

# Recovery Strategy - Goal

## Aims and Objectives

### 9.1 LONG-TERM GOAL

To maintain and, where possible, enhance the current abundance, distribution and genetic diversity of kiwis.

*Comment: This goal reflects a commitment to endeavour to prevent further declines of kiwi populations. It may not be achievable in all areas, but provides a yardstick against which to measure future success.*

The plan's approach towards this goal is to identify two aims, one of information gathering or research and one of management. Within each aim are several specific objectives.

### 9.2 AIMS

**1. To identify the current distribution, abundance and genetic diversity of kiwis, the trends of their populations and the threats they face (Objectives 1-4).**

**2. To take action to remove the short-term risk of extinction of endangered kiwi taxa, prevent further declines and begin recovery of other kiwi populations (Objectives 5-9).**

Our ability to achieve these aims will be greatly enhanced if the programme has public support and participation. There is therefore an additional objective (Objective 10) to encompass this.

Further information on kiwi distributions, genetics and population trends (Objectives 1-3) is needed to ensure that management is focused first on priority populations. At present one endangered taxon is identified, the little spotted kiwi, and further actions to safeguard it are given in Objectives 5 and 9 (part). However work proposed in the first year may confirm current indications that

populations of South Island brown and great spotted kiwi (both currently classified as 'threatened') are sufficiently small and genetically distinct to fall into this category. Preparatory action for these is thus proposed in Objectives 6 and 9 (part).

Once the priority populations that require immediate work to prevent extinction have been identified and management initiated, the next step is to identify other 'key' populations for each species. These populations would then receive particular management attention, beyond the general initiatives that can be recommended for all populations (see Objective 7). The criteria used to determine these key populations needs further discussion. They are likely to include characteristics of the populations themselves, (e.g. size, rate of decline), and other factors such as the feasibility of management (e.g. whether the land was Crown-owned or not), and the likelihood of such management benefiting other species.

The management directed at key populations would be aimed at increasing their productivity and reducing mortality. To do this requires more information on the threats faced by individual kiwis. Research on this question (Objective 4) is the final objective under the first aim.

### 9.3 OBJECTIVES

**AIM 1: Identify distribution, abundance and genetic diversity of kiwis, their population trends and threats.**

**1. Identify Current Distribution and Abundance of Kiwis**

*Undertake surveys of known range and areas where taxa are considered to have recently become extinct.*

## **2. Identify Genetic Diversity of Kiwis**

*Investigate the genetic variation within kiwis across their geographic distribution using a combination of morphological and molecular techniques. Identify potential management options based on these analyses.*

## **3. Determine Kiwi Population Trends Through Monitoring**

*Develop a technique to index the abundance of kiwis in an area. Identify key populations for each taxa and monitor these at regular intervals to establish trends.*

## **4. Determine Threats to Wild Populations and Develop Management Techniques for Population Maintenance and Recovery**

*Undertake research to determine the causes of mortality of kiwis in the wild. Develop management techniques to tackle those causes that we can influence directly.*

**AIM 2: Take action to remove the risk of extinction of endangered taxa, prevent further declines and begin recovery of other kiwi populations.**

## **5. Ensure Survival of Little Spotted Kiwi**

*Establish little spotted kiwis on one additional island capable of supporting a large, self-sustaining population and ensure their survival on the islands they currently occupy.*

## **6. Identify and Evaluate Islands Available for Brown or Great Spotted Kiwis**

*Preliminary work should be undertaken to identify islands for these kiwis in case they are required in the short-term for endangered populations.*

## **7. Manage Mainland Populations to Reduce Their Rate of Decline**

*Endeavour to protect and enhance kiwi habitat and reduce impacts of dogs, pigs, possum trapping and poisoning, and road kills.*

## **8. Manage Recovery of Key Mainland Populations**

*Take action to reduce mortality and/or increase productivity of key mainland populations.*

## **9. Develop Techniques to Breed Kiwis in Captivity**

*Undertake captive breeding research to ensure we have the expertise to take birds or eggs from any kiwi taxon and to rear and breed these.*

## **10. Promote Public Interest and Involvement in Kiwi Conservation**

*Keep the public informed of conservation work relating to kiwi. Educate the public to reduce losses of kiwis during hunting and trapping activities. Involve interested groups and individuals in field work where appropriate.*

## **10.0**

# **Work Plan**

The tasks needed to implement this plan are identified as 'plan' under the ten objectives. In brackets after each task are the names of those individuals, divisions of the Department of Conservation, or other

agencies that are expected to be involved in each. This does not imply that they necessarily will be involved nor have a responsibility for carrying them out.

## **OBJECTIVE 1: IDENTIFY CURRENT DISTRIBUTION AND ABUNDANCE OF KIWI**

The Department of Conservation currently runs the 'Kiwi Call Scheme' whose three aims are as follows:

- 1) to determine the national distribution of kiwis
- 2) to relate kiwi density to location and habitat
- 3) to assign a 'kiwi call index' at a known time of year to each listening station to enable the dynamics of the population to be determined with time.

It is intended to continue this scheme, collecting records from all individuals that can be encouraged to participate in it. Publicity should be increased to maximise the productive involvement of the public in this scheme. In addition it is proposed to send experienced personnel to survey identified gaps in the distributions of each taxa, as identified below. Such surveys may provide an opportunity to train interested people in the use of call counts to identify and monitor populations. Research is planned under Objective 5 to enable kiwi call counts to be used as a reliable method of indexing kiwi abundance.

