Monitoring Bird Populations in New Zealand: A Workshop to Assess the Feasability of a National Bird Population Monitoring Scheme

Eric B. Spurr
Landcare Research

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Summary

A workshop on monitoring bird populations in New Zealand was held at Landcare Research, Lincoln, on 28 June 2004. The objective was to assess the feasibility of establishing a national bird-population monitoring scheme in New Zealand.

Organisations invited to the workshop were the Ministry for the Environment (MfE), Department of Conservation (DOC), Canterbury Regional Council (Environment Canterbury), Christchurch City Council (CCC), Ornithological Society (OSNZ), Forest & Bird, Fish & Game, and Landcare Research. Unfortunately, MfE, Environment Canterbury, and Fish & Game were unable to attend.

Each organisation was asked what bird population monitoring it currently undertook, what data requirements it had, and whether it would support a nationally coordinated scheme for monitoring bird populations.

All organisations (except MfE) currently undertake some form of bird-population monitoring, and several were planning to set up new schemes. There was little or no coordinated planning between organisations, each 'doing its own thing'.

DOC needs to know about trends in native bird populations for biodiversity monitoring (including monitoring response to intervention management). Territorial authorities (such as regional and city councils) need to know bird population trends for planning and environmental management purposes. Although not represented at the workshop, forest industry organisations need to know bird population trends for international forest accreditation purposes, and Fish & Game for management of game bird species.

All participants supported the concept of a nationally coordinated scheme for monitoring bird populations. Issues that need to be addressed in setting up a scheme include the purposes of monitoring, survey design, methods of monitoring, access to data, and funding.

The workshop participants recommended that a working group be established, including representatives from OSNZ, DOC, Landcare Research, and other interested organisations, to develop a strategy for setting up a scheme for monitoring long-term trends in the abundance of birds in New Zealand, and to recommend methods for its implementation. The participants also recommended that Eric Spurr (Landcare Research) should seek policy support and 'in principal' funding agreements between organisations for establishment of the working group.

Introduction

Birds are conspicuous components of the biota, and sensitive to environmental changes such as the impacts of agricultural practices, pesticide use, industrial development, pollution, and climate change (e.g. Fuller et al. 1995; Campbell et al. 1997; Eeva et al. 1998; Gregory & Baillie 1998; Siriwardena et al. 1998; Crick et al. 1999; Krebs et al. 1999). Many countries overseas have national schemes for monitoring common bird populations, using changes in bird abundance as indicators of environmental changes. The longest running scheme is possibly the Christmas Bird Count in the USA, which started in 1900 (www.audubon.org/bird/cbc/). Other long-running schemes include the Breeding Bird Survey in the UK, which started as the Common Bird Census in 1962 (www.bto.org/bbs/), and the Breeding Bird Survey in North America, which started in 1966 (www.mbr-pwrc.usgs.gov/bbs/). More recently, the European Bird Census Council has been instrumental in establishing national bird-population monitoring schemes in at least 20 European countries (www.ebbc.info/). In 2002, it established the Pan-European Breeding Bird Monitoring Scheme, and used data from these schemes to generate trends in the abundance of common birds across Europe over the past 20 years. In Australia, the Royal Australasian Ornithologists Union (Birds Australia) initiated a nationwide Australian Bird Count in 1989 (Clarke et al. 1999). Birds Australia has also recently completed its second nationwide bird-distribution mapping exercise, and produced a report on the state of Australia's birds that will feed into the Government's State of the Environment reporting, as an indicator of national environmental health (Olsen et al. 2003).

New Zealand has national schemes for monitoring populations of several bird species, such as some waders (e.g. Maloney 1999), some game birds (e.g. Rodway 2003a,b), and some rare landbirds (e.g. Kiwi Call Monitoring Scheme), but has no schemes for monitoring populations of common landbirds and seabirds. The Ornithological Society of New Zealand conducted national bird-distribution mapping exercises between 1969 and 1979 (Bull et al. 1985) and 1999 and 2004 (http://osnz.org.nz/). However, no information was collected on bird numbers.

Landcare Research reviewed bird-population monitoring schemes overseas and in New Zealand (Spurr 2003), and produced a discussion paper on the potential design of such a scheme for New Zealand (Appendix 1). Subsequently, an inter-organisation workshop was convened to consider the feasibility of establishing a national bird-population monitoring scheme in New Zealand.

Agenda

Representatives from the Ministry for the Environment (MfE), Department of Conservation (DOC), Canterbury Regional Council (Environment Canterbury), Christchurch City Council (CCC), Ornithological Society of New Zealand (OSNZ), Royal Forest and Bird Protection Society (Forest & Bird), Fish and Game New Zealand (Fish & Game), and Landcare Research were invited to attend the workshop. However, representatives from only five of the organisations were able to attend (Appendix 2). MfE, Environment Canterbury, and Fish & Game were unable to send representatives.

The workshop started with an overview of bird-population monitoring schemes overseas. This was followed by presentations from the various organisations represented, on what bird-population monitoring they are currently doing or planning to do and, if relevant, what bird-population data they require. The workshop finished with a discussion on whether a national bird-population monitoring scheme was needed and, if so, which scheme(s), and how to get the scheme(s) established.

Overview of bird-population monitoring schemes

Eric Spurr (Landcare Research)

Introduction

Bird-population monitoring schemes overseas include:
In UK/Europe:

- Breeding Bird Survey
- Winter Bird Survey
- Waterways Breeding Bird Survey
- Waterways Bird Survey
- Wetland Bird Survey
- Seabird Survey
- Constant Effort Sites
- Retrapping Adults for Survival
- Garden BirdWatch
- Big Garden Birdwatch

In North America:

- Breeding Bird Survey
- Christmas Bird Count
- Great Backyard Bird Count
- Project Feeder Watch
- eBird

In Australia:

- Australian Bird Count

Some schemes have been running for a long time, e.g. the Christmas Bird Count in the USA for more than 100 years, Breeding Bird Survey or its equivalent in the UK for 43 years and in the USA for 39 years, Big Garden Birdwatch in the UK for 26 years, Australian Bird Count for 16 years, Garden BirdWatch in the UK for 10 years, and Great Backyard Bird Count in the USA for 7 years. Most schemes are run by non-government organisations, or a combination of government and non-government organisations, with field input from a large number of volunteers. Details of some schemes for landbirds are presented below.

