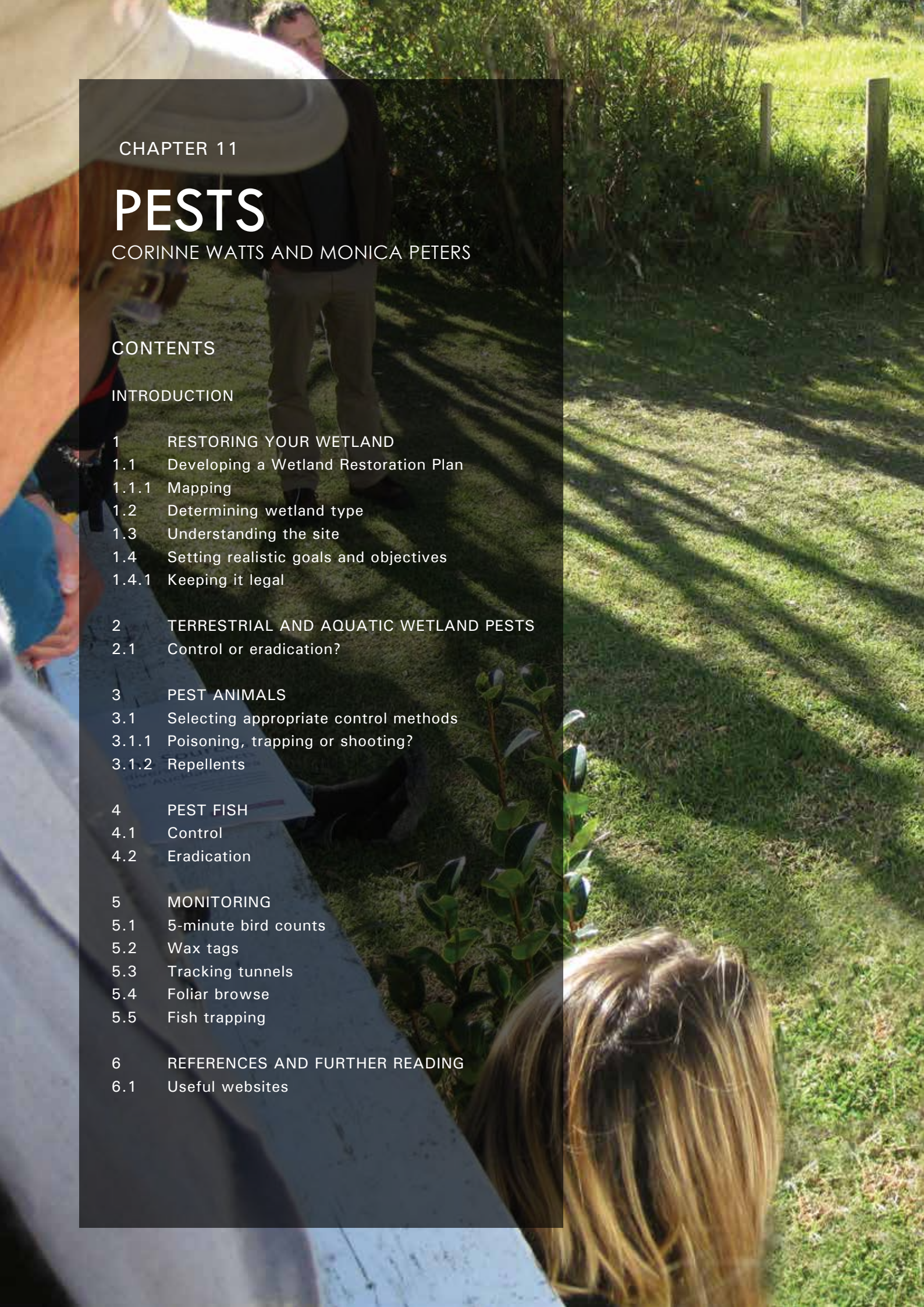


CHAPTER 11

PESTS

CORINNE WATTS AND MONICA PETERS

CONTENTS


PESTS

PESTS

CORINNE WATTS AND MONICA PETERS

Since the human colonization of New Zealand began, many new animals have arrived. Some species have been intentionally introduced – the Australian brushtail possum for the fur trade, and stoats to kill previously introduced rabbits that had begun to reach plague proportions. Others have arrived unintentionally, often as stowaways on boats. Irrespective of the method of arrival, the proliferation of non-native mammalian, invertebrate and aquatic fauna – many of them now regarded as serious pests – has forever changed the New Zealand landscape. Our unique native flora and fauna are now their source of food. This chapter introduces a range of wetland pests, both terrestrial and aquatic, and outlines a range of management and monitoring methods to enhance and protect native biodiversity.

To date, very little research has been carried out on the effects of pests on native wetland plants and animals, and controlling pests in wetlands. However, based on knowledge of pest species within forest and other ecosystems, we know that rodents, possums, hedgehogs, mustelids, and cats all eat invertebrates, birds' eggs, chicks and even adult birds. Introduced browsing animals, e.g., possums, goats, rabbits, hares and cattle eat native vegetation and will target recent plantings of nursery-grown plants as they provide rich sources of nutrients. In addition, rats will devour seeds that are so important for seedbanks. To a lesser extent, dogs may harass wetland birds. Trout, koi carp, catfish and mosquito fish, along with introduced insects, all place further pressure on native biodiversity.

Two case studies highlight comprehensive pest control programmes carried out by community groups. The first case study centres on a large wetland complex situated on the eastern shore of the Coromandel peninsula. The second case study outlines a pest control programme within a fully "predator proof" fenced reserve in rural Taranaki. An additional case study profiles a Department of Conservation project that aims to understand the behaviour, territorial dynamics, and feeding habits of predators in a wetland environment.

