution once fine sediment is in an estuary. In most cases, trying to remove the sediment is practically very difficult, expensive and causes far greater adverse effects than doing nothing.

With planned development in the upper-catchment area, the risk of increased sedimentation will be ongoing, however these risks are managed through erosion and sediment control plans and water sensitive design that control sediment, and treat any runoff. If any adjacent watercourses, or the estuary have unusually coloured (e.g. fawn brown) or opaque water, or areas of recent sediment deposition is observed on the margins, please report it to the Auckland Council Pollution Response Team. Take a photo of the pollution, make a note of the time and exact location, and if possible try and detect the source. This information will help Auckland Council to undertake a more detailed investigation, and stop the issue at the source.

QUICK TIP

Reduce sediment

Focusing on the source of the problem is the best approach for management. Reducing the amount of sediment entering the Orewa Estuary will have the best result for reducing mangrove encroachment and improving water quality.

The Pollution Response Team is available seven days a week, and will only ask you for details of the pollution you have seen, a contact name and phone number. Your details will be handled confidentially at all times and will not be passed on to anyone outside Auckland Council.

Pollution hotline: 09 377 3107

Pollutants may include:

- Dirty, clay and soil sediment;
- Concrete wash;
- Oils, fuel and detergents; and
- Paint and chemicals.

An example of fawn-coloured water as a result of sediment laden runoff being discharged into a stream. Note - not in Orewa Estuary tributary, Source anon.

Dirty water in the Orewa Estuary following recent rain.. Source anon.

9 SUMMARY

This plan provides the ecological and restoration advice aimed at practically supporting and enabling action by private landowners and local community groups. The objectives and priorities in this plan are most likely going to change with time, and efforts should adapt with the external pressures on the system.

Reflect on your work, learn from mistakes, and you'll understand what is needed to achieve success in the future.

The best time to plant a tree was 20 years ago. The second best time is now. – *Chinese Proverb*

By getting involved with the various elements of this plan, you will connect with the environment and community, and become empowered to achieve common goals. You'll find that once things get started, momentum will build, and interest and curiosity will captivate those around you. Counting the removed pests, watching the plants grow, birds feed, and the estuary become alive will instil a sense of pride, kaitiaki and link you to the area for life.

With time, Orewa's Estuary will bounce back to a place rich in native biodiversity, and become a safe haven for our native flora and fauna.

Orewa's locals enjoying the sunrise © Tony Payne by Tony Payne

10 RECOMMENDED READING

10.1 Matauranga Maori

- Orewa Estuary Matauranga Maori, report prepared by Shona Oliver June 2017 Ngati Whatua o Kaipara. Contact Ngati Whatua o Kaipara.

10.2 Planting

- **PHOTOPOINT FORM**
- Coastal Restoration Trust of New Zealand provides a free online planting calculator to help budget for planting: www.coastalrestorationtrust.org.nz/resources/planting-calculator/
- Auckland Council Ecosourcing information: www.aucklandcouncil.govt.nz/EN/environmentwaste/coastalmarine/Documents/biodiversityecosourcing.pdf
- Waitakere Ecosourcing Code of Practice and Ethics: www.waitakere.govt.nz/abtcit/ne/pdf/ecosourcing-codeofpractice.pdf
- Department of Conservation seed collection and propagation guide for native trees and shrubs: www.doc.govt.nz/get-involved/run-a-project/restoration-advice/native-plant-restoration/ecosource-seeds/collection-and-propagation-guide-trees/
- Plant identification and search tool at New Zealand Plant Conservation Network www.nzpcn.org.nz
- Plant identification and search tool at http://www.terrain.net.nz/friends-of-te-henui-group/about-the-walkway/friends-of-te-henui.html
- Further information on Myrtle Rust, including how to recognise it and what to do if it is suspected, is on the MPI website: https://www.mpi.govt.nz/protection-and-response/responding/alerts/myrtle-rust/ and New Zealand Plant Producers Inc. website www.nzppi.co.nz/myrtlerust.
- Further information on Kauri Dieback can be found at the following website - http://www.kauridieback.co.nz/

10.3 Environmental Weeds

- New Zealand Agrichemical Education Trust runs GROWSAFE® courses - www.growsafe.co.nz
- Auckland Council, Biosecurity page has information about environmental weeds and control - http://www.aucklandcouncil.govt.nz/EN/environmentwaste/biosecurity
- Weedbusters website has information about environmental weeds and control - http://www.weedbusters.co.nz
- Forest and Bird Weed Control Guide - http://www.forestandbird.org.nz/files/Weed_Guide_Final_small.pdf
- Further information on pest plants at Nature Space – www.naturespace.org.nz

10.4 Bird Monitoring

- **BIRD COUNT FORM**
- FORMAKs website provides advice on bird monitoring and field forms for recording observations: www.formak.co.nz/webfolder.html
- Department of Conservation provides advice and field forms for 5-minute Bird Counts: www.doc.govt.nz/our-work/five-minute-bird-counts/

10.5 Animal Pest Control and Monitoring

- **PEST ANIMAL MONITORING FORM**
- Forest and Bird Hibiscus Coast branch - www.forestandbird.org.nz/branches/hibiscus-coast

- Department of Conservation Tracking Tunnel Guide: www.doc.govt.nz/Documents/science-and-technical/inventory-monitoring/im-toolbox-animal-pests-using-tracking-tunnels-to-monitor-rodents-and-mustelids.pdf
- Gotcha Traps tracking guide provides advice on tracking tunnel interpretation: www.gotchatraps.co.nz
- FORMAKs website provides advice on wax chew cards and field forms for recording observations: www.formak.co.nz/webfolder.html
- Kiwimana's website provides instructions on how to use a Timms Trap: http://kiwimana.co.nz/how-to-use-a-timms-trap/
- Department of Conservation provide advice on using DOC 200s – http://www.doc.govt.nz/documents/conservation/threats-and-impacts/animal-pests/doc200-predator-trap.pdf
- For further information on possum monitoring see http://www.npca.org.nz/images/stories/NPCA/PDF/a1_possum%20monitoring_2015-nov_lr.pdf

10.6 Mangrove Management and Monitoring

- NIWA Guidelines for Managing Mangrove (Mānawa) Expansion in New Zealand - https://www.niwa.co.nz/
- Estuary monitoring by communities. Mangrove habitats a case study - https://www.niwa.co.nz/sites/niwa.co.nz/files/import/attachments/monitoring_mangrove.pdf
- Auckland Council website - Ecological Status of Mangrove Removal Sites in the Auckland Region (Technical Report 2014/033) - http://www.aucklandcouncil.govt.nz
- Auckland Council Mangrove Management rules - www.aucklandcouncil.govt.nz
- Freshwater monitoring techniques and council water monitoring web pages at Nature Space's website - http://www.naturespace.org.nz/resource-centre/wetland-and-waterway-monitoring

10.7 Community Safety

- Conservation Volunteers New Zealand, 'In Safe Hands Toolkit' – www.conservationvolunteers.co.nz

REFERENCES

Auckland Council, Auckland East Coast Estuarine Monitoring Programme: Report on data collected 2000 to October 2013. Ref: 2015/010. Published March 2015.

Auckland Council, Riparian Facts – Stream Side Planting Guide.

Auckland Council, Coastal Planting Guide – Coastal Forest.

Green, M.O. (2006). New Zealand's estuaries: how they work and the issues that affect them. NIWA Information Series No. 59. 101 p. ISSN 1174-264X.

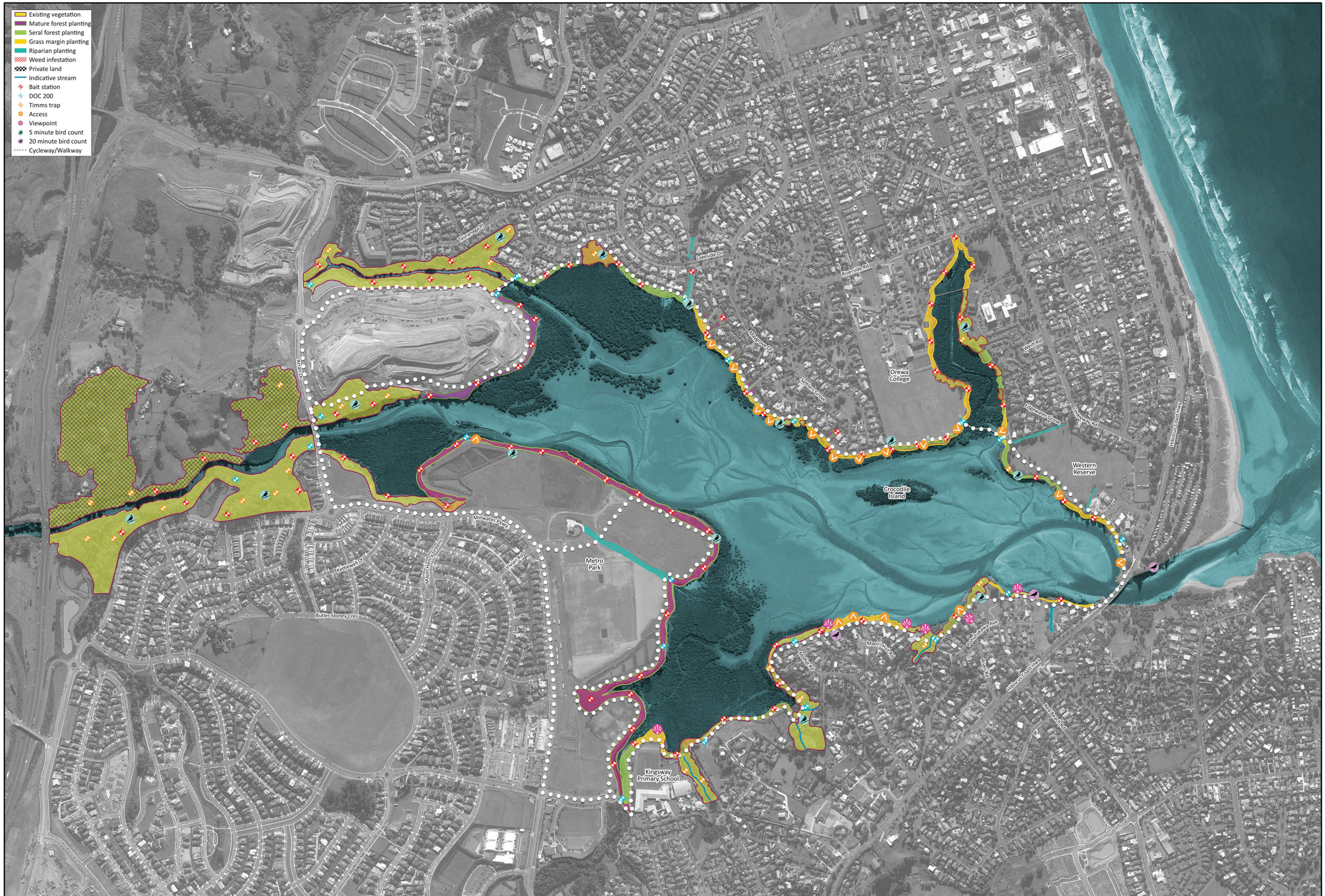
Orewa bird sightings 2003-2016. List compiled by Derek Lamb, Eilene Lamb, Doug Booth and Stuart Chambers.

Repeat Photography Monitoring Made Easy. Utah State University Extension. March 2001.

Tasman District Council, Estuary Restoration Workshop Proceedings. Ref:R08003. Published June 2008

Appendix A:

Orewa Estuary Te Ara Tahuna – Restoration Guidance Maps



Aerial imagery sourced from Google Earth Pro

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AA2506 - Orewa Estuary Restoration Plan

Overarching Restoration Map

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 27/06/2016
Version: 1.0
Drawn: Sam Hendrikse
Checked: Tony Payne
Approved: Tony Payne

Hibiscus and Bays Local Board
Auckland Council

4SIGHT CONSULTING

Aerial imagery sourced from Google Earth Pro

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AA2506 - Orewa Estuary Restoration Plan

Kōtare / Sacred Kingfisher

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 27/06/2016
Version: 1.0
Drawn: Sam Hendrikse
Checked: Tony Payne
Approved: Tony Payne

Hibiscus and Bays Local Board
Auckland Council

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Aerial imagery sourced from Google Earth Pro

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0 25 50 75 100m

AA2506 - Orewa Estuary Restoration Plan

Tūturiwhatu / Banded Dotterel

Plan prepared for Auckland Council by 4Sight Consulting.

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Version: 1.0
Drawn: Sam Hendrikse
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Approved: Tony Payne

Hibiscus and Bays Local Board
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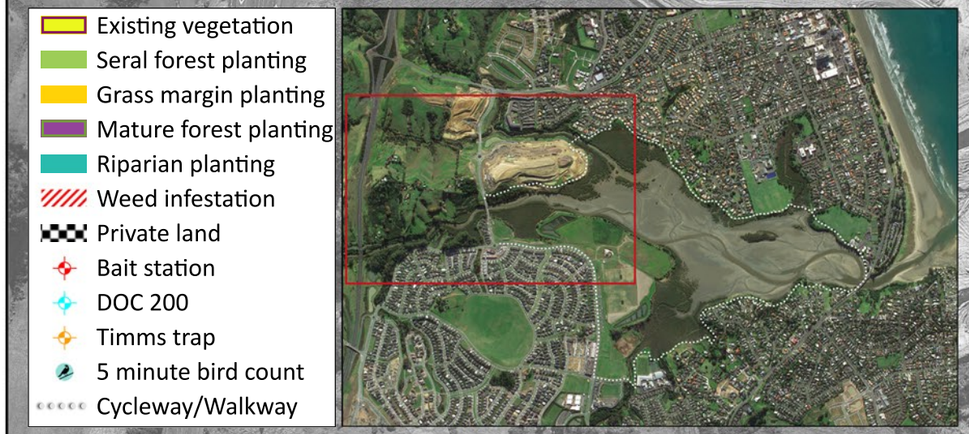

- Existing vegetation
- Seral forest planting
- Grass margin planting
- Mature forest planting
- Riparian planting
- Weed infestation
- Private land
- Bait station
- DOC 200
- Timms trap
- 5 minute bird count
- Cycleway/Walkway

Tauranaga Pl
Arran Dr
Millwater Pkwy
Major Henry Greens
Vivian Rd
Kettlewell Dr

Aerial imagery sourced from Google Earth Pro

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0 50 100 150m

AA2506 - Orewa Estuary Restoration Plan

Kāruhiruhi / Pied Shag

Plan prepared for Auckland Council by 4Sight Consulting.

