Kiwi (*Apteryx* spp.) recovery plan

2008–2018

THREATENED SPECIES RECOVERY PLAN 60

Department of Conservation
Te Papa Atawhai

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Sebastian (Avi) Holzapfel, Hugh A. Robertson, John A. McLennan, Wendy Sporle, Kevin Hackwell and Michelle Impey

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Cover: Little spotted kiwi (*Apteryx owenii*) male and chick, Kapiti Island, 2002.
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Foreword

The General Manager (Research and Development Group) of the Department of Conservation (DOC) formally approved this threatened species recovery plan in September 2008. A review of the plan is due after 5 years in 2013, or sooner if new information or technology leads to a significant change in management direction. This plan will remain operative until a new plan has been prepared and approved, or will become redundant if recovery is achieved and management effort enters a 'maintenance phase'.

The Kiwi Recovery Group prepared this plan in conjunction with people interested in or affected by this plan, or with an expert knowledge of the species. Drafts have been sent to relevant conservancies for comment and to people or organisations with an interest in conservation management of kiwi (*Apteryx* spp.). Changes to the plan were made as a result of that consultation.

The Recovery Group will review progress in implementation of this plan and will recommend to managers any changes that may be required in management.

The recovery planning process provides opportunities for further consultation between DOC, tangata whenua and others regarding management of this species. Comments and suggestions regarding conservation of kiwi are welcome and should be directed to the Kiwi Recovery Group via any DOC office or to the Manager, Ecosystem and Species Unit (Research and Development Group, Department of Conservation, PO Box 10420, The Terrace, Wellington 6143). Those interested in being more involved in management of kiwi or in receiving information should also contact the Recovery Group.

The Recovery Group consists of people with knowledge of the ecology and management needs of the species. The role of the Recovery Group is to provide high-quality technical advice that achieves security and recovery of the species.

Threatened species recovery plans are statements of the Department's intentions for the conservation of a particular species of plant or animal, or group of species for a defined period.

Recovery plans:

- Are proactive and operational in nature, focussing on specific key issues, providing direction, and identifying recovery actions for managers and technical workers.
- Set objectives to secure from extinction and recover the species, and outline measurable actions needed to achieve those objectives.
- Are primarily used by DOC staff to guide their annual work programmes; however, they also provide a forum for planned initiatives with tangata whenua, community interest groups, landowners, researchers and members of the public.
- Stimulate the development of best-practice techniques and documents, which can be transferable across similar species recovery programmes.

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A B S T R A C T

Kiwi (*Apteryx* spp.) populations have been in decline since the arrival of humans to New Zealand more than 700 years ago, resulting in all species currently being at risk, and some even precariously close to extinction. This is the third national recovery plan for kiwi and has a term of 10 years (2008–2018). It covers all five formally described species, as well as six distinct provenances within two species. This recovery plan provides a brief overview of kiwi species, their status and population trends, and agents of decline and current threats to them. It outlines the strategic framework underlying kiwi recovery, and the cultural importance, public awareness and community involvement in kiwi recovery. The long-term goal for kiwi recovery has remained largely unchanged from the previous two plans: 'To restore and, wherever possible, enhance the abundance, distribution and genetic diversity of all kiwi taxa'. The plan has nine plan-period goals, covering management, community relations and engagement, and research. The implementation section sets out 55 issues, 41 objectives and 92 prioritised actions. A timeline for all actions, their link to the plan-period goals, and their relevance to each of the species and distinct provenances are provided in appendices, as is a summary of achievements towards the goals and objectives of the previous recovery plan (1996–2006). This plan will be reviewed mid-term after 5 years, in 2013.

Keywords: *Apteryx*, kiwi, threatened species recovery, kiwi sanctuaries, predation, taxon plans, BNZ Save the Kiwi Trust, community engagement, BNZ Operation Nest Egg

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1. Introduction

Kiwi (*Apteryx* spp.) are among the most distinctive, recognised and cherished animals in New Zealand. Endemic to New Zealand, they are the unofficial national emblem and a taonga (treasure) species of strong significance for Maori. Yet despite kiwi being New Zealand's best recognised bird species, knowledge about their life in the wild is still incomplete.

The decline in abundance and distribution of kiwi went largely unnoticed until less than two decades ago (e.g. Reid & Williams 1975; Mclennan & Potter 1992). Populations have declined since the arrival of humans more than 700 years ago, resulting in all species currently being at risk, and some even precariously close to extinction. Today, few New Zealanders ever see a kiwi in the wild.

This is the third national recovery plan for kiwi and, like its predecessors (Butler & McLennan 1991; Robertson 2003), it covers all five formally described species, as well as generally recognised, but not yet formally described, variations within these.

Since the publication of the first plan in 1991, the landscape for kiwi recovery has changed significantly. Critical information on the main agents of decline and population trends is now available for several species (McLennan et al. 1996), and the relevance of these findings has been considered and tested for the remaining species. Tools to mitigate or eliminate the threats to kiwi populations have been developed, implemented and refined (e.g. Colbourne et al. 2005). The main focus for kiwi recovery shifted from research in the first plan (Butler & McLennan 1991) to raising awareness of the species' status and involving the public in their conservation in the second plan (Robertson 2003). This third plan builds on the achievements of its predecessors.

Today, about 70 community groups actively protect kiwi over a combined area of 50 000 ha, which is a similar area to the 70 000 ha protected through the Department of Conservation's (DOC's) efforts. Funding for kiwi protection has increased significantly, both through public and private funds and corporate sponsorship through the BNZ Save the Kiwi Trust.

Yet, even with these extraordinary achievements, the fight for kiwi is far from won. The three most abundant species are either confirmed (brown kiwi *Apteryx mantelli*) or assumed (great spotted kiwi *A. haastii* and the Fiordland and Stewart Island populations of tokoeka *A. australis*) to be still in decline overall, even though the decline has been halted or even reversed in managed populations (Robertson 2003). Although the declines of the critically endangered rowi (*A. rowi*) and Haast tokoeka have been arrested, the birds are still at such precariously low numbers that they remain vulnerable to catastrophic events, disease or population processes such as skewed sex ratios and inbreeding depression. Little spotted kiwi (*A. owenii*) have been extinct on the mainland for decades but are now increasing in numbers on offshore islands and at one mainland sanctuary (Colbourne & Robertson 1997; Colbourne 2005).

The focus for this plan has shifted towards increasing our management efforts by using the knowledge and tools we have developed over a greater area to halt the overall decline of species, while still refining further management prescriptions for those species for which existing methods are not yet fully effective.

Such an increase in effort can not be undertaken by DOC alone. Community groups and funds from outside DOC, which are already an integral part of kiwi recovery, will need to play an even stronger role to reach the challenging goals of this plan.

Within the highly competitive pool of conservation funds, such an increase might be seen as a luxury, given the large number of other threatened species that currently receive little or no funds. Consequently, for protection of kiwi to be truly sustainable, it needs to take the health of the ecosystem into account rather than simply focussing on the species in isolation. In this way, kiwi will function as umbrella and indicator species, with their management benefiting many other species, and successes reflecting the increasing health of the entire ecosystem. Conversely, kiwi will also benefit from management undertaken for general ecosystem health improvement, such as landscape-scale animal pest control or carbon-credit restoration projects. The recognition and utilisation of such synergies is likely to significantly advance kiwi recovery, as well as protect the environment they live in.

Despite the scale of the issues, there are many positive signs that we can be successful: there is strong public awareness and engagement in the plight of the kiwi; advances have been made through critical research findings guiding recovery planning; and population trends are generally positive where effective conservation management is applied.

This plan aims to provide a platform for the recovery of kiwi over the next 10 years, its ambitious goals setting out a challenge that needs to be met with joint effort. It will not be the last plan, but it will take us a step closer to reinstate kiwi as an important, flourishing part of our natural heritage.

2. Plan term and review date

Term of the plan: 10 years, from 2008 to 2018.

Review dates: 2013 and 2018.

3. Context

3.1 OVERVIEW OF SPECIES

3.1.1 Taxonomy

Kiwi (*Apteryx* spp.) belong to a distinct family of birds, the Apterygidae, which is either placed in its own order, Apterygiformes (e.g. Turbott 1990), or grouped with other ratites in the Struthioniformes. The family is endemic to New Zealand, and is known to have existed at least 65 million years ago (Cooper et al. 2001; Haddrath & Baker 2001). The closest relatives to kiwi today are emus and cassowaries in Australia (Cooper et al. 1992).

Currently, there are five formally described species of kiwi (Burbidge et al. 2003): brown kiwi *Apteryx mantelli* in the North Island; rowi *A. rowi* at Okarito; tokoeka *A. australis* in Fiordland, Haast Range and on Stewart Island/Rakiura and Kapiti Island; great spotted kiwi/roroa/roa *A. haastii* in the northern South Island; and little spotted kiwi *A. owenii* on several offshore islands and at Karori Wildlife Sanctuary in Wellington.

Within both brown kiwi and tokoeka, four geographically and genetically distinct forms can be distinguished: Northland, Coromandel, western and eastern brown kiwi; and Haast, northern Fiordland, southern Fiordland and Stewart Island tokoeka (Baker et al. 1995; Burbidge et al. 2003; Shepherd & Lambert 2008). The other species show no such clear genetic variation along geographic lines (e.g. Herbert & Daugherty 2002), although a distinct North Island form of little spotted kiwi existed prior to its extinction in the late 1800s (Shepherd 2005).

Just how many species or subspecies of kiwi should be formally recognised has not yet been determined, but using a precautionary principle, the 11 units noted above will be managed separately. As these are a mix of fully described species and distinct forms within species, the general term taxon (plural: taxa) is used throughout this plan where the level of formal description (as species or not) is not specified.

3.1.2 Species ecology and biology

The following information has been taken from Heather & Robertson (2005) and Reid & Williams (1975), unless otherwise indicated.

Kiwi are flightless birds, having only vestigial wings and no external tail. They are largely nocturnal and make loud, far-carrying repeated shrill (male) or guttural (female) calls, mainly in the 2 hours after dark and again before dawn. Daytime dens and nests are made in burrows, hollow logs or under dense vegetation.

Unlike most birds, kiwi have an exceptional sense of smell, with nostrils uniquely placed near the tip of their long (65–155 mm) bill. The bill is used for probing for food, not defence, and has specialised vibration/pressure-sensing nerve endings at its tip to detect prey movement (Cunningham et al. 2007). Kiwi diet consists mainly of soil and litter invertebrates, and fruit. The birds are strong runners and are capable of swimming rivers. Kiwi have a lower body temperature than most birds (37–38°C).

Adult kiwi are monogamous, forming persistent pair bonds, although occasional divorces do occur; birds will re-pair following the loss of their mate. A clutch consists of 1–2 very large eggs, and re-nesting in a season is possible. The incubation period is long (70–85 days), with incubation either carried out by the male alone or shared between the male and female, sometimes with older siblings as helpers, depending upon the species.

Chicks hatch fully feathered and are relatively mature and mobile from the moment of hatching (semi-precocial), first emerging from the nest to feed at c. 5 days old. Chicks are never fed by their parents. In some species, chicks become independent at 2–6 weeks old, but in others they remain with their parents in a family group for up to 7 years.

Dispersal of juveniles is often local, although individual birds have been tracked moving up to 30 km from their natal site (Basse & McLennan 2003). Juveniles grow slowly, taking 3–5 years to reach adult size (McLennan et al. 2004), by which time they weigh between 1000 g and 4000 g (depending on species).

Adults are strongly territorial, with territories ranging from 2–3 ha to 100 ha, depending on species, habitat and population density. In the absence of predation, kiwi life expectancy is between 25 and 50 years, depending on species.

3.1.3 Status and species recovery phases

All kiwi taxa are threatened, but to varying degrees (Table 1).

In a generalised species recovery planning model (DOC 2008), the focus for recovery work progresses through several phases: from research to security to recovery and finally to maintenance of the species. Kiwi recovery planning covers all phases of this model except maintenance, although exact phases differ for different species:

- Recovery of great spotted kiwi, and to some extent also Fiordland and Stewart Island tokoeka, is in the research phase, as some important information about population status and trends, and possible agents of decline is not yet available.
- Rowi and Haast tokoeka are still so vulnerable due to their small population size and limited number of populations that focus for their recovery is on securing the species from extinction, despite their slowly increasing numbers.
- Brown kiwi and little spotted kiwi can be considered in a recovery phase.

TABLE 1. THREAT CLASSIFICATION OF KIWI ACCORDING TO HITCHMOUGH ET AL. (2007).

TAXON	CLASSIFICATION	QUALIFIERS*
Brown kiwi (4 taxa)	Serious Decline	HI, RF, CD
Rowi	Nationally Critical	CD, RF, OL
Tokoeka		
Haast	Nationally Critical	RF, OL, CD
Northern Fiordland	Gradual Decline	HI, RF, DP
Southern Fiordland	Gradual Decline	HI, RF, DP
Stewart Island	Gradual Decline	HI, RF, DP
Great spotted kiwi	Gradual Decline	RF
Little spotted kiwi	Range Restricted	RC, HI

* Qualifiers are associated with each threat ranking, outlining the specific reasons for a particular ranking. CD: Conservation Dependent; DP: Data Poor; HI: Human Induced; OL: One Location; RC: Recovering; RF: Recruitment Failure.

3.1.4 Past and present distribution

Archaeological and historical records and genetic data (DNA) show that most, and possibly even all, species of kiwi were once more widespread than they are today[1]:

- Brown kiwi: Former distribution extended into southern Northland, Mt Pirongia (Waikato) and Mt Hikurangi (East Cape) (Butler & McLennan 1991). This species has been largely extinct in these areas since the 1970s.
- Rowi: Prehistorically present in the northern South Island and southern North Island as far north as Hawke's Bay (Shepherd & Lambert 2008). They have been confined to their current range at Okarito since the late 1800s.
- Tokoeka: Prehistorically extended east to the Otago coast and northeast to North Canterbury (Shepherd & Lambert 2008). Within the past 50 years, tokoeka have disappeared from parts of eastern Fiordland and north of the Te Anau-Milford Sound Road, including the Caples and Greenstone Valleys.
- Great spotted kiwi: Historically more widespread in lowland areas; early records of populations south of Greymouth–Hokitika were, however, probably of little spotted kiwi and hybrids between rowi and little spotted kiwi (R. Colbourne, DOC, unpubl. data).
- Little spotted kiwi: A distinct form occurred throughout the North Island, but this became extinct in the late 1800s (Heather & Robertson 2005; Shepherd 2005). In the South Island, little spotted kiwi were widespread in the west from Fiordland to the Marlborough Sounds in the early 1900s, but died out on the mainland around 1980. Birds on Kapiti Island and D'Urville Island have been used to form the current populations.

The present distribution of kiwi (Fig. 1) is a mix of largely unchanged distributions (e.g. Stewart Island tokoeka), remnant populations, and new, translocated populations on islands or mainland islands that were not naturally inhabited by kiwi.

[1] But note that the identity of kiwi species being referred to in early historical records was not always clear, as identification was based on calls, which are similar for some taxa.