Breeding Bird Survey (UK)

The Breeding Bird Survey in the UK is run jointly by the British Trust for Ornithology (BTO), Royal Society for the Protection of Birds (RSPB), and the Joint Nature Conservation Committee (JNCC), with government assistance. It started in 1962 as the Common Bird Census, and was revised to its present format in 1994. Its aim is to track changes in the breeding populations of widespread landbird species in the UK. The survey design involves:

- Counts of birds seen or heard in a set time or distance (see below)
- In summer (breeding season)
- Annually (twice between April and June in Northern Hemisphere)
- At stratified random sampling locations

The scheme (or a variant of it) has now been adopted by more than 18 European countries. Methods vary in different countries (e.g. transect-based distance counts on farmland in the UK, and point-based distance counts in continental Europe) (see also Appendix 2). In the UK, transects are 2 km long, located in randomly selected 1-km grid squares, stratified by observer density. Birds are counted in three distance bands (<25 m, 25–100 m, and >100 m either side of the transect line). In France, 10 points are located within 2-km grid squares, and birds are counted for 5 minutes in three distance bands (<25 m, 25–100 m, and >100 m around each point). There are about 1700 observers in the UK, counting on about 2300 transects. Each transect takes about a half day to complete (www.bto.org/bbs/). Results are published annually on the web, and show the trends in populations of more than 100 terrestrial bird species since 1966 (www.bto.org/birdtrends/).

Garden BirdWatch (UK)

The Garden BirdWatch in the UK started in 1995, and is run by the BTO. It involves:

- Records of bird species present in private gardens, public parks, etc.
- Over the period of a week
- Every week of the year
- No time specified but must spend same amount of time each week

In 2004 there were 16,500 participants. Each participant paid £12 per annum. Results for each species are reported on the BTO website as the proportion of gardens that reported the species during a particular week. Results are published annually on the web, and show how bird species change their use of gardens throughout the year and from one year to the next since 1995 (www.bto.org/gbw/).

Big Garden BirdWatch (UK)

The Big Garden BirdWatch in the UK started in 1979, and is run by the RSPB. It involves:

- Counts of birds in private gardens, public parks, etc.
- The highest number of each species seen at any one time
- In 1 hour
- Once per year
- During set week in January (winter)

Approximately 250,000 gardens were surveyed in 2004, with more than 400,000 people taking part, and more than 8 million birds counted. Results are published annually on the web, and show trends, by species, in the average number of birds per garden since 1979 (www.rspb.org.uk/birdwatch/).

Breeding Bird Survey (USA)

The Breeding Bird Survey in the USA started in 1966. It is run by the Wildlife Research Center, US Geological Survey (in conjunction with the Canadian Wildlife Service in Canada). It involves:

- Counts of birds in roadside habitats
- At 50 points along 24.5-mile (39.4-km) randomly located routes (roads)
- In summer (June) (breeding season)
- Annually
- Count for 3 minutes
- All birds heard and/or seen within 0.25 miles (400 m) of each point
- Starting at the first point half an hour before sunrise

Data from the 50 counts are summed to provide a total for each bird species for the route. The database contains data from more than 3500 routes, some going back 39 years. Results are available on the web (www.mbr-pwrc.usgs.gov/bbs/BBS_Results_and_Analysis.html).

Christmas Bird Count (USA)

The Christmas Bird Count started in the USA in 1900, and is run by the Audubon Society. It involves:

- Counts of all birds along a specified route through a 15-mile (24-km) diameter circle
- Total number of each species
- In one whole day
- Between 14 December and 5 January (early winter)

More than 50,000 observers participated in 2004. Each adult over 18 years paid US$5 to participate. The results are published annually on the web, and show trends in the number of each species counted per party hour since 1900 (www.audubon.org/bird/cbc/).

Great Backyard Bird Count (USA)

The Great Backyard Bird Count in the USA started in 1998. It is run by the Cornell Lab of Ornithology and the Audubon Society. It involves:

- Counts of birds in private backyards, public parks, etc.
- Highest number of each species seen at any one time
- In at least 15 minutes
- Once per year
- During set days in February (winter)

The results are published annually on the web, and show the number of birds of each species counted and the number of lists reporting each species each year since 1998 (www.birdsource.org/gbbc/).

eBird (USA)

eBird was developed by the Cornell Lab of Ornithology and the Audubon Society. It contains four types of bird observations:

- Casual sightings
- Stationary counts (known time)
- Travelling counts (known distance and time)
- Area counts (known area)

Data entry is web-based. The database now has more than 100,000 entries (www.ebird.org/).

Bird population monitoring in New Zealand

Two main methods have been used for monitoring forest bird populations in New Zealand, the slow-walk transect and the 5-minute point count.

Slow-walk transects involve walking (slowly) along a set route (or transect) counting all birds of selected species detected within a set distance either side of the transect. Exact methods have varied. For example, Lovegrove (1988) used transects 500 m long and 20 m wide (10 m either side) (see also Handford 2002). Westbrooke et al. (2003) used transects 250 m long and 100 m wide (50 m either side of the transect line). This contrasts with the UK, where transects are 2 km long, and birds are counted in three distance bands (<25 m, 25–100 m, and >100 m) either side of the transect line.
Five-minute counts involve standing at selected points and counting the number of each bird species heard and/or seen in exactly 5 minutes (Dawson & Bull 1975). In most studies, the counting points have been 200 m apart (e.g. Dawson et al. 1978), but in some only 150 m (Gill 1980), 100 m (Clout & Gaze 1984; Robertson & Hackwell 1995), or even only 20 m apart (Williams & Karl 2002). The counting points have usually been along tracks or compass bearings, seldom randomly located. In some studies the counts have had a 200-m radius cut-off (e.g. Dawson et al. 1978, Clout & Gaze

1984), in others a 100-m radius (e.g. Miller & Anderson 1992), and in others they have been unbounded (Spurr 1985). In some studies birds were separated into near (within 20 m) and far (all other observations) (e.g. Moffat & Minot 1994), and in others into first seen or first heard (e.g. Gibb 1996). Monitoring has usually been to answer specific questions, such as comparison of bird populations in native and exotic forest (Clout & Gaze 1984) and assessment of the impacts of vertebrate pest poisoning operations on bird populations (Spurr 1991; Miller & Anderson 1992).