Previous page: Pest control workshop on Great Barrier Island sponsored by Auckland Regional Council.
Photo: Monica Peters, NZ Landcare Trust

The owners of this portion of Te Hapua swamp (Wellington) trap rodents, possums and mustelids, as well as protect new plantings from hare browsing. Photo: Monica Peters, NZ Landcare Trust

The widely used DOC 200 kill trap is designed to dispatch hedgehogs, stoats and rats humanely. Photo: Monica Peters, NZ Landcare Trust

1 Restoring your wetland

The theory and practice of pest control in and around wetlands is a rapidly evolving field. New products are being trialled, as are new techniques and monitoring methods. Maintaining regular contact with experts in the field is essential to keep up to date with new developments. Contacts may include contractors and suppliers as well as end users, including the Department of Conservation (DOC), councils, science providers (e.g., Landcare Research and universities), and established community groups undertaking pest control work.

1.1 Developing a Wetland Restoration Plan

A Wetland Restoration Plan or Action Plan is extremely useful for clarifying the goal setting, implementation and monitoring phases of the restoration project. Follow the steps laid out in Chapter 2 – Restoration planning or use one of the templates in the Useful websites section at the end of the chapter.

1.1.1 Mapping

A useful starting point for developing a Wetland Restoration Plan is a sketch map. A bird's-eye view sketch map is important as it helps summarise knowledge about the natural and man-made character of the restoration site. It is a practical tool to define, for example, management zones and locations of trapping lines, bait stations, etc. The map can be hand drawn using a range of resources such as aerial photos, topographic maps and Google Earth combined with your own knowledge.

The following features should be included:

- Vegetation types
- Water sources and outflows, hydrological modifications, water level
- Soil type
- Man-made, natural and cultural features

For more detail on what to include, see Chapter 2 – Restoration planning.

1.2 Determining wetland type

Determining the type of wetland you have is important as each type has specific nutrient and hydrological regimes that favour specific plant communities and therefore faunal communities. Further information can be found in Chapter 3 – Wetland types.

1.3 Understanding the site

Researching historical records and locating similar wetlands (outlined in Chapter 4 – Site interpretation 1) may yield important information on the types and population numbers of animals – both introduced and native. Knowledge of the species that were once likely to be present in the wetland will help guide restoration goals.

Talon rat bait with chew marks. Te Anau.
Photo: Crown Copyright, Department of Conservation

Hare damae on karamu. Hawke's Bay.
Photo: Crown Copyright, Department of Conservation

Fenn trap on the edge of a wetland. Battle Hill Farm Park, Wellington.
Photo: Monica Peters, NZ Landcare Trust

The Great Barrier Island Trust found a novel way to raise awareness of the damage rats do to native biota: a Christmas float dressed as a rodent!
Photo: Fenella Christian, Great Barrier Island Trust

1.4 Setting realistic goals and objectives

Before tackling animal pest control, begin with a goal – what needs protecting, e.g., native wetland vegetation, young plantings, and/or native wetland birds, such as fernbird and bittern. An important goal of any restoration project should be to control animal pests to enhance and restore native biodiversity to your wetland and in addition, protect any young plantings. The examples provided by the case studies demonstrate the importance of having clear goals to guide the control/ eradication activities. Objectives for a pest control programme may be to:

- control stoats, ferrets, ship rats, Norway rats, and feral cats year round to protect nesting waterfowl, their ducklings and other birds such as marsh crake, spotless crake, fernbird, and bittern
- control deer, goats, possums, hares, and rabbits to minimise damage to young plants in revegetated areas

Once the restoration goal and objectives have been established, activities for pest control/ eradication should focus on the following:

Initial knock-down methods

- Identify pests for initial control
- Identify methods to be used
- Establish timing of control

Maintenance control methods

- Identify control methods
- Identify timing for ongoing maintenance

Monitoring techniques

- Identify techniques for the target pest(s)
- Identify techniques for the biodiversity attribute (e.g., native plants, fernbirds) you are trying to help
- Baseline information on the site before starting pest control can be used to evaluate the success of your pest control

Costs for, e.g., equipment, training, poison, baits, and labour) should be included along with an overall cost. This information is also needed when applying for funding to carry out pest control activities.

Victor professional rat trap with wire mesh to prevent accidental damage to ground foraging native birds.
Photo: Bevan Brent. Crown Copyright, Department of Conservation

Signage for use in public places warning of potential threats to animal, pet and human health. Photo: Monica Peters, NZ Landcare Trust

1.4.1 Keeping it legal

Regional Councils each have their own Regional Pest Management Strategy (RPMS). The purpose of the strategy is to set out the strategic and statutory framework for the effective management of pest animals and pest plants/weeds. Under the RPMS, selected pest animals (and weeds) are either the responsibility of the regional council or the landowner. RPMS for different regions can be found on Regional Council websites. See Chapter 9 – Weeds, for a diagrammatic representation of how responsibility is designated for pest control.

When using toxins, always follow the instructions on the label. Compliance with these restrictions is required by law and is also likely to provide a greater chance of success and less impact on the environment (and those applying the toxin). You must have a Controlled Substance License to handle some toxins (e.g., cyanide, 1080) and consent from the Medical Officer of Health before they can be used. Some restrictions are placed on the use of certain leg-hold traps and also restrictions on where they can be used. Read the animal welfare guidelines and seek advice from your local Department of Conservation office, Regional or District Council.

