Rotoiti Nature Recovery Project Annual Report July 2003 – June 2004

St Arnaud's Mainland Island, Nelson Lakes National Park

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Cover photo: Lake Rotoiti School Students and Massey University veterinarian with Great Spotted Kiwi, Matt Lawrey, The Leader

Rotoiti Nature Recovery Project Annual Report July 2003 - June 2004

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Executive Summary

This report documents the eighth year of the Rotoiti Nature Recovery Project (RNRP) from 1 July 2003 to 30 June 2004 (based on the Department's financial year) which was the seventh season of comprehensive pest control. Good progress was made in advancing all three of the projects primary objectives.

KEY RESULTS

Possum control – Vegetation Response

Possum numbers were maintained at very low levels in the treatment area for the seventh year in a row with no browse observed on the sensitive plant species monitored. Pressure on surrounding populations has been applied via Animal Health Board operations. Control methods moved away from the use of toxins to simply using kill traps. A new line was established on the middle of the road (MOR) ridge and the majority of others were placed along existing Fenn™ trap lines.

Rodent Control

Rat tracking indices are indicating that the current trapping techniques are not as effective as brodifacoum when attempting to meet a 5% tracking target. There was however a significant difference between the treatment and non-treatment area. If the target is to be met it is clear that an enhanced trapping effort will need to be developed.

Mustelid Control

A moderate mustelid year was experienced based upon capture records. Tracking tunnel data this year demonstrated a significant difference in presence between the non-treatment site and the treated site. A new tracking tunnel site with 13 lines in the Wairau Valley was set up to monitor the Friends of Rotoiti trapping. Ranger trainees from Nelson Marlborough Institute Technology (NMIT) assisted with the establishment and running of these lines.

Wasp Control – Invertebrate Response

The current control area of 1,100 hectares was treated with a non-preferred toxin, Finitron as opposed to the toxin of choice which had been Fipronil. Finitron takes far longer to control wasp numbers however they were reduced below the ecological damage threshold. Inclement weather in February reduced wasp numbers across the treatment and non-treatment areas, although active nest numbers at Rotoiti were declining prior to the wet weather arriving. The response of native invertebrates is still difficult to determine.

Response of Native Fauna

This was the first year that kaka have bred since the extensive stoat control regime was fully established. There were twelve nests altogether. Nine of these nests were within or on the periphery of the treated area and six were successful, fledging 17 chicks. Six of these chicks were female. These six were fitted with transmitters and five survived to at least two months, a higher percentage than in previous years. Of the nine females with failing transmitters at the start of the season, eight were recaptured and had new transmitters fitted.

The number of robin territories held in the survey area has remained stable over the past two years. However, there seems to have been a total lack of recruitment between the two seasons, with no new birds taking up territories in areas of historical robin breeding activity. Five-minute bird counts were characterised by high counts for several species in May.

Reintroductions

After considerable planning and consultation ten great spotted kiwi were transferred to the RNRP in May 2004. One was injured during the transfer and was sent to Massey for rehabilitation. All nine remaining birds were closely monitored and have remained within the stoat treatment area on the eastern side of Lake Rotoiti.

Advocacy and Education

New interpretive panels with a significant RNRP component have been commissioned to be erected at the lookout beyond the Mt. Robert car park. Talks and or/tutorial walks were given to schools and several tertiary classes almost every week of the school year. The introduction of great-spotted kiwi involved considerable advocacy through the media releases, radio interviews and an event to welcome the first birds. Additional advocacy was promulgated around the threat of dogs to kiwi.

Volunteers and Friends of Rotoiti

An enormous amount of work was carried out by volunteers this year totalling 347 days. Volunteers comprised 18 individuals, Friends of Rotoiti, two local Conservation Corps groups and the Nelson Marlborough Institute of Technology Trainee Rangers class. The Friends now have over 70 members including groups such as 50+ tramping club and Forest and Bird making up a ‘member’ each. The Friends were also involved in the kiwi release.

Skill Sharing

Numerous requests for information and advice were received from internal and external sources across a variety of pest control and monitoring programmes. One staff member attended the Mainland Island Hui at Lewis Pass where valuable information transfer occurred. Members of the project team were also invited to be involved in national projects and events such as the D’Urville Island stoat workshop and the International Wildlife Management Congress.

Research

Rotoiti Nature Recovery Project scholarships were awarded to two Canterbury University students carrying out bellbird and beech scale insect research within the project area. Other students from Victoria, Canterbury, Waikato and Otago also took advantage of the area throughout the year. Landcare continued their wasp research and brodifacoum research involvement. Stoat carcasses were sent to Science and Research as part of their national diet analysis.

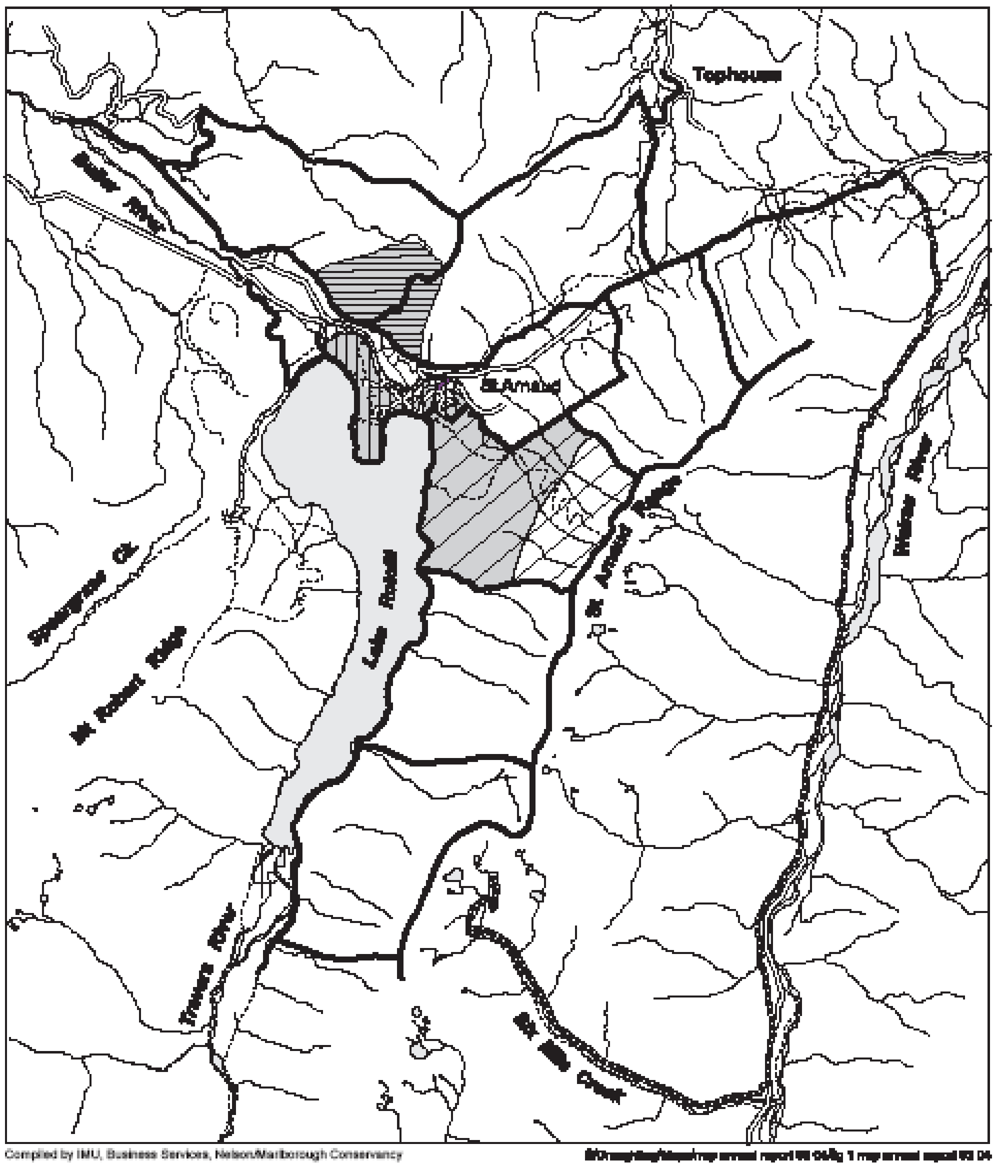
1. Introduction

The Rotoiti Nature Recovery Project (RNRP) is the title given to the mainland island project. It is based on beech forest containing honeydew, and is one of six such projects funded within a national programme focussed on different habitats. The project area was extended in 2002 from the original 825 hectares on the slopes of the St Arnaud Range, Nelson Lakes National Park, to take in further forest in the Park to the north and south and part of Big Bush Conservation Area. Figure 1 shows that different parts of the extended area are targeted for different pests and that some of the trapping is conducted by the recently formed Friends of Rotoiti community group. The overall site was chosen as representative of a habitat type that occupies about 1 million hectares or 15% of New Zealand's indigenous forests (Beggs 2001) particularly in the northern South Island, at a location accessible to visitors. It is crossed by three popular walking tracks adjacent to St Arnaud, the main gateway into Nelson Lakes National Park. A more detailed description of the original project area is available in the project's Strategic Plan (Butler, 1998), (Appendix 6).

The same two non-treatment sites were used as in previous years at Lakehead (Figure 2), situated at the head of Lake Rotoiti about five kilometres from the treatment area covering similar aspect and altitudinal range, and Rotoroa or Mt Misery (Figure 3), situated at Lake Rotoroa 18 kilometres to the west of Lake Rotoiti, which extends to lower altitude.

This report presents its results within the project's three objectives (2.0 below). Readers are referred to the Strategic Plan (Butler 1998) for the thinking behind these objectives and their translation into a long-term programme of scientifically based activities. More detail on methodologies or past results can be found in the project's 1998-2001 Triennial Report (Butler, 2003) and previous annual reports.

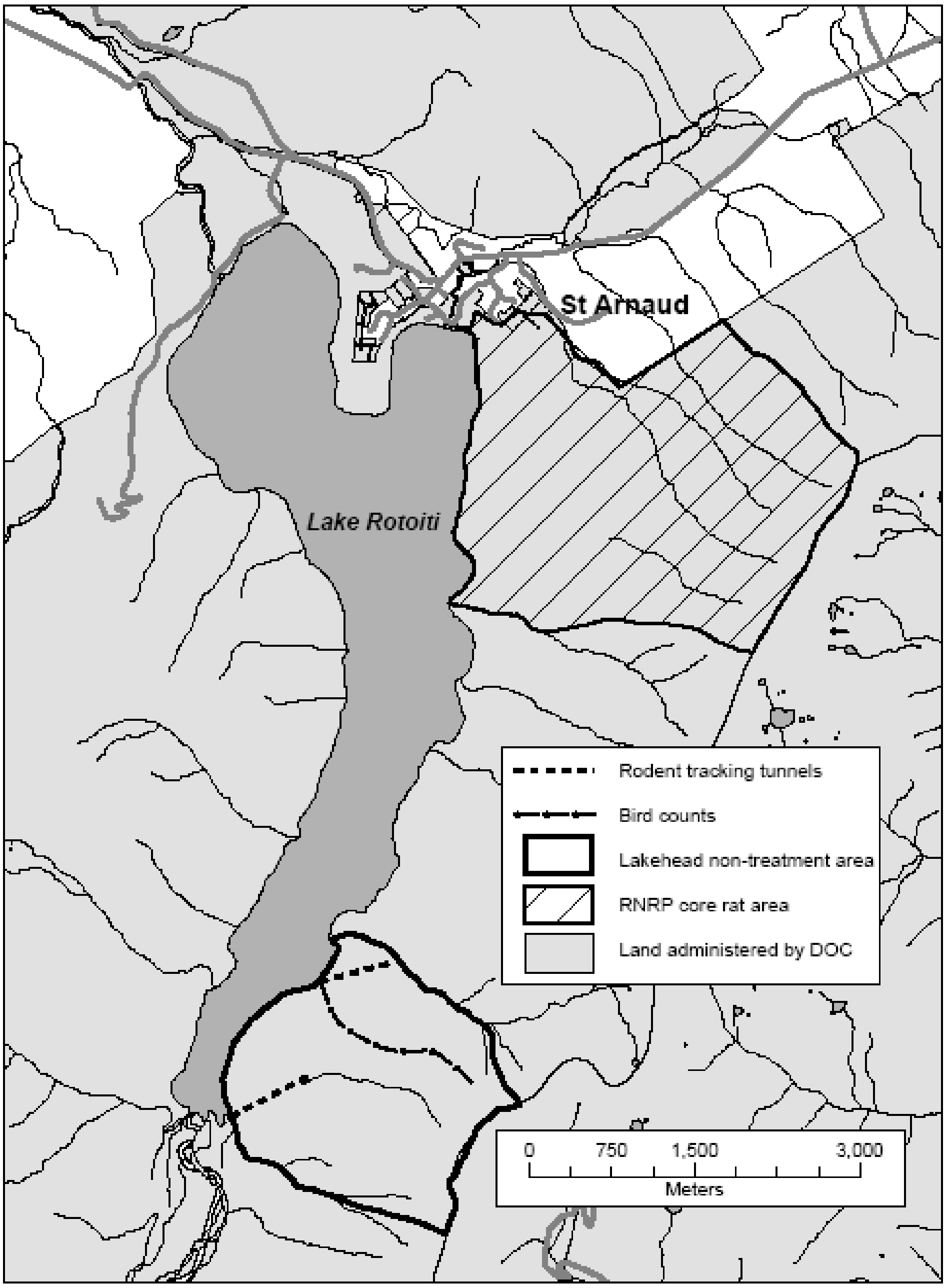
Figure 1 **Pest control areas RNRP**



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

- Rotoiti Nature Recovery Project core rat control area
- Rotoiti Nature Recovery Project stoat lines
- Rotoiti Nature Recovery Project Big Bush rat control area
- Rotoiti Nature Recovery Project wasp control area
- Friends of Rotoiti stoat line
- Friends of Rotoiti rat control areas

Figure 2 Lakehead non-treatment site



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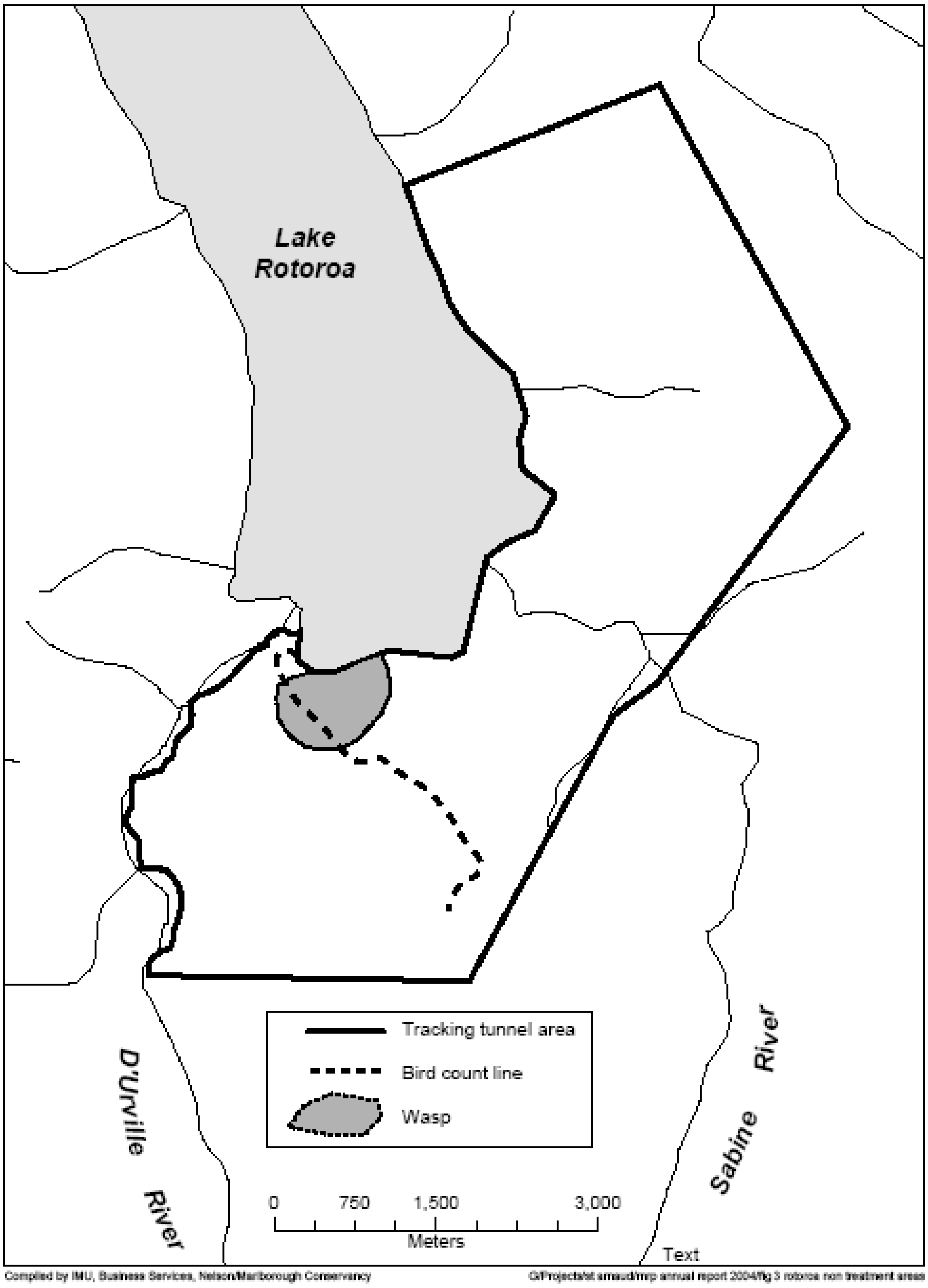
G/Projects/st arnaud/rnrp annual report 2004/fig 2 non treatment area

Figure 3 **Rotoroa (Mt Misery) non treatment site**



2. Project Goal and Objectives

GOAL

Restoration of a beech forest community with emphasis on the honeydew cycle.

Objectives

- To reduce wasp, rodent, stoat, feral cat, possum and deer populations to sufficiently low levels to allow the recovery of the indigenous ecosystem components (especially kaka, yellow-crowned parakeet, tui, bellbird, robin, long-tailed bat, and mistletoe) and ecosystem processes (especially the honeydew cycle).
- To re-introduce recently depleted species, such as yellowhead (mohua), kiwi and kokako (S.I. sub-species if possible), once the beech forest ecosystem is sufficiently restored.
- To advocate for indigenous species conservation and long-term pest control, by providing an accessible example of a functioning honeydew beech forest ecosystem, so a large number of people can experience a beech forest in as near-to-pristine condition as possible.

3. Results – Pest Control and Monitoring

3.1 BRUSHTAIL POSSUM (TRICHOSURUS VULPECULA) CONTROL AND MONITORING

Objectives

To reduce possum numbers and hold them continuously at a low level such that:

- preferred browse species show increased growth/productivity and further plants re-establish (see section 4.5 Plant Monitoring);
- impacts on invertebrates, particularly land-snails are reduced to a level that is insignificant compared to other mortality factors;
- impacts on birds through nest predation are reduced to a level that is insignificant compared to other mortality factors (see section 4.1 Bird Monitoring);
- impacts on other forest biodiversity, e.g. fungi, are reduced to levels that are insignificant compared to other factors (no monitoring of these impacts is currently in place).

Performance Targets

Operational

- Maintain existing kill traps and check in conjunction with mustelid Fenn™ trap lines
- Establish control line following MOR ridge mustelid Fenn™ trap line using kill traps and toxin (Feratox™)

Result

- Possum densities maintained at less than 2% residual trap catch (RTC), as assessed biennially by the standard national possum control agencies (NPCA) monitoring protocol.

Outcome

- Foliar browse indexing (FBI) monitoring shows an improvement in indicators within the treatment area

Methods

After inspection of existing possum control lines and methods, discussions around future methods and targets led to the decision of various changes in the possum control operation. As well as these changes a national field trial involving Feratox™ application was conducted in the Mainland Island core and Lakehead areas.

Northern Boundary

The established BMI™/ Conibear™ kill trap line, named the Borlase boundary possum line (BBPL), and numbered 6-66 and lettered A-E was changed and revamped.

The changes include:

- BMI™ / Conibear™ kill traps lettered A-E and numbered one to five were removed.
- A new long life aniseed and raspberry/cinnamon bait (supplied from Connovation) was installed.
- An aniseed/raspberry lure was sprayed around the trap location,
- All trap trees had three pieces of white coreflute installed to create a permanent visible lure, and
- A commitment to have these traps checked on more regular basis was adopted.

To complement these changes, a new possum kill trap line, called the German Village possum line (GVPL) was installed from the end of the BBPL (trap number six) along the existing German Village Fenn™ trap line. This line consisted of 22 Warrior™ kill traps and five BMI kill traps spaced every 50 metres. The traps were baited with aniseed long life bait and the trap locations were sprayed with aniseed lure, marked with three strips of white coreflute. A rat trap/tunnel was installed at the base of each possum trap to address the problem of rats eating the possum baits.

Snail Ridge

In June 2004 ten new Warrior™ kill traps were installed on this line. Each trap was baited with long life bait, had aniseed lure sprayed around the trap location, and had three white coreflute strips installed on the trap tree. It was decided that this method would be used as there is an existing Fenn™ trap line, which allows two tasks to be completed while walking the same line.

Grunt Ridge

At the end of June 2004, ten new Warrior™ kill traps were installed on this line. Each trap was baited with long life bait, had aniseed lure sprayed around the trap location, and had three white coreflute strips installed on the trap tree. It was decided that this method would be used as there is an existing Fenn™ trap line (see reasoning above).

MOR Ridge

A new possum kill trap line, called the MOR line, was installed along the existing MOR Fenn™ trap line. The five BMI™ kill traps were placed within 15 metres of the existing Fenn™ boxes. Each trap was baited with long life bait, had aniseed lure sprayed around the trap location, and had three white coreflute strips installed on the trap tree. These traps were checked by mainland island staff carrying out regular Fenn™ trap line duties. At the end of June 2004, seven new additional Warrior™ kill traps were installed.

Mainland Island Core

Up to six Warrior™ kill traps were set temporarily where 'chew stick' monitoring (see below) showed possums to be present. Traps were shut down at the end of the financial year.

Trap-catch Monitoring

No trap catch monitoring was undertaken in 2003-04 following a recommendation from the 2003 annual Technical Advisory Group meeting. Specifically, the recommendation was that the possum trap catch monitor did not need to be done in 2004 because no increase in possum numbers in the core area were detected through chew stick and outcome monitoring during the past year. Dropping the trap catch monitor allowed resources to be put towards other key work.

Chew Stick Monitoring

Possum interference with wax chew sticks (designed by Pest Control Research as precursor to Wax-Tag™) was measured on four occasions. The objectives of this monitoring were to:

- Identify seasonal patterns in possum activity.
- Identify 'hot spots' of possum activity.
- To calibrate a potentially low cost possum monitoring method with the national standard (leg hold trapping to NPCA protocol) at low possum densities.
- To observe this difference in interference rate between one night and three night exposure.

Monitoring was undertaken concurrently with rodent and mustelid tracking tunnel surveys in the possum treated area (RNRP core) at quarterly intervals (February, May, August, November). Rodent tracking and possum chew stick sites are identical: five lines of 20 stations at 50 metre intervals. Each chew stick station consists of a 50 cm long probe made of eight gauge wire, with one raspberry scented red coloured wax 'lollypop' attached with rubber bands. Immediately below the 'lollypop' is a square plate of galvanised steel (measuring approximately 250mm x 250mm) atop a 'pigtail' twist in the wire. The plate acts as a barrier to rodents attempting to climb the probe. Chew sticks were set for one night with the rodent monitor, and then replaced if chewed and run a further three nights with the mustelid monitor. The checking after the first night allows each group to be analysed independently. All marked chew sticks were analysed and bite marks attributed to possum, rodent, bird etc. Unmarked chew sticks were re-used at subsequent monitors.