### **All Species**

#### **Plan:**

Continue the Kiwi Call Scheme (Science & Research, Conservancies, General Public)

#### **Outcome:**

Regularly updated distribution maps of kiwis and measures of call rates in some areas.

### **North Island Brown Kiwi**

#### **Explanation:**

The distribution of the North Island brown kiwi is fairly well known in some areas, e.g. Northland. The plan identifies priorities for survey within different conservancies of the Department to fill in gaps in present knowledge, the completion

of which will ensure that we can identify the key populations in each area for monitoring (see objective 3). An important element of all surveys will be the collating of existing data, e.g. Wildlife Service's Fauna Survey Unit's records.

#### **Plan:**

Northland Conservancy

survey gaps in known distribution.

Auckland Conservancy

survey Hunua Range, Kawau and Ponui Islands

Waikato Conservancy

survey Coromandel, Kawhia, Pirongia forests.

Bay of Plenty Conservancy

re-survey Mamaku Plateau.

East Coast Conservancy

survey Raukumara and Te Urewera Ranges.

Tongariro/Taupo Conservancy

survey gaps in known distribution.

Hawkes Bay Conservancy

survey Ruahine and western Kaweka Ranges.

Wanganui Conservancy

survey gaps in known distribution in Taranaki

#### **Outcome:**

Identification on a conservancy basis of kiwi distribution, with an indication of the density in different areas. This information will form the basis for the design of a monitoring programme under objective 3.

### **South Island Brown Kiwi**

#### **Explanation:**

Determination of the distribution and abundance of brown kiwis at the apparently isolated populations at Haast and Okarito is a high priority. If genetic work (objective 2) determines these to be different from those in Fiordland they may need to be treated as endangered taxa.

**Plan:**

Survey population of Haast area and complete survey of Okarito (West Coast Conservancy). Compare with previous surveys to evaluate current trend.

**Outcome:**

Identification of the approximate number of kiwis in these areas and their distribution. Comparison with previous surveys will assess whether these populations are in decline and determine the urgency for recovery action.

**Stewart Island Brown Kiwi**

This kiwi is known to be widespread on Stewart Island and sites for monitoring can be identified without the need for further survey.

**Great Spotted Kiwi****Explanation:**

Current knowledge indicates several discontinuities in the distribution of great spotted kiwis and doubt about the southern limit of the species. Densities appear to have declined in lowland areas in recent years and the distribution of the lowland form (see objective 2) is of particular importance. Surveys of this species are a high priority.

**Plan:**

Survey population from northwest Nelson to South Westland. (Nelson/Marlborough, Canterbury, West Coast Conservancies).

**Outcome:**

Distribution of great spotted kiwi and identification of current disjunct populations. Comparative densities in upland/lowland areas.

**Little Spotted Kiwi**

The mainland population is considered extinct although reports (e.g. South Westland) will be followed up. The probable presence of one bird on D'Urville

Island requires confirmation (see objective 5). (Nelson/Marlborough Conservancy).

**OBJECTIVE 2: IDENTIFY GENETIC DIVERSITY OF KIWI**

If one of the accepted goals of management is to conserve genetic diversity, it is essential to establish first the extent of variation between and within regional populations of kiwi. It is just as essential to resolve the long-standing arguments over their taxonomy, so that the birds can be grouped into appropriate management units.

**Brown Kiwi****Explanation:**

Preliminary findings from current studies by Dr. C. Daugherty of Victoria University, Wellington, together with those from an earlier investigation by D. Fountain (in Powlesland, 1988) show:

- there is moderate to high genetic variation at the individual, local and regional levels in brown kiwi
- brown kiwis from Northland and Taranaki are closely related to each other, but distinct from those in the Bay of Plenty
- brown kiwis at Okarito are more closely related to those in the North Island than their conspecifics in Fiordland
- only two (instead of three) groups of brown kiwis should be recognised: a northern form, extending south to Okarito, and a southern form, centred on Fiordland and Stewart Island.

Birds at Haast may group with either of these two distinct forms or represent a third form. There is also new evidence indicating that Okarito birds may be of a different form than the northern one. Completion of analyses is essential to determine the priority given to different populations.

The brown kiwis on Kapiti may prove of

particular significance and their identity needs confirmation. Though birds from North and South Islands were apparently released there originally, there is evidence that only the latter are now represented. They would have originated from five birds from Haast and two from Fiordland. This may mean that Kapiti brown kiwis represent a significant proportion of the small Haast populations on an island.

**Plan:**

Complete analyses of blood samples currently held, using blood protein and mitochondrial DNA techniques. Collect further blood samples from Haast and Kapiti populations for analysis. Compare genetic analyses with morphological data. (West Coast & Wellington Conservancies, Science & Research Division; Charles Daugherty, Victoria University (VUW); Alan Baker, Royal Ontario Museum).

**Outcome:**

A revised taxonomy for brown kiwi. Assessment of the effort that should be put in to conserving different populations.

**Great Spotted Kiwi**

**Explanation:**

Measurements of body size and weight indicate that great spotted kiwis in upland areas in northwest Nelson are significantly larger and heavier than birds in lowland areas. Genetic analyses are needed to assess whether this is a clinal response to altitude, or whether there are distinct forms occupying the two areas. There may also be significant genetic differences between the apparently disjunct populations from north to south.

