MONITORING BIRDS TIROMOANA BUSH (KATE VALLEY CONSERVATION MANAGEMENT AREA), CANTERBURY

SECOND PRE-TREATMENT MONITOR

prepared for Transwaste Canterbury

by

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1. BACKGROUND

Transwaste Canterbury Ltd have committed to a comprehensive ecological restoration project as part of the mitigation for the establishment of the Canterbury regional landfill at Kate Valley for which a 35-year resource consent has been granted. This project is being carried out in a designated Kate Valley Conservation Management Area (CMA) also known as Tiromoana Bush, which is located in the Motunau Ecological District in coastal North Canterbury.

The proposed conservation, protection and restoration over a 35-year period will result in a substantial increase in the overall biodiversity values in this area (Norton 2004). In particular, the restoration of Tiromoana Bush will result in the protection and enhancement of a substantial area of lowland forest which is a nationally rare and poorly represented vegetation type. Conservation management will involve removal of domestic stock, animal and plant pest control, and the establishment of restoration plantings (Norton 2004).

Since the bird monitor in 2005 domestic stock have been excluded from the conservation area, and restoration planting has commenced. Predator control has not yet been established for restoration purposes, although possums and mustelids (ferrets) are controlled for Tb purposes. Notwithstanding this Tb-based control, this bird monitor can effectively be described as the second-year pre-treatment monitor.

It is proposed that population trends of common indigenous forest birds (particularly bellbirds[1] and grey warblers) are monitored from the outset of conservation management for the duration of this management. Methods to measure these population trends involve a standard five-minute bird count technique (after Dawson & Bull 1975) modified to include distance sampling of common indigenous forest birds (after Moffat & Minot 1994).

This report describes the results of the second-year field monitoring survey carried out by the author between 6th and 11th October 2006, somewhat earlier in the month than last year (19-26 October 2005).

2. METHODOLOGY

The same monitoring method used during the 2005 survey was used during the 2006 survey (Buckingham 2006). This involved a standard New Zealand method of measuring the relative abundance of forest birds (Dawson & Bull 1975), modified to include a simplified distance sampling technique (Barraclough 2000; Moffat & Minot 1994). In addition, five-minute bird-call audio atmospheres were recorded once at each count during mornings (between 0800 hrs and 1200 hrs, New Zealand Daylight Saving Time (NZDT)). Counts were carried out between 0800 hrs and 1530 hrs NZDT during appropriate weather conditions (Dawson & Bull 1975).

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[1] Scientific names of birds are given in Appendix 1

A total of 13 count transects each with three count stations was established in 2005 (Buckingham 2006). The GPS locations and locality/habitat descriptions of these count stations are given in Appendix 2 (see also attached map). In 2006, each forest transect was visited three times and the scrub transect (Transect 5) four times, providing a total of 120 counts (108 forest counts and 12 scrub counts). In 2005, one less replicate was carried out at the scrub transect making a total of 117 counts.

3. RESULTS

3.1 General results

A total of six indigenous bird species were recorded in forest and scrub patches within the survey area, the same number of species as in 2005 . Bellbirds and grey warblers were the most frequently recorded indigenous species, silvereyes and fantails were moderately common, and kingfisher and shining cuckoo occasional. Bellbirds were present at all sites except the scrub patch (Transect 5) where they were also absent in 2005. Harriers were commonly recorded flying over patches, and welcome swallows were occasionally seen in adjacent open country.

As in 2005, kereru, kaka, kakariki, falcons, tomtits, robins, brown creepers, and riflemen were not recorded, though kereru are known to visit the area seasonally. The possible tui heard on one transect in 2005 (Transect 8) was not heard in 2006.

Introduced bird species and individuals were overall more abundant than indigenous species/individuals which was expected given the patchiness of the forest habitat. A total of eleven introduced species were recorded as being associated with forest or scrub patches. The most common introduced species were chaffinches, redpolls, goldfinches, greenfinches, blackbirds, song thrushes and dunnocks which were all widespread. Yellowhammers were generally associated with pasture though they were occasionally recorded at forest edges. Californian quail, magpies and particularly starlings tended to be more localized though magpies were often seen flying between patches.

Considerable differences in counts of many species were noted between 2005 and 2006 monitoring with overall less average species and counts recorded in 2006 (for both indigenous and exotic species). Interestingly, the proportion of counts where indigenous bird species were more common than exotic species was higher in 2006 than 2005 (12% *cf.* 7%).

No additional forest/scrub bird species were recorded in 2006. One new species (grey teal) was seen on lagoons. Paradise shelducks were again noted with ducklings on many of these water bodies. Pied stilt and New Zealand scaup were also present in low numbers, being similar to 2005.