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Drawn: Sam Hendrikse
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Approved: Tony Payne

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Millwater Pkwy

Major Henry Greens

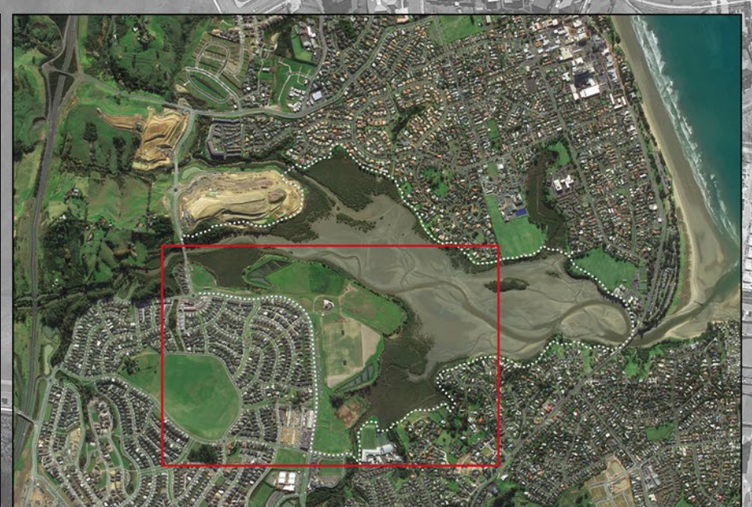
Butler Stoney Cres

Metro Park

Moffat Rd

Kingsway Primary School

- Existing vegetation
- Mature forest planting
- Seral forest planting
- Grass margin planting
- Riparian planting
- Weed infestation
- Indicative stream
- Bait station
- DOC 200
- Timms trap
- Access
- Viewpoint
- 5 minute bird count
- 20 minute bird count
- Walkway/Cycleway



Aerial imagery sourced from Google Earth Pro

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AA2506 - Orewa Estuary Restoration Plan

Tākapu / Australasian Gannet

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 27/06/2016
Version: 1.0
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Approved: Tony Payne

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Aerial imagery sourced from Google Earth Pro

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AA2506 - Orewa Estuary Restoration Plan

Taranui / Caspian Tern

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 27/06/2016
Version: 1.0
Drawn: Sam Hendrikse
Checked: Tony Payne
Approved: Tony Payne

Hibiscus and Bays Local Board
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Appendix B:

Orewa Estuary Te Ara Tahuna – Planting Plans

GRASS MARGIN PLANTING PLAN – TOP PRIORITY STAGE 1

Maori name / common name	Species	Planting unit (sequence order)					Life Form	Height	Abundance	Comments
		Tidal flat	Bank margin	Upper-bank margin	Grass Margin	Outer-grass - margin			(+++ use plentifully, ++ use commonly, + use sparingly)	
Swamp twig rush	*Machaerina juncea*	•	•				rush	1m	+++	Easily grown from rooted pieces and fresh seed. Rooted pieces establish best if first healed in within a potting medium of mostly untreated saw dust. Once established remarkably tolerant of drought. Does best when planted in full sun, in a permanently damp soil.
Three-square	*Schoenoplectus pungens*	•	•				rush	0.8m	+++	Summer-green perennial that is easily grown from fresh seed and the division of whole plants.
Sea rush	*Juncus kraussii var australiensis*	•	•				rush	0.5m	+++	Found in lowland coastal swamps and saltmarsh areas. Easily grown from fresh seed and division of whole plants.
Oioi/ jointed wire rush	*Apodasmia similis*	•	•	•			rush	1m	++	Distinctive grey-green, orange, purple or rainbow colouring. Plant in areas bordering salt marshes and estuaries. Easily grown from fresh seed and rooted pieces. Does well in a range of soils and moisture regimes. Requires full sun to flourish.
Kukaraho/pūrua/ marsh clubrush	*Bolboschoenus fluviatilis*	•	•	•			sedge	1-2m	++	Coastal to lowland in saltmarshes and other poorly drained saline areas. Easily grown from fresh seed and rooted pieces. Will grow in almost any soil but prefers a sunny, damp soil.
Swamp sedge / pukio	*Carex virgata*			•	•		sedge	0.6m	++	A fast growing sedge that is easily grown from fresh seed and by the division of established plants.
Giant Umbrella Sedge	*Cyperus ustulatus*			•	•		sedge	0.8m	++	Forms large dense clumps. Good in open spaces. Lowland and coastal swamps, backdune wetlands
Saltmarsh ribbonwood	*Plagianthus divaricatus*			•	•	•	shrub	3m	+	Bushy tangled shrub with wide-angled thin twigs bearing small very narrow clusters of leaves and small drooping flowers inhabiting estuary areas.
Coastal shrub daisy	*Olearia solandri*				•	•	shrub	3-4m	+	Bushy shrub with square yellow sticky twigs bearing clusters of dark green leaves with a downturned margin and that are white underneath.
Tauhinu	*Ozothamnus leptophyllus*				•	•	shrub	3m	+	It has an attractive silver-grey appearance and from July to August it flowers in profusion with clusters of tiny cream daisy (wheel-shaped) flowers followed by down-covered seed heads.
Pohuehue	*Muehlenbeckia complexa*			•	•	•	vine	1m	+	A twining vine that can climb or clamber over any support. Dense, wire-like stems are covered with inter-laced, tiny round light-green leaves.
Wiwi/knobby clubrush	*Ficinia nodosa*		•	•	•	•	rush	0.7m	++	Fine rush with creeping root mass. Easily grown from fresh seed and by the division of whole plants. Does best when planted in a free draining soil in a sunny site.
Pukupuku	*Doodia parrisiae*				•	•	fern	0.3m	++	Distinguished small fern with pink to red coloured young emergent fronds.
Creeping Wire Vine	*Muehlenbeckia axillaris*				•	•	creeping vine	0.2m	+++	A dense ground-cover with wiry stems and small dark-green leaves. Flowers prolifically in summer with masses of small creamy flowers.

N

Scale 1:100 @ A3

0 100 200 300 400 500cm

AA2506 - Orewa Estuary Restoration Plan

Estuarine margin cross section

Plan prepared for Auckland Council by 4Sight Consulting.

Date: 09/06/2016
Version: 1.0
Drawn: Sam Hendrikse
Checked: Tony Payne
Approved: Tony Payne

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SERAL FOREST MARGIN PLANTING PLAN – STAGE 2

Maori name / common name	Species	Life Form	Height	Abundance (+++ use plentifully, ++ use commonly, + use sparingly)		Comments
				Stage 1	Stage 2 (Enrichment)	
Toetoe	*Austroderia fulvida*	grass	1.5m	+++		Smallest of the toetoes. Can be distinguished from invasive pampas by its drooping flowering spike. Able to grow on dry, disturbed, compacted sites. Plant densely.
Rangiora	*Brachyglottis repanda*	small tree	7m		+	Striking large leaves with grey undersides. Creamy flowers in spring.
Taupata	*Coprosma repens*	shrub or small tree	2-4m	++		Large shrub or small tree with dark green, glossy, rounded leaves. Very hardy, excellent wind and seaspray shelter. Orange berries attract birds
Ti Kouka	*Cordyline australis*	monocot tree	8m	++		Bird-distributed. Can grow on lower slopes on brackish streams.
Whau	*Entelea arborescens*	tree	6m	+		Relatively short-lived. Fast growing tree with large leaves. Attractive white flowers attract birds.
Hangehange	*Geniostoma ligustrifolia*	broadleaf shrub	4m		++	Fast growing shade tolerant species that grows well beneath a canopy or gorse
Kānuka	*Kunzea robusta*	tree	16m	+++		Good colonising species. White flowers (spring-summer).
Mānuka	*Leptospermum scoparium*	tree	4m	+++		Grows vigorously and has a wide ecological tolerance. Needs to be planted in autumn and must not have roots disturbed during planting.
Wharangi	*Melicope ternate*	small tree	8m		+	Frost tender when young. Attractive shiny green foliage.
Māhoe	*Melicytus ramiflorus*	tree	10m	++		Fast growing tree. Good for damp shady sites. Very hardy.
Māpou	*Myrsine australis*	tree	7m	++		Slender tree with red stems. Hardy. Attracts birds.
Ngaio	*Myporum laetum*	tree	8m	+		Very wind hardy. Fleshy gland dotted leaves. Good shelter tree. Frost tender
Houpara/ coastal five finger	*Pseudopanax lessonii*	small tree	7m	+	+	Good colonising tree in coastal areas. Glossy leathery leaves. Responds well to pruning. Very hardy.
Akepiro	*Olearia furfuracea*	small tree	7m	+		Exposure tolerant. Daisy like flowers in summer
Harakeke / Flax	*Phormium tenax*	monocot clump former	2m	+++		Very hardy with wide environmental tolerances.
Kawakawa	*Piper excelsum*	small tree	7m		+	Large heart shaped leaves, usually holed by chewing native moth. Orange fruits in summer attract birds. Self-seeds easily. May need some shelter to establish.
Nikau	*Rhopalostylis sapida*	palm	10m	+	+	Slow growing. Red berries provide food for kereru/ native pigeon.
Kōwhai	*Sophora chathamica*	tree	20m	+	+	Prefers shady sites, frost tender. Vulnerable to possums. Flowers and fruit attracts birds.
Koromiko	*Veronica stricta/Veronica macrocarpa*	shrub	2m	++		Very hardy, fast growing native shrub species.

RIPARIAN PLANTING PLAN – STAGE 2

Maori name / common name	Species	Planting unit				Life Form	Height	Moisture Requirements	Salt-wind tolerance	Abundance		Comments
		Stream edge	Flood area	Back wetland	Slope					(+++ use plentifully, ++ use commonly, + use sparingly)		
										Stage 1	Stage 2 (Enrichment)	
Small swamp sedge	*Carex virgata*	•	•			sedge	80cm	Wet or dry		+++		Plant densely.
Rautahi	*Carex geminata*	•	•		•	sedge	1m	Wet		+++		Good for bank stability. Plant densely
Toetoe	*Austroderia fulvida*			•	•	grass	1.5m	Wet or dry	•	+++		Smallest of the toetoes. Can be distinguished from invasive pampas by its drooping flowering spike. Able to grow on dry, disturbed, compacted sites. Plant densely.
Harakeke/ Flax	*Phormium tenax*			•	•	monocot clump former	2m	Wet or dry	•	+++		Very hardy with wide environmental tolerances.
Karamū	*Coprosma robusta*				•	broadleaf shrub	2-4m	Wet or dry		+++		Fast growing, hardy species with wide tolerances from shade to full sun.
Mānuka	*Leptospermum scoparium*			•	•	tree	4m	Wet or dry		+++		Grows vigorously and has a wide ecological tolerance. Needs to be planted in autumn and must not have roots disturbed during planting.
Koromiko	*Veronica stricta/Veronica macrocarpa*				•	shrub	2m	Dry		++		Very hardy, fast growing native shrub species.
Kawakawa	*Macropiper excelsum*				•	broadleaf shrub	4m	Wet or dry		+	++	Bird distributed. Prefers shade.
Hangehange	*Geniostoma ligustrifolium var. ligustrifolium*				•	broadleaf shrub	4m	Mid			++	Fast growing shade tolerant species that grows well beneath a canopy or gorse
Māpou	*Myrsine australis*				•	broadleaf shrub	8m	Dry		++		Bird distributed.
Tı Kōuka/ Cabbage Tree	*Cordyline australis*	•	•	•	•	monocot tree	8m	Wet or dry	•	++		Bird-distributed. Can grow on lower slopes on brackish streams.
Kōwhai	*Sophora chathamica*		•		•	broadleaf tree	20m	Dry	•	+	+	Yellow flowers in spring attract tūı.
Kohekohe	*Dysoxylum spectabile*					broadleaf tree	15m	Mid			+	Bird-distributed seed. Highly palatable to possums
Karaka	*Corynocarpu llaevigatus*		•		•	broadleaf tree	12m	Moist			+	Large orange fruits in summer attract kererū.

MATURE FOREST ENRICHMENT PLANTING PLAN - STAGE 3

Maori name / common name	Species	Life Form	Height	Comments
Karaka	*Cornyocarpus laevigatus*	large tree	18m	Hardy, leafy canopy tree. Produces large numbers of bright yellowish orange fruit in summer.
Mangeao	*Litsea calicaris*	tree	15m	May be hard to establish but grows into an attractive tree.
Porokaiwhiri/ Pigeonwood	*Hedycarya arborea*	tree	15m	Attractive glossy, green leaves, bright orange fruits and black wood. Attracts birds.
Tawāpou	*Planchonella costata*	tree	15m	Hardy but frost tender. Large orange to dark crimson berries in autumn.
Kohekohe	*Dysoxylum spectabile*	large tree	17m	Prefers shady sites, frost tender. Vulnerable to possums. Flowers and fruit attracts birds
Pūriri	*Vitex lucens*	large tree	20m	Pink flowers and berries. Prefers fertile sites. Seeds distributed by kererū/native pigeon
Taraire	*Beilschmiedia tarairi*	large tree	20m	Frost tender. Large rounded glossy leaves. Big purple fruit eaten by kererū/native pigeon.
Rewarewa/ NZ honeysuckle	*Knightia excelsa*	large tree	30m	Slender tapering tree with long narrow serrated leaves. Rusty red flowers in spring and summer attract tūı

Planting density guide				
Plant Type	*Plant spacing*	*10 m^2*	*100 m^2*	*1,000 m^2*
			Number of plants needed	
Ferns, Rushes Small Sedges	*0.5m apart*	*45*	*460*	*4600*
Shrubs	*1m apart*	*10*	*115*	*1150*
Small tree	*3m apart*	*1*	*15*	*130*
Large trees	*5m apart*	*1*	*5*	*50*

Appendix C:

Orewa Estuary Te Ara Tahuna – Environmental Weed Reference Guide

OREWA ESTUARY TE ARA TAHUNA - ENVIRONMENTAL WEED REFERENCE GUIDE

All information provided in the table below is sourced from Auckland Council and Weedbusters. Further information about these and weeds is available from their websites http://www.aucklandcouncil.govt.nz/en/environmentwaste/biosecurity/pages/pestplants.aspx

	Common Name / *Scientific Name*	General Description	Environmental Impact	Site Management	Recommended Approaches	Photo
1	**Agapanthus / *Agapanthus praecox***	Dense clumps of robust, evergreen leaves <60cm high from bulbs. Light blue or white tubular composite flowers.	Forms dense mats especially on coastline. Can exclude all other vegetation	Hard to kill. At least 2-3 follow-up treatments needed. Begin eradication at top of banks or stream & work down. Remove flowerheads early summer to stop seed dispersal. Don't replant until after 2-3 treatments. Attempt to clear local gardens, especially on the coast. Infestation along the margin at Orewa College.	1. Dig out isolated plants, removing all bulbs/rhizomes. 2. Slash leaves close to ground & paint fresh stump (Vigilant gel or triclopyr 100ml/L or Yates Hydrocotyle Killer 500ml/L or glyphosate 250ml/L or metsulfuron 10g + 20ml penetrant/L). 3. Spray (60ml triclopyr + 20ml penetrant/10L).	
2	**Arum Lily / *Zantedeschia aethiopica***	Robust, persistent, evergreen, clump-forming perennial herb <1.5m tall. Large arrow-shaped shiny green leaves. White, erect, funnel- shaped 'flower' (Aug-Jan, occasionally other times of year) of central yellow spike and white outer modified leaf.	Smothers ground, preventing regeneration of native flora. All parts of the plant poisonous to humans, pets and livestock.	Abundant throughout the Ti Kouka/ Cabbage Tree stand by Kath Hopper Drive.	1. Slash tops and dig out tubers. 2. Cut and stump paint (1g metsulfuron + 100ml glyphosate + 10ml penetrant/1L). 3. Weed wipe (1g metsulfuron + 150ml glyphosate + 10ml penetrant/1L). 4. Overall spray Jun - Sept (3g metsulfuron + 150ml glyphosate + 10ml penetrant/10L). Two applications may be required early in the season to prevent flowering, then later to control daughter rhizomes. 5. Overall spray in spring - late autumn (5g metsulfuron + 10ml penetrant/10L).	
3	**Bears Breeches / *Acanthus mollis***	Herbaceous perennial, in clumps <120 cm height, with thick roots. Leaf stalk 10-50 cm on leaves from the root crown, much shorter (2-5 cm) on leaves on vertical stems. Large shiny dark green leaves, shape variable, usually several lobes. White flowers with pink, purple or brownish veins on central tall spike. Flowers mature first at the bottom of the spike. Flattened seeds in individual capsules 3-4 cm long.	Can form dense infestations under forest canopy and in dry, sandy conditions, suppressing regeneration of other species.	Begin control at top of site, work along contours to prevent erosion & minimise reinfestation from above	1. This species is included because it is one of the species to be researched in the 2007-2012 Auckland Regional Pest Management Strategy. 2. Dig out scattered plants (all year round)	