TOP TIPS FOR HEALTH AND SAFETY IN THE FIELD

- Tell someone where you are going and when you expect to return!
- Always follow label instructions when using toxins – be extra careful around water
- To avoid picking up, e.g., campylobactor and leptospirosis (carried by rats and hedgehogs), you should:
  - wear disposable gloves for all handling of traps
  - use water-proof bandaids over cuts
  - sterilize your hands with alcohol-based anti-bacterial wipes or gels before eating
- Mind those sedges! – wear glasses to protect your eyes

– NZ Landcare Trust , Pest Control Guidelines

CASE STUDY

INSIDE THE FENCE: PEST ERADICATION AT THE ROTOKARE SCENIC RESERVE

The Great Wall! Photo: Rotokare Scenic Reserve Trust

The Rotokare Sanctuary Project is led by a community-based charitable trust, Rotokare Scenic Reserve Trust (est. 2004).
Photo: Monica Peters, NZ Landcare Trust

The 230-ha Rotokare Scenic Reserve lies east of Eltham on the edge of the Taranaki hill country. An 8.2-km predator-proof fence (completed in 2008) completely surrounds the forested catchment, which contains extensive wetlands and a lake. Significant native fauna include fernbird, spotless crake and banded kokopu. The fence and eradication programme have been supported by the South Taranaki District Council, TSB Community Trust, Taranaki Regional Council, Taranaki Electricity Trust, Lotteries Environment & Heritage, Significant Community-based Projects Fund, Biodiversity Condition Fund, WWF Heritage Protection Fund and many others, including by donations. Community and neighbour support and goodwill have been vital to this project. Rotokare will be a prime site for studying what happens when a large, natural wetland is free from pests.

Pest control: changing tack

The Rotokare Scenic Reserve Trust (www.rotokare.org.nz) quickly recognised that ongoing control of pest species, i.e. Norway and ship rats, mice, ferrets, stoats, weasels, hedgehogs, rabbits, hares, feral cats, possums, and goats, within the previously unfenced reserve was financially and operationally unsustainable. Breeding of surviving pests continued, as did reinvasion from outside the reserve. A new objective was established: create a pest-free sanctuary through construction of a pest-proof fence and eradication of all pests inside the fence.

Fixing fence surveillance equipment. Photo: Rotokare Scenic Reserve Trust

Meticulous planning

A successful eradication programme requires meticulous planning that involves setting realistic objectives and timeframes, having the financial and operational capacity to do the work, and ensuring the community is supportive. The Trust sought external help in planning, contracted a technical advisor/planner, and established a mulit-party advisory group. The Animal Pest Eradication Plan (Natural Logic Environmental Management 2007) adapted methods for controlling single or multi-species from successful Department of Conservation, community and private conservation programmes. The Plan included detailed information on:

- eradication best practice and lessons from other mainland multi-species eradication attempts
- aerial baiting specifications and eradication techniques to be used
- monitoring methods
- project management

Pest control methods

Goats were eradicated by hunting before completion of the fence. Pestoff 20R (a brodifacoum-based cereal bait) was used in an aerial baiting operation (2009) to eradicate rodents. Other pests were also likely to be affected: possums, rabbits, hares and hedgehogs would directly eat the bait, and mustelids, feral cats and hedgehogs would be susceptible to secondary poisoning. The Trust monitored fernbird numbers before, during and after the bait drops. Data to date suggest fernbirds were not affected at all.

Aerial baiting – the follow up

A ground-based "mop up" programme to remove any survivors began in November 2009. An intensive (50 m x 50 m grid) tracking tunnel and trapping system maximises the chances of detecting and removing survivors as quickly as possible. Once survivors have been detected, localised areas are either intensively hand-baited with brodifacoum and/or trapped, depending on the species detected. As of July 2009, it appears that possums, cats, mustelids, hedgehogs, rabbits and hares have been removed. Rats have not been detected in the tunnels. Two stoats, two rats and a small number of mice have been caught since the bait drops. As eradication work is ongoing, it is unlikely the area will be declared pest free until late 2010.

– Jo Ritchie and Jenny Steven, Rotokare Scenic Reserve Trust

2 Terrestrial and aquatic wetland pests

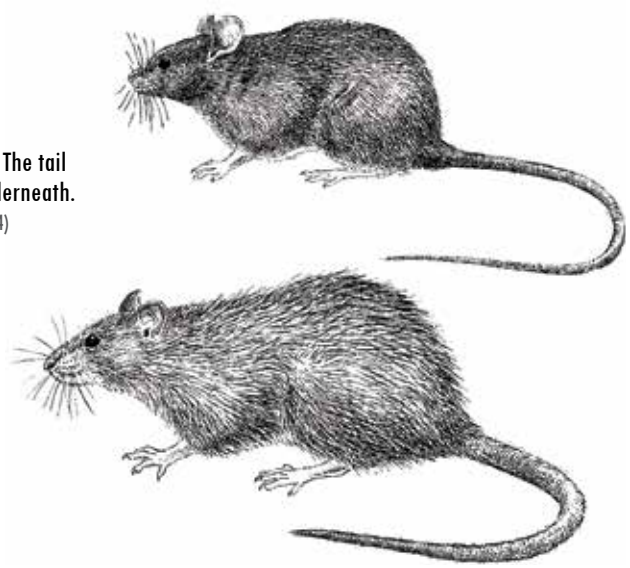
The following table outlines some of the pests that may be present in wetlands. Further detailed information can be found in fact sheets and publications listed in the References and further reading section at the end of the chapter.

Table 1. Wetland pests, their characteristics and threats to native biodiversity

Pests	Characteristics and threats to native biodiversity
Possums	• Alter forest composition by heavily browsing favoured food trees • Disrupt vital ecological processes such as flowering, fruiting, seed dispersal and germination • Compete with native wildlife for food, and are wildlife predators (eat eggs, chicks, and a wide range of invertebrates)
Mustelids ***(ferrets, stoats and weasels)***	• All good swimmers • Can breed rapidly in response to the availability of food – rats, rabbits and mice are staples, but also target birds, bird eggs, lizards and invertebrates • Difficult to trap – seek advice from an experienced mustelid trapper
Rodents ***(ship/black rat and Norway rat)***	• Ship rat (or black rat) is highly agile and able to climb trees • Norway rat is large, usually found near water and is an excellent swimmer • Both are rapid breeders – ship rats producing 3 litters per year with approximately 5 young, and Norway rats (in suitable environments) producing 3–6 litters per year of up to 10 young • Ship rats are key ecosystem changers, frequently predating small forest birds, seeds, invertebrates, and possibly lizards • Norway rats may be a greater threat to waterfowl
Hares	• Damage native flora through browsing
Rabbits	• Damage native flora through browsing • Rabbits are a major source of prey for ferrets and feral cats, but when rabbit numbers are low, native fauna are eaten as secondary prey
Mice	• Mice impacts on native plants and animals are poorly known, though it seems they can have serious impacts on insects, e.g., weevils, some lizards, and plant germination rates • Effective control for other pests, e.g., rodents, may lead to increases in mice numbers. Control methods for mice are not perfected and any attempts to control mice should be carefully designed and monitored
Cats ***(feral and domestic)***	• Predate insects, eels, koura, fish, lizards, birds, rabbits and rodents • Often present in far greater numbers than is obvious – they are highly alert and quick to hide • Have large overlapping home ranges (males roam up to 20 km, though females with kittens seldom move more than 500 m from their den)
Hedgehogs	• Primarily insectivores but will eat a wide variety of food including eggs of ground nesting birds
Dogs ***(domestic, hunting, working and wild)***	• Some dogs kill and eat wildlife • Can also disturb wildlife during breeding season

