# Mohua (yellowhead) recovery plan

2002-2012
Threatened Species Recovery Plan

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Department of Conservation
*Te Papa Atawhai*

# Recovery plans

This is one of a series of recovery plans produced by the Department of Conservation. Recovery plans are statements of the Department's intentions for the conservation of particular plants and animals for a defined period. In focusing on goals and objectives for management, recovery plans serve to guide the Department in its allocation of resources and to promote discussion amongst a wider section of the interested public.

After preparing a technical report which was refined by scientists and managers both within and outside the Department, a draft of this plan was sent to the New Zealand Conservation Authority and relevant Conservation Boards for comment. After further refinement, this plan was formally approved by the Southern Regional Office in June 2002. A review of this plan is due after ten years (2012), or sooner if new information leads to proposals for a significant change in direction. This plan will remain operative until a reviewed plan is in place.

The Department acknowledges the need to take account of the views of the tangata whenua and the application of their values in the conservation of natural resources. While the expression of these values may vary, the recovery planning process provides opportunities for consultation between the Department and the tangata whenua. Departmental Conservancy Kaupapa Atawhai Managers are available to facilitate this dialogue.

A recovery group consisting of people with knowledge of mohua, and with an interest in their conservation has been established. The purpose of the Mohua Recovery Group is to review progress in the implementation of this plan and to recommend to the Department any changes which may be required as management proceeds. Comments and suggestions relating to the conservation of mohua are welcome and should be directed to the recovery group via any office of the Department or to the Biodiversity Recovery Unit.

# Abstract

The mohua (or yellowhead, *Mohoua ochrocephala*) is a small, insectivorous, forest passerine bird, endemic to the South Island. Mohua are a taonga species to Ngäi Tahu. During the 1980s it was recognised that mohua had disappeared from 75% of its former range and that declines were continuing. A monitoring programme and detailed research recognised that sudden population crashes coincided with years in which predator numbers, particularly stoats (but also rats) were high. Experimental predator control during a predator plague increased mohua breeding success to *c.* 80%, whereas breeding success was only 36% in untreated areas.

Management aims to maintain and enhance mohua populations throughout their present range and beyond, by halting and reversing the degradation of the forest ecosystem. The mohua is one threatened species that is still accessible to the public in mainland forests. Priority will be given to managing mohua within these forests, mainly through the control of introduced predators. Developing the ability to manage mohua predators will also assist in the conservation and management of other forest birds. As such, the mohua is a key indicator for monitoring biodiversity in mainland forests. Second priority is given to establishing new populations on predator-free islands within the former range of mohua, and third priority to developing a captive breeding and release capability, should it be needed in the future.

# Contents

# 1. Introduction

The mohua (or yellowhead, *Mohoua ochrocephala*) is a small, insectivorous, forest passerine bird, endemic to the South Island. It belongs to an endemic genus along with the whitehead (*M. albicilla*), and the brown creeper (*M. novaezelandiae*). All three species have suffered through habitat loss at least since the arrival of Europeans in New Zealand, but unlike the whitehead and brown creeper, the mohua has disappeared from large, relatively unmodified forests and is continuing to decline.

Mohua is taonga to Te Rünanga o Ngai Tahu. This means that they have a special relationship with it. The Ngai Tahu Claims Settlement Act (1998) requires the Department of Conservation to consult with, and have particular regard to the views of Te Rünanga when making decisions regarding the management of any taonga species.

# 2. Past/present distribution

Last century mohua were one of the most abundant and conspicuous forest birds in the South Island. Historical records show that they were once present in most forest habitats of the South Island and Stewart Island (some 6.5 million ha). For example, Smith (1888) noted that they were common in the Lake Brunner district where he saw one flock of 200 birds. Mohua began to decline noticeably around the 1890s but their populations have contracted gradually over many years. Between 1900 and 1930 mohua disappeared from many localities on the West Coast, Stewart Island, Nelson, and Marlborough (Gaze 1985). They are now all but absent from 75% of their former range (see Figure 1) and much of this reduction in range has occurred in the last 30 years (Gaze 1985, O'Donnell 1996a).