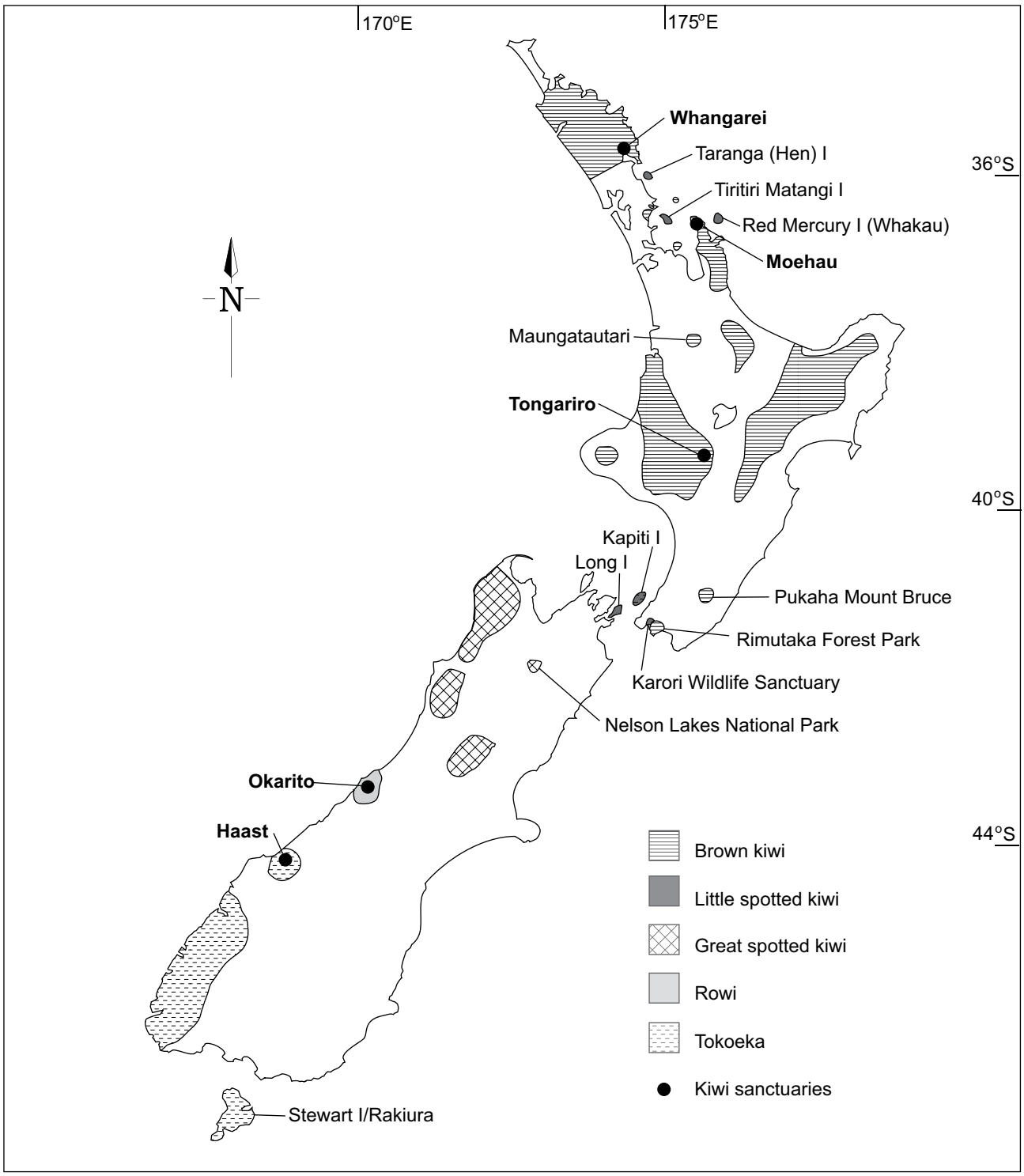

Figure 1. Present distribution of kiwi (*Apteryx* spp.) in New Zealand and location of five kiwi sanctuaries (note: symbol does not reflect the extent of these sanctuaries).

Management of kiwi over the past 15–20 years has halted or reversed the decline for some taxa:

- Little spotted kiwi: Have passed their lowest estimated population size in the mid-1900s due to rapid growth of the Kapiti Island population and, more recently, the successful transfers to several predator-free offshore islands (Colbourne & Robertson 1997) and to Karori Wildlife Sanctuary, a predator-proof site on the mainland.
- Rowi: Have increased from their lowest total population of about 150 birds in the mid-1990s, mainly due to successful BNZ Operation Nest Egg programmes run from 1995 to 2000 and from 2004 onwards.
- Haast tokoeka, and Northland and Coromandel brown kiwi: The decline of these taxa has now been halted. Over half of the current Haast tokoeka population of 300 birds receives some protection from an extensive trapping programme, and BNZ Operation Nest Egg is further boosting productivity. Predator control over 50 000 ha by DOC and four major community groups has halted the decline of Coromandel brown kiwi at about 1000 birds, and an increase in numbers is expected over the next decade. While only about a fifth of Northland birds is currently under management, their increase approximately equals the assumed decline in the unmanaged populations.

However, other taxa are predicted to continue to decline over the next decade without additional effort, because management currently only covers a small portion of their range:

- Eastern and western brown kiwi: Still in decline because although some actively managed populations are flourishing, most birds still remain in sites with little or no management.
- Stewart Island, northern Fiordland and southern Fiordland tokoeka: Have no direct management and are assumed to be gradually declining, especially in lowland and drier areas.
- Great spotted kiwi: Receive little active management, and although some populations in upland wet areas appear to be stable (McLennan & McCann 1991; Robertson et al. 2005), those in lowland and drier areas are assumed to be declining gradually.

An annual decline as high as 5.8% has been published for mainly brown kiwi (McLennan et al. 1996), though recent data indicate that at least in Northland this might be closer to 2% (Hugh Robertson, DOC, unpubl. data). In this plan, a mid-point figure of 3% is assumed for unmanaged populations of brown kiwi, and a 2% decline for unmanaged populations of other taxa. The current population trend estimates of kiwi taxa are presented in Table 2.

TABLE 2. POPULATION TREND ESTIMATES OF CURRENTLY RECOGNISED GENETICALLY DISTINCT KIWI TAXA.

Estimates assume continuation of current management effort. See Table A1.1, Appendix 1 for a summary of 1996 population figures.

TAXON	ESTIMATED/PROJECTED NUMBER OF BIRDS	
	2008	2018*
Little spotted kiwi *Apteryx owenii*		
Kapiti Island	1200	1200
Red Mercury Island (Whakau), Taranga (Hen) Island, Tiritiri Matangi Island, Long Island (Queen Charlotte Sound), Karori Wildlife Sanctuary	300	600
Great spotted kiwi/roroa *A. haastii*		
Northwest Nelson to Buller River, northern West Coast, Southern Alps/ka Tiritiri o te Moana (Arthur's Pass to Lake Sumner), Nelson Lakes National Park	16000	13000
Brown kiwi *A. mantelli*		
Northland	8000	8500
Coromandel	1000	2000
Eastern North Island	8000	6500
Western North Island	8000	6500
Rowi *A. rowi*		
Okarito Sanctuary	300	600
Tokoeka *A. australis*		
Haast Range and Arawhata River	300	600
Stewart Island/Rakiura	15000	12500
Northern Fiordland	10000	8000
Southern Fiordland	4500	3500
Total	72600	63500

* Assumptions for projections (Hugh Robertson, DOC, unpubl. data):

- Little spotted kiwi: Kapiti Island population at carrying capacity; c. 6% annual increase for recently established populations.
- Brown kiwi: c. 3% annual decline for unmanaged portion of population and annual increase for managed populations of 9% in Northland (1500 managed), 10% in Coromandel (800 managed), and 7% in eastern North Island (300 managed) and western North Island (200 managed). The population of western brown kiwi on Hauturu/Little Barrier Island (1000 birds) is stable at carrying capacity.
- Rowi and Haast tokoeka: c. 7% annual increase through BNZ Operation Nest Egg (both) and trapping (Haast only).
- Great spotted kiwi: c. 2% annual decline for unmanaged portion of the population and 7% annual increase for managed populations (100 birds).
- Tokoeka (except Haast tokoeka): c. 2% annual decline. A small population (< 50 birds) of tokoeka on Kapiti Island is expected to remain stable.

3.1.5 Agents of decline

Prehistorically, kiwi are likely to have experienced non-human-induced episodes of decline (and expansion). Over millions of years, the distribution, numbers and genetic make-up of tokoeka were apparently strongly affected by climate change, which must have reduced its populations to small refugia during ice ages and allowed a gradual expansion of range during intervening warm periods. In the North Island, volcanism and sea-level changes seem to have been major driving forces separating brown kiwi into various refugia and causing the genetic divergence of the four recognised taxa (Baker et al. 1995).

Human-induced decline began following the arrival of Maori in New Zealand, more than 700 years ago. The likely main agents of decline were habitat loss as a result of extensive burning and clearing of forest in the drier eastern parts of New Zealand, harvest by Maori, predation by dogs and possibly competition with kiore (*Rattus exulans*), which together led to extensive range reductions of kiwi and near loss of little spotted kiwi from the North Island. Following European arrival in the mid-1800s, the rate and efficiency of habitat destruction increased rapidly, and a new suite of efficient mammalian predators and competitors was introduced (McLennan et al. 1996).

Today, the rate of habitat loss has been greatly reduced, and mammalian predators, in particular stoats (*Mustela erminea*), are now considered the key agents of decline (McLennan et al. 1996). In most parts of the country, stoats are responsible for approximately half of the deaths of kiwi chicks on the mainland. Cats (*Felis catus*) also kill some kiwi chicks, contributing to the very low (10%) survival rate of young kiwi up to an age of 6 months. Predation of adult kiwi by dogs (*Canis familiaris*) and ferrets (*Mustela puorius*) can cause catastrophic declines in local populations (e.g. Taborsky 1988; Pierce & Sporle 1997) and strongly influence population trends by significantly reducing the life expectancy of adults in some areas (e.g. Northland).

Other, as yet unrecognised, agents of decline also can not be excluded, including the possibility that competition, mainly by rodents, has an effect on kiwi chick growth and overall population trends at some sites.

While the agents of decline are widespread, their impact varies with local circumstances. For example, kiwi populations decline faster in Northland, where high kiwi productivity is more than offset by very high rates of mortality as a result of predation by dogs, ferrets, stoats and cats. In contrast, at very wet high-altitude sites in the South Island, where kiwi productivity and predator densities are low, kiwi are stable or declining only slowly (McLennan & McCann 1991).

3.1.6 Threats

The main threats to kiwi today are unmanaged agents of decline as well as, for some species, the small size and distribution of populations. Risks to these small populations include loss of genetic diversity, inbreeding and vulnerability to localised stochastic events such as fire, disease or predator increases (e.g. East & Williams 1984). Limited dispersal and associated lowered chances of finding a mate in declining, small populations can also lead to lowered overall fecundity, worsening the effect of the decline. Low fecundity is currently found in Haast tokoeka and rowi (Hugh Robertson, DOC, pers. comm.), although this may also be the result of ageing populations or sub-optimal habitat conditions, e.g. for feeding.

New avian diseases and parasites that may reach New Zealand present a further threat to kiwi. The import of ratites (e.g. emus, ostriches) to New Zealand presents a particularly great risk due to the close phylogenetic relationships and characteristics with kiwi.

As a result of their low blood temperature, kiwi are also more vulnerable to some mammalian diseases, e.g. *Cryptococcyx* (Clark & McKenzie 1982; Hill et al. 1995).

3.1.7 Past management

In 1991, DOC published the first kiwi recovery plan (Butler & McLennan 1991) and started implementing the Kiwi Recovery Programme in conjunction with BNZ (Bank of New Zealand) and the Royal Forest & Bird Protection Society.

The initial phase of kiwi recovery (1991–1996) focussed on the identification of the taxonomic and numerical status of species, the agents of decline, and the current threats to each taxon. Predation, particularly by stoats, was identified as the key agent of decline for kiwi. More accurate estimates of the distribution, population size and trends were made for each species, and genetic and other differences amongst kiwi were recognised, indicating the likely presence of more distinct species than previously thought. Further detail is provided by Robertson (2003: appendix 1).

The next phase of recovery (1996–2008), guided by the second recovery plan (Robertson 2003), focussed on the development and refinement of tools such as BNZ Operation Nest Egg (see section 5.1.17), and management of populations and mitigation of threats via landscape-scale stoat trapping. The taxonomy of kiwi and the genetic structure within different populations were further clarified, and five kiwi sanctuaries were established (at Whangarei, Moehau, Tongariro, Okarito and Haast) as part of the New Zealand Biodiversity Strategy, to protect the most threatened kiwi taxa (rowi and Haast tokoeka) and populations of three taxa of brown kiwi. The plan also aimed to increase the wider community's understanding of and involvement in kiwi recovery. During its term, there was strong growth in the number and scale of community-led projects for kiwi recovery and the BNZ Save the Kiwi Trust was established as a formal partnership between BNZ and DOC (see section 5.2).

Appendix 1 summarises the significant gains made in kiwi recovery since 1996.

3.1.8 Options for recovery

There are four main options for recovery of kiwi:

1. Do nothing: This would result in the continued decline of most taxa, the probable extinction of the most threatened taxa and the loss of many recovery gains made over the terms of the first two recovery plans.
2. Protect kiwi in captivity only: This would lead to similar losses in the wild as doing nothing. Outcomes in captivity are uncertain, as for many taxa captive management has not yet proven a successful tool for maintaining healthy populations.
3. Protect minimum numbers of each taxon: This would likely result in no further extinctions, but the more numerous species (great spotted kiwi, tokoeka and brown kiwi) would decline to population levels much below present, with the complete loss of many local populations.
4. Protect kiwi over their current range: This would result in a slowing and eventually a halting of the decline of the more numerous species, and the continued survival of current main populations of all species.

Options 1–3 are not seen as appropriate given the current threats to taxa, the range of available tools, and the strong public interest in minimising further losses and actually increasing numbers of kiwi again. Therefore, the preferred option for recovery of kiwi remains unchanged from the previous plan (Robertson 2003): to sustainably manage kiwi in their natural range by reducing their exposure to predators.

3.1.9 Recovery principles for kiwi

The selection of goals, objectives and actions in this plan has been directed by a number of underlying principles for kiwi recovery, namely:

- Prevention of extinction of any species of kiwi is the highest priority for recovery management
- Intraspecific genetic variation and distribution will be maintained or enhanced as much as is feasible within the core areas of distribution of each taxon
- Where possible, kiwi will be managed within their natural (prehistorical or historical) range or, if outside the range, with the overall aim of restoring them to such sites
- Mixed-provenance populations form an integral part of recovery planning outside the core areas of distribution for each taxon
- Kiwi recovery will, wherever possible, focus on gaining maximum benefits for the wider ecosystem

3.2 STRATEGIC DIRECTIVES

3.2.1 New Zealand Biodiversity Strategy

This plan supports three of the four goals of the New Zealand Biodiversity Strategy (DOC & MfE 2000), as well as key associated principles, actions and strategic priorities:

Goal 1: Community and individual action, responsibility and benefits

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated community action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous genetic resources

Goal 2: Treaty of Waitangi

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity

Goal 3: Halt the decline in New Zealand's indigenous biodiversity

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity

3.2.2 Department of Conservation Strategic Direction

This plan is aligned with DOC's Strategic Direction (DOC 2007b) and all four of the strategic approaches that will help deliver the Strategic Direction in the medium term:

The overarching purpose of the Department is to increase the value that New Zealanders attribute to conservation

This leads to enhanced care of New Zealand's unique heritage for people to benefit from and enjoy

Approach 1: Promoting the benefits and value of conservation

Approach 2: Demonstrating that conservation contributes to economic prosperity

Approach 3: Achieving conservation results through collaboration

Approach 4: Demonstrating excellence in conservation knowledge and practice, and sharing it with others

3.2.3 Department of Conservation Statement of Intent

This plan supports four of the five intermediate outcomes in DOC's Statement of Intent 2007–2010 (DOC 2007a), which are identified as steps required to achieve DOC's high-level goal of protecting and restoring New Zealand's natural, historic and cultural heritage:

1. *The damage from harmful organisms established in New Zealand is reduced*
2. *The natural character of managed places is maintained or improved*
3. *Managed threatened species have a lower risk of extinction*
4. *A representative range of New Zealand's environments is protected*

3.3 CULTURAL IMPORTANCE

The image of the kiwi and the image of Aotearoa/New Zealand have been considered synonymous for a long time.

The bird itself is a taonga (treasure) to Maori, who have strong cultural, spiritual and historic associations with the kiwi. Its feathers are valued in weaving kahukiwi (kiwi feather cloak) for people of high rank. Due to the cultural significance to Maori and the traditional knowledge about the bird, tangata whenua are a key stakeholder in kiwi recovery planning and implementation.

The kiwi was also admired by later European settlers, and today has become a significant national icon, equally cherished by all cultures in New Zealand. It has become a symbol for the uniqueness of New Zealand wildlife and the value of our natural heritage.