**Plan:**

Collect blood and morphometric data from great spotted kiwis from throughout their range. Analyse blood using molecular identification techniques and compare results with morphology. (Nelson/Marlborough, Canterbury, West Coast Conservancies; John McLennan, DSIR

Land Resources, Charles Daugherty, VUW; Jim Jolly, private consultant).

**Outcome:**

Identification of variation within great spotted kiwi populations and possibly revision of taxonomy. Assessment of the effort that should be applied to the conservation of different populations.

**Little Spotted Kiwi**

**Explanation:**

Until recent translocations, little spotted kiwis remained only on D'Urville and Kapiti Islands. Preliminary work indicates that there are no significant genetic differences between these two populations but this needs confirmation.

**Plan:**

Collect blood and morphometric data from the D'Urville island bird now on Long Island from which samples have not been obtained. Collect similar data from any birds remaining on D'Urville. (Nelson/Marlborough Conservancy, Science & Research, Charles Daugherty, VUW).

**Outcome:**

Identification of any differences between D'Urville and Kapiti Island little spotted kiwis and a recommendation on the degree of effort and resources that should be expended to maintain the two as separate genetic lines.

**Note to objective 2**

It is important to recognise that the studies proposed may not always produce results that are beyond interpretation and dispute. Different methods can produce different conclusions when applied to the same population. This means that a cautious approach must be adopted when considering the findings of genetic studies. They advance strong support for a hypothesis, but do not provide definitive answers. The biggest problems are likely to arise when electrophoretic studies do not support obvious morphological and behavioural

differences between populations. This has arisen already with the brown kiwis at Okarito. They exhibit many features characteristic of South Island birds and have their own unique type of lice, but appear to be indistinguishable genetically from those in the North Island. In such cases it is probably best to continue to manage the populations as separate identities, at least until the original finding can be confirmed by additional tests.

### **OBJECTIVE 3: MONITOR POPULATIONS OF ALL KIWI TAXA TO DETERMINE TRENDS**

#### **Explanation:**

Monitoring of key populations of all kiwi taxa is considered important to determine trends and indicate where management effort should be directed. A monitoring strategy needs to be developed to determine which populations are used, (e.g. high or low density? centre or edge of range?), which techniques are applied to each and with what frequency.

Monitoring requires a means of determining kiwi abundance, yet little is known about the reliability of the techniques that have been developed for this purpose. The most common method relies on counts of calls, largely because it is quick and simple to use. Kiwi call rates do correlate with adult density, although on any one night the relationship may be masked by other factors, many of which are still unknown.

McLennan and McCann (in prep.) are developing a set of standard procedures for sampling great spotted kiwis, based on the variation that they recorded in their study populations at Kahurangi and Saxon. These will show:

- 1) how many nights are needed to obtain a reliable estimate of call rate
- 2) which nights should be sampled
- 3) which parts of the night should be sampled

- 4) the corrections that have to be applied to allow for seasonal variations in call rates.

Further research is needed to establish:

- whether the procedures developed for sampling great spotted kiwis are applicable to the other species,
- whether between and within-night variation in call rate can be reduced by broadcasting taped calls to elicit responses,
- the shape of the relationship between call rate and adult density.

Once a reliable method of indexing kiwi abundance has been developed, populations can be monitored, and it is essential that this is done. Much of the evidence for a decline in kiwi populations is anecdotal. It is clearly important to determine whether this is in fact true and (if so) the rate at which it is happening, so that corrective action can be planned and executed before it is too late.

Baseline information already exists for four populations of brown kiwis in the North Island (Waipoua, Waitangi, Tangiteroria, and Waitere/Haliburtons), for one population in the South Island (Okarito), and for one population on Stewart Island (Masons Bay). In these situations a sample of pairs have been banded on territories, and recapturing these birds at intervals provides a measure of turnover of breeding birds. Population indices have also been established for little spotted kiwis on Kapiti (one survey) and for two populations of great spotted kiwis in northwest Nelson (Saxon and Kahurangi).

Ideally, some 12 populations should be monitored in the North Island (including Kapiti Island), 20 in the South Island (to cover both species), and two or three on Stewart Island. The populations selected for sampling must be representative, in that they span the known geographical range of the species in question, and a reasonable proportion of the types of habitats that it occupies. The baseline information already

available is heavily biased towards brown kiwis in the North Island, especially those living in high density populations in Northland.

Some research is required to:

- select appropriate sampling sites,
- select a level of sampling which provides an appropriate trade-off between effort and sensitivity,
- decide on the frequency of repeating surveys,
- develop the systems and agency for collecting, analyzing and storing the information.

The monitoring proposed requires effort across much of the country. It provides an opportunity for interested members of the public to make an important contribution, if they receive suitable training.

**Plan:**

3.a Develop a monitoring strategy to be applied to all kiwi taxa. Develop a reliable method for indexing abundance using call counts and apply this technique together with the banding of samples of territory holders. (Science & Research).

3.b Identify key populations for each taxa. (Science & Research, Conservancies).

3.c Establish regular monitoring on a regional basis. (Conservancies).

**Outcome:**

A reliable indexing technique and key populations identified by end of 1992/93. Monitoring programme established for all kiwi taxa following this.