Today, the core populations are fragmented. Small outlying populations persist in the Hurunui, Poulter, and Hawdon Valleys in the Arthur's Pass-Lewis Pass area, the Landsborough Valley in South Westland (Figure 1), and until recently (December 2000), on Mt Stokes in the Marlborough Sounds. Most mohua now occur in the eastern valleys of Aspiring and Fiordland National Parks, in the Takitimu and Longwood Ranges, the Blue Mountains and the Catlins. Fourteen populations were monitored over 11 years from 1982 to 1993. Of these, one population became extinct, five declined significantly (three to the verge of extinction), one population increased and seven did not change significantly (O'Donnell 1996a).

# 3. Causes of decline and threats

Monitoring of key mohua populations (O'Donnell 1996a) and detailed research (Elliott 1990, O'Donnell 1996b, O'Donnell *et al.* 1996) recorded periodic crashes in mohua populations. In these years introduced predator numbers, particularly stoats

(*Mustela erminea*), but also rats (*Rattus* spp.), (King and Moller 1997), were very high (O'Donnell and Phillipson 1996) on at least nine occasions. For example, mohua populations declined by 50% in the Eglinton Valley (Fiordland) and 65% in the Hawdon Valley (Arthur's Pass) during the summer following heavy beech seed-fall and irruptions of mouse and stoat populations. In the Eglinton Valley there was 43% mortality of incubating female mohua while they were on nests (Elliott and O'Donnell 1988). Mohua were found in stomach contents of stoats and mohua feathers were found lining stoat dens (E. Murphy, pers. comm.). Several cases of ship rats (*Rattus rattus*) preying on incubating female mohua have now been recorded using infrared video (P. Dilks, pers. comm.). Population monitoring indicated that in mohua populations with low productivity, the period between crashes is probably insufficient for mohua to recover fully, and consequently such populations are declining (Elliott 1996). Population monitoring has also indicated some unexplained populations crashes (e.g., Hawdon 1993-94, Eglinton 1997, Blue Mountains 1997). Some of these may be related to colder than average winter temperature.

Between 1999 and 2001 there have been significant mohua population declines at Mt Stokes (local extinction) (Gaze 2001, Studholme 2000), Hurunui, Hawdon Dart, Eglinton (local extinction), and Rowallan. These declines appear to have been caused by ship rat irruptions in conjunction with beech mast events and with warmer than average winter temperatures, thus allowing increased rat survival, and expansion of their range in altitude into mohua habitat. The recent observation of hole roosting by mohua adds to their level of risk outside the breeding season (P. Dilks *pers comm*.). The effect of ship rat irruptions on mohua has not been previously reported in such detail, but may help explain the rapid decline of mohua populations in podocarp forests and low-altitude beech forests. The effects of ship rat irruptions and an increase in their range highlights a previously unquantified threat to mohua survival on the mainland.

Mohua may also be vulnerable to competition with introduced wasps (Vespulidae) (Elliott 1990). Changes in forest structure resulting from logging and probably browsing by possums and deer and competition with introduced birds have also contributed to mohua decline. Forest clearance caused the elimination of mohua from many lowland forest areas by the 1920s, including Banks Peninsula and central Westland, but they have also now gone from extensive areas of relatively unmodified forest. More recent logging in Southland has seen the disappearance of more birds (e.g. Coker 1980, Spurr 1987).

# 4. Species ecology

All recent records of mohua are from beech (*Nothofagus* spp.) forests, but even in areas where mohua are numerous, they are patchily distributed. Mohua are almost entirely insectivorous, feeding predominantly in the upper understorey and canopy of tall forests (25-45 m). They show a significant preference for forest with large red beech trees, probably because these trees often occupy the most fertile sites, which have greater productivity and invertebrate biomass. These trees also usually contain the most nesting sites (Elliott 1990, Elliott and Ogle 1985, O'Donnell and Dilks

1986, 1994, Read 1988a, 1988b, Read and O'Donnell 1987, Elliott *et al.* 1996). However, mohua were once also present in podocarp-hardwood forest, and therefore don't require beech. Compared to other small passerines, mohua have relatively large home ranges, ranging from 2.85 ha/group in the Eglinton Valley to 3.4 ha/group in the Hawdon Valley.

