



Department of Conservation biodiversity indicators— *2012 assessment: supplementary material*



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DOC biodiversity indicators— 2012 assessment: supplementary material

Introduction

This DOC report underpins the intermediate outcome “*the diversity of our natural heritage is maintained and restored*” in the Department of Conservation’s Annual Report for the year ending 30 June 2012. It provides more detailed information on a subset of DOC’s biodiversity indicators which are not covered in the Landcare Research report, “Department of Conservation biodiversity indicators: 2012 assessment¹” Both reports are summarised in the Department of Conservation’s Annual Report² for 2011/12.

The DOC Annual Report and both technical reports are available on the DOC website.

Summary view of information on biodiversity indicators

Indicator	Location of information
1. % of environmental unit under indigenous vegetation and protected	Refer to this report for general overview. Note that additional information is available in the Landcare Research report “Department of Conservation biodiversity indicators: 2012 assessment”.
2. % of environmental unit in marine protected areas	Refer to this report
3. Size-class structure of canopy dominants	Refer to Landcare Research report.
4. Representation of plant functional types	Refer to Landcare Research report.
5. Demography of widespread animal species	This indicator contributes to the Landcare Research analysis on the status of New Zealand’s biodiversity. However, this report provides a case study on South Island robins (as summarised in the Annual Report).

1 “DOC biodiversity indicators: 2012 assessment” by Landcare Research www.landcareresearch.co.nz

2 Appendix 1 Natural Heritage Indicators – Methodology.

6. Representation of animal guilds	This indicator is not being reported in 2011/12. The first report on the measure will be made in 2015-2016 and annually thereafter
7. Extent of potential range occupied by focal taxa	This indicator is not being reported in 2011/12 but will be reported in 2012/13 for selected taxa and thereafter every 5 years.
8. Number of extinctions	Refer to this report
9. Number of 'threatened' and 'at risk' species	Refer to this report
10. Demographic response to management at a population level for selected 'threatened' and 'at risk' taxa	Refer to this report
11. Number, extent and control of fire	Refer to this report
12. Change in extent and integrity of nationally uncommon, significantly reduced habitats/ecosystems that are protected	Refer to Landcare Research report.
13. Occurrence and intensity of mast flowering and fruit production	There was no significant mast flowering and fruiting this year. Please refer to summary in Annual Report.
14. Distribution and abundance of exotic weeds and animal pests considered a threat	Refer to Landcare Research report

Supplementary indicator reports

1. Percentage of environmental unit under indigenous vegetation and protected

Measure 6.1.1 & 6.1.2³: Percentage of environmental unit under indigenous cover and protected.

Definition: Percentage of LENZ environments in indigenous cover and legally protected. This measure is a quantification of the transformation of the New Zealand landscape and assesses the degree to which the potential for indigenous biodiversity is realised.

Methods: This measure combines three national datasets to produce a table showing the overall changes in New Zealand's native vegetation by Environment type; and changes in the amount of native cover protected. The percentage of LENZ environments under indigenous vegetation and legally protected was evaluated using the national Landcover Database categorised by indigenous versus modified vegetation for New Zealand as a whole. The data presented use Landcover information from 1996, 2001 and 2008. We are using the Land Environments of New Zealand (LENZ) database, developed by Landcare Research and managed by the Ministry for the Environment. DOC uses it to identify 20 types of "Environment" across New Zealand – places that are grouped together because they are more similar to each other environmentally than they are to other places. The legal protection layer⁴ includes DOC estate, Nga Whenua Rahui and QE2 covenants calculated in July 2012.

The landcover categorisation into native versus modified vegetation can be found in the DOC spreadsheet *LCDB3 LENZ Protected Summary, 6 July 2012* (DOCDM-1023236). The threat categories for Environment types relate to the percentage of environments legally protected and/or the per cent of remaining native cover. Using this measure, we identified two categories of threat; acutely (< 10% indigenous cover remaining) and chronically threatened (10–20% indigenous cover remaining). Environment types in the threatened categories are likely to contain some of our most severely reduced and poorly protected ecosystems, habitats and species.

Results: Table 1 shows the change in native cover 1996/97 to 2001/02 and 2001/2002 to 2008 by environment and legal protection. The data show that there has been no marked difference in indigenous cover by environment unit or in protection status between 1996 and 2008. As of 2008, the lowland regions throughout the North Island and in the

³ See chart in Biodiversity monitoring and reporting system technical fact sheet at <http://www.doc.govt.nz/upload/documents/about-doc/role/policies-and-plans/biodiversity-monitoring-and-reporting-system.pdf> for the full list of DOC measures.