Insects ***(wasps, Argentine ants, etc.)***	• The common wasp, Asian and Australian paper wasps and German wasps prey on native invertebrates • Argentine ants colonies combine to reach large numbers and are highly aggressive toward native insects
Fish ***(koi carp, catfish, feral goldfish, Gambusia, rudd, perch, etc.)***	• Stir up sediments and reduce water clarity • Increase nutrient levels and algal concentrations • Contribute to erosion • Compete with native species by feeding on, and removing aquatic plants, preying on invertebrates, native fish and their eggs • Can be unintentionally introduced to waterbodies as eggs and juveniles by boats and fishing gear

Many people are unaware of the damage pest fish such as koi carp do to our waterways. Photo: Nelson Mail



The tail of the ship rat (top) is longer than the body and all dark. The tail of the Norway rat (bottom) is shorter than the body and pale underneath.
Image: The Handbook of British Mammals (Blackwell Scientific Publications 1964)

A quick clean kill of a ferret in a DOC trap.
Photo: Matthew Brady. Crown Copyright, Department of Conservation

A section of the 42-km pest-proof fence at the Maungatautari Ecological Island, Waikato. Photo: Monica Peters, NZ Landcare Trust

2.1 Control or eradication?

The aim of pest control is not to remove every single pest. Control operations manage the impacts of pest animals and fish by reducing their numbers and therefore reducing the impacts on native flora and fauna. By contrast, eradication operations permanently remove the impacts of pest animals and fish by eliminating the entire population. This may be feasible, if for example, pest numbers are initially low or the area is protected from reinvasion such as inside a pest-proof fence. Understanding the difference between control and eradication is important as this can affect public perception of why and how an operation is being undertaken.

Pest control and pest eradication require a long-term commitment, and both have advantages and disadvantages. For example, pest-proof fences to create a pest free ecosystem are initially expensive to set up and require ongoing maintenance and monitoring to assess potential pest animal re-invasion. Ongoing terrestrial pest control using poisons, trapping and/or shooting, or aquatic pest control using nets requires long-term funding and an obligation to keep pests at low levels if gains in native biodiversity are to be made. Links to further information on pest proof fences can be found at the end of the chapter. Section 4 provides more information on controlling and eradicating pest fish.

3 Pest animals

It is important to identify the pest species for control as this will help define the methods used (e.g., a combination of trapping, poisoning and shooting may be used for possum control), as well as the timing of control. However, in most cases, multiple species will need to be controlled. To optimise control solutions, consideration will need to be given to the:

- dynamic nature of interactions between suites of animal pests (carnivores, omnivores and herbivores)
- different impacts of pest species on different site values at different population densities
- different rates of pest species recovery following control

For example, reducing possum or stoat numbers may result in an increase in rat numbers. Reducing rat or mice numbers can result in increased predation by stoats on native birds. A suite of animals such as mice, rats, feral pigs, and deer may affect native plant regeneration, which will eventually alter ecosystem structure, with consequences for both native flora and fauna. Effectively managing a suite of pests (as the case studies in this chapter demonstrate) means a shift from a single-species focus to a site-based focus.

Hare's teeth (like a rabbit's) grow throughout their life, thus needing constant chewing to keep them from growing too long.
Photo: Crown Copyright, Department of Conservation

Conditions are so favourable for possums in New Zealand that they can breed twice a year. Photo: David Mudge, Nga Manu Images

Stoats are considered "public enemy number one" for New Zealand birds.
Photo: Crown Copyright, Department of Conservation

CASE STUDY

WAIKAWAU BAY WETLAND PEST CONTROL: LEARNING BY DOING

The restoration goal of the Moehau Environment Group (www.meg.org.nz) is to reduce mammal (particularly rodents and possums) densities to very low levels within the wetland to halt the decline of native wetland bird species, including fernbird, pateke, Australasian bittern, spotless crake and banded rail. Pest control methods are based on other DOC and MEG rat control projects on the Coromandel Peninsular. The group is "learning by doing" as very little information on predator control in NZ wetlands is available. The project began in June 2006 and involves 9 landowners and DOC.

Poisoning and trapping

(24 hrs per week, including track maintenance)

- 150 bait stations @ 50 m intervals around wetland perimeter and 2 parallel lines of stations 75 m apart within the wetland. Poisoning began September 2006 with Brodifacoum for the initial knock down and to target possums. After 6 weeks, pulses of Racumin were put out as needed. Stations filled every 3 months
- 250 rat traps @ 25 m intervals around the wetland perimeter, initially checked weekly, now fortnightly
- 10 mustelid traps in the vicinity of the wetland
- 6 cat traps c. 250 m apart around wetland perimeter and sand dunes. Checked Dec–mid-Feb as needed (dependent on sightings); additional 12 hours 4 times a year.

Traps

'Victor Professional' rat traps are used that have a plastic tread plate and are double sprung for rodents. These are placed inside boxes to protect them and stop by-catch of birds. DOC 200 traps are used for mustelids and these are mounted in tamper-proof boxes for safety.