3.4 PUBLIC AWARENESS

There is a considerable level of community awareness and concern about kiwi. People feel a strong association with kiwi and place great importance on the survival of the species (see section 3.3). High-profile kiwi projects (e.g. kiwi sanctuaries) and a considerable breadth of the kiwi work being undertaken (e.g. translocations) have attracted media interest. Awareness has further been heightened by the BNZ Save the Kiwi Trust focussing on increasing public awareness and enhancing the capacity of New Zealanders to become involved in kiwi recovery.

Kiwi have become flagship species for conservation and are often used as a guide-stick to measure the state of our natural environment and the outcome, and sometimes value, of conservation projects.

On the other hand, the length of exposure to information on the plight of kiwi has resulted in 'message fatigue' or an assumption that recovery efforts have not made any difference.

3.5 PARTNERSHIPS AND KEY ASSOCIATES

Kiwi work is now carried out by a variety of organisations, agencies, groups and individuals outside DOC. Key players include iwi, community groups, landowners and landcare trusts, Royal Forest & Bird Society and other non-government organisations, local government, and captive practitioners and institutions. Some of this work runs alongside DOC-led projects, whilst other work is separate, sometimes with different, but complementary, objectives, capacity and foci. Each of these projects contributes to the greater objectives of saving kiwi.

For a number of local iwi and hapu throughout New Zealand, the relationship between tangata whenua and kiwi and their involvement in kiwi management has been formally recognised as part of their Treaty of Waitangi settlement claims, which include specific references to species recovery work. This includes the Ngai Tahu Claims Settlement Act 1998 and protocols outlining the requirement for communication and consultation with iwi.

Since 1991, BNZ has been the major sponsor for kiwi recovery, resulting in the establishment of the BNZ Save the Kiwi Trust in 2002. This is a formal partnership established between BNZ and DOC to support kiwi recovery, including through the allocation of sponsorship money.

Representatives of many of the above groups or organisations are members or associates of the Kiwi Recovery Group, ensuring an overall coordination of recovery effort beyond the work carried out by DOC.

4. Goals

4.1 LONG-TERM RECOVERY GOAL

To restore and, wherever possible, enhance the abundance, distribution and genetic diversity of all kiwi taxa

This goal has remained largely unchanged from the previous two versions of the recovery plan.

'Restoring', in this context, implies the re-establishment of kiwi as a common component of New Zealand natural ecosystems beyond the levels that existed in 1991, the year of publication of the first plan.

4.2 RECOVERY PLAN-PERIOD GOALS

4.2.1 Management

Goal 1.1: To double the wild populations of rowi and Haast tokoeka

Goal 1.2: To halt the overall decline of great spotted kiwi, tokoeka and brown kiwi

Goal 1.3: To minimise the loss of distribution and genetic diversity of populations in the wild for all species of kiwi

Goal 1.4: To increase the wild population of little spotted kiwi by 50%

Notes: The baseline for Goals 1.1, 1.2 and 1.4 is the current (2008) population size and distribution. Goal 1.3 refers to losses that are expected to continue until, and even after, Goal 1.1 has been reached, at which time the net population decline will be zero but individual populations might still be declining.

4.2.2 Community relations and engagement

Goal 2.1: To increase and sustain community-led projects in kiwi recovery for all species and across a broad range of sectors of the New Zealand society

Goal 2.2: To double the corporate sponsorship funding for kiwi recovery

Note: The baseline for Goal 2.2 is the current (2008) level of sponsorship.

4.2.3 Research and innovation

Goal 3.1: To clarify kiwi taxonomy and provide robust information guiding management of genetic diversity

Goal 3.2: To undertake robust population modelling for all species

Goal 3.3: To undertake or support research into tools for sustainable landscape-scale pest management and monitoring

5. Implementation

This section provides short-term direction for departmental and community group managers by identifying:

- What is going to happen
- Who is going to do it
- Where it is going to happen
- When it is going to happen

Three themes with a number of topics have been prepared. Each topic outlines issue(s) and objective(s), and presents an action table showing how to resolve the issue(s). A number of actions are at a strategic (i.e. less specific) level, with the specifics needing to be developed in taxon planning (see section 5.1.2).

All action tables indicate which groups or individuals are accountable for completing each action. In some instances, this will be the conservancy that is accountable for the particular taxon plan (see section 5.1.2).

All actions have been prioritised and timelined (see Appendix 2). Their relevance to kiwi taxa and the plan-period goals are outlined in Appendices 3 and 4, respectively. Prioritisation has been assigned according to kiwi recovery in general, rather than for each species individually. Individual species/taxon priorities will be assigned in taxon plans. Priorities are marked as follows:

- **Essential**: Needs to be carried out within the timeframe and/or at the frequency specified to achieve the goals for kiwi recovery over the term of this plan. Highest risk for kiwi recovery if not carried out within the timeframe and/or at the frequency specified.
- **High**: Necessary to achieve long-term goals. To be progressed and ideally completed within the term of the plan, with moderate risk if not carried out within the timeframe and/or at the frequency specified.
- **Medium**: Necessary to achieve long-term goals. To be progressed within the term of the plan, but least risk if not completed within the term of the plan or within the timeframe and/or at the frequency specified.

No actions are 'extras'; a medium priority does not mean that there are no reasons to do it. Priorities are given to assist with choice if required.

Actions are predominantly timelined until 2013, except those relevant throughout the plan-period. This reflects the increasing uncertainty in assigning timeframes beyond 5 years, and the need to review progress for all actions by 2013.

5.1 MANAGEMENT

Management of kiwi populations and the supporting systems that enable this management to be effective are at the core of recovery planning for kiwi. The advances made over the previous decades in pest control techniques, captive breeding and restoration have demonstrated that the decline in populations can be reversed if effort is applied.

Kiwi recovery has become a complex undertaking, requiring a number of planning documents that can translate the strategic direction (i.e. this plan) into implementation at a regional or species- or topic-specific level. Some formal, national coordination is required to ensure that the right set of supporting plans and manuals are available and up to date.

During the initial years of kiwi recovery planning, the Kiwi Recovery Group was a key source of technical and procedural information for DOC and community-led initiatives. However, due to the increased complexity of kiwi recovery, the Recovery Group has changed to a predominantly strategic group. The provision of technical and procedural advice is now to a large extent provided by specialist positions associated with the Recovery Group (e.g. National Mentor for Advocacy) or communicated through best practice manuals.

5.1.1 Topic 1—Recovery planning

Issues

Issue 1.1: Progress with implementation of the recovery plan needs to be monitored against current objectives, and the plan itself assessed and adjusted against changing circumstances to remain effective

Issue 1.2: Members of the Kiwi Recovery Group need to be able to interact with the key networks of stakeholders (e.g. community, tangata whenua, captive holding institutions, research institutions, sponsors, DOC), and membership needs to reflect these networks

Issue 1.3: The Recovery Group is still seen as the first port of call for technical and procedural advice, while other resources for such enquiries are not fully utilised or have not been established (see also section 5.1.5, 'Best practice')

Objectives and actions

Objective 1.1: To ensure that the current recovery plan remains effective, and has its progress assessed and its direction regularly reviewed

Objective 1.2: To ensure that the Kiwi Recovery Group successfully directs and oversees kiwi recovery at an appropriate scale

Objective 1.3: To ensure that stakeholders have access to resources and high-quality advice

ACTION		ACCOUNTABILITY	PRIORITY
1.1	Prepare a progress report annually against recovery plan objectives, and communicate across DOC and to other stakeholders	Recovery Group	Essential
1.2	Undertake a full review of the recovery progress in 2013, at half-way point of the current plan	Recovery Group	Essential
1.3	Review membership of the Kiwi Recovery Group every 2 years (from 2008), to ensure it reflects key relationships and networks of kiwi management at all times	Recovery Group	Medium
1.4	Communicate the purpose of the Kiwi Recovery Group in a consistent manner to DOC staff and all other stakeholders throughout the term of the plan	Recovery Group	Medium
1.5	Review resources available for advice on all levels of kiwi recovery planning and fill key gaps as identified throughout the term of the plan	Recovery Group and BNZ Save the Kiwi Trust	High

5.1.2 Topic 2—Taxon plans

The recovery plan will provide strategic direction at a national level, but will not prescribe management for each taxon at the level of detail required to guide work-plans and thus implement successful recovery. This will be achieved through individual taxon plans developed in a more regional context.

The accountability for each plan rests with a lead conservancy (see Table 3), which will be guided and supported by the Recovery Group. It is expected that plans will be developed in collaboration with key stakeholders for the taxon, including other conservancies involved in its recovery, iwi, landowners, communities and local authorities.

TABLE 3. COST CENTRES ACCOUNTABLE FOR THE DEVELOPMENT OF TAXON PLANS.

TAXON	CONSERVANCY	
	ACCOUNTABLE LEAD	CONTRIBUTING
Little spotted kiwi	Wellington	Northland, Auckland, Southland
Great spotted kiwi	Canterbury	West Coast, Nelson/Marlborough
Brown kiwi		
Northland	Northland via Whangarei Area	None
Coromandel	Waikato via Hauraki Area	None
Eastern North Island	East Coast/Hawke's Bay	Bay of Plenty, Tongariro/Taupo, Wanganui
Western North Island	Wanganui	Tongariro/Taupo, Waikato
Rowi	West Coast	None
Tokoeka		
Haast	West Coast	None
Northern Fiordland*	Southland	None
Southern Fiordland*	Southland	None
Stewart Island*	Southland	None

* Could be combined in single plan.

Individual taxon plans will be peer-reviewed by the Recovery Group to ensure that they fulfil their role as integral parts of the national recovery plan. The term of these plans will be that considered appropriate for the status of each taxon, expected to be between 5 and 10 years.

Issues

Issue 2.1: Detail in the national recovery plan is not sufficient to guide implementation of recovery for individual taxa

Issue 2.2: Taxon plans need to be consistent with the national recovery plan while stating local solutions

Objectives and actions

Objective 2.1: To develop nationally consistent, locally relevant recovery planning documents ('taxon plans') for each of the 11 recognised taxa

	ACTION	ACCOUNTABILITY	PRIORITY
2.1	Develop a taxon planning template and procedural guidance in 2008	Recovery Group	Essential
2.2	Develop taxon plans for each of the 11 recognised taxa by 2009	Conservators	Essential

5.1.3 Topic 3—Kiwi sanctuaries

Five kiwi sanctuaries (Whangarei, Moehau, Tongariro, Okarito and Haast) were established in 2000 with funding through the Biodiversity Strategy (DOC & MfE 2000). Their initial focus was on the development of successful management prescriptions for kiwi protection at key sites, using mainly trapping, aerial predator control and BNZ Operation Nest Egg as tools.

In 2007, proof of management success had been achieved for some sanctuaries, while others were still in the development phase. In addition to site-specific kiwi protection, sanctuaries have been critical as sites for fundamental research into kiwi ecology and protection, and for the development of new technologies. Sanctuaries remain a key component of future recovery planning.

Issues

Issue 3.1: Findings from sanctuaries individually and as a combined project have been mainly communicated in dispersed form in a variety of reports rather than as a formal review in peer-reviewed publication(s)

Issue 3.2: The transition between proof-of-concept and management phases for individual sanctuaries requires a review of their overall direction, including their goals and role in the wider kiwi recovery context

Issue 3.3: Communication between sanctuary kiwi staff is infrequent

Objectives and actions

Objective 3.1: To ensure that kiwi sanctuaries continue to be an integral part of kiwi recovery, as sites of successful management and for learning

ACTION		ACCOUNTABILITY	PRIORITY
3.1	Formally review progress of kiwi sanctuaries through the publication of findings in peer-reviewed literature by 2009	Research and Development Group	Essential
3.2	Review the goals and wider direction for each sanctuary as part of the overall recovery effort for kiwi by 2009	Recovery Group/ sanctuary conservators	Essential
3.3	Based on the findings of the review, prepare a new strategic plan for kiwi sanctuaries, including their funding structure and the potential for additional sanctuaries, by 2009	Recovery Group/ General Manager Research and Development Group	Essential
3.4	Initiate a kiwi sanctuary network for dialogue, information and staff exchange amongst sanctuaries in 2009, and utilise throughout the term of the plan	Recovery Group/ sanctuary programme managers	Medium

5.1.4 Topic 4—Island strategy

Since the 1890s, conservation management of kiwi has involved the translocation of populations to the offshore islands of New Zealand (Colbourne 2005). However, there has been little long-term planning and some translocations have taken place in a haphazard manner. At least 28 offshore islands (excluding Stewart Island/Rakiura) currently support populations of kiwi. Since only 34 islands over 100 ha in size are available, and not all of these are necessarily suitable for kiwi, there is a strong need to prioritise which kiwi species might be suitable for which islands, and vice versa, whilst also taking into account existing or potential uses of islands for other threatened species.

Issues

Issue 4.1: The potential use of islands for kiwi recovery should be guided by a single document rather than decisions made *ad hoc* and without national overview

Objectives and actions

Objective 4.1: To optimise use of islands for kiwi recovery

ACTION		ACCOUNTABILITY	PRIORITY
4.1	Develop an island strategy for kiwi recovery by 2009, which is consistent with DOC's national island strategy (in draft at time of writing) and the national recovery plan	Recovery Group/ Research and Development Group	Essential

5.1.5 Topic 5—Best practice

(Note: Best practice for captive management is covered separately under sections 5.1.15–5.1.17.)

Over the years, a tremendous amount of information on best practice in kiwi management has been developed, summarised mainly in the 'Kiwi best practice manual' (Robertson & Colbourne 2003). Since this manual is referred to in the conditions listed on permits (e.g. for permits to handle kiwi), it needs to be updated regularly to truly reflect best practice. As new information and technologies become available, they need to be assessed and, if appropriate, included in the manual.

Issues

Issue 5.1: The kiwi best practice manual requires regular updates

Objectives and actions

Objective 5.1: To ensure that kiwi management is undertaken to a consistent and high standard

ACTION		ACCOUNTABILITY	PRIORITY
5.1	Undertake an update of the kiwi best practice manual by 2010 and then update annually	Recovery Group	High
5.2	Develop and assess variations to current best practice on a case-by-case basis and communicate these to stakeholders throughout the term of the plan	Recovery Group	Medium
5.3	Provide regular technical best practice workshops (e.g. kiwi handling, transponder, egg handling) throughout the term of the plan	Recovery Group/ BNZ Save the Kiwi Trust	High
5.4	Maintain and annually update a database of qualified and experienced persons (internal and external) working to best practice standards from 2009	Recovery Group	Medium
5.5	Ensure best practice is referred to and monitored through local permit systems throughout the term of the plan	Area managers/ conservators	High

5.1.6 Topic 6—Review schedule

Issues

Issue 6.1: Supporting documents relevant to kiwi recovery that are in existence or developed during the life-time of this plan need regular updating to maintain their relevance (e.g. kiwi best practice manual, husbandry manual and captive management plan).

Objectives and actions

Objective 6.1: To ensure that key supporting plans for kiwi recovery contain up-to-date and relevant information

	ACTION	ACCOUNTABILITY	PRIORITY
6.1	Develop in 2008 and operate annually a review schedule for key supporting documents for kiwi recovery	Recovery Group	Medium

5.1.7 Topic 7—Island biosecurity

Populations of kiwi on islands, including *ex situ* populations, crèche sites and restoration populations, are a critical part of recovery planning. Stewart Island tokoeka and little spotted kiwi solely or mainly occur on islands. The status of island populations of kiwi is predominantly determined by the status of threats on these islands, especially the absence or impact of predator/competitor species and, to a lesser degree, diseases. Biosecurity plans for these islands will minimise the risk of the establishment of pests, but are no guarantee.

Issues

Issue 7.1: An increase of threats on islands with kiwi populations could jeopardise individual island populations and the wider recovery objective(s) associated with the affected taxa

Objectives and actions

Objective 7.1: To maintain the current status of threats to kiwi on islands with kiwi populations

	ACTION	ACCOUNTABILITY	PRIORITY
7.1	Develop, maintain and implement island biosecurity plans and protocols for islands with kiwi throughout the term of the plan	Area managers/ conservators	Essential
7.2	Develop contingency plans for kiwi populations on islands as part of taxon plans by 2009	Area managers/ conservators	Essential

5.1.8 Topic 8—Small population number and size

Where species exist in only one or a few populations that are small in both geographic extent and number of individuals (rowi and Haast tokoeka), stochastic threat events (e.g. fire or localised predator eruption) can have a strong impact on the recovery of the species. Increasing the population size within each population as well as the number and geographic extent of populations will buffer such events. The former can be achieved through a mixture of BNZ Operation Nest Egg and optimising predator management, while the latter requires the establishment of new populations. Managing all populations as a single meta-population would allow transfers from more productive populations ('kohanga kiwi'; see section 5.1.10) to those that are less productive (including back to the original source population) to increase abundances quickly.