Results

TABLE 1. CHEW STICK RESULTS

	% STICKS CHEWED (+/- ONE STANDARD DEVIATION)			
	AUGUST	NOVEMBER	MARCH	MAY
One night	5 (3)	1 (1)	1 (1)	3 (2)
Three night	7 (5)	4 (2)	2 (1)	3 (2)

There are some unresolved issues of independence between sample units. A single possum could chew more than one consecutive station (as is suspected for the August 3 night monitor). Protocols for the use of wax chew sticks as a result monitoring tool is under development.

No trap catch monitor was undertaken this year for correlation with this method.

KILLS OF BUFFER OPERATION

Northern Boundary	BMI™ kill trapping (BBPL)	4 possums recovered
	BMI™/Warrior™kill trapping (GVPL)	14 possums recovered
MOR Ridge	BMI™ kill trapping (MORPL)	7 possum recovered
MI Core	Warrior™ kill trapping:	4 possums recovered
MI Core	Field trial (extended 2 months) (Feratox™ on upper D and F rat lines)	5 possums recovered
Lakehead	Field trial	11 possums recovered

NON-TARGET KILLS

NORTHERN BOUNDARY	BMI™ KILL TRAPPING (BBPL)	15 RATS RECOVERED
	BMI™ kill trapping and rat trapping (GVPL)	64 rats recovered 31 mice recovered
MOR Ridge	BMI™ kill trapping (MORPL)	3 rats recovered

Neighbouring Operations

Animal Health Board: Contractor: Southern Pest Management

Tophouse Operation, 16 February – 31 March 2004 (Figure 4)

Subcontractor: Target Pest Contracting

Hand-laid toxins: 1080 Exterminator™ paste in bait bags (north of three kilometres buffer line), Feratox™ in bait bags, cyanide paste in KK™ bait stations, Cholecalciferol long life gel baits in bait stations and trapping (raised sets).

Upper Motueka Operation, May - June 2004 (Figure 5)

Subcontractor: Stratford Pest Control

Hand-laid toxins: 1080 (north of Beebys walking track), cyanide paste, and trapping.

Discussion

Wax chew stick monitoring indicates similar possum activity in the RNRP core as in the 2002-03 season for the spring, summer and autumn monitors. The winter monitor result indicates higher numbers of possums in 2003-04, however consecutive chews on one of the lines suggests this result might be misleading. Until the issue of analysis of consecutive chews is resolved, not much more can be said about wax chew results.

Higher numbers of possums caught on the northern boundary might be a function of the higher number of traps active in that area at a comparatively (to other lines) low altitude, and neighbouring pasture habitat. Capture data could be analysed to better target future trapping effort. Benefit from the MOR trap line cannot be gauged due to lack of monitoring outside the RNRP core.

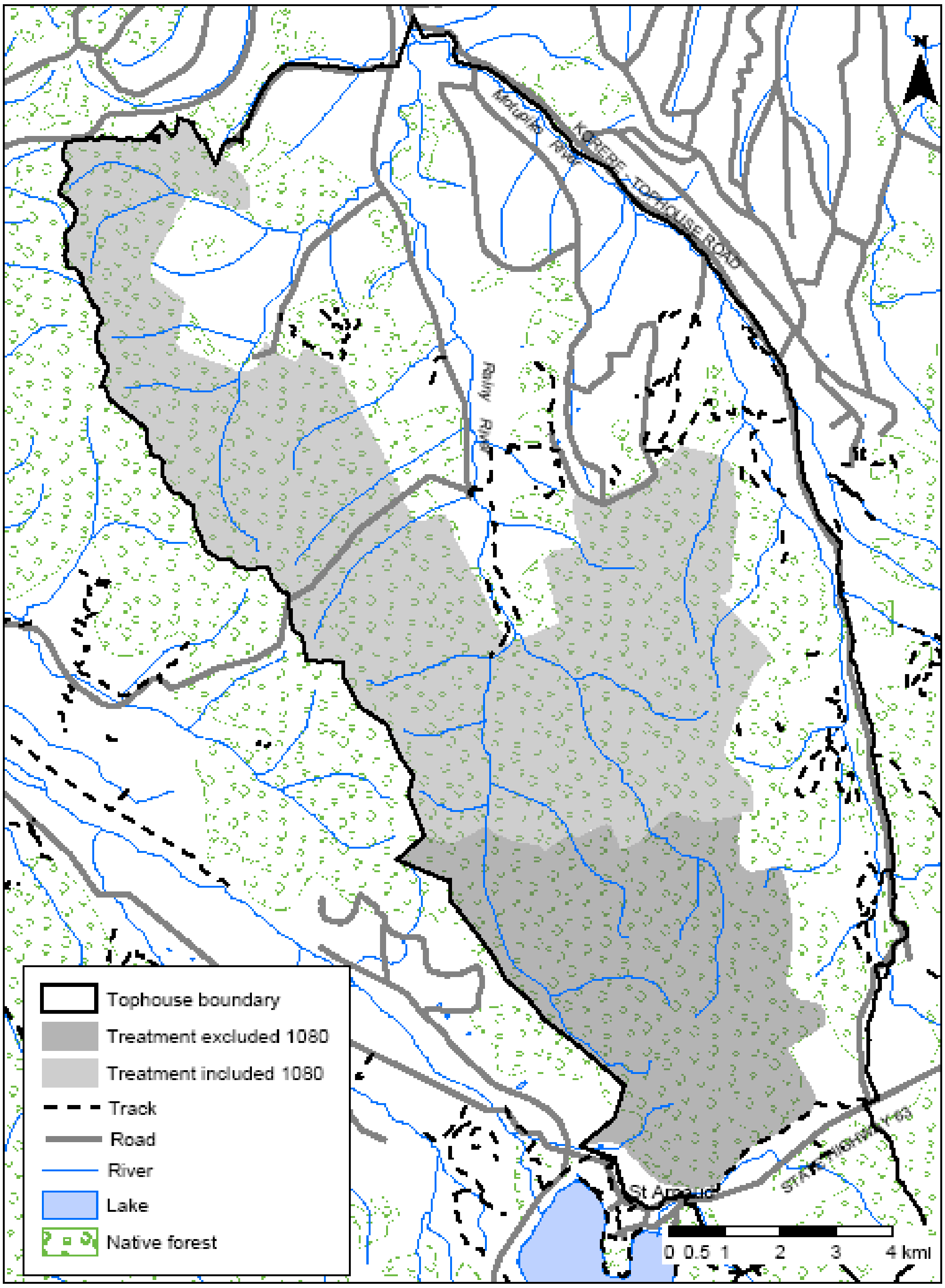
Rat interference of possum baits along the Borlase boundary kill trap line is still unacceptably high. Placement of rat traps at each possum trap site might reduce this interference. It is hoped that the new possum trap lines installed along the existing Snail and Grunt Fenn™ lines will help maintain low possum numbers in the RNRP core.

RNRP possum control efforts may have been assisted to some extent by the Animal Health Board's continued possum ground maintenance control in the Tophouse, Upper Motueka, and Rainbow/Upper Wairau areas.

Chew stick monitoring is advantageous in that this method can be undertaken at little extra cost to the field programme as the lines are being worked for other purposes (tracking tunnels). This does have the risk (and benefit) of repeatedly sampling the same locality. It could also be deployed in a more randomised fashion whilst undertaking rat trapping. This is desirable if attempting to locate 'hot spots' of possum activity to lead reactive control. The repeat measures run with tracking tunnels are better suited to determining seasonal variation.

The continuing benefits of possum control are also evident in the health of mistletoes and other palatable plants (Section 4.5). Kaka monitoring (Section 4.1.2) indicates possums were more significant than stoats as predators of kaka nests in 2003-04.

Figure 4 Animal Health Board Tophouse possum operation



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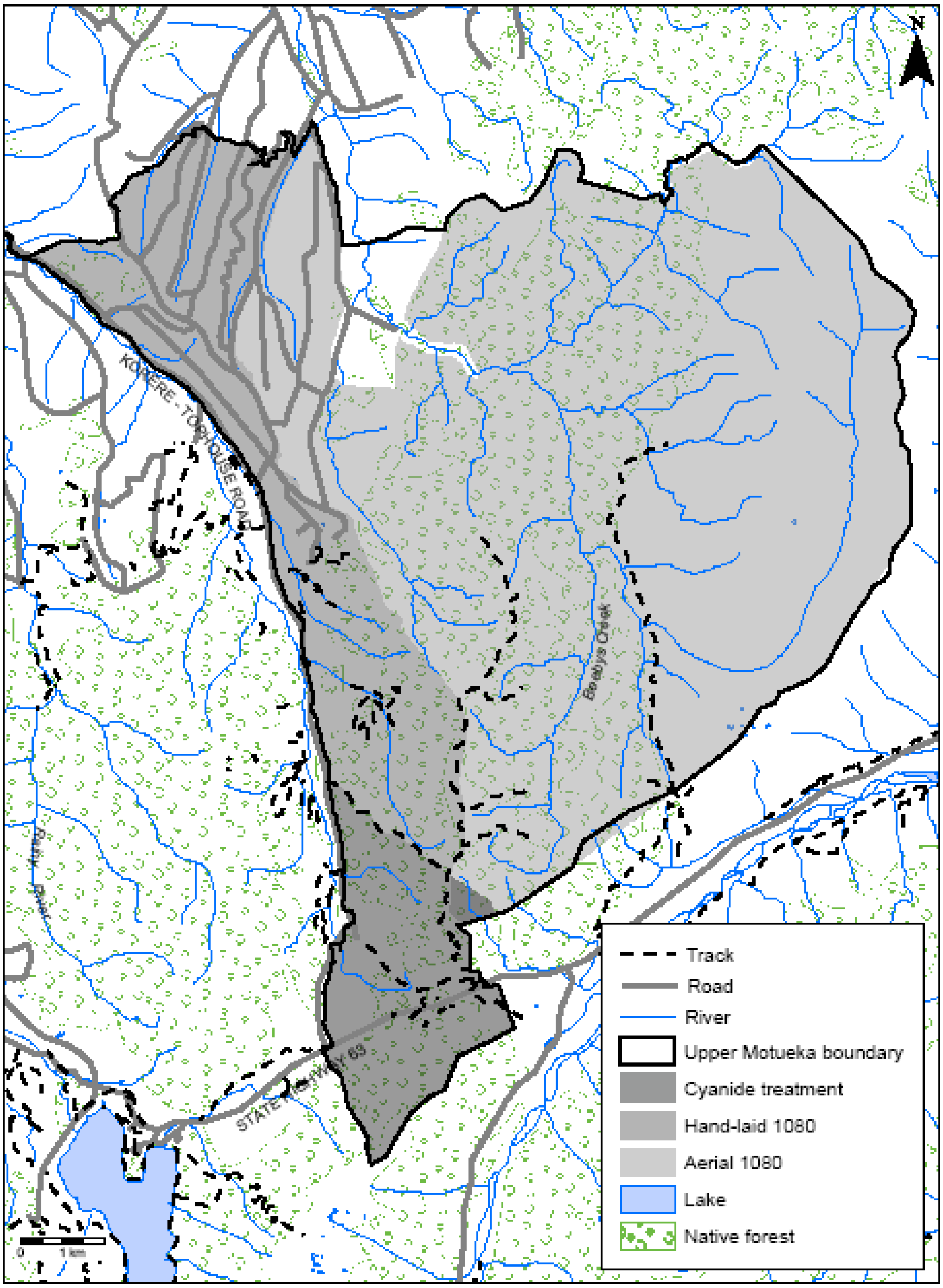
G/Projects/st arnaud/rnrp annual report 2004/fig 4 tophouse treatments

Figure 5 Animal Health Board Upper Motueka possum operation



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G:\Projects\st arnaud\rnrp annual report 2004\fig 5 upper motueka operation

Recommendations

- Continue trapping of possums along existing possum trap lines.
- Continue quarterly wax chew stick monitoring and biennial trap catch monitoring.
- Undertake chew stick monitoring along rat trap lines to indicate 'hot spots' for reactive possum control.
- Possum control to benefit nesting kaka should be planned for in future years.

Feratox™ Field Trial

With the conclusion of a trial in the Marlborough Sounds showing that weka are eating and dying from Feratox™ pellets used for possum control, the Nelson/Marlborough Conservancy and Area Offices decided that further trials needed to be conducted in order to test two bait stations that appeared to present less Feratox™ bait to ground birds. These stations are being used or considered for use by possum control operators. It was decided that these further trials should be undertaken in an area with known rat and possum populations. The Rotoiti Nature Recovery Project (RNRP) in Nelson Lakes National Park, St Arnaud Area Office, was chosen for the national field trial site as it provides an area of intensive rat, possum and stoat control/monitoring and a non-treatment site where pest populations are monitored. The aim of the field trial was to determine if Feratox™ is released to ground birds when using Sentinel baits or peanut butter balls in KK™ bait stations. The Sentinel™ baits are being considered for a Departmental maintenance operation in the Matiri, and the peanut butter balls are a common Animal Health Board maintenance tool on Crown land.

The first location was within the Mainland Island core area (MI), which included tracking tunnel lines L and R. The area within the MI is designated as an area where possums, rats and stoats are controlled. The second was at Lakehead, which included tracking tunnel lines F and G, and has only stoat control. Each location on all four lines had both types of bait stations trialled for a period of seven days. At the end of the second seven day period, the lines with the Sentinel™ bait stations were not removed or replenished but rather left intact and removed 16 days later. This gave data results for Sentinels for a period of 23 days. After the initial field trial was completed, an additional 45 sentinels were placed on two different rat trapping lines (upper D and F) with low rat populations and left for a two month period.

Results showed that both Sentinel™ and KK™ bait stations release Feratox™ pellets to the ground when located in an area with high rat and low possum populations. KK™ bait stations released an unacceptable number of Feratox™ pellets from the day they were first installed. The Sentinel™ released fewer Feratox™ pellets during the trial, with a small number of pellets becoming available to ground birds within four to seven days, and an unacceptable number beyond that. Five of the eight possums retrieved from Sentinels™ were killed within three days of the stations being set up in the field. This indicates that Sentinels may be usable under the condition that all stations are removed within five days.

From this field trial, the following two recommendations were made to apply to areas where there are known populations of weka:

1. The use of the KK™ bait station with Feratox™ pellets in peanut butter balls should not be permitted.

2. The use of Sentinel™ bait stations should be permitted only subject to complete removal of the bait stations within five days of being placed in the field.

A file reference for a full copy of the report can be found at Appendix 6.

3.2 RODENT CONTROL AND MONITORING

3.2.1 Ship Rats (*Rattus rattus*)

Objectives

To reduce rat numbers to levels at which:

- predation of nesting birds (see section 4.1 bird monitoring);
- predation of ground dwelling invertebrates;
- inhibition of plant regeneration (through eating of fruit, seed);

are insignificant alongside other mortality factors affecting these groups.

Performance Measures

Operational

- Grid spacing effectiveness will be examined at the end of the financial year, with indicative analyses done prior to Business Planning.
- Non-target captures will be analysed against trap tunnel entrance size by June 2004.
- Traps will be checked in accordance with prescribed frequency (see methods below).

Biological

- Rat tracking tunnel indices will be reduced to and maintained at less than five percent. If this reduction is unable to be achieved the shape of the Rotoiti tracking curve will be compared to the non-treatment areas before any move to contingencies is made.

Methods

Control – targeted trapping

Control was undertaken in 2003-04 by trapping as in the previous year. There are 1,042 trap sites each consisting of one Victor Professional rat trap in a coreflute cover per hectare. Delivery spacing is 100 x 100m grid in the RNRP core area, and 200 x 50 m in

Duckpond Stream catchment of Big Bush. Traps are baited with peanut butter and oats, and checked fortnightly.

Friends of Rotoiti (FOR) had their second full year of rat trapping throughout Black Hill, Black Valley, St Arnaud village and the Brunner Peninsula. The FOR trap grid aims to replicate that of the RNRP (one trap/ha at 200 x 50 metre grid) but uses mostly walking tracks and roads to approximate this. Only two tracks have been cut for FOR trapping. All trap tunnels used by the FOR are white, and all have a larger entrance than RNRP of 60 x 60mm. This entrance size was modified in autumn to 45 x 40mm in response to non target capture of a robin. (Figure 6, Figure 7).

Data Management

An Access database for capture of rat trapping information was established at the inception of this programme in 2000. The support of Graeme Elliott (DOC Scientist, Biodiversity Recovery Unit) is acknowledged for ongoing modification and maintenance of this tool.

Non-targeted Trapping

Rodents are captured as non-target species during both possum and mustelid control.

Monitoring

Tracking tunnels networks for rodents established at Rotoiti and Rotoroa (non treatment site) in previous years are monitored quarterly (August, November, February and May). All tunnels for rodent monitoring are centrally-baited with peanut butter, as opposed to end-baited as per the Department's Standard Operating Procedure (SOP) (Gillies and Williams 2002[a]), to retain continuity with the methodology previously used at this site. Tracking media are ferric nitrate and tannic acid treated papers.

A new site was established in the Wairau Valley/Eastern St Arnaud Range to monitor the effect of Friends of Rotoiti mustelid trapping in the valley floor and ski-field road. (See Section 3.3 Mustelids). This site provides rodent tracking information for a rodent non treatment site within a mustelid treated area. Tracking media is food colour on untreated papers. These tunnels are centrally baited for rodents.

Results

Trapping Effort

The prescribed operational performance measure was for fortnightly servicing of all traps. An exception was made for the higher altitude 'H' and 'G' lines which were to be serviced as required, based upon activity rates on the immediately lower altitude lines. Excluding 'H' and 'G' it is clear that this checking regime has not been met consistently, with average values exceeding the prescribed 14 days.

Figure 6 Ship rat control and monitoring

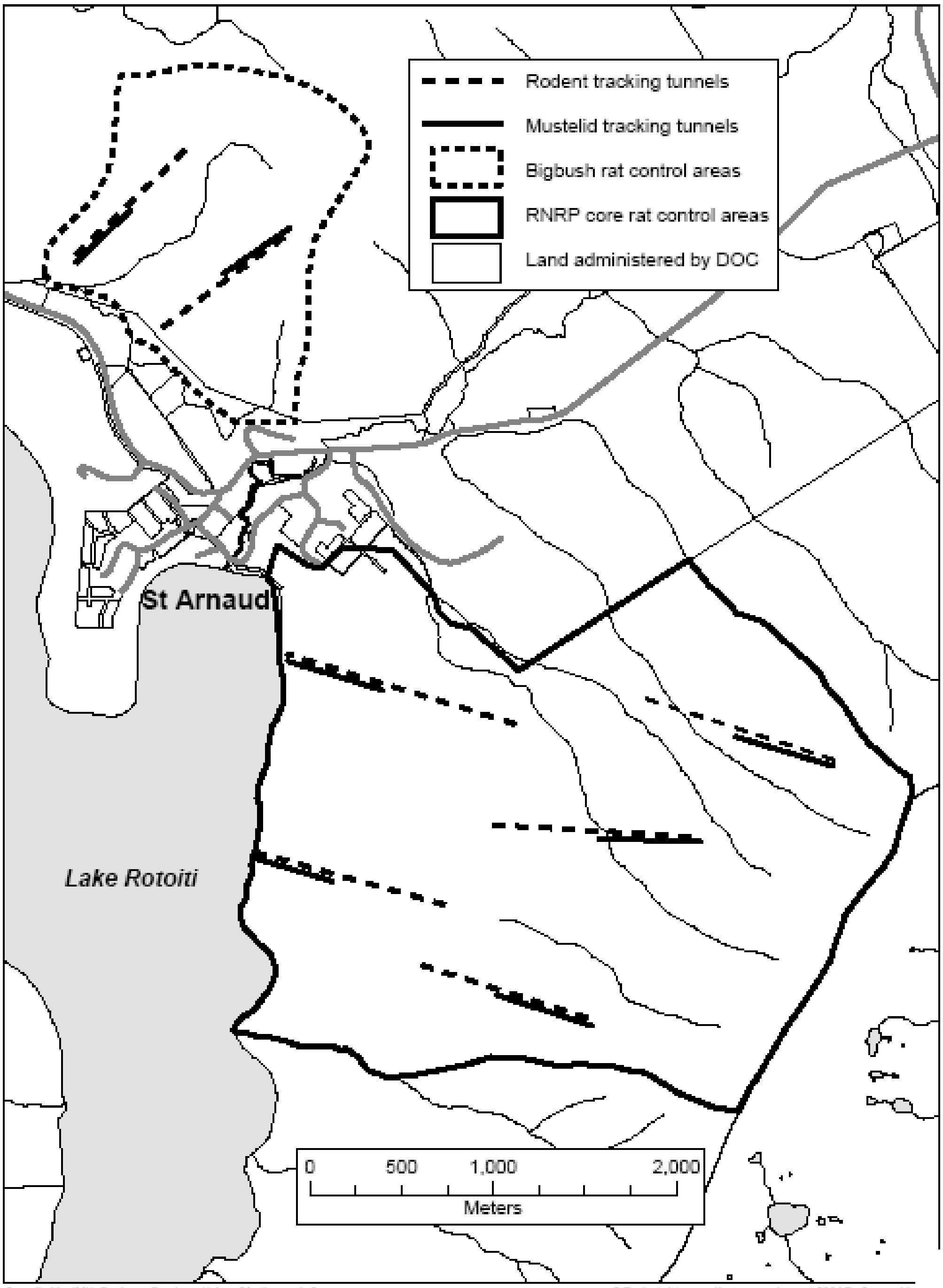

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Figure 7 Friends of Rotoiti rat trapping and lizard pitfall area

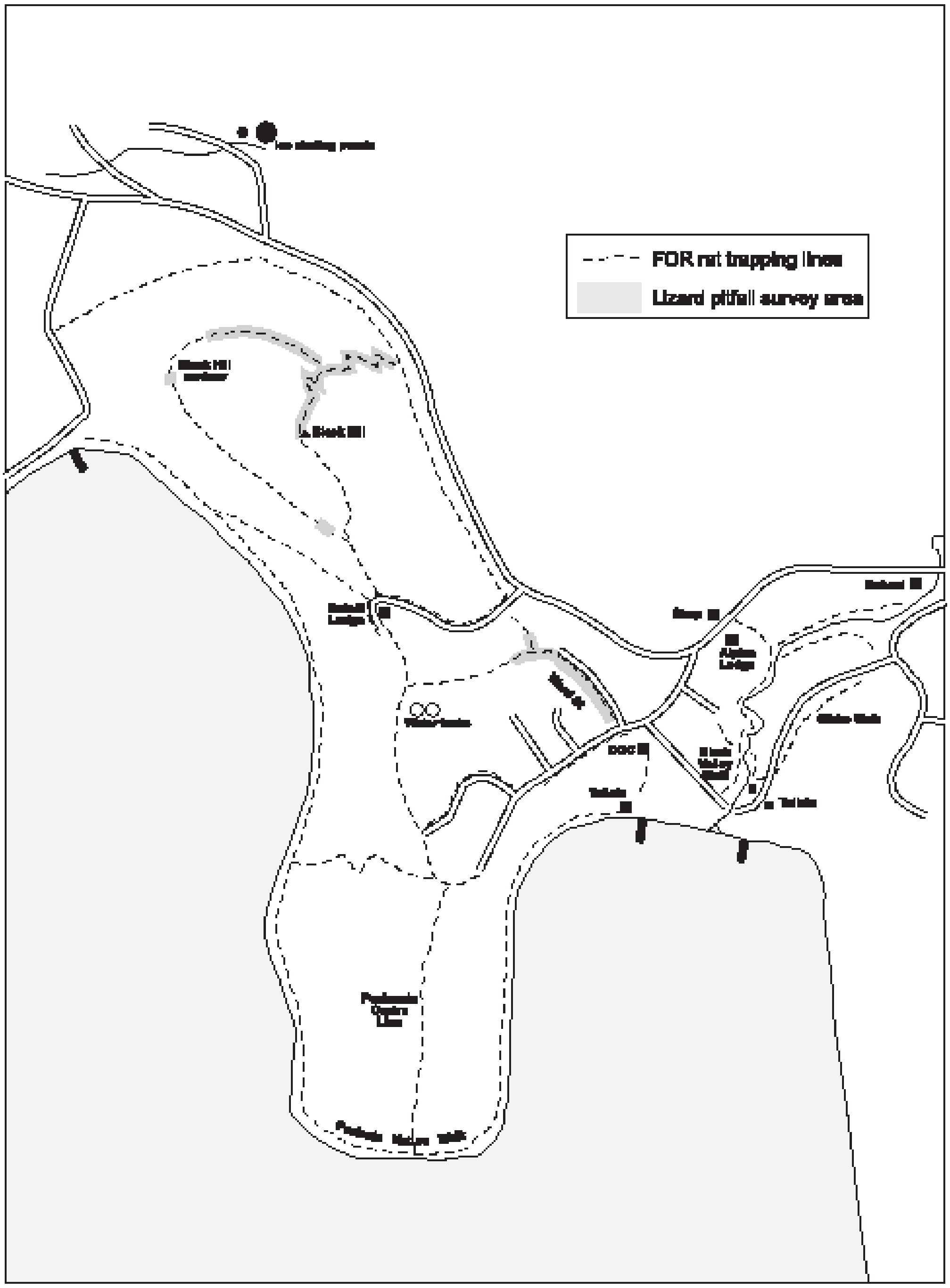

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TABLE 2. RODENT TRAP CHECK FREQUENCY

	EXPOSURE (TRAP NIGHTS BETWEEN CHECKS)			
SITE	RANGE	MEDIAN	MEAN	STANDARD DEVIATION
All traps RNRP core[1]	1 – 179	17	19.59	13.6
Lower RNRP core	1 – 102	15	17.27	9.1
Upper RNRP core[2]	1 – 179	21	27.5	21.2
Big Bush[3]	1 – 55	14	17.7	9.1

[1] Excludes high altitude 'H' and 'G' lines. [2] Data to 26-1-2004 (pre – vandalism). [3] Excludes period of vandalism

One cause of loss of trap checks was a period of several incidences of vandalism in the Big Bush rat control area in January. This saw the removal of traps, tunnels and line marking systems from approximately 150 hectares. This was partially restored and vandalism repeated and expanded. After inquiries involving Department led surveillance operations and police investigation the decision was made to leave the affected area unrepaired until the issue was resolved. This was not resolved by the end of the financial year.