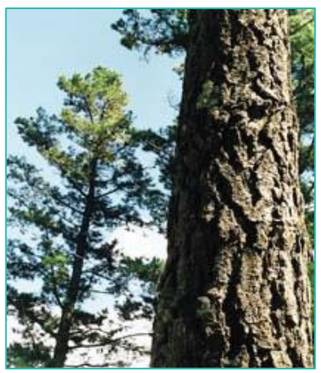
4	**Blackberry / *Rubus fruticose agg.***	Erect, scrambling, thorny perennial shrub. Grows in thickets <2m tall formed by arching stems or canes <7m long. Dark green shiny leaves normally shed in winter. Small white or pink flowers (Nov-Apr). Delicious sweet purplish berries (Jan-Mar).	Develops dense canopy cover in short time. Dominates native flora in swamps. Pasture use and access are reduced. Provides shelter for animal pests.	Where underlying vegetation is undesirable, spraying is preferred as gives 95%+ control with little regrowth. Spray at least 4 months before planting. Native spp. (over 3m) will usually overtop blackberry, then control needed only on margins. Where control is necessary, slashing improves access preceding dense planting, but small plants may be smothered by regrowth.	1. Dig out small patches. 2. Stem scrape and paint (glyphosate 100mls/100mls)immediately. 3. Cut and paint (glyphosate 200-500mls/1l). Only for small patches. 3. Spray when in active growth & with good leaf (5g metsulfuron + 10ml penetrant/10L or 100-150ml glyphosate + 20ml penetrant/10L).	
5	**Blue Morning Glory / *Convolvulous spp.***	Tall growing, twining creeper. Distinctive heart-shaped, 3-lobed leaves, purple tubular flowers all year round. Hairy stems often purple.	Smothers native vegetation either as groundcover or climber. Very fast growing.	Eliminate from planting sites, and adjacent areas. Limited follow-up required.	1. Hand pull small infestations removing all stem fragments. 2. Cut & paint larger stems (100ml glyphosate/1L or 1g metsulfuron/1L). 3. Cut vines at waist height & spray areas below this, summer-autumn (100ml glyphosate + 20mls penetrant/10L or 2g metsulfuron+10ml penetrant/10L).	
6	**Boneseed / *Chrysanthemoides monilifera***	Hardy, bushy, much-branched shrub <2m tall. Young stems woolly but soon become smooth. Leaves smooth, leathery, oval to elliptical & irregularly serrate. Bright yellow, daisy-like flowers (Sept-Feb). Round, green drupes (stone fruit) with hard protective cover ('boneseed'), ripening to black.	Competes with native vegetation particularly in coastal environments. Changes environments of high light to heavy shade.	Begin control at top of site, work along contours to prevent erosion & minimise reinfestation from above. Easiest during spring flowering when visible. This also prevents seed being dispersed from plants cut later in the season. Follow up 6-monthly.	1. Hand pull all but the largest plants before seeding. 2. Cut larger plants & stump paint (100ml glyphosate /1L or 1g metsulfuron/1L or Vigilant gel). 3. Spray (100ml glyphosate+20ml penetrant/10L or 5g metsulfuron + 20ml penetrant/10L). Follow up for seedlings required. 4. Spray seedlings (if numerous) 5ml clopyralid/1L (will leave grass cover). Do not use clopyralid in home gardens.	
7	**Casuarina / *Casuarina glauca***	Evergreen tree <15m high. Resembles a pine; from a distance may be confused with young kahikatea. Slender, often-weeping branches; new growth often orange-brown. Many small cone-like seedpods directly on branches.	Changes water flow in wetlands & forms dense growth shading out native species.	Plants will coppice if cut without stump painting with herbicide.	1. Hand pull small plants. 2. Cut larger trees & stump paint (5g metsulfuron/1L or 100ml triclopyr/1L). 3. Basal spray (20ml triclopyr/1L diesel).	

8	**Climbing Asparagus / *Asparagus scandens***	Scrambling & climbing plant; can also grow in trees as epiphyte. Slender, extensively branched stems wrap around small trees & saplings. Fine, fern-like foliage, small, delicate leaves attached to hook vines. Tiny white flowers (Sept-Dec). Many round, berries ripen green to red-orange.	Kills host plants by smothering or ring barking. Carpets the forest floor preventing regrowth of native seedlings. Fast growing, rapid coloniser.	Maintain rolling front of control, work in from edge of infestation. Follow up at least 6-monthly. Replant treated areas where possible after 2-3 treatments to establish dense ground cover & minimise reinvasion.	1. Use vial treatment. Cut stems above ground, insert ends into vials of glyphosate (10 ml/30 ml water), dig out all roots & tubers. 2. Weed wipe (300ml glyphosate/1L water, no penetrant, total coverage not required). 3. Spray lightly spring-early summer, avoid runoff, total coverage not required (200ml glyphosate/10L. Do not add penetrant when spraying against tree trunks). Spray autumn- winter only in frost-free areas on healthy growth, (increase rate to 300ml glyphosate/ 10L).	
9	**Cotoneaster / *Cotoneaster glaucophyllus, C. franchetii***	An arching, spreading, evergreen shrub usually <3m tall (can grow up to 5m). Egg to diamond-shaped leaves in clusters along stem <25mm long, shiny on upper surface with impressed veins, blue-green on underside (young leaves buff-white underneath). Small white - pinkish flowers (Oct-Jan) in clusters of 1-4. Distinctive bunches of small red berries (Feb-Aug).	Competes directly with native shrubs & forms pure stands.	Plan to control whole areas to minimise reseeding by birds. Replant bared areas with dense groundcover or shrubs to prevent seedling regrowth. Make sure that the plant being controlled is not the native species kumarahou.	1. Hand pull seedlings (can be difficult). 2. Cut & paint stems summer - autumn (5g metsulfuron/1L or Vigilant gel). 3. Frill big stems, 'feather' bark & paint summer - autumn (5g metsulfuron/1L). 4. Spray summer - autumn (5g metsulfuron+10ml penetrant/10L).	
10	**Giant Reed / *Arundo donax***	Large robust clump forming perennial <5m high. Resembles leafy bamboo with wide leaves. Stout, knotty stems. Arching grey-green striped leaves. Feathery plume-like flowerheads mature from reddish to white.	Displaces all surrounding vegetation. Changes habitat by shading & impeding drainage. Gully plants heavily affected.	Follow up frequently until eradicated. Don't replant until 6 months after last herbicide application.	Cut down close to ground, dig out entire root/rhizome mass. 2. Cut stray emergent shoots at ground level, inject 10 ml undiluted Amitrole into each stem. 3. Cut down close to ground & knapsack spray regrowth (150ml haloxyfop + 50ml crop oil/10L) before it reaches 60 cm. Continue respraying at under 60 cm until regrowth ceases (may require 4-6 treatments).	
11	**Wild Ginger – Kahili / *Hedychium gardnerianum* & *Hedychium flavescens***	Non-woody perennial to 2 m tall, ginger-scented. Massive, taro-like rhizomes are long, shallow rooted, much-branched, growing over each other close to the ground surface, and form deep beds.	Extremely shade-tolerant, tolerates most soil types, good or poor drainage and fertility, and is drought and frost tolerant once established. Long-lived, fast growing and forms deep rhizome beds.	Seeds survive for 2-4 years so it is possible to eliminate this plant from sites. Maintain rolling front and check for seedlings annually.	Plants in deep shade produce few or no seed, so begin control on margins to minimise reseeding. 1. Cut down and paint stump (all year round): cut above pink 'collar' at base and apply or glyphosate (250ml/L) or metsulfuron-methyl 600g/kg (1g /L). Leave stems and leaves on site to rot down. 2. Dig or pull out small plants (all year round). Don't compost, leave on site to rot down or hang rhizomes in trees, as they survive indefinitely. Dispose of rhizomes at a refuse transfer station or by drying out and burning. 3. Spray (all year round): metsulfuron-methyl 600g/kg (5g/10L knapsack). Add penetrant in winter. For dense patches keep spray away from roots of vulnerable plants. Don't replant sprayed sites for 6 months.	

12	**Gorse / *Ulex eupropaeus***	Erect, spiny, much-branched perennial shrub <2m tall. Green-brown spiny stems & branchlets, woody when mature. Bright yellow pea-like flowers (May-Nov), black seed pods explode in summer.	Rapidly forms dense impenetrable infestations that compete vigorously with native regrowth, harbour pests (eg rabbits & possums), & are a fire hazard.	When spraying, ensure total coverage to the point of running off both leaves & stems. Do not burn or graze. Only use glyphosate spray when all vegetation on site is to be removed for replanting (generally not required). Sites with appropriate tall forest spp. present can usually be left to be overtopped; can speed by selective slashing, stump swabbing or planting.	1. Introduce biocontrol agents wherever possible. 2. Hand pull seedlings and small plants. 3. Cut & stump paint (50ml triclopyr/1L or 1g metsulfuron/1L or 50ml Tordon BK/1L or Vigilant gel or 200ml glyphosate + 10ml penetrant/1L). 4. Spray all year round (100ml glyphosate + 20ml penetrant/10L). 5. Spray spring-summer (60ml triclopyr +10ml penetrant/10L). 6. Spray autumn-winter (5g metsulfuron+10ml penetrant/10L).	
13	**Himilayan honeysuckle / *Leycesteria formosa***	Large, many-stemmed, deciduous, perennial shrub <2m tall. Round, straight stems hairless & hollow. Pointed, heart-shaped leaves broad, opposite, <14cm long, & may be lobed. White, funnel-shaped flowers (Dec-May) surrounded by larger, drooping, reddish-purple bracts. Roundish, deep brown-purple fleshy berries with a staining juice.	Forms dense thickets that displace native species. Penetrate into untouched forest via natural light gaps.	Replant sites where native spp. are slow to recover, to prevent reseeding.	1.Dig out small plants. 2. Cut & stump paint (1g metsulfuron/1L or 100ml triclopyr or glyphosate/1L). 3. Spray spring - summer, (5g metsulfuron + 10ml penetrant/10L or 60ml triclopyr/10L).	
14	**Ivy – Cape / *Senecio angulatus***	Scrambling perennial herb <2m high. Thick, bright green, ivy-shaped leaves, coarsely toothed. Clusters of yellow, daisy-like flowers (Mar-Aug), hairy seeds.	Forms dense tangled shrubs, smothering existing native vegetation	Best control at flowering, when highly visible, before seed is produced.	1. Slash small infestations, grub out regrowth. 2. Cut and stump paint (100ml glyphosate/1L or 1g metsulfuron/1L). 3. Cut stems below waist height & spray below this point, spring-summer (100ml glyphosate+20ml penetrant/10L or 2g metsulfuron+10ml penetrant/10L or handgun at 20g metsulfuron+100ml penetrant/100L).	
15	**Ivy – German / *Delairea odorata***	Perennial climber. Thin ivy-like leaves on smooth stems with small ear-like projections at base of the leaf stalks. Clusters of yellow daisy-like flowers (May-Oct) without ray florets (petal like flowers). Small, dry hard windborne one-seeded fruit.	Forms dense infestations that can smother host species.	Easiest controlled at flowering, when highly visible before seed produced.	1. Hand pull or dig out scattered plants & seedlings. 2. Cut & paint stems (1g metsulfuron/1L or 100ml glyphosate/1L). 3. Cut stems below waist height, spray below this point (100ml glyphosate+20ml penetrant/10L or 2g metsulfuron+10ml penetrant/10L).	

16	**Ivy – English / *Hedera helix***	Long-lived, woody, climbing, evergreen perennial. Stems <30m long, climb or creep with holdfast roots. Also, has non-climbing fertile branches with unlobed leaves arranged spirally around stem. Leaves of non-fertile shoots 5-lobed. Yellowish-green flowers (Mar-May) in rounded, umbrella-shaped clusters. Purplish-black, berry-like fruit.	Carpets forest floor & trees, climbing to top of tallest trees. Specialised rockland & epiphytic plants significantly impacted.	Many plants do not produce viable (or any) seed, but once established, ivy is hard to kill & dispose of.	1. Cut stem & paint (5g metsulfuron/1L or 50ml Tordon BK/1L). Best for aerial vines. 2. Vial method for ground infestations. Pull up all stems possible & dispose. Treat remainder by placing cut vine ends in vials 5-10m apart containing 1g metsulfuron/20ml. Move vials monthly until plant eradicated. 3.Spray in summer (5g metsulfuron+10ml penetrant/10L).	
17	**Japanese Honeysuckle / *Lonicera japonica***	Evergreen climber, can grow <15m/year. Oval leaves, lighter green underneath; in winter or low light conditions may be toothed or cut. Fragrant, paired, white or yellow tubular flowers (Sept-May). Black berries.	Invades disturbed forests & margins. Out-competes other plants by smothering.	Very shy seeder, sites usually remain clear after treatment, however is hard to kill. Check for new sprouts 6-monthly until clear. Replant bared areas if seedlings are a problem.	1. Cut & dig roots out. 2. Vial method for ground infestations. Pull up all stems possible & dispose. Treat remainder by placing cut vine ends in vials 5-10m apart containing 1g metsulfuron/20ml. Move vials monthly until plant eradicated. 3. Cut & paint (5g metsulfuron/1L or 200ml Tordon BK /1L or Vigilant Gel). 4. Large vines can be cut at head height & sprayed below this summer- autumn (5g metsulfuron + 10ml penetrant/10L or 60ml Tordon BK/10L). 5. Spray (125ml clopyralid/10L).	
18	**Japanese Spindle Tree / *Euonymus japonicus***	Much-branched, evergreen shrub or small tree <7m high tall. Oval, serrated, opposite leaves variegated (green to yellowy cream) in cultivation but revert to green when naturalised. Bunches of greenish-yellow flowers (Nov-Dec). Deep pink round fruit capsule turns bright orange after opening.	Garden escape that invades forest margins.	Garden escape, commonly cultivated, wild plants often not traced to yellow-leaved parents. Local garden clearance recommended in vulnerable areas.	1. Pull out all small plants. 2. Cut and stump paint all year round (1g metsulfuron/1L or 100ml Tordon BK/1L or 100ml triclopyr/1L or 200ml glyphosate/1L). 3. Spray all year round (5g metsulfuron + 10ml penetrant/10L or 60ml triclopyr +10ml penetrant/10L).	
19	**Jasmine / *Jasminum polyanthum***	Evergreen climber up to mid canopy height, twines around host. Opposite, compound leaves, 7 leaflets, small, shiny, dark green when mature; new growth red-tinged. Masses of highly scented, small white tubular flowers in spring; some flowers present all year round. Glossy black fruit with dark red pulp.	Forms impenetrable groundcover, smothers all vegetation to mid-canopy level. Alters forest composition, suppresses regeneration.	Many plants do not produce seed. Once established is hard to kill & dispose of. Most infestations will require several herbicide applications.	1. Prune vines as close to original stem as possible, then paint cut stem (5g metsulfuron + 1ml penetrant/1L or 250ml 2,4-D plus dicamba + 10ml penetrant/1L). Remove all cut stems. 2. In summer, vial treatment good for ground infestations. Pull up all stems possible & dispose. Treat remainder by placing vines in vials 5-10m apart (metsulfuron 1g/20ml). Move monthly. 3. Cut back & spray regrowth in summer (5g metsulfuron+10ml penetrant/10L or 2,4-D plus dicamba + 10ml penetrant/10L).	