Despite intensive management of rowi and Haast tokoeka over the previous decade, the effective population size (i.e. the proportion of individuals contributing to recruitment into the population) is still small due to low average fecundity of birds. For rowi, for example, up to 40% of potential breeders are not contributing to recruitment (R. Colbourne, DOC, pers. comm.). Reasons for low fecundity in these populations are not yet understood and may include old age or sub-optimal resource availability. In addition, current management does not yet include all birds that could contribute to recruitment.

Issues

Issue 8.1: Rowi and Haast tokoeka are vulnerable due to their small population sizes and low numbers of populations

Objectives and actions

Objective 8.1: To double the population size of existing populations of rowi and Haast tokoeka

Objective 8.2: To double the number of populations in the wild of rowi and Haast tokoeka

Objective 8.3: To manage as single meta-populations all populations of rowi and Haast tokoeka, respectively

Objective 8.4: To increase fecundity within rowi and Haast tokoeka populations

Objective 8.5: To accelerate recovery rates within rowi and Haast tokoeka populations by increasing the proportion of birds managed as part of BNZ Operation Nest Egg

ACTION		ACCOUNTABILITY	PRIORITY
8.1	Maximise BNZ Operation Nest Egg efforts for rowi and Haast tokoeka, through increasing the proportion of individuals managed for egg production and encouraging re-laying while monitoring the effect on population structure and behaviour throughout the term of the plan	West Coast Conservator	Essential
8.2	Develop and implement landscape-scale pest control prescriptions at existing sites with rowi and Haast tokoeka by end of 2013	West Coast Conservator	High
8.3	Establish at least one new, self-sustainable population for both rowi and Haast tokoeka at a site where main threats are managed or absent by end of 2011	West Coast Conservator	Essential
8.4	Manage at least one new population of both rowi and Haast tokoeka predominantly for the purpose of increasing the number of individuals to allow for transfer to other, less productive populations by 2011 and then throughout the term of the plan	West Coast Conservator	Essential
8.5	Research (including through research by management) reasons for low fecundity and small effective population size for rowi and Haast tokoeka, and develop management prescriptions based on these findings by 2011 (Note: Same as Action 26.4, section 5.3.3)	Research and Development Group	Essential

5.1.9 Topic 9—Minimum secure populations

Some kiwi taxa still have relatively (e.g. compared with rowi) high numbers of individuals and/or populations, but are either in confirmed decline (all taxa of brown kiwi) or assumed to be declining (great spotted kiwi, Fiordland and Stewart Island tokoeka). An important step in the recovery of these taxa is to provide sustainable security from key threats for a minimum number of pairs, while other recovery effort continues or is implemented. Such 'security populations' need to be of sufficient size to provide confidence that a taxon will not become extinct in the medium term.

International literature puts the minimum size for such populations as 500 *effective* individuals, translating to several thousand individuals overall (Reed et al. 2003). A smaller population size of 500 breeding pairs overall has been chosen for kiwi. This is seen as more appropriate in the New Zealand context, where species have survived for many generations in populations of much lower size than suggested by Reed et al. (2003).

Northland and western brown kiwi and Stewart Island tokoeka are considered to have reached this goal already, with more than 500 breeding pairs under sustained management and secure from main threats in the Whangarei kiwi sanctuary, on Hauturu/Little Barrier Island and on Stewart Island/Rakiura, respectively. For the remaining taxa, a goal of 500 breeding pairs will require additional effort. Some of these taxa are already managed by a number of projects (Coromandel and eastern brown kiwi), while the remaining taxa (great spotted kiwi, Fiordland tokoeka) are currently only managed on a limited scale.

Issues

Issue 9.1: Minimum secure populations do not currently exist for most taxa that are confirmed or assumed to be in decline

Objectives and actions

Objective 9.1: To secure a minimum of 500 pairs of brown kiwi (all taxa), great spotted kiwi and Fiordland tokoeka from the relevant agents of decline

Note: It is assumed that the current effort for these taxa will not decline, i.e. the majority of projects will continue or increase their efforts throughout the term of the plan.

	ACTION	ACCOUNTABILITY	PRIORITY
9.1	Control relevant pests (stoats, ferrets, dogs and cats) at all managed sites with populations above 200 pairs, and 30% of sites with populations between 50 and 200 pairs where management is based on BNZ Operation Nest Egg only (brown kiwi, great spotted kiwi and tokoeka) by 2018	Conservators	High
9.2	Maximise effectiveness and efficiency of predator control at currently managed sites for Coromandel and eastern brown kiwi through review of existing management and/or increase in effort by 2010 and then throughout the term of the plan	Conservators	High
9.3	Optimise large-scale pest control undertaken in current range of Fiordland tokoeka and great spotted kiwi to benefit existing kiwi populations by 2012 and then throughout the term of the plan	Conservators	High
9.4	Increase the number and scale of managed sites for Fiordland tokoeka and great spotted kiwi by 2013	Conservators	High
9.5	Establish one additional managed site capable of securing an additional 200 pairs of eastern brown kiwi by 2010	Conservators East Coast/ Hawke's Bay, Bay of Plenty	High

5.1.10 Topic 10—Declining populations

Populations of brown kiwi, great spotted kiwi and Fiordland tokoeka are dispersed, with the majority currently receiving little or no targeted management (though populations benefit from general protection, e.g. in National Parks, through dog control, habitat protection, etc.). This has resulted in the continuation of the net overall decline of these taxa, despite local increases in managed populations. Halting the overall decline for these more abundant taxa will result in the survival of a large number of individuals and thus create a strong base for future recovery.

If specific populations can be managed at or near carrying capacity, then these can be used as source populations for translocations to other sites. We suggest that kohanga kiwi (a breeding ground for kiwi) is an appropriate term for such populations.

Issues

Issue 10.1: Despite local population stability or increases at managed sites, the most abundant species are still declining overall

Objectives and actions

Objective 10.1: To manage a sufficient proportion of the population of brown kiwi (all taxa), great spotted kiwi and Fiordland tokoeka to ensure that the net rate of loss for each taxon over the whole population is zero

ACTION		ACCOUNTABILITY	PRIORITY
10.1	Apply landscape-scale pest control at sufficient intervals at the sites with greatest potential gain, i.e. largest number of currently unmanaged kiwi (brown kiwi, great spotted kiwi and Fiordland tokoeka)	Conservators	High
10.2	Establish new and enhance existing projects, including those utilising BNZ Operation Nest Egg, to increase local population abundance to the point where the population can be used as kohanga kiwi, a source for other sites (brown kiwi, great spotted kiwi and Fiordland tokoeka)	Conservators	High

5.1.11 Topic 11—Carrying capacity

Issues

Issue 11.1: The current populations of little spotted kiwi are at or near capacity, with possible room for up to 300 more individuals. To increase the total population of the current 1500 birds by 50% (i.e. to 2250 birds) to meet Management Goal 1.4 (see section 4.2.1), additional sites for up to 450 little spotted kiwi are required. Due to their small size and therefore greater vulnerability to predation, sites must be free of mustelids. This may require predator-proof fencing at mainland sites.

Objectives and actions

Objective 11.1: To increase the number of little spotted kiwi populations, including on the mainland, to accommodate a further 450 birds

ACTION		ACCOUNTABILITY	PRIORITY
11.1	Identify by 2010 four new sites (at least two of these on the mainland) for the establishment of new populations of little spotted kiwi with a combined carrying capacity of 450 birds, and initiate translocations by 2013	Recovery Group/ conservators	High

5.1.12 Topic 12—Inbreeding depression

The current Kapiti Island population of little spotted kiwi appears healthy, despite being based on a limited number of founders (all from South Westland provenance). Inbreeding depression remains a potential risk to this and other populations based on Kapiti Island founders that have been recently established on offshore islands and at Karori Wildlife Sanctuary. Introducing new founders to Kapiti Island from the D'Urville provenance on Long Island carries the risk of introducing novel diseases to this key source population. It would also result in mixing birds from two extreme provenances.

Issues

Issue 12.1: Inbreeding depression might increase the risk of population failure for little spotted kiwi populations due to the small number of founders

Issue 12.2: The Kapiti and Long Island populations represent two different founding provenances that, once mixed, will not be able to be easily separated

Issue 12.3: Introducing new founders to Kapiti Island might negatively affect the health of this apparently thriving population, while the potential benefit to the population is not well understood

Issue 12.4: Because new populations foundered by birds from Kapiti Island have been through another bottleneck (12–40 birds), there may be advantages in adding birds from D'Urville Island stock (from Long Island) to increase the genetic diversity and resilience of these small island/sanctuary populations

Objectives and actions

Objective 12.1: To ensure that new populations of little spotted kiwi are as genetically diverse as possible, whilst maintaining the genetic diversity of the current Kapiti Island population at its current status

ACTION		ACCOUNTABILITY	PRIORITY
12.1	Research genetic diversity within and between current populations of little spotted kiwi and evidence of bottleneck effects by 2009 (Note: refer also to Action 25.3, section 5.3.2)	Research and Development Group	High
12.2	If research confirms that Long Island little spotted kiwi population is sufficiently different from Kapiti Island population, initiate translocation(s) to maximise Long Island genotype in new populations by 2010	Research and Development Group, Conservators Wellington, Nelson/Marlborough	Essential

5.1.13 Topic 13—Distribution and genetic diversity

The overall decline of populations of brown kiwi (all taxa), great spotted kiwi and Fiordland tokoeka is likely to result in a further constriction of their distribution and the associated loss of genetic diversity. Genetic research (Baker et al. 1995; Herbert & Daugherty 2002; Burbidge et al. 2003; Shepherd & Lambert 2008) has confirmed natural (i.e. non-human-induced) isolation of the separate taxa of brown kiwi and tokoeka, as well as fine-scale genetic variation within taxa.

Management of these taxa needs to recognise isolation as one of the drivers for speciation, as well as the risks it can carry (e.g. genetic inbreeding).

While maintenance or enhancement of the distribution of these taxa and preservation of their genetic variation is of lower priority than other recovery objectives outlined in this plan, it is encouraged if opportunities present themselves, e.g. as part of wider site restoration objectives. Where possible, a precautionary principle will be applied to management of the genetic structure of these taxa until the importance of their genetic diversity is fully understood.

Previous translocations have already established populations of brown kiwi outside their natural geographic range, including a number of mixed-provenance island populations (e.g. Pounui Island, which is a mix of Hauturu/Little Barrier Island and Northland birds) and, more recently, mainland populations (Rimutaka and Pukaha Mount Bruce, both of which are a mix of western and eastern brown kiwi).

Issues

Issue 13.1: There is a continued reduction in the distribution of declining taxa

Issue 13.2: The genetic structure that has been recognised within species needs to be managed

Issue 13.3: Mixed-provenance populations are currently not part of the national recovery planning framework

Objectives and actions

Objective 13.1: To manage kiwi over as large a part of their historical range as possible

Objective 13.2: To maintain genetic integrity within species at the appropriate scale

Objective 13.3: To integrate mixed-provenance populations into the national recovery framework for kiwi, using them as source populations for translocations and designating 'mixed-provenance zones', i.e. areas between existing taxon boundaries where mixing between two taxa could have occurred naturally

ACTION		ACCOUNTABILITY	PRIORITY
13.1	Identify in taxon plans opportunities for the establishment of new populations within the historic range of the taxon in 2009	Taxon plan lead conservators	High
13.2	Optimise low-level, landscape-scale management undertaken for non-kiwi-specific goals to benefit kiwi over their current distribution by 2012 and then throughout the term of the plan	Area managers/ conservators	High
13.3	Manage currently recognised taxa within species as separate conservation management units, except in recognised mixed-provenance zones, throughout the term of the plan	Area managers/ conservators	High
13.4	Manage populations within recognised taxa as much as feasible to maintain fine-scale diversity by minimising translocations between geographic extremes and natural boundaries throughout the term of the plan	Area managers/ conservators	Medium
13.5	Manage mixed-provenance population on Hauturu/Little Barrier Island as part of the western brown kiwi taxon throughout the term of the plan	Auckland Conservator	Medium
13.6	Manage mixed-provenance populations at Rimutaka and Pukaha Mount Bruce as part of the mixed-provenance zone between the western and eastern brown kiwi taxa throughout the term of the plan	Wellington Conservator	Medium
13.7	Prepare a full list of mixed-provenance populations, their history and options for continued management (including inclusion in relevant taxon plan(s) and their potential as source or receiving populations for translocations) by 2010	Recovery Group	Medium

5.1.14 Topic 14—Data management

Kiwi recovery projects rely on good operational data management practices to allow them to work efficiently and effectively and to report on their progress. At the same time, these projects generate data that form an important information resource for research.

Issues

Issue 14.1: Data management is inconsistent across kiwi projects, including all sanctuaries, with regard to the procedures and technology used. Data management procedures are not regularly updated due to a lack of available software and consistent protocols. This increases the risk of unnecessary effort, inability to effectively manage, report or research kiwi data, and even data loss across kiwi projects.

Objectives and actions

Objective 14.1: To ensure that data from kiwi recovery projects are managed in a consistent, efficient and effective manner, and are available for key users

ACTION		ACCOUNTABILITY	PRIORITY
14.1	Develop a database for kiwi sanctuaries as part of the wider database environment of DOC by 2010	General Manager Research and Development Group	High
14.2	Undertake biennial reviews of data management procedures across all kiwi sanctuaries, starting in 2010	General Manager Research and Development Group	Medium
14.3	Investigate the incorporation of data from other DOC and community-led kiwi projects into a single database by 2011	General Manager Research and Development Group	Medium

5.1.15 Topic 15—Captive coordination

Ex situ and captive management play an important role in kiwi recovery, in particular by enabling the development of skills in captive husbandry and tools such as BNZ Operation Nest Egg. These provide opportunities to increase scientific knowledge of kiwi and advocate for the species and its conservation.

Up to 2008, captive breeding has almost exclusively focussed on brown kiwi. However, many of the skills and techniques developed have been transferable to other, more threatened species. Offspring from captive breeding have so far mainly been used in existing or new captive programmes, though some release into the wild has occurred.

During the term of this plan, *ex situ* and captive management will be used to:

- Help secure from extinction the most threatened taxa (Okarito rowi, Haast tokoeka), in particular through BNZ Operation Nest Egg
- Assist with the recovery of other taxa through captive breeding of birds for release and BNZ Operation Nest Egg, where this is considered the optimal tool to use (refer to section 5.1.17)
- Develop and refine captive husbandry techniques
- Advocate for the species and conservation

Captive management is coordinated through the Recovery Group via captive coordinators and is supported by the professional association of captive institutions (New Zealand Conservation Management Group: Australasian Regional Association of Zoological Parks & Aquaria—CMaG: ARAZPA), a Kiwi Captive Management Advisory Committee (KCMAC) and a captive management plan for kiwi (KCMAC & DOC 2004), the latter of which provides further detail background to the captive programme.

There are a large number of issues surrounding captive management of kiwi, which include diverse specialist topics (e.g. disease management, husbandry techniques) that are not the expertise of the Recovery Group and are best managed through close collaboration with captive holders. This role is currently partly undertaken by KCMAC, even though the primary function of this group was to generate and provide technical advice.

The strategic direction for captive management of kiwi as part of the wider kiwi recovery effort is provided in the 'Captive management plan for kiwi' (KCMAC & DOC 2004), due for review in 2009. While the plan nominally covers all species, it currently focusses on only one species (brown kiwi; three taxa).