Organisations involved in bird population monitoring in New Zealand

Ministry for the Environment (MfE)
The MfE does not monitor bird populations, but is developing tools for national biodiversity monitoring and reporting, including trends in bird biodiversity. For birds, it has recommended 5-minute point counts plus distance sampling (Froude 2003).

Ornithological Society
See separate presentation below.

Department of Conservation
See separate presentation below.

Regional councils
Councils have responsibility under the Resource Management Act (RMA) 1991 for resource consents. Currently, they get resource consent applicants to undertake bird impact assessments (e.g. for gravel extraction in riverbeds). Councils also have responsibility under the RMA for maintaining biodiversity in their regions. They need to know bird population abundance and trends.

City councils
See separate presentation below.

Forest industry
The Forest Stewardship Council has an internationally recognised system of forest accreditation, requiring production forest managers to attain specified performance standards of biodiversity and conservation. Consequently, the forest industry is interested in monitoring bird population trends and the impacts of forest management practices on bird populations (Spurr & Coleman 2002).

Fish & Game
Fish & Game is responsible for management of game bird populations. Currently, it monitors some game birds nationally (e.g. shoveler) and others regionally (e.g. paradise shelduck and black swan).

Forest & Bird
The Manawatu Branch initiated the Manawatu Birdwatch in 2003, based on the RSPB Big Garden Birdwatch in the UK. The highest number of each bird species seen at any one time in half an hour, in private gardens, public parks, etc., is counted once per year, during a set weekend in October (spring).

Landcare Research
Landcare Research has two regional web-based bird monitoring schemes: the Lincoln-based *Bellbirds in Canterbury* (www.landcareresearch.co.nz/research/biodiversity/bellbird/observation.asp), and the Waikato-based *Tui in my Backyard* (www.landcareresearch.co.nz/research/biodiversity/tui/tui_report_form_new.asp). Both schemes are open to public submission. They record data primarily on bird distribution rather than abundance. Landcare Research is also attempting to establish a web-based system on the Global Biodiversity Information Facility (GBIF) node for monitoring national biodiversity (including birds), based on the Swedish Artportalen system (Appendix 3).

Ornithological Society bird monitoring

Introduction

Kerry-Jayne Wilson (Chairperson, Scientific Committee, OSNZ)

Existing OSNZ schemes include:

- Atlas of bird distribution 1969–79 and 1999–2004
- National wader counts
- Nest record scheme
- Beach patrol scheme
- Bird banding scheme
- Classified Summarised Notes (CSN)
- Various local schemes (e.g. Ashburton Lakes)
- Species-specific schemes (e.g. cattle egret)

The Society is assessing future directions.
What replaces the Atlas?
Bird-population monitoring?
Revised national wader counts
Revision of CSN
The future of banding
Making use of local/species-specific schemes

The OSNZ has 900 observers, both professional and amateur, spread nationwide, most with good bird identification skills, some retired with time to spend birding, keen to apply their skills to projects that advance the knowledge and well-being of New Zealand birds. There is an opportunity for professionally directed studies to use the skills of these keen and knowledgeable amateur observers to undertake projects that would otherwise be financially impossible. To get buy-in from members, projects must be enjoyable and worthwhile.

OSNZ national wader counts

Paul Sagar (OSNZ)

National wader counts have been made since the formation of the OSNZ. Initially, counts were made at selected sites such as the Firth of Thames and Manukau Harbour, annually in both summer and winter. In 1983, it was decided to extend these counts to all the major estuaries and harbours in New Zealand. Counts of flocks of waders were made at high tide, when the birds were concentrated in roosts, annually in summer (November) and winter (June). This provided information on the numbers of Arctic migrants that summered in New Zealand and how many remained over the winter. It also provided counts of New Zealand waders that formed flocks in the winter, e.g. South Island pied oystercatcher, wrybill, and pied stilt. The national wader counts were conducted at all sites until 1996. Today, counts are continuing at a selection of key sites to monitor long-term trends in the wader populations. Some of the data have been used for environmental impact assessments (e.g. in the marina proposal at Tauranga).

OSNZ nest record scheme

Paul Sagar (OSNZ)

The objective of the nest record scheme is to provide data on the length, time, and peak of breeding seasons, clutch size, number of clutches, incubation and fledgling periods, nest sites, materials used in nest building, and breeding success. Hundreds of cards are needed before a valid analysis can be attempted for any one species and hundreds more to confirm results of the first analysis and show what variations occur between seasons or between districts. By April 1997, 24,122 cards had been contributed to the scheme, covering 144 species. Information from nest record cards was used in compiling the breeding sections in the new field guide. However, little other use has been made of the data to date.

OSNZ beach patrol scheme

Paul Scofield (OSNZ)

The Beach Patrol Scheme started in 1951. A beach patrol is a walk along the high-tide line of a beach to find, identify and record what birds have been washed ashore. Birds are removed from the beach during each patrol to prevent the same birds being reported by another patroller. The aim is to record systematically the seabirds found dead on New Zealand beaches. Infrequent or opportunistic patrols may result in a few specimens of rare birds being sent to museums and the occasional recovery of a banded bird. However, regular patrols yield a greater volume of information, and in some districts are organised by groups of members taking turns to do a monthly or fortnightly patrol of suitable beaches. The results establish and confirm what species of seabirds occur in New Zealand waters, and accumulate information leading to an understanding of their distribution, abundance, seasonal or annual movements and migrations.

Banding and the monitoring of bird populations

David Melville (Banding Liaison Officer, OSNZ)

The objective of the New Zealand National Banding Scheme (administered by DOC) is to accurately record information about the life expectancy and movements of birds. Banding started in New Zealand in 1911. Over one million birds have been banded.