⁴ Protected areas defined as:

NATIS1.NATISADM.VS_ADMINISTRATIVE_LANDREG_CONSERVATIONUNITS:

"Leg_Group_Code" = 'D' AND "Leg_Code" NOT IN ('MMSA', 'MRMR', 'CAMSM', 'WARF', 'UNRS') OR "Leg_Group_Code" = 'P' AND "Leg_Code" IN ('EASE', 'PROTD', 'RASRA', 'WWA', 'WAWS', 'RARR')

natis2.NATISADM.ADMINISTRATIVE_NWR_Kawenata

natis2.NATISADM.ADMINISTRATIVE_QEII_Covenants

eastern South Island are the regions with the least area under protection (less than 10%). Of these, less than 1% of the eastern South Island Plains and Western, Central and Southern North Island lowlands are covered by indigenous vegetation and protected.

Interpretation and implications: These quantitative data on Environment types, their degrees of representation in protected areas, and their threat status, will help conservation managers consider opportunities for protection. For example, if a landowner wants to sell or covenant an area of land, the question arises whether that Environment type is already well represented in protected areas and therefore a low priority, or whether it is a highly-threatened Environment type and therefore a high priority for protection.

Table 1. Percentage of Environmental unit under indigenous vegetation and protected.

LENZ (Classification level 1)	Land environment name	Threat classification	Total area of each LENZ Level 1 classification (ha) across all New Zealand, excluding offshore islands	Percent protected in 2008	Percent indigenous & protected 2008	Change in Indigenous cover from 1996 - 2001 (%)		Change in Indigenous cover from 2001 - 2008 (%)	
						Protected	Unprotected	Protected	Unprotected
A	Northern lowlands	Chronically threatened	1,853,478.5	5.5	4.7	0.00%	-0.08%	0.00%	-0.09%
B	Central dry lowlands	Chronically threatened	691,616.3	2.1	1.1	0.00%	-0.08%	0.00%	-0.14%
C	Western and southern North Island lowlands	Acutely threatened	636,262.4	1.2	0.9	0.00%	-0.03%	0.00%	0.01%
D	Northern hill country		2,103,297.0	22.1	21.6	0.00%	-0.05%	0.01%	-0.03%
E	Central dry foothills		1,323,344.4	28.5	21.0	-0.01%	-0.10%	-0.03%	-0.22%
F	Central hill country and volcanic plateau		5,245,896.7	20.4	19.7	0.00%	-0.04%	0.02%	-0.02%
G	Northern recent soils	Chronically threatened	338,895.4	7.8	5.0	0.00%	-0.02%	0.01%	0.00%
II	Central sandy recent soils		155,380.3	21.9	20.5	0.00%	-0.01%	0.00%	0.00%
I	Central poorly-drained recent soils	Acutely threatened	121,102.8	3.1	2.0	0.00%	0.01%	0.00%	0.01%
J	Central well-drained recent soils	Acutely threatened	293,525.5	2.1	0.8	0.00%	-0.05%	0.00%	-0.11%
K	Central upland recent soils		160,771.1	28.1	15.6	0.01%	-0.01%	-0.08%	-0.10%
L	Southern lowlands	Chronically threatened	802,604.9	8.1	7.1	0.00%	-0.03%	0.01%	-0.05%
M	Western South Island recent soils		220,661.7	50.8	45.0	-0.01%	-0.11%	-0.03%	-0.41%
N	Eastern South Island plains		2,044,918.1	1.0	0.4	0.00%	-0.03%	0.00%	-0.23%
O	Western South Island foothills and Stewart Island	Acutely threatened	1,415,944.3	82.5	81.6	0.00%	-0.04%	-0.01%	-0.36%
P	Central mountains		3,248,187.3	77.2	75.9	-0.01%	-0.07%	0.00%	-0.04%
Q	Southeastern hill country and mountains		3,277,187.8	21.3	20.0	0.00%	-0.16%	0.00%	-0.45%
R	Southern Alps		1,931,525.7	94.9	94.8	0.00%	0.00%	0.00%	0.00%
S	Ultramafic soils		38,513.4	93.4	92.9	0.00%	-0.01%	0.01%	-0.10%
T	Permanent snow and ice		157,155.9	97.8	97.8	0.00%	0.00%	0.00%	0.00%
Other *	Other *		2114,215	20.7	13.4	-0.02%	-0.06%	-0.08%	-0.11%
Total	Total		2624,6688.0	33.5	32.1				

* Other is the NULL class in LENZ layer. These are predominantly in Rivers, Estuaries and Lakes.