20	**Kangaroo Acacia**	Shrub or small tree <3m high. Alternate, sparsely hairy leaves [actually flattened leaf stems] with thin stiff spines at base. Golden, pea-like flowerheads (Jul-Oct); hairy seedpods.	Forms tall thickets in disturbed & bare sites, inhibiting regrowth. Nitrogen fixing, alters species composition.	Succeeded in tall canopy habitats by native spp. (not in kauri or tānekaha forest). Natural regeneration can be speeded by slashing, selective spraying replanting of shade-creating spp.	1. Dig out small plants minimising soil disturbance. 2. Cut & stump paint larger plants (5g metsulfuron/1L or 50ml triclopyr/1L). 3. Spray spring -summer, (60ml triclopyr +10ml penetrant/10L).	
21	**Kikuyu Grass / *Pennisetum clandestinum***	Perennial grass with creeping stems & rhizomes. Leaf blades usually long, soft, hairy, & drooping. Tiny feathery seed heads. Distinguished from other grasses by yellowy light green leaf colour, especially in summer when appears very green compared to other drier grasses.	Almost completely inhibits regeneration by smothering seedlings & other low growing plants. Particularly invasive in coastal areas.	Do not spray after heavy frost. Physical removal largely ineffective, creates disposal problem. Weedmat suitable only around plantings, does not prevent reinvasion. Grazing gives some control. Maintain rolling control front, check for seedlings. Aim to lower light levels with planting.	1. Weedmat discrete spots for 2-3 months. 2. Spray new growth (spring & autumn), follow up with spot spraying of regrowth or mow or graze back hard then spray regrowth (60ml haloxyfop (selective) + 50ml crop oil/10L). 3. Spray (100ml glyphosate (non-selective) + 20ml penetrant/10L).	
22	**Monkey Apple / *Syzygium smithii***	Long-lived, evergreen tree <18m tall. Shiny, oval, opposite leaves release an aromatic fragrance when crushed. Bunches of whitish flowers (Oct-Jan). Heavy crops of white to pink-mauve, berry-like fruit.	Able to establish under low light conditions & hold a permanent place in forest canopy. Will outgrow native trees in light gaps. Can become dominant seedlings under pigeon roosts.	Hard to kill. Maintain rolling front, follow up at least 6 monthly to control seedlings. Replant densely (use pigeon-friendly spp. where possible) to minimise seedling growth.	1. Pull or dig out seedlings. 2. Cut or drill hole every 10cm stem diameter & fill each cut or hole with 2g metsulfuron (dissolved in approx 50ml water). All year round. 3. Cut & stump paint (5g metsulfuron/1L). All year round. 4. Frill (continuous cut) (4g metsulfuron + 10ml penetrant/L). 5. Spray spring - autumn (5g metsulfuron + 10ml penetrant/10L).	
23	**Montbretia / *Crocosmia x crocosmiiflora***	Stiff, leafy, clumping perennial <90cm tall. Erect, sword-shaped, light green leaves with conspicuous mid-vein. Reddish-orange, trumpet-like flowers (Jan-Feb) opposite each other in a zigzag pattern on the stem. Small, green, 3-sided seed capsules.	Covers large areas of open streamside. Displaces natives such as kiokio & streamside herb communities.	Sites regenerating to canopy over 2 m can normally be left alone, may benefit from thinning where weed is dense. Target areas that could infest streams & follow up to prevent reinfestation (work downstream). Replant with dense groundcover where appropriate. Check soil or road metal sources for contamination.	1. Dig out very small sites. Usually futile in large sites as corms resprout. 2. Weed wipe at full leaf stage (1g metsulfuron + 100ml glyphosate + 1ml penetrant/1L). 3. Spray foliage after flowering (100ml glyphosate/10L). Will require retreatment. 4. Spray at full leaf stage (100ml glyphosate + 4g metsulfuron + 10ml penetrant/10L).	
24	**Moth Plant / *Araujia sericifera***	Slender evergreen vine growing over hosts <6m. Arrowhead-like, opposite leaves, dark green on top, grey-green below. Clusters of small creamy coloured, waxy, tubular flowers (Dec-May) Large choko-like seed pods dry & split, releasing 250-1000 parachute-like seeds (autumn- winter).	Becomes the dominant species in urban situations, & competes with or replaces native plant species. Poisonous, with sap that has an irritant effect.	Avoid skin contact with sap. Remove fruits to prevent seeding. Follow up regularly.	1. Dig and pull out all seedlings. 2. Cut near ground (summer - autumn) and stump paint (20ml 2,4-D plus dicamba/1L or 10ml Tordon BK/1L or Vigilant gel). If using Vigilant gel, paint approx 20cm of the stem below the cut as well. 3. Spray in summer (120ml Tordon BK/10L or 120ml 2,4-D plus dicamba/10L).	

25	**Nasturtium / *Tropaeolaceae majus***	Scrambling hairless aromatic annual or short-lived perennial. Succulent stems <10m long. Round leaves green above, bluish underneath, stalk attached to the back. Edible, open, tubular flowers (Oct-May), scarlet, yellow or commonly orange. Fruit green, 1-seeded carpels.	Forms dense cover restricting other vegetation, particularly on stream sides.	Easy to control. Check for resprouting stems, follow up 6-monthly. Replant sites densely to lower light levels.	1. Hand pull. 2. Spray larger infestations spring-summer (100ml glyphosate + 20ml penetrant/10L).	
26	**Pampas (Common & Purple) / *Cortaderia selloana; C. jubata***	Clump-forming grasses <4m tall. Leaves with cutting edges, dark green with hairs on underside of midrib, bluish green above; dead leaves spiral like wood shavings. Showy, erect, pink, purple or white seedheads (Feb-late May).	Competes with & smothers other vegetation. Creates fire risk, harbours pests e.g. rabbits, possums, rats.	Establish that species is not native toetoe. Control before seeding when possible. Always use most selective method. Plan for increased fire risk after control. Do not burn at any stage. Large infestations can be grazed by cattle as long as toetoe is not present. Pampas recedes as shade increases, so encourage weed replacement (planting, regeneration).	1. Grub out small to plants. Remove large plants with digger. 2. Weed wipe all year round (200ml glyphosate + 2ml penetrant/1L). 3. Spray summer-autumn (150ml haloxyfop (selective) + 50ml crop oil/10L). 3. Spray (summer-autumn) dense sites where non-target damage is unlikely (100ml glyphosate (non-selective) + 20ml penetrant/10L).	
27	**Periwinkle / *Vinca major***	Prostrate, scrambling, hairless, evergreen perennial <50cm tall. Forms dense mats of long running stems with roots at nodes. Dark green, glossy, leathery leaves, opposite & oval, pointed tips, hairy midribs & edges. Blue-violet tubular flowers (with paler centres) <5cm in diameter all year round.	Similar to tradescantia it forms a thick carpet that smothers other plants even in shade conditions. Stops regeneration of native seedlings.	Extremely difficult to kill. Follow up spray when foliage is still small to prevent recovery of root reserves. This usually means 4 times a year.	1. Weedmat for 6 months or more, check edges for creeping stems. 2. Hand pull removing all plant material including runners. Repeat regularly. 3. Weed wipe, all year round (300ml glyphosate + 2ml penetrant/1L). 4. Spray all year round (200ml glyphosate + 20ml penetrant/10L). Requires constant follow up, spray regrowth (300ml glyphosate + 20ml penetrant/10L).	
28	**Pines (self seeded) / *Pinus spp.***	Resinous, evergreen trees <25m tall. Bark rough & often fissured. Bunches of green, needle-like leaves. Cones produced with many seeds.	Dominate & exclude other vegetation. Change soil acidity, precluding some native species. Older trees become canopy trees in forest.	Plant tall, shady trees to inhibit germination. Create wide shelterbelt where seedlings occur adjacent to plantations. Discourage germination (& encourage native spp.) by maintaining deep humus layer. Exclude livestock.	1. Pull or dig out small plants. 2. Cut down close to ground below lowest branch. Large trees: Ring bark below lowest branches (min width 100mm). If this is not possible any branches below ring must be cut off close to trunk. Make sure cambium layer is completely cut through. 3. Cut or drill every 150mm of stem diameter & fill each cut or hole (1g metsulfuron (dissolved in approx 50ml water) or 10ml Tordon BK). All year round. 4. Spray in summer (100ml glyphosate + 20ml penetrant/10L or 5g metsulfuron + 10ml penetrant/10L or 60ml Tordon BK + 10ml penetrant/10L).	

29	**Privet – Tree / *Ligustrum lucidum***	Small med, hardy, fast growing, evergreen tree or dense shrub <10m high that can reach 14m in foliage diameter. Dark green, glossy oval leaves, pointed tips, smooth edges. Long panicles of strongly scented white flowers (Nov-Mar). Berry-like bluish or purplish-black drupes.	Replaces mid canopy trees (taraire, towai, pohutukawa) & completely dominates areas of forest if unhindered. Leaves & fruit poisonous, perfume contributes to asthma.	Firstly, ensure correct identification. Easy to kill with metsulfuron. Follow up 6-monthly; easiest to spot during spring flowering. Don't replant until seedling regrowth ceases, as privet will grow through groundcover.	1. Pull or dig seedlings. 2. Cut & stump paint (1g metsulfuron/1L). 3. All year round drill 1 hole per 20cm stem diameter & fill each hole with 2g metsulfuron (dissolved in approx 50ml water). 4. Spray spring autumn, (5g metsulfuron+10ml penetrant/10L).	
30	**Sweet Pea Shrub / *Polygala myrtifolia***	Evergreen legume-like shrub (<2 m tall) with young shoots that have short curly hairs, otherwise the plant is hairless.	Fast growing, shades out low-growing coastal shrubs, and produces many, very long-lived seeds.	Seed germinates in bare areas, especially after fires. Easy to kill, however seedling regrowth is usually extensive, so budget for ongoing follow up. Replant where possible	1. Hand pull small plants (all year round). Mulch. 2. Slash larger plants in regenerating shrubland (summer). Mulch. 3. Stump swab (all year round): metsulfuron-methyl 600g/kg (1g/L) or Tordon Brushkiller (100ml/L) or Tordon Gold (200ml/L). 4. Spray (larger infestations): glyphosate (100ml/10L) + penetrant.	
31	**Tuber ladder-fern / *Nephrolepis cordifolia***	Upright rambling fern with densely pinnate fronds <80cm long. Produces numerous spore masses per leaflet. Only fern with tubers, round, potato-like, to 2 cm wide.	Forms dense masses, crowding out other vegetation, becoming the dominant species.	Often mistaken for a native plant. Easy to kill. Leave treated sites 3-4 months to kill tubers before clearing or replanting.	1. Dig out taking care to remove all tubers. 2. Weed wipe (2g metsulfuron/1L) 3. Spray (1g metsulfuron/10L).	
32	**Wandering Willie / *Tradescantia fluminensis***	Hairless, succulent creeping plant <50cm tall. Alternate, oval, shining leaves form a sheath around stem. Clusters of white star-shaped flowers (Aug-Nov).	Serious forest floor competitor forming dense mats that smother vegetation & prevent regeneration. Causes dermatitis in dogs & other animals.	Work down catchment from top & sides. Maintain strict regime to prevent reinfestation from fragments & regrowth; don't replant until site is clear.	1. Weedmat for several months. 2. Rake or hand pull small areas during a dry period, working towards centre of infestation. Major disposal problem, dropped fragments spread infestation. 3. Weed wipe (250ml triclopyr/L). Follow up within 2-3 months before plant recovers. 2-3 treatments needed for total control. 4. Spray larger areas (300ml glyphosate + 30ml penetrant/10L near waterways).	
33	**Wattle - Acacia spp. / *Acacia spp.***	Shrubs to large trees. Two groups of Acacias: those with pinnate leaves (leaflets arranged in two rows on either side of stalk); & those with flat phyllodes (extensions of stem). Flowers are spikes or many-flowered round heads & usually yellow or cream. Long flat seedpods.	Dense stands are a serious threat to regenerating bush. Nitrogen fixer.	Maintain native groundcover wherever possible.	1. Hand pull seedlings minimising soil disturbance. 2. Make cuts at 100ml spacings around the base of tree & fill each cut with 5ml triclopyr undiluted. 3. Ringbark trees; ensure danger to public from falling branches is minimised. Paint ringbarked area immediately with herbicide (50ml triclopyr/1L or 50ml Tordon BK/1L). 4. Where trees have been felled, paint stump (50ml triclopyr/1L or 50ml Tordon BK/1L). 5. Spray where appropriate, spring - summer, (5g metsulfuron + 10ml penetrant/10L water	

34	**Wattle – Brush / *Paraserianthes lophantha***	Fast growing woody evergreen tree <5m high. Frond-like leaves divided into 20-40 pairs of leaflets giving a feathery appearance. Silky down on underside of leaflets. Greenish-yellow flowers (May-Aug) in bottlebrush-like heads. Long, flat, green pods containing hard-coated black seeds.	Out-compete native species because of fast growth & long-term seed bank. Marginal pasture land may also be affected.	Check area regularly for seedlings due to the long life of seeds.	1. Hand pull seedlings. 2. Cut larger trees & stump paint (5g metsulfuron/ 1L). 3. Drill holes every 200mm and fill (250mls glyphosate/1L or 10mls triclopyr undiluted).	
35	**Willow – Crack / *Salix fragilis***	Deciduous tree <25m high. Trunk roots at nodes when laid down, forming bright red rootlets. Branchlets break off easily with an audible 'crack'. Shiny, green lanceolate, alternate leaves. Flowers Sep - Oct.	Aggressive willow, forming dense stands in rivers and drains totally excluding native vegetation and blocking waterways.	Do not fell unless able to dispose of plant material; best to poison standing, to avoid live stem contact with ground. Begin control at top of catchment, treat every stem. Prevent grazing & other disturbance. Interplanting can follow if non-spray follow-up control options used. Discourage use & replace with native alternatives.	1. Hand pull small plants taking care to remove all parts. 2. Cut or drill every 100 mm around trunk diameter and fill each cut/hole (10ml glyphosate or 2 ml metsulfuron at 20g/1L) summer-autumn 3. Frill (feather cut bark) and paint (100ml glyphosate/1L or metsulfuron at 20g/L) summer - autumn. 4. At full leaf stage spray (125ml glyphosate + 20ml penetrant/10L). Ensure full coverage.	
36	**Willow – Grey / Salix cinerea**	Deciduous shrub or small tree <7m tall but usually 2m tall. Bark is rather smooth. Stems grey or greenish-grey & hairy, or reddish to dark purple and are not brittle. Leaves shiny on upper side and covered with fine grey hairs underneath, not bitter. Flowers (Sept-Oct) appear as separate male and female cylindrical catkins (no petals). Fruit may contain many seeds.	Blocks waterways & modifies wetlands.	Early detection and eradication important with this willow. Begin control at top of catchment, treat every stem. Interplanting can follow if non-spray follow-up control options used. Discourage use & replace with native species.	1. Cut or drill hole every 100mm around trunk diameter and fill each cut or hole (10ml glyphosate or 10 ml metsulfuron at 20g/1L) summer - autumn. 2. Frill (make feather cuts in bark) summer - autumn and paint (100ml glyphosate/1L or 5g metsulfuron/1L with penetrant). 3. Cut stump application (Vigilant gel or 5g metsulfuron/1L with penetrant). 4. At full leaf stage spray (125ml glyphosate + 20ml penetrant/10L). Ensure full coverage.	
37	**Woolly Nightshade / *Solanum mauritianum***	Shrub or tree <8m tall. Leaves smelling of kerosene greyish-green on upper surface, white to yellowish green beneath, & covered in dense felt-like hairs. Clusters of purple flowers at end of branches, yellow berries with many seeds	Berries toxic. Forms pure colonies, crowding out other plants. Dust from plant irritates skin, eyes, nose, throat.	Rarely invades intact habitats. Maintain shade by planting dense cover. Follow up for 3 years. Maintain rolling front of control. Exclude livestock, maintain pest control.	1. Pull up all small plants 2. Cut & stump paint or frill (100ml/L Tordon BK or triclopyr 100ml/1L or picloram gel). 3. Paint a 70cm high collar around stem (picloram gel) to kill standing. 4. Make 2 cuts either side of stem & fill each cut (1.5mls Tordon BK). 5. Spray Oct - Feb (60ml triclopyr +10ml penetrant/10L).	

Appendix D:

Orewa Estuary Te Ara Tahuna – Bird Reference Guide

OREWA ESTUARY TE ARA TAHUNA - BIRD REFERENCE GUIDE

This reference guide details the species previously recorded in the area from 2003-2016. All information provided in the table below is sourced from New Zealand Birds Online, and further information about these and other birds is available from their website www.nzbirdonline.org.nz.