Targeted Trapping

Slightly higher numbers of rats and one third fewer mice were caught in the core area in rat traps this year compared with the last. This is expressed in Table 3 below as a ratio.

TABLE 3 TOTAL CAPTURES FROM RNRP CORE RAT TRAPS BY YEAR

	RAT	MICE	STOAT	WEASEL	TOTAL
2000-01 [1]	2174	4093	18	14	6299
2001-02	708	341	4	5	1058
2002-03	925	1210	1	2	2138
2003-04	1017	820	3	11	1851
Ratio 2000-01: 2001-02	3.1:1	12:1	4.5:1	2.8:1	6:1
Ratio 2001-02: 2002-03	0.8:1	0.3:1	4:1	2.5:1	0.5:1
Ratio 2002-03: 2003-04	0.9:1	1.5:1	0.3:1	0.2:1	1.2:1

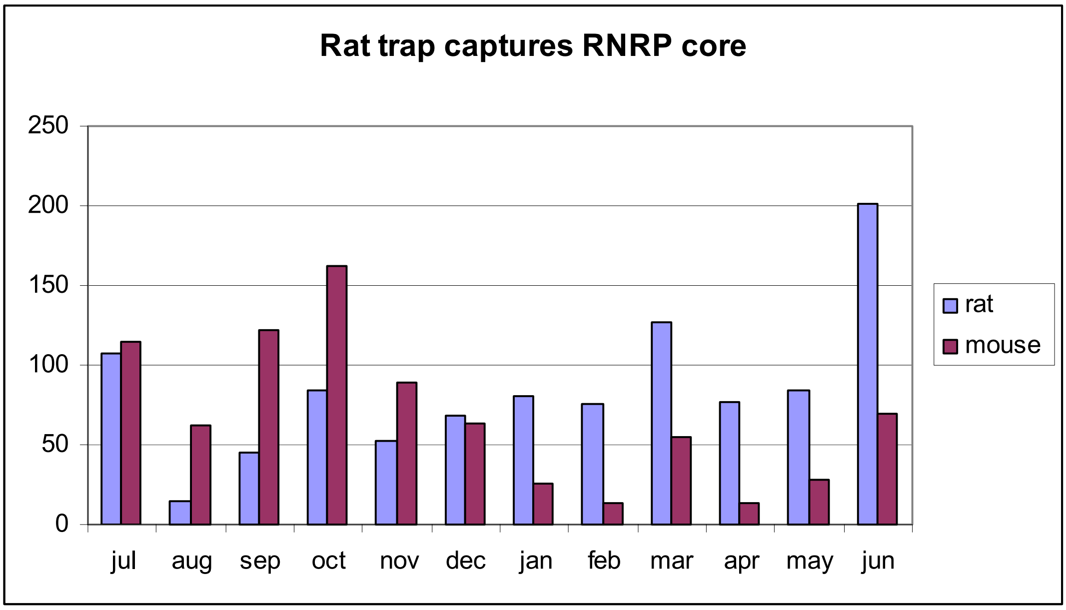
[1] Not a full year (traps opened August)

TABLE 4. TOTAL CAPTURE FROM BIG BUSH RAT TRAPS BY YEAR

	RAT	MICE	STOAT	WEASEL	TOTAL
2001-02[1]	241	855	1	0	1097
2002-03	240	851	1	0	1092
2003-04[2]	174	393	0	3	570
Ratio 2001-02: 2002-03	1:1	1:1	1:1		1:1
Ratio 2002-03: 2003-04	1.4:1	2.2:1			1.9:1

[1] Not a full year (traps opened October)
[2] Not a full year (traps affected by vandalism from January to June)

GRAPH 1. RAT TRAP CAPTURES RNRP CORE



Note: Captures are recorded against date trap checked. Number of trap checks per month not always equal.

Rat capture peaks over the year were July, March and then June. This is a similar pattern to the previous year. Rat captures were exceeded by mouse captures from July to November, and this pattern was then inverted through the remainder of the year.

Trap covers in the core area are alternately black and white. Captures by cover colour were similar to the previous year, with no preference by any species for either colour. Colour choice has now been tested in both high and low pest years and is shown to have no significant effect upon trap efficacy.

TABLE 5 RAT TRAP CAPTURES BY COLOUR COVER

	MICE		RAT		STOAT		WEASEL		TOTAL	
	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE
2000-01	1988 (48.6%)	2105 (51.4%)	1131 (52.0%)	1043 (48.0%)	8 (44.4%)	10 (55.6%)	7 (50%)	7 (50%)	3134 (49.8%)	3165 (50.2%)
2001-02	176 (51.6%)	165 (48.3%)	385 (54.4%)	323 (45.6%)	2 (50%)	2 (50%)	3 (60%)	2 (40%)	566 (53.5%)	492 (46.5%)
2002-03	583 (48.2%)	627 (51.8%)	474 (51.2%)	451 (48.8%)	1 (100%)	0 (0%)	1 (50%)	1 (50%)	1059 (49.5%)	1079 (50.5%)
2003-04	410 (50%)	410 (50%)	541 (53.2%)	476 (46.8%)	3 (100%)	0 (0%)	7 (63.6%)	4 (36.4%)	961 (51.9%)	890 (48.1%)
Total to June 2004	3157 (48.8%)	3307 (51.2%)	2531 (52.5%)	2293 (47.5%)	14 (53.8%)	12 46.2%)	18 (56.3%)	14 (43.8%)	5720 (50.4%)	5626 (49.6%)

Cover colour preference by sex of trapped animal was examined, but is confounded by the high proportion (c.50%) of unsexed animals due to decomposition in the trap, or skill level/willingness of volunteers to sex. Mice were unsexed as they are considered non-targets.

Captures by Site

All rat traps are assigned to one of four major 'trap sites' - RNRP (core, perimeter north and perimeter south) and Big Bush. Results presented in Table 5 exclude Big Bush data as these are incomplete due to lost checks following vandalism.

TABLE 6. RAT CAPTURES BY SITE

	CORE	PERIMETER N.	PERIMETER S.
% of traps	61.8	25.8	12.4
% all captures	57.7	30.9	11.4
Ratio % of all captures: % of traps	0.93:1	1.20:1	0.92:1
% of mouse captures	56.5	33.7	9.9
Ratio % of mouse captures: % of traps	0.91:1	1.31:1	0.80:1
% of rat captures	58.5	28.8	12.7
Ratio % of rat captures: % of traps	0.95:1	1.20:1	1.02:1

If all traps have an equal probability of capture then the ratio of captures to traps would equal one. Good 'fits' to this model are all sites for all species. RNRP Perimeter North does catch nearly 20% more animals than could be expected from its share of traps. This data should be matched against trap effort to ensure that probability of check for all traps is equal to one.

This analysis, when corrected and checked for statistical significance can provide guidance to priority areas for rat trapping effort, including augmentation by additional traps or trap checks.

Non-target Captures

One robin was caught (trap SF7, 17 March 2004) and one bellbird (DRE3, 16 July 2003). There were no other bird captures.

Three stoats and 14 weasels were caught in rat traps. Mustelid captures vary across years (32 in 2000-01, nine in 2001-02, and three in 2002-03).

Trap tunnel entrances in the RNRP core area vary as they were cut as assembled in the field by a variety of operators from rather loose guidelines. It has been suggested that this variation may exclude some target and desirable non target captures (mustelids) from accessing the trap as entrances may be too small. Those in Big Bush are much more uniform being 60 x 60 mm as these were pre-cut in the workshop prior to assembly and installation in the field.

Tunnel entrance dimension data exists for 430 of the 708 core traps (60%). Width ranges were 26 – 78 mm (median = 35, mean = 36) and height ranges from 28 – 65 mm (median and mean = 40). Of 26 stoats caught from 26 traps in the core area trap entrance data exists for 14 (54%). Width ranges were 30 - 43 mm (median and mean = 35) and height ranges 33 – 50 mm (median = 40, mean = 41). Of 31 weasels caught from 30 traps in the core area trap entrance data exists for 17 (57%). Width ranges were 30 - 45 mm (median = 35, mean = 36) and height ranges 33 – 49 mm (median and mean = 41). Only one bird has associated entrance data. A robin was caught in a trap with an entrance 41mm wide x 49 mm high.

If we assume that the minimum entrance sizes that have caught mustelids reflects the minimum that can catch mustelids (which is by no means certain) then we can test how many traps would be unavailable to these animals based on this criteria. Minimum width for all mustelids is 33 mm and 3.3% of traps are smaller than this. Minimum height is 33 mm and 5.6% of traps are smaller than this.

Grid Space Efficacy

No data is presented as this experiment is confounded by lack of adherence to prescribed trap checking frequency regime and inoperative traps in Big Bush due to vandalism. Trap check efficiency is greater with the 200 x 50 m grid space in Big Bush with more traps checked per trapper hour.

Friends of Rotoiti Trapping

TABLE 7. FRIENDS OF ROTOITI RAT TRAP CAPTURES

	RAT	MOUSE	HEDGEHOG	STOAT	FERRET	WEASEL
2001-02[1]	74	102	12	1		
2002-03	151	951	11	2	1	1
2003-04	150	1447	5	2	0	0

[1] December 2001 to June 2002

Friends of Rotoiti Non-target Captures

2003-04 yielded seven mammalian non target captures (five hedgehogs, two stoats), and two birds (song thrush and robin). The capture of a robin led to the reduction of trap tunnel entrances from 60 x 60 mm to 45 x 40 mm as this level of non target native bird capture was unacceptable to this community led programme.

Non-targeted Trapping

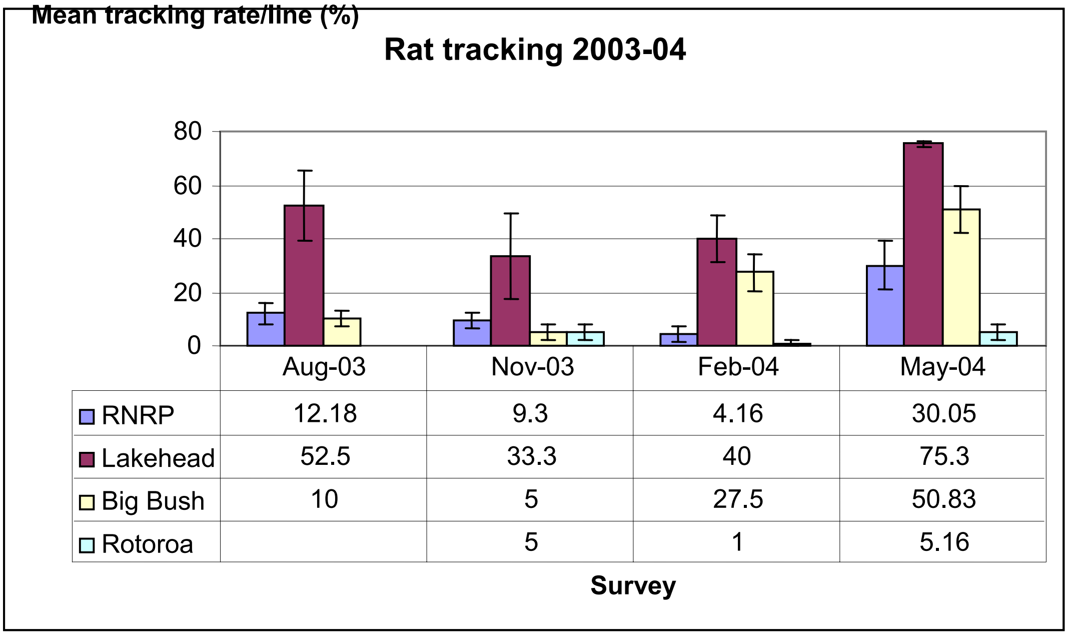
401 rats and one mouse were caught in RNRP Fenn™ traps for mustelid control. 42 rats and no mice were caught in Friends of Rotoiti Fenn™ traps. For both operations these numbers are greater than last year.

Tracking Tunnel Monitoring

Rodent tracking results:

Four rodent tracking tunnel surveys were undertaken this year, with the first excluding the Rotoroa site due to poor weather.

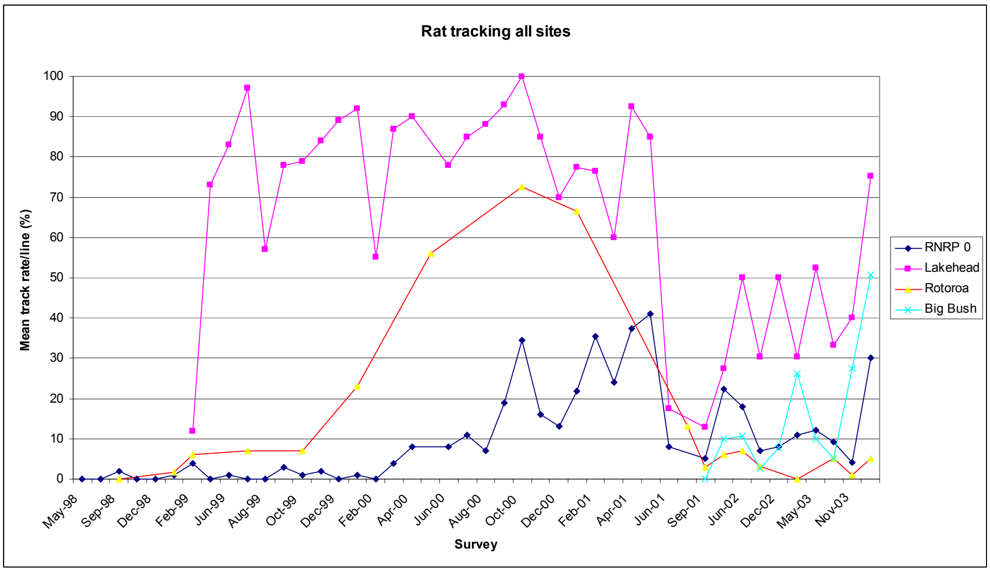
GRAPH 2. RAT TRACKING 2003-04



Notes: Rotoroa August no monitor due poor weather; Big Bush treatment ceased January.

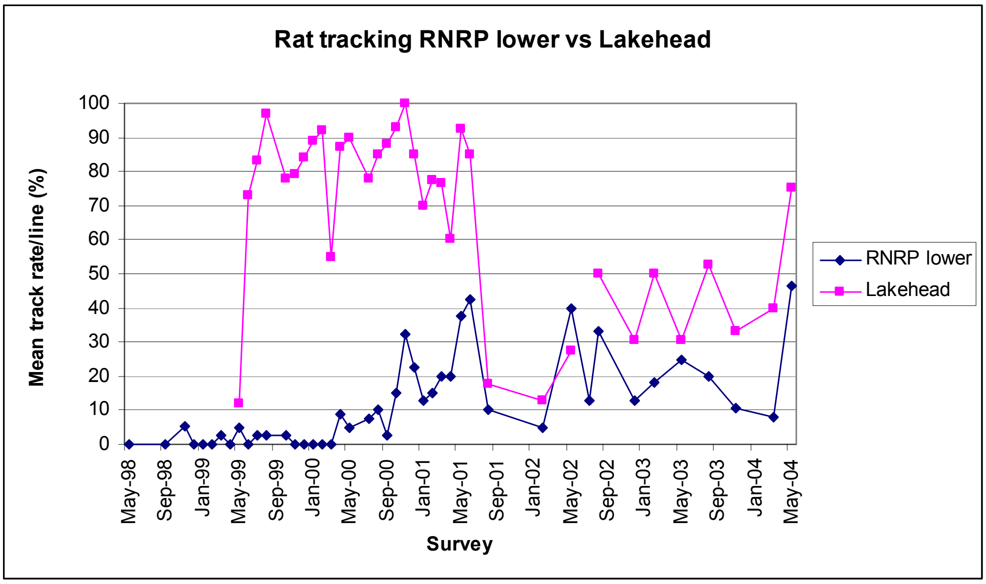
Tracking indices for treated areas are different from those of the local non-treatment site of Lakehead. The Rotoroa non-treatment site tracked very low numbers of rats over the previous few seasons.

GRAPH 3. RAT TRACKING ALL SITES



Data presented above aggregates all tracking line data in RNRP as mean tracking rate per line. For comparison with the local non treatment site (Lakehead) it is useful to focus upon those lines occupying similar altitudinal range. Tracking lines ‘Loop’ and ‘Rata’ fit similar altitudinal ranges to Lakehead (approximately 620 - 950 metres above sea level).

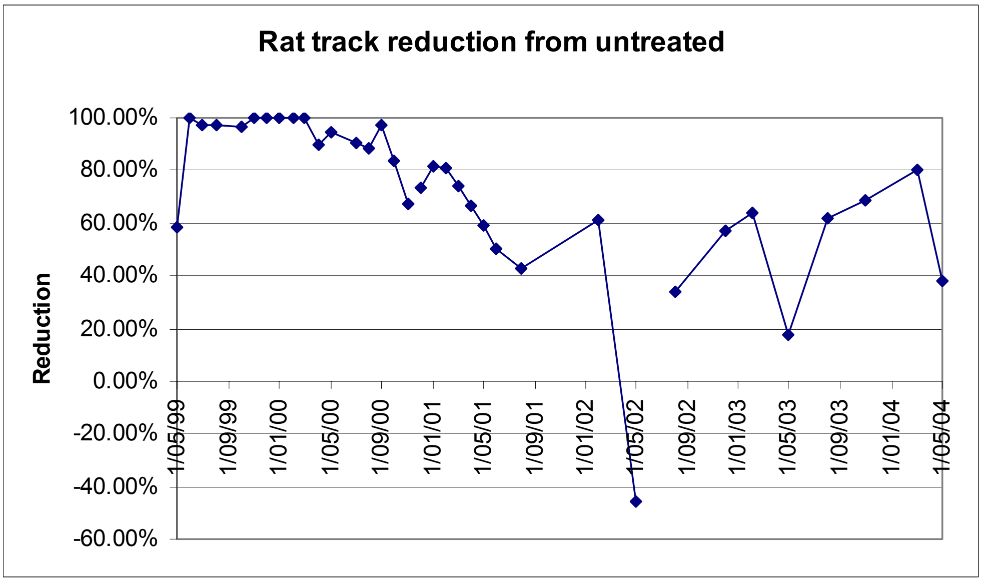
GRAPH 4. RAT TRACKING RNRP LOWER VS LAKEHEAD



Difference in tracking rates between RNRP lower and Lakehead are not as great as differences between RNRP total and Lakehead.

There is also a clear difference in the distance between curves for treated and non treated sites for the period of toxin use (May 1998 - August 2000) and the period of trapping (August 2001 to May 2004). If we assume that if Lower RNRP were not treated, rat indices would be similar to Lakehead we can ask the question “what reduction in tracking index has treatment achieved?”

GRAPH 5. RAT TRACKING REDUCTION FROM UNTREATED



Note: Reduction of rat index in treated site from non-treated = [(Index non-treated) minus (index treated)] divided by (index non-treated).

Average reduction of the Lakehead index at the RNRP treated using toxins is 93% (standard deviation 10.6), and 54% (standard deviation 29.5) for trapping.

Rodents were tracked when tracking tunnel surveys were run targeting mustelids. This data is not presented as it represents a 'by-catch'.

Discussion

The inability to meet the operational performance targets for trap check frequency is a major limitation to testing any of the hypotheses. This precluded any effective review of rat trapping being undertaken, and precluded an analysis of relative efficacy of trap grid spacing.

The above is compounded by ongoing issues of vandalism affecting rat trapping operations. Until this is resolved the ability to compare treatment regimes is compromised.

The 2003 beech seed fall was negligible with similar amounts of seed falling to 1997 and 2001. This would not be expected to generate a rodent response. Similar capture rates and tracking indices of rats to the previous two seasons were experienced, although there were substantial differences in the tracking rates of the two non-treatment sites.

The more substantial 2004 beech seedfall may have had a positive effect upon rodent population as evident from increased tracking indices at both treated and non-treated sites in May. This is also reflected in a sharp increase in rat captures in June. The full effect of this event will not be known until 2004-05 data is examined.

To effectively examine relationships between beech seedfall and rodent response it would be useful to convert beech seedfall to energetic contribution. Presently beech seedfall is expressed as total viable seed per square metre, which does not take into account varying composition by species which affects energetic input.

Rats appeared to be almost absent from the Rotoroa non-treatment area for this period. Similar magnitude seed fall events to Rotoiti occurred there in both 2002 and 2003. Data from this site has not been used for analysis; rather the focus has been placed upon the local non-treatment site of Lakehead. It must be acknowledged that this site is now encompassed within the expanded mustelid control regime.

Although tracking indices show that the five percent target was not met, figures from both treatment areas are better than those at the Lakehead non-treatment site. Thus, a rat control effect was achieved. However the effect of rat control when expressed as a reduction in the treated area of the activity index of the non-treated area, a 'result index', shows a lesser effect of suppressing rats by trapping than by brodifacoum poisoning.

These findings, together with the fact that the rat index in the treatment area has been consistently above our target level of five percent, has led to plans to enhance the rat trapping programme in 2004-05 by reducing the spacing between traps along lines to 50m by adding extra traps, and strictly adhering to the fortnightly checking regime. Only when the prescribed treatment regime has been delivered can we comment upon its efficacy.

While trap entrance data is available for only 60% of traps and 55% of mustelids trapped analysis shows that only three to five percent of traps may be unable to trap mustelids. Data for birds is even poorer with data for only one of two birds caught. It is important to capture the data for the remaining 40% of traps to complete this analysis. The modified Friends of Rotoiti trap entrances are not sufficiently small to exclude further bird captures, but may make traps significantly less attractive. It is unlikely that any trap entrance could ever be small enough to exclude birds and allow entry of target (and desired non-target) animals. Other factors of tunnel design should be explored for excluding bird capture.

The potential positive outcomes of rat control are discussed under bird monitoring (Section 4.1).

3.2.2 Mice (*Mus musculus*)

Since July 2000 mice have not been targeted for any control but they have been caught as a significant by-catch during rat trapping. It is noted that although mice were targeted prior to August 2000 via brodifacoum poisoning it was shown to be ineffective at reaching target indices (Butler, 2003; Ecosystems Consultants, 2000). Monitoring was carried out using tracking tunnels as for rats.