Monitoring

(32 hours x 4 times per year)

- 25 tracking tunnels layout modified from DOC Small Mammal Index (SMI) protocols – 5 lines with 5 tunnels each through representative habitats. 2008: tracking tunnels monitored every 3 months
- Bird monitoring using 5-minute bird counts along 2 km x 2 km transects through all wetland habitats – 144 hrs twice a year
- 10 large pitfall traps installed to assess invertebrate increases over time. Monitored twice annually. A qualified entomologist carries out the invertebrate identification.
- 3.5 km of tracks for bait stations and traps cut and marked.

Results

- June 2006: 95% rodent tracking
- August 2006: 85% rodent tracking
- April 2008: 27% rats, 30% mice, 20% weta, 25% skink
- Pest catches 2007: 350 rats, 112 mice, 19 feral cats, 9 stoats, 6 weasels and 13 hedgehogs. Number poisoned unknown
- Bird observations: June and August 2006: spotless crake, c. 20 fernbirds, 2 bittern, several banded rail, 14 pateke. May 2008: 85 fern birds, 47 pateke
- New baiting regimes and toxins investigated and new trapping techniques trialled (especially in regularly inundated areas)
- Students from Bay of Plenty Polytech Environmental Management Studies Group help carry out bird monitoring and Global Volunteers Network carry out the 3-monthly Small Mammal Indexing.

– *Wayne Todd, Moehau Environment Group*

The 42 ha Waikawau Bay wetland on the remote north eastern tip of the Coromandel Peninsula comprises an almost unbroken sequence from saline to fresh water wetland types. Photo: Wayne Todd, Moehau Environment Group

Minimising disturbance to the wetland means keeping to established tracks for pest control and other activities such as monitoring.
Photo: Wayne Todd, Moehau Environment Group

3.1 Selecting appropriate control methods

When selecting appropriate methods for controlling pest species, a range of factors must be considered. These include:

- Project scale
- Available human and financial resources
- Species being protected
- Restoration site accessibility (e.g., high water levels, dense vegetation)
- Surrounding land accessibility (e.g., steep hills; gorse or hakea covered areas) if required for pest control/monitoring
- Restoration site and surrounding land tenure (e.g., Recreation Reserve, covenant, private land, DOC Wildlife Management Reserve)
- Public use of the restoration site and surrounding area
- Public understanding of, and attitudes toward, e.g., toxins

Once the pests you are going to target have been identified, the most appropriate initial control method may be different from the maintenance control methods. For example, it is important to lower possum densities before controlling rats when a first generation anticoagulant is being used. The next important step is to select the appropriate timing for your pest control. In some cases, year-round control may be chosen. In other cases, control may be confined to winter and spring when pest animals are limited by food supply and protection is important for spring nesting birds and plant growth. Web links to fact sheets on pest species, as well as control methods can be found at the end of the chapter.

3.1.1 Poisoning, trapping or shooting?

The use of poisons versus trapping or shooting has been widely debated. Controlling pests with any of these methods needs to be ongoing, and is therefore time-consuming and expensive. The advantages and disadvantages are outlined below. A number of websites (e.g., Department of Conservation and Regional/District Councils) provide practical advice and factsheets on using poisons and trapping – links to websites are included at the end of the chapter.

Poisons: advantages and disadvantages

- ✓ Long lasting
- ✓ Kill multiple numbers of the target pest before needing to be checked/ refilled
- ✓ No associated noise, bang or trigger
- ✓ Cost effective and can be associated with multi-species pest control (e.g., brodifacoum is toxic to both rats and possums)
- ✓ New poisons are being released that are more efficient, pose less risk to non-target organisms and are less toxic to terrestrial and aquatic ecosystems
- ✗ Some active ingredients have associated ecosystem effects such as bio-persistence and bio-accumulation in food webs (e.g., brodifacoum)
- ✗ Can affect non-target species though can be minimised with signage and warnings (e.g., cholecalciferol possum and rat poison is very toxic to dogs)
- ✗ If either too little, or the wrong poison is used, it won't last long and won't kill any target pests

Some poisons used to control possums are not effective and/or cannot legally be used for controlling rodents (e.g., cyanide), so knowledge about appropriate use of poisons when making your selection is important. It is also important to note that anticoagulants such as Pindone can be ecotoxic in aquatic environments. Doing your homework into the poisons classification is critical along with knowing the best poison to use and in which form to present it (e.g., pastes, gels, pellets or liquids).

Traps: advantages and disadvantages

- ✓ No non-target deaths resulting from secondary poisoning
- ✓ Effective in wetlands (though need to be attached to stakes in wet situations)
- ✓ Designed for the target species alone and must meet stringent ethical criteria
- ✓ Often regarded more favourably by the wider community than poisons
- ✗ Labour intensive to set, clear and bait
- ✗ When sprung or the pest captured the trap can kill no more until cleared and reset
- ✗ Some species, e.g., feral cats, can be 'trap shy'
- ✗ Can be faulty, jam or not fine-set enough, leading to trap shyness of target species
- ✗ Can kill non-target species, e.g., kiwi caught in possum traps

When trapping pest animals it is advisable to consider the welfare of the animals you are intending to trap as well as the effectiveness of the trap. Test results for traps are available on the Landcare Research website – see the Useful websites section at the end of the chapter.

Shooting: advantages and disadvantages

- ✓ Relatively low cost
- ✓ Able to be selective
- ✗ Can be difficult to follow-up if not killed outright
- ✗ Time consuming and diminishing returns
- ✗ Skilled shooters/markspeople required
- ✗ Possums and other pests can become light and gun shy

Every person shooting must either hold a firearm license, or be under the supervision of a person over 20 years old who holds a firearms license. Neighbouring properties should be informed of intentions to shoot.

3.1.2 Repellents

In some cases it may be worthwhile using repellents, for example, if poisoning is not feasible, if rabbit/hare populations are not very large or if plastic plant protectors are not available.