**OBJECTIVE 4: DETERMINE THREATS TO WILD POPULATIONS AND DEVELOP MANAGEMENT TECHNIQUES FOR THEIR RECOVERY**

**Explanation:**

Current management of mainland populations is largely an exercise in 'damage minimisation' with the emphasis

mainly on preservation of adults. Specific actions are detailed in objective 7 below. However this plan recognises the need to move towards a position in which we can halt or reverse current declines. To do this we need to clearly identify the threats to kiwi populations before we can address them. Earlier sections indicated that we know a fair amount about egg production and adult survival, but we know little about juvenile survival, the key stage of the life-cycle where kiwis seem under greatest threat. The first and highest priority project under this objective should provide the information to fill this gap. With the other projects listed, it should allow us to apply effective management to large blocks of forest in the care of the Department of Conservation (objective 8).

**Plan:**

4.a Undertake research on the survival and dispersal of juveniles (Science & Research).

*The survival of juveniles after leaving the nest and the threats to them are significant unknowns that restrict our ability to manage kiwi populations. Both chicks and juveniles are thought to be especially vulnerable to mammalian predators, yet there is little information to confirm or deny this view. Research is required to:*

- determine the survival of chicks in the presence (mainland) and absence (islands) of mammalian predators,
- determine the size at which juveniles become large enough to resist attacks from cats and stoats,
- compare the dispersal patterns of juveniles in continuous forests with those raised in isolated remnants.
- establish whether males and females differ in their patterns of dispersal and susceptibility to predators.

*Note: This research could perhaps usefully be combined with the management proposal in project 8.1. in an experimental*

*management approach similar to that adopted for North Island kokako.*

4.b Undertake research on the effects of possum control operations on kiwi. (Science & Research, Conservancies).

*Large-scale campaigns against possums will increase in the immediate future, in an attempt to reduce both their numbers in forests and the rate at which they spread Tb. In most of these campaigns, pollard baits laced with 1080 will be dropped from the air into forests. The baits break down quickly in rain, but are otherwise toxic for several days.*

*Recent work in Waipoua indicates that kiwis seldom eat pollard baits, and so are unlikely to be adversely affected by the campaigns (Pierce, R., pens. comm.). Careful experiments of the type undertaken by Pierce should, however, be repeated in other localities and seasons. Kiwis could well eat them in significant quantities when their natural foods are scarce (such as during drought), or when their energy demands are high (e.g. during laying).*

4.c Undertake research on South Island kiwis and evaluate options for the management of small populations (Science & Research, West Coast & Southland Conservancies).

*The South Island brown kiwi is now the least well known of all kiwis. Richard Henry's observations on Resolution Island provide the bulk of the information on this sub-species, and these are not detailed or comprehensive enough to assess whether the birds have any special management needs.*

*The first priority for this sub-species, then, is to investigate and describe its ecology, with a view to identifying factors which may be compromising the bird's chances of survival.*

*The brown kiwis at Okarito and Haast are likely to require immediate attention if they prove to be sufficiently different to warrant preserving. The suspicion that,*

*stoats are causing their decline will need to be checked. At the same time, other research should be undertaken to provide the tools for reversing the decline, assuming that stoats are responsible for it. One option is to remove the eggs of some pairs, hatch them in captivity, then return the chicks to the wild after they have reached an age of six to 12 months. This is less disruptive than removing adults, and would be especially attractive if the birds re-lay after 'losing' their first clutch. Such management is possible only if it can be shown that the eggs of South Island brown kiwis can be incubated artificially, and that captive-reared chicks have a reasonable chance of surviving after being returned to the wild. The work necessary to answer these two questions could be undertaken on Stewart Island brown kiwis or directly on South Island birds. The Stewart Island kiwis have similar incubation behaviour to the Okarito birds (R. Colbourne, pers. comm) yet are sufficiently numerous and productive to withstand the removal of some of their eggs. Combining such releases of juveniles with predator control may allow management 'in situ'. An alternative approach may be translocation to a predator free island as addressed in Objective 6.*

4.d Undertake research on the management of kiwis in rough farmland. (Science & Research).

*It is important to be able to advise farmers with kiwis on their land how they might alter their management practices to help the species. Potter (1990) showed that kiwis did use small patches of forest surrounded by farmland, but further work is needed, e.g. on the effects of different stock grazing regimes on kiwi. Further research, perhaps at Aotuhia in Taranaki, would be useful.*

4.e Undertake research on the social systems of kiwis. (Science & Research).

*Preliminary work indicates that different kiwi taxa exhibit a range of social systems, breeding as pairs or in groups.*

*Further research on this on Stewart Island and other areas would enhance our ability to manage populations.*

4.f Undertake research on the use of exotic forests by kiwis. (Science & Research).

*The only kiwis that appear to make significant use of exotic forests are the brown kiwis of Northland and east Taranaki. Research needs to be undertaken to identify why forests in other areas are not being used. If, for example, it is due to different management regimes then these could perhaps be altered and lead to an increase in habitat available to kiwis.*

### **OBJECTIVE 5: ENSURE THE SURVIVAL OF LITTLE SPOTTED KIWI**

#### **Explanation:**

The threat of extinction of the little spotted kiwi has been significantly reduced by recent translocations to islands free of mammalian predators. However it cannot be considered safe until self-sustaining populations are achieved on sufficient islands, so that a threat to one island, e.g. the arrival of a mammalian predator, does not threaten the species as a whole. Until the degree of difference between D'Urville and Kapiti Island birds (objective 2) is established, they will be considered separately.

#### **Plan for Kapiti Island Little Spotted Kiwi:**

5.a Establish whether the population on Kapiti Island is self-sustaining. (Wellington Conservancy, Science & Research).