Mohua are more vulnerable to predation than most other forest birds for five reasons:

1. They nest in holes. Nest predators not only eat mohua eggs and chicks but also incubating adults, which are unable to escape. Furthermore since only females incubate, nest predation results in a biased sex ratio.

2. Mohua have long incubation and nestling periods (20 and 22 days, about two weeks longer than most introduced passerines) during which they are vulnerable to predation.

3. Groups of mohua occasionally spend long periods feeding on, or close to, the ground. These groups are very noisy and, although there is no evidence of predation, they would make conspicuous targets for predators.

4. Mohua nest later than most other forest passerines and are still nesting when stoat numbers reach their summer peak.

5. From a recent observation at least some mohua also roost in holes, how common this activity is by mohua is unknown, but it does increase the risk of mohua predation outside the breeding season.

Mohua have a good potential for recovery if the factors that have caused their decline can be eliminated or reduced significantly. They lay up to five eggs, and are capable of raising two broods per year. When predator numbers are low adult survival is about 85%, and juvenile survival of 0-38% can rise to 67% when mohua populations are small.

# 5. Past conservation effort

Past effort has been a mixture of survey, monitoring, management, and research.

Surveys have determined the distribution the species presently occupies (Figure 1). Monitoring techniques have been developed and monitoring programmes established at 14 key sites, and repeated annually for the last 10 years (Table 1).

Management has included predator control (particularly stoats) at key sites, and the development of a low-key captive management programme. The aim was not to develop a population in captivity but to secure a captive population while there were still significant wild populations that could be cropped in a small way. The captive programme has been run through Orana Park, and the aviaries were built with WWF-NZ sponsorship from Thomas Cook Ltd. Outcomes from the project include:

- Documentation of birds double-clutching in mohua.

- Productions of fledglings though none so far have survived.
- Development of a suitable "insectivorous" diet formula for mohua.
- Development of appropriate medication for aspergillosus.
- Trialling of different types of nest boxes to determine suitable microclimates.
- Study of the behaviour of the birds and a university thesis produced (Elliott 1990).

Research aimed at increasing the efficiency of stoat control (Dilks *et al.* 1996) determined that during a predator plague, mohua breeding success increased to *c.* 80% in areas subject to control. Breeding success was only 36% (and half the breeding females were preyed upon) in a similar, but untreated, area (O'Donnell *et al.* 1996). At the only site where stoat trapping effort has been constant (Mt Stokes), mohua numbers had increased from <10 in 1982 to >90 in 1999 (M. Aviss *pers. comm.*). The subsequent decline of the mohua population was due to ship rat irruption.

### RESEARCH AND MANAGEMENT ACHIEVEMENTS FROM THE FIRST FIVE YEARS INCLUDE:

1. Developing a system for predicting the years when a predator plague will occur in beech forests (using seed-fall and mouse population indicators), and therefore indicating which years intensive management is required.

2. Improving efficiency of tunnel designs and baiting regimes for predator trapping programmes.

3. A "Best Practice" manual for intensive Fenn trapping of stoats.

4. Poisoning regimes for stoat control.

Active management programmes were implemented at eight key sites (Figure 1). Translocation techniques were developed (Dilks *et al.* 1994) and mohua populations established on predator-free Breaksea, Pigeon, Centre, Nukuwaiata and Ulva Islands. Techniques were developed to hold mohua in captivity following approval of a Captive Management Plan (Dilks 1993).

In 1998 the Mohua Recovery Group reviewed outcomes of the plan (O'Donnell 1998) and recommended a revised plan be written that incorporate findings of the monitoring and research programmes.

# 6. Long term recovery goal

To maintain and enhance mohua populations throughout the present range and beyond, by halting and reversing the degradation of the forest ecosystem.