	Species	General Information	Identification	Call	Photo
1	**Bar-tailed Godwit** (***Limosa lapponica)***. ▪ Conservation status: Declining ▪ New Zealand status: Native	Godwits hold cultural significance for many New Zealanders. For Maori, they were birds of mystery, ('Who has seen the nest of the Kuaka?') and were believed to accompany spirits of the departed. Eastern bar-tailed godwits breed in western Alaska and migrate to New Zealand and eastern Australia. Migration departures are staggered through March	▪ Length: 39 cm (male); 41 cam (female) ▪ Weight: 275-400 g (male); 325-600 g (female) ▪ Similar species: Hudsonian godwit, Black-tailed godwit, Whimbrel A large long-legged wader, brown above, pale below, with a long tapering and slightly upturned pink bill with black tip. Males are markedly smaller with shorter bills than females	Usually silent on the ground; commonly call in flight, usually a-wik,a-wik,a-wik.	 Photo 1: Image © Glenda Rees by Glenda Rees (http://www.flickr.com/photos/nzsamphotofanatic/)
2	**Whimbrel** (***Numenius phaeopus***) ▪ Conservation status: Migrant ▪ New Zealand status: Native	Whimbrels are large shorebirds which migrate to New Zealand from Arctic breeding grounds in small numbers. Most records are during the summer but a few birds occasionally overwinter. In New Zealand, they typically associate with bar-tailed godwits, from which they differ in being darker, having a striped head and a strongly down-curved bill	▪ Length: 43 cm ▪ Weight: 350 - 450 g ▪ Similar species: Little whimbrel, Eastern curlew, Bristle-thighed curlew A large wader with a medium-sized dark decurved bill, a pale stripe on the centre of the crown, and a pale eyebrow stripe separating the dark eye-stripe and side-crown. The upperparts are mottled dark brown contrasting pale underparts with brown streaking on the throat and breast, and the rump and back pattern is highly variable.	A distinctive seven note whistle: ti-ti-ti-ti-ti-ti-ti.	 Photo 2: Image © Scott Brooks (ourspot) by Scott Brooks
3	**Eastern Curlew** (***Numenius madagascariensis***) ▪ Conservation status: Vagrant ▪ New Zealand status: Native	The eastern curlew is the largest wader in New Zealand, and has the longest bill of any wader at around 20 cm in length. The eastern curlew is a long-distance migrant, making non-stop flights from east and north Australia direct to east Asia, from Taiwan northwards to major mudflat staging sites of the Yellow Sea. They reach New Zealand from September to November and leave in March and April. Eastern curlews are very wary birds, and are difficult to approach. In New Zealand, they may be solitary, associate with other curlews, or join with bar-tailed godwits.	▪ Length: 63 cm ▪ Weight: 900 g ▪ Similar species: Whimbrel A very large bulky wader with a very long heavily decurved bill, head and neck streaked dark brown, thin white eye-rings, and whitish throat. The upperparts are brown with pale olive-brown edging and the underparts are dark brownish-buff, paler towards the vent, with fine streaking grading to thicker arrow-shaped streaks on the flanks	A bubbling song ker ker-ee-ker-ee when disturbed.	 Photo 3: Image © Duncan Watson by Duncan Watson
4	**Royal spoonbill/ Kōtuku Ngutupapa** (***Platalea regia***) ▪ Conservation status: Naturally Uncommon ▪ New Zealand status: Native	Feeds while wading in water, repeatedly scything the submerged spoon-shaped bill left and right in an arc. Feeds day or night, whenever tide is suitable. Eats mainly fish in freshwater, and shrimps in tidal flats; also eats other crustaceans, aquatic insects and frogs.	▪ Length: 74 - 81 cm ▪ Weight: 1.4 - 2.0 kg ▪ Similar species: Yellow-billed spoonbill, White heron A large white heron-like bird with long black legs and a large black spoon-shaped bill. In breeding plumage it has long white crest feathers on the nape.	Grunts, groans and hisses with chew and cho calls made at the nest.	 Photo 4: Image © Steve Attwood by Steve Attwood http://www.flickr.com/photos/stevex2/)

	Species	General Information	Identification	Call	Photo
5	**White Heron / Kōtuku** **(*Ardea modesta*)** ▪ Conservation status: Nationally Critical ▪ New Zealand status: Native	The white heron or kotuku is well-loved by the New Zealand people, but it is rarely seen except by those who specifically seek it out. Its sole New Zealand breeding site near Okarito Lagoon in Westland is well-known and well-protected, but elsewhere it is 'He kotuku rerenga tahi' or the bird of single flight, implying something seen perhaps once in a lifetime. When seen in close proximity it is a magnificent bird, with its large size and clean white plumage.	▪ Length: 83-103 cm ▪ Weight: 700-1200 g ▪ Similar species: Plumed egret, Cattle egret, Little egret, Royal spoonbill A large white heron with a long pointed yellow bill, a gape that extends well behind the eye, long dark legs, and a very long neck. In flight, it retracts its head so that the length of its neck is hidden, giving it a hunched appearance	A harsh croak	 Photo 5: Image © Glenda Rees by Glenda Rees (http://www.flickr.com/photos/nzsamphotofanatic/)
6	**White-faced Heron/ Matuku** **(*Egretta novaehollandiae*)** ▪ Conservation status: Not threatened ▪ New Zealand status: Native	The white-faced heron is New Zealand's most common heron, despite being a relatively new arrival to this country. It is a tall, elegant, blue-grey bird that can be seen stalking its prey in almost any aquatic habitat, including damp pasture and playing fields. Because it occupies space also shared with people it is usually well habituated to their presence, and may allow close approach. Foraging white-faced herons walk slowly with long, controlled steps, watching for any signs of prey, which is grabbed with lightning speed.	▪ Length: 67 cm ▪ Weight: 550 g ▪ Similar species: Reef heron, Pacific heron A medium-sized blue-grey heron with white face, long dark grey bill, and pale yellow legs. In flight the open wings show a marked contrast between the pale grey fore-wing and dark grey main flight feathers on both the upper and lower surfaces.	A harsh croak, usually given in flight.	 Photo 6: Image © Adam Clarke by Adam Clarke
7	**Reef Heron / Matuku** **(*Egretta sacra*)** ▪ Conservation status: Nationally Endangered ▪ New Zealand status: Native	The reef heron is a dark grey wading bird most often seen in coastal areas in the north of the North Island. One or two birds may be found patrolling a rocky shoreline or nearby estuary. Although similar to the common white-faced heron it is not seen as frequently and has slightly different feeding habits. Reef herons occur throughout Polynesia, and their prevalence in northern New Zealand may reflect their preference for warmer climates. The dark grey colour provides the bird with excellent camouflage when it is patrolling the shoreline rocks that are its main habitat. The reef heron is wary, and flies away when approached too closely. It will, however, use man-made structures for nesting.	▪ Length: 66 cm ▪ Weight: 400 g ▪ Similar species: White-faced heron A medium-sized dark grey heron with a long, greyish-yellow bill, and greenish-yellow legs, that is uniformly dark in flight. An all-white form of reef heron also exists but is rare in New Zealand.	A harsh croak	 Photo 7: Image © Neil Fitzgerald by Neil Fitzgerald www.neilfitzgeraldphoto.co.nz
8	**Wrybill/ Ngutuparore** **(*Anarhynchus frontalis*)** ▪ Conservation status: Nationally Vulnerable ▪ New Zealand status: Endemic	The wrybill is a small pale plover which breeds only in braided rivers of the South Island. It is the only bird in the world with a laterally-curved bill (always curved to the right), which it uses to reach insect larvae under rounded riverbed stones. Wrybills are completely dependent on braided rivers for breeding; all their life stages are predominantly grey, and highly cryptic among the greywacke shingle of the riverbeds. The wrybill is an internal migrant. After breeding, almost the entire population migrates north to winter in the harbours of the northern North Island. On their wintering grounds, wrybills form dense flocks at high-water roosts; the highly-coordinated aerial manoeuvres of these flocks have been described as resembling a flung scarf.	▪ Length: 20 cm ▪ Weight: 55 g ▪ Similar species: Banded dotterel, Sanderling, Terek sandpiper A relatively small pale plover with a long black bill curving to the right, dark grey to black legs and, in breeding males, a black line above the white forehead. The underparts are white, with a black upper breast band from mid-winter to the end of the breeding season, and the upperparts and sides of the face are pale grey.	The common 'chip' appears to indicate alertness. Rapid 'churring' is used when chasing intruding banded dotterels or other wrybills, and very quiet 'grating' call used to communicate with chicks. Flocks in flight (and sometimes when milling on the ground) may indulge in excited high-pitched 'chattering'.	 Photo 8 Image © Craig McKenzie by Craig McKenzie

	Species	General Information	Identification	Call	Photo
9	**Banded Dotterel/ Tūturiwhatu** (***Charadrius bicinctus***). ▪ Conservation status: Nationally Vulnerable ▪ New Zealand status: Endemic	The banded dotterel is the most common small plover of New Zealand seashores, estuaries and riverbeds. Although their plumage varies seasonally, they are readily identified by their brown upperparts and complete or partial chestnut breast band, the latter being quite striking in breeding plumage. Inland-breeding birds undertake a post-breeding migration to estuaries and other coastal wetlands the length of New Zealand and many also travel to Tasmania and south-east mainland Australia in an unusual east-west migration..	▪ Length: 20 cm ▪ Weight: 60 g ▪ Similar species: Lesser sand plover, New Zealand dotterel A small compact brown and white plover with a short black bill, relatively long dark legs and large round dark eyes. Breeding males have a broad chestnut breast band with a narrow black neck band above it; females have both bands but they are duller. Like other typical plovers, the body is held erect and they have a characteristic run-stop-peck-run foraging behaviour in their pursuit of small invertebrates.	Flight calls are an unobtrusive chip call sometimes repeated, and sounding like continuous chattering when a sizeable flock is flying by. Territorial birds are much more vocal giving a “chee-aree-aree” call, with males often puffing out the breast feathers at the same time.	 Photo 9: Image © Neil Fitzgerald by Neil Fitzgerald Neil Fitzgerald: www.neilfitzgeraldphoto.co.nz
10	**New Zealand Dotterel/ Tūturiwhatu** (***Charadrius obscurus***) ▪ Conservation status: Recovering ▪ New Zealand status: Endemic	Both subspecies form post-breeding flocks, typically at large estuaries. They gather from January, and numbers peak in March. Some northern birds move back to breeding sites from May, with all gone by August. Flocks of the southern subspecies stay together throughout winter.	▪ Length: 25 cm ▪ Weight: 146 g (northern) ▪ Similar species: Banded dotterel, Greater sand plover A bulky plover with a heavy black bill, relatively long grey legs and large round dark eyes. The upperparts are brown and the underparts off-white, becoming orange-red from May, with the depth and extent of red varying individually and seasonally, and males generally being darker than females.	The common call is a sharp chip, often heard before the bird is seen. The call indicates alertness, with the rate increasing as the perceived threat level rises. The same call is also used to maintain contact. A high-pitched tseep is used to warn chicks to stay hidden. A long rattling churr is used when chasing intruders. A sharp werr-wit is used during territory boundary disputes.	 Photo 10: Image © Tony Whitehead by Tony Whitehead Tony Whiteheadwww.wildlight.co.nz
11	**Black-fronted Dotterel** (***Elseyornis melanops***). ▪ Conservation status: Naturally Uncommon ▪ New Zealand status: Native	Black-fronted dotterel are generally not gregarious, with birds are usually seen singly, in pairs or up to 4-5 birds. After breeding most birds stay on rivers, but some form flocks at lagoons, lakes, estuaries and sewage ponds in winter. Birds feed throughout the day at the water’s edge of slow moving streams, rivers, estuaries or at still ponds. When walking the body is often held in a nearly horizontal posture. Flights are mostly short. Birds tend to run for short periods, then stop and walk when feeding.	▪ Length: 16 - 18 cm ▪ Weight: 30 - 35 g ▪ Similar species: Banded dotterel, Red-kneed dotterel A small plover with black-tipped red bill, orange legs, and prominent black bands on the breast and face contrasting the rest of the white and light brown plumage. Young birds have mostly white on the breast with black bands developing with adulthood.	A faint high-pitched sharp note like a peeep	 Photo 11: Image © Neil Fitzgerald by Neil Fitzgerald Neil Fitzgerald: www.neilfitzgeraldphoto.co.nz
12	**South Island Pied Oystercatcher/ Tōrea** (***Haematopus finschi***) ▪ Conservation status: Declining ▪ New Zealand status: Endemic	The South Island pied oystercatcher (SIPO) is the most abundant oystercatcher in New Zealand. The conspicuous black and white plumage and long red bill make this a familiar species. It is found on most estuaries, with numbers greatest during the period December to July. Fewer birds remain in coastal areas during the rest of the year, with most of the population moving to inland South Island riverbeds and farmland to breed.	▪ Length: 46 cm ▪ Weight: 550 g ▪ Similar species: Variable oystercatcher, Chatham Island oystercatcher A large solidly-built black-and-white wader with a long straight bright orange bill and stout pink legs. The sharply delineated border on the lower breast between the black upperparts and white underparts is diagnostic.	flight call a loud shrill “kleep”. Loud piping calls are given when defending breeding and feeding territories.	 Photo 12: Image © Craig McKenzie by Craig McKenzie Craig McKenzie

	Species	General Information	Identification	Call	Photo
13	**Variable Oystercatcher/ Tōrea Pango** (***Haematopus unicolour***) ▪ Conservation status: Recovering ▪ New Zealand status: Endemic	Variable oystercatchers are often highly aggressive towards people close to nests or chicks, dive-bombing (sometimes making contact) and screeching. They also undertake distraction displays on the ground in defence of eggs and chicks. On the North Island east coast, territories often overlap with those of New Zealand dotterels. Unlike most shorebirds, variable oystercatchers feed their young. Small chicks often remain hidden under vegetation, rocks, etc, with parents bringing food; this probably reduces the risk of predation by gulls and harriers.	▪ Length: 48 cm ▪ Weight: 720 g ▪ Similar species: South Island pied oystercatcher, Chatham Island oystercatcher A large heavily-built wader with black upperparts and underparts that vary from all black through a range of 'smudgy' intermediate states to white. The long straight bill is bright orange, the stout legs coral-pink, and the eyes red each with an orange eye-ring.	Variable oystercatchers are very vocal; loud piping is used in territorial interactions and when alarmed, and they have a loud flight call similar to other oystercatchers. Chicks are warned of danger with a sharp, loud 'chip' or 'click'.	 Photo 13: Image © Peter Reese by Peter Reese
14	**Pied Stilt/ Poaka** (***Himantopus himantopus***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The pied stilt is a dainty wading bird with, as its name suggests, black-and white-colouration and very long legs. It is common at wetlands and coastal areas throughout New Zealand and may be seen feeding alongside oystercatchers. Pied stilts tend to be shy of people and fly away, yapping, when approached.	▪ Length: 35 cm ▪ Weight: 190 g ▪ Similar species: Black stilt A compact, black-and-white stilt with long red legs and a long fine pointed black bill. Adult hybrid stilts have a black band of variable width across the breast.	The calls heard most often are high pitched yapping alarm calls. A less strident version is used as a contact call, including by flocks flying at night.	 Photo 14: Image © Tony Whitehead by Tony Whitehead Tony Whiteheadwww.wildlight.co.nz
15	**Little Black Shag/ Kawau tūi** (***Phalacrocorax sulcirostris***). ▪ Conservation status: Naturally Uncommon ▪ New Zealand status: Native	Little black shags are highly gregarious species, especially after breeding although birds are also seen singly or in small groups. Conspicuous flocks of up to 100 birds (sometimes more) feed, roost and travel together at estuaries, lakes and rivers. They forage co-operatively, herding and encircling shoals of small fish. Birds feed throughout the day but rest at times on rocks, shingle, or river banks or mudflats. Roosting is in flocks in trees or on rocky outcrops on the shoreline.	▪ Length: 61 cm ▪ Weight: 800 g ▪ Similar species: Little shag, Black shag A medium-sized shag of coastal and inland waters with all-black plumage, dark facial skin, a thin black bill and black feet. The distinctive iris is much brighter green eye than other shag species.	Little black shags are quiet except when breeding, when males utter a variety of throaty croaks and whistles	 Photo 15: Image © Thomas Musson by Thomas Musson tomandelaine@xtra.co.nz
16	**Pied Shag/ Kāruhiruhi** (***Phalacrocorax varius***). ▪ Conservation status: Recovering ▪ New Zealand status: Native	This large black-and-white shag is often seen individually or in small groups roosting on rocky headlands, trees or artificial structures. In regions where it occurs, it can usually be readily seen about harbours and estuaries associated with cities or towns. Unlike most other shag species, the pied shag is reasonably confiding, allowing close approach when roosting or nesting in trees. It generally forages alone, but occasionally in small groups when prey is abundant.When resting during the day, birds occur on undisturbed beaches, shoreline rocks, trees and artificial structures. During the late afternoon or evening, pied shags return to nesting colonies or favoured roosts in trees near water for the night.	▪ Length: 65 - 85 cm ▪ Weight: 1.3 - 2.1 kg ▪ Similar species: Little shag, New Zealand king shag, Stewart Island shag, Black shag A large, relatively slim black-and-white shag with white face, black feet, blue eye-rings and yellow facial skin. Black back, nape and upperwings contrast with white throat, breast and belly.	Generally silent away from nesting colonies, but quite vocal at colonies during pair formation, nest building and when one of a pair returns to nest during incubation. Females give wheezy haa calls, while males give a variety of loud calls, that may be repeated several times, and that sound like aark, kerlick and whee-eh-eh-eh.	 Photo 16: Image © Glenda Rees by Glenda Rees (http://www.flickr.com/photos/nzsamphotofanatic/)