In New Zealand, banding has been used to monitor populations of only a few bird species. In the UK, banding is used as part of an integrated population-monitoring (IPM) scheme to: (a) Establish thresholds to notify conservation bodies of requirements for further research or conservation monitoring, (b) Identify the stage of the life cycle at which changes are taking place, (c) Provide data that will assist in identifying the causes of population changes, (d) Distinguish anthropogenic changes in populations from ‘natural’ population fluctuations. Banding contributes to IPM by monitoring survival rates through the Retrapping Adults for Survival (RAS) scheme, and monitoring changes in numbers and productivity through the Constant Effort Sites (CES) scheme.

Effective banding requires trained banders, technically competent at applying bands, aging and sexing birds, and measuring body proportions (e.g. wing length), moult, fat deposits, pectoral muscle profiles, etc. At present, New Zealand has no training standards for bird banding and no bird-bander training programme. The OSNZ is committed to promoting bander training.

Effective banding also requires a properly resourced Banding Office, with functional databases and electronic data submission.

DOC perspective on monitoring bird populations

Terry Greene (Department of Conservation)

DOC has 489 bird monitoring projects on its books (189 of which are current and ongoing). The objectives of these projects are to monitor:

- Changes in ecological status and integrity (51%)
- Management actions (38%)
- Functional understanding (11%)

The parameters measured include:

- Indices of abundance (mainly 5-minute counts) (51%)
- Demographics (survival/recruitment) (27%)
- Distribution (19%)
- Actual abundance (3%)

The types of bird monitoring data that DOC needs include:

- Distribution and inventory
- Status and trends
- Response to management interventions
- Research

(a) Distribution and inventory:

- Presence/absence (what species are present where?)
- Point records (casual observations)
- OSNZ atlas (large-scale distribution patterns and change)
- Site occupancy modelling (probability of occurrence, etc.)

(b) Status and trends:

- Demographic parameters (survival, productivity, sex ratio, etc.)
- Complete counts (OSNZ wader/riverbed surveys, albatrosses, gannets)
- Population estimates (robust across time and space)

(c) Response to management interventions:

- Status, trend, and distribution as a function of some management action, such as pest control, pest eradication, translocation, habitat augmentation, habitat and community restoration (local but able to be amalgamated nationally)

(d) Research:

- Specific management questions (e.g. non-target impacts)
- Method testing (e.g. validation of ‘new’ methods, calibration of indices)
- Assessing new and existing management techniques

Improvements needed to current DOC monitoring practices include:

- Appropriate field methods for particular situations
- Appropriate statistical techniques
- Proper design to account for variation
- Monitoring for long enough to determine factors influencing trend
- Robust tools for predicting long-term consequences of management

Without improvements to monitoring, DOC will not be able to provide robust data to the Natural Heritage Monitoring Scheme (NHMS), GRASP, BIOWEB, Pest Spread, or predictive population models (e.g. for kiwi).

Any national bird population monitoring must therefore be:

- Robust and provide comparable, defensible data
- User friendly and resource efficient
- Able to make use of and inform local-scale and past monitoring effort

Concepts behind the Natural Heritage Monitoring System

Matt McGlone (Landcare Research)

Landcare Research was contracted by DOC to help develop a Natural Heritage Monitoring System (NHMS), in response to DOC's needs for biodiversity monitoring.

The system is required to determine ecological integrity (i.e. whether all indigenous plants and animals typical of a region are present, major ecosystem processes are intact, and ecosystems occupy the full environmental range). The fundamental components of ecological integrity are indigenous dominance, species occupancy, and environmental representativeness.

Types of monitoring:

- Inventory (monitoring to document presence/absence, with no particular re-measurement interval; e.g. flora and fauna surveys)
- Status and trends (monitoring based on a network of sites, plots, or transects, with regular re-measurement; e.g. NVS permanent plots, national bird survey)
- Management (monitoring to detect and assess potential problems and trigger action pre-intervention, and assess success of management action in reducing pressure (action monitoring) and assess affect of management action in improving outcome for biodiversity asset of interest (outcome monitoring) post-intervention).
- Research (monitoring to understand, with focus on hypotheses).

Functional monitoring groups:

- Inventory (mainly non-DOC, mainly inventory monitoring; e.g. floras and faunas)
- Remote sensing (non-DOC, inventory, status & trend, and surveillance; e.g. land cover)
- Permanent location monitoring (DOC and non-DOC, status & trend, and surveillance; e.g. long-term animal censuses)
- National mapping (DOC and non-DOC, surveillance, inventory, status & trend; e.g. land cover types)
- Management activity records (mainly DOC; e.g. exotic control)
- Intensive monitoring (mainly DOC; e.g. rare biota recovery programmes).

National outcomes:

- Maintaining ecosystem processes
- Reducing exotic spread and dominance
- Reducing environmental pollutants
- Preventing declines and extinctions
- Maintaining ecosystem composition

- Mitigating climate change and variability
- Ensuring sustainable use
- Engaging communities in conservation

Framework structure for the proposed NHMS:

Outcome	National (national goal for biodiversity)
	Targeted national (critical components for achieving national outcome)
	Objectives (key factors contributing to targeted national outcome)
Performance	Indicators (parameters that can be assessed in relation to objective)
	Measures (methodology and source information for the indicator)
	Elements (data layer(s) that support a measure, if needed)

Bird monitoring around Hamilton

John Innes (Landcare Research)

Hamilton City Council is supporting the development of a bird survey as part of its sustainability programme. It has 25 sustainability indicators as part of the global plan for sustainable development (Rio UN Earth Summit 1992). The indicators provide ways in which the council can measure, directly or indirectly, changes to the environment, society and economy over a period of time. The objective of the bird survey is to describe the species composition, distribution and abundance of birds (especially native species) in green and residential areas of Hamilton City in such a way that future large changes can be detected.

The proposed counting regime is to do 5-minute counts of birds in green and residential areas plus slow-walk transect counts of birds in native vegetation in November–December, and repeat the 5-minute counts in green areas in August (to count tui). Five-minute counts enable many species of birds to be monitored with minimal effort, and because the technique is widely used, enable comparisons to be made with other areas. However, absolute densities remain unknown. Also, rare species require many counts to verify modest abundance increases. Slow-walk transects give an absolute density (with assumptions) from counts of all birds in a transect 500 m long by 20 m wide.