Developing the ability to manage mohua predators will also assist in the conservation and management of not only for other hole-nesting species (e.g. kaka, kakariki), but also the whole forest bird community. As such, the mohua is a key indicator for monitoring biodiversity in mainland forests.

## OPTIONS FOR RECOVERY

1. Do nothing.

2. Manage mohua at all sites.

3. Manage mohua at key sites to maintain and enhance their distribution and abundance.

It would be inappropriate to do nothing as mohua have special significance to Maori; nor does "doing nothing" fit the Department's strategic direction of "Restoring the dawn chorus" (DOC 1998). Option 2 is unrealistic at the present time, given that advances in predator control techniques are still required to enable cost-effective control over large geographic areas.

Option 3 is considered the most appropriate management option. Management at key sites is achievable and protects a spread of populations throughout the current range. Management of mohua is usually a mixture of predator control, either every year or in years when predator irruptions occur, monitoring, and island translocations.

## OBJECTIVES FOR TERM OF PLAN

1. To manage wild mohua populations within key mainland forests throughout their range (Table 2).

2. To improve management techniques so they are effective over large geographic areas.

3. To search for new mohua populations.

4. To establish mohua populations on suitable predator-free islands.

5. To improve our understanding of factors that impact on mohua populations.

6. To continue developing a captive management capability.

# 7. Work plan

**Objective 1: To manage wild mohua populations in key mainland forests throughout their range.**

*Performance measure*

Key mohua sites are identified and managed so that population levels at 2005 are at least as high as those in 2000.

*Explanation*

Key sites have already been identified. These are Hurunui, Hawdon, Landsborough, Dart, Eglinton, Blue Mountains, Catlins and Rowallan.

Predator (stoat and rodent) control is required in mohua areas so that predicted declines do not continue and so mohua can recover. Current research indicates that predator control might not be needed every year. Therefore a system for predicting the summers in which predator control is necessary has been developed, and South Island-wide monitoring sites have been established. Prior to 2000 "best practice" was Fenn trapping with 100- metre spacing on 1-km$^2$ perimeters, and was used in years when mouse and seed-fall thresholds were surpassed. Table 2 summarises status and significance of key populations, priority sites for management, management techniques and sites for research. Recent advancement of stoat control in the Eglinton Valley has improved "best practice" so that it now comprises of a single line of a double set of traps spaced 200 metres apart, which is checked on a monthly basis. (Roberts, 2000). The new "best practice" should be implemented at all sites as soon as practicable. Stoat control is required at the key mohua management sites every year, and at some sites where "best practice" is not practicable, on average once every 4-5 years. Control of ship rats may also be needed at some locations at some times, however further investigation of ship rat irruptions may be required first. The Department's funding system is still not well set up to cater for one-off funding needs such as predator irruptions. Some type of contingency fund is needed for such events. Potential innovations for predator control (such as the use of lures, poisons, biological control, and new trap designs) need to be pursued so that the costs of control are reduced and benefits to mohua are improved. If biological control is investigated a greater level of consultation may be required with stakeholders.

Animal Health Boards and the Department are beginning to undertake 1080 poison operations in southern beech forests to control possums. No assessment has been made of whether mohua are at risk from direct poisoning from 1080 baits used in aerial possum control programmes or from secondary poisoning from eating invertebrates that may have fed on baits. Given that there is an impact on other insectivorous species, then this could be important. On the other hand, there could also be potential benefits of such operations if secondary poisoning kills stoats and rats. The costs and benefits of these operations in mohua areas needs to be assessed. Some data, which may be helpful, is available from 1080 operations in mohua habitats in the Landsborough Valley and the Catlins area.

Forest logging has been detrimental to mohua populations in the past (Coker 1980, Spurr 1987, Buckingham 1989). Mohua select large stem diameter beech trees for nesting and feeding (O'Donnell and Dilks 1994, Elliott *et al.* 1996), so if logging is proposed in mohua areas then Sustainable Management Plans need to ensure that there is no impact on mohua populations. The importance of advocacy is acknowledged but is not recommended as a separate task because there should be components in all areas of work.