** Area Outside LENZ are areas where LENZ coverage doesn't extend, largely Rivers, Lakes, Coastline differences, some estuaries and off-shore islands

2. Percentage of environmental unit in marine protected areas

Measures: Percentage of environmental unit in marine protected areas.

Definition: The area of marine reserves and marine mammal sanctuaries.

Methods: All data (marine reserve name, date and legal area) are taken directly from the relevant Order in Council. Please note that areas may not be completely accurate and may differ from other reported figures, particularly those calculated using GIS.

Results: Approximately 7%, or 1.28 million hectares, of New Zealand's Territorial Sea is protected within marine reserves. The gazettal of Tawharanui Marine Reserve in 2011 increased the total number of marine reserves in New Zealand's marine environment to 34. In 2011 the Subantarctic Islands Marine Reserves Bill was introduced and is awaiting its first reading. This Bill seeks to establish three new marine reserves in the Subantarctic Islands Biogeographic Region. A process to develop marine protected area proposals for the South Island's West Coast was completed and applications for five marine reserves were notified in 2012. In 2011, a gaps analysis and inventory of marine protected areas in New Zealand's Territorial Sea was completed.

Table 2 lists gazetted marine reserves as at 30 June 2012, and Table 3 lists marine mammal sanctuaries gazetted at that date. Table 4 collates the total marine area managed by DOC.

Table 2: New Zealand marine reserves as at 30 June 2012 (34 Marine Reserves).

Identifier	MR Name	Date established	Legal Area (ha ⁵)	% of NZ TS
MR1	Cape Rodney-Okakari Point Marine Reserve	1975	547	0.003%
MR2	Poor Knights Islands Marine Reserve	1981	2,410	0.013%
MR3	Kermadec Islands Marine Reserve	1990	748,000	4.128%
MR4	Kapiti Island Marine Reserve	1992	2,167	0.012%
MR5	Whanganui A Hei (Cathedral Cove) Marine Reserve	1992	840	0.005%
MR6	Tuhua (Mayor Island) Marine Reserve	1992	1,060	0.006%
MR7	Long Island-Kokomohua Marine Reserve	1993	619	0.003%
MR8	Te Awaatu Channel (The Gut) Marine Reserve	1993	93	0.001%
MR9	Piopiotaahi (Milford Sound) Marine Reserve	1993	690	0.004%
MR10	Tonga Island Marine Reserve	1993	1,835	0.010%
MR11	Westhaven (Te Tai Tapu) Marine Reserve	1994	536	0.003%
MR12	Long Bay-Okura Marine Reserve	1995	980	0.005%
MR13	Motu Manawa-Pollen Island Marine Reserve	1995	500	0.003%
MR14	Te Angiangi Marine Reserve	1997	446	0.002%
MR15	Pohatu Marine Reserve	1999	215	0.001%
MR16	Te Tapuwae o Rongokako Marine Reserve	1999	2,452	0.014%

⁵ Note: All figures are rounded to the closest zero, including the total.

Identifier	MR Name	Date established	Legal Area (ha ⁵)	% of NZ TS
MR17	Auckland Islands (Motu Maha) Marine Reserve	2003	498,000	2.748%
MR18	Ulva Island - Te Wharawhara Marine Reserve	2004	1,075	0.006%
MR19	Te Hapua (Sutherland Sound) Marine Reserve	2005	449	0.002%
MR20	Hawea (Clio Rocks) Marine Reserve	2005	411	0.002%
MR21	Kahukura (Gold Arm) Marine Reserve	2005	464	0.003%
MR22	Kutu Parera (Gaer Arm) Marine Reserve	2005	433	0.002%
MR23	Taipari Roa (Elizabeth Island) Marine Reserve	2005	613	0.003%
MR24	Moana Uta (Wet Jacket Arm) Marine Reserve	2005	2,007	0.011%
MR25	Taumoana (Five Finger Peninsula) Marine Reserve	2005	1,466	0.008%
MR26	Te Tapuwae o Hua (Long Sound) Marine Reserve	2005	3,672	0.020%
MR27	Te Matuku Marine Reserve	2005	690	0.004%
MR28	Horoirangi Marine Reserve	2006	904	0.005%
MR29	Parininihi Marine Reserve	2006	1,844	0.010%
MR30	Te Paepae o Aotea (Volkner Rocks) Marine Reserve	2006	1,267	0.007%
MR31	Whangarei Harbour Marine Reserve	2006	237	0.001%
MR32	Tapuae Marine Reserve	2008	1,404	0.008%
MR33	Taputeranga Marine Reserve	2008	855	0.005%
MR34	Tāwharanui Marine Reserve	2011	394	0.002%
			1,279,574	7.061%

Table 3: Marine mammal sanctuaries in New Zealand as at 30 June 2012.