HOME-MADE RABBIT REPELLENT RECIPE

Repellents rely on grazing (vegetarian) animals disliking animal protein and are therefore based on blood and bone, egg or fish meal.

- 5 eggs (or equivalent in egg powder)
- 150 ml white acrylic paint
- 600 ml water

Mix it all up together and spray directly onto the plant. Repeat as required — after a long period of rain and when rabbits' food sources are getting low (autumn).

– *www.bioprotection.org.nz/system/files/Greening+Waipara+Newsletter+No+1.pdf*

Hare control using sturdy plastic frames that wrap around plant stakes. Te Hapua, Wellington. Photo: Monica Peters, NZ Landcare Trust

Two cats, three ferrets and a stoat (a single day's haul from the wetland), would likely put a dent in the native bird population.
Photo: Matthew Brady. Crown Copyright, Department of Conservation

The elusive Australasian bittern.
Photo: Crown Copyright, Department of Conservation

Whangamarino (Waikato) is an extensive mosaic of different wetland types and is administered by the Department of Conservation.
Photo: Kerry Bodmin. NIWA (with permission from DOC)

CASE STUDY

MAMMALIAN PREDATOR CONTROL IN THE WHANGAMARINO WETLAND

The Waikato's Whangamarino wetland was designated a site of international significance (Ramsar site) in 1989, predominantly for its bird life. Along with significant populations of waterfowl, and specialist wetland birds like fernbird (*Bowdleria punctata*), marsh crake (*Porzana pusilla affinis*) and spotless crake (*Porzana tabuensis plumbea*), Whangamarino has one of the largest populations of endangered Australasian bittern (*Botaurus poiciloptilus*) in New Zealand.

The wetland is part of Department of Conservation's Arawai Kākāriki Wetland Restoration Programme, and predator control is important for safeguarding and increasing the native bird populations. However, to do this efficiently and effectively it is necessary to understand the behaviour, territorial dynamics, and feeding habits of predators in a wetland environment, a field about which there is a decided lack of knowledge.

How many predators are there?

Monitoring of the distribution and abundance of mammalian predators in the Whangamarino wetland has proved troublesome. Many traditional methods are ineffective due to variable water levels and areas of very dense grasses, sedges and rushes (e.g., wire rush *Empodisma minus*). Initial monitoring in 2008 concentrated on cats and mustelids (ferrets, stoats and weasels). Approximately 70 traps were set up across swamp, fen and bog habitats, using varied types of bait. Traps were checked regularly, catch numbers recorded, and all mustelids and cats collected for gut analysis. Over a year 10 cats, 71 ferrets, 23 stoats and 37 weasels were caught. Further research is planned to begin in January 2010 and will focus on recapture techniques, to increase our understanding of movement patterns and predator abundance.

Status of native wetland birds

We also require an understanding of the habits and habitats of native wetland birds. DOC has recorded the distribution and abundance of bittern in Whangamarino in 2004, 2006 and 2008. Relative abundance of bittern was measured by recording the 'booming' of male bittern at selected sites. Preliminary analysis suggests bittern abundance was lower in 2008, possibly because high water levels reduce the availability of suitable foraging and breeding habitat. Further testing of cryptic bird survey methods at Whangamarino is planned for Sept–Nov 2009.

Management implications

Early observations suggest mammalian predators do not frequently move into the centre of the Whangamarino peat bogs, keeping to high ground and around wetland fringes. This means predator control may be most effective by targeting peripheral areas. However, critical knowledge gaps remain on the population dynamics of cats, stoats, ferrets and other predator species, and ultimately, on the extent of damage to our native wetland birds.

– *Matthew Brady & Hugh Robertson, Department of Conservation*

www.doc.govt.nz/documents/conservation/land-and-freshwater/wetlands/ak-whangamarino-factsheet-web.pdf

4 Pest fish

There are over 35 species of native freshwater fish in New Zealand and also 22 species of introduced fish, some of which have a devastating effect on native biodiversity and waterways. Pest fish are already well established in many regions. In the Waikato, for example, koi carp make up 80% of the total fish biomass in lakes and rivers. To help stop the spread of koi carp, a containment area between Auckland and Hamilton was created. Although recreational fishing is permitted in the containment area, all koi carp must be killed when caught.

Pest fish present a considerable management challenge as once established they are able to spread rapidly through whole catchments and are very difficult and expensive to remove. Pest fish eggs, juveniles and water weeds can be unintentionally introduced to water bodies by boats and fishing gear. In some cases pest fish such as koi carp may be deliberately introduced by sports fishermen. Preventing both the colonisation of new water bodies and recolonisation of cleared water bodies may therefore depend on strong awareness-raising campaigns. Preventing pest fish incursions is the preferred option but physical interventions to preclude colonisation of pest fish free water bodies can be problematic. Placing barriers along waterways will prevent the passage of some native fish species, hence the challenge of designing structures that will allow the movement of some fish species but not others.

4.1 Control

Pest fish breed rapidly, so any control programme must have specific outcomes in mind and long-term – possibly indefinite – commitment. The standard approach used by DOC is trapping and netting, which can simultaneously be used as a monitoring tool. Special permits are normally required from the Ministry of Fisheries to use nets and traps used in pest fish control. However, as with terrestrial pest control, new techniques are evolving such as electrofishing using a specially constructed boat to deliver an electric charge. This technique is currently being used both to collect baseline data on both native and pest fish as well as to remove pest fish from water bodies.

A novel control method is the “Koi Carp Classic”. This is an annual weekend-long recreational event run by the NZ Bow Hunters Society and sponsored by a range of organizations, including DOC. The results are impressive, – in 2008, 1770 koi weighing 4269.5 kg were harvested from Lake Whangape (1450 ha). As different waterbodies in the Waikato are targeted each year, the event helps raise awareness of pest fish numbers in the region. Additionally, fish caught over the 2 days are weighed and measured and data provided to researchers to help understand population dynamics and find ways of stopping their spread in New Zealand.