*Actions required to achieve this objective (in priority order):*

1. Operate standardised mouse trapping and beech seed-fall monitoring systems annually at Mt Stokes (if mohua persist), Hurunui, Hawdon, Landsborough, Dart, Eglinton, Blue Mountains, Catlins and Rowallan mohua sites.

2. Undertake "best-practice" stoat control (Double set Fenn trapping, 200 m spacing on single lines checked monthly, all year round) or variations agreed upon by the Mohua Recovery Group, (should research indicate more effective techniques).
   This should be undertaken at key sites: Mt Stokes (if mohua persist), Landsborough, Eglinton Valley, Rowallan, Blue Mountains, Dart, Hawdon, Hurunui, and Catlins.

3. Apply for contingency funds for emergency predator control through Conservancy business plans when seed-fall and mouse indices indicate that predator irruptions are likely to occur during the following summer.

4. Continue monitoring mohua populations annually at Mt Stokes (if mohua persist), Hurunui, Landsborough, Dart, Catlins, Eglinton, Blue Mountains, and Rowallan study areas using standard transect techniques to assess performance of populations.

5. Pursue new priority research by bidding for resources in the Department of Conservation Science Planning Round annually. Priority research needs are:
   - To continue investigating factors that help us understand mohua populations and their responses to predation levels and predator management. (This is particularly urgent given the widespread ship rat irruptions across the South Island in between 1999-2001).
   - To continue developing predator control techniques specifically for large scale control.
   - To improve and test techniques for monitoring mohua numbers and the assessing the performance of populations in relation to management.

6. Additional sites for stoat control within the Iris Burn and Clinton Valley if resources permit.

7. Increase annual monitoring of non-treatment areas by incorporating mohua counts in Takahe Valley to improve performance indicators using standard walk-through counts by December 2001.

8. Investigate mechanisms for setting up a Contingency Fund for one-off, urgent threatened species problems, that would cater for the types of problem faced by managers responsible for mohua conservation.

9. Use forthcoming 1080 possum control operations in Southland and Otago as a de-facto experiment to investigate potential costs and benefits to mohua of undertaking 1080 operations in southern beech forest. Mohua should be monitored using standard transects and predator response using standard tracking tunnels followed by kill-trapping after the operation.

10. Oppose logging in forests containing mohua if systems do not sustain mohua and their nesting and feeding habitat.

*Responsibility*

All South Island conservancies, Recovery Group and Southern Regional Office.

## Objective 2: To improve management techniques so they are effective over large geographic areas.

*Performance measure*

To carry out and report on trials of landscape-wide predator control techniques for mohua.

*Explanation*

There has been a proven response of mohua populations to intensive predator control in small scale (50 ha) experimental areas during stoat plagues (O'Donnell *et al.* 1996). Stoat control experiments at six sites resulted in:

- significantly improved tunnel designs, baits and lures (Dilks *et al.* 1996);
- improved layout of tunnels (Lawrence and O'Donnell 1998);
- development of poisoning systems using 1080 or diphacinone toxins (>95% kill within 1 month using 1080 in eggs; P.Dilks unpubl. data);
- and successful video monitoring to confirm the efficacy of these toxins at killing stoats (P.Dilks unpubl. data).

Predator control techniques can be improved further, therefore prudent "research by management" is required to develop "best practice". These include: trialling "landscape-scale" predator control; continuous, low intensity control; and assessing new toxins (which may be more cost-effective than trapping).

*Actions required to achieve this objective:*

1. Design new experiments to increase productivity and survival of mohua should new impacts (e.g. rodent predation) or new control techniques be identified.

2. Undertake experimental predator control in Eglinton (low intensity Fenn trapping), Blue Mountains (predator guild trapping and tracking tunnels), and

South Hurunui (low intensity 1080 poisoning) and circulate results by June 2005.

3. Use the Caples Valley as a non-treatment area for annual experiments.

*Responsibility:*

Southland Conservancy and Science and Research Unit.