	Marine Mammal Sanctuary Name	Date gazetted	Legal (Conservation Unit) area (hectares) ⁶
1	Banks Peninsula Marine Mammal Sanctuary	1988	407,696
2	Auckland Islands Marine Mammal Sanctuary ⁷	1993	505,710

⁶ These data are derived from the legal area of each marine mammal sanctuary (DOC Conservation Units), which likely differs from area calculated using GIS, due to aspects such as differing projection.

⁷ For the Auckland Islands Marine Mammal Sanctuary, the Conservation Unit area included the area of the islands themselves (which are not included within the boundaries of the Sanctuary) and so for this Sanctuary the area of the GIS shape area has been provided. This explains the discrepancy between the area calculated for the Auckland Islands Marine Mammal Sanctuary and the Auckland Islands Marine Reserve, which overlap spatially.

	Marine Mammal Sanctuary Name	Date gazetted	Legal (Conservation Unit) area (hectares) ⁶
3	Te Waewae Bay Marine Mammal Sanctuary	2008	34,884
4	Catlins Coast Marine Mammal Sanctuary	2008	65,388
5	Clifford and Cloudy Bay Marine Mammal Sanctuary	2008	138,600
6	West Coast North Island Marine Mammal Sanctuary	2008	1,193,542
		Total area	2,345,820

Table 4: Summary of marine areas managed by DOC.

		At 30 June 2012	Change since last annual report
Marine reserves	Total area	1.28 million hectares	Increase of 394.2 hectares
	Percentage of Territorial Sea	7.061 %	Increase of 0.002 %
	Percentage of marine area	0.31 %	Increase of <0.001 %
Marine mammal sanctuaries	Total area	2.35 million hectares	Now excludes land area of Auckland Islands from Marine Mammal Sanctuary
	Percentage of Territorial Sea ⁸	12.946 %	No change
	Percentage of marine area ⁹	0.57 %	No change

⁸ Area of Territorial Sea is 18.12 million hectares

⁹ Area of Territorial Sea and Exclusive Economic Zone ("marine area") is 414.57 million hectares (excludes New Zealand land masses and extended continental shelf).

3. Size-class structure of canopy dominants

Refer to Landcare Research report.

4. Representation of plant functional types

Refer to Landcare Research report.

5. Demography of widespread animal species

Measure 5.1.2: Demography of widespread animal species – case study, South Island Robin

Note: This measure is also referenced in the Landcare Research Technical Report.

Definition: This measure assesses the number and distribution of widespread species, and selected indicator species (eg robins), and is used as an early warning of long-term changes in populations so that action can be taken before it is too late.

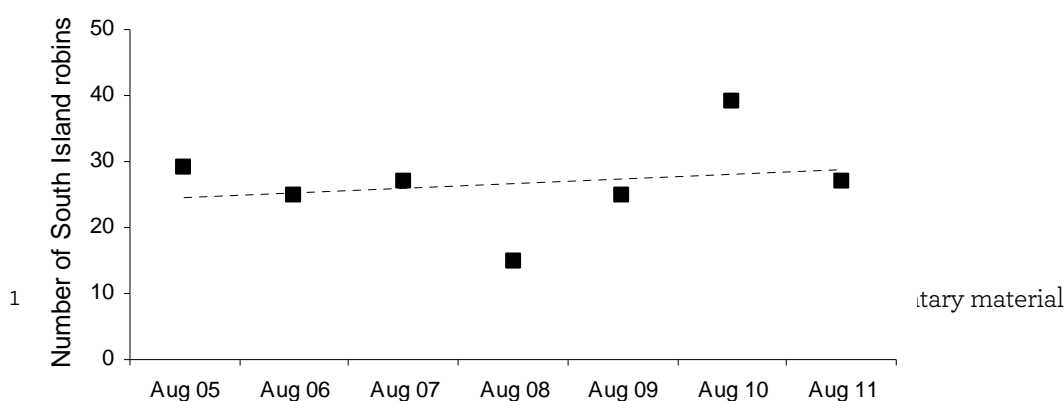
South Island robins have been identified as a useful indicator for measuring changes in demography of a widespread forest bird species which is vulnerable to predation by rats and stoats.