Christchurch City Council bird monitoring

Andrew Crossland (Christchurch City Council)

The Christchurch City Council (CCC) needs accurate information on birdlife and habitats for planning and environmental management processes. The Council has a tradition of using in-house ecological skills for bird monitoring. This has been found to be more cost-effective, and to generate more comprehensive and longer-term information, than contracting consultants.

Established bird monitoring projects include:

(a) Wetland and coastal birds
Some 37 species of wetland and coastal birds are monitored at 40+ sites across the city, on a 2 times to >20 times per year basis. Many sites have been monitored for up to 20 years. Recently completed projects include:

- The third series of 12 monthly trend counts of all waterbirds on the Avon River (repeated every 5 years)
- The second series of 12 monthly trend counts of all waterbirds on Brooklands Lagoon
- A series of 12 monthly counts of Eastern bar-tailed godwits on the Avon-Heathcote Estuary and Brooklands Lagoon
- Monitoring scaup fledgling production on the Bromley Oxidation Ponds
- Birdlife monitoring on the Lower Heathcote Floodplain

(b) Landbirds
A programme for monitoring landbirds (specifically bush/woodland-inhabiting birds) was set up in the Port Hills in 2002 (nine sites) and later expanded citywide (eight sites). Each site will be monitored for 12 consecutive months, and then resurveyed at 3-yearly intervals. All native and introduced birds are recorded using the slow-walk transect method. Five-minute counts have also been used at Kennedys Bush to enable direct comparisons with a study undertaken by Amanda Freeman in 1992/93.

In addition, the following monitoring has been or is being undertaken:

- Winter and spring surveys of Port Hills bush reserves to ascertain seasonal distribution of native bush birds
- Mapping NZ pipit, NZ falcon, tomtit, morepork, and cuckoo sightings on the Port Hills to ascertain seasonal distributions
- Surveys of urban wasteland and vacant lots in autumn and winter to ascertain bird species occurrence, relative abundance, and conservation values of this habitat type
- A study of kereru population dynamics, movements, diet, and breeding success – carried out by Ngai Tahu and university researchers with assistance from CCC when requested

There are a number of birds for which a better level of monitoring is needed (e.g. on seasonal abundance, population trends, distribution, breeding success, habitat requirements, impacts of disturbance, conservation threats, and risks to the sustainability of populations in Christchurch). Much of this is likely to be undertaken by CCC Park Rangers under the umbrella of regional park habitat management or under the proposed Christchurch biodiversity strategy, which, among other things, proposes the development of recovery plans for threatened species.

Volunteer bird monitoring

Lesley Shand (Forest & Bird)

Lesley reported on a volunteer holiday programme run by DOC that surveys the presence or absence of great spotted kiwi in the Lewis Pass – Lake Sumner area. Participants also note the presence or absence of other bird species. The survey lasts for up to 2 weeks in summer, around the new moon. It starts 2 hours after dark (following the national standard). Volunteers are often university students. Training in recognizing bird calls is given from tapes.

Discussion

Discussion centred around two draft resolutions:
(1) That a nationally co-ordinated, annual bird-population monitoring scheme (or a number of such schemes) be established in New Zealand.
(2) That a working group be established to (a) design, (b) plan the management of, and (c) seek funding for the scheme(s).

Recognising the need for national reporting of the state of New Zealand's environment and the current lack of information available to determine whether populations of most New Zealand birds are in decline, increase, or stasis, workshop participants supported the development of a scheme (or a series of schemes) for monitoring long-term trends in the abundance of birds in New Zealand.

To advance this cause, workshop participants supported the establishment of an inter-organisation working group to develop a strategy for setting up a bird population monitoring scheme in New Zealand. Suggested terms of reference for the working group were to:

- Identify bird population monitoring needs in New Zealand
- Review best practice bird population monitoring in relation to those needs overseas
- Recommend bird population monitoring protocols for New Zealand
- Seek long-term funding for implementing a bird population-monitoring scheme.

The draft strategy should consider which bird groups should be monitored (e.g. seabirds, waders, waterfowl, terrestrial birds), the agencies responsible (e.g. DOC, OSNZ, Fish & Game), and the type of monitoring to be undertaken (e.g. counts, banding, nest records). Counts will provide quantitative data on bird population trends. Banding and nest records will help identify the stages of the life cycle at which population changes are taking place, and assist in identifying the causes of any changes.

Workshop participants recognised the need for collaboration between MfE, DOC, regional councils, territorial authorities, Landcare Research, OSNZ, Forest & Bird, Fish & Game, and others for the success of the strategy. Inter-organisational policy support and 'in principal' funding agreements will be essential for the establishment of the working group.

Recommendations

A working group should be established, including representatives from OSNZ, DOC, Landcare Research, and other interested organisations to develop a strategy for setting up a scheme for monitoring long-term trends in the abundance of birds in New Zealand, and to recommend methods for its implementation.

Eric Spurr (Landcare Research) should seek policy support and 'in principal' funding agreements between organisations for the establishment of the working group.

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Appendices

Appendix 1. Discussion paper

A bird-population monitoring scheme for New Zealand?

Eric B. Spurr
Landcare Research
PO Box 69, Lincoln 8152
New Zealand

Introduction
The Scientific Committee of the Ornithological Society of New Zealand (OSNZ) requested a discussion paper on a bird-population monitoring scheme for New Zealand. Below, I cover the need for, and potential design and funding of, such a scheme.

The need for a bird-population monitoring scheme
New Zealand does not have a national scheme for monitoring bird population trends. The OSNZ conducted a national bird-distribution mapping exercise, based on the presence of bird species in 10 000-yard grid squares, between 1969 and 1979 (Bull et al. 1985). A second bird-distribution mapping exercise is currently underway, recording the presence of bird species in 10 000-m (10-km) grid squares, from 1999 to 2004 (Robertson 2003). No information is being recorded on bird numbers. However, there are several ad hoc bird-population monitoring schemes in New Zealand, and a number of organisations are independently considering monitoring bird populations for a variety of purposes (Spurr 2003). There appears to be little or no coordinated planning between these organisations, each 'doing its own thing'.