Issues

Issue 15.1: The link between the Recovery Group and CMaG: ARAZPA, and the role of KCMAC are not clearly defined

Issue 15.2: The current focus for captive breeding does not include the species most at risk of extinction

Objectives and actions

Objective 15.1: To ensure that captive management supports key recovery planning objectives for all kiwi taxa

ACTION		ACCOUNTABILITY	PRIORITY
15.1	Clarify the formal link between the Kiwi Recovery Group and CMaG: ARAZPA as the industry's official representative body by 2009	Recovery Group/ ARAZPA	Medium
15.2	Review the role of KCMAC by 2009	Recovery Group/ ARAZPA	Medium
15.3	Review the captive management plan by 2009 (and 5-yearly thereafter), to ensure linkage with the recovery plan and taxon plan objectives, including the identification of capacity requirements (BNZ Operation Nest Egg, public viewing opportunities, crèche sites)	Recovery Group/ Research and Development Group/ ARAZPA	Essential
15.4	Report on progress towards captive management plan objectives, and provide recommendations annually to the Recovery Group and captive holders throughout the term of the plan	Recovery Group/ ARAZPA	Medium

5.1.16 Topic 16—Captive husbandry

Best practice for holding kiwi in captivity has been developed over considerable time and key findings are summarised in a husbandry manual for brown kiwi (Johnson 1996). Further advances in husbandry techniques have been made since the publication of that manual, which are recognised and often implemented by captive holders as best practice, even though they are not currently included in the manual. However, the 1996 manual remains the required standard referred to in captive holding permits and correspondence, creating a legally insecure situation for captive holders and DOC, and potentially resulting in better techniques being under-utilised.

Issues

Issue 16.1: Updating of the captive husbandry manual is neither regular nor frequent enough

Objectives and actions

Objective 16.1: To ensure that best practice for captive husbandry, including minimum standards, is collated, communicated efficiently and implemented

ACTION		ACCOUNTABILITY	PRIORITY
16.1	Review and update the kiwi captive husbandry manual by 2008 and biennially thereafter	Captive coordinator/ ARAZPA	High
16.2	In collaboration with CMAG: ARAZPA, develop standards for accreditation and monitoring of kiwi captive management facilities and practitioners, including for BNZ Operation Nest Egg and breeding for release programmes, by 2010	Recovery Group/ captive coordinator/ ARAZPA	High
16.3	Include implementation of best practice as described in the kiwi captive husbandry manual as part of the permit conditions for captive facilities by 2010 and then throughout the term of the plan	Area managers/ conservators	Medium

5.1.17 Topic 17—BNZ Operation Nest Egg

BNZ Operation Nest Egg was developed in 1994 using funding from BNZ. It has become a powerful tool for increasing kiwi populations that is used for several taxa of kiwi and involves six captive facilities and a large number of community- and DOC-led programmes.

Throughout the development phase of BNZ Operation Nest Egg, data on its use were collected and analysed nationally. However, since completion of the development phase, data collection has not been continued, making comparisons between taxa and techniques difficult and thus hindering further improvements and optimisation of its employment.

Standards that were developed for critical aspects of the programme, such as egg handling, incubation and chick rearing, have been superseded by further refinements undertaken by practitioners and captive institutions. A variety of protocols are now used, without national guidance as to minimum standards required.

The identification or creation of incubation capacity and suitable crèche sites has been largely uncoordinated, driven by local need rather than through regional or national planning. This has increased the risk of duplication or less efficient use of resources. Communication and sharing of information between captive facilities appears to be restricted.

Because it provides the opportunity to be directly involved in handling of kiwi, BNZ Operation Nest Egg is an attractive tool for advocacy purposes. However, its high cost and labour requirement make it less economical than other tools in larger populations. The comparison of cost versus benefit of BNZ Operation Nest Egg versus predator control is not widely understood.

A national, long-term plan for BNZ Operation Nest Egg and how it supports the kiwi recovery plan is lacking. There is currently no plan for the number of crèche sites/location, number of incubation facilities needed, etc.

Issues

Issue 17.1: National data on the use and success of BNZ Operation Nest Egg is not available

Issue 17.2: Minimum standards have not been developed or updated and agreed on between practitioners

Issue 17.3: The use of BNZ Operation Nest Egg lacks national coordination

Objectives and actions

Objective 17.1: To ensure that the use of BNZ Operation Nest Egg is effective and undertaken to sufficient standard

ACTION		ACCOUNTABILITY	PRIORITY
17.1	Review protocols for all components of BNZ Operation Nest Egg, including the development of minimum standards as part of best practice, by 2009 and update biennially	Recovery Group/ captive coordinator/ ARAZPA	Essential
17.2	Initiate national coordination for the collection and reporting of data on the use of BNZ Operation Nest Egg by 2009	Recovery Group/ captive coordinator/ ARAZPA	Medium
17.3	Develop guidelines for when and where to use BNZ Operation Nest Egg instead of, or in conjunction with, other tools by 2010	Research and Development Group	High
17.4	Develop a 10-year plan for BNZ Operation Nest Egg, including number and location of incubation facilities and crèche sites, by 2010	Recovery Group/ captive coordinator/ ARAZPA	High

5.2 COMMUNITY RELATIONS AND ENGAGEMENT

Recovery and protection of kiwi relies on the interest, understanding and engagement of many sectors of New Zealand society, not just professional conservation organisations and ecologists. The strong association New Zealanders have with kiwi (see sections 3.3–3.5) presents both opportunities and challenges. Realising these opportunities will have a strong influence on the outcome of this plan and the future of kiwi in the wild.

5.2.1 Topic 18—Advocacy

Advocacy continues to be an important component of kiwi recovery, helping to ensure broader public acceptance and buy-in, as well as creating actual support and resources. It includes sharing information, promoting specific issues and solutions, and generally raising awareness about kiwi protection.

Since 2006, kiwi advocacy has been coordinated by the 'National Mentor for Kiwi Advocacy'. This position is funded through BNZ Save the Kiwi Trust and has replaced the regional kiwi advocacy positions previously established in some areas (e.g. Northland, Coromandel). The National Mentor coordinates the development and dissemination of national and local advocacy material, and supports individual projects through visits, workshops and technical advice.

Issues

Issue 18.1: National coordination of advocacy might not be able to serve specific local needs

Issue 18.2: Advocacy is not always considered as an integral part of recovery planning

Issue 18.3: Advocacy material is sometimes of poor quality or outdated, under-utilising opportunities or even creating negative advocacy

Objectives and actions

Objective 18.1: To increase awareness and support for kiwi protection through the provision of high-quality advocacy for kiwi projects at all levels

	ACTION	ACCOUNTABILITY	PRIORITY
18.1	Coordinate advocacy nationally, including the development of resources and provision of advice, through a National Mentor for Kiwi Advocacy throughout the term of the plan	Recovery Group/ BNZ Save the Kiwi Trust	Essential
18.2	Establish a regional support structure for local kiwi projects, including for advocacy, by 2010 and maintain this throughout the term of the plan (Note: Same as Action 20.2, section 5.2.3)	National Mentor for Kiwi Advocacy	High
18.3	Develop an advocacy section in each taxon plan that outlines methods and tools by 2009	Taxon plan lead conservators	Essential

5.2.2 Topic 19—Tangata whenua

The Department of Conservation is committed to giving effect to the unique relationship that tangata whenua (iwi or hapu that have customary authority in a place) have with kiwi. This includes memoranda of understanding, partnerships, protocols and legal agreements such as under the Ngai Tahu Claims Settlement Act 1998.

Tangata whenua have a repository of knowledge about kiwi, which is invaluable when dealing with the bird. In many areas, iwi have embraced the kaupapa (principles) of kiwi recovery and kiwi habitat restoration, and are applying an active kaitiaki (guardian) role by carrying out predator control, building protection fences and implementing BNZ Operation Nest Egg. Iwi also take part in kiwi programmes generally, e.g. by being kept informed, having input into decision making and being directly involved in translocations.

Issues

Issue 19.1: Involvement by tangata whenua in aspects of kiwi management is variable across the country, with more opportunities present than have been utilised

Issue 19.2: The role of iwi in kiwi recovery planning and implementation and access to cultural materials is not always understood or given effect to

Objectives and actions

Objective 19.1: To ensure that iwi are involved at all levels of kiwi management and research in an interactive way and in a way appropriate to all parties' commitments and expectations

	ACTION	ACCOUNTABILITY	PRIORITY
19.1	Include tangata whenua in the development and implementation of taxon plans throughout the term of the plan	Taxon plan lead conservators	Essential
19.2	Identify opportunities and current barriers for the involvement of tangata whenua in kiwi recovery throughout the term of the plan	Area managers/ conservators	Essential
19.3	Ensure that agreed processes for involvement of tangata whenua in kiwi management are observed throughout the term of the plan	Area managers/ conservators	Essential

5.2.3 Topic 20—Community-led initiatives

Over the term of the previous recovery plan, community-led initiatives for the protection of kiwi greatly increased in number and extent. These include initiatives led by private landowners, local interest groups, trusts and businesses. In some places, these initiatives now equal or surpass the effort able to be committed by DOC.

Community-led initiatives and the support for them form a vital part of national kiwi recovery.

Issues

Issue 20.1: Community-led projects face a number of issues that endanger their long-term sustainability, including:

- Working within a mainly annual grant structure and therefore a lessened ability for long-term planning
- Workload being carried mostly by volunteers, including aspects of strategic planning, funding and administration (e.g. translocation proposals) that are time-consuming and require specialist knowledge and skills
- Practitioners not always having good access to the latest information pertaining to kiwi recovery, e.g. best practice, land management techniques, priority sites for kiwi protection

Objectives and actions

Objective 20.1: To ensure that community involvement in kiwi protection is optimised, sustained and follows best practice

	ACTION	ACCOUNTABILITY	PRIORITY
20.1	Provide regular opportunities to strengthen networks and information sharing among community-led projects, including regional/national meetings ('kiwi hui') for kiwi practitioners and other stakeholders throughout the term of the plan	Recovery Group/ BNZ Save the Kiwi Trust	Essential
20.2	Establish a regional support structure for local kiwi projects, including for advocacy, in 2010 and maintain this throughout the term of the plan (Note: Same as Action 18.2, section 5.2.1)	National Mentor for Kiwi Advocacy	High
20.3	Provide regular suitable forums and training opportunities to share information on best practice, sustainability, strategic planning and funding for community-led initiatives throughout the term of the plan	BNZ Save the Kiwi Trust/ Recovery Group	Essential
20.4	Provide community groups with information on priority areas for management of kiwi by 2010 and then throughout the term of the plan	Recovery Group/ BNZ Save the Kiwi Trust/ taxon plan lead conservators	High
20.5	Include community groups, where applicable, in the development and implementation of taxon plans throughout the term of the plan	Taxon plan lead conservators	Essential

5.2.4 Topic 21—Corporate sponsorship

Kiwi recovery has benefited from a high public profile and interest, which in turn has made it attractive for corporate sponsorship.

Since 1991, BNZ has been the major sponsor for kiwi recovery planning, resulting in the establishment of the BNZ Save the Kiwi Trust, a formal partnership between BNZ and DOC, in 2002. The Trust allocates sponsorship money and supports kiwi recovery through the provision of information, resources, workshops and training. National sponsorship to the Trust is received from several sources, with BNZ currently being the principal sponsor. Further local sponsorship arrangements also contribute to the overall recovery support.

As part of the sponsorship agreement when the Trust was formed, all kiwi work carried out by DOC falls under the banner of BNZ Save the Kiwi Trust, regardless of whether it has received direct funding through the Trust or not. This has led to confusion among stakeholders between sponsor acknowledgement and sponsored recovery management, and a perception of exclusivity with the principal sponsor, despite the Trust deed accommodating further sponsors within the Trust's umbrella.

Issues

Issue 21.1: Strategic planning processes for kiwi recovery by DOC (i.e. through this plan) and BNZ Save the Kiwi Trust are largely undertaken independently

Issue 21.2: The role of BNZ Save the Kiwi Trust in overall kiwi recovery requires clarification, including its relationship with the Kiwi Recovery Group

Issue 21.3: To fulfil the goals of this plan, funding for kiwi recovery, including that obtained from outside DOC, needs to increase to allow for the necessary expansion of projects

Objectives and actions

Objective 21.1: To ensure that the strategic direction of the BNZ Save the Kiwi Trust is consistent with the national kiwi recovery plan

Objective 21.2: To ensure that the benefits and responsibilities through the formation of the BNZ Save the Kiwi Trust are fully realised

Objective 21.3: To increase the support (financial and otherwise) for kiwi recovery through sponsorship

ACTION		ACCOUNTABILITY	PRIORITY
21.1	Review and communicate the focus and role of BNZ Save the Kiwi Trust in national kiwi recovery in 2009 then every 3 years thereafter	General Manager Marketing and Communications Group/ BNZ Save the Kiwi Trust	Essential
21.2	Undertake joint development and implementation of national strategies by the Kiwi Recovery Group and BNZ Save the Kiwi Trust throughout the term of the plan	Recovery Group/ BNZ Save the Kiwi Trust	Essential
21.3	Promote within DOC and externally the role of BNZ Save the Kiwi Trust as a key participant in kiwi management throughout the term of the plan	Area managers/ conservators	High
21.4	Ensure DOC staff are aware of and follow their obligation under the sponsorship agreement with BNZ throughout the term of the plan	Area managers/ conservators	High
21.5	Develop strategies in 2009 to double the amount of corporate sponsorship funding for kiwi recovery available by 2013	General Manager Marketing and Communications Group/ BNZ Save the Kiwi Trust	Essential

5.2.5 Topic 22—Statutory planning

Some of the threats to kiwi are activities that can be addressed by statutory authorities by means of legislation, regulations, rules, incentives and policies.

Issues

Issue 22.1: Predation of kiwi by domestic animals, in particular dogs and cats, is likely to increase with further land development and is difficult to manage outside public conservation land

Issue 22.2: Land development has the potential to negatively impact on kiwi habitat but could also provide opportunities for increased kiwi protection

Objectives and actions

Objective 22.1: To avoid, remedy or mitigate threats to kiwi and their habitat by promoting legislative and policy changes to statutory authorities

ACTION		ACCOUNTABILITY	PRIORITY
22.1	Raise awareness of kiwi threats associated with land use and how statutory planning and policy can support kiwi recovery by 2009 and then throughout the term of the plan	Area managers/ conservators/ BNZ Save the Kiwi Trust	High
22.2	Promote the inclusion of statutory protection of kiwi habitat and of kiwi from predation in district plans by 2009 and then throughout the term of the plan	Area managers/ conservators/ BNZ Save the Kiwi Trust	High
22.3	Provide local authorities with information on priority areas for management of kiwi by 2009 and then throughout the term of the plan	Area managers/ conservators	High

5.2.6 Topic 23—Development of environmental standards

The rural production sector (forestry, life-stock farming and horticulture) is developing standards that take into consideration the needs of ecosystems, wildlife and water quality. There is an opportunity for the development and implementation of these standards to play a major part in kiwi protection.

Issues

Issue 23.1: Guidance about kiwi-specific issues is either unavailable or not being promoted to the rural production sector

Objectives and actions

Objective 23.1: To optimise opportunities for kiwi protection on private production land through inclusion in appropriate environmental standards

ACTION		ACCOUNTABILITY	PRIORITY
23.1	Provide information to certifying bodies for forestry, life-stock farming and horticulture regarding kiwi biology and protection methods, and promote their consideration in the development of standards and certification criteria by 2009 and then throughout the term of the plan	Area managers/ conservators/ BNZ Save the Kiwi Trust	Medium

5.3 RESEARCH AND INNOVATION

The recovery of kiwi has greatly benefited from research and technology that has been developed in the past, and will continue to be dependent on good scientific understanding and adequate tools. Current limitations include affordability and the scale of pest management, monitoring and management of episodic impacts (e.g. dogs, ferrets). New technology that addresses these limitations will provide the next big leap forward in kiwi recovery.

Research and developments that have either recently been completed or are currently underway include investigations into the genetic status of populations and taxa, diet of captive kiwi, the development of multi-set traps, smart transmitters and new monitoring tools (see also Appendix 1). This research is being carried out at a number of universities, within DOC and through private enterprise.

5.3.1 Topic 24—Research planning

Issues

Issue 24.1: In a field as diverse as kiwi recovery, good communication of research needs, opportunities and ideas is required to optimise the investment (both within and outside DOC) into kiwi research and to ensure that opportunities to address the key recovery questions are recognised and supported.