4.2 Eradication

The eradication of pest fish is only possible in small lakes and ponds <5 ha in area. Where possible, draining the water body is a most effective technique. Other options include electrofishing and poisoning using cube-root powder, which has the same active ingredient as derris dust. However, as all fish and invertebrates are killed, currently only DOC is allowed to use this method.

The ability of Gambusia/mosquito fish to control mosquitoes has been exaggerated. They are highly aggressive, attacking fish much larger than themselves. Photo: Nelson Mail

University of Waikato researchers electrofishing in Whangamarino. Photo: Wayne Barrar

Sign to help raise awareness and stop the spread of pest fish. Lake Janet, Canterbury.
Photo: Ferne McKenzie. Crown Copyright, Department of Conservation

5 Monitoring

It is important to monitor not only pest animal densities, but also the resource you are trying to protect as this shows whether your pest control has been successful. Recording a range of information will help you build up a database, which may identify likely invasion routes and areas of preferred habitat, both of which will help planning and refining pest control operations.

Due to the difficulty in measuring absolute abundance, relative density measures are used instead. Determining absolute abundance would mean the study area would need to be fully checked, with all individual pests measured and counted and no other individuals or populations entering the study area. By comparison, relative density measures (using, e.g., bird counts, wax blocks, and tracking tunnels) are cheaper and less time consuming to measure, don't require all individuals in a population to be accounted for, and, in many situations, can provide similar information to direct counting methods.

This section summarises several widely used methods primarily to determine native/exotic bird abundances, as well possum, rodent and hedgehog abundance, and presence/absence. In some cases, the methods to monitor native and introduced species are the same (e.g., using 5-minute bird counts) and are therefore repeated in both chapters. For more methods to monitor native plants and native fauna, refer to Chapter 10 – Revegetation and Chapter 12 – Native fauna. Chapter 13 – Monitoring provides a method for determining overall wetland condition.

5.1 5-minute bird counts

In a 5-minute bird count the observer records the number and species of all birds seen and heard. Each bird is counted only once. As with other index counts, it is important to remember that a 5-minute bird count does NOT result in an accurate count of all birds present. The numbers recorded are used to indicate the number of birds present, though many factors need to be taken into account including observer skill levels and hearing ability, bird habitat preferences, and bird visibility.

Bird counting stations can be set up throughout the wetland. These should be at least 200 m apart to avoid duplication of bird calls from one station to another. Small wetlands therefore may only have one station. In larger wetlands, stations should be distributed so that they cover all vegetation types. In the original method (Dawson & Bull 1975) 200 m was specified as the cut-off distance for recording birds. Although many current studies don't stipulate an actual cut-off distance, recording birds that are obviously very far away (e.g., on the other side of the valley) is not recommended. The number and species of all birds seen and heard should be documented, along with the station location, name of person doing the bird count, date, start time, temperature, wind, other noises, sun, and precipitation. The DOC website listed at the end of the chapter details the method more fully and includes field sheets and digital data entry sheet.

Additionally, keep an annual list of bird sightings and observations throughout the year. Information on specific monitoring of bird populations, e.g., threatened species, can also be accessed via the DOC website.

5.2 Wax tags

Wax tags area used by possum control contractors, DOC, regional and city council staff, and scientists to detect and monitor possums. The tags are nailed c. 30 cm above the ground to a tree or post and marked either with a luminescent strip, or a piece of flagging tape nearby. The location and number of each tag is documented. Depending on the sampling design, the wax blocks are retrieved after 3 or 7 days for analysis. The Bite Mark Index (BMI) is a series of calculations used to determine relative possum abundance. The BMI (reported as a percentage) is the mean proportion of wax blocks bitten by possums over a 3- or 7-night period for a sample of lines.

Peanut-butter flavoured wax tags are available for rodent detection and mapping. These are widely used for rodent incursion, detection and monitoring, in particularly on mainland and offshore island sanctuaries. The wax tags can be left out as surveillance devices for months at a time. Links to protocols for using wax tags can be found at the end of the chapter.

As sampling needs be unbiased, seek expert advice on how to lay out the wax tags – in other words, all potential possum habitats have to have an equal chance of being sampled. Systematic sampling creates an effective spatial sampling pattern over the landscape.

5.3 Tracking tunnels

Tracking tunnels are used widely to gain an index of the density of introduced small mammals (e.g., possums, mustelids, rodents, and hedgehogs) and to determine whether wetland predator control has been successful. In recent years, use of such tunnels has largely replaced the use of kill-trapping as the main rodent density index. Tracking tunnels rely on ink-pads and paper to record the tracks of target species (e.g., rats). Their abundance is calculated by extrapolation. Inked papers are laid out within a plastic tunnel and baited with a small amount of peanut butter or rabbit meat. Tunnels are pegged to the ground using wire. Footprint guides are available – see the Useful website section for links.

Tracking tunnels prints showing ship rat (top) and hedgehog. Solid blocks of colour are the ink pads. Image: Corinne Watts, Landcare Research

Relative possum abundance can be calculated using wax tags and the Bite Mark Index (BMI).
Photo: Monica Peters, NZ Landcare Trust

5.4 Foliar browse

The foliar browse index (FBI) method (Payton et al. 1999) measures the impacts of possum browsing on natural area "health" by monitoring trends in canopy and sub-canopy tree condition. A range of factors are subjectively measured including:

- canopy cover
- canopy dieback and recovery
- possum browse
- stem use by possum
- fruiting and flowering levels of individual trees of palatable species

Note that this method does not provide answers to longer term questions such as recruitment rates of palatable species.