Five additional indicator species have been selected for reporting, and sampling programmes for them will be implemented in 2012/13. This number will incrementally increase to a total of 25 indicator species over the next five years.

Methods: The numbers of robins inhabiting two forest blocks (Walker Creek and Knobs Flat) within the Eglinton Valley, Fiordland have been monitored intensively since 2005. The data collected have provided a valuable time series useful for the real-time evaluation of various pest management regimes and the performance of monitoring methods. Sufficient data have also been collected to allow development of predictive population models to assess the long-term benefits of different conservation management techniques.

Results: Following the significant increase in the numbers of rats within the Eglinton Valley in 2006, intensive pest management was initiated at Walker Creek. Although robin numbers had declined by 48% to a low of 15 by 2008 (Fig1) there has been a steady increase in robin numbers in subsequent years. The small decline in robins between August 2010 and August 2011 (from a peak of 39 to 27 birds) was thought to be the result of significant winter mortality (deep snow for prolonged periods) and increasing rat numbers (8% tracking rates). Pest control was subsequently implemented in the spring of 2011 and a particularly productive 2011-12 breeding season followed with robin numbers at Walker Creek increasing by 44% to a total of 48 birds in March 2012 (not shown on graph). Although we expect some winter mortality, pest control at Walker Creek has clearly contributed to an increasing trend in robin numbers and we anticipate further increases in future years.

At Knobs Flat, where pest control was not initiated until 2011, the reduction in robin



numbers was even more marked with the population declining by 58% to 15 birds in 2008. Although there has been a subsequent increase in robins (38 in March 2012), the rate of recovery has been slower than that seen at Walker Creek and is yet to surpass the known population (42 robins) reached in 2006. The overall trend has therefore remained one of slow decline. It is hoped that the initiation of pest control at Knobs Flat in 2011 (along with large areas in the rest of the Eglinton Valley) and good winter survival rates will reverse this trend within a relatively short period.

Fig 1- Estimate of number of robins derived from territory mapping at Walker Creek

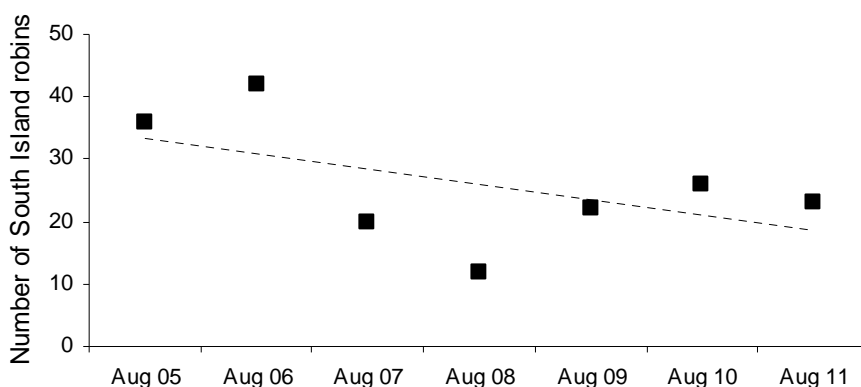


Fig 2: Estimate of the number of robins derived from territory mapping at Knobs Flat

Interpretation and implications: Robins are an engaging presence within forests throughout New Zealand and are often attracted to human activities within them. Although currently widespread, robin numbers and their distribution have contracted markedly over the previous century. Ongoing predation pressure, especially that from periodic irruptions of rodents and mustelids, is particularly damaging. Rapid declines in robin numbers (and for many other forest birds) such as those observed in the Eglinton Valley appear to be the inevitable consequence. Without the effective management of predator populations (particularly in peak predator years), the recovery and long-term survival of robins and other bird species at healthy levels within mainland forests remains uncertain.

6. Representation of animal guilds

As per the Annual Report, the first report on this indicator will be made in 2015-16 and annually thereafter.

7. Extent of potential range occupied by focal taxa

As per the Annual Report, this indicator is to be reported in 2012/13 for selected taxa and thereafter every 5 years.

8. Number of extinctions

Measure: Preventing declines and reducing extinctions

Definition: Taxa (species, subspecies, varieties and forma) that have become extinct since human settlement (here defined as the last 1000 years).

Methods: Taxa are assessed as being extinct only if there is no reasonable doubt, after repeated surveys in known or expected habitats at appropriate times (diurnal, seasonal and annual) and throughout the taxon's historic range, that the last individual has died. Taxa that are extinct in the wild but occur in captivity or cultivation are not listed in this category; these are listed instead as 'Nationally Critical' with qualifier 'EW' (Extinct in the Wild) – see further Townsend et. al. (2008)¹⁰.