The Ministry for the Environment (MfE) is developing a core set of national environmental performance indicators, to help the government to assess the state of the environment and monitor the outcomes of environmental policies and key legislation such as the Resource Management Act (MfE 1996; www.mfe.govt.nz). Birds are being considered as one of a range of environmental performance indicators for biodiversity. Initially, the kiwi was selected as the sole bird indicator, based on the Department of Conservation (DOC) kiwi call scheme, tracking a mixture of environmental pressures including habitat loss, predation, disease, and competition (MfE 1998). The latest proposals recommend monitoring changes in the abundance of a range of terrestrial bird species in selected or representative locations, using 5-minute bird counts supplemented by distance sampling (Froude 2003).

DOC has established an Inventory and Monitoring Advisory Group to review what monitoring (including bird-population monitoring) is currently being undertaken by the Department, recommend what monitoring should be undertaken, and establish methodologies for undertaking this monitoring (Elaine Wright, Southern Regional Office, pers. comm.). The details have not yet been decided.

Fish and Game New Zealand (Fish & Game) monitors the numbers of some game bird species such as paradise shelduck and black swan regionally, and others such as shoveler nationally (Rodway 2003a,b). Together with Richard Barker (University of Otago) they are also experimenting with a new national aerial-transect survey of dabbling ducks.

The Royal Forest and Bird Protection Society (Forest & Bird) currently has no plans for a national bird-population monitoring scheme. However, some branches, such as Manawatu, are proposing to set up a regional bird-population monitoring programme for local members (Donald Kerr, Chair,

Manawatu Branch). At present, they are planning to copy the UK Royal Society for the Protection of Birds 'Big Garden Birdwatch' and run twice-yearly (winter/spring) surveys of birds in the Manawatu. They would like the data collected to be suitable for feeding to the Palmerston North City Council to determine if 'green corridor' and other projects are working.

The OSNZ has a number of regional and national programmes monitoring bird populations, including 5-minute bird counts (e.g. Kapiti Island and Karori Wildlife Sanctuary), harbour surveys of waders, gulls, and terns (e.g. Kaipara, Waitemata, Tauranga, Ohiwa, and Wellington), lake surveys of waterfowl (e.g. Ashburton Lakes and Rotorua Lakes), and surveys of river birds (e.g. Hurunui River and Ashley River) and other species (e.g. black shags, dotterels, and gannets). The Society considers it timely to set up a national scheme for monitoring bird populations in New Zealand (David Medway, President, and Kerry-Jane Wilson, Chairperson, Scientific Committee). The current bird-distribution mapping scheme is due to finish in about a year's time, and the Society is looking for follow-up activities.

To summarise, New Zealand needs measures of biodiversity change, and birds are potential indicators of such change. There are potentially a relatively large number of volunteers wanting to participate in bird observations. This enthusiasm could be channelled to help provide some of the information needed for measuring biodiversity change.

Design of a bird-population monitoring scheme

Many countries overseas have national schemes for monitoring bird populations (Spurr 2003). Each has strengths and weaknesses. Gregory (2000) considered some basic questions that need to be answered when embarking upon a new monitoring scheme.

- What are the objectives of the monitoring (e.g. which species, which habitats, what precision)?
- What resources are available (e.g. number of skilled observers, long-term funding)?
- What is the sampling strategy (e.g. random sampling, stratified by observer density and/or habitat type)?
- What is the survey method (e.g. line transect, point count, area search/territory mapping)?
- How should data be collected (e.g. form design, data handling, computerisation, data analysis)?
- Should habitat be recorded (e.g. broad-scale habitat type, land use)?
- What training and support is needed for running volunteer surveys (e.g. for organisers and counters)?

These and other questions are considered below. Other useful references include Ralph et al. (1995) and Bibby et al. (2000).

Objectives?

Which species (e.g. terrestrial birds, wetland birds, riverine birds, coastal birds)? Which habitats (e.g. forest, grassland, farmland, rivers, lakes, coastline)? Gregory (2000) noted that the broader the base of the monitoring scheme, the more likely it is to detect environmental problems. Stratification (e.g. by habitat) is a way of increasing precision (see sampling strategies below).

In the UK, there are at least three broad-based bird-population monitoring schemes:

- *Breeding Bird Survey* (BBS), which comprises counts of terrestrial birds on 2300 farmland and woodland plots (c. 70% of the UK is farmland). At least 18 other European countries, the USA, Canada, and Australia currently have Breeding Bird Surveys. In the UK (and maybe other countries) there is also a *Winter Bird Survey* on farmland plots, using different methods to the breeding bird survey.

- *Waterways Bird Survey* (WBS), which maps the territories of birds on rivers, streams and canals on 100–300 plots, each covering, on average, 4.5 km.
- *Constant Effort Sites* (CES) scheme, based on banding birds at over 100 sites.

In New Zealand, I suggest we start with a survey of breeding terrestrial birds (i.e. a breeding bird survey), and add other schemes after we have mastered that.

Resources?
Volunteer bird counters will be the basis of any national bird-population monitoring scheme. About 1700 volunteer counters contribute to the BBS in the UK, and more than 200 contribute to the equivalent scheme in Hungary. In New Zealand, more than 800 observers contributed to the first bird-distribution mapping scheme, and more than 600 to the second (current) scheme. A question we need to consider is whether sufficient volunteers will contribute, in an ongoing way, to a bird-population monitoring scheme.

In addition to volunteer bird counters, professional staff are needed to run the scheme. In the UK, the BBS is run by two full-time professional staff (a senior manager/analyst and a national organiser), and some part-time analysts, in addition to 100+ volunteer regional organisers and the 1700+ volunteer counters. The scheme costs about £120,000 per year, including associated costs (e.g. data input is done by an outside agency at a cost of about £10,000 annually).

Dr Richard Gregory (RSPB) considers that the bare minimum would be one full-time organiser, but it would be helpful to have at least a part-time analyst and a manager overseeing the whole programme (as well as contract data entry). I think there will also be a need for part-time/contract secretarial services. The scheme will also need at least one office, a dedicated computer with back-up security, and access to statistical software packages. Analysis of the data for population changes is based upon a TRIM-type model in the statistical package SAS (Gregory 2000).