Methods

Monitoring

Mouse activity indices are derived from rodent tracking tunnel monitoring at RNRP, Lakehead, Big Bush, Rotoroa and a new site this year in the Wairau Valley/eastern St Arnaud Range. (Section 3.2.1). Mouse activity indices are also generated from mustelid tracking tunnel monitoring at the above sites. This data is not presented as it represents a 'by-catch'.

Non-targeted Trapping

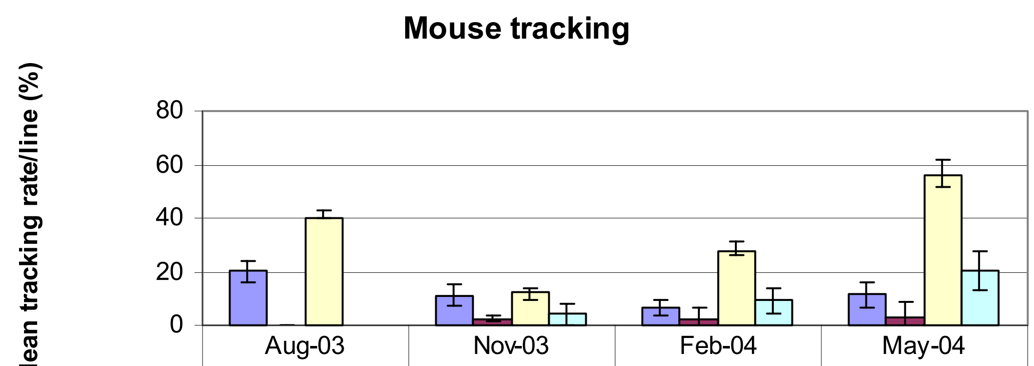
Mice are caught as by-catch from rat trapping operations (Section 3.2.1).

Results

Tracking Tunnel Monitoring

Four tracking surveys were achieved this year at all sites with the exception of Rotoroa in August (poor weather).

GRAPH 6. MOUSE TRACKING



	Aug-03	Nov-03	Feb-04	May-04
RNRP	20.36	11.05	6.39	11.29
Lakehead	0	2.5	2.5	2.63
Big Bush	40	12.5	27.5	55.83
Rotoroa		4.17	9.17	20.35

Survey

Notes for table: Rotoroa August no monitor due poor weather; Big Bush treatment ceases January.

Non-targeted Trapping

Rat traps caught 820 mice as by-catch. Mouse capture rates in rat traps were relatively high from winter through spring, with mouse captures exceeding rat captures through this period. A further increase in mice caught was observed in June.

Friends of Rotoiti rat traps caught 1,447 mice, exceeding rat captures approximately 10:1. A similar relationship was apparent in the previous year.

Discussion

From tracking tunnel results mice were present in moderate numbers in the two rat trapped areas in August. This is reflected in mouse capture rates from rat trapping. There was a decline in activity index at these sites through the summer. Mouse tracking indices remained low at the Lakehead non-treatment site throughout the year. Mice appear to have responded to the seedfall of 2004 with an increase in tracking indices and mice caught in traps in May and June respectively.

Mice captures were down by a third from 2002-2003 so there was a reduced clogging effect upon traps.

Both effectively targeting mice, and removing the negative influence of mice upon targeted rat control, remain areas of concern for this programme.

3.3 MUSTELID (STOAT - MUSTELA ERMINEA, FERRET - M. FURO, WEASEL - M. NIVALIS) CONTROL AND MONITORING

Objectives

- To maintain mustelid numbers long term within the recovery area at a level that allows local recovery of populations of resident birds (particularly kaka) and re-introduction of species vulnerable to mustelid predation (e.g. mohua, kiwi, tieke).
- To monitor thirty kaka nesting attempts and during this period develop a target mustelid tracking index related to kaka nesting success .
- To refine and maximise efficiency of mustelid control in RNRP.
- To contribute to national tracking tunnel survey (DOC Science and Research Unit investigation 3647).

Performance Targets

Operational

Check and maintain all Fenn™ sets and manage carcasses as described in the 2003-2004 Operational Plan (Appendix 6) and the RNRP Operational Field Manual (Appendix 5).

Liaise with and support the Friends of Rotoiti community trapping group and national mustelid research project leaders as required.

To obtain quarterly 'relative activity' indices for mustelids at treatment and non-treatment sites as result monitoring of mustelid control.

Forward tracking tunnel data to national survey coordinator.

Establish new tracking tunnel network in Wairau Valley/Eastern St Arnaud Range for result monitoring of Friends of Rotoiti mustelid trapping programme.

Result

No result targets have been set. Mustelids were monitored for the second time this year using tracking tunnels in accordance with the National Tracking Tunnel standard operational procedure (SOP). Over the next few years tracking tunnel indices for mustelids will be correlated with kaka nesting success to guide development of a target tracking index for future operations.

Outcome

Maintain an increasing kaka population in RNRP. For further detail see the 2003-2004 RNRP Operational Plan (refer Appendix 6) and Moorhouse, (1998).

Increase in numbers and/or range of bird species recorded in 5-minute bird counts, compared with historical data and non-treatment areas.

Contribute to national understanding of mustelid activity and the effects of control.

Control Methods

Stoats are the primary target for mustelid control. Ferrets and weasels are caught as well but may not be optimally targeted by this system. Control consists of a trapping system of single Mark VI Fenn™ traps set in wooden see-through tunnels baited with white fresh hen eggs (see RNRP Operational Field Manual for tunnel design). Traps are spaced at 100m intervals along trap lines (Figure 8).

Trapline configuration in the project area consists of perimeter trapping of contiguous 800ha blocks, covering approximately 5000ha. A total of 893 trap sets were operated.

Trapline configuration in the buffer zone, managed by the Friends of Rotoiti volunteer group, consists of a 25 kilometre line (the 'Rainbow Valley' line) following the Wairau valley road from the State Highway 63 turnoff to the top of the Rainbow Valley skifield, and a 3.5 kilometre line (the 'Mt Robert Road' line) following the road from the Buller River intake to the top Mt Robert carpark.

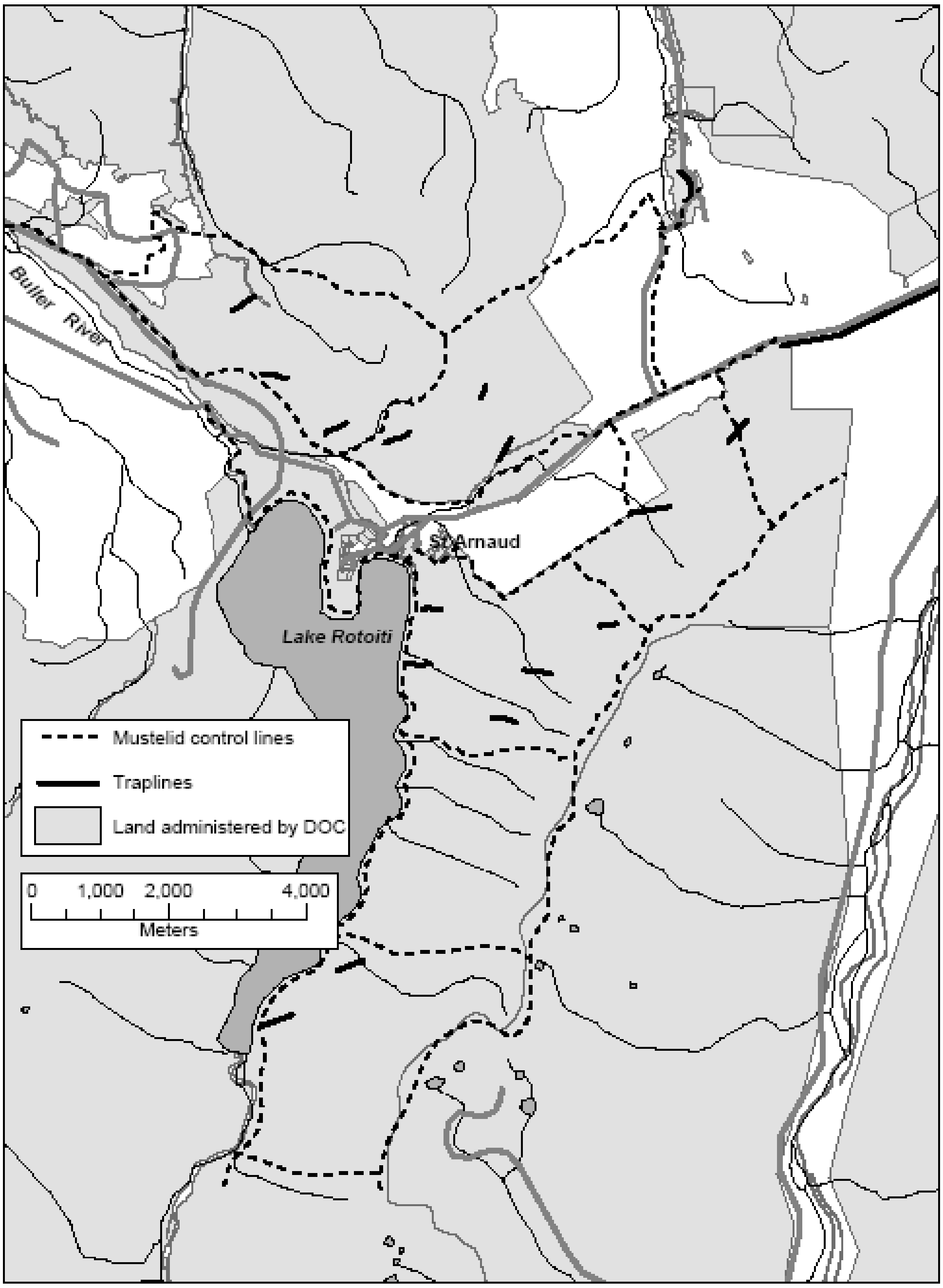
A total of 243 trap sets were operated on the Rainbow Valley line in the 2002-2003 year. The section of trapline up the Rainbow Valley skifield (21 traps) is removed with the first snowfall each year, about early May, and then all traps from the gate at the bottom to the top of the skifield road (48 traps) are removed, generally from early June until the end of September. This prevents loss of traps due to skifield road maintenance activities. A total of 24 Fenn™ traps were operated on the Mt Robert Road line in the 2002-2003 year. Trap spacing on the Mt Robert Road and Rainbow Valley lines is constrained by landscape; in some areas road verges are too steep to accommodate trap sets and so traps are placed as close to 100m spacings as practicable.

All traps were checked according to the following regime unless weather (for example snowfall) prevented this:

- once a month during July – September and May – June
- once a fortnight during October – November and March – April
- once a week during December – February.

All fresh carcasses were retained and sent to researchers requiring carcasses for their work (further detail in Section 6, Research). Liaison with the Friends of Rotoiti trapping group continued throughout the 2002-2003 financial year.

Figure 8 Mustelid control and monitoring



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

G/Projects/st arnaud/rnrp annual report/fig 8 rnrp mustelid

Neighbouring Pest Control Operations

The Animal Health Board (AHB) is responsible for managing Tuberculosis (Tb) vector control in land adjacent to the RNRP on the northern and eastern boundaries. A buffer zone of three kilometres exists adjacent to the RNRP project area, where 1080 and other toxins with secondary poisoning potential are prohibited. The aim is to minimise impact on surrounding stoat populations through secondary poisoning, allowing testing of a trapping-only system for predator control. However, it is acknowledged that Tb vector control may still have some impact on numbers of mustelids invading RNRP.

Neighbouring Tb vector control operations in the 2003-04 year are as follows:

1. Upper Motueka possum control (Figure 4), Stratford Pest Control (Kevin Stratford), May - June 2004.

   Control methods: hand laid 1080 pellets, cyanide paste and trapping.

   Trap captures: 3 stoats, 10 cats, 780 possums.

2. Tophouse possum control (Figure 5), Target Pest (Bruce Waddell), 16 February – 31 March 2004.

   Control methods: Cholecalciferol long life gel baits in bait stations, trapping (raised sets) and Feratox™ in bait bags, and 1080 Exterminator™ paste in bait bags beyond the 3 kilometre buffer.

3. Tophouse ferret control (Figure 9) Martin Lucas, March-May 2004.

   Control method: trapping (raised or ground set under weka-proof cover).

   Trap Captures: 6 stoats, 5 ferrets 15 possums, 11 cats.

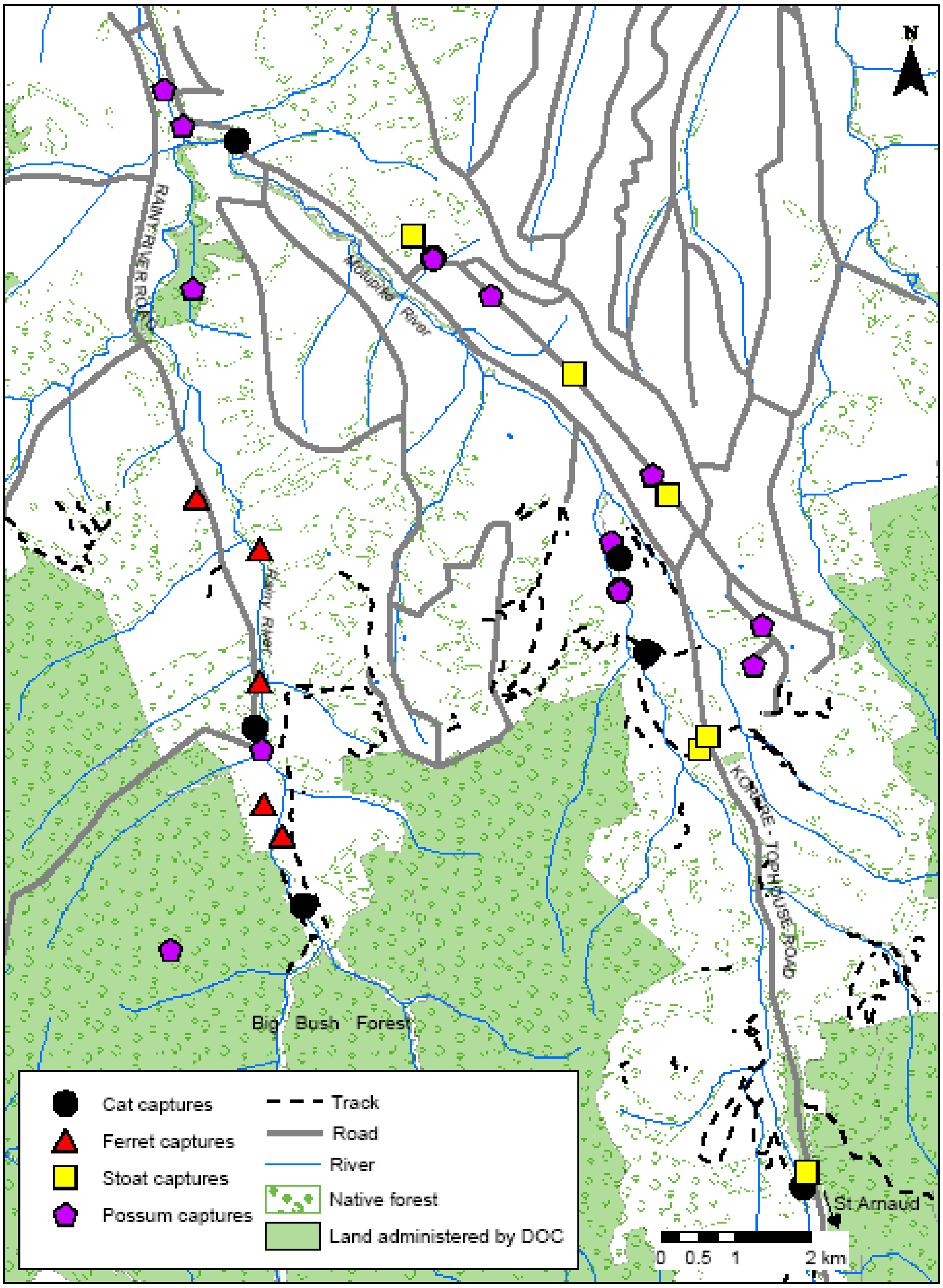
Ferret control was also undertaken in the Wairau and Rainbow valleys south of the Six Mile Stream, using traps. The closest mustelid capture to the RNRP was four kilometres south of the Six Mile Stream. This programme is considered too remote to impact on the RNRP trapping test.

Monitoring Methods

Tracking tunnel networks were augmented in 2002-03 at Rotoroa (non treatment) (Figure 10) and Rotoiti (treatment) (Figure 11) to give eleven and fifteen lines of five tunnels respectively in accordance with the SOP for monitoring small mammals (Gillies and Williams, 2002a). Tunnels are spaced at 100 metre interval along lines one kilometre apart. A tray within the tunnel contains two papers separated by an ink pad. Rabbit meat bait is placed centrally on the ink pad to lure animals.

Mustelid tracking surveys are run quarterly (August, November, February, and May) over three nights at each site immediately following rodent tracking monitor. Sites cannot logistically be run concurrently, but are run as close as possible temporally.

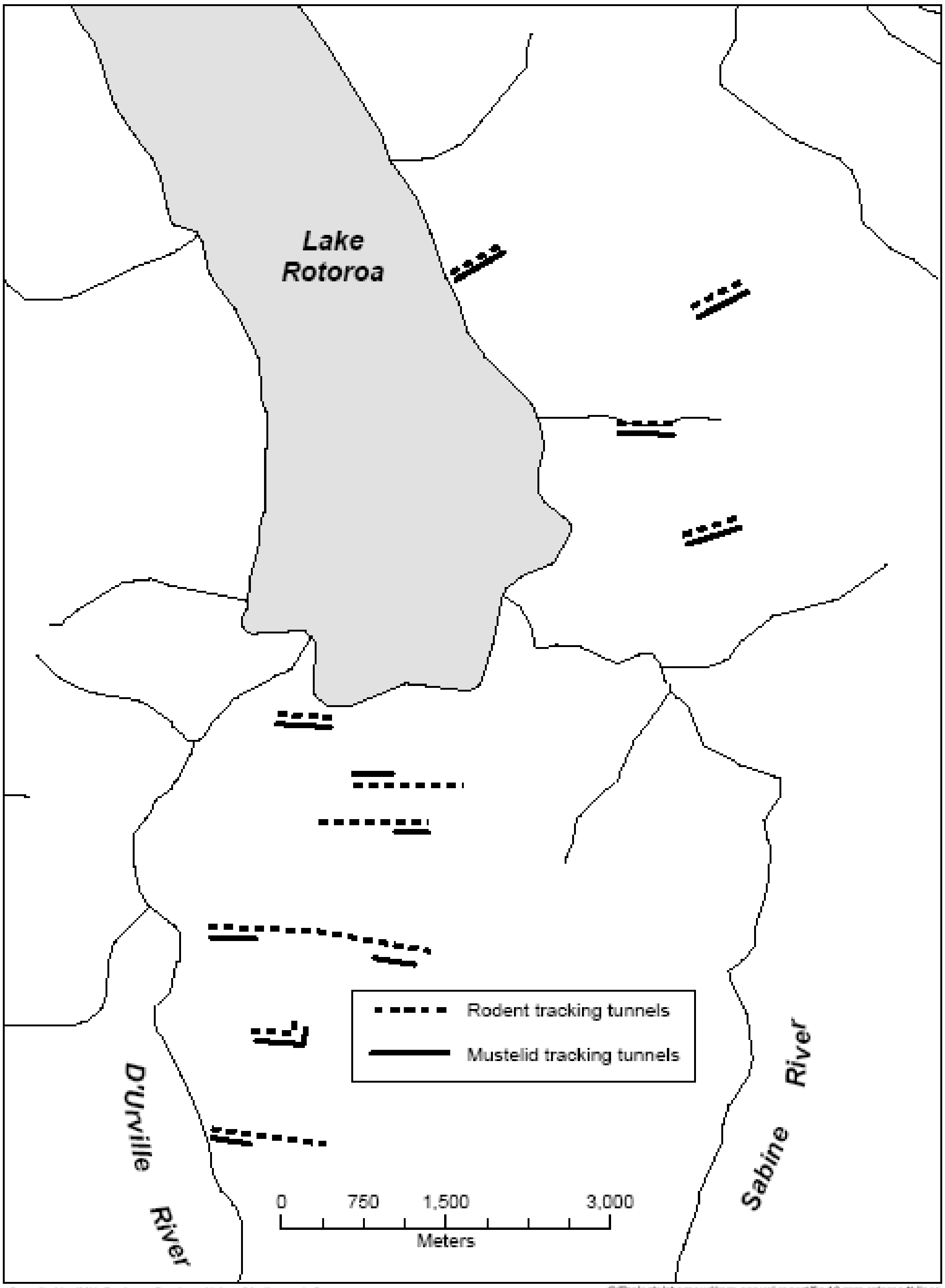
Figure 9 Animal Health Board Tophouse ferret operation



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

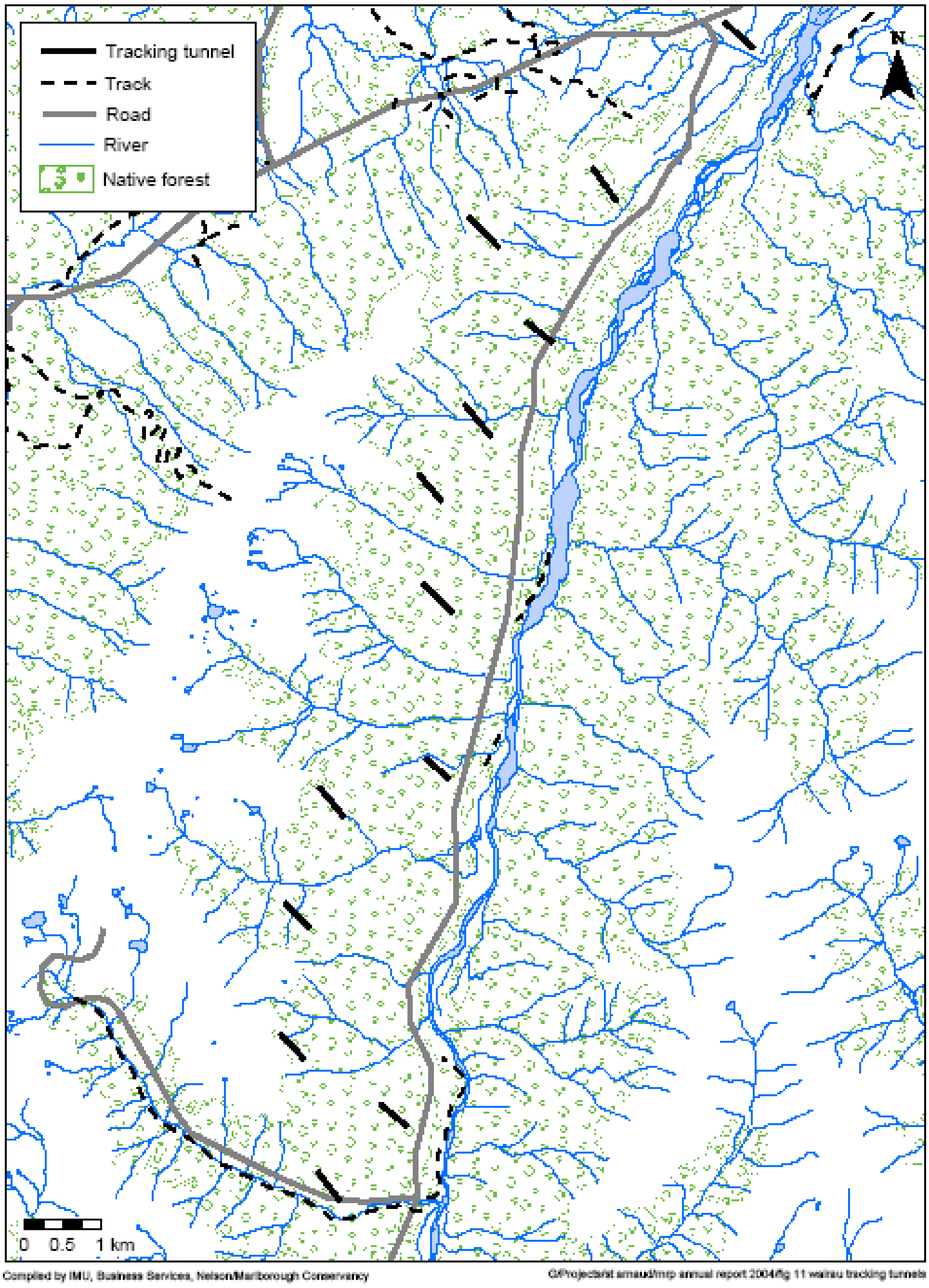
G/Projects/st arnaud/nrp annual report 2004/fig 9 tophouse trap results report

Figure 10 Rotoroa non-treatment tracking tunnels



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

Figure 11 Wairau tracking tunnel locations



Tracked papers are analysed by a single observer per survey, and assigned to animal (after Gillies and Williams, 2002b). Mustelid tracks are not assigned to species as this is considered unreliable due to overlap in parameters.