One lizard was seen scampering quickly across grassy slope disappearing into tall grass. This was a relatively plumpish-bodied greenish-brown skink that appeared to have faint markings dorsally. The location was NZMG 2497310 5789339, at altitude approximately 195m asl. The habitat was grassland slopes with tussock, various indroduced grasses, and scattered manuka, gorse and shrubs.

3.2 Comparison in bird relative abundance between 2005 and 2006

Tables 1-3 present the mean counts of common birds and totals in 2005 and 2006. The overall averages of counts for indigenous and introduced species and individuals were less in 2006 than 2005 (Figure 1, Table 1). The greatest difference was observed in the counts of introduced birds in the scrub habitat, though sampling was limited in that habitat.

Figure 1 Average counts of indigenous and introduced birds in forest transects in 2005 and 2006

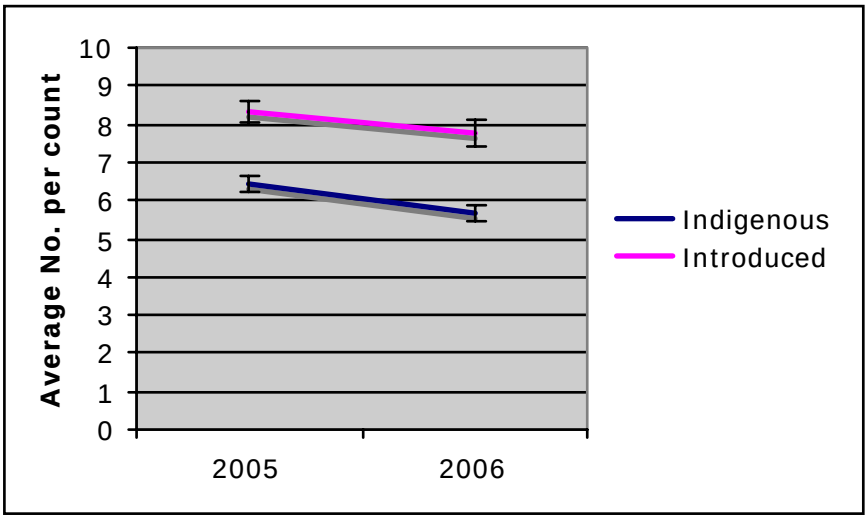

Table 1 Five-minute bird count averages for total indigenous and introduced bird species and individuals in different habitats within Tiromoana Bush: 2005 and 2006 (standard error values in brackets)

	All counts		Forest counts		Scrub counts	
	2005	2006	2005	2006	2005	2006
No. counts	117	120	108	108	9	12
Indigenous species	2.62 (0.09)	2.49 (0.07)	2.67 (0.09)	2.54 (0.08)	2.11 (0.20)	2.08 (0.15)
Introduced species	4.67 (0.11)	4.18 (0.15)	4.61 (0.12)	4.32 (0.15)	5.33 (0.29)	2.83 (0.32)
Indigenous individuals	6.20 (0.21)	5.41 (0.20)	6.44 (0.21)	5.69 (0.21)	3.33 (0.33)	2.83 (0.32)
Introduced individuals	8.40 (0.27)	7.42 (0.34)	8.30 (0.28)	7.75 (0.35)	9.67 (0.91)	4.42 (0.57)

3.3 Bellbirds, grey warblers and other common indigenous birds: distribution and abundance 2005 and 2006

Bellbirds were the most common indigenous bird recorded in forest patches but were not recorded in the scrub patch (Transect 5) either in 2005 or 2006 (Figure 2, Table 2). Highest counts of bellbirds during both years were recorded in Transect 8, within the only patch where beech was recorded (5.89/count in 2005 and 4.67/count in 2006; n=9). As in 2005, count averages for bellbirds were higher in coastal forest patches than inland ones (4.86/count *cf.* 3.56/count in 2005 and 3.50/count *cf.* 3.00/count). Overall count averages for bellbirds were lower in 2006 than in 2005 (Figure 2).

Grey warblers were also common and widespread throughout forest patches and unlike other indigenous species were recorded in higher counts overall in 2006 than in 2005 (Figure 2). Grey warblers were fairly consistently abundant in most habitats and locations except were noticeably less common in the beech patch (transect 8) than other areas in both years (0.11/count in 2005 and 0.56/count in 2006 *cf.* averages of all areas: 1.03/count in 2005 and 1.40/count in 2006). Counts of grey warblers were similar in coastal and inland areas in 2006 unlike the previous year (Buckingham 2006).