	Species	General Information	Identification	Call	Photo
17	**Black shag/ Kawau** **(*Phalacrocorax carbo)*** ▪ Conservation status: Naturally Uncommon ▪ New Zealand status: Native	This large, mainly black shag is often seen individually or in small groups roosting on rocky headlands, in trees or on artificial structures. It usually forages alone. Even though readily seen about harbours and estuaries associated with cities or towns, black shags are wary of close approach by people, probably as a result of persecution by fishers and waterfowl hunters.Black shags have also been recorded wading in shallow streams searching for prey under pebbles. They forage mainly in water less than 3 m deep, dives averaging 21 seconds, with 7 seconds between dives.	▪ Length: 80 - 88 cm ▪ Weight: 2.0 - 2.4 kg ▪ Similar species: Little black shag, Little shag, Pied shag A large all-black shag of coastal and inland waters with white feathering on the cheeks and throat, yellow facial skin, black feet and grey-green eyes. Adults in breeding plumage have red-orange facial skin, white thigh patches, a small black head crest, and white filoplumes on the neck.	Generally quiet away from nest. At the nest a variety of calls with marked sexual differences, males having a range of loud raucous sounds, females soft and husky sounds early in the breeding cycle but becoming more like those of males during incubation.	 Photo 17: Image © George Curzon-Hobson by George Curzon-Hobson
18	**Australasian shoveler/ Kuruwhengi** **(*Anas rhynchotis*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The Australasian shoveler is a highly mobile species with many birds probably traversing the length of New Zealand annually before returning again to their breeding areas. Like other shoveler species, Australasian shovelers moult communally in large numbers at very few places and generally occur in flocks for most of the year.	▪ Length: 46 - 53 cm ▪ Weight: 570 - 850 g (male); 545 - 745 g (female) ▪ Similar species: Northern shoveler A medium-sized dabbling duck with a large black spoon-shaped bill, yellow eyes and orange legs. Breeding plumage males have a blue-grey head and neck with a white crescent at the base of the bill, mottled brown and white breast, chestnut flanks, and a white patch at the tail base; females are mottled light brown with a dull brown bill and eyes, and brown-orange legs.	Australasian shovelers are rarely vocal. Displaying males have a rapid “chuff-chuff” call, and females may give a typical descending quack quack quack….	 Photo 18: Image © Ormond Torr by Ormond Torr
19	**New Zealand Scaup/ Papangoi** **(*Aythya novaeseelandiae*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Endemic	New Zealand scaup are gregarious diving ducks common throughout New Zealand. Compact and blackish, they have the silhouette of a bath-toy duck. Scaup have a fast wing beat and often fly just above the water. They sometimes rest on land, but quickly retreat to water when disturbed.	▪ Length: 40 cm ▪ Weight: 695 g (male); 610 g (female) ▪ Similar species: Brown teal, Australian white-eyed duck, Australian coot A small dark round-bodied diving duck. Males are dark black-brown with iridescent blue-green head and wings, lighter mottling on the chest and underparts, yellow eyes and blue-grey bill; females are duller chocolate brown with paler underparts, white feathers at the base of a grey bill, and brown eyes.	Males have a high-pitched whistle call weeee weo-weo weo-weo weo-weoooo. The female call is a low quiet wack wack.	 Photo 19: Image © Raewyn Adams by Raewyn Adams
20	**Mallard** **(*Anas platyrhynchos*** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Mallards are the ducks that gather en masse whenever bread is thrown out at an urban pond. The mallard is a legal gamebird that is hunted during the annual May-June waterfowl season. Fish & Game New Zealand estimate that approximately 500,000 mallards are shot each year; this number undoubtedly including mallard-like hybrids. Mallards are typically associated with waters in proximity to human activity but will also occur on remote lakes and headwater rivers. They form large flocks in December–March when moulting, although females may also moult secretively in lakeside vegetation. Although strong fliers, mallards tend to be quite sedentary, and widespread dispersal or movements are uncommon.	▪ Length: 50 - 70 cm ▪ Weight: 1050 - 1300 g ▪ Similar species: Grey duck A large dabbling duck with a yellowish or grey and orange bill, dark eyes, orange legs and feet, chestnut breast, and metallic blue speculum. Breeding plumage males have a glossy green head and neck, pale grey back and flanks, and blackish rump and undertail with curled black upper tail coverts; females are dull brown with buff edged body feathers and a dark eye-stripe on the face	Female gives typical decrescendo call of about 6-8 loud quacks in a row, soft quacks in communication with ducklings, and a rapid “gag gag gag” repulsion call in courting displays and when pursued by males. Males give soft “raeb raeb” call of variable length.	 Photo 20: Image © Tony Whitehead by Tony Whitehead www.wildlight.co.nz

	Species	General Information	Identification	Call	Photo
21	**Black Swan/ Kakīānau** **(*Cygnus atratus*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	Although present in New Zealand and on Chatham Islands at the time of first human settlement, black swans were no longer extant at the time of European settlement. They were deliberately reintroduced, initially from Melbourne, in the 1860s. Their distribution and abundance within a few years of those small reintroductions suggests that, coincidentally, natural re-colonisation may have occurred. Periodic immigration from Australia may still occur but has yet to be confirmed. Widespread and common in eastern and south-western Australia and Tasmania, the black swan also ranges into the continent's interior following heavy rain events.	▪ Length: 110 - 140 cm ▪ Weight: 5 - 7 kg (male), 4 - 6 kg (female) A large black swan with a bright red bill with a terminal white band, red eyes, and dark grey legs. Females are markedly smaller than males; both sexes have conspicuous white flight feathers.	Generally described as "a musical bugling" given primarily as a contact call between mates and often accompanied by flicking head movements. Hisses when defending young or when threatening.	 Photo 21: Image © Tony Whitehead by Tony Whitehead www.wildlight.co.nz
22	**Canada Goose** **(*Branta Canadensis*)** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The distinctive and well-known Canada goose is a North American native that has been extensively introduced to UK, Scandinavia, and North Sea nations from Denmark to France, Russia and Ukraine, as well as New Zealand.	▪ Length: 85 -95 cm ▪ Weight: 4.5 - 5.5 kg ▪ Similar species: Greylag goose, Cape Barren goose A large light-brown goose with black head, neck, bill, legs and feet, white 'chinstrap', and light brown barring on the white breast and abdomen	A distinctive and loud honk given when the birds are disturbed or surprised, or when flying.	 Photo 22: Image © Neil Fitzgerald by Neil Fitzgerald www.neilfitzgeraldphoto.co.nz
23	**Australasian gannet/ Tākapu** **(*Morus serrator*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	With its 1.8 m wing-span, the Australasian gannet is a conspicuous, predominantly white seabird that is common in New Zealand coastal waters. They can be observed feeding solitarily or in large congregations, especially near the larger colonies. Australasian gannets breed in dense colonies on coastal islands and on cliffs and beaches of some headlands of the New Zealand mainland; the breeding distribution also encompasses south-east Australia and Tasmania. The torpedo-like plunge dive of gannets is a spectacular sight, particularly when large foraging flocks form over surface aggregations of fish.	▪ Length: 90 cm ▪ Weight: 2.3 kg ▪ Similar species: Cape gannet, Masked booby A large slender-bodied seabird with mainly white plumage, buff-yellow head and neck, a wedge-shaped bluish-grey bill and blue skin around the eyes. The trailing edges of the long pointed wings and a varying proportion of the central tail feathers are black.	A distinctive 'urrah urrah' to announce landing, during territorial indication at the nest site, and during mutual bill fencing and bowing with the mate. Also an attenuated 'oo-ah' to indicate take-off. Both sexes' calls are identical, with some locational and marked individual variation.	 Photo 23: Image © Malcolm Pullman by Malcolm Pullman www.pullmanpix.kiwi.nz
24	**White-fronted tern/ Tara** **(*Sterna striata*).** ▪ Conservation status: Declining ▪ New Zealand status: Native	White-fronted terns are common all around New Zealand coasts. White-fronted terns feed on small and larval fish at sea, in lagoons or up rivers. At sea it frequently feeds in shoaling fish swarms associated with kahawai, gulls and shearwaters. The New Zealand population has declined markedly over the last 40 years and is currently regarded as threatened.	▪ Length: 42 cm ▪ Weight: 160 g ▪ Similar species: Common tern, Arctic tern A medium-sized tern, pale grey above and white below, with a long white forked-tail, a black cap separated from the long pointed black bill by a white band, and a narrow dark band on the outer edge of the first primary. Breeding adults have a black cap that extends from the white frontal strip down to the back of neck; non-breeding adults have a reduced cap leaving the forehead white	The main call is a high-pitched siet; a harsh keark or keeahk is uttered by birds defending their nests.	 Photo 24: Image © Thomas Musson by Thomas Musson tomandelaine@xtra.co.nz

	Species	General Information	Identification	Call	Photo
25	**Caspian tern/ Taranui** **(Hydroprogne caspia)** ▪ Conservation status: Nationally Vulnerable ▪ New Zealand status: **Native**	The Caspian tern is a large distinctive gull-like tern of shallow coastal waters and, particularly outside of the breeding season, inland lakes and rivers throughout New Zealand. It is an attractive sleek species whose guttural call is often heard before the bird is seen. Their usual hunting method is to fly up to 15 m above the surface of the water, then diving steeply on to prey, often becoming completely submerged in the process. Caspian terns are susceptible to nest disturbance by people, their dogs, and off-road vehicles.	▪ Length: 50 cm ▪ Weight: 700 g ▪ Similar species: Crested tern A very large heavily built tern, silver-grey above and white below, with dark wing tips, a large pointed bright red bill with dark tip, a relatively short slightly forked tail. Adults have black legs and a black cap to below the eye during the breeding season; the cap becomes speckled with white and less sharply delineated at other times of the year	Distinctive harsh 'karh' is often given in flight, particularly around breeding colonies.	 Photo 25: Image © Les Feasey by Les Feasey)
26	**Red-billed gull/ Tarāpunga** **(*Larus novaehollandiae*)** ▪ Conservation status: Declining ▪ New Zealand status: Native	Red-billed gulls are found in most coastal locations throughout New Zealand. They are also commonly found in towns, scavenging on human refuse and offal from fish and meat processing works. he red-billed gull is a very abundant species that has recently suffered huge declines at its three main breeding colonies. A major threat to breeding birds is predation from introduced predators such as cats, ferrets, rats and stoats. The red-billed gull is often confused with the similar-looking black-billed gull, especially as juveniles and immature birds of both species have an overlapping range of bill and leg colours. The black-billed gull is always a paler, more elegant bird, with a longer, more slender bill, and with less black on the outer wing	▪ Length: 37 cm ▪ Weight: 240 - 320 g ▪ Similar species: Black-billed gull A medium-sized white gull with pale grey mantle, back and wing coverts, black main flight feathers with white tips, white iris, and bright red bill, eyelids and legs. Immatures are similar to adults but with brown patches on the mantle, brownish primaries, and dark brown iris, bill and legs.	a wide range of calls are used in different circumstances. The alarm call used during the breeding season is a strident "kek" call	 Photo 26: Image © Alan Tennyson by Alan Tennyson.
27	**Southern Black-backed gull/ Karoro** **(*Larus dominicanus*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The southern black-backed gull (or 'black-back') is one of the most abundant and familiar large birds in New Zealand, although many people do not realise that the mottled brown juveniles are the same species. Bold and conspicuous, black-backed gulls are often attracted to food sources provided inadvertently or deliberately by people. In cities, they often roost and even nest on roofs. They are common in urban parks, seeking hand-outs and scraps, or harvesting earthworms from water-logged playing fields. Black-backed gulls are often seen on the water's edge where they scavenge corpses and fish frames washed up on the tide.	▪ Length: 60 cm ▪ Weight: 1.0 kg ▪ Similar species: Pacific gull, Subantarctic skua A large black-and-white gull with a white head and underparts, black back, yellow bill with a red spot near the tip, and pale green legs. Juveniles are dark mottled brown with black bill and legs; their plumage lightens with age until they moult into adult plumage at 3-years-old.	A long series of loud calls 'ee-ah-ha-ha-ha' etc, given in territorial and aggressive contexts	 Photo 27: Image © Rebecca Bowater FPSNZ by Rebecca Bowater FPSNZ Courtesy of Rebecca Bowaterwww.floraandfauna.co.nz
28	**Welcome swallow/ Warou** **(*Hirundo neoxena*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	Welcome swallows are small fast-flying birds found in open country particularly around lakes, coasts, riverbeds and ponds. elcome swallows are gregarious. They often nest as pairs, but other birds may help with caring for the young. When not breeding they roost together in large numbers under bridges or in raupo swamps and they will mob predatory birds.	▪ Length: 14 - 16 cm ▪ Weight: 9 - 20 g ▪ Similar species: Tree martin, Fairy martin, Fork-tailed swift, White-throated needletail A small bird with rufous on the forehead, neck, breast and flanks, a black eye stripe, a short broad black bill, blue-black back and upperwings, pale buff underparts, long dark tail with white spots towards the ends of the feathers, and a deeply-forked tail and long pointed wings. Juveniles are similar but with duller colouring and a darker head.	Fantail-like twittering, chattering and chirrups. Calls are generally quiet and do not carry far	 Photo 28: Image © Tony Whitehead by Tony Whitehead Tony Whiteheadwww.wildlight.co.nz