Data is recorded in an Excel spreadsheet and summary information forwarded each quarter to the national tracking tunnel survey coordinator. All tracked papers are retained for reference.

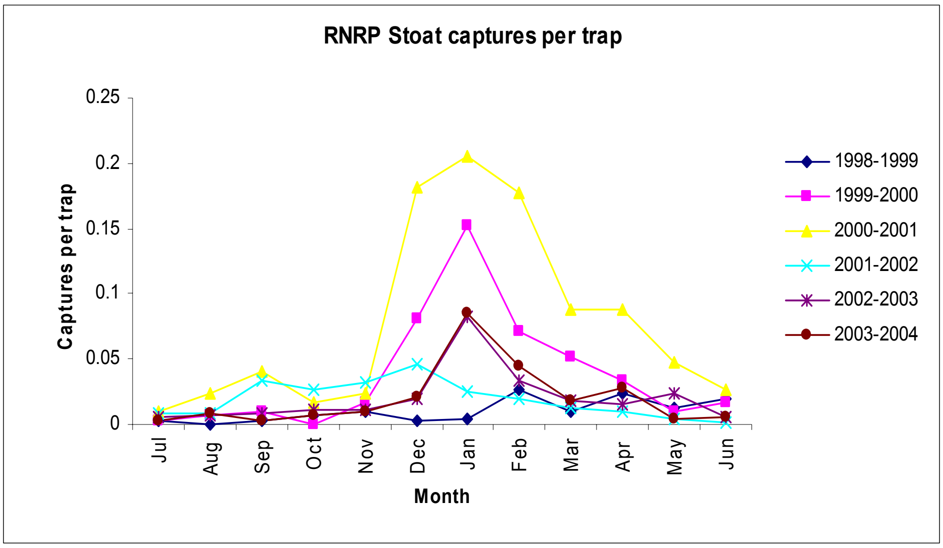
A new site was established in the Wairau Valley/eastern St Arnaud Range to monitor the effect of Friends of Rotoiti mustelid trapping in the valley floor and skifield road. This site has been established as a collaborative project between the RNRP and the Nelson Marlborough Institute of Technology Trainee Ranger class. This project has been led by Tamsin Bruce (Trainee Ranger) as part of the Ecological Management Skills Inventory and Monitoring course. This site will be surveyed contemporaneously with Rotoiti and Rotoroa indefinitely. Field work will be delivered by the Trainee Ranger class, with the exception of November monitors which coincide with students' summer placements. Additional labour will need to be sourced for this survey each year.

As no target tracking tunnel index has been set, data cannot be used to assess achievement of result targets. The primary use of this data is to record the effect upon the mustelid population of trapping according to the operational performance target.

Results

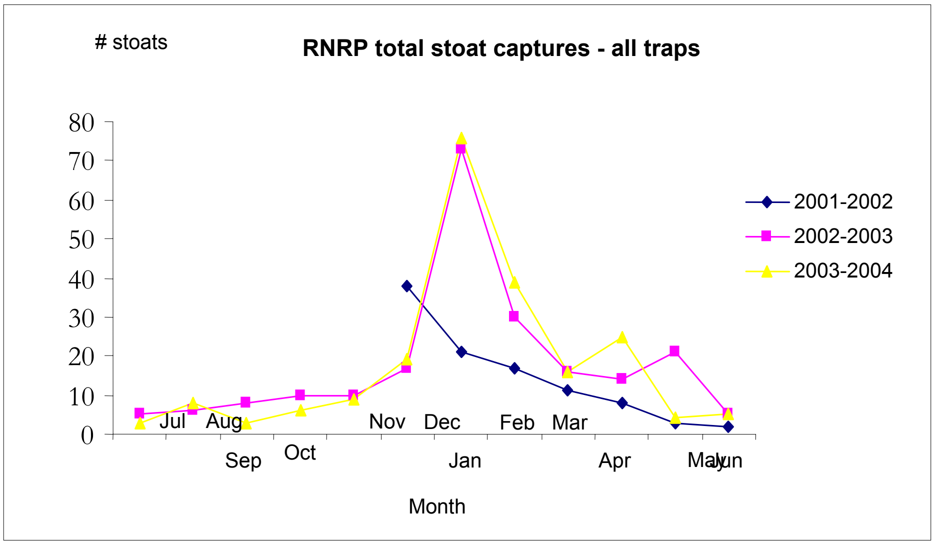
Stoats

GRAPH 7. RNRP TOTAL STOAT CAPTURES PER TRAP



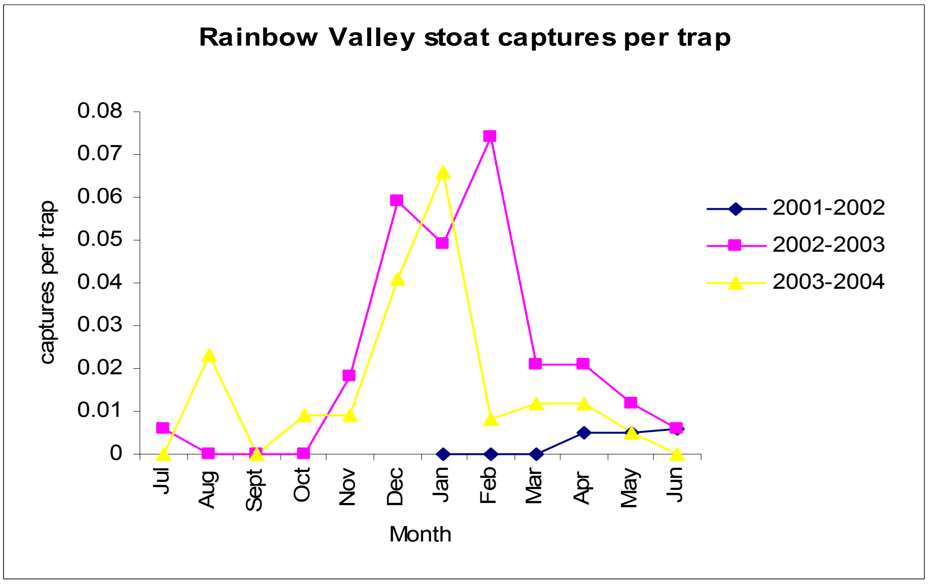
Stoat captures per trap for all traps (excluding the Friends of Rotoiti programme) that have been in place from the outset, allowing comparison of annual patterns. Note the similar capture numbers between 2002-03 and 2003-04.

GRAPH 8. RNRP TOTAL STOAT CAPTURES



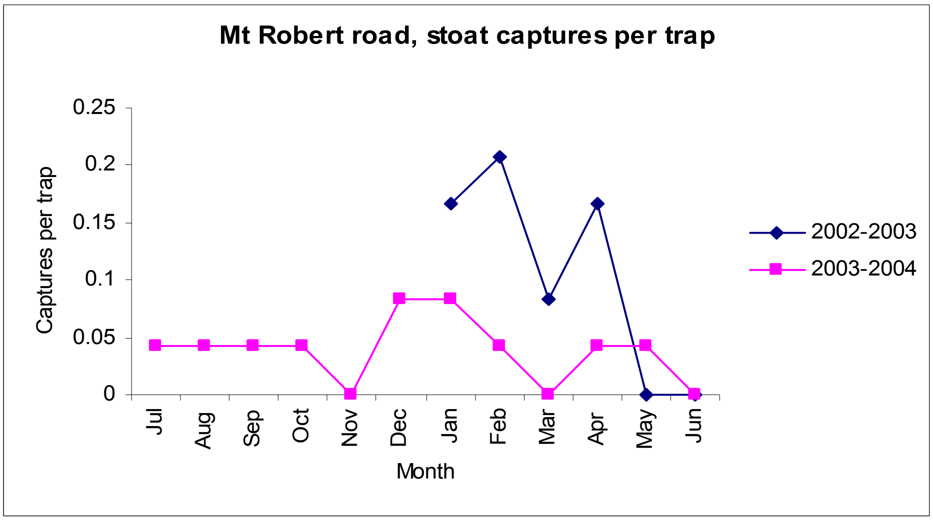
Stoat captures per month for the 5000 ha project area, from the outset of this regime (note that number of traps increases from 831 traps in December 2001 to 893 traps in November 2002, when the final lines were established). Note the similar capture numbers between 2002-03 and 2003-04.

GRAPH 9. RAINBOW VALLEY STOAT CAPTURES PER TRAP



Stoat captures per trap for the Friends of Rotoiti, Rainbow Valley Fenn™ trap line.

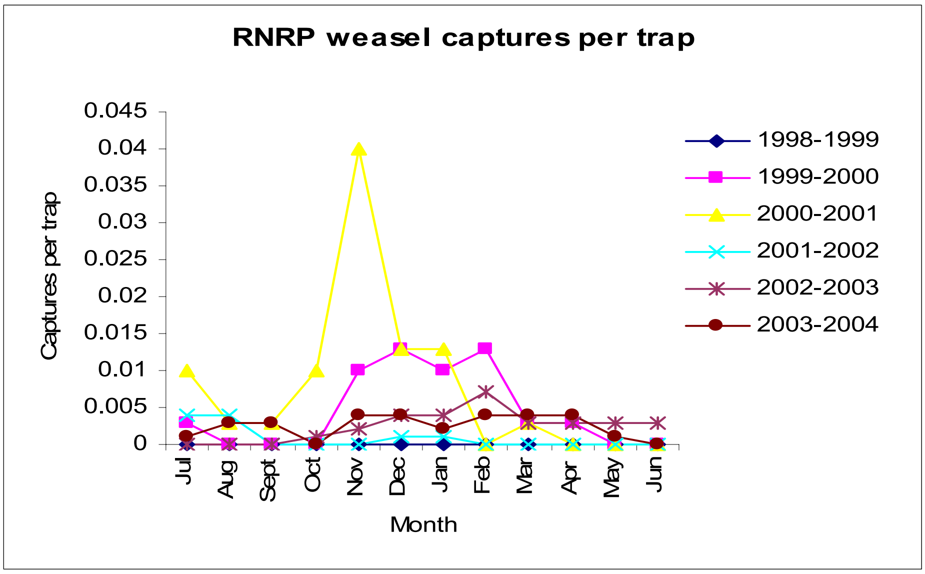
GRAPH 10. MT ROBERT ROAD, STOAT CAPTURES PER TRAP



Stoat captures per trap for the Friends of Rotoiti, Mt Robert Road Fenn™ trap line.

Weasels

GRAPH 11. RNRP WEASEL CAPTURES PER TRAP



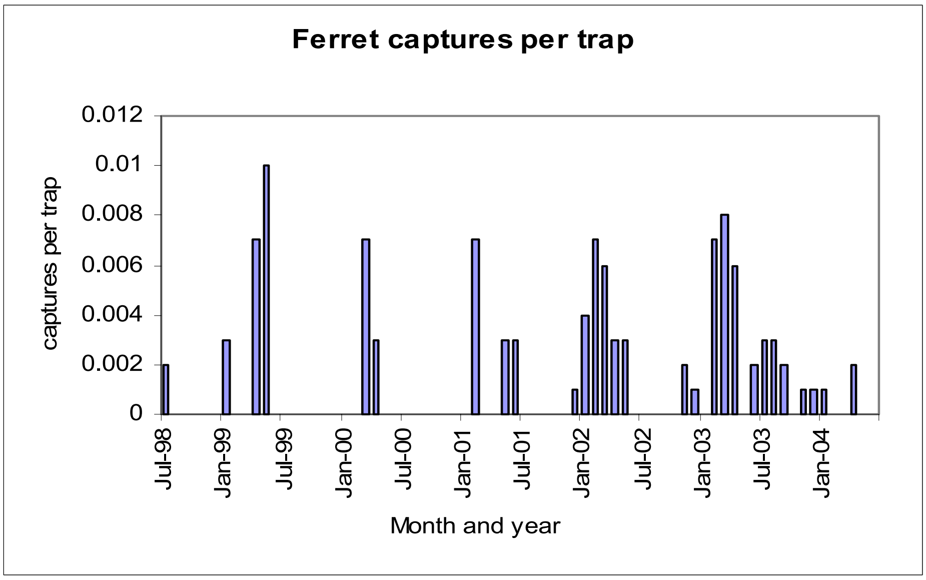
Weasel captures per trap for all years, allowing comparison of annual patterns.

No weasels were recorded as captured on either the Mt Robert Road or Rainbow Valley lines.

Ferrets

Ferret captures have been combined for the RNRP and Friends of Rotoiti Rainbow Valley trapping operations, due to low numbers caught. No ferrets were caught on the Mt Robert Road line.

GRAPH 12. FERRET CAPTURES PER TRAP



Ferret captures for all years, allowing comparison of annual patterns.

Non-target Captures

TABLE 8. FENN™ TRAP NON-TARGET CAPTURES 2003-04

SPECIES	RNRP	MT ROBERT ROAD	RAINBOW VALLEY
Cat	11	0	0
Rat	401	7	34
Hedgehog	154	1	146
Possum	12	1	11
Rabbit	64	0	12
Mouse	1	0	0
Song thrush	2	0	0

By-catch in Rat Trapping Operation

Three stoats and 11 weasels were caught in the old RNRP core area in 2003-04. Three weasels were caught in the Big Bush area, although this operation only ran for part of the year. One stoat was caught in the Friends of Rotoiti rat trapping operation in January 2004 on the Peninsula Nature Walk rat trap line.

Monitoring – Tracking Tunnels

Tracking surveys were achieved all quarters at Rotoiti, but were not achieved at the Rotoroa non-treatment site in August or May due to poor weather. In May the tunnels were set following the rodent monitor but heavy rainfall prevented retrieval of papers after three nights. It was elected not to pull papers late at the first opportunity after six nights as results would not be comparable with the three night survey at Rotoiti. While the loss of this data is regrettable, completed surveys did capture the peak mustelid activity period of November through February. It would not be expected that values for August and May would exceed the summer indices.

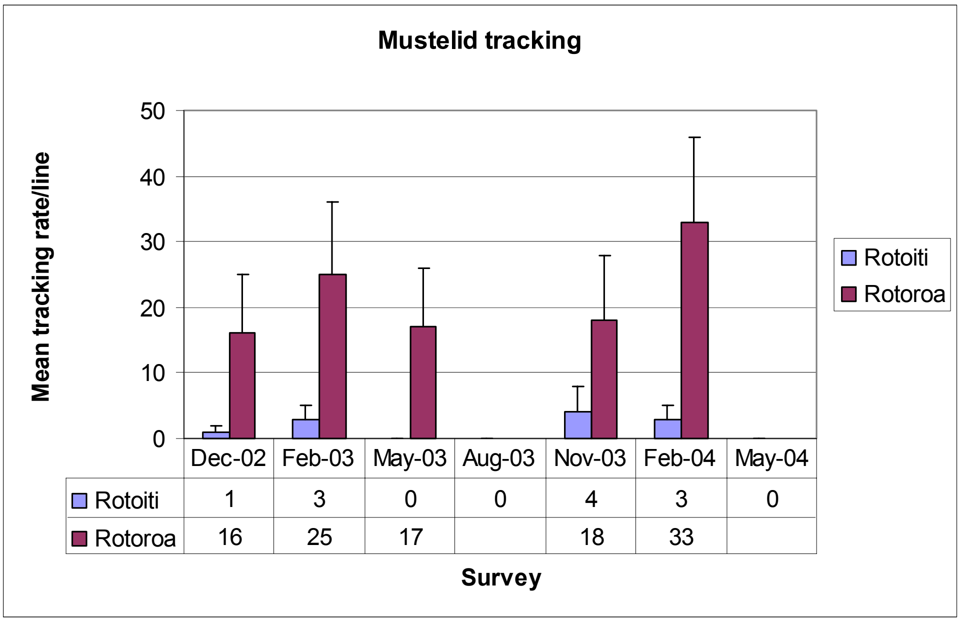
Wairau tracking tunnels were established in February with the Nelson Marlborough Trainee Ranger class. These were allowed to weather before the initial survey run in May.

Wairau tracking data can potentially be stratified for proximity to trap line. This has not been done for data of the single survey to date.

TABLE 9. MUSTELID TRACKING INDICES 2003-04

		AUGUST	NOVEMBER	FEBRUARY	MAY
Rotoiti (treatment)	Lines tracked (%) n=15	0	7	13	0
	Mean track rate /line (%(standard error))	0 (0)	4 (4)	3 (2)	0 (0)
	Tunnels tracked (%) n=75	0	4	3	0
Rotoroa (non treatment)	Lines tracked (%) n=11	No survey, poor weather	27	45	No survey, poor weather
	Mean track rate /line (%(standard error))		17 (10)	33 (13)	
	Tunnels tracked (%) n=55		18	35	
Wairau (FOR treatment)	Lines tracked (%) n=13	No survey, not established.			8
	Mean track rate /line (%(standard error))				2 (2)
	Tunnels tracked (%) n=65				2

GRAPH 13. MUSTELID TRACKING INDICES 2002-04



Note: No Rotoroa surveys August and May.

Mustelid indices for Rotoiti are significantly different (logistic regression, F=27.1, df = 1,123, p=0.000) to Rotoroa indices, and are more similar to mustelid treated sites than non-treated sites nationally (after Maddigan 2004).

Hedgehogs were only tracked once at Rotoiti in the February survey (1.48%) and were absent from both sites for all other surveys.

Rat and mouse indices from mustelid tracking surveys are ignored as better quality data is derived from rodent tracking surveys run immediately prior.

Discussion

Effects of Control on Mustelid Numbers

While it cannot be assumed that without predator management the number of mustelids in the environment at Rotoiti would be the same as at Rotoroa, data collected nationally suggests that without treatment, tracking indices at Rotoiti would be more similar to those collected at Rotoroa (after Maddigan, 2004). Thus results suggest that trapping in RNRP is having a significant impact. For the previous year and a half the mean track rate per line in the RNRP was held within the threshold recommended by Greene et. al. (2004), as providing most benefit to kaka populations. Capture trends indicate that the 2003-04 year was moderate in terms of stoat numbers in the environment. The regime now needs to be tested in the presence of high numbers of stoats, as seen during the 1999-2000 and 2000-2001 years.

Capture Trends and Beech Mast Response

Stoats and Weasels

All trapping operations showed a typical summer peak in captures, tailing off slowly to typical low winter captures. Stoat capture rates were similar on all lines during the 2003-04 year.

From 1998-99 to 2002-03 there has been a strong relationship between beech mast events and stoat and weasel captures, with more animals caught in response to heavier beech seeding (see section 4.5.4 for yearly beech seedfall results). The 2003-04 year is different in that, despite the almost negligible seedfall in autumn 2003, peak captures were very similar to those of the 2002-03 year, in which a response was evident following a reasonable seeding. Rotoroa tracking tunnel data also suggest a similar background number of mustelids in the environment over the 2002-03 and 2003-04 years.

Ferrets

Ferrets are caught in very low numbers in all areas, with apparently little response to beech mast events. Captures peak later than for stoats. The 2003-04 year is different in that captures continued through the July-November period for the first time.

By-catch in Rat Traps

A higher by-catch of weasels was evident this year (cf. two in 2002-03 in the old RNRP core area, and none in Big Bush). This supports the notion, suggested by the Fenn™ trapping results, that there were more weasels in the environment than one would expect given the negligible beech seedfall in 2003.

Animal Health Board (AHB) Operations

An unknown number of mustelids were killed in the Tophouse and Upper Motueka possum operations (although at least three stoats were killed in the Upper Motueka operation). Six stoats and five ferrets were killed in the Tophouse ferret operation.

It is possible that AHB control could have impacted stoat populations enough to directly affect RNRP trapping operations. If this effect was strong one might expect stoat captures per trap on the St Arnaud Range lines to be higher than those on the Big Bush lines, due to the far smaller proportion of lines adjacent to AHB operations on the St Arnaud Range. However, stoat capture rates were similar on all lines this year. This suggests that AHB operations are not impacting surrounding stoat populations enough to show up in our Fenn™ trapping results in these areas. Trends will have to be monitored over a few years, however at this stage it looks like we can be reasonably confident about drawing conclusions about a 'Fenn™-trapping only' mustelid control regime.

Recommendations

- Continue to collect mustelid tracking indices for correlation with Fenn™ capture rates and kaka nesting success. The Fenn™ trapping regime should continue without modification until enough kaka nesting attempts have been observed to determine the effectiveness of the trapping regime (c. 30 attempts, after Moorhouse, 1998).
- Continue to foster the relationship between AHB contractors and DOC St Arnaud, focussing on provision of technical information regarding surrounding AHB control operations.
- A large amount of data has been collected over the years, and the opportunity exists for detailed temporal and spatial analysis of capture trends, which should be pursued.

3.4 FERAL CAT CONTROL AND MONITORING

Objectives

- To reduce feral cat numbers long term within the Recovery Area to benefit resident native bird populations and allow re-introduction of species vulnerable to cat predation (e.g. tieke, kiwi).
- To reduce to zero the population of pet cats in St Arnaud in the long term, with support of the local community.

Performance Target

Operational

Run and maintain cat trapping regime as described in the 2003-04 RNRP Operational Plan.

Design a 'result monitor' in collaboration with Dave Seelye, utilising his 'cat' dog 'Roger'. (Roger is a Border Terrier – Fox Terrier cross bred by Scott Theobold of Northland, and is part of the National Predator Dog programme).

Provide information and support to advocacy team as required.

Result

No result targets have been set, due to the absence of a good method to monitor cats. Stomachs are kept from all carcasses and contents will be sorted at some stage as an initial gauge of the impacts of cats. Captures in Fenn™ traps may act as an index of cat activity in the area.

Outcome

No loss, due to cats, of robins or kaka within the RNRP project area that would compromise continued increase in populations of these species.

Methods

Nineteen 'Steve Allan Conibear™ style' kill traps were located in areas of historical cat sign/sightings, and cat sign/sightings detected during the year. Some of these traps were moved during the year. One Timms™ trap was set on 27 February and run for the remainder of the year. See Appendix 1 for trap locations and period set. (Figure 11)

Kill traps were generally checked in conjunction with other work, mainly Fenn™ trapping and rodent trapping. The checking and re-baiting periods are uneven for each trap. Generally rabbit was used as bait, however, other baits trialled were eel, ferret, fish, ham, hare, possum, rat, sausage (meat unknown) and stoat. As always, problems with bait life occurred during the summer when wasps remove all protein bait within a few hours.

Fifteen possum leg-hold (Victor™ number1 or 1.5) traps were run up the Travers Valley in response to cat sign detected by field staff working in the area. Because these traps have not been passed as a cat kill trap they were checked daily. Fifteen traps were run for five nights, 75 nights total. Traps were baited with goat meat.

A small amount of live trapping was undertaken by RNRP staff in the village (eight traps, 63 trap nights), along the Anglers walk track alongside the Buller River (five traps, 20 trap nights) and around Lakehead Hut (five traps, 30 trap nights). Traps were baited with a mixture of fish, rabbit, possum and hare. See Appendix 1 for locations. One Friends of Rotoiti member regularly ran one live trap at the water tank between St Arnaud and Rotoiti Lodge and, for a short period, one live trap in West Bay.