*The Kapiti population of little spotted kiwis is so important that its status must be determined precisely. The contradictory views on its present trends, espoused by Jolly and Colbourne, need to be resolved. Various methods might be used to accomplish this and further discussion is occurring on these. One method would be to determine the proportion of juveniles in*

*another sample of birds (say 50), collected from a randomly selected part of the island over a period of one or two months. Two criteria need to be defined and agreed upon at the outset of such a study:*

- 1) *what constitutes a juvenile,*
- 2) *what result indicates that the population is self-sustaining.*

*Neither are particularly difficult, although the second of them may have to be an informed guess rather than a robust calculation.*

*Such a survey provides a simple snapshot of the age-structure of the population, and specifically indicates whether the birds have bred successfully in the previous two seasons. An absence of juveniles is not necessarily a cause for immediate concern, since it may be a temporary aberration. A reasonable proportion of juveniles (say 10% or better) together with a high density of adults would, however, indicate a healthy population. The survey is therefore weak in that only one of several possible results would resolve the question of the bird's status.*

*Another method would be to remove territory-holding birds from the island, an event that would occur when birds are transferred to a further island, and record the rate at which the territories were re-occupied. The usefulness of this method in answering the immediate question depends on the timing of such a transfer (see task 4 below).*

*A third method would be one of intensive study including monitoring of productivity and juvenile dispersal. It is proposed to set up a further study area (in addition to those used by Jolly and Colbourne) as part of the monitoring programme on Kapiti. Checking the success of burrows in this area, along with monitoring of one of the other study areas and call counts at sites throughout the island, may also allow determination of the health of the whole population.*

5.b Establish whether the Hen Island population is self-sustaining without further intervention. (Northland Conservancy).

5.c Establish whether the Red Mercury Island population is self-sustaining without further intervention. (Waikato Conservancy).

5.d Establish a self-sustaining population on a further island capable of supporting a large population. (Recovery Group, Wellington Conservancy).

*The risk of having such a large proportion of the remaining little spotted kiwis in one place (Kapiti) is unacceptable, and a second, large population should be established on an offshore island in the next few years. The release site selected should be large enough to support a self-sustaining population of about 1000 individuals, similar to that on Kapiti today. Six islands have been considered which satisfy the requirement for size: Great Barrier, Little Barrier, Mayor; Great Mercury, Pitt, and Codfish - but none of them are immediately suitable for little spotted kiwis. Great Barrier, Mayor, Great Mercury and Pitt hold potential predators, Little Barrier holds a dense population of brown kiwis which might compete for resources, and there is some doubt that there is sufficient invertebrate food on Codfish. Jolly and Colbourne (in press) consider the problems associated with each one, and conclude that Little Barrier is probably the most suitable of them all.*

*Both the feasibility and desirability of this transfer cannot be considered in detail until it is known:*

- *whether little spotted kiwis and North Island brown kiwis compete for resources (by studying the birds in those areas which they share on Kapiti Island), and if they do,*
- *whether little spotted kiwis can be established in an area already containing a dense population of brown kiwis, and if so,*

- *whether this would jeopardise the survival of the brown kiwis already present on Little Barrier.*

*Opportunities for removing the predators from the other possible islands and a re-assessment of the food available for kiwis on Codfish should also be considered.*

#### **Plan for D'Urville Island Little Spotted Kiwi:**

5.e Transfer any birds remaining on D'Urville Island to Long Island. (Nelson/Marlborough Conservancy).

5.f Determine the current Long Island population and take steps to ensure its survival. (Nelson/Marlborough Conservancy).

*Steps include ensuring that water catchments are maintained, and that the island remains predator free. If the D'Urville Island form is distinct, steps should be taken to 'line breed' it; i.e. Kapiti Island birds should eventually be removed and 'hybrid' birds back-crossed to D'Urville Island birds. The ability to achieve this will depend on how many birds are found on D'Urville Island and on the productivity of the existing D'Urville Island birds on Long Island.*

5.g Select another island for possible transfer of birds from Long Island. (Recovery Group).

*If the D'Urville form is distinct, its presence on this one small island (142 ha) is unsatisfactory in ensuring long-term survival. A number of smaller islands are potentially suitable as release sites for little spotted kiwis, with Breaksea, Tiritiri Matangi and Cuvier being among the more obvious candidates.*

#### **Outcomes:**

Little spotted kiwi's future secure in medium-term. The island populations can be seen as holding measures until such time as re-introduction to the mainland is a possibility.

### *Note to objective 5*

Monitoring of all island populations, perhaps every five years, is important, for the failure of one elevates the importance of the others and may require a further one to be established elsewhere. In the longer term, individuals may have to be transferred from one island population to another to preserve genetic diversity. It is not yet known how often such transfers should take place, and how many individuals should be involved in each one, or indeed whether such transfers truly increase genetic diversity. However, geneticists will probably be able to answer these questions in the next decade or two, long before the kiwis already on islands experience 'genetic difficulties'.

### **OBJECTIVE 6: IDENTIFY AND EVALUATE ISLANDS FOR SOUTH ISLAND BROWN AND GREAT SPOTTED KIWI**

#### **Explanation:**

The number of offshore islands potentially suitable for these kiwi species are few, and further evaluation is needed in the short-term pending the results of the genetic analyses and surveys, in case this option is needed for any endangered taxa. The Haast population of brown kiwis may already be represented on Kapiti, but the Okarito population may need an island population as an insurance. (Note: the Fiordland population which apparently does not warrant urgent action at present is represented on several islands, e.g. Resolution).