Objectives and actions

Objective 24.1: To identify, communicate and support key research needs for kiwi recovery

	ACTION	ACCOUNTABILITY	PRIORITY
24.1	Develop (by 2010) and review (in 2013 or more regularly if required) a research plan for kiwi, and communicate this to researchers (internal and external to DOC) as part of kiwi recovery planning	Research and Development Group	High

5.3.2 Topic 25—Genetics and taxonomy

Some recently established populations of kiwi may have passed through genetic bottlenecks. This is particularly likely for populations that are on islands and/or have been established through BNZ Operation Nest Egg. Genetic bottlenecks may also have naturally occurred in the past (see section 3.1.5). In the absence of a good understanding of their effects, management needs to apply a precautionary principle of minimising the risk of genetic bottlenecks occurring.

A basic requirement for recovery planning of any species is a good understanding of the actual identity of the species (or other significant taxonomic units) that need to be considered for recovery. While important progress has been made over the last decade in understanding kiwi taxonomy (Burbidge et al. 2003; Tennyson et al. 2003; Shepherd & Lambert 2008), some of the taxonomic work that has been completed still awaits formal publication, while other work awaits completion.

Issues

Issue 25.1: The potential or actual effects of genetic bottlenecks on kiwi populations have not yet been quantified but may be significant

Issue 25.2: Kiwi taxonomy is not resolved, leading to uncertainties about the taxonomic status and the associated importance of distinct populations

Objectives and actions

Objective 25.1: To formally clarify the taxonomy of kiwi

Objective 25.2: To maximise the genetic diversity of kiwi within each taxon within the bounds of natural rates of genetic exchange and to ensure that new populations are established with the best possible composition of founders

ACTION		ACCOUNTABILITY	PRIORITY
25.1	Complete research on kiwi taxonomy by 2010 and formally publish findings	Research and Development Group	Essential
25.2	Support/lead research on the genetic diversity of translocated, captive, BNZ Operation Nest Egg-based and island populations by 2013	Research and Development Group	High
25.3	Research the implications of bottlenecking, fine-scale diversity and genetic homogenisation by 2013	Research and Development Group	High

5.3.3 Topic 26—Autecology and population dynamics

Issues

Issue 26.1: For some taxa, the lack of baseline data on key parameters (mortality, recruitment, etc.) means that trend analysis, including population modelling, is not possible. For other taxa, this information is available but has not yet been fully utilised in population modelling.

Issue 26.2: Despite great advances in research on kiwi, key information required to assess their status and management needs is not yet available for some species.

Objectives and actions

Objective 26.1: To ensure that robust population modelling is undertaken for all taxa

Objective 26.2: To increase our understanding of the ecology and behaviour of kiwi

ACTION		ACCOUNTABILITY	PRIORITY
26.1	Initiate/improve collection of baseline data for modelling of great spotted kiwi and southern Fiordland tokoeka by 2010	Research and Development Group	High
26.2	Initiate/complete population modelling and disseminate results from available data (including banding and territory mapping) for all species by 2013	Research and Development Group	Essential
26.3	Liaise with research providers to initiate/support research on the ecology and behaviour of all kiwi species, with a particular focus on South Island species, throughout the term of the plan	Research and Development Group	Medium
26.4	Research (including through research by management) reasons for low fecundity and small effective population size for rowi and Haast tokoeka, and develop management prescriptions based on these findings by 2011 (Note: Same as Action 8.5, section 5.1.8)	Research and Development Group	Essential

5.3.4 Topic 27—Pest management

While successful pest control technologies that protect kiwi exist (e.g. trapping), they have associated high labour costs. This limits their applicability, as they would need to be used over large areas to halt the decline of several species of kiwi. Aerial 1080 is currently being tested as a large-scale tool for kiwi protection.

Without the development and application of new and more efficient technologies for pest control, kiwi will be limited to a few populations existing in relatively small, intensively managed pockets; unmanaged populations in the wild will continue to decline or become extinct.

For some populations (e.g. in Northland), dogs have surpassed mustelids as the main agent of decline, yet few tools are available to mitigate or reduce that problem. Kiwi avoidance training for dogs is widely used as one method to limit the impact of dogs on kiwi. However, there is no conclusive proof of its effectiveness.

Issues

Issue 27.1: Existing technologies for pest control to protect kiwi are labour intensive

Issue 27.2: Tools for dog control are limited or unproven

Objectives and actions

Objective 27.1: To improve the cost-effectiveness of pest control management

Objective 27.2: To reduce the impact of dogs on kiwi populations

ACTION		ACCOUNTABILITY	PRIORITY
27.1	Support and/or lead the development of traps, bait, toxins and delivery systems for control of mustelids, rats, cats and dogs in kiwi areas throughout the term of the plan	Research and Development Group	Essential
27.2	In collaboration with other landscape-scale predator control programmes, support/initiate the development of integrated pest management techniques that support broader biodiversity maintenance and enhancement while fulfilling the goal for kiwi recovery throughout the term of the plan	Research and Development Group	Essential
27.3	Implement aerial 1080 at two or more additional sites by 2011, and monitor effects for kiwi and the wider ecosystem	Research and Development Group	Essential
27.4	Support/lead research into the effectiveness of kiwi avoidance training for dogs and standardise the technique according to research findings by 2010	Research and Development Group	Essential

5.3.5 Topic 28—Monitoring

Recovery effort needs to be directed and informed by data on population trends in managed and unmanaged populations. The nationwide Kiwi Call Count Scheme (McLennan 1992) and a programme of 5- or 10-yearly checks of banded populations of kiwi around the country have provided a good basis for measuring broad population trends of all taxa since the early 1990s. These need to be continued to provide sufficiently robust information. However, both techniques are only effective in moderate to dense populations.

More detailed assessment of population trends requires robust data on key population parameters (mortality, recruitment, etc.) through monitoring of individual birds (e.g. using transmitters). However, this is labour intensive, limiting the scale of many projects. The development of new techniques, such as detection of age ratios using dog surveys (McLennan & Potter 1993), remote landscape-scale detection of the number and geographical distribution of kiwi calls in sparse populations, and remote recognition of individuals (e.g. from their calls, or DNA in faeces or feathers), is likely to improve the cost-effectiveness of monitoring population turnover and change.

Issues

Issue 28.1: Population trend monitoring requires a long-term commitment of effort that is difficult to maintain with short-term funding cycles

Issue 28.2: Tools for broad population trend monitoring are unsuitable for low-density (e.g. widely dispersed) populations

Issue 28.3: Detailed population monitoring is cost- and labour-intensive

Objectives and actions

Objective 28.1: To ensure that sufficient and robust information is available to assess the status and trends of kiwi species and key populations

ACTION		ACCOUNTABILITY	PRIORITY
28.1	Continue the nationwide Kiwi Call Count Scheme and 5- or 10-yearly monitoring of banded populations in moderate- to high-density populations throughout the term of the plan	Research and Development Group	High
28.2	Support/lead research on remote landscape-scale monitoring methods for use in sparse populations by 2013	Research and Development Group	High
28.3	Support/lead research into identification of individuals, e.g. automated call recognition, genetic fingerprinting from faeces or feathers, by 2013	Research and Development Group	Medium
28.4	Support/lead research into the link between index methods (e.g. call counts) and the actual abundance of kiwi by 2013	Research and Development Group	High

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Appendix 1

RESULTS OF KIWI RECOVERY PROGRAMME, 1996–2006

The long-term recovery goal for the 1996–2006 kiwi recovery plan was:

> *... to maintain and, where possible, enhance the current abundance, distribution and genetic diversity of kiwi* (Robertson 2003: 9)

Goals for the term of the 1996–2006 plan were:

> *1. To encourage and support public and community protection of kiwi and their habitat throughout the term of this plan.*
>
> *2. To secure representative populations of all kiwi taxa in the wild and in their natural range by April 2006.*
>
> *3. To identify all genetically distinct kiwi populations, and determine their range, trends, threats, and suitable management units by April 2006.*
>
> (Robertson 2003: 9)

The following objectives were presented in the 1996–2006 kiwi recovery plan (Robertson 2003), in response to specific issues. Particular actions that needed to be carried out to attain these objectives were identified in the plan; the level of achievement is assessed for each action identified.

Topic 1—Tangata whenua

Issue: Tangata whenua might not be involved in kiwi recovery in a way appropriate to parties' commitments and expectations under the Treaty of Waitangi.

Objective: Iwi are involved at all levels of kiwi research and management in an interactive way and in a way appropriate to all parties' commitments and expectations under the Treaty of Waitangi, taking particular note of the requirements of the Ngai Tahu Claims Settlement Act 1998.

	IDENTIFIED ACTION	ACHIEVEMENT
1.1	Identify any gaps in the current presentation of data on kiwi protection to ensure that tangata whenua are fully aware of all activities related to this protection.	The relationship between DOC, kiwi management and iwi is developing. As this relationship continues to develop, information exchange will continue to increase. It is still some way off ideal.
1.2	Ensure that tangata whenua have access to taonga material according to processes as agreed between them and the Department of Conservation.	While significant effort has been placed in this area, it is still not the smoothest process for all parties at some sites.

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IDENTIFIED ACTION		ACHIEVEMENT
1.3	Ensure that the Department acts in synergy with tangata whenua to maintain open communication about, and involvement in, kiwi management and research, welcoming and respecting contributions from tangata whenua.	Engagement has been modest, but is increasing. The annual 'kiwi hui' is now becoming the most appropriate forum for iwi aspirations and information exchange.
1.4	Assess methods of kiwi conservation which are now in place with respect to the full sharing of knowledge with tangata whenua.	Some notable examples achieved, e.g. Waikaremoana Hapu Restoration Trust.

Topic 2—Communities

Issue: Many New Zealand communities are not actively involved in kiwi conservation because of a lack of information and resources, and lack of kiwi protection on private land.

Objective: Communities are empowered to protect kiwi by the sharing of knowledge and best management practices among all individuals and organisations concerned with this protection.

IDENTIFIED ACTION		ACHIEVEMENT
2.1	Reinforce messages about the threats to kiwi and actions people can take to enhance kiwi populations in their local areas.	Local advocates reinforcing messages. Kiwi practitioners' hui is providing networking and information sharing opportunities.
2.2	Encourage and empower people to develop and carry out their own conservation projects, or to assist with other research and management.	Many community groups have been empowered to protect kiwi on private and, in some cases, DOC-administered land.
2.3	Advocate land management practices and voluntary codes of conduct for companies and private landowners that will help to maintain or enhance kiwi populations and their habitats.	Several forestry companies now have kiwi management plans and are funding protection on their land. District and regional authorities (especially in Northland) have recognised the need for kiwi protection in their planning documents.
2.4	Evaluate proposals to transfer kiwi to 'open sanctuaries, 'mainland islands' or other suitable sites where they can act as a resource for advocacy and education, as well as contributing to the conservation of kiwi.	Three species of kiwi were translocated to five new locations during the course of the plan. Although it is still early days, indications are that populations are likely to establish from these releases.
2.5	Encourage captive breeding institutions to present accurate information on kiwi and their conservation.	The captive industry has met the challenge of good record keeping of its own accord. This has been further enhanced by stronger relationships between DOC and the industry, brought about by a shared vision of 'making more kiwi'.
2.6	Endeavour to secure kiwi habitat on private land.	Community projects on private land are growing very rapidly. Legal long-term protection through Queen Elizabeth II National Trust is being applied to more projects, and pest management (along with fencing) plans are now being developed for these.

Topic 3—Planning

Issue: In some instances, kiwi are threatened by activities that can be addressed by statutory authorities (by means of legislation, regulations, rules, and policies) and by other organisations.

Objective:—Threats to kiwi and their habitat are reduced by promoting legislative and policy changes to statutory authorities.

IDENTIFIED ACTION		ACHIEVEMENT
3.1	Promote statutory and policy changes to assist with the conservation of kiwi and their habitats.	The Dog Control Act (1996) includes provision for tighter control on dogs. Regulations have restricted the ability to sell or shift pet ferrets around the country. Some small success in local bylaws, particularly at subdivisions (pet-free zoning, etc.).
3.2	Minimise road deaths of kiwi.	Road signage warning motorists of kiwi is now commonplace in kiwi areas, though road kills do still occur.

Topic 4—Threat management of agent(s) of decline (*in situ* pest animals or plants; climatic extremes, disease)

Issue: Mainland populations of kiwi are still under threat from introduced predators and will decline without management.

Objective: Representative populations of mainland kiwi are stabilised or increasing.

IDENTIFIED ACTION		ACHIEVEMENT
4.1	Maintain intensive management of Okarito brown kiwi/rowi in the wild and increase population to 200 birds or more by 2006.	The rowi population is now estimated to be 250 birds. This has primarily come about through efforts from BNZ Operation Nest Egg. *In situ* management techniques (predator control) still require considerable refinement to be effective.
4.2	Develop programmes to secure representative wild kiwi populations resulting in the IUCN and DOC threat classification status of all presently recognised kiwi taxa being either maintained or improved by 2006.	Although overall numbers of kiwi have declined, significant steps have been taken to secure their long-term viability. The IUCN threat ranking of all kiwi taxa has remained the same; however rowi, as a newly described species, will now be classified as Critically Endangered. The basis of the DOC Threat Classification System changed during the period. Brown kiwi is now unlikely to go extinct if current efforts from community and departmental programmes continue. Tokoeka will benefit from planned pest eradications from large islands in Fiordland and new initiatives on the mainland have begun. Great spotted kiwi populations are stable or declining only gradually and so have received little attention over the term of the plan, but this is changing with the development of community programmes. All little spotted kiwi populations are stable or increasing.

Topic 5—Restoration (translocation, ecosystem)

Issue: Techniques to effectively manage kiwi predators over large areas are still under development, and some taxa may continue to decline unless moved to secure offshore islands.

Objective: Secure island locations are found for threatened taxa of kiwi.

	IDENTIFIED ACTION	ACHIEVEMENT
5.1	Evaluate islands that may be ecologically and culturally suitable for kiwi.	This evaluation has been completed.

Topic 6—Maximising productivity of wild-laid eggs in captivity

Issue: The lack of knowledge of kiwi social systems and incubation procedures is leading to reduced productivity of wild-laid kiwi eggs in captivity, and of captive-raised kiwi chicks when released to the wild.

Objective: Tools are developed to maximise productivity of wild-laid eggs in captivity.

	IDENTIFIED ACTION	ACHIEVEMENT
6.1	Undertake research to identify the social systems of all kiwi, especially their incubation regimes.	Social systems are better understood for some taxa but knowledge gaps remain, especially for tokoeka in southern Fiordland and great spotted kiwi.
6.2	Develop *ex situ* egg and chick handling protocols to maximise productivity and minimise disease risk.	Successful BNZ Operation Nest Egg protocols have been developed for brown kiwi, rowi and Haast tokoeka, including the use of crèche islands or predator-fenced sites, whenever possible.
6.3	Monitor the fate of captive-reared chicks released into the wild and establish locally appropriate protocols to maximise survivorship.	Releases have been monitored closely. Survivorship has been very high, especially where reared on crèche islands.
6.4	Determine the average annual egg production, recruitment and survival of adult females with and without egg-cropping.	Data have been presented for brown kiwi and rowi. Low mortality rates of adult females make statistical comparisons difficult.
6.5	Assess the genetic diversity of the captive-reared wild kiwi.	Significant work done; at most sites, eggs/chicks are being collected from a broad range of pairs.

Topic 7—Captive breeding

Issue: The captive management of kiwi is not being managed sufficiently for the captive population to make a contribution to conservation of wild kiwi.

Objective: Captive institutions produce surplus kiwi progeny for release.

	IDENTIFIED ACTION	ACHIEVEMENT
7.1	Develop and adopt a captive management plan for kiwi.	A captive management plan has been produced and adopted.
7.2	Refine kiwi husbandry techniques, especially to reduce mortality of adult females and chicks.	In progress. Research into and development of an appropriate captive diet is nearing completion.
7.3	Assess health status of birds in captivity to establish husbandry protocols for all taxa.	An update to the 'husbandry manual' is still outstanding.
7.4	Bring further taxa into captivity to establish husbandry protocols for all taxa.	This has been achieved for rowi and Haast tokoeka (through BNZ Operation Nest Egg).
7.5	Determine what, if any, captive breeding programme is required for release into the wild, and identify kiwi captive breeding targets.	The capability of the captive industry to contribute to kiwi conservation has been assessed and the contribution has been evaluated as significant. BNZ Operation Nest Egg is the primary contributor; however, with ongoing management of captive founders, a significant contribution to the wild is possible through breeding for release. This outcome is starting to be realised through exchanges of founder stock between institutions and from the wild, with several releases of captive-bred birds to the wild having been completed.