	Species	General Information	Identification	Call	Photo
29	**Sacred kingfisher/ Kōtare** **(*Todiramphus sanctus*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The sacred kingfisher is one of the best known birds in New Zealand due to the iconic photographs published over many years by Geoff Moon. These early images showed in detail the prey, the foraging skills and the development of chicks in the nest and as fledgings. Equally recognisable is the hunched silhouette waiting patiently on a powerline or other elevated perch over an estuary or mudflat which converts in a flash to a streak of green diving steeply to catch a prey item. Kingfishers are found widely in New Zealand in a wide range of habitats: the key ingredients are elevated observation posts to hunt from, banks or suitable standing trees to excavate nests in, and open or semi-open habitats which support a range of prey items.	▪ Length: 23 cm ▪ Weight: 55 g A medium-sized kingfisher with a green-blue back, yellow-buff undersides, a large pointed black bill, a broad black eye-stripe from lores to ear-coverts, and a white collar in adults. Immatures are duller, with buff feather edges on upper parts and brownish mottling on the chest and collar	Kingfishers have a wide range of unmusical calls, the most distinctive of which is the staccato ‘kek-kek-kek’ territorial call.	 Photo 29: Image © Rebecca Bowater FPSNZ by Rebecca Bowater FPSNZ Courtesy of Rebecca Bowaterwww.floraandfauna.co.nz
30	**Pūkeko/ Swamphen** **(*Porphyrio melanotus*)** ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The pukeko is a widespread and easily recognisable bird that has benefitted greatly by the clearing of land for agriculture. In addition to its brilliant red frontal shield and deep violet breast plumage, the pukeko is interesting for having a complex social life. In many areas, pukeko live in permanent social groups and defend a shared territory that is used for both feeding and breeding. Social groups can have multiple breeding males and females, but all eggs are laid in a single nest and the group offspring are raised by all group members.	▪ Length: 38 - 50 cm ▪ Weight: 1090 g (male); 880 g (female) ▪ Similar species: South Island takahe, Dusky moorhen, Black-tailed native-hen A large relatively compact rail with deep blue-violet head, breast and throat, black back and wings, white under-tail coverts, red eyes and orange legs and feet with long slim toes. The distinctive bright red conical bill is connected to a similarly coloured ‘frontal shield’ ornament covering the forehead.	Pukeko are very vocal with a variety of calls. Territorial ‘crowing’ is the loudest and most frequently heard call. A variety of contact calls including ‘’n’yip’, ‘hiccup’ and ‘squawk’ are used between adults, and between adults and chicks. The defence call is a loud, shrill screech used when a harrier is nearby. A similar, but deeper and hoarser, call is made during aggressive interactions between individuals	 Photo 30: Image © Noel Knight by Noel Knight
31	**Tui** **(Pro*sthemadera novaeseelandiae*)** ▪ Conservation status: Not threatened ▪ New Zealand status: Endemic	Tui are boisterous, medium-sized, common and widespread bird of forest and suburbia. They look black from a distance, but in good light tui have a blue, green and bronze iridescent sheen, and distinctive white throat tufts (poi). They are usually very vocal, with a complicated mix of tuneful notes interspersed with coughs, grunts and wheezes Tui play a very important role in the dynamics of New Zealand forests because they are one of the most common pollinators of flowering plants, and also disperse the seeds of trees with medium-sized fruits.	▪ Length: 30 cm ▪ Weight: 125 g (male); 90 g (female) ▪ Similar species: Eurasian blackbird, Bellbird A large dark honeyeater with a decurved black bill, dark brown eyes, black legs and feet, and black head, underparts, wings and tail showing iridescent blue-green on the head and wings. The upper back and flanks are brown with a bronze sheen, the nape and sides of the neck have filamentous white feathers, and there are two curled white feather tufts on the throat.	A loud and complicated mix of tuneful notes interspersed with coughs, grunts and wheezes. Bellbirds have very similar song, but this is more fluid, and lacks the loud coughs, grunts and wheezes of tui.	 Photo 31: Image © Craig McKenzie by Craig McKenzie Craig McKenzie
32	**Kākā** **(*Nestor meridionalis*)** ▪ Conservation status: Recovering ▪ New Zealand status: Endemic	Generally heard before they are seen, kaka are large, forest-dwelling parrots that are found on all three main islands of New Zealand and on several offshore islands. Kaka are obligate forest birds that obtain all their food from trees. They are adept fliers, capable of weaving through trunks and branches, and can cover long distances, including over water. Kaka consume seeds, fruit, nectar, sap, honeydew and tree-dwelling, especially wood-boring, invertebrates.	▪ Length: 38 - 44 cm ▪ Weight: 340 - 400 g ▪ Similar species: Kea A large olive-brown forest parrot with grey-white crown, bright red-orange underwing and deep crimson belly and under-tail coverts. Males have a noticeably longer and deeper upper mandible and bigger head than females which is apparent when the two are seen side by side.	A harsh, repeated, rhythmic “ka-aa” when flying above the forest canopy, harsh grating “kraak” alarm call when disturbed. Also a variety of loud, musical whistles, but these vary markedly from place to place. A seemingly Jurassic combination of calls	 Photo 32: Image © Jean-Claude Stahl by Jean-Claude Stahl

	Species	General Information	Identification	Call	Photo
33	**Red-crowned parakeet/ Kākāriki** (***Cyanoramphus novaezelandiae***) ▪ Conservation status: Relict ▪ New Zealand status: Endemic	Red-crowned parakeets are medium-sized, emerald green parrots with an obvious red crown. Although they are widely distributed throughout the New Zealand region, and very common on some islands, they are now rare on the two main islands. Red-crowned parakeets occupy a variety of habitats ranging from tall forests to grass and shrublands. In the late 1800s, this species sometimes occurred in large flocks with two other species of Cyanoramphus parakeets, causing considerable damage to orchards.	▪ Length: 25 - 28 cm ▪ Weight: 70 - 80 g ▪ Similar species: Yellow-crowned parakeet, Forbes' parakeet A medium-small long-tailed parakeet with broad rounded wings, mainly green plumage, crimson forehead, fore-crown and patches behind the eyes and on each flank at the base of the tail. The leading edge of the primary wing feathers are a rich cyan blue and their flight appears to be erratic when crossing open spaces.	A characteristic parakeet chatter, with variety of softer tur-tur-tur calls.	 Photo 33: Image © Laurie Ross by Laurie Ross Courtesy Laurie Ross Photography http://laurieross.com.au/
34	**Eastern Rosella** (***Platycercus eximius***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The eastern rosella is a brightly coloured, broad-tailed parakeet native to south-eastern Australia. It was introduced to New Zealand in the early 1900s, and is now common over much of the North Island. They typically move around the landscape in pairs or small flocks, often given away by their noisy chatter or loud, in-flight alarm call. Eastern rosella have been observed feeding with red-crowned parakeets in a mixed flock on the ground. They are a very wary bird, particularly of people, and will take flight quickly if disturbed, flying swiftly with characteristic undulating flight	▪ Length: 30 cm ▪ Weight: 90 - 120 g ▪ Similar species: Crimson rosella, Red-crowned parakeet A medium-sized long-tailed rosella with a bright red head, white cheek patches, yellow belly. yellow-green upper back mottled with black, bright green rump, dark blue upperwings with bright blue shoulders, and dark green and light blue tail feathers. Males are brighter than females; juveniles are duller than adults, with greener plumage.	Up to 25 different calls have been described for eastern rosella. Most frequently heard are the unparrotlike “pee-ping” contact call, reminiscent of a bellbird; the in-flight alarm call – a metallic “pink pink pink pink”, and the noisy parroty chatter associated with intraspecific interactions. Juveniles and nestlings near fledging have a distinct “choy choy choy” call.	 Photo 34: Image © Les Feasey by Les Feasey
35	**Morepork/ Ruru** (***Ninox novaeseelandiae***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The morepork is a small, dark, forest-dwelling owl. Found in both native and plantation forests, its distinctive “more-pork” call is commonly heard at night in many urban parks and well-vegetated suburbs. Moreporks are relatively common throughout much of New Zealand but are sparse through the eastern and central South Island. Their diet consists of insects, small mammals and birds, which it hunts at night.	▪ Length: 29 cm ▪ Weight: 175 g ▪ Similar species: Little owl A small, dark brown owl of forests and forest remnants, including in suburbs. Its striking yellow to yellowish-green eyes are set into two facial disks either side of a small sharply hooked bill. The back feathers are dark-brown spotted sparsely with off-white. The breast is dark-brown variably streaked with cream and brown through to rufous. The legs are feathered legs down to the yellow feet.	All calls are given only at night. The onomatopoeic ‘more-pork’ call is the most characteristic and often heard call. They also utter a repetitive ‘quork-quork’ and a rising ‘quee’ call.	 Photo 35: Image © Adam Clarke by Adam Clarke
36	**New Zealand Pigeon/ Kererū** (***Hemiphaga novaeseelandiae***) **Not Threatened** ▪ Conservation status: Not Threatened ▪ New Zealand status: Endemic	This large and distinctively-coloured pigeon is a familiar sight to many New Zealanders. During the non-breeding season, kereru can be fairly inconspicuous, feeding and then roosting under a thick canopy for sometimes hours at a time. In the breeding season, they can be just the opposite, perching on top of trees and males giving frequent display flights at the start of a nesting cycle. While not a territorial species, an individual will defend a food tree against other pigeons attempting to feed in it too. Fights involve hitting each other with their wings while flapping about in flight and moving only a metre or two.	▪ Length: 50 cm ▪ Weight: 630 g A large arboreal pigeon with a red bill, feet and eyes. The upperparts are blue-green with purple-bronze iridescence on the neck, mantle and wing coverts, and the underparts are white with a sharp demarcation between the white and blue-green on the upper breast	Kereru are generally silent except for occasional ‘oos’. Brief, moderate volume ‘oos’ are given when alarmed, such as a harrier flying close by, and longer, low volume ‘ooooos’, with a rising tone towards the end given as contact calls, often repeated several times.	 Photo 36: Image © Ormond Torr by Ormond Torr

	Species	General Information	Identification	Call	Photo
37	**Shining Cuckoo/ Pīpīwharauroa** (***Chrysococcyx lucidus***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The shining cuckoo (shining bronze-cuckoo in Australia) is a summer migrant to New Zealand. It is common throughout New Zealand but it is small and cryptically-coloured and so is more often heard than seen. It has a distinctive whistling call. Two intriguing aspects of its life history are its brood-parasitic habits and the long annual trans-oceanic migration. The New Zealand subspecies breeds only in New Zealand (including Chatham Islands) but other subspecies breed in southern Australia, Vanuatu, New Caledonia and on Rennell and Bellona Islands (Solomon Islands).	▪ Length: 16 cm ▪ Weight: 23 g A relatively small cuckoo with iridescent dark green plumage upperparts and white below with narrow dark green transverse bands. Immature plumage is slightly duller, especially on the throat and chest, with less distinct ventral barring.	The main call is a loud upwardly-slurred whistle repeated several times; the sequence usually ends with a downwardly-slurred whistle. Repeated downward-slurred calls are generally, perhaps always, due to several birds gathering together, and may be part of courtship behaviour.	 Photo 37: Image © Rob Lynch by Rob Lynch
38	**Grey warbler/ Riroriro** (***Gerygone igata***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Endemic	The grey warbler is New Zealand's most widely distributed endemic bird species, based on the number of 10 x 10 km grid squares it occupied over the whole country in a 1999-2004 survey. It vies with rifleman for the title of New Zealand's smallest bird, with both weighing about 6 g. The title usually goes to rifleman, based on its shorter tail and therefore shorter body length. The grey warbler is more often heard than seen, having a loud distinctive song, and tending to spend most of its time in dense vegetation. They are closely related to other members of the Gerygone genus, which are found throughout Australasia and South-East Asia, and include the other native warbler, the Chatham Island warbler.	▪ Length: 11 cm ▪ Weight: 5.5 - 6.5 g ▪ Similar species: Silvereye A tiny slim songbird that is olive-grey above with a grey face and off-white underparts, with a darker grey tail getting darker towards the tip, contrasting with white tips to the tail feathers, and showing as a prominent white band in flight. The finely pointed bill and slender legs are black, the eye is bright red, and birds often glean insects from the outside of the canopy while hovering.	A characteristic long trilled song. The song is louder than expected, given the bird's size. Only males sing, although females do give short chirp calls, usually as a contact call near the male. Nestlings and fledglings have a hig- pitched begging call. Begging calls are mimicked by their brood parasite, the shining cuckoo, while in the nest and as a dependent fledgling.	 Photo 38: Image © Bartek Wypych by Bartek Wypych
39	**Silver eye/ Tauhou** (***Zosterops lateralis***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The silvereye colonised New Zealand from Australia in the 1850s, and is now one of New Zealand's most abundant and widespread bird species. It is found throughout New Zealand and its offshore and outlying islands, occurring in most vegetated habitats, including suburban gardens, farmland, orchards, woodlands and forests. Silvereyes are small songbirds that are easily recognised by their conspicuous white eye-ring; their plumage is mainly olive-green above and cream below. It is an an active, mobile species that moves about frequently, including making sea crossings.	▪ Length: 12 cm ▪ Weight: 13 g ▪ Similar species: Bellbird A small songbird with olive-green upperparts, grey hindneck, neck-sides and upper back, dark olive green tail, whitish-cream underparts on the throat and upper breast, creamy grey on the belly and undertail, pinkish-buff flanks, white thighs, and creamy-white on the underside of the wings. Both eyes have a silvery-white ring and dark reddish-brown iris, and the bill and legs are dark brown-black.	A range of clear often high-pitched and melodious calls including warbles, and trills, often repeated, used in a wide variety of contexts. The main contact is a plaintive creee, and the flight call a shorter cli-cli, with many birds calling at once. Full song is a quiet, long liquid warble, similar to the song of the dunnock.	 Photo 39: Image © Tony Whitehead by Tony Whitehead Tony Whiteheadwww.wildlight.co.nz
40	**New Zealand Fantail/ Pīwakawaka** (***Rhipidura fuliginosa***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Endemic	The fantail is one of New Zealand's best known birds, with its distinctive fanned tail and loud song, and particularly because it often approaches within a metre or two of people. Its wide distribution and habitat preferences, including frequenting well-treed urban parks and gardens, means that most people encounter fantails occasionally. They can be quite confiding, continuing to nest build or visit their nestlings with food when people watch quietly. There are two colour forms or 'morphs' of fantail, with the more common pied morph occurring throughout its range, and the black morph comprising up to 5% of the South Island population, and occasionally occurring in the North Island.	▪ Length: 16 cm ▪ Weight: 8 g ▪ Similar species: Willie wagtail A small songbird with greyish head, white eyebrows, brown back and rump, cinnamon breast and belly, white and black bands across the upper breast, and a long black and white tail. Five percent of South Island birds are mainly black with black-brown over the rump, belly and flight feathers, and sometimes have a white spot over each ear.	Fantails are quite vocal, except when it is particularly cold. They regularly give 'cheep' calls in a number of situations, such as when foraging or alarmed. The species' distinctive song has been described as "a chattering tweeta-tweeta-tweeta…. of regular rhythm", and of high pitch. It can be heard throughout the year, particularly during the breeding season (August-March), but least of all during cold, wet days of winter.	 Photo 40: Image © Ormond Torr by Ormond Torr