The great spotted kiwi is the only kiwi species which has no population on an offshore island. It probably does not need this insurance now but might in future, especially if monitoring shows those in sub-alpine regions of the mainland are in decline. Possible candidates include Pitt, Great Barrier and Codfish, none of which contain kiwis. The evaluation proposed

should take account of the fact that kiwis will eat large insects, so that islands containing endangered weta or beetle species should probably be excluded.

#### **Plan:**

Evaluate all islands that may be suitable for these species. (Recovery Group).

#### **Outcome:**

Islands provisionally identified as available for kiwi translocations if required in future.

### **OBJECTIVE 7: MANAGE MAINLAND POPULATIONS TO REDUCE THEIR RATE OF DECLINE**

#### **Explanation:**

Current information on the threats to kiwis allow certain management actions to be recommended in the short-term to try and prevent further population declines.

#### **Plan:**

7.a Endeavour to prevent further loss of kiwi habitat. (Conservancies, Advocacy & Information)

*This task is largely one of advocating the importance of protecting forest areas that contain kiwis. Private land-owners should be encouraged to protect land through covenants or the use of Forest Heritage and Nga Whenua Rahui funds. Conservancy staff should provide input through regional and district planning, identifying key areas of habitat for kiwi in District and Regional plans and presenting submissions on proposals that may affect such areas. Use of departmental funds to purchase land may be appropriate as a last resort in exceptional cases.*

7.b Encourage the safer use of leg-hold traps and cyanide baits for possums. (Conservancies, Advocacy & Information).

*Information exists that allows recommendations to be made to possum hunters to set traps and baits in certain*

ways to minimise impacts on kiwis. A leaflet should be produced with this information (see plan 10.4., p.38).

7.c Develop '1080' and cyanide baits that are unattractive to kiwi. (Science & Research).

7.d Minimise impacts of dogs on kiwis. (Conservancies, Advocacy & Information).

*Dogs can clearly have a drastic impact on kiwi populations as the Waitangi example showed, and there have been cases of birds being killed in other areas. Dogs are currently not permitted in National Parks without a special permit, and some people advocate a similar ban over all forests protected by the Crown. However it should be noted that pigs may be significant predators of kiwis and concern has been expressed about high numbers in some areas. Hunting with dogs may be an effective way of controlling pig numbers, and the possibility of individual dogs being left in forests overnight as a threat to kiwis, may be a justifiable risk. It seems there is insufficient evidence to ban dogs from large areas and the plan advocates research (as Plan 4.1) to clarify this question. Until the results of that research are available, the approach favoured would be to focus on key populations, which will be identified through objectives 1, 2 and 3. Restrictions could be placed on the use of dogs in these, and if pigs were a problem, attempts would be made to control them by other means.*

7.e Advocate management practices that are compatible with kiwi conservation to the owners of exotic forests. (Conservancies, Advocacy & Information).

*Some large populations of kiwis in Taranaki and Northland live in habitats which are managed mainly for production rather than conservation. These birds are exposed to practices which both harm and favour them, and their persistence depends in part on the balance between the two. R. Colbourne (cited by Powlesland, 1988) has listed ways in which the managers of exotic*

*forests might alter their practices to help kiwis, but at the same time achieve their production objectives.*

7.f Minimise road deaths of kiwis. Place signs on roads in areas where kiwis are being killed (e.g. Waipoua), suggesting care when driving at night. (Conservancies).

*Deaths on roads may be significant in some areas to judge by the results at Waipoua.*

## **OBJECTIVE 8: MANAGE RECOVERY OF KEY MAINLAND POPULATIONS**

### **Explanation:**

The results of the research identified in objective 4 should enable a well-directed effort to be made to manage some mainland populations to bring about their recovery. The ultimate aim would be for such populations to become self-sustaining without intervention, but the best that may be possible in the short-term is to bring them to a point that they require only minimal intervention. As such management may prove costly, it is important that it is directed at key populations identified from the results of objectives 1-3. As mentioned earlier (objective 4), it may be appropriate for the first management initiative of this type to be combined with research on the threats facing a population. This speeds up the process, for management does not then have to wait for all the results of research but can begin and be modified as these are produced.

### **Plan:**

8.a Initiate a programme to manage a large area of Crown-owned native forest to directly benefit its kiwi population. (Conservancies).

*There is little point in monitoring a number of mainland populations of kiwi, if declines cannot be halted or reversed once they have been identified. If this proves to be the case, the only action remaining is to transfer a genetically diverse sample of*

*individuals to islands and captivity, and leave those remaining to struggle on as best as they can.*

*Sooner or later, our ability to manage mainland populations in situ has to be tested. The East Coast population of North Island brown kiwis is one that provides this opportunity. There is no doubt that it is declining, for reasons that have probably been correctly identified (McLennan, 1988 and in press). The population in Urewera National Park would be the best one to manage in this region because: 1) their forest habitat is both extensive and secure, 2) the birds are still present in some parts of it in reasonable numbers, and 3) the activities of both possum trappers and pig hunters can be more readily managed within the boundaries of the Park.*

*Which population is chosen will depend on the first year results of the surveys in objectives 1 and 2. For example if the Okarito brown kiwi is shown to be distinct and present in sufficient numbers for management in situ to be attempted, this might be the priority.*

8.b Develop through research and then advocate management practices that are compatible with kiwi conservation to farmers whose land includes kiwi habitat. (Science & Research, Conservancies, Advocacy & Information).