Topic 8—Genetics and taxonomy

Issue: The lack of clarity about the genetic status of kiwi populations is leading to difficulty in identifying priority populations for management.

Objective: Kiwi populations with distinct genetic difference are identified.

	IDENTIFIED ACTION	ACHIEVEMENT
8.1	Analyse further blood samples from Okarito and Haast populations to ascertain the taxonomic status of those populations.	Completed. Rowi has been formally described as a separate species. Haast tokoeka has been isolated for an extended period from other tokoeka, and is being managed as a separate taxon.
8.2	Analyse blood samples from populations not sampled adequately to ascertain the taxonomic status of major (geographical) North Island kiwi populations.	Completed. Four genetically distinct populations have been identified in the North Island.
8.3	Define appropriate management units, including identification of minimum founder population size, and genetically viable populations for all kiwi taxa.	Partly completed (see Action 11.4); ongoing.
8.4	Publish a new taxonomy of kiwi.	Not achieved, although rowi have now been formally described, and the draft taxonomy is supported by a variety of research.

Topic 9—Monitoring

Issue: Lack of information on kiwi population dynamics is leading to difficulty in interpreting trends in kiwi recovery and identifying populations where management effort is most needed.

Objective: Population trends of all taxa are monitored.

IDENTIFIED ACTION		ACHIEVEMENT
9.1	Collate and publish the baseline data for nationwide kiwi monitoring.	Information has been collated and is available electronically. Analysis of Northland counts has been published.
9.2	Repeat the nationwide kiwi monitoring scheme every five years to determine trends and confirm variations by further monitoring the next year.	Achieved (see Table A1.1), and some results have been formally published.
9.3	Undertake intensive monitoring of banded populations of kiwi to identify population dynamics.	Achieved (see Table A1.1), and some results have been formally published.

TABLE A1.1. DISTRIBUTION AND POPULATION ESTIMATES OF THE SIX KIWI TAXA RECOGNISED IN 2003.

Data for 2006 are given as both the number originally projected (without management) in 1996, and the actual situation in 2006 based on more recent survey information and population models that used more robust data than was available in 1996.

TAXON	LOCATION	1996	2006	
			PROJECTED	ACTUAL
North Island brown kiwi *Apteryx mantelli*	North Island	35000	20000	25000
Okarito brown kiwi/rowi *A. mantelli* 'Okarito'	Okarito, South Island	150	100	250
Haast tokoeka *A. australis* 'Haast'	Near Haast, South Island	225	125	300
Southern tokoeka *A. australis*	Stewart Island/Rakiura and Fiordland, South Island	27000	24000	34500
Great spotted kiwi/roroa *A. haastii*	Northern South Island	22000	12000	17000
Little spotted kiwi *A. owenii*	Kapiti Island and several smaller offshore islands	1100	1200	1500
Total (rounded)		85000	57000	79000

Topic 10—Autecology and population dynamics (survival, productivity, dispersal, recruitment, modelling) and management

Issues: Lack of knowledge about the population dynamics of some kiwi taxa is impeding recovery of those taxa.

Objective: The agents of decline for each taxon have been determined and the effectiveness of management assessed.

	IDENTIFIED ACTION	ACHIEVEMENT
10.1	Undertake research on the productivity, survival, and dispersal of kiwi to ascertain factors affecting survival and productivity.	Achieved to varying degrees for all taxa except for tokoeka in southern Fiordland.
10.2	Develop population models to support management decisions.	Ongoing. Models are available to, and being used by, managers.
10.3	Undertake research on the effects of pest management on kiwi to identify kiwi survivorship through pest control/ eradications using new techniques and/or timing.	Ongoing. Results are available to, and being used by, managers.
10.4	Undertake research on the ecology of, and threats to, the Haast tokoeka.	Ongoing. Results are available to, and being used by, managers.
10.5	Undertake research on the Southern Alps population of great spotted kiwi/roroa to determine regional variation in population dynamics and management.	Not undertaken, although some preliminary work has been carried out in North Hurunui as part of long-term monitoring work.
10.6	Undertake research on the management of kiwi in rough farmland to determine the best practical land management to enhance/maintain kiwi population in these areas.	Work carried out in eastern Taranaki by Massey University not completed.
10.7	Undertake research on the use of exotic forests by kiwi to determine the best practical land management to enhance/ maintain kiwi populations in pine plantations.	Small independent research project in progress, with funding from industry and from BNZ Save the Kiwi Trust sponsorship.
10.8	Undertake research on the short-term and long-term impacts of land clearance to determine the best practical land clearance to maintain kiwi populations.	Research started in Northland was not completed due to a change in plans by property developer.
10.9	Undertake research on feral pigs and pig hunting as a threat to kiwi to determine the best practical pig hunting methods to maintain kiwi in recreational hunting areas.	Pigs shown to present a low risk to kiwi compared with dogs. Kiwi aversion training for dogs has been developed and anecdotally has been successful, although some research into its effectiveness gave ambiguous results. Work continues in this area.

Topic 11—Distribution

Issue: Lack of information about kiwi distribution is leading to difficulty in identifying key populations for management.

Objective: Gaps in our knowledge of kiwi distribution have been identified and surveyed.

	IDENTIFIED ACTION	ACHIEVEMENT
11.1	Continue the Kiwi Call Scheme to determine relative kiwi abundance (over time) from casual observation.	Ongoing. Data have been collated centrally within Research and Development Group, DOC, but problems with database storage remain unresolved.
11.2	Continue the Kiwi Reporting Scheme to identify kiwi distribution (and changes over time).	Ongoing. Data have been collated centrally within Research and Development Group, DOC.
11.3	Survey southern tokoeka in Fiordland to determine distribution, abundance, and population trends.	Ongoing. Considerable progress has been achieved through specific surveys and synergies with other programmes (kiwi genetics and kakapo survey).
11.4	Survey specific sites for all species to gain an understanding of kiwi distribution to a level suitable for defining management units.	Achieved. Eleven taxonomic units have been identified and distribution boundaries are now well understood.

Appendix 2

TIMELINE AND PRIORITIES FOR RECOVERY ACTIONS FOR KIWI (*Apteryx* spp.)

Actions have been abridged to include key points; see section 5 for full details. Shaded areas are years when actions should be implemented or completed.

Priorities (national):

E—Essential: Needs to be carried out within the timeframe and/or at the frequency specified to achieve the goals for kiwi recovery over the term of this plan. Highest risk for kiwi recovery if not carried out within the timeframe and/or at the frequency specified.

H—High: Necessary to achieve long-term goals. To be progressed and ideally completed within the term of the plan, with moderate risk if not carried out within the timeframe and/or at the frequency specified.

M—Medium: Necessary to achieve long-term goals. To be progressed within the term of the plan, but least risk if not completed within the term of the plan or within the timeframe and/or at the frequency specified.

ACTION NUMBER	ACTION	PRIORITY	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Topic 1—Recovery planning													
1.1	Annual reporting against recovery plan objectives	E	■	■	■	■	■	■	■	■	■	■	■
1.2	Full review of recovery progress	E						■					
1.3	Review membership of the Kiwi Recovery Group	M			■		■		■		■		■
1.4	Communicate purpose of the Kiwi Recovery Group	M	■	■	■	■	■	■	■	■	■	■	■
1.5	Review resources available for recovery planning advice	H	■	■	■	■	■	■	■	■	■	■	■
Topic 2—Taxon plans													
2.1	Develop taxon planning template and procedural guidance	E	■										
2.2	Develop taxon plans for each of the 11 recognised taxa	E		■									
Topic 3—Kiwi sanctuaries													
3.1	Review and publish progress of kiwi sanctuaries	E		■									
3.2	Review goals and wider direction for each sanctuary	E		■									
3.3	Prepare a new strategic plan for kiwi sanctuaries	E		■									
3.4	Initiate and utilise a kiwi sanctuary network	M		■	■	■	■	■	■	■	■	■	■
Topic 4—Island strategy													
4.1	Develop an island strategy for kiwi recovery	E		■									
Topic 5—Best practice													
5.1	Update kiwi best practice manual	M			■	■	■	■	■	■	■	■	■
5.2	Develop and assess variations to current best practice	M	■	■	■	■	■	■	■	■	■	■	■
5.3	Provide regular technical best practice workshops	H	■	■	■	■	■	■	■	■	■	■	■
5.4	Database of best practice qualified persons	M		■	■	■	■	■	■	■	■	■	■
5.5	Best practice in local permit system	H	■	■	■	■	■	■	■	■	■	■	■

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ACTION NUMBER	ACTION	PRIORITY	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Topic 6—Review schedule													
6.1	Review schedule for key supporting documents	M	■										
Topic 7—Island biosecurity													
7.1	Island biosecurity plans and protocols	E	■	■	■	■	■	■	■	■	■	■	■
7.2	Contingency plans for kiwi populations on islands	E		■									
Topic 8—Small population number and size													
8.1	Maximise BNZ Operation Nest Egg efforts for rowi and Haast tokoeka	E	■	■	■	■	■	■	■	■	■	■	■
8.2	Landscape-scale pest control prescriptions for rowi and Haast tokoeka	H						■					
8.3	New populations for rowi and Haast tokoeka	E				■							
8.4	Population of rowi and Haast tokoeka as sources for transfers	E				■	■	■	■	■	■	■	■
8.5	Fecundity and effective population size for rowi and Haast tokoeka	E				■							
Topic 9—Minimum secure populations													
9.1	Establish pest control at BNZ Operation Nest Egg sites	H											■
9.2	Maximise effectiveness and efficiency of predator control	H			■	■	■	■	■	■	■	■	■
9.3	Optimise large-scale pest control to benefit kiwi	H					■	■	■	■	■	■	■
9.4	Increase managed sites for Fiordland tokoeka and great spotted kiwi	H						■					
9.5	Additional 200 pairs of eastern brown kiwi secure	H			■								
Topic 10—Declining populations													
10.1	Landscape-scale pest control at sites with greatest potential gain	H	■	■	■	■	■	■	■	■	■	■	■
10.2	Manage populations as sources (kohanga kiwi) for translocations	H	■	■	■	■	■	■	■	■	■	■	■
Topic 11—Carrying capacity													
11.1	Additional populations of little spotted kiwi	H			■			■					
Topic 12—Inbreeding depression													
12.1	Research genetic diversity and bottleneck effects in little spotted kiwi	H		■									
12.2	Maximise Long Island genotype of little spotted kiwi	E			■								
Topic 13—Distribution and genetic diversity													
13.1	Investigate new populations within the historic range of a taxon	H		■									
13.2	Optimise low-level landscape-scale management to benefit kiwi	H					■	■	■	■	■	■	■
13.3	Manage taxa as separate conservation management units	H	■	■	■	■	■	■	■	■	■	■	■
13.4	Manage fine-scale diversity within recognised taxa	M	■	■	■	■	■	■	■	■	■	■	■
13.5	Western brown kiwi on Hauturu/Little Barrier Island	M	■	■	■	■	■	■	■	■	■	■	■
13.6	Mixed-provenance populations at Rimutaka and Pukaha Mount Bruce	M	■	■	■	■	■	■	■	■	■	■	■
13.7	Review management of existing mixed-provenance populations	M			■								
Topic 14—Data management													
14.1	Database for kiwi sanctuaries	H			■								
14.2	Review data management procedures in kiwi sanctuaries	M			■		■		■		■		■
14.3	Data from other DOC and community-led kiwi projects	M				■							
Topic 15—Captive coordination													
15.1	Clarify link between the Kiwi Recovery Group and CMaG: ARAZPA	M		■									
15.2	Review the role of KCMAC	M		■									
15.3	Review the captive management plan	E		■					■				
15.4	Report on progress towards captive management plan objectives	M	■	■	■	■	■	■	■	■	■	■	■

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ACTION NUMBER	ACTION	PRIORITY	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Topic 16—Captive husbandry													
16.1	Review and update the kiwi captive husbandry manual	H	■		■		■		■		■		
16.2	Standards for captive management facilities and practitioners	H			■								
16.3	Best practice as part of the permit conditions for captive facilities	M			■	■	■	■	■	■	■	■	■
Topic 17—BNZ Operation Nest Egg													
17.1	Protocols and minimum standards for BNZ Operation Nest Egg	E		■		■		■		■		■	
17.2	National coordination for BNZ Operation Nest Egg data	M		■									
17.3	Guidelines for use of BNZ Operation Nest Egg	H			■								
17.4	10-year plan for BNZ Operation Nest Egg	H			■								
Topic 18—Advocacy													
18.1	National Mentor for Kiwi Advocacy	E	■	■	■	■	■	■	■	■	■	■	■
18.2	Regional support structure for local kiwi projects	H			■	■	■	■	■	■	■	■	■
18.3	Advocacy section in each taxon plan	E		■									
Topic 19—Tangata whenua													
19.1	Tangata whenua included in taxon planning and implementation	E	■	■	■	■	■	■	■	■	■	■	■
19.2	Identify opportunities and barriers to involve tangata whenua	E	■	■	■	■	■	■	■	■	■	■	■
19.3	Observe agreed processes for involvement of tangata whenua	E	■	■	■	■	■	■	■	■	■	■	■
Topic 20—Community-led initiatives													
20.1	Networks and information sharing among community-led projects	E	■	■	■	■	■	■	■	■	■	■	■
20.2	Regional support structure for local kiwi projects	H			■	■	■	■	■	■	■	■	■
20.3	Best practice, sustainability, strategic planning and funding	E	■	■	■	■	■	■	■	■	■	■	■
20.4	Communicate priority areas for management of kiwi	H			■	■	■	■	■	■	■	■	■
20.5	Community groups included in taxon planning and implementation	E	■	■	■	■	■	■	■	■	■	■	■
Topic 21—Corporate sponsorship													
21.1	Review focus and role of BNZ Save the Kiwi Trust in kiwi recovery	E		■			■			■			■
21.2	Joint strategies of Kiwi Recovery Group and BNZ Save the Kiwi Trust	E	■	■	■	■	■	■	■	■	■	■	■
21.3	Promote role of BNZ Save the Kiwi Trust in kiwi recovery	H	■	■	■	■	■	■	■	■	■	■	■
21.4	DOC staff obligations under sponsorship agreement	H	■	■	■	■	■	■	■	■	■	■	■
21.5	Strategies to double corporate sponsorship funding for kiwi	E		■									
Topic 22—Statutory planning													
22.1	Statutory planning and policy support for kiwi recovery	H		■	■	■	■	■	■	■	■	■	■
22.2	Statutory protection of kiwi and kiwi habitat in district plans	H		■	■	■	■	■	■	■	■	■	■
22.3	Priority areas for management of kiwi for local authorities	H		■	■	■	■	■	■	■	■	■	■
Topic 23—Development of environmental standards													
23.1	Certification criteria and standards for rural production sector	M		■	■	■	■	■	■	■	■	■	■
Topic 24—Research planning													
24.1	Research plan for kiwi	H			■			■					
Topic 25—Genetics and taxonomy													
25.1	Complete and publish research on kiwi taxonomy	E			■								
25.2	Genetic diversity of translocated and island populations	H						■					
25.3	Bottlenecking, fine-scale diversity and genetic homogenisation	H						■					

Continued on next page

Appendix 2—continued

ACTION NUMBER	ACTION	PRIORITY	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Topic 26—Autecology and population dynamics													
26.1	Data for modelling of great spotted kiwi and southern Fiordland tokoeka	H			■								
26.2	Population modelling for all species	E						■					
26.3	Ecology and behaviour of all kiwi species	M	■	■	■	■	■	■	■	■	■	■	■
26.4	Fecundity and effective population size for rowi and Haast tokoeka	E				■							
Topic 27—Pest management													
27.1	Tools for control of mustelids, rats, cats and dogs	E	■	■	■	■	■	■	■	■	■	■	■
27.2	Integrated pest management techniques	E	■	■	■	■	■	■	■	■	■	■	■
27.3	Aerial 1080 for kiwi protection	E				■							
27.4	Kiwi avoidance training for dogs	E			■								
Topic 28—Monitoring													
28.1	Kiwi Call Count Scheme and monitoring of banded populations	H	■	■	■	■	■	■	■	■	■	■	■
28.2	Remote landscape-scale monitoring methods	H						■					
28.3	Identification of individuals	M						■					
28.4	Link between index methods and actual abundance of kiwi	H						■					

Appendix 3

RELEVANCE OF RECOVERY ACTIONS TO INDIVIDUAL KIWI TAXA

Actions have been abridged to include key points; see section 5 for full details.