Due to other commitments and Roger not yet being certified, no work was done on designing a result monitor in collaboration with Dave Seelye. This year predator dog work in the RNRP was focussed on continued training of Roger. Roger was 'worked' on three occasions in May 2004 as training exercises, for 14 hours total. (Figure 12) One cat scat was located during this work. Twelve hours work was undertaken with Roger on 29-30 June 2004 and one cat scat detected. One cat was seen on this line a few days later by a staff member.

No active advocacy work was done to discourage St Arnaud residents from keeping pet cats, however discussions were held with owners on a casual basis when the opportunity arose. Several cage traps were loaned to St Arnaud residents to capture wild cats seen on their properties.

Results

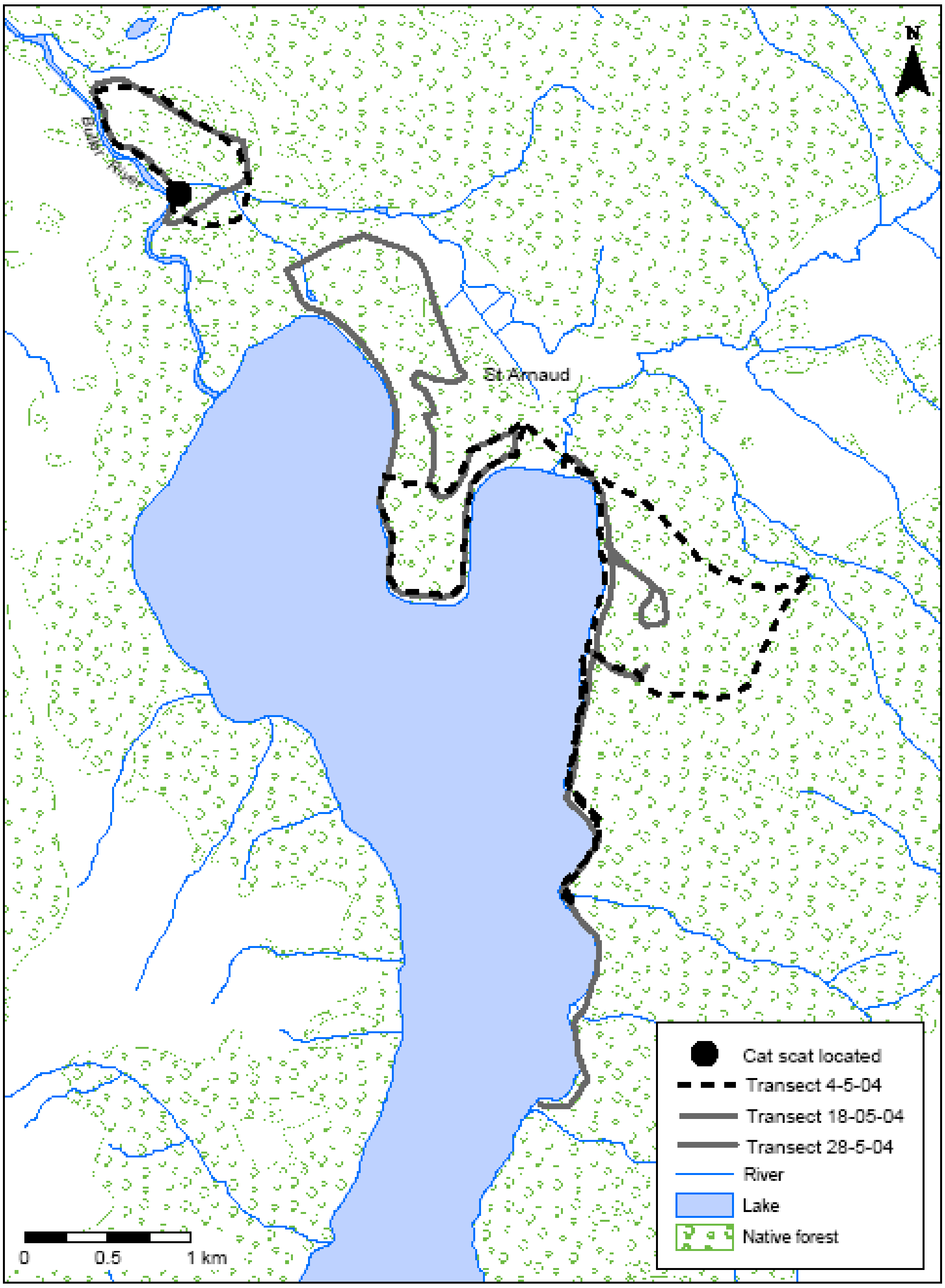
A total of 6511 kill trap nights (uncorrected) were run. No cats were caught. Four possums and two stoats were caught in Steve Allan modified Conibear™ traps. No cats were caught in traps set up the Travers Valley.

A total of 111 live trap nights (uncorrected) were run by RNRP staff. Two cats were caught in a trap set in Ward Street, one pet cat which was returned to the owner with a warning about kill traps in the area, and one wild juvenile which was shot.

An unknown number of trap nights were run by the Friends of Rotoiti member. During the period March 2003 to September 2004, nine cats were caught in the live trap at the water tank, and one in the live trap at West Bay. Captures occurred between March to July each year.

An unknown number of cats were caught by landowners in the St Arnaud Village.

Figure 12 Transects walked with cat dog



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

G/Projects/st arnaud/rnrp annual report 2004/fig 12 cat dog transect

Eleven cats were caught in RNRP Fenn™ traps during the 2003-2004 year (cf. e1even in 2002-03 and eight in 2001-02).

No losses of robins or fledgling kaka were detected during the year that could be positively attributed to cats.

Discussion

Bait life is a major issue in honeydew beech forest as wasps remove bait in a few hours during the day. A long-life cat lure that is unattractive to wasps is needed. However, cat control was not a high priority for work in the RNRP in the 2003-04 year. Monitoring of native fauna has not shown cats to be endangering the continued survival of these species in this area. It is probable that current monitoring would not detect cat impacts, because species targeted are not significant components of cat diet. Casual observation of cat scats indicates lizards and weta are possibly more important (Jimbo McConchie, pers. comm.). In previous years, cat captures in Fenn traps have suggested a response to beech mast events (RNRP annual report 2002-03). This year, the number of cat captures in Fenn™ traps was the same as in the 2002-03 year, despite quite different beech seedfall between the two years. This trend was also observed for stoat and weasel captures in the RNRP.

Dave Seelye will continue training Roger in the 2004-05 year, aiming to have him certified in October 2004. Once Roger is fully trained and certified he will be used in monitoring, and possibly control, of cats in the RNRP area, to aid assessment of success of the current cat control regime, and targeting of areas for control. This will be especially important when kiwi breed.

Recommendations

- Continue cat targeted trapping as the best tool available for cat control.
- Develop a strategy for future cat control and monitoring, utilising Dave Seelye and Roger. This must involve researching a 'wasp proof' cat attractant.
- Support Dave Seelye and Roger as required.
- Support the advocacy team to establish a programme to encourage responsible ownership of pet cats resident in St Arnaud, and discourage acquisition of new cats by St Arnaud residents.

3.5 WASP (*VESPULA SPP.*) CONTROL AND MONITORING

Common wasps (*Vespula vulgaris*) build up to high densities in these forests in summer when they reduce the levels of honeydew, which is a significant food source for native fauna, and take large numbers of native invertebrates.

Objectives

General objectives were:

- to reduce the removal of honeydew by wasps;
- to reduce predation by wasps on native invertebrates and bird nestlings (Moller, 1990) so that the impacts of wasps are insignificant alongside other mortality factors affecting these groups;
- to improve the public's experience visiting the beech forest in late summer.

Performance Targets

The performance measure was based on the Ecological Damage Threshold (EDT) (Beggs & Rees, 1999) used in the previous three years, to maintain wasp activity levels below 2.7 captures per Malaise trap per day.

Methods

Wasp Control

Control was undertaken using the toxin Finitron™ (sulfuramid, 0.5%) in sardine cat food based bait, applied in KK™ bait stations. The preferred toxin Fipronil™ used at this site 1999-2003 was unavailable because its experimental use permit had expired.

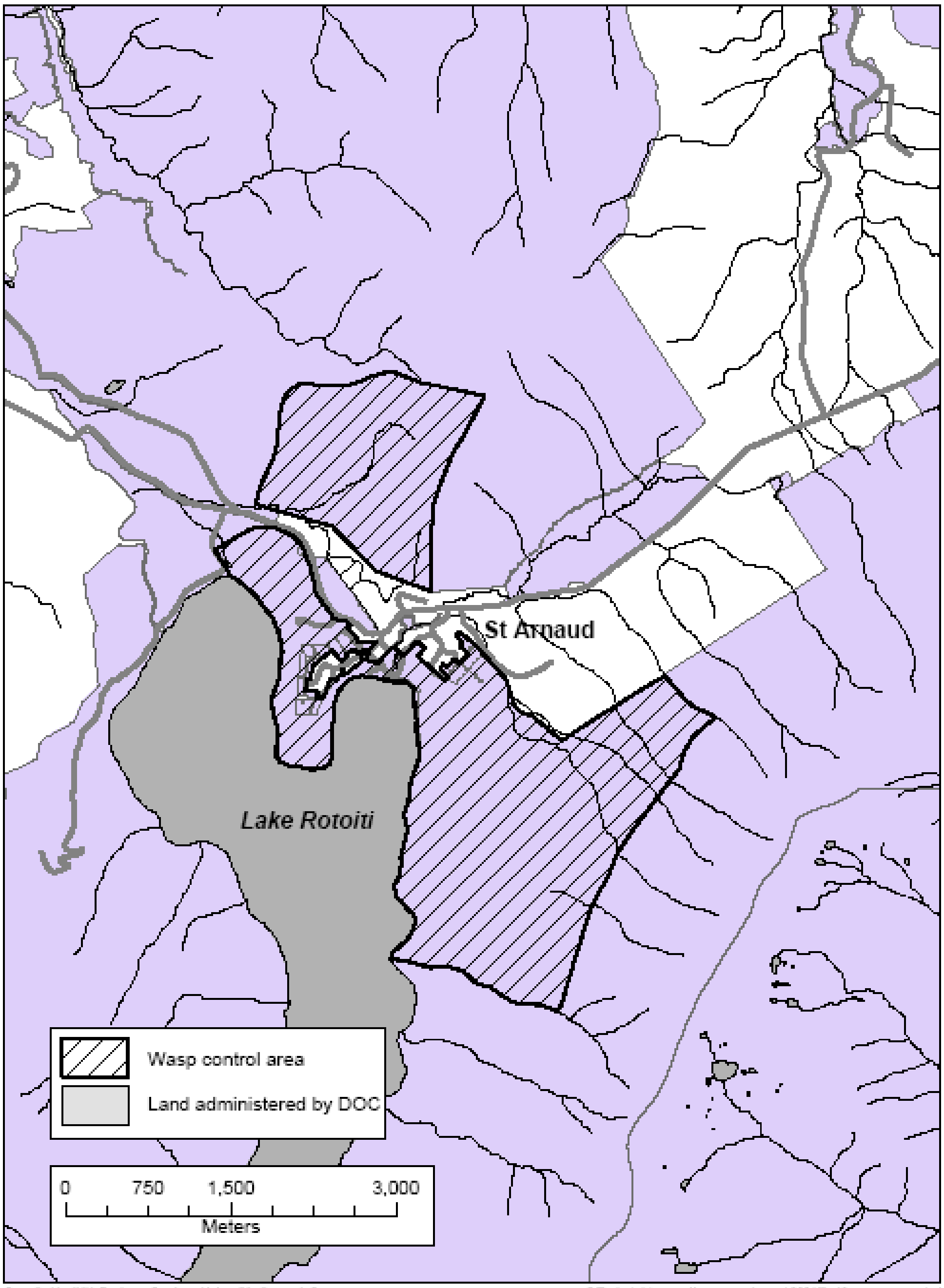
The 2004 operation covered the same area as those of 2002 and 2003 (lower slopes RNRP core, Duckpond Stream, Brunner Peninsula, and St Arnaud Village) giving a total treated area of approximately 1,100 hectares. (Figure 13).

Bait stations were spaced throughout the core area on a grid of 100 x 50 m which contrasts with a grid of 200 x 50 metres used for the toxin Fipronil™, which has been shown to be the optimum to maximize effectiveness while minimizing resources required for delivery of this toxin. The increased density of bait stations was implemented as delivery of Finitron™ has not been tested at the wider spacing, and this delivery reflected previous use of this toxin at this site. In Duckpond, village and Peninsula areas a delivery spacing of 200 x 50 metres was used, reflecting existing infrastructure. The grid was established using lines cut in the Duckpond and RNRP core areas, whereas in the village and Peninsula areas roads, tracks and other existing features were used to approximate this.

Poisoning was planned for the 28 January in accordance with the Wasp Poisoning Decision Maker flowchart prepared by Landcare Research (refer Appendix 6).

One hundred and ten kilograms of bait was prepared on 27 January using the accredited laboratory facilities of Landcare Research, Nelson. Bait needed to be prepared as close as possible to the date of application as once mixed it has a short shelf life. Ingredients required were 275 x 440g tins Pams Purrr™ cat food (sardine in aspic), 2.75 kilograms Finitron™ (at 200g/kg = 550g pure Finitron™), and 44ml green dye. Bait was packaged in two kilogram Tecpak™ SAP/450 tubs. Thirty-two person hours were used for bait preparation. (For Finitron™ bait preparation prescription, refer to Appendix 6). Bait was stored overnight in refrigerators, although insufficient space was available and

Figure 13 Rotoiti wasp control area



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

G/Projects/st arnaud/nrp annual report 2004/fig 13 nrp wasp control some was stored in ice baths. This latter option could have caused problems with bait condition if a delay in the poison operation had been encountered.

On 28 January 60grams of bait was applied per KK™ bait station giving a loading of 0.06 kilogram bait/ha in the core area, and less in other operational areas (minimum 0.03kg/ha.). A small group of bait stations in the RNRP core were filled on 29 January. Any remaining bait was removed on 3 February. Eleven person days of labour was required to put the bait out. The greater labour requirement than past operations is largely attributable to the increased density of bait stations requiring filling.

The quantity of bait applied was greater than the previous year's operation in response to the use of a different toxin and past experience using Finitron™.

An additional bait application in the Loop area of the RNRP core was undertaken on 5 February as additional bait was available and it was desirable to ascertain if there were still foraging wasps attracted to bait indicating unaffected or insufficiently affected nests (see results of bait take below). Twenty grams of additional bait was applied to all stations in this area, and unconsumed bait removed within one week.

An Assessment of Environmental Effect (AEE) for Control of Common Wasps was prepared in December 2003 (refer Appendix 6). There were no significant outstanding issues following consultation and risk assessment.

Wasp Monitoring

Malaise traps are used for result monitoring of wasp activity. Twenty traps at the Rotoiti treatment site and ten and six respectively at Lakehead and Rotoroa non-treatment sites were open from November to May and samples collected fortnightly. Wasps were counted and removed and the remainder of the sample stored in 70% ethanol. These samples are also used for outcome monitoring as covered in Section 4.2.

Wasp nest monitoring utilised the strip plots of previous seasons. Three strip plot transects (two treatment (Rotoiti A and B) and one non-treatment (Rotoroa)) of approximately one kilometre length and 10 metres width are walked by observer(s). All nests encountered are individually marked and one minute traffic counts undertaken. Strip plots are measured pre and post poisoning to detect changes in wasp nest activity and abundance attributable to management intervention and natural variation. Strip plots or nest monitoring are not undertaken at the Lakehead non-treatment site, or the Duckpond Stream treatment site.

Honey bee and bumblebee nests were also searched for as strip plots were primarily undertaken by a research student with a focus upon interactions between these species and wasps (see Research Section 7.0).

Landcare Research provided wasp nest data they collected from strip plots at Mt Misery (Rotoroa) and Rotoiti Lakeside (near Lakehead).

Wasp foraging activity for protein is assessed by placing 20 Petri dishes with sardine cat food at five metre intervals on the forest floor in the middle of the day. Bait was left out for one hour and then an instantaneous count of wasp numbers on each bait was made. An average of one wasp per bait is required to indicate sufficient attraction of wasps to protein for poisoning to be effective, and is the trigger point used when following the Wasp Poison Decision Maker.

Results

Bait Take

This season the majority of bait stations had all bait consumed within 24 hours of initial baiting, and a substantial amount of this was observed to occur on the day of poisoning.

This high bait take indicated the potential for some nests to have received insufficient toxin either due to size of nest, or missed foraging opportunity through competition from neighbouring nests. Therefore, additional bait was applied in the Loop area of the RNRP core. Very little of this additional bait was removed by wasps, indicating that there were not many wasps left foraging on protein.

Wasp Monitoring

Strip Plot Transects

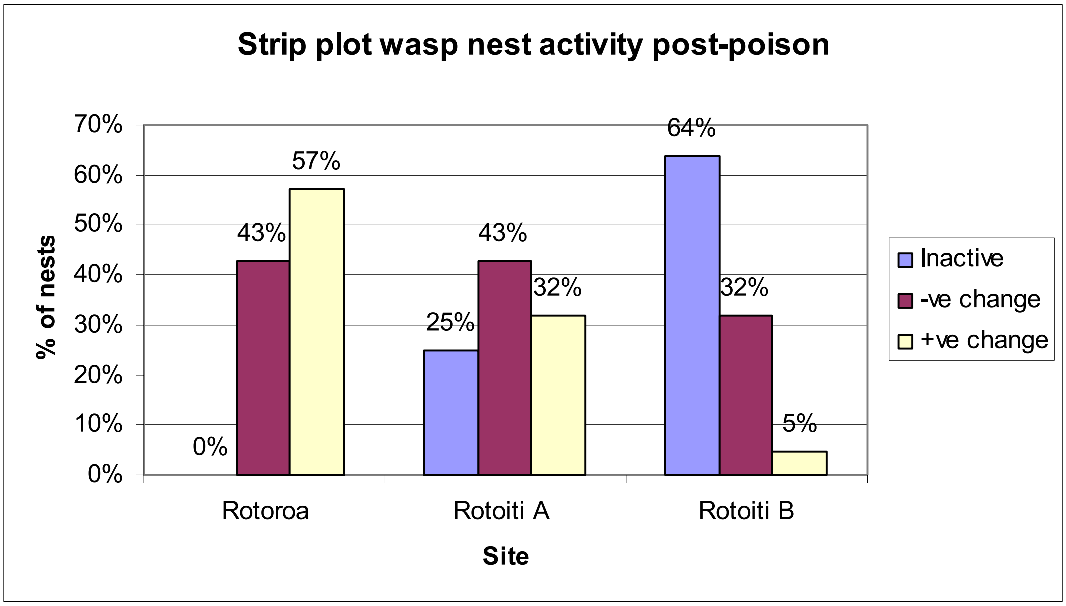
Strip plots at all three sites were undertaken at least twice, but the timing of these was not always concurrent. The 'pre-poison' and 'post-poison 2' data was collected reasonably concurrently, so these data were used for comparisons.

TABLE 10. STRIP PLOT MONITORING SCHEDULE

SITE	PRE-POISON	POST-POISON 1	POST-POISON 2	POST-POISON 3
Rotoiti A (treatment)	18/1/04 -10 days	3/2/04 +6 days	13/2/04 +16 days	6/4/04 +69 days
Rotoiti B (treatment)	21/1/04 -7 days	-	19/2/04 +22 days	9/4/04 +72 days
Rotoroa (non-treatment)	20/1/04 -8 days	-	12/2/04 +15 days	-

Pre-poison data provides a baseline of all detectable wasp nests (wasp activity) on the strip plot in the early season, and their respective activity rates (nest activity). The following analyses use the pre-poison data as 100% activity, and then compare these baseline figures to the post-poison data.

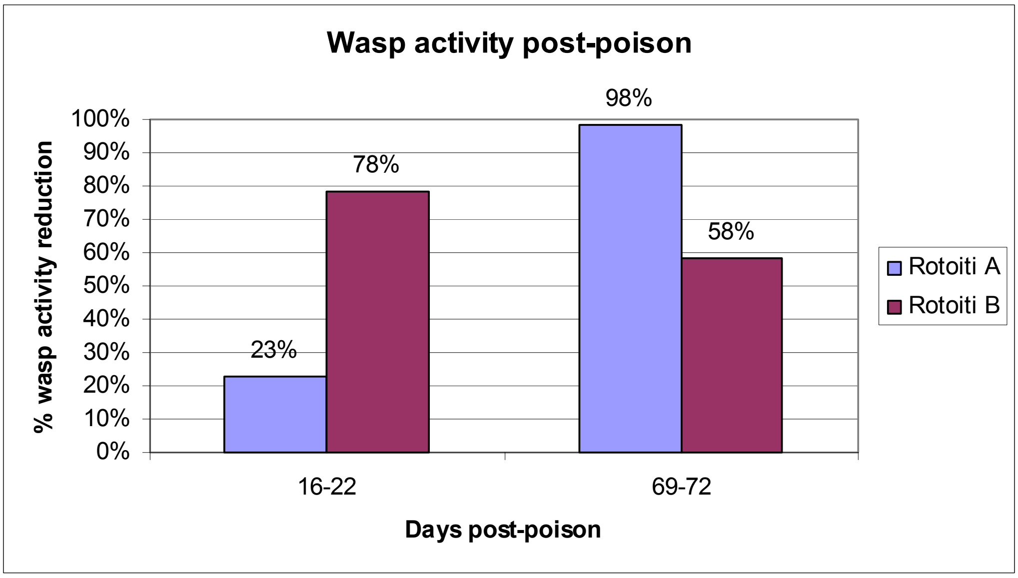
GRAPH 14. STRIP PLOT NEST ACTIVITY 15-22 DAYS POST-POISON



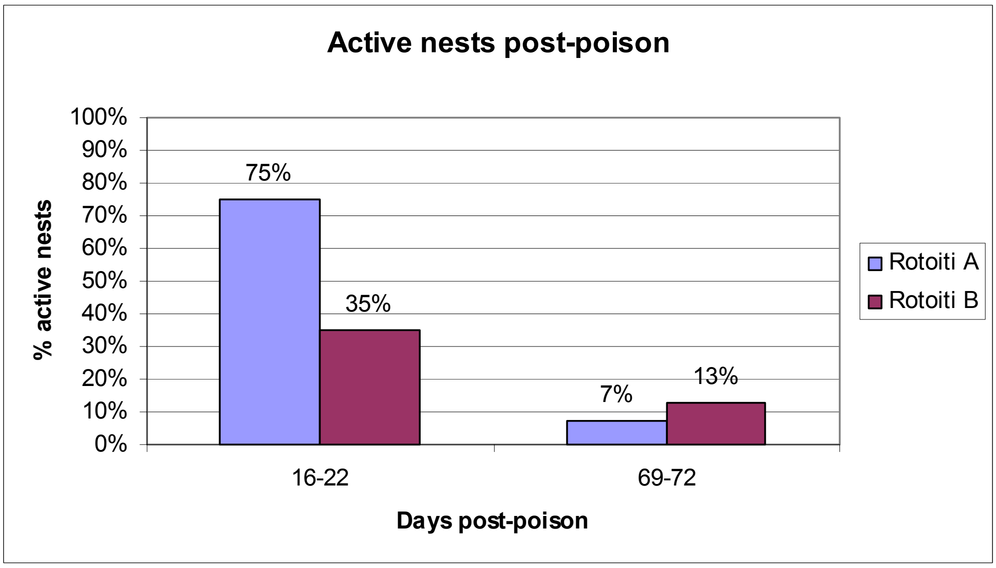
Note: Inactive = no activity, -ve change = decreased activity of nest from pre poison monitor, +ve change = increased activity of nest from pre poison monitor.

Although insufficient data exists for all sites to examine trend of wasp nest activity with time from poisoning, this data does exist for site 'Rotoiti A' from pre poison through to 6 April, and to a lesser extent for Rotoiti B. This is presented below as indicative of the treated area, but must be treated with caution it has no non-treatment data.