*Based on the information collected by Potter (1990), we can recommend farmers to retain and protect bush remnants adjacent to areas of forest inhabited by kiwis. With further research, detailed recommendations on stocking of areas of rough farmland and scrub should become available.*

## **OBJECTIVE 9: DEVELOP THE EXPERTISE TO BREED ALL KIWI TAXA IN CAPTIVITY**

### **Explanation:**

The plan's first priority is conservation of kiwis in the wild, but it supports keeping of them in captivity for two main reasons:

### **1) Research:**

- to develop the ability to breed all species in captivity. The ability to artificially incubate eggs and rear chicks is necessary if wild populations are to be supplemented with the release of sub-adults, as suggested as an option for Okarito kiwis. We may also be faced with emergency situations in which birds could be temporarily held or bred in captivity before re-introduction to the wild.

### **2) Advocacy:**

The nocturnal habits of kiwis make it very difficult for people to see them. Rather than encourage disturbance of birds in the wild, the continuing use of a self-sustaining North Island brown kiwi population in captivity is thought justified.

North Island brown kiwis have been housed and bred successfully in captivity for at least 30 years. There are currently about 80 in captivity in New Zealand and 20 overseas, which between them raise some 13 to 17 chicks each year (R. Goudswaard (International stud-book keeper for N.I. brown kiwi), pers. comm.). Captive females lay up to eight eggs a year, more than twice as many as their wild counterparts. Most curators allow the eggs to be incubated naturally for about a month, then transfer them to an artificial brooder for the remaining 40 to 50 days. Techniques for brooding them artificially from day 1 are not well established, mainly because it is not yet clear how often the egg should be turned.

The world-wide captive population of North Island brown kiwi is now self-sustaining, with productivity just exceeding death rate. A significant number of females die when they are about to lay for the second or third time, for reasons that are not known.

There are few South Island brown kiwis in captivity, and those that are have not

bred. Given the marked differences now being found between the reproduction of North Island and Stewart Island/South Island brown kiwis (R. Colbourne, pers. comm.), it is likely that techniques applied to North Island brown kiwis in captivity are not readily transferable to South Island birds. These require specific work undertaken on them.

Little spotted kiwis are the most difficult of the three species to keep and breed because most die soon after being taken into captivity. An artificial diet which suits them has not yet been developed, so the birds can be kept only in large enclosures with a wide range of natural foods. Captive pairs have bred twice, in both cases by incubating the egg themselves. Artificial incubation has been tried using the procedures developed for brown kiwis, without success.

Great spotted kiwis have been held in captivity for some years, but their mortality has been high, perhaps because most have arrived there in an injured condition. Attempts to breed them have been successful twice, using a combination of natural and artificial incubation. No breeding pairs are held in captivity today. Two established pairs were lost this year when the females died just before they were about to lay.

Research is required to:

- develop better artificial diets for all species,
- reduce the death rates of captive adults, especially females,
- develop better techniques for incubating eggs artificially, especially those of little spotted kiwi,
- develop techniques for breeding South Island brown kiwis in captivity.

Organisations likely to be involved in this research include zoos that have particular expertise with kiwis, and Massey University who are planning the

development of a specific facility for captive kiwi research.

**Plan:**

9.a Develop a captive management plan for kiwi and appoint co-ordinator(s) to manage the captive programmes of each species. (Protected Species Policy Division (PSPD)).

9.b Bring further great spotted, little spotted and South Island (or Stewart Island brown kiwi) into captivity to facilitate research on husbandry of these taxa. (PSPD, Conservancies, Science & Research, zoos, Massey University).

9.c Develop better artificial diets for all species. (Science & Research, Massey University, zoos).

9.d Investigate means of reducing death rates of captive adults, particularly females. (Science & Research, Massey University, zoos).

9.e Develop better techniques for incubating eggs artificially, especially those of little spotted kiwi. (Science & Research, Massey University, zoos).

**Outcome:**

Knowledge that will allow us to take any kiwi taxa into captivity, either as eggs or adults, and breed it successfully.

**OBJECTIVE 10: ENCOURAGE PUBLIC INTEREST AND INVOLVEMENT IN KIWI CONSERVATION**

**Explanation:**

Kiwis are birds of great significance to most New Zealanders. Their conservation on the mainland can be greatly assisted by the public through the stance they adopt to issues like forest clearance or pig hunting, and through direct involvement in projects such as the Kiwi Call Scheme. Certain groups, such as possum trappers, can have significant effects on kiwis through the way they carry out their activities. For these

reasons advocacy and education are important elements of this recovery programme. Responsibility in this area falls on all who are involved in kiwi conservation, but several specific initiatives can be proposed as below:

**Plan:**

10.a Evaluate proposals to transfer kiwis to 'open sanctuary' islands where they can act as a resource for advocacy and education, (e.g. Tiritiri Matangi for the northern area). (Recovery Group).

10.b Encourage the display of North island brown kiwis at suitable zoological gardens here and overseas. Work with these institutions to present accurate information on kiwi conservation. (Recovery Group, zoo industry, Advocacy & Information).

10.c Produce a revised information

leaflet to replace that produced by the NZ Wildlife Service in 1986. Particular targets for such a leaflet would be landowners with kiwis on their land and those taking dogs into native forest, in addition to the general public. (Recovery Group, Advocacy & Information).