An important point to consider for funding is the long-term nature of monitoring schemes. In this regard, it is advantageous to build partnerships of government and non-government organisations so that the costs of running the scheme are shared (and, of course, the results are also shared). If it costs £120,000 annually to run the BBS in the UK, then in relative terms it should cost about NZ$120,000 to run a similar-sized scheme in New Zealand. However, it could cost more (e.g. two professional staff @ $60,000, contract secretarial services $10,000, contract data entry $10,000, travel costs $10,000, office rent $10,000, office supplies $1000, postage $5000, telephone $1000, electricity $250, and insurance $250 = total $167,500), say $170,000–$200,000. In addition there would be set-up costs (e.g. computer).

Sampling strategy?
The ideal sampling strategy should incorporate random sampling and stratification (Gregory 2000). The method of selecting plots for breeding bird surveys varies in different countries.

United Kingdom: 1-km grid squares were selected randomly, stratified by observer density (but not by habitat type). Within each square, two 1-km transect lines were located, ideally parallel, 500 m apart and 250 m from the edge. Birds are recorded in 200-m subdivisions along these transects.

Ireland: 1-km grid squares were located at the extreme southwest corner of every 10-km grid square of the Irish national grid (i.e. a stratified random sample). As in the UK, two transect lines are located within each square.

France: 2-km grid squares were randomly selected from a 10-km radius around a plot identified by each observer. Ten points were placed homogeneously within each square by the observer, and point counts made at each of these points.

Poland: 1-km grid squares were selected using a stratified random sampling design within 15 geographical regions (strata). Within each stratum, the number of squares selected was proportionate to the number of potential observers there.

Hungary: 2.5-km grid squares were selected at random from within particular areas where volunteers indicated they were able to do fieldwork (and therefore can be described as semi-random). Each square is marked out with 25 evenly spaced points in a 5 × 5 grid. Point counts are made at 15 of these points, in a randomly selected order.

Spain: 10-km grid squares were chosen at random within circles of 100-km radius around selected urban centres. Within each square, a transect was established with 20 points along it, and point counts made at each of these points.

In New Zealand, I suggest we use 1-km grid squares, rather than 2-km, 2.5-km, or 10-km, and select squares randomly. I think we should stratify by broad habitat type (e.g. forest, grassland, mixed grassland/cropping land). Do we need to stratify by observer density? If we use point counts (see survey methods below), the configuration of counting points within each square will also need consideration (perhaps 16 points 200 m apart and 200 m from the edge, on four lines).

Coverage?
The number of plots (squares) used for breeding bird surveys varies in different countries.

United Kingdom: 2300 × 1-km grid squares (about 1% of the number available), with about 1700 observers, some doing multiple squares.

Ireland: 1-km squares were located at the extreme southwest corner of every 10-km grid square of the Irish national grid (i.e. a 1% sample).

France: 200 × 2-km squares were surveyed in 2001, and 800 in 2002.

Poland: 134 × 1-km grid squares were surveyed in 2000, and 240 in 2001.

Hungary: 278 × 2.5-km grid squares were surveyed by at least 218 volunteers.

Spain: nearly 300 × 10-km grid squares were surveyed in 2000.

New Zealand is about the same size as the UK but has a much lower human population, so we might struggle to cover the same number of squares. Dr Richard Gregory (RSPB) suggested we might need a minimum of 300–500 squares.

Survey method?
There are three main methods of surveying birds: point counts, transect counts, and territory mapping/area searches (and variations thereof). Gregory (2000) compared their strengths and weaknesses.

Point counts vs transect counts vs area searches. There is a choice between transect counts as in the UK and Ireland, point counts as in most of the rest of Europe, Canada, and the USA, and area searches as in Australia. Transect counts and point counts were compared in the UK, and produced

very similar results, but transect counts were chosen because they were preferred by observers, required less time per visit, recorded more birds per unit time, were slightly more precise at measuring change, and could be applied to a wider range of habitats than point counts (Gregory 2000). Most continental European countries have chosen point counts, sometimes because of tradition and sometimes because they better suit the denser habitat types and more limited access (Dr Richard Gregory, pers. comm.). Australian researchers found area searches most suited to their habitats (Loyn 1986). New Zealand has some steep mountains covered in dense forest, as well as flat, open farmland. I suggest point counts are more appropriate here than transect counts or area searches. Should we use the same methods in forests and farmland? Visibility is different in forest and on farmland.

Timed counts vs distance measurements. There is also a choice between timed counts (e.g. 5-minute count) and distance measurements, or some combination of the two. In the UK transect counts, birds are recorded in three distance bands (0–25 m, 25–100 m, and more than 100 m either side of the transect line). In France, 5-minute point counts are made using the same three distance bands. In Hungary, point counts are made in three different distance bands (0–50 m, 50–100 m, and 100–200 m). New Zealand has a history of 5-minute counts, with a 200-m cut-off but no internal distance bands (Dawson & Bull 1975). At a recent seminar (11 December 2003), Dr Dave Dawson (pers. comm.) recommended 5-minute counts with near and far distance categories (<25 m and >25 m). Retaining the 5-minute count methodology means that comparisons can be made with historical 5-minute counts dating back to the 1970s.

Number of counts: In the UK, two counts are made in the breeding season each year, whereas in the USA only a single count is made each year. In Australia, counts are made at least once in the summer, but monthly if possible. Gregory (2000) noted that it is preferable to have more plots and fewer counts per plot than fewer plots and more counts per plot.

When to count: In the UK, two counts are made in the breeding season each year, one between the beginning of April and mid-May, and the second between mid-May and the end of June. The visits should be at least 4 weeks apart. In the USA, a single count is made in June each year. To be equivalent to the UK, counts in New Zealand should be made between the beginning of October and end of December.

Start and finish times. In the UK, counts are made in the morning, ideally starting between 0600 and 0700 hours, and no later than 0900 hours, and take about 1.5 hours to complete. In the USA, counts start half an hour before sunrise, and finish about midday. Morning counts are made to maximise the number of birds encountered. However, in New Zealand, 5-minute counts traditionally start about 0900–0930 and finish about 1500–1530 hours, to avoid the rapid change in bird conspicuousness near dawn and dusk (Dawson & Bull 1975). We will need to consider the pros and cons of these options.