Average counts of silvereyes and fantails found in forest patches (and all patches) are shown in Figure 2 and Table 2. Counts of both species were less in 2006 than in 2005 however these species are known to fluctuate widely in abundance from season to season or year to year.

Figure 2 Average counts of common indigenous birds in forest transects in 2005 and 2006

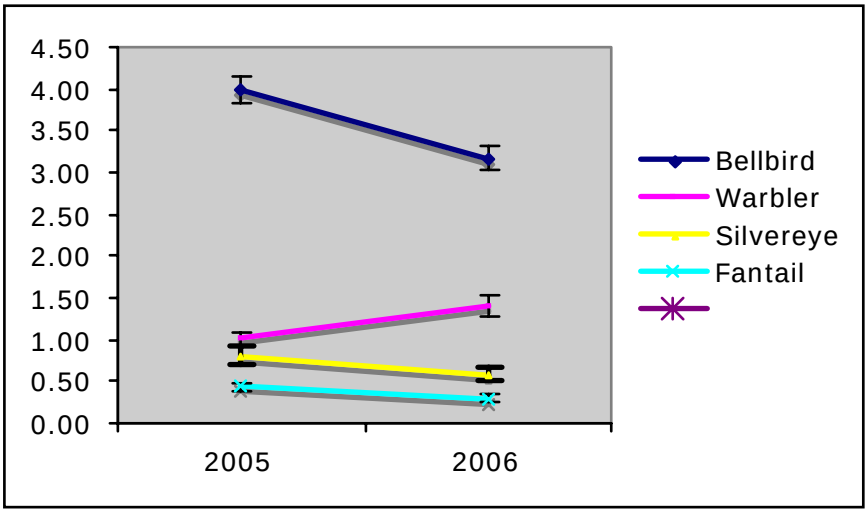

Table 2 Five-minute bird count averages for common indigenous birds in different habitats within Tiromoana Bush: 2005 and 2006 (standard error values in brackets)

SPECIES	All counts		Forest counts		Scrub counts	
	2005	2006	2005	2006	2005	2006
No. counts	117	120	108	108	9	12
Bellbird	3.68 (0.18)	2.85 (0.16)	3.99 (0.16)	3.17 (0.15)	0 (0)	0 (0)
Warbler	1.03 (0.09)	1.40 (0.11)	1.01 (0.09)	1.40 (0.12)	1.33 (0.29)	1.42 (0.19)
Silvereye	0.85 (0.11)	0.64 (0.09)	0.81 (0.11)	0.59 (0.09)	1.33 (0.24)	1.08 (0.26)
Fantail	0.45 (0.05)	0.27 (0.05)	0.44 (0.05)	0.29 (0.05)	0.67 (0.29)	0.08 (0.08)

3.4 Introduced birds

Counts of common introduced birds apart from chaffinches and song thrushes also varied widely between the two monitor years (Table 3). For example, counts of blackbirds and greenfinches were notably lower in 2006 than 2005 whereas counts of goldfinches increased (except in the scrub transect). All introduced birds except chaffinches were counted far less in scrub habitat in 2006 than 2005 (Table 3).

Table 3 Five-minute bird count averages for common introduced birds in different habitats within Tiromoana Bush: 2005 and 2006 (standard error values in brackets)

SPECIES	All counts		Forest counts		Scrub counts	
	2005	2006	2005	2006	2005	2006
No. counts	117	120	108	108	9	12
Blackbird	1.26 (0.09)	0.54 (0.06)	1.27 (0.12)	0.57 (0.06)	1.22 (0.28)	0.25 (0.18)
Song thrush	0.72 (0.07)	0.62 (0.07)	0.69 (0.10)	0.65 (0.08)	1.11 (0.26)	0.33 (0.14)
Dunnock	0.52 (0.07)	0.71 (0.07)	0.43 (0.11)	0.66 (0.07)	1.67 (0.29)	1.17 (0.21)
Chaffinch	2.09 (0.13)	2.09 (0.12)	2.11 (0.15)	2.12 (0.13)	1.78 (0.32)	1.83 (0.30)
Redpoll	1.25 (0.11)	0.78 (0.10)	1.24 (0.14)	0.82 (0.11)	1.33 (0.58)	0.42 (0.23)
Goldfinch	0.97 (0.10)	1.43 (0.14)	0.94 (0.13)	1.55 (0.15)	1.33 (0.58)	0.42 (0.15)
Greenfinch	1.34 (0.12)	0.83 (0.12)	1.36 (0.14)	0.93 (0.13)	1.11 (0.42)	0 (0)

4. DISCUSSION

4.1 Survey design and analysis

The methodology and survey design is discussed in the previous report (Buckingham 2006). Overall it is considered that the five-minute bird count sampling will provide adequate assessment of population trends of at least the common indigenous birds, i.e. bellbirds and grey warblers, and can be used to measure changes in bird species richness and diversity, and changes over time in the ratio of indigenous/introduced birds and species.