### Objective 3: To search for new mohua populations.

*Performance measure*

Potential new mohua populations are discovered; potential locations where mohua do not occur are eliminated.
Surveys are carried out based on approved survey strategies.

*Explanation*

If new and viable mohua populations are found, then the urgency of managing existing populations might be reduced. Surveys may lead to identification of better management sites. The Department of Conservation often receives sightings of mohua. These should be followed up. Such a sighting led to the discovery of a significant population in the Hurunui Catchment during the late 1990s.

*Actions required to achieve this goal:*

1. Develop conservancy-based strategies to undertake mohua survey programmes by June 2002.

*Responsibility*

All South Island conservancies.

### Objective 4: To establish mohua on suitable predator-free islands.

*Performance measure*

Successful transfer and establishment of breeding populations of mohua on at least five islands by 2007.

*Explanation*

The three island transfers undertaken since 1993 (Breaksea Island, Pigeon Island (Lake Wakatipu), Centre Island (Lake Te Anau)) have been successful. These populations continue to breed, and the largest, on Breaksea Island, has increased considerably. The aim of future transfers is to restore birds in permanent populations to parts of their former range where they occurred in podocarp-

hardwood forests. The recent loss of the Mt Stokes population and the declines reported in other mainland populations (Eglinton, and elsewhere) has highlighted the need for the establishment of larger mohua populations on island refuges. Transfers were carried out to Ulva Island, Chetwode/Nukuwaiata Island in 2001, and to Te Kakahu/Chalky Island in 2002, but it is too early to tell how successful these transfers have been. It is now urgent to establish further populations on Whenua Hou (Codfish Island) and to investigate other predator-free islands for their potential to hold mohua, e.g. Anchor Island.

*Actions required to achieve this goal:*

1. Obtain appropriate approvals for translocations, in accordance with the Translocation SOP, and establish new mohua populations, by June 2005.

2. Iwi consultation will be required with Ngai Tahu and the relevant Papatipu Rünanga before any taonga species can be transferred to any island.

3. Ngati Koata, Ngati Kuia and Rangitane will be consulted before any taonga species are transferred to islands in the Marlborough Sounds.

*Responsibility*

Southland and Nelson/Marlborough Conservancies.

**Objective 5: To improve our understanding of factors that impact on mohua populations.**

*Performance measure*

Factors that influence mohua populations are understood by 2006, and the results of research are reported on in an appropriate format by 2007.

*Explanation*

A number of gaps in our knowledge exist; filling these gaps will lead to improved management of mohua. Current gaps include:

- The minimum size(s) of core populations of mohua that need to be managed to ensure viable populations are maintained.
- Potential causes of decline and their relative importance compared with the role of stoats (e.g., predation by ship rats, competition with introduced finches and habitat deterioration).
- The impacts of climate and changing food availability (e.g. winter diet, winter habitat use, and winter predation) on population viability.
- Thresholds that trigger predator irruptions through the range and in different beech forest types. These do not appear to be consistent.
- Improved and lower-cost performance measures (e.g. lower-cost indices of response of mohua populations to management).
- Factors influencing migration, dispersal and re-invasion of stoats in managed areas.

*Actions required to achieve this goal:*

1. That Expressions of Research Need be written and submitted to annual Science Planning Rounds to cover programmes investigating performance measures and other research questions (above).

*Responsibility*

Recovery Group and South Island conservancies.

**Objective 6: To continue developing a captive management capability.**

*Performance measure*

Mohua Husbandry Manual completed and the Mohua Captive Management Plan reviewed by 2002.

*Explanation*

The Recovery Group has followed a policy of running a low-key captive management programme, but The Captive Management Plan is now out of date and needs to be reviewed and rewritten. Options for the future include:

- terminating the captive programme if the Recovery Group believe that there is sufficient information to initiate a new programme in the future, should it be needed;
- continuing the low-key programme, and further refining techniques;
- increasing the size of the programme to provide stock for island and mainland island releases;
- increasing advocacy opportunities associated with the captive birds. (The group favours continuation of the programme until at least a second generation of birds had bred in captivity.)