Possums mark their territory by leaving chew marks on trees – pidgeonwood being one of their favourite for marking. This tree would score a 3 on the FBI possum sign scoring. Photo: Astrid Dijkgraaf. Crown Copyright, Department of Conservation

Take care not to misidentify the browser. Damage to this five finger was most likely caused by insects, not possums. Waihi beach, Waikato.
Photo: Monica Peters, NZ Landcare Trust

5.5 Fish trapping

A basic monitoring method is to use traps or fyke nets. However, it is worth noting that each type of sampling gear has a bias toward different fish species so it pays to use a range of methods to get a full picture of the fish community. The traps and nets are easy to use and if set properly are unlikely to kill fish – an important consideration as native species may also be caught. Set traps/nets in a secure place overnight, for example under overhanging stream banks or vegetation.

Mark the spot with flagging tape so that the traps can easily be found the next morning. Leave an air gap at the top of the traps and nets because water in wetlands can become de-oxygenated overnight. Care should also be taken to avoid setting gear during floods when water levels can drop and expose fish. If pest fish are caught, contact DOC as this information could help the Department and other interested parties keep track of the spread of these species.

Fyke net set up underwater for freshwater fish surveying. Canterbury. Photo: Sjaan Charteris. Crown Copyright, Department of Conservation

6 References and further reading

Blackwell, G.L., Potter, M.A. and McLennan, J.A. 2002. *Rodent density indices from tracking tunnels, snap-traps and Fenn traps: do they tell the same story?* New Zealand Journal of Ecology 26(1)

Dawson, D.G. and Bull, P.C. 1975. *Counting birds in New Zealand forests.* Notornis 22: 101-109.

Gillies, C.A. and Williams, D. 2007. *Using tracking tunnels to monitor rodents and mustelids.* V2.5.1. Department of Conservation Intranet, Department of Conservation, Research, Development & Improvement Division. Hamilton, New Zealand.

King, C.M. ed. 2005. *The Handbook of New Zealand Mammals*. 2nd ed. Oxford University Press. Melbourne, Australia

Payton, I.J., Pekelharing, C.J. and Frampton, C.M. 1999. Foliar Browse Index: *A Method for Monitoring Possum* (Trichosurus vulpecula) *Damage to Plant Species and Forest Communities.* Manaaki Whenua Landcare Research NZ Ltd, Christchurch, New Zealand.

6.1 Useful websites

Wetland restoration templates

Waikato Regional Council Wetland Restoration Plan templates

www.waikatoregion.govt.nz/PageFiles/5799/Wetlandtemplate1.pdf

www.waikatoregion.govt.nz/PageFiles/5799/Wetlandtemplate2.pdf

Wetland restoration guides and factsheets (New Zealand)

Northland Regional Council

www.nrc.govt.nz/upload/2217/Wetland%20Restoration%20Guide%20(second%20edition%20Feb%2009).pdf

Auckland Regional Council

www.arc.govt.nz/albany/fms/main/Documents/Environment/Plants%20and%20animals/wetlandsfacts2.pdf

Waikato Regional Council

www.waikatoregion.govt.nz/Environment/Natural-resources/Water/Freshwater-wetlands/

Hamilton City Council

www.gullyguide.co.nz/index.asp?pageID=2145821537

Bay of Plenty Wetlands Forum

www.doc.govt.nz/upload/documents/conservation/land-and-freshwater/wetlands/wetland-restoration-guide.pdf

Greater Wellington

www.gw.govt.nz/a-beginner-s-guide-to-wetland-restoration/

Department of Conservation Protecting Natural Areas Design Guide

www.doc.govt.nz/publications/getting-involved/volunteer-join-or-start-a-project/start-or-fund-a-project-/nature-heritage-fund/protecting-natural-areas-design-guide/

Wetland restoration guides (International)

USA Environmental Protection Agency

www.epa.gov/owow/wetlands/pdf/restdocfinal.pdf

Pest animals

Control methods, fact sheets and literature references

www.doc.govt.nz/conservation/threats-and-impacts/animal-pests/

www.landcare.org.nz/files/file/80/pest-control-guidelines.pdf

www.npca.org.nz/index.php/landowner-information

Pesticides

Facts about 1080 and the use of 1080 for pest control

www.doc.govt.nz/documents/conservation/threats-and-impacts/animal-pests/use-of-1080-04.pdf

Traps and predator proof fences

Independent test results for traps

www.landcareresearch.co.nz/science/plants-animals-fungi/animals/vertebrate-pests/traps

Predator proof fences, pests and pest control

www.sanctuariesnz.org

Restrictions on using leg-hold traps

www.legislation.govt.nz/regulation/public/2007/0353/latest/whole.html

Monitoring

5 minute bird count methods, field sheets and digital data entry sheet

www.doc.govt.nz/conservation/native-animals/birds/five-minute-bird-counts/

www.wildaboutnz.co.nz/index.php?option=com_content&view=article&id=54:5minbird&catid=52:landmethods&Itemid=74

Footprint Identification Guide for tracking tunnels

www.rimutakatrust.org.nz/downloads/download.htm

www.gotchatraps.co.nz/html/photo_gallery.html

Protocols for using wax tags

www.pestcontrolresearch.co.nz/docs-monitoring/waxtagprotocol.pdf

Bird counts, setting up photopoints, pest animal transects

www.formak.co.nz

Foliar browse index

nvs.landcareresearch.co.nz/html/FOLIAR_BROWSE_INDEX.pdf

Freshwater Fish

www.wildaboutnz.co.nz/index.php?option=com_content&view=article&id=53:fish-surveying&catid=51:watermethods&Itemid=75

Lizards and frogs

www.wildaboutnz.co.nz/index.php?option=com_content&view=article&id=90:tracking&catid=52:landmethods&Itemid=74

www.gotchatraps.co.nz/html/photo_gallery.html

Invertebrates (terrestrial and aquatic)

www.wildaboutnz.co.nz/index.php?option=com_content&view=article&id=55:inverts&catid=52:landmethods&Itemid=74

Note that many of the resources above are available as hard copy from the respective organisations. There is also a CD containing all above hyperlinks at the back of this Handbook. If you are using the online version of the Handbook and having problems with the hyperlinks above, try copying and pasting the web address into your browser search bar.