GSK: great spotted kiwi (*Apteryx haastii*); LSK: little spotted kiwi (*A. owenii*); toko: tokoeka (*A. australis*); rowi: rowi (*A. rowi*); brown: brown kiwi (*A. mantelli*); S Fiord: southern Fiordland; N Fiord: northern Fiordland; St.Isl: Stewart Island; N-land: Northland; Coro: Coromandel; W: western; E: eastern.

ACTION NUMBER	ACTION	GSK	LSK	HAAST TOKO	ROWI	S FIORD TOKO	N FIORD TOKO	ST-ISL TOKO	N-LAND BROWN	CORO BROWN	W BROWN	E BROWN	NOT TAXON SPECIFIC
1.1	Annual reporting against recovery plan objectives												×
1.2	Full review of recovery progress												×
1.3	Review membership of the Kiwi Recovery Group												×
1.4	Communicate purpose of the Kiwi Recovery Group												×
1.5	Review resources available for recovery planning advice												×
2.1	Develop taxon planning template and procedural guidance	×	×	×	×	×	×	×	×	×	×	×	
2.2	Develop taxon plans for each of the 11 recognised taxa	×	×	×	×	×	×	×	×	×	×	×	
3.1	Review and publish progress of kiwi sanctuaries			×	×				×	×	×		
3.2	Review goals and wider direction for each sanctuary			×	×				×	×	×		
3.3	Prepare a new strategic plan for kiwi sanctuaries												×
3.4	Initiate and utilise a kiwi sanctuary network												×
4.1	Develop an island strategy for kiwi recovery												×
5.1	Update kiwi best practice manual												×
5.2	Develop and assess variations to current best practice												×
5.3	Provide regular technical best practice workshops												×
5.4	Database of best practice qualified persons												×
5.5	Best practice in local permit system												×
6.1	Review schedule for key supporting documents												×
7.1	Island biosecurity plans and protocols												×
7.2	Contingency plans for kiwi populations on islands												×
8.1	Maximise BNZ Operation Nest Egg efforts for rowi and Haast tokoeka			×	×								
8.2	Landscape-scale pest control prescriptions for rowi and Haast tokoeka			×	×								
8.3	New populations for rowi and Haast tokoeka			×	×								
8.4	Population of rowi and Haast tokoeka as sources for transfers			×	×								
8.5	Fecundity and effective population size for rowi and Haast tokoeka			×	×								
9.1	Establish pest control at BNZ Operation Nest Egg sites	×				×	×		×		×	×	
9.2	Maximise effectiveness and efficiency of predator control									×		×	
9.3	Optimise large-scale pest control to benefit kiwi	×				×	×						

Continued on next page

Appendix 3—continued

ACTION NUMBER	ACTION	GSK	LSK	HAAST TOKO	ROWI	S FIORD TOKO	N FIORD TOKO	ST-ISL TOKO	N-LAND BROWN	CORO BROWN	W BROWN	E BROWN	NOT TAXON SPECIFIC
9.4	Increase managed sites for Fiordland tokoeka and great spotted kiwi	×				×	×						
9.5	Additional 200 pairs of eastern brown kiwi secure											×	
10.1	Landscape-scale pest control at sites with greatest potential gain	×				×	×		×	×	×	×	
10.2	Manage populations as sources (kohanga kiwi) for translocations	×				×	×		×	×	×	×	
11.1	Additional populations of little spotted kiwi		×										
12.1	Research genetic diversity and bottleneck effects in little spotted kiwi		×										
12.2	Maximise Long Island genotype of little spotted kiwi		×										
13.1	Investigate new populations within the historic range of a taxon	×	×	×	×	×	×	×	×	×	×	×	
13.2	Optimise low-level landscape-scale management to benefit kiwi	×	×	×	×	×	×	×	×	×	×	×	
13.3	Manage taxa as separate conservation management units					×	×	×	×	×	×	×	
13.4	Manage fine-scale diversity within recognised taxa					×	×	×	×	×	×	×	
13.5	Western brown kiwi on Hauturu/Little Barrier Island										×		
13.6	Mixed-provenance populations at Rimutaka and Pukaha Mount Bruce										×	×	
13.7	Review management of existing mixed-provenance populations												×
14.1	Database for kiwi sanctuaries												×
14.2	Review data management procedures in kiwi sanctuaries												×
14.3	Data from other DOC and community-led kiwi projects												×
15.1	Clarify link between the Kiwi Recovery Group and CMaG: ARAZPA												×
15.2	Review the role of KCMAC												×
15.3	Review the captive management plan												×
15.4	Report on progress towards captive management plan objectives												×
16.1	Review and update the kiwi captive husbandry manual												×
16.2	Standards for captive management facilities and practitioners												×
16.3	Best practice as part of the permit conditions for captive facilities												×
17.1	Protocols and minimum standards for BNZ Operation Nest Egg												×
17.2	National coordination for BNZ Operation Nest Egg data												×
17.3	Guidelines for use of BNZ Operation Nest Egg												×
17.4	10-year plan for BNZ Operation Nest Egg												×
18.1	National Mentor for Kiwi Advocacy												×
18.2	Regional support structure for local kiwi projects												×
18.3	Advocacy section in each taxon plan												×
19.1	Tangata whenua included in taxon planning and implementation												×
19.2	Identify opportunities and barriers to involve tangata whenua												×
19.3	Observe agreed processes for involvement of tangata whenua												×
20.1	Networks and information sharing among community-led projects												×
20.2	Regional support structure for local kiwi projects												×
20.3	Best practice, sustainability, strategic planning and funding												×
20.4	Communicate priority areas for management of kiwi												×
20.5	Community groups included in taxon planning and implementation												×
21.1	Review focus and role of BNZ Save the Kiwi Trust in kiwi recovery												×
21.2	Joint strategies of Kiwi Recovery Group and BNZ Save the Kiwi Trust												×
21.3	Promote role of BNZ Save the Kiwi Trust in kiwi recovery												×
21.4	DOC staff obligations under sponsorship agreement												×
21.5	Strategies to double corporate sponsorship funding for kiwi												×

Continued on next page

Appendix 3—continued

ACTION NUMBER	ACTION	GSK	LSK	HAAST TOKO	ROWI	S FIORD TOKO	N FIORD TOKO	ST-ISL TOKO	N-LAND BROWN	CORO BROWN	W BROWN	E BROWN	NOT TAXON SPECIFIC
22.1	Statutory planning and policy support for kiwi recovery												×
22.2	Statutory protection of kiwi and kiwi habitat in district plans												×
22.3	Priority areas for management of kiwi for local authorities												×
23.1	Certification criteria and standards for rural production sector												×
24.1	Research plan for kiwi												×
25.1	Complete and publish research on kiwi taxonomy												×
25.2	Genetic diversity of translocated and island populations												×
25.3	Bottlenecking, fine-scale diversity and genetic homogenisation												×
26.1	Data for modelling of great spotted kiwi and southern Fiordland tokoeka	×				×							
26.2	Population modelling for all species												×
26.3	Ecology and behaviour of all kiwi species												×
26.4	Fecundity and effective population size for rowi and Haast tokoeka			×	×								
27.1	Tools for control of mustelids, rats, cats and dogs												×
27.2	Integrated pest management techniques												×
27.3	Aerial 1080 for kiwi protection												×
27.4	Kiwi avoidance training for dogs												×
28.1	Kiwi Call Count Scheme and monitoring of banded populations												×
28.2	Remote landscape-scale monitoring methods												×
28.3	Identification of individuals												×
28.4	Link between index methods and actual abundance of kiwi												×

Appendix 4

RELEVANCE OF RECOVERY ACTIONS TO RECOVERY PLAN-PERIOD GOALS

Actions have been abridged to include key points; see section 5 for full details.

Plan-period goals are as follows:

Goal 1.1: To double the wild populations of rowi and Haast tokoeka

Goal 1.2: To halt the overall decline of great spotted kiwi, tokoeka and brown kiwi

Goal 1.3: To minimise the loss of distribution and genetic diversity of populations in the wild for all species of kiwi

Goal 1.4: To increase the wild population of little spotted kiwi by 50%

Goal 2.1: To increase and sustain community-led projects in kiwi recovery for all species and across a broad range of sectors of the New Zealand society

Goal 2.2: To double the corporate sponsorship funding for kiwi recovery

Goal 3.1: To clarify kiwi taxonomy and provide robust information guiding management of genetic diversity

Goal 3.2: To undertake robust population modelling for all species

Goal 3.3: To undertake or support research into tools for sustainable landscape-scale pest management and monitoring

ACTION NUMBER	ACTION	GOAL 1.1	GOAL 1.2	GOAL 1.3	GOAL 1.4	GOAL 2.1	GOAL 2.2	GOAL 3.1	GOAL 3.2	GOAL 3.3	NOT GOAL SPECIFIC
1.1	Annual reporting against recovery plan objectives										×
1.2	Full review of recovery progress										×
1.3	Review membership of the Kiwi Recovery Group										×
1.4	Communicate purpose of the Kiwi Recovery Group										×
1.5	Review resources available for recovery planning advice										×
2.1	Develop taxon planning template and procedural guidance	×	×	×	×	×					
2.2	Develop taxon plans for each of the 11 recognised taxa	×	×	×	×	×					
3.1	Review and publish progress of kiwi sanctuaries	×							×	×	
3.2	Review goals and wider direction for each sanctuary	×							×	×	
3.3	Prepare a new strategic plan for kiwi sanctuaries	×	×	×					×	×	
3.4	Initiate and utilise a kiwi sanctuary network										×
4.1	Develop an island strategy for kiwi recovery	×	×	×	×						
5.1	Update kiwi best practice manual										×

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ACTION NUMBER	ACTION	GOAL 1.1	GOAL 1.2	GOAL 1.3	GOAL 1.4	GOAL 2.1	GOAL 2.2	GOAL 3.1	GOAL 3.2	GOAL 3.3	NOT GOAL SPECIFIC
5.2	Develop and assess variations to current best practice										×
5.3	Provide regular technical best practice workshops										×
5.4	Database of best practice qualified persons										×
5.5	Best practice in local permit system										×
6.1	Review schedule for key supporting documents										×
7.1	Island biosecurity plans and protocols	×	×	×	×						
7.2	Contingency plans for kiwi populations on islands	×	×	×	×						
8.1	Maximise BNZ Operation Nest Egg efforts for rowi and Haast tokoeka	×									
8.2	Landscape-scale pest control prescriptions for rowi and Haast tokoeka	×								×	
8.3	New populations for rowi and Haast tokoeka	×									
8.4	Population of rowi and Haast tokoeka as sources for transfers	×									
8.5	Fecundity and effective population size for rowi and Haast tokoeka	×							×		
9.1	Establish pest control at BNZ Operation Nest Egg sites		×	×		×					
9.2	Maximise effectiveness and efficiency of predator control		×	×		×				×	
9.3	Optimise large-scale pest control to benefit kiwi		×	×		×				×	
9.4	Increase managed sites for Fiordland tokoeka and great spotted kiwi		×	×		×					
9.5	Additional 200 pairs of eastern brown kiwi secure		×	×		×					
10.1	Landscape-scale pest control at sites with greatest potential gain		×	×		×				×	
10.2	Manage populations as sources (kohanga kiwi) for translocations		×	×		×					
11.1	Additional populations of little spotted kiwi			×	×						
12.1	Research genetic diversity and bottleneck effects in little spotted kiwi			×	×			×	×		
12.2	Maximise Long Island genotype of little spotted kiwi			×	×						
13.1	Investigate new populations within the historic range of a taxon	×	×	×	×	×					
13.2	Optimise low-level landscape-scale management to benefit kiwi	×	×	×		×				×	
13.3	Manage taxa as separate conservation management units			×							
13.4	Manage fine-scale diversity within recognised taxa			×							
13.5	Western brown kiwi on Hauturu/Little Barrier Island			×							
13.6	Mixed-provenance populations at Rimutaka and Pukaha Mount Bruce			×		×					
13.7	Review management of existing mixed-provenance populations			×							
14.1	Database for kiwi sanctuaries										×
14.2	Review data management procedures in kiwi sanctuaries										×
14.3	Data from other DOC and community-led kiwi projects										×
15.1	Clarify link between the Kiwi Recovery Group and CMaG: ARAZPA										×
15.2	Review the role of KCMAC										×
15.3	Review the captive management plan										×
15.4	Report Report on progress towards captive management plan objectives										×
16.1	Review and update the kiwi captive husbandry manual										×
16.2	Standards for captive management facilities and practitioners										×
16.3	Best practice as part of the permit conditions for captive facilities										×
17.1	Protocols and minimum standards for BNZ Operation Nest Egg	×	×	×	×	×					
17.2	National coordination for BNZ Operation Nest Egg data	×	×	×	×	×					
17.3	Guidelines for use of BNZ Operation Nest Egg	×	×	×	×	×					
17.4	10-year plan for BNZ Operation Nest Egg	×	×	×	×	×					
18.1	National Mentor for Kiwi Advocacy		×	×		×					

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ACTION NUMBER	ACTION	GOAL 1.1	GOAL 1.2	GOAL 1.3	GOAL 1.4	GOAL 2.1	GOAL 2.2	GOAL 3.1	GOAL 3.2	GOAL 3.3	NOT GOAL SPECIFIC
18.2	Regional support structure for local kiwi projects		×	×		×					
18.3	Advocacy section in each taxon plan		×	×		×					
19.1	Tangata whenua included in taxon planning and implementation					×					
19.2	Identify opportunities and barriers to involve tangata whenua					×					
19.3	Observe agreed processes for involvement of tangata whenua					×					
20.1	Networks and information sharing among community-led projects					×					
20.2	Regional support structure for local kiwi projects					×					
20.3	Best practice, sustainability, strategic planning and funding					×					
20.4	Communicate priority areas for management of kiwi					×					
20.5	Community groups included in taxon planning and implementation					×					
21.1	Review focus and role of BNZ Save the Kiwi Trust in kiwi recovery										×
21.2	Joint strategies of Kiwi Recovery Group and BNZ Save the Kiwi Trust										×
21.3	Promote role of BNZ Save the Kiwi Trust in kiwi recovery										×
21.4	DOC staff obligations under sponsorship agreement										×
21.5	Strategies to double corporate sponsorship funding for kiwi						×				
22.1	Statutory planning and policy support for kiwi recovery		×	×		×					
22.2	Statutory protection of kiwi and kiwi habitat in district plans		×	×		×					
22.3	Priority areas for management of kiwi for local authorities		×	×		×					
23.1	Certification criteria and standards for rural production sector		×	×		×					
24.1	Research plan for kiwi										×
25.1	Complete and publish research on kiwi taxonomy							×			
25.2	Genetic diversity of translocated and island populations			×				×			
25.3	Bottlenecking, fine-scale diversity and genetic homogenisation	×		×	×			×			
26.1	Data for modelling of great spotted kiwi and southern Fiordland tokoeka								×		
26.2	Population modelling for all species								×		
26.3	Ecology and behaviour of all kiwi species								×		
26.4	Fecundity and effective population size for rowi and Haast tokoeka	×									
27.1	Tools for control of mustelids, rats, cats and dogs									×	
27.2	Integrated pest management techniques									×	
27.3	Aerial 1080 for kiwi protection									×	
27.4	Kiwi avoidance training for dogs									×	
28.1	Kiwi Call Count Scheme and monitoring of banded populations								×		
28.2	Remote landscape-scale monitoring methods									×	
28.3	Identification of individuals								×		
28.4	Link between index methods and actual abundance of kiwi								×	×	

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