*Actions required to achieve this goal:*

1. Complete a Husbandry Manual for mohua by December 2002.

2. Review and improve security from predators of the mohua compound at Orana Park by December 2003.

3. Review and rewrite the Mohua Captive Management Plan following the objectives of the new Recovery Plan and consultation with the Recovery Group and other interested parties by December 2002.

*Responsibility*

Captive Management Co-ordinator, Orana Park, Christchurch.

# 8. Review date

This recovery plan should be reviewed by June 2012.

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FIGURE 1: LOCATIONS OF MOHUA MANAGEMENT AND MONITORING SITES IN THE SOUTH ISLAND, 1993-1998.

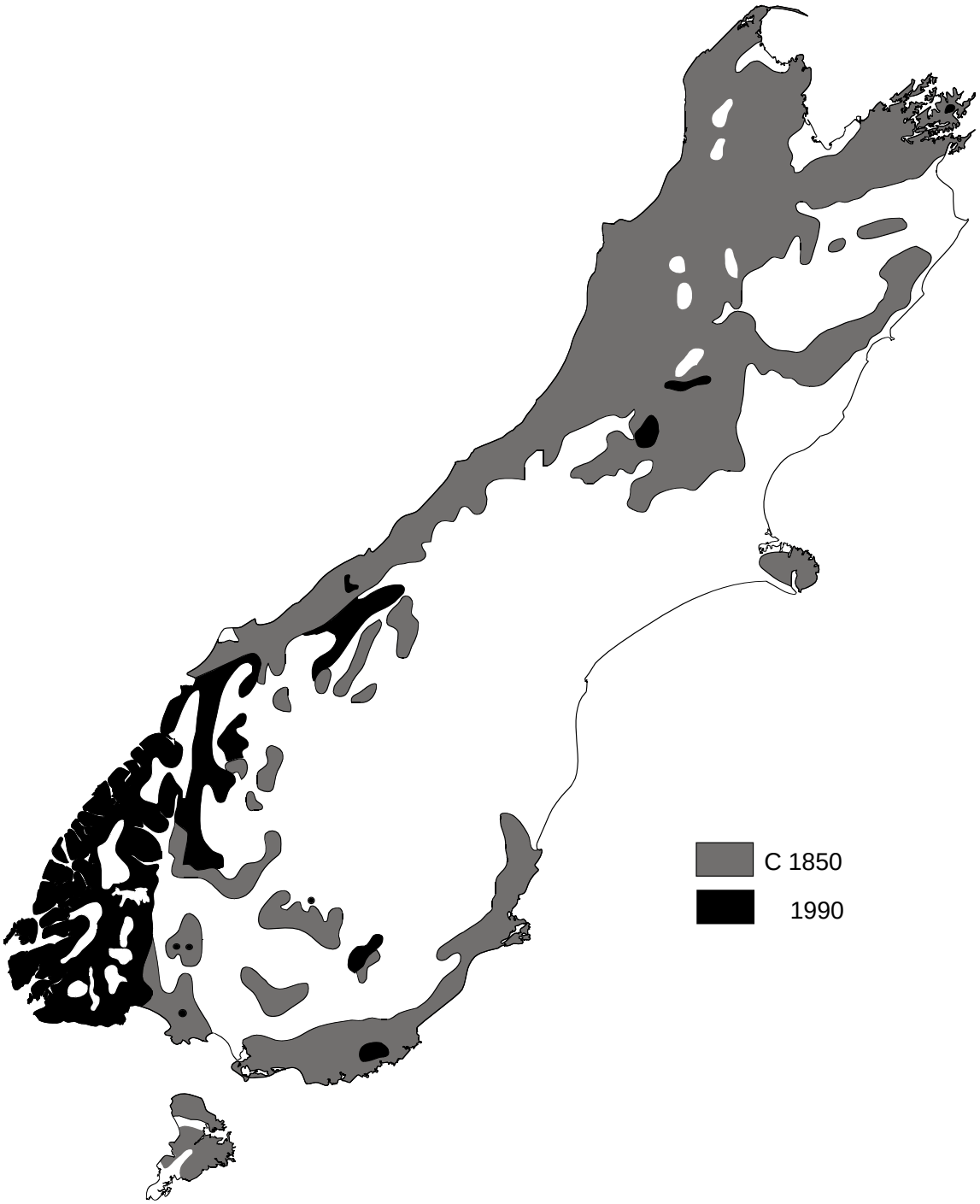

TABLE 1: PERFORMANCE AT KEY MOHUA MANAGEMENT SITES, 1993-98

| Place | Management | Performance |
|---|---|---|
| **Mt Stokes** | Annual trapping and nest protection | Six birds increased to c. 70 |
| **Hawdon Valley** | No control | Decline to 1-2 pairs |
| **Hurunui Valley** | Large scale 1080 poison in eggs (baits in stoat tunnels) | New project, too early for trends |
| **Landsborough Valley** | Trapping large core area only during stoat plagues | Arrested decline<br>No overall increase<br>Loss of birds at edge of range |
| **Dart Valley** | Large scale poison operation during plagues | Arrested decline<br>No overall increase<br>Loss of birds at edge of range |
| **Catlins** | Annual trapping in core area<br>Large scale operation during plagues | Arrested decline<br>No overall increase<br>Loss of birds at edge of range |
| **Eglinton Valley** | Annual control<br>Experimental trapping and poisoning used | 12 pairs after decline increased up to 40+ pairs<br>Harsh winter caused significant mortality |
| **Blue Mountains** | Monitoring only | Stable with quick recovery after cropping for transfers |
| **Rowallan** | Annual trapping | Unknown<br>Inconsistent monitoring |