Results: The total number of extinct taxa has gone from 33 in the 2007 threatened taxa lists to 65, mainly because pre-European extinctions are now included in the data. This figure was reported incorrectly as 79 last year because bird extinctions which occurred before human settlement were incorrectly included in the total. Improvements in identification, and acknowledgement of uncertainty, have also caused amendments.

More than 70 other taxa have not been seen for more than 20 years. However, these are not formally listed as extinct, because the necessary level of certainty has not been reached for these small and cryptic species.

This indicator will be reported on again in 3 years.

9. Number of 'threatened' and 'at risk' species

Measure: Improve status of 'threatened' taxa and 'at risk' taxa

Definition: 'Threatened' taxa are those that are facing imminent extinction. 'At risk' taxa are those that, although declining, have small populations or have small areas of occupancy, are not facing imminent extinction.

Methods: The New Zealand Threat Classification System (NZTCS) is used to assess the threat status of New Zealand taxa, with the status of each taxon group being assessed over a 3-year cycle. The system methodology was revised in 2008 to improve its utility (Townsend et. al. 2008). 'Threatened' taxa are grouped into three categories: 'Nationally Critical' (at greatest risk of extinction), 'Nationally Endangered', and 'Nationally Vulnerable'. 'At Risk' taxa are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations. Four 'At Risk' categories exist: 'Declining', 'Recovering', 'Relict' and 'Naturally Uncommon'. There is no ranking or hierarchy of threat status amongst these because 'At Risk' categories reflect different types of risk, not different levels of risk.

Results: The results of the 2008-2011 cycle of listings are shown in Table 5. The totals are slightly changed from those presented in the 2011 Annual Report because lists in draft form then have since been finalised. Marine fish, algae and Powelliphanta snails were not assessed during the 2008-11 review cycle and so totals included for these groups are from the 2007 list.

¹⁰ Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. 2008: New Zealand Threat Classification System manual. Department of Conservation, Wellington. 35p.

Table 5: Number of ‘threatened’ and ‘at risk’ taxa identified in the 2007 and 2008-11 Threat Classification Lists

	Number of ‘threatened’ taxa	Number of ‘at risk’ taxa
2007 Threat Classification List	672	2,123
2011 Threat Classification List	870	2,723

Note that in the 2008 revised system, ‘threatened’ is roughly equivalent to ‘acutely threatened’ in the previous system, and ‘at risk’ is roughly equivalent to ‘chronically threatened’ plus ‘at risk’ in the previous system.

Most changes between 2007 and 2011 result from improved coverage of groups previously not assessed, and improved knowledge and changes of definitions of categories. However, 55 taxa have declined sufficiently to trigger a change to a more severely threatened category, and 10 taxa have recovered under management sufficiently to move to a less severely threatened category.

These trends will be reported on again in 3 years.

Work on the 2012-14 cycle of list reviews has started. Preliminary draft lists have been prepared for vascular plants, birds and reptiles.

10. Demographic response to management at a population level for selected ‘threatened’ and ‘at risk’ taxa

Measure 4.2.4 Demographic response to management at a population level for selected taxa

Definition: Robust demographic data for intensively managed species, in terms of births, deaths and population size, are related to management effort and variability in factors responsible for declines. The data presented can constitute actual current trend or predicted population trend with and without management. This measure provides a report for two forest dwelling species vulnerable to predation by stoats, rats and cats:

- The long-tailed bat, one of only two forest dwelling terrestrial mammals found in New Zealand and;
- Kakapo, a flightless, ground nesting species.

Methods: Two methods are described:

- Predicted population from a population model (Long-tailed bats)
- Complete census of number of individuals (Kakapo)

LONG-TAILED BATS

The long-tailed bat viability in temperate beech forest in the Eglinton Valley, Fiordland was estimated using mark-recapture field data from 1993 to 2012 using Program MARK. The survival of juvenile and adult female long-tailed bats along with the proportion of

females breeding each year for one social group was recorded and modelled using an age-classified population projection matrix. The survival figures were averaged over two time periods; (i) before 2006 when there was no rat management and five mast events and (ii) after 2006 when there was rat management and three mast events. The intrinsic rate of increase, λ , was calculated for both time periods and the results were projected over a 25 year scenario (Fig. 1). The confidence intervals were calculated using the variation of survival figures within each time period.