GRAPH 15. ROTOITI A AND B STRIP PLOT WASP ACTIVITY REDUCTION POST-POISON



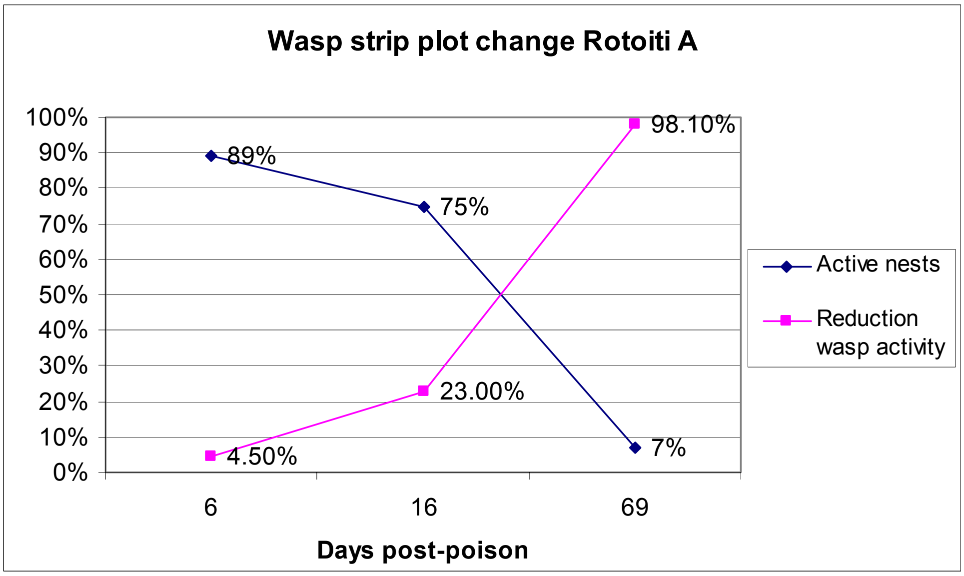
GRAPH 16. ROTOITI A AND B STRIP PLOT NEST ACTIVITY POST-POISON



Although the number of active nests declined with time from poisoning on both Rotoiti strip plots there was a difference in overall wasp activity observed on these plots between sites. Residual activity rates will be influenced by the behaviour of nests that remain active. In the absence of management intervention wasp nests can be expected to increase in size over this time period. Rotoiti A wasp activity declined as the seven percent of nests (two of 13) that remained active in April exhibited negative growth. Rotoiti B wasp activity increased as the 13% of nests (three of 23) that remained active exhibited growth changes ranging from -19% to + 533%. At Rotoroa all nests (n = 21) remained active at mid February but exhibited growth changes ranging from -70% to +1200%.

The elapsed time between post-poison monitors two and three (50 days) is too great to allow identification of the point of maximum effect from poisoning. The lack of inclusion of Rotoroa in post-poison monitor three does not allow for comparison to be made with a non-treated area. Rotoiti A offers the best time series and is shown below to illustrate what may happen across sites.

GRAPH 17. ROTOITI A STRIP PLOT ACTIVITY CHANGE



Malaise trapping

Malaise trapping was undertaken as planned with fortnightly collections at all sites between November and May.

GRAPH 18. COUNTS OF WASPS CAUGHT IN MALAISE TRAPS, 2003-04

(± 1 standard error)

All sites showed a similar rate of increase in the early season and had comparable indices of wasps per trap group per day prior to 3 February (collection immediately following poisoning on 28 January). From this point the curves diverge with Rotoiti showing a decline, Lakehead an increase at a lesser rate than before, and Rotoroa continuing to increase at same rate. By 17 February the number of wasps at all sites had decreased.

February weather was uncharacteristically wet with 26 rain days delivering 259mm of rain. This represents an approximately 300% increase in rainfall compared to the average in earlier years of nine rain days delivering 97mm.

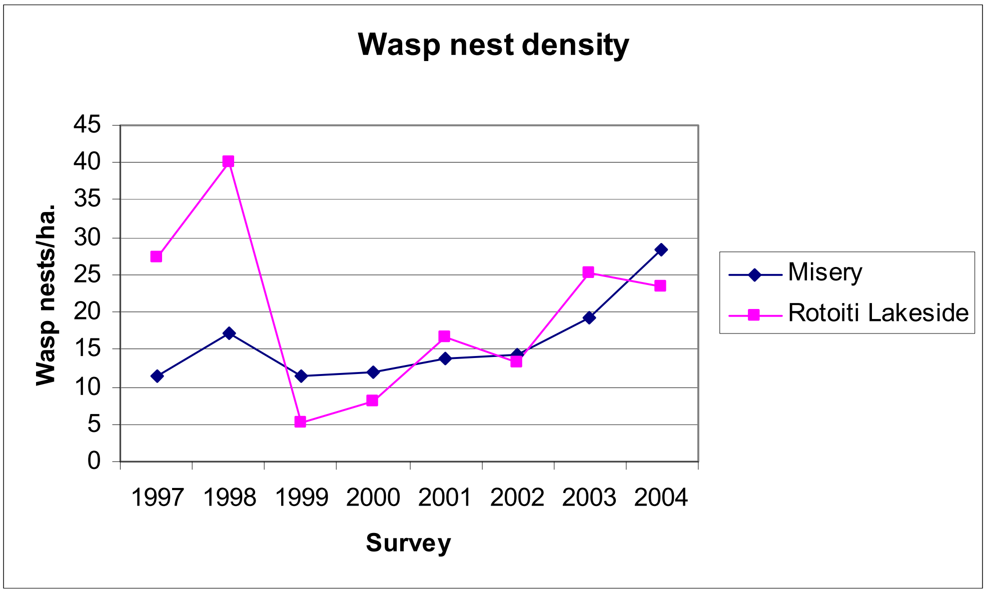
Reduction in malaise indices from maximum value (one to three weeks post-poison) to minimum value (five to seven weeks post-poison) are 69% for Rotoroa and Lakehead and 88% for Rotoiti.

All sites exhibit similar trends of positive growth from the collection of 2 March through to mid April when wasp populations can be expected to decline naturally.

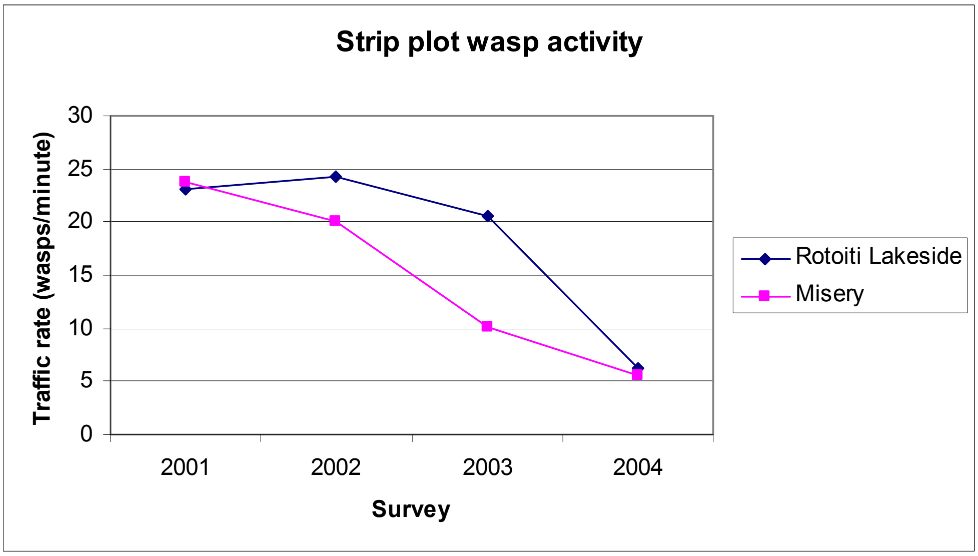
Wasp numbers from malaise traps at point of poisoning were approximately 12 wasps/trap group/day. This is higher than wasp numbers at point of poisoning than any other season where control has been undertaken. Typical indices at this point are seven wasps/trap group/day (range three to ten).

Had the unseasonable weather not occurred, this season could have been exceptional for wasps. Peaks of >25 wasps/trap group/day from malaise data are typical of 'good' seasons. This point was reached relatively early (mid February) compared with previous seasons. Peak wasp density is typically in late March and it is unknown what the potential for this season may have been if populations had not crashed in February. Wasp nest transects monitored by Landcare Research at Mt Misery (Rotoroa) and Rotoiti Lakeside (near Lakehead malaise site) in early March showed high nest densities at each site (Rees, unpublished data, 2004). The density of nests at each site are comparable, and are close to peak densities for these sites over the period for which wasp control has been undertaken at the RNRP (1998-2004). Activity rate data for these surveys was also very low when compared to the mean values for 2001 to 2003 with average traffic rate values of 6.3 (mean 22.6) and 5.5 (mean 18.0) wasps per minute for Rotoiti Lakeside and Misery respectively (Ibid).

GRAPH 19. WASP NEST DENSITY (after Rees, unpublished data, 2004)



GRAPH 20. WASP NEST ACTIVITY (after Rees, unpublished data, 2004)



Queen Wasps

Queen wasps were separated and kept from malaise samples from all sites. These have not been assessed for 'quality' (by dry weight) to test the hypothesis 'that reduced wasp competition resulting from poisoning will allow a higher quality of queen in the RNRP' as 2002-03 data showed there was no significant difference between sites. Samples have been stored to allow later analysis.

Caterpillar Experiment

The predation of free living caterpillars is an indicator of predation pressure exerted upon invertebrates by wasps (Beggs & Rees 1999). This experiment was undertaken across a range of treatment and non-treatment sites prior to poisoning by Mike Sim (MSc candidate, University of Auckland) but was unable to be repeated post-poisoning due to weather. Pre-poison predation rates of 40-70% (mean 58%) across sites (Sim, unpublished data 2004) are comparable to pre-poison values from previous seasons.

Honeydew

The honeydew resource was not monitored this year as a clear link between wasp reduction and honeydew recovery has been demonstrated from previous operations. Honeydew quality was to be inferred from wasp reduction.

Non-target Impacts

In previous seasons invertebrates found dead at bait stations were collected and identified (Paton et al. 2004). Advice received was that we were unlikely to find anything new as past seasons had yielded similar information across years. Additionally, as Finitron™ is a slower acting toxin than Fipronil™ we were less likely to find non-target invertebrate kills at bait stations.

No vertebrates were observed feeding on baits or found dead following the operation.

Discussion

The 2003-04 season showed the potential to be a high wasp density season, as illustrated by high early season malaise indices, and mid season wasp transects measured by Landcare Research showing high densities of nests relative to previous measures throughout the history of wasp control at this site.

Wasp numbers from malaise traps at the time of poisoning were higher than in previous seasons. Three factors contributed to this. Firstly, the 'go for poison' trigger from the Wasp Poison Decision Maker, based on the take of non-toxic bait, was not reached until numbers were higher than usual, indicating a delayed interest in feeding on protein. Secondly, some conservatism was applied to the decision to poison after the trigger point to ensure high wasp interest in protein bait to compensate for the less efficacious toxin Finitron™. Thirdly, a short delay (less than one week) was experienced once the trigger point was reached to allow for mixing of bait, and to ensure a suitable weather window for application as mixed bait is perishable.

The success of the poisoning programme seems apparent but is inconclusive, because wasp activity declined mid-season across all sites. While wasp numbers were reduced below the ecological damage threshold (EDT) in the treated area, significant reductions in wasp numbers were observed at both non-treatment sites a fortnight to a month later. These reductions at Lakehead and Rotoroa, although similar in magnitude, did not result in a minimum value below the EDT as for Rotoiti. The clearest indication of a poisoning effect is the change in gradient of malaise indices between sites following poisoning, with Rotoiti declining and both Rotoroa and Lakehead continuing to increase. Prior to poisoning confidence intervals around malaise indices overlap for all sites and diverge thereafter.

The decline in malaise indices at all sites following poisoning at Rotoiti is reflected in the strip plot data with reduced activity rates. However there is a difference between sites, with Rotoiti exhibiting a loss of active nests, which increased with time. Rotoroa showed no loss of active nests, rather the activity of these nests declined. Thus the change in malaise activity rates for Rotoroa and Rotoiti are attributable to different types of change in the wasp population, with the former being a reduction in activity of most nests, and the latter a reduction in active nests and reduced activity of most of those surviving. The best explanation for this difference is the toxic baiting treatment at Rotoiti.

We can not conclude that the poisoning programme was ineffective as the key performance measure of reducing wasp numbers below the EDT was achieved. It is probable based upon the evidence discussed above that the principal cause of decline was the application of toxic bait, but an additive effect of inclement weather in reducing wasp numbers is also probable. The relative effect of each factor cannot be determined retrospectively.

A relatively slow decline in malaise trap wasp activity indices for RNRP post-poisoning was observed, with a period of four weeks between maximum and minimum values. Previous wasp control programmes at this site have generally shown a rapid decline from point of poisoning to a point below the EDT, usually within a single malaise collection period of two weeks. One factor potentially influencing this slow rate of decline is the use of the toxin Finitron™ which has been shown to take longer (up to one month in 1997-98) than Fipronil™ to achieve a kill; also this site may be another factor (Harris & Etheridge, 2001). A possible alternative explanation is the high activity rate prior to poisoning, which at twelve wasps per trap group per day is the highest activity rate at point of poisoning across all years of wasp control at this site. This is considered less important than type of toxin.

Despite there being almost no unconsumed bait remaining in stations at the time of removal it is unlikely that insufficient was applied as very little of the supplementary bait applied to the Loop area was consumed. Thus the risk of missing nests that could be poisoned appears to be low. A tool for assessing bait required based upon wasp density and interest in protein to maximise potential kill without unnecessarily over-provisioning bait stations is needed. Financial and environmental costs of overprovision must be minimised while being mindful that additional costs in labour and bait of repeat application will be significantly greater than the cost of a single application.

Result monitoring of the Duckpond Stream and St Arnaud Village and Brunner Peninsula areas was not undertaken. In previous seasons the effect of wasp control at these sites has been inferred from the monitoring of the RNRP core. This year this was not able to be done as the delivery of toxin between core and other sites was different in bait station density and configuration. Ability to explain changes in the Lakehead non-treatment wasp population was limited as the sole measure was malaise trapping, and this cannot be correlated with strip plots. This has not been an issue for previous seasons where results have been unambiguous between treated and non-treated sites.

Outcome monitoring via analysis of non-wasp invertebrate indicator species (e.g. Sandlant 2003; Standish, 2003) was not undertaken. Given the ambiguous result of wasp control and that this control was undertaken using a less optimal toxin it is unlikely that this will be undertaken retrospectively for outcome monitoring of this season's control. It may however be used as part of a meta-analysis of the history of wasp control at this site if undertaken.

Recommendations

- That wasp control using Finitron™ be undertaken in the absence of Fipronil™ availability.
- That strip plot monitoring be undertaken as close as possible temporally across sites, and as close as possible temporally to malaise collections.
- That additional strip plots, or samples of nests, are monitored at Duckpond Stream to identify the effect of wasp control at greater bait station density, and at Lakehead for correlation of colony change with local non treatment malaise.

Community Led Wasp Control Programme

The St Arnaud Community Association has not undertaken any poison baiting of wasps for several years. Several individuals from the community did undertake individual nest destruction using Permex ™ (a pyrethroid powder) killing 160 nests, principally in the village and peninsula area. This compares with 65 nests treated last season for similar effort, and 90 and 150 in 2001-02 and 2000-01 respectively (Drew Hunter, pers. comm). The high number of nests encountered is consistent with the high density of wasp nests recorded from strip plots monitored by the project and Landcare Research. The voluntary effort of these individuals is greatly appreciated by the project, and presumably by the local and visiting public.

3.6 DEER (*CERVUS ELAPHUS*) AND CHAMOIS (*RUPICAPRA RUPICAPRA*) CONTROL AND MONITORING

Objective

The target of hunting is red deer but any chamois encountered are to be shot too. Hunting is primarily focussed upon gathering stomach samples to assess diet to guide outcome monitoring relating to deer impacts.

Results

Sightings/Incidental Encounters

Only sightings of animals are reported on here. Incidental records of pellets, prints, and feed sign are recorded in field diaries. These are treated as an unreliable index as not all observers will record sign, multiple recording of same sign can not be discounted, and assignation of sign to species can not be guaranteed.

Deer and Chamois

There were two reported encounters of deer in core area: on14 October 2003 a deer (or chamois) was sighted at rat trap GB6 (southern boundary), and on 25 November 2003 a red deer hind was seen WM/WN rat traps (farm corner). One encounter of deer in Big Bush was reported: a red deer hind was seen at Fenn™ trap DOF 45 15 March 2004.

Hunting

No hunting effort was undertaken by project staff. Recreational hunting effort is unknown, although much of the site, excluding Big Bush is a closed hunting area due to presence of field staff, past history of toxin use, and potential conflict with other park users.

Discussion

Although no project initiated hunting effort was undertaken this year there were still very few encounters of deer or chamois, comparable with previous seasons. Outcome monitoring of deer impacts/control remains to be designed and implemented, as do outcome targets.

3.7 PIG (*SUS SCROFA*) CONTROL & MONITORING

Objective

Most of the project area is historically free of pigs. The northern St Arnaud Range and Big Bush hold resident pig populations, and incursions south into the remainder of the project area are occasional. Such incursions or expansion in range to new areas are to be prevented, principally as a biosecurity measure.

Method

No pig control work was planned this year, although the capacity to respond in a reactive manner to pig interference with management tools or expansions in range was allowed for.

Results

Sightings/Incidental Encounters

Only sightings of pigs are reported on here. Incidental records of pellets, prints, and feed sign are recorded in field diaries. These are treated as an unreliable index as not all observers will record sign, multiple recording of same sign can not be discounted, and assignation of sign to species can not be guaranteed.

Eight encounters relating to 23-25 pigs were recorded. All were in Big Bush, with none in the St Arnaud Range. This compares with seven encounters relating to eight pigs in 2002-2003.

TABLE 11 PIG ENCOUNTERS BY RNRP STAFF

DATE	LOCATION	SEEN/HEARD	ANIMAL(S)
16 July 2003	IR30	Seen	1 x adult (mid size)
6 October 2003	IRD17	Heard	Unsighted
31 October 2003	BSG 17	Seen	1 x juvenile
19 January 2004	BSG21	Seen	1 x adult, 1 x juvenile
28 January 2004	DRF4	Seen	1 x boar, 1 x sow, 5 piglets
15 March 2004	IR 37-39	Heard	Unsighted
26 April 2004	DOF41	Seen	1 x sow, 8-10 piglets
26 April 2004	BSG 34-35	Seen	1 x boar

Ground Hunting

No hunting of pigs by project staff was planned or undertaken this year.

Recreational pig hunters are restricted in their activities in the RNRP as approximately two thirds of the area falls within the boundaries of Nelson Lakes National Park, from which dogs are excluded. Additionally within this area is a permanently closed area due to presence of field staff, past history of toxin use, and potential conflict with other park users. The remaining third of the RNRP falls largely within Big Bush Conservation Area where hunting (with dogs) is allowable subject to conditions of hunting permit and Pesticide Use Summaries. A permit was granted to a recreational hunter to operate pig dogs in the recovery area, including some areas normally closed. Permit conditions included requirement for provision of hunter effort and return, and for revocation of permit in the event of kiwi reintroduction. The permit was revoked in May 2004 upon the arrival of kiwi (see Section 5.0 Reintroductions).

Hunter effort and return information was not provided, but verbal follow up indicated approximately ten hunter days yielded seventeen animals. Locations, age and sex of animals killed unknown.

Discussion

The number of staff encounters with pigs was similar to last year, but significantly more animals were involved in these encounters. The use of pig traps will be implemented in the 2004-2005 financial year as a potential tool for reducing costs of pig control. This will not exclude ground-based hunting with dogs (subject to assessment of technique and practitioners as kiwi-safe) as a reactive measure to disturbance of project tools, or sites of significant or repeat encounters.

3.8 HEDGEHOG (*ERINACEUS EUROPAEUS*) CONTROL AND MONITORING

Fenn™ traps caught 161 hedgehogs in the year, most between October and April. Friends of Rotoiti caught an additional 77 on their lines, most of them (63) in the Rainbow Valley.

No hedgehog prints were recorded incidentally through the rodent tracking tunnel programme at any site.

3.9 HARE (*LEPUS EUROPAEUS*) AND RABBIT (*ORYCTOLAGUS CUNIULUS*) CONTROL AND MONITORING

No planned hare or rabbit control was undertaken. Chris Berg, a BSc (Hons) student from University of Canterbury was studying the foraging behaviour of hares, in particular their food and habitat preferences with respect to plant secondary metabolites. Fieldwork includes faecal pellet analysis, plant collection and biochemical analysis, and indicator plant inspection. This student withdrew from study before completion of fieldwork. It is hoped that another student may be attracted to this study.

Incidental sightings confirm continued use of forest habitat by hares, commonly, but not exclusively within several hundred metres of forest margin.

3.10 WEED CONTROL AND MONITORING

Weed control within the mainland island falls under the Area Office weed programmes. Weed sightings are reported by RNRP staff, and small incidental encounters of weeds are often treated manually at the time of encounter (e.g. rowan, cotoneaster and douglas fir).

4. Results – Monitoring of Native Species and Systems

The results of monitoring native flora and fauna are presented here, by groups or species. Performance targets could rarely be determined from existing knowledge. Performance is thus generally measured by assessing whether there has been positive change in numbers or productivity, either compared to a base level before pest control started or compared with a non-treatment area where no control is taking place.

4.1 BIRD MONITORING

Objectives

Programme objective: to increase bird numbers through the reduction of predation and competition by pest species.

Monitoring objective: to document changes in bird populations and determine those that relate to pest control programmes.

4.1.1 Multi-species Bird Monitoring – Five Minute Counts

Objective

To document changes in bird populations and determine those that relate to pest control programmes.

Methods

Five-minute counts were undertaken on the same transect lines within the project area ('St Arnaud') and at Lakehead ('Lakehead') as in previous years. Five-minute counts were also conducted in the Rotoroa non-treatment site ('Rotoroa'). Counts were done to a standard technique based on Dawson & Bull (1975).

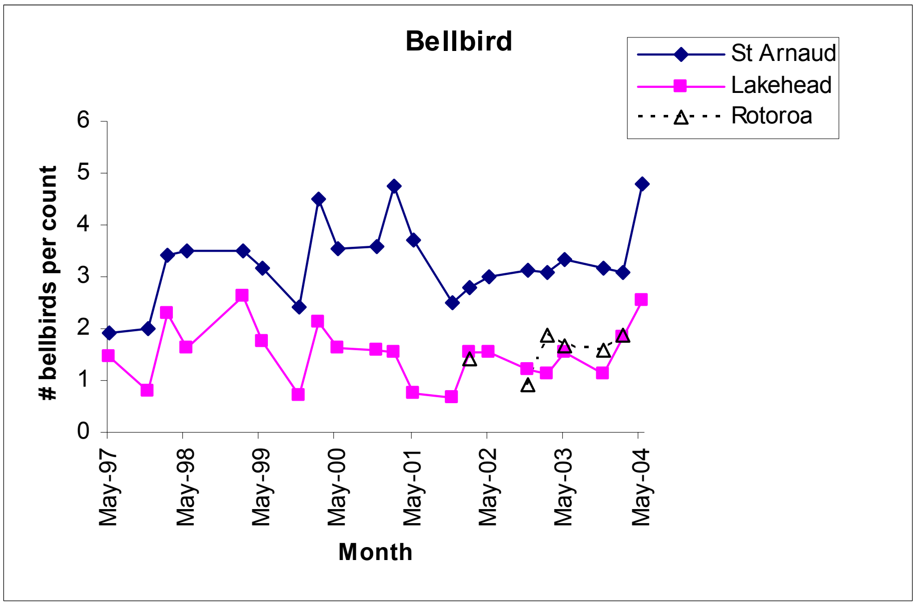
This is the third season of Fenn™ trapping around the Lakehead bird count line, and the third season of DOC bird counts at Rotoroa. A nine year database of bird counts exists from Landcare Research studies at Rotoroa, conducted during the 1970s and 1980s (Peter Wilson, pers. comm.). DOC bird counts at Rotoroa are conducted at the same count sites as those used by Landcare Research.