| **Longwood** | No control | Unknown |
| **Makarora** | No control | Unknown |

TABLE 2. Key Mohua populations, 2002-2012

| Conservancy | Site | Actively Manage? | How? | Monitor populations and indicators |
|---|---|---|---|---|
| **1. MAIN DIVIDE-MONTANE VALLEY POPULATIONS** | | | | |
| Canterbury | **HURUNUI VALLEY** | Y | Best practice stoat and rat control | Y |
| Canterbury | **HAWDON VALLEY** | | Best practice stoat and rat control | Y |
| West Coast | **LANDSBOROUGH** | Y | Best practice stoat and rat control | Y |
| Otago | **MAKARORA** | Y | Stoat and rat control by community groups | Y |
| Otago | **DART VALLEY** | Y | Best practice stoat and rat control | Y |
| Otago | **CAPLES VALLEY** | Y | Best practice if resources allow | If resources allow |
| Southland | **EGLINTON VALLEY** | Y | Best practice stoat and rat control | Y |
| **2. HILL COUNTRY MONTANE POPULATIONS** | | | | |
| Otago | **CATLINS** | Y | Best practice stoat and rat control | Y |
| Southland | **BLUE MOUNTAINS** | Y | Stoat and rat control only in mast years | Y |
| Southland | **ROWALLAN** | Y | Best practice stoat and rat control | Y |
| **3. FIORDLAND STEEP-SIDED VALLEY POPULATIONS** | | | | |
| Southland | **IRIS BURN** | Y | As part of other programmes | In part |
| Southland | **CLINTON VALLEY** | Y | As part of other programmes | In part |
| Southland | **MURCHISON MOUNTAINS** | Y | As part of other programmes | In part |
| **4. ISLAND POPULATIONS (all established by translocation)** | | | | |
| Nelson/ Marlborough | **INNER CHETWODE** | Y | Prevent pest invasion | In part |
| Otago | **PIGEON** | Y | Prevent pest invasion | In part |
| Southland | **CENTRE (TE ANAU)** | Y | Prevent pest invasion | In part |
| Southland | **BREAKSEA** | Y | Prevent pest invasion | In part |
| Southland | **ULVA** | Y | Prevent pest invasion | In part |
| Southland | **CHALKY** | Y | Prevent pest invasion | In part |