Results: The management of rats in the Eglinton Valley was instigated following a mast event in 2006. Two more mast events have occurred since 2006 with rats having been controlled on both occasions. The intrinsic rate of increase for the time period with rat management is >1.0 ($\lambda = 1.09$) therefore the population increases, whereas the rate of increase for the time period without rat management is <1.0 ($\lambda = 0.98$) causing a decline in the population. These predicted trends are based on a start point of 70 adult females for this social group.

Interpretation and implications: Temperate beech forests experience fluctuating predator numbers in relation to food availability. The beech trees flower and seed heavily (mast) at irregular intervals, usually every 3-5 years, dramatically increasing the food supply for introduced rodents. Irruptions in mouse and rat numbers that follow will then trigger the prolific breeding of stoats and increase the predation pressure on native fauna even further. Effective management of predator irruptions is essential for improving the long-term survival of threatened native species in these forests.

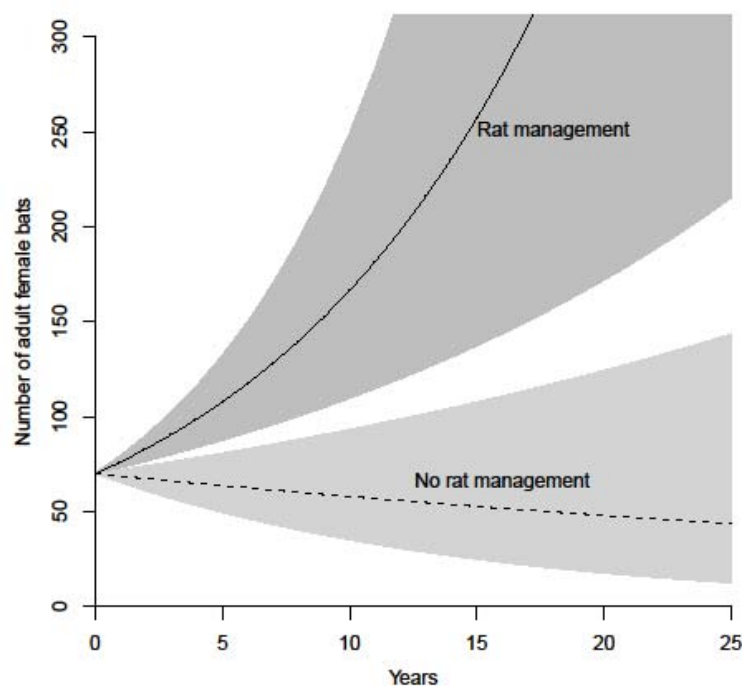


Fig 3. Predicted trends in numbers of female long-tailed bats in the Eglinton Valley over 25 years with and without management of rats.

Kakapo

Methods: Data on live individuals were estimated between 1974 and 1990. Since about 1990 the whole population has carried transmitters so from then on the number of birds known to be alive is approximately equal to the total population size

Results: With the arrival of Europeans and their cats, rats and stoats in the mid to late 1800s the rate of decline of kakapo accelerated such that by the 1970s they were thought to be confined to remote parts of Fiordland where only a few male birds were known to survive. In 1977 a population of more than 100 birds was discovered on southern Stewart Island. Between 1977 and the late 1980s these birds were transferred from Stewart Island, where they being eaten by cats, to islands that were mostly predator-free (Maud, Codfish and Little Barrier). The rate of decline decreased, but the population still did not increase. In 1995, in response to this lack of increase, kakapo management was intensified, and spending on research increased. Six new management techniques were developed: Nests were monitored intensively; chicks that did not thrive were rescued and hand raised, rats were controlled around nests and eventually eliminated from the islands, breeding effort became predictable from the fruiting of forest trees, and birds were moved between islands to make the most of fruiting. By 2009 kakapo management had become so successful that there were now more young birds than old ones and management moved to a new phase: recovery rather than rescue.

Interpretation and implications: The kakapo is the world largest parrot, the only flightless one and the only lek breeding one. It is confined to New Zealand and its flightlessness, ground nesting and infrequent breeding have made it particularly vulnerable to hunting and introduced stoats, rats and cats. Kakapo are good food and were enthusiastically hunted by Maori and their dogs and were in decline even in Maori times. Research and management is now focused on overcoming the kakapo's low fertility which is a consequence of inbreeding and very low genetic diversity. Matings between kakapo are planned and manipulated to maximise genetic diversity of offspring, and artificial insemination has been developed and used also to maximise genetic diversity. In the 2011-12 financial year, 11 new kakapo were produced (a low breeding year), and five birds died. The population increased by about 5%.