Ceisha Poirot, University of Canterbury, MSc, undertook the final year of a two year study investigating bellbird nesting success and time budgets this season. At the time of writing, a final report was still awaited for this work.

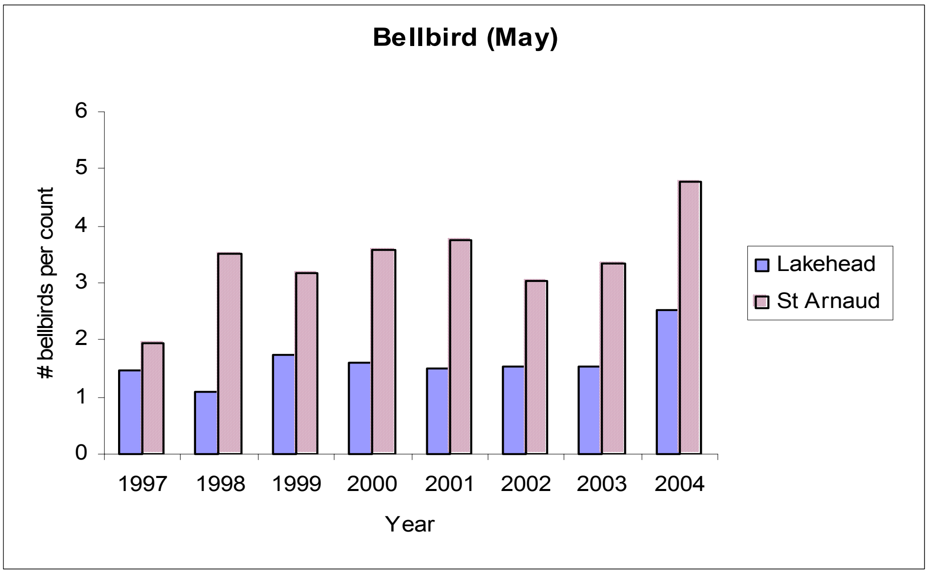
Results

Graphs 21 to 43 summarise the results for a range of native and introduced species at the St Arnaud, Lakehead and Rotoroa sites. No counts were done at Rotoroa during May 2002, and no counts were done at the Rotoiti sites in November 1998.

GRAPH 21. BELLBIRD

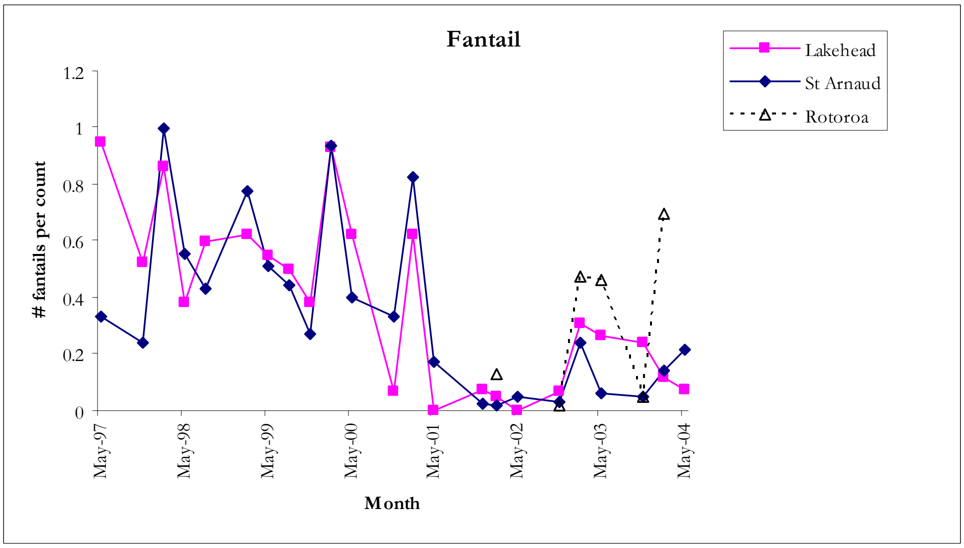


GRAPH 22. BELLBIRDS MAY

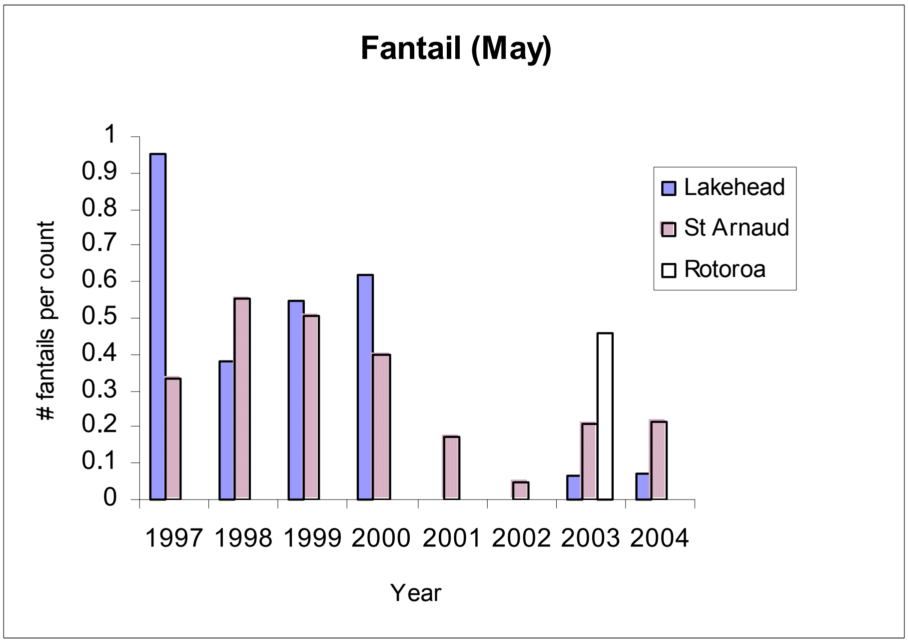


The trend in bellbird numbers at St Arnaud is stable, possibly increasing, and at Lakehead stable but at a much lower level. There was an obvious reduction in the seasonal fluctuation of numbers recorded in 2002 and 2003 and an obvious increase in numbers detected in May 2004.

GRAPH 23. FANTAILS

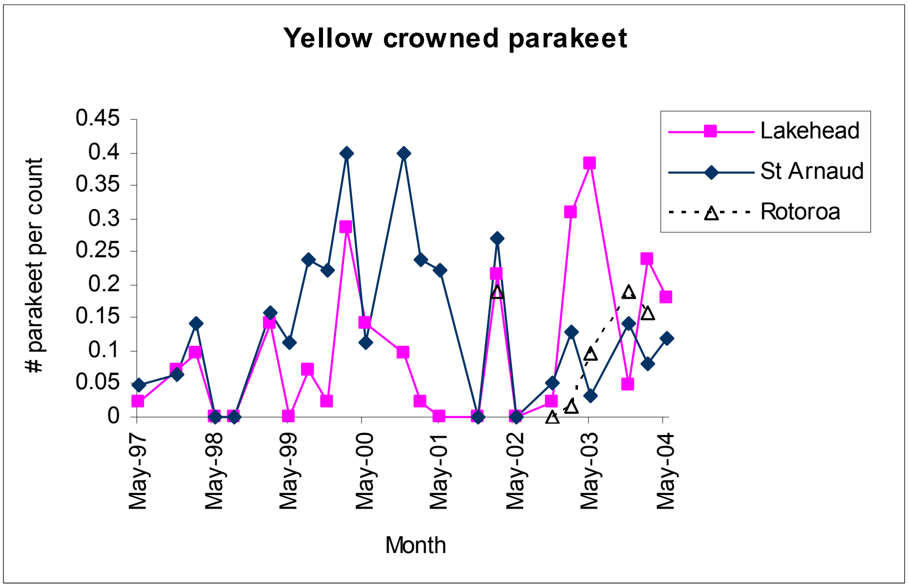


GRAPH 24. FANTAILS MAY



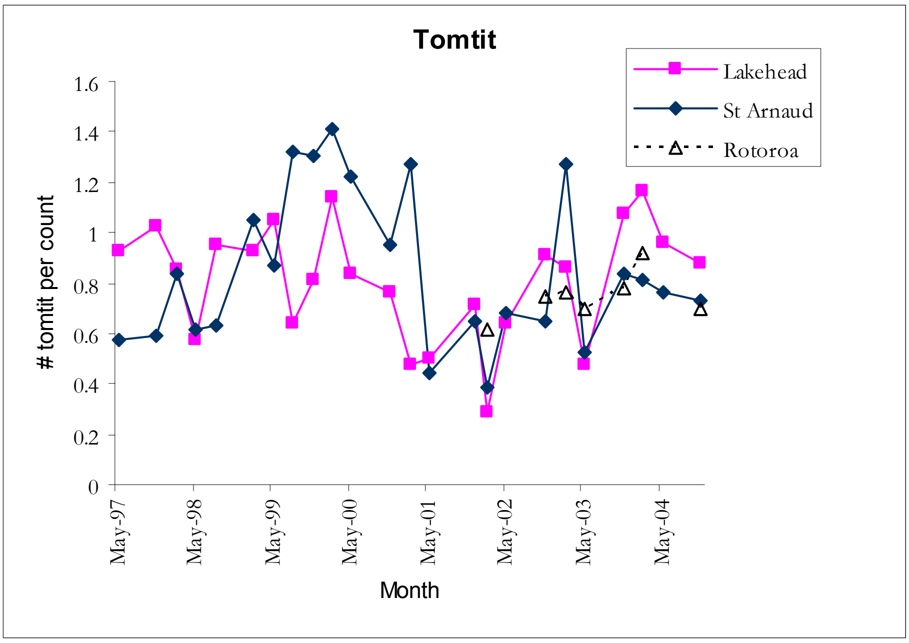
Similar trends in fantail numbers are apparent at the St Arnaud and Lakehead sites, with fantails absent from counts at Lakehead for two years in May. There has been a small increase since the dramatic decline (discussed in 2001-2002 annual report) in numbers in 2001-2002, but numbers are not back to former levels. Similar low numbers in 2002 are apparent at Rotoroa but they appear to have increased more rapidly there since.

GRAPH 25. YELLOW CROWNED PARAKEET



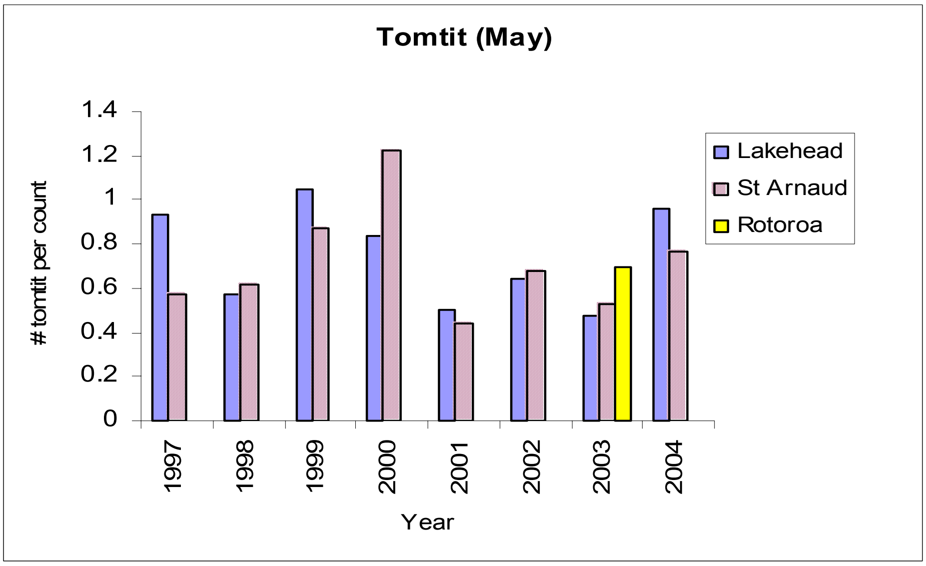
After apparent gains at St Arnaud in early years, parakeet numbers recorded seem to have declined back to levels similar to those at the start of the project, with a rise (seen at all sites) in February 2002 being only temporary. Numbers heard in February at Lakehead have increased to higher levels than at St Arnaud in recent years. Stoat control first encompassed the Lakehead area in August 2001 which could have contributed to this change.

GRAPH 26. TOMTITS



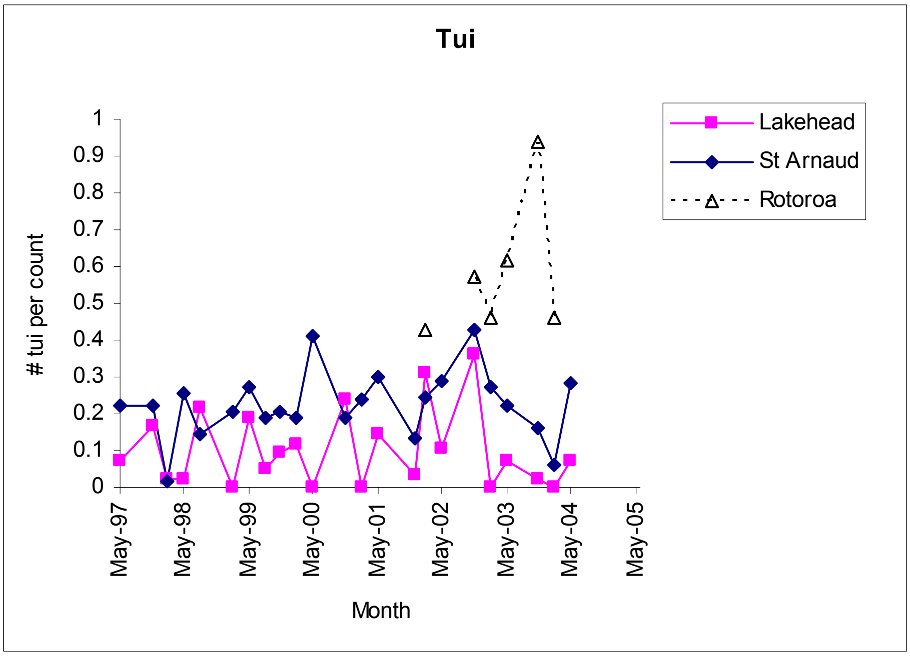
Numbers of tomtits recorded at St Arnaud dropped in 2001 but have since recovered to levels similar to, but slightly higher than, those detected at the start of the project.

GRAPH 27. TOMTITS MAY

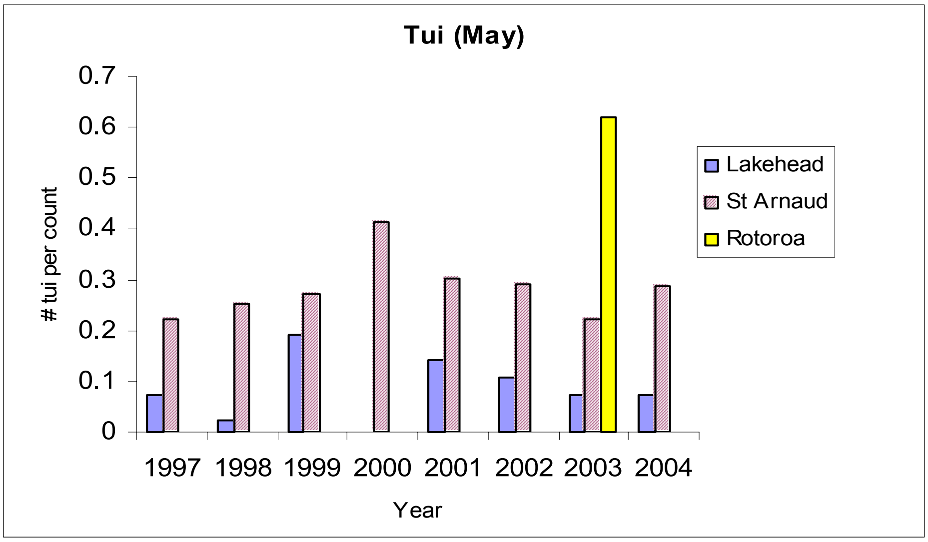


An increase in numbers detected in May counts is apparent at the St Arnaud and Lakehead sites in 2004.

GRAPH 28. TUI

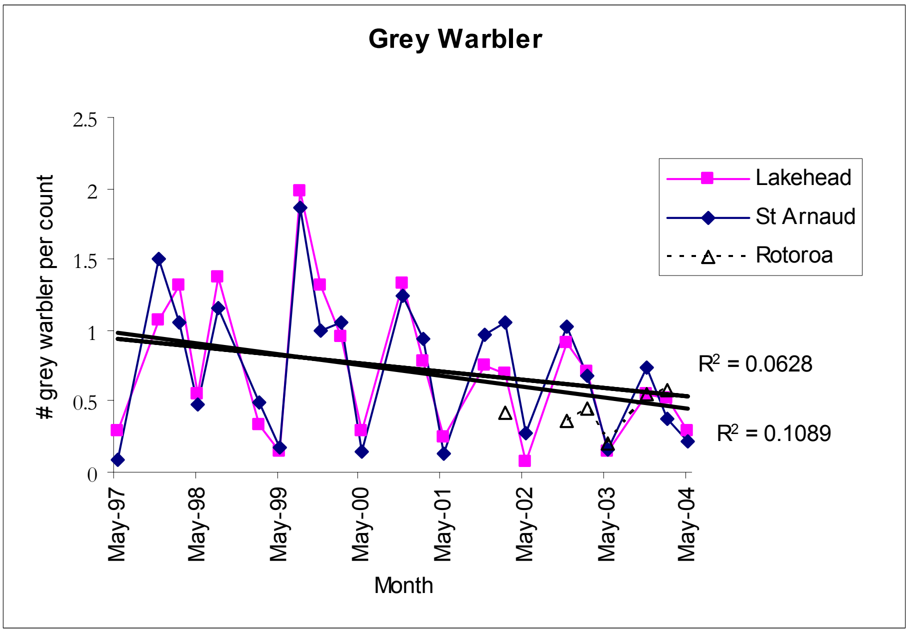


GRAPH 29. TUI MAY



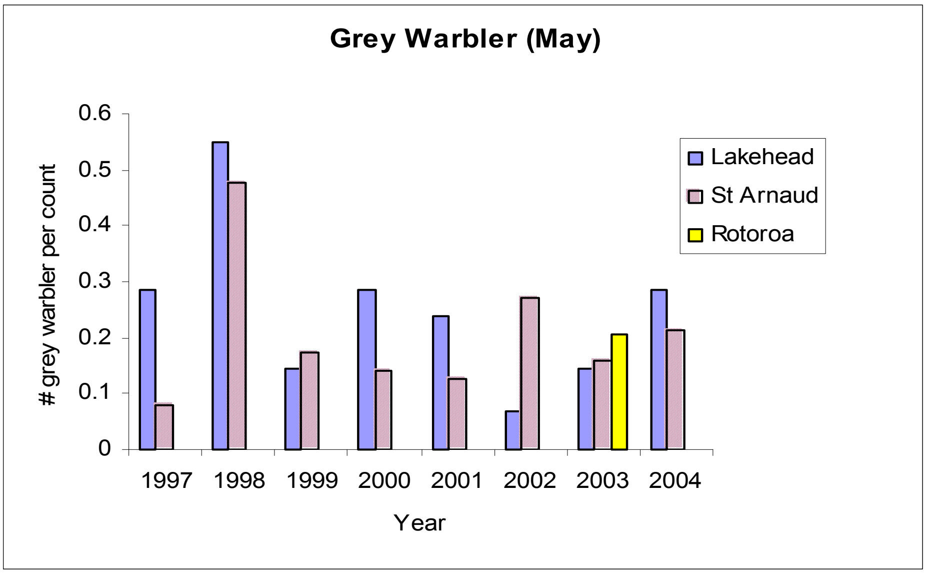
No obvious change in tui numbers is apparent from year to year at the St Arnaud site. No tui were detected in some months at Lakehead. Tui are present in much higher numbers at Rotoroa compared to Rotoiti.

GRAPH 30. GREY WARBLER



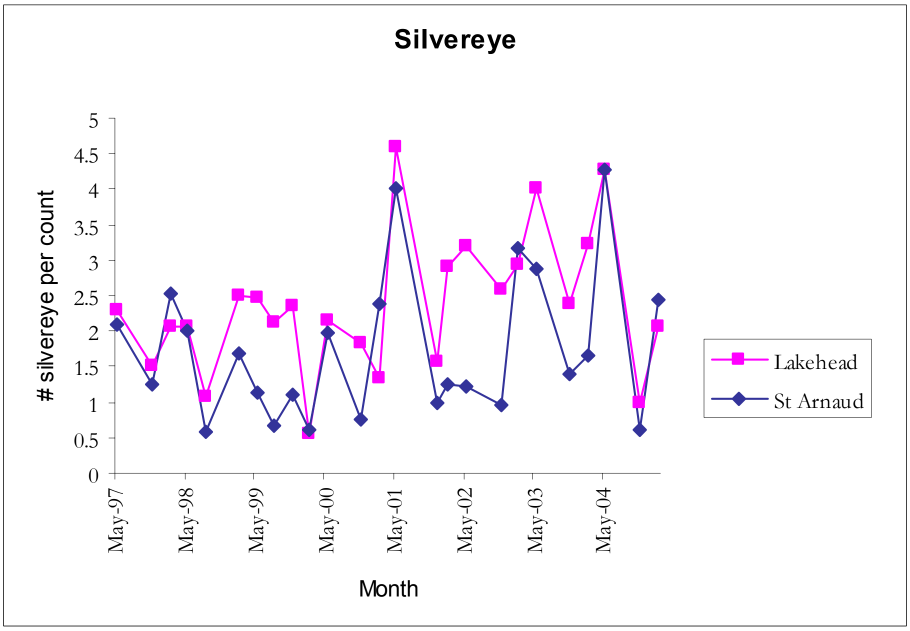
Similar seasonal trends in grey warbler numbers are apparent at all sites. A general declining trend is suggested at the St Arnaud and Lakehead sites.

GRAPH 31. GREY WARBLER MAY



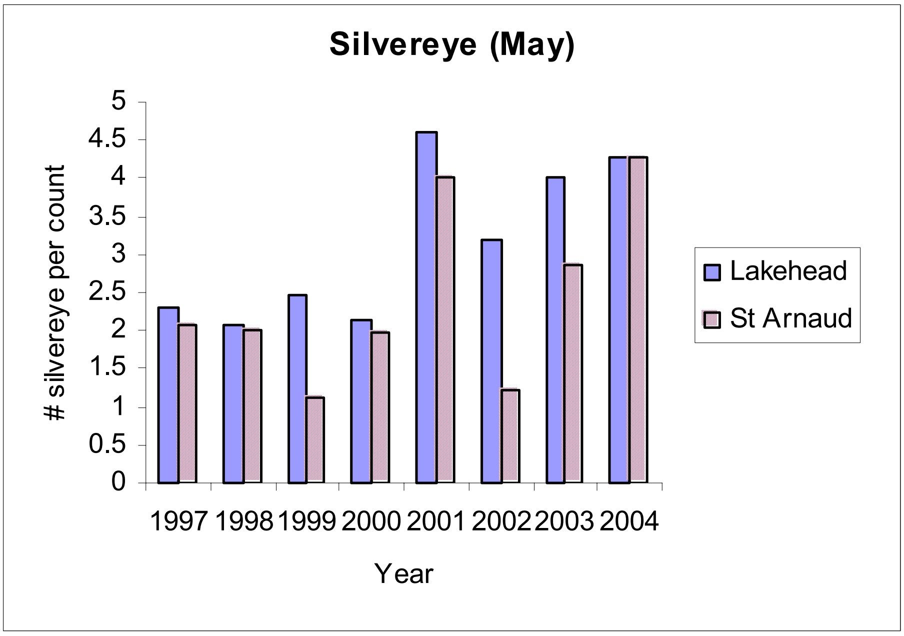
An increase in numbers detected in May counts is apparent at the St Arnaud and Lakehead sites in 2004.

GRAPH 32. SILVEREYE