10.d Produce a leaflet for those involved in trapping and poisoning of possums, identifying techniques that will minimise risks to kiwis. Such a leaflet could go out with each possum hunting licence. (Recovery Group, Advocacy & Information).

10.e Encourage the involvement of volunteers in kiwi surveys so that they can develop the expertise to assist in continuing monitoring of populations. (Conservancies).

## 11.0

# Critical Path

## Introduction

The critical path and budget that follow reflect the need for balance between information and action discussed earlier. The first phase (Year I and part Year 2) involves gathering further information on the kiwi 'resource', while at the same time continuing work to safeguard the little spotted kiwi and advocate the conservation of all species. The second phase continues rescue action for endangered kiwis (the little spotted and any others identified in the first phase), sets up monitoring of all species, and begins research on the factors affecting mainland populations. The third phase builds on the research on mainland populations to undertake management of them on a long-term basis. This phase could be combined with elements of the research of the second phase in an experimental management approach.

The path should be taken as a guide only. As soon as sufficient information is obtained to effectively undertake a given management action this should occur. Priorities are shown within some objectives. The proposed timing below reflects to some extent the priority between different objectives, but recognises that projects that require significant funds (see Budget) or particular expertise have to occur sequentially.

	1991/2	1992/3	1993/4	1994/5	1995/6
<b>Objective 1: Survey</b>					
<b>Priority 1</b>					
Great spotted kiwi - full range					
S. I. brown kiwi - Haast, Okarito					
Little spotted kiwi - D'Urville Is.					
<b>Priority 2</b>					
North Island brown kiwi - full range					
<b>Objective 2: Genetics</b>					
<b>Priority 1</b>					
All species					
<b>Objective 3: Monitoring</b>					
<b>Objective 4: Determine Threats</b>					
<b>Priority 1</b>					
Research on juvenile survival.					
Research on possum control operations					
<b>Priority 2</b>					
Research on S.I. kiwi					
<b>Priority 3</b>					
Research on kiwis in rough farmland					
Research on social systems					
Research in exotic forests					
<b>Objective 5: Secure Little Spotted Kiwi</b>					
<b>Priority 1</b>					
Establish if Kapiti population is self-sustaining					
Establish if Hen Island population is self-sustaining					
Transfer birds on D'Urville to Long Island					
<b>Priority 2</b>					
Establish if Red Mercury population is self-sustaining					
Establish population on further large island					
Determine Long Island population and safeguard it					
<b>Priority 3</b>					
Select an island for transfer of birds from Long Is.					
<b>Objective 6: Islands for Other Species</b>					
<b>Priority 1</b>					
South Island brown kiwi					
<b>Priority 2</b>					
Great spotted kiwi					

	1991/2	1992/3	1993/4	1994/5	1995/6
<b>Objective 7: Manage to Reduce Declines</b>					
<b>Priority 1</b>					
Habitat protection					
Minimise impact of possum trapping and poisoning					
Minimise impact of dogs					
<b>Priority 2</b>					
Develop new baits and poisons					
Advocate exotic forest management					
<b>Objective 8: Manage to Recover</b>					
<b>Priority 1</b>					
Initiate management of a large forest population					
<b>Priority 2</b>					
Develop and advocate management practices for rough farmland					
<b>Objective 9: Captive Breeding</b>					
<b>Priority 1</b>					
Develop captive management plans and appoint co-ordinators					
Bring further species into captivity					
<b>Priority 2</b>					
Develop better artificial diets					
Reduce death rates of captive adults					
Develop artificial incubation techniques					
<b>Objective 10: Advocacy</b>					
<b>Priority 1</b>					
Evaluate transfer to Tiritiri					
Produce a leaflet for trappers					
Develop volunteer programmes					
<b>Priority 2</b>					
Produce a revised information leaflet					
Display of kiwis in captivity with appropriate information					

**Note:**

Research projects have been identified throughout this plan in most objectives. The priorities for the 1991/92 year are as follows:

Genetics (all species) (Objective 2), monitoring technique (Obj. 3), evaluating options for S.I. brown kiwi at Okarito (Obj. 4), determine recruitment of Kapiti Island little spotted kiwi population (Obj. 5), captive research on South Island brown, little and great spotted kiwis (Obj. 9).

Priorities for later years will be set by the Department of Conservation in conjunction with the Recovery Group, depending on the information then available. The priority is likely to be given to work needed for endangered taxa, and work to determine the threats to mainland populations (Obj. 4).

## Budget

This budget aims to reflect true costs including the time of staff directly involved in projects. It can only be a guide for the overheads which have been estimated for

each project will vary considerably depending on who undertakes the work, i.e. DOC staff, private consultants or other agencies.

OBJECTIVE:	1991/2	1992/3	1993/4	1994/5	1995/6
1. Survey	250	200	10	10	10
2. Genetics	50	10			
3. Monitoring	30	30	30	30	30
4. Research on Threats	50	200	250	250	250
5. Little Spotted Kiwi	40	50	50	20	20
6. Islands for Brown/Great Spotted	20				
7. Manage to Reduce Declines	30	20	20	20	20
8. Manage to Recover Populations			150	150	150
9. Captive Breeding	40	40	10	10	10
10. Advocacy	20	10	10	10	10
<b>TOTAL (\$000's)</b>	<b>530</b>	<b>560</b>	<b>530</b>	<b>500</b>	<b>500</b>

## 13.0

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