	Species	General Information	Identification	Call	Photo
41	**Australasian Harrier/ Kāhu** (***Circus approximans***) ▪ Conservation status: Not Threatened ▪ New Zealand status: Native	The swamp harrier is a large, tawny-brown bird of prey that occurs throughout New Zealand. It is an opportunistic hunter that searches for food by slowly quartering the ground with its large wings held in a distinctive shallow V-shape. Adapted to hunt in open habitats, its numbers have benefitted from widespread forest clearance and the development of agriculture. Although carrion is a major component of the harrier's diet, it also actively hunts live prey such as small birds, mammals and insects. Capable dispersers, birds from New Zealand visit islands as far north as the Kermadec Islands and as far south as Campbell Island. Known for their dramatic 'sky-dancing' courtship display the swamp harrier is the largest of the 16 species of harriers found worldwide.	▪ Length: 50 - 60 cm ▪ Weight: 650 g (male), 850 g (female) ▪ Similar species: New Zealand falcon, Black kite A large long-legged harrier with long taloned toes, long pointed wings, prominent facial disks and a strongly hooked bill. Adults have a tawny-brown back, pale cream streaked breast, yellow eyes, yellow cere and a creamy white rump visible in flight; juvenile and immature birds are uniformly dark chococlate brown.	Harriers mainly vocalise as part of their courtship displays during the breeding season. Their call is a series of same note, high-pitched, short, sharp "kee-o kee-o." At other times of the year they are generally silent.	 Photo 41: Image © Glenda Rees by Glenda Rees http://www.flickr.com/photos/nzsamphotofanatic/
42	**New Zealand Pipit/ Pīhoihoi** (***Anthus novaeseelandiae***) ▪ Conservation status: Declining ▪ New Zealand status: Endemic	The New Zealand pipit is a small brown-and-white songbird that resembles a lark, but has longer legs, and walks rather than hops. They are birds of open country, including the tideline of sandy beaches, rough pasture, river beds and above the tree-line. Pipits are members of the wagtail family, and frequently flick their long tails as they walk. Pipits are approachable, often running a short distance in front of people walking, rather than flying away.	▪ Length: 18 cm ▪ Weight: 35 g ▪ Similar species: Eurasian skylark, Chaffinch, House sparrow A slender small-medium long-tailed songbird streaked grey-brown above and off-white below, with brown streaking on the breast, a pale eyebrow stripe, white outer tail feathers. The crown is streaked grey-brown, the bill fine and dark, and the legs long, slender and pale brown.	The main call given all year is a strident tzweep. Song given in air with arched fluttering flight over home ranges.	 Photo 42: Image © Duncan Watson by Duncan Watson
43	**Eurasian Skylark/ Kaireka** (***Alauda arvensis***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Eurasian skylarks are more often heard than seen. Their small size and streaked brown plumage make them difficult to see on the ground, but their vibrant aerial song quickly reveals their presence, a song that has inspired poets and musicians for centuries. Skylarks were introduced into New Zealand from England between 1864 and 1879, when more than 1000 birds were released. Birds from New Zealand were released in turn on the Hawaiian Islands in 1870, supplementing a population introduced there from England five years earlier.	▪ Length: 18 cm ▪ Weight: 38 g ▪ Similar species: New Zealand pipit, Yellowhammer A small brown and creamy-buff bird with off-white underparts, streaked breast and throat, variegated brown upperparts, a sturdy horn-coloured bill that is yellow-brown at the base, and pink legs and feet with a long slightly curved hind toe. Adults have a faint mask of pale feathers around and behind the eye, and a small streaked crest on the hind crown that is raised when alert.	A rich and prolonged sequence of chirps, trills and whistles, rising and falling rhythmically, given during an aerial display, 30-100 m overhead. Males sing a shorter version from elevated perches such as fence posts or bushes. Call is a liquid chirrup, given in level flight.	 Photo 43: Image © Dick Porter by Dick Porter
44	**House Sparrow/ Tiu** (***Passer domesticus***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	One of the world's most successful introduced species, It lives mostly in close association with man. Sparrows vie with silvereyes in being the most abundant New Zealand bird, at least near human habitation. The population density in New Zealand is about 25 times that in comparable habitat in Britain, probably reflecting the scarcity of specialised predators of small birds in New Zealand.	▪ Length: 15 cm ▪ Weight: 28 g ▪ Similar species: Dunnock, Chaffinch, European greenfinch A small songbird species in which breeding adult males have chestnut-brown, white and grey plumage with a distinctive black bib, grey underparts, variegated brown and white backs and wings, a robust black conical bill, dark brown eyes and dull pink legs. Females and juveniles lack the bib, are greyer with lighter brown dorsal plumage than adult males, and a have a pinkish-brown bill.	The familiar unmelodious chirp is the male's song, and the same call is used by both sexes in roosts and other social gatherings. The alarm call is harsher.	 Photo 44: Image © Ormond Torr by Ormond Torr

	Species	General Information	Identification	Call	Photo
45	**Song Thrush** (***Turdus philomelos***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The song thrush is easily recognised by its speckled brown-on-cream breast. It is often heard before it is seen, as it is one of the main songsters of suburban New Zealand, with a very long singing season. Thrushes sing from a high branch, at the top of a tree or on power poles and lines. Their distinctive song comprising a wide range of notes, with each phrase typically repeated 2-3 times in succession. hrushes frequent a wide range of lowland and hilly habitats including suburban gardens, farmland, woodlands and some forests. They feed mostly on the ground on earthworms and snails, also insects and berries.	▪ Length: 21 -23 cm ▪ Weight: 70 g ▪ Similar species: Eurasian blackbird A medium-sized songbird with pale cream underparts speckled with fawn-brown chevrons, smooth grey-brown head, back, upper wings and tail, indistinct streaking on the head and the upper wing mostly uniform brown in flight. The sexes are alike with a robust dark pointed bill with yellowish lower mandible; juveniles have similar colouring but the speckling on the breast is less distinct.	Distinctive and attractive song comprising a wide range of notes, often repeated, from about May to November, but calling can occur throughout the year. Calling can commence before sunrise. Singing is thought to be by males advertising territorial ownership.	 Photo 45: Image © Ormond Torr by Ormond Torr
46	**Euarasin Blackbird/ Manu Pango** (***Turdus merula***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The Eurasian blackbird was introduced to New Zealand, and is now our most widely distributed bird species. Adult males are entirely black apart from their yellow bill and eye-ring. Females and juveniles are mostly dark brown, slightly mottled on the belly. Blackbirds are common in a wide range of habitats including suburban gardens, farmland, woodlands and indigenous forests. Their song is given from winter to summer, with the singing male usually perched on a high branch, tree top or power line. They sing most in the early morning and evening. Blackbirds feed mostly on the ground on earthworms, snails, and insects. They also take berries while perched in foliage.	▪ Length: 25 cm ▪ Weight: 90 g ▪ Similar species: Song thrush A medium-sized songbird that is entirely black in adult males with a yellow bill, a yellow eye-ring around the dark eye, and long reddish-brown legs. Adult females are mostly dark brown, with light brown or grey throat, and a light brown bill; juveniles are similar but with light mottling over the body.	The loud male territorial advertising song is mainly given from July to January. The song is similar to that of the song thrush, but without the repeated phrases that characterise thrush song. Other calls are given throughout the year, including a sharp quickly repeated alarm call made by if a predator threatens.	 Photo 46: Image © Steve Attwood by Steve Attwood http://www.flickr.com/photos/stevex2/)
47	**Common Starling** (***Sturnus vulgaris***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Starlings from Europe were introduced for insect control to North America, South Africa, Australia and New Zealand. They have iridescent purple and green feathers tipped with white spots, but appear black at a distance. Large flocks roost communally at traditional sites, spreading out to pasture and urban feeding grounds each day. One of the commonest garden birds, starlings are easily recognised by their noisy, hyperactive behaviour. They are resident throughout New Zealand on open country, including most offshore islands.	▪ Length: 21 cm ▪ Weight: 85 g ▪ Similar species: Common myna, Song thrush A medium-sized glossy iridescent black songbird with tiny white spots, a tapering pointed yellow bill (black in winter and in juveniles), and a short tail and orange-red legs. Males have dark eyes and females have a pale brown edge to the iris; juveniles leaving the nest are pale greyish brown and lack white spots.	Shrill whistles, song with interspersed clicks and gurgles, and a penetrating scream when handled. Starlings can imitate other sounds (e.g. police sirens, telephones, voices) with uncanny accuracy, and incorporate calls and song phrases from other bird species in their song.	 Photo 47: Image © Philip Griffin by Philip Griffin Philip Griffin - www.philipgriffin.com
48	**Common Myna** (***Acridotheres tristis***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The common myna is a native of India, east and west Pakistan and Burma. It was introduced to many Pacific lands, including New Zealand, usually to combat invertebrate pests. Mynas are large, conspicuous passerines. A shiny black head and shoulder plumage merges into vinous brown for the remainder of the body and a large patch of white is flashed from each wing during flight. They are commonly seen deftly avoiding traffic while foraging for road-killed insects.	▪ Length: 24 cm ▪ Weight: 125 g A stocky brown songbird with a glossy black head and shoulders, yellow bill and facial skin, white-tipped tail feathers, primaries and upper and lower coverts, white-flecked brown-grey irises, and yellow brown legs with horn-coloured claws. Juveniles have paler plumage, a light yellow bill streaked with dark grey, and facial skin which is white for the first two weeks.	A loud chickork-chickork-chickork (territorial proclamation) given while Head-bobbing, may be accompanied by a complicated series of quiet calls including pee pee pee, bell-like notes and deep guttural booming. Other quiet trills are used when inviting a mate to fly.	 Photo 48: Image © Philip Griffin by Philip Griffin Philip Griffin - www.philipgriffin.com

	Species	General Information	Identification	Call	Photo
49	**Australian Magpie** (***Gymnorhina tibicen***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The black-and-white Australian magpie is a common and conspicuous inhabitant of open country throughout much of New Zealand. It was introduced from Australia and Tasmania by Acclimatisation Societies between 1864 and 1874, mainly to control insect pests. There are three subspecies; the black-backed, and two white-backed forms, with white-backed birds predominating in most parts of New Zealand.	▪ Length: 41 cm ▪ Weight: 350 g ▪ Similar species: Magpie-lark A large black songbird in which the adult male has a white hind-neck, mantle, rump and shoulder patches, upper tail and under-tail coverts. The female is similar, but the mantle is grey, and the black parts of the plumage are less iridescent; both sexes have a blue-grey bill with a dark tip, and red eyes.	Both sexes have a distinctive carolling song; “quardle oodle ardle wardle doodle”.	 Photo 49: Image © Ormond Torr by Ormond Torr
50	**Rock/ Feral Pigeon** (***Columba livia***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The rock pigeon is a familiar species to most New Zealanders, given its distribution from Northland to Southland, and being present in both urban and rural areas. While rural birds are usually quite timid, flying off at close approach, urban birds are often quite the opposite, walking about at one’s feet and even alighting on people to take food. It is a gregarious species, often roosting, commuting and foraging in flocks.	▪ Length: 31 - 34 ▪ Weight: 265 - 432 g A medium-sized pigeon that occurs in a wide variety of plumages, including all-black, blue-grey, red-brown, buff, white, and pied variants of each. The wild-type rock pigeon is blue-grey with black wing bars, lighter tones over the back and wings, a white rump, a black tail band, iridescent purple-green on the neck, upper mantle and chest, grey-black bill, white cere, red-pink legs and red eyes	A variety of “coo” calls are given, often associated with male courtship displays and at potential nest sites	 Photo 50: Image © Scott Brooks (ourspot) by Scott Brooks
51	**Barbary Dove** (***Streptopelia risoria***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The Barbary dove is the domesticated form of the African collared dove. he Barbary dove is a tame and confiding species, gregarious outside the breeding season, often associating with spotted doves, where present. ales also have a display flight, flying steeply upwards while clapping their wings, then gliding back to a perch with wings and tail stiffly spread. Clashes over territory can occur, with both birds using their wings alternately to beat each other.	▪ Length: 28 cm ▪ Weight: 140 g ▪ Similar species: Spotted dove A medium-sized creamy grey-brown dove with a black half-collar on the back of the neck bordered with white above. The bill is grey-black, eyes red and legs crimson	A soft, melodious, repeated two-note phrase, coo crrooo, with a brief pause between the two syllables; also has a hehhehhehheh challenge call, given when approaching another individual.	 Photo 51: Image © Les Feasey by Les Feasey
52	**Spotted Dove** (***Streptopelia chinensis***) ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	A native of south and south-east Asia, the spotted dove was introduced to New Zealand in the 1920s, when some were released from captivity in Mt Eden, Auckland. No doubt this population has been supplemented periodically by other releases and escapes from captivity. Spotted doves forage on the ground in grassland, cultivated areas and around homesteads, feeding on the seeds of grasses, cereals, small herbs and fallen seeds.	▪ Length: 32 cm ▪ Weight: 160 g ▪ Similar species: Barbary dove, Rock pigeon A medium-sized, long-tailed dove with a greyish head, pink-grey underparts, speckled greyish brown upperparts and a large white-spotted black half-collar around the back and sides of the neck. The legs are deep pink, and the iris red.	A deep, slightly lilting coo corrr cuk, the inflection of each syllable rising slightly then falling. This 3-second phrase is repeated over and again, for minutes at a time.	 Photo 52: Image © Sonja Ross by Sonja Ross)

	Species	General Information	Identification	Call	Photo
53	**Yellowhammer** **(Emberiza citronella)** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	The colourful yellowhammer is a common inhabitant of open country throughout much of New Zealand. Introduced from Britain by Acclimatisation Societies between 1865 and 1879, it has spread widely, including reaching many off-shore islands. Yellowhammers feed on a variety of seeds and invertebrates. They are frequently seen feeding on the seeds in hay fed to livestock, and also on newly-sown grass seed.	▪ Length: 16 - 16.5 cm ▪ Weight: 18 - 30 g ▪ Similar species: Cirl bunting, Yellowhead, New Zealand pipit, Eurasian skylark, Chaffinch A small relatively long-tailed songbird with a grey-black bill and pinkish legs in which the male has a mostly bright yellow head and underparts, and a dark-streaked borwn mantle, and the browner female has more streaking on the head and upper surface with some yellow on the underparts. Both sexes have a rich chestnut rump and white outer tail feathers, which show during flight.	The song of the male is distinctive and repetitive; often rendered as 'a little bit of bread and no cheese'. A pattern similar to that of the typing and subsequent pulling on the 'carriage lever' of a mechanical typewriter. The contact call of 'twick' or 'twitic' is given frequently by both sexes.	 Photo 53 Image © Sonja Ross by Sonja Ross
54	**Chaffinch** **(*Fringilla coelebs*)** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Chaffinches are the commonest and most widespread of New Zealand's introduced finches, and are found in a wide range of habitats. Chaffinches form flocks of varying size outside the breeding season, often with other species of finches and buntings, especially at a good food source e.g. weeds growing amongst crops.	▪ Length: 14.5 cm ▪ Weight: 17.5 - 24.5 g ▪ Similar species: House sparrow A small songbird species in which males are brightly coloured in spring-summer with a brick-red breast and chestnut mantle, greyish-blue crown and nape, black wings with a prominent white wing-bar and shoulder patch. Males are duller in winter while females are dull brownish-grey with similar wing markings year-round; both sexes have white outer tail-feathers that show during flight.	The call is a familiar 'chink chink', uttered by both sexes throughout the year. The male has a short rattling song, frequently repeated, during the breeding season.	 Photo 54: Image © Adam Clarke by Adam Clarke
55	**European Greenfinch** **(*Carduelis chloris*)** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Greenfinches are the largest and most stockily built of New Zealand's introduced finches. A heavy bill allows the bird to crack larger seeds than other species can manage. They were introduced from Britain by Acclimatisation Societies between 1862 and 1868, and are now common throughout much of the mainland. Greenfinches feed mostly on seeds, including those from a number of crops; therefore they are regarded as a pest in some districts. Large flocks are frequent outside the breeding season, often mixed with other species of finches.	▪ Length: 16 cm ▪ Weight: 28 g ▪ Similar species: Bellbird, Silvereye, House sparrow A small songbird species in which adult males are green with yellow on the abdomen, bright yellow bars on the leading edges of the wings, a pinkish conical bill and pink legs. Females are duller with little yellow on the wings while juveniles are similar to adult females but with streaking on the breast.	The male has a not unpleasant song during the breeding season, and also utters a loud dzweee call frequently during this time.	 Photo 55: Image © Dick Porter by Dick Porter
56	**European Goldfinch** **(*Carduelis carduelis*)** ▪ Conservation status: Introduced and Naturalised ▪ New Zealand status: Introduced	Goldfinches are small finches with flashes of bright yellow and red, common in open country throughout New Zealand. Introduced from Britain 1862-1883, their tinkling calls contribute to the collective noun "a charm of goldfinches". They are mainly seed-eaters, and often gather in flocks to feed on thistle seed.	▪ Length: 12 cm ▪ Weight: 15 g ▪ Similar species: European greenfinch A small songbird with bright yellow wingbars, black wings and tail, a buff-brown back, and pale legs and conical bill, in which adults have bright red, white and black facial feathering, and juveniles are drab brown on the head. Often seen in flocks.	Goldfinch has a shrill, clear pee-yu. Bouncy undulating flight accompanied by frequent liquid, tinkly calling.	 Photo 56: Image © Tony Whitehead by Tony Whitehead Tony Whiteheadwww.wildlight.co.nz