Data collection?

Data collection should be made as simple as possible if we wish volunteer counters to continue long-term. Careful thought needs to be given at an early stage to form design, data handling, computerisation, and data analysis (Gregory 2000).

Habitat recording?

Recording habitat data is necessary to be able to interpret any changes in bird populations. In line with collection of bird data, collection of habitat data should also be kept as simple as possible (Gregory 2000). Various habitat recording categories are available for consideration (e.g. OSNZ categories used for bird-distribution mapping and BTO categories used for the Breeding Bird Survey).

Training and support?
Training and support are essential for volunteer counters and for organisers of volunteer counters, to promote good practice. Feedback (talks, workshops, newsletters, personal letters, etc.) is also extremely important (Gregory 2000).

Where based?
In the UK, the BBS is based in the BTO (equivalent of the OSNZ). A decision needs to be made where the scheme should be based in New Zealand; e.g. in the OSNZ, DOC, Landcare Research, or elsewhere? OSNZ, DOC, and Landcare Research all have experience in managing databases; e.g. OSNZ manages the bird-distribution mapping scheme, nest record scheme, and other schemes such as wader surveys, DOC manages various bird monitoring schemes such as the Kiwi Call Scheme (www.kiwirecovery.org.nz) and bird banding scheme, and Landcare Research the National Vegetation Survey (NVS) database (nvs.landcareresearch.co.nz). One point in favour of the scheme being based in the OSNZ is that OSNZ members will comprise the bulk of the volunteer bird counters, and they may feel some ownership of the scheme. Whether the OSNZ, DOC, or Landcare Research manages the scheme will need to be decided after further discussions with these organisations.

What funding sources?
In the UK, the BBS is funded by a partnership of the British Trust for Ornithology (BTO) (equivalent of the OSNZ), the Royal Society for the Protection of Birds (RSPB), and the Joint Nature Conservation Committee (JNCC), which obtains funding from the government. In New Zealand, potential contributors include OSNZ, DOC, Landcare Research, MfE, local authorities such as regional councils and city councils, Forest & Bird, Fish & Game, and direct government grant. Is it possible that the total amount required could be achieved if each organisation contributed $5,000–$10,000 and the government matched that?

What steps are needed from here?
Decisions to be made:
1. Do we need/want a bird-population monitoring scheme?
2. If yes, can we find resources to run the scheme?
3. If yes, what scheme?

Hold a workshop of interested parties (who should we invite?).

OSNZ, DOC, Landcare Research, and other organisations to consider their roles.

Set up a working group to secure funding, and design a draft bird-population monitoring scheme for consideration by interested parties. Keep the scheme simple.

Run a trial scheme before adopting full scheme.

Summary
Points to consider when setting up a bird-population monitoring scheme.

1. Objectives: (a) Should we start with a terrestrial breeding bird survey?
   (b) Other scheme(s)?
2. Resources: (a) Do we have the necessary pool of volunteers?
   (b) How many professional staff do we need?
   (c) Secretarial services?
   (d) Office?
   (e) Computer facilities?
   (f) Software?
3. Sampling strategy: (a) Random, stratified by habitat and/or observer density?
   (b) 1-km squares?
4. Coverage: (a) 1% of squares?
   (b) more or fewer?
5. Survey method: (a) Transect counts?
   With/without distance measurements?
   Number of counts?
   When to count?
   Start/finish times?
   (b) Point counts?
   With/without distance measurements?
   How many points/square?
   Number of counts?
   When to count?
   Start/finish times?
   (c) Area searches?
6. Data collection: (a) Design of recording form (select from existing ones)?
7. Habitat recording: (a) Which habitat classification (select from existing ones)?
8. Training and support: (a) Plan training and support.
9. Where based: (a) OSNZ?
   (b) DOC?
   (c) Landcare Research?
   (d) Other?
10. Funding sources: (a) OSNZ, DOC, Landcare Research, other?
11. Next steps: (a) Workshop of interested parties (who should we invite?)
    (b) Secure funding (where from)?
    (c) Working group design a draft scheme?
    (e) Run trial of draft scheme before adopting full scheme?

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Spurr EB 2003. A national scheme for monitoring bird populations in New Zealand? Landcare Research Contract Report LC0304/058 (unpublished), 17 p.

Appendix 2. List of workshop participants

OSNZ	Kerry-Jayne Wilson (Chairperson, Scientific Committee) Paul Sagar (member, Scientific Committee) Paul Scofield (member, Council) David Melville (Banding Liaison Officer)
DOC	Terry Greene (Science & Research) Lynette Hartley (Science & Research)
Christchurch CC	Andrew Crossland (Ornithologist) Richard Earl (Research Analyst) Scott Butcher (Ornithologist)
Forest & Bird	Lesley Shand Judy Bugo
Landcare Research	Matt McGlone (NHMS) John Innes Catriona MacLeod Colin Meurk Kerry Borkin Eric Spurr

Appendix 3. Artportalen (or Species Gateway)

Artportalen (or Species Gateway) is a Swedish web-based, online data reporting, storage, and retrieval system (found at http://artportalen.se) for public and institutional input of observations and records of birds (since 2000), butterflies, moths, plants, and fungi (all since 2003). Modules for reporting amphibians, reptiles, and mammals will be added soon. The system was awarded the 2004 Ebbe Nielson Prize by the Governing Board of the Global Biodiversity Information Facility (GBIF). By 2004, the scheme had received 2.6 million sightings (98% of which were birds), from 50,000 sites, contributed by 6,200 volunteer observers. It is publicly available, and an application has been made for funding to start it up in New Zealand (C. Meurk, Landcare Research, pers. comm.).

The scheme allows the reporting of casual sightings (like the OSNZ Classified Summarised Notes), or timed observations (like 5-minute counts). An output system generates continually updated distribution maps and summary statistics. The reported information is normally freely available, although providers can limit or prevent public access to information if they wish (e.g. the exact location of protected species).

The system seems similar to eBird in the USA (www.ebird.org/content/).

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