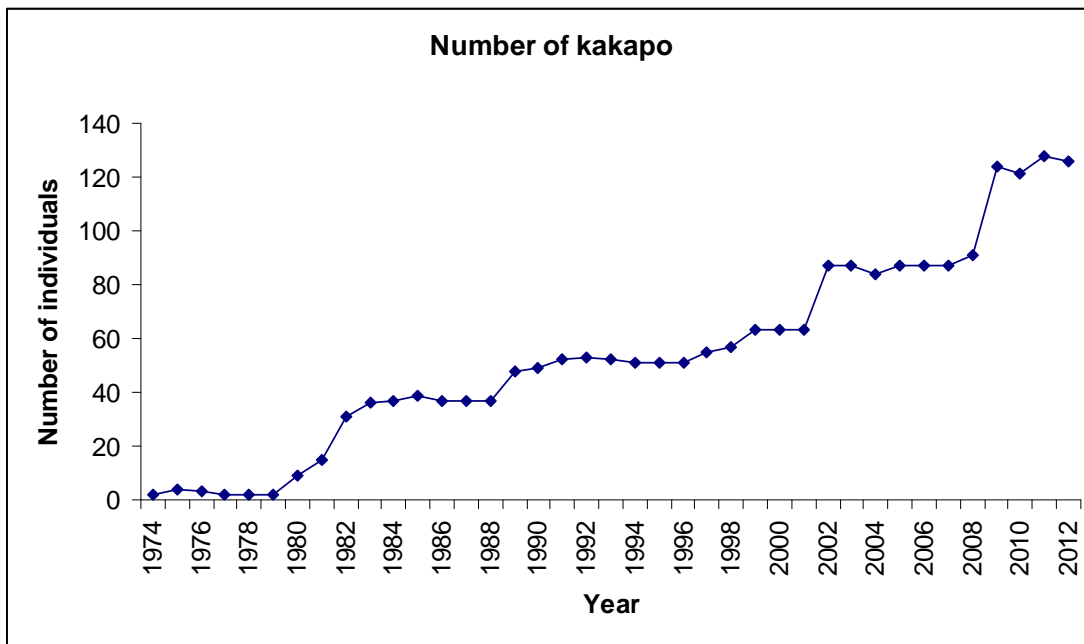


Figure 4. Total number of kakapo

11. Number, extent and control of fires

Measure 1.4.1: Number, extent and control of fires

Definition: This measure records the extent of areas burnt on public conservation land. Fire on DOC land, or fire from DOC land that affects other landowners (or vice versa), is crucial input to assessing risks, DOC management, and community relations.

Methods: Data were compiled from the Fire Occurrence database maintained by departmental staff. A number of agencies are involved in fire control. Spatial extents of area burnt are maintained by DOC on behalf of the National Rural Fire Authority.

Results: There was a total of 62 fires during 2011-2012, covering a total area burnt of 171 ha (Table 6). Most of the burnt land was within the 1-kilometre fire safety margin (114 hectares) and 46 hectares of public conservation land were also burnt. The vast majority occurred within the South Island- (59 Fires, 95%) and accounted for 99% of the total area. Most fires occurred in Canterbury (23 fires; 37%) and Otago (29 fires; 47%).

Interpretation and implications: During 2011-2012, the total area burnt was relatively low for a second year due to the continuation of a La Nina weather pattern, which reduced the fire risk in many areas. DOC has invested in compiling a comprehensive record of the spatial extent of historic fires. These data will contribute to DOC's ability to identify vulnerable environments and loss of indigenous biodiversity in relation to fire return time and vegetation condition.

Table 6. Number, area and cost of fires managed during 2011-2012 by the Department.

Conservancy	Area Burnt (ha)	Number of Fires	Percentage of Fires (%)	Percentage of Cost (%)	Cost (\$)
Canterbury	26.0	23	37	71	228,900
Nelson/Marlborough	5.1	7	11	6	18,643
Northland	0.3	2	3	-	0
Otago	139.7	29	47	23	75,735
Tongariro/Taupo	0.0	1	2	-	387
Total	171.0	62	100	100	323,665

12. Change in extent and integrity of nationally uncommon, significantly reduced habitats/ecosystems that are protected

Refer Landcare Research report.

13. Occurrence and intensity of mast flowering and fruit production

There is no report for 2011/2012 because there was no significant mast flowering and fruiting that year.

14. Distribution and abundance of exotic weeds and animal pests considered a threat

Refer Landcare Research report.