The programme MONITOR which takes a simulation approach was used to estimate power on 2005 data (J. Brown, *in lit.* 17 February 2006). Because there was no information on temporal variation (ie change in bird counts between successive years) and only information on small-scale temporal variation (repeat visits to transects

about a week apart) MONITOR overestimates power. This is because the repeat visits to transects one week apart are likely to be more similar than repeat surveys a year apart (as was noted for the 2005 data). Thus it will be necessary to re-do power analysis to estimate among-year variation after a few year's data collection (suggested after three years monitoring). Among-year variation is the appropriate measure for determining long-term bird trends.

4.2 Differences in counts

The difference in counts of some species between the two monitoring years may be attributed to different weather conditions between the two years (2006 was windier and cooler) and/or the slightly different times of survey (a few weeks earlier in October during 2006). However, variations in bird counts between years is usual and may be due to a number of reasons such as breeding success, food availability, seasonal weather patterns, or environmental changes etc. Over time, these variations may show some regularity allowing trends to become evident.

There is always some problem in the interpretation of call-biased counts as being either a measure of actual abundance or conspicuousness (Gibb 1996; Moffat & Minot 1994; Scott *et al*. 1981). Noting whether birds are first heard or first seen, or using a technique such as distance sampling to estimate a probability of detection, will help to reduce this problem (Barraclough 2000; Buckland *et al* 1993). However, with the relatively low intensity of sampling being carried out at Tiromoana Bush, data from several years may need to be pooled to complete the analysis.

Despite these variables and constraints, some patterns of bird distribution and relative abundance are emerging from the bird surveys. For example, bellbirds and silvereyes appear to be more common in the coastal forest patches while grey warblers and fantails are distributed fairly evenly in all areas. Bellbirds were not recorded either year in the scrub patch (Transect 5) yet silvereyes were more prevalent there than other patches. Counts of bellbirds have been consistently higher in the beech patch (Transect 8) while counts of grey warblers are lowest there.

Counts of some introduced birds (e.g. dunnock and song thrush) also show consistencies between the two years of monitor, though counts of others (e.g. greenfinch and goldfinch) were quite variable. Dunnocks appear to prefer coastal forest to inland forest, and for both years highest counts were recorded in the scrub patch (Transect 5). Chaffinches and song thrushes were fairly evenly counted throughout the forest patches but the latter showed variation between the two years at the scrub patch. Counts of greenfinches were higher overall and in all forest areas than counts of goldfinches in 2005 though the pattern completely reversed in 2006. A consistency between counts of these species was observed only in the scrub patch were counts of goldfinches exceeded those of greenfinches each year.

4.3 Conservation management

Since the bird monitor completion in 2005 domestic stock have been excluded from the conservation area, and restoration planting has commenced. The plantings are very young and have not at this stage contributed to a rehabilitation of habitat for birds, at least affecting counts. No indications of understorey regeneration were observed as a

result of stock exclusion but this is expected to show over the next few years. Predator control for restoration purposes has not yet been established in Tiromoana Bush, although Tb-based predator control does occur. Notwithstanding this, this bird monitor can effectively be described as the second-year pre-treatment monitor.

5. RECOMMENDATIONS

The monitoring surveys to date have set a baseline for bird counts pre conservation management treatment. However, to increase the statistical power of the pre-treatment sampling, a further year of monitoring is recommended (October 2007). Also, an extra year of data will increase the precision of determining through a power analysis if the sampling design is adequate.

After this, monitoring may be carried out at 3-5 year intervals, with each monitoring period involving 3-5 consecutive years (a pulsed monitoring regime). Note that this monitoring is designed to evaluate trends of common indigenous birds (especially bellbird and grey warbler) and that additional and specialised monitoring will need to be carried out for other species such as kereru which are presumed to be regular seasonal visitors.

General recommendations are listed below.

- It is recommended that at least one further consecutive year of monitoring be carried out in Tiromoana Bush so that a power analysis can be carried out to examine among-year variations in bird counts, and ascertain whether the current sampling regime provides sufficient sampling intensity to detect trends in common bird populations over a ten-year period.
- A population trend analysis should be carried out at the same time (2007-2008), thence after future monitoring periods (about every 6-10 years). This analysis will require examining distance sampling and first heard/first seen data for bellbirds and grey warblers and possibly other species.
- Audio recordings should be stored carefully and converted to mp3 files or CD disc so that songbird choruses can be compared over time as a measure of determining possible response to conservation management. The recordings are also useful for detecting the range of species heard at each count station.

Acknowledgements

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APPENDICES

Appendix 1 Scientific names of birds detected in Tiromoana Bush (2005 and 2006)

Canada goose	*Branta canadensis*
Paradise shelduck	*Tadorna variegata*
Mallard	*Anas platyrhynchos*
Grey teal*	*Anas gracilis*
New Zealand scaup	*Aythya novaeseelandiae*
Australasian harrier	*Circus approximans*
California quail	*Callepepla californica*
Pied stilt	*Himantopus himantopus*
Spur-winged plover	*Vanellus miles novaehollandiae*
Southern black-backed gull	*Larus dominicanus*
Shining cuckoo	*Chrysococcyx lucidus*
New Zealand kingfisher	*Halcyon sancta vagans*
Skylark	*Alauda arvensis*
Welcome swallow	*Hirundo tahitica*
Dunnock (hedge sparrow)	*Prunella modularis*
Blackbird	*Turdus merula*
Song thrush	*Turdus philomelos*
Grey warbler	*Gerygone igata*
South Island fantail	*Rhipidura fuliginosa fuliginosa*
Silvereye	*Zosterops lateralis*
Bellbird	*Anthornis melanura*
Tui?	*Prosthemadera novaeseelandiae*
Yellowhammer	*Emberiza citrinella*
Chaffinch	*Fringilla coelebs*
Greenfinch	*Carduelis chloris*
Goldfinch	*Carduelis carduelis*
Redpoll	*Acantha flammea*
Starling	*Sturnus vulgaris*

Australian magpie *Gymnorhina tibicen*

Note: * Grey teal recorded in 2006 only

? Possible tui heard on three or so occasions on transect 8 in 2004 only

Appendix 2 Locations of Tiromoana Bush bird count stations

Tiromoana Bush area	Locality area	Habitat	Transect	Count	Easting	Northing
4	Coastal	Forest	1	1	2499293	5789800
4	Coastal	Forest	1	2	2499258	5789898
4	Coastal	Forest	1	3	2499261	5789925
4	Coastal	Forest	2	1	2499230	5790083
4	Coastal	Forest	2	2	2499211	5790129
4	Coastal	Forest	2	3	2499161	5790148
4	Coastal	Forest	3	1	2498929	5789600
4	Coastal	Forest	3	2	2498886	5789566
4	Coastal	Forest	3	3	2498840	5789550
4	Coastal	Forest	4	1	2498544	5789117
4	Coastal	Forest	4	2	2498588	5789076
4	Coastal	Forest	4	3	2498599	5789093
2	Mid Kate	Scrub	5	1	2498545	5790122
2	Mid Kate	Scrub	5	2	2498463	5790175
2	Mid Kate	Scrub	5	3	2498426	5790190
2	Mid Kate	Forest	6	1	2498033	5790214
2	Mid Kate	Forest	6	2	2497989	5790230
2	Mid Kate	Forest	6	3	2497945	5790261
2	Mid Kate	Forest	7	1	2497568	5790206
2	Mid Kate	Forest	7	2	2497574	5790160
2	Mid Kate	Forest	7	3	2497617	5790097
1	Mid Kate	Forest	8	1	2497532	5789815
1	Mid Kate	Forest	8	2	2497459	5789807
1	Mid Kate	Forest	8	3	2497435	5789857

Appendix 2 (continued)

Tiromoana Bush area	Locality area	Habitat	Transect	Count	Easting	Northing
7	Top Kate	Forest	9	1	2496775	5789546
7	Top Kate	Forest	9	2	2496743	5789575
7	Top Kate	Forest	9	3	2496693	5789520
7	Top Kate	Forest	10	1	2497233	5789185
7	Top Kate	Forest	10	2	2497216	5789140
7	Top Kate	Forest	10	3	2497186	5789115
7	Top Kate	Forest	11	1	2496890	5788765
7	Top Kate	Forest	11	2	2496860	5788825
7	Top Kate	Forest	11	3	2496856	5788858
7	Top Kate	Forest	12	1	2496740	5789044
7	Top Kate	Forest	12	2	2496742	5789079
7	Top Kate	Forest	12	3	2496750	5789122
6	Selby Rd	Forest	13	1	2495390	5789325
6	Selby Rd	Forest	13	2	2495355	5789358
6	Selby Rd	Forest	13	3	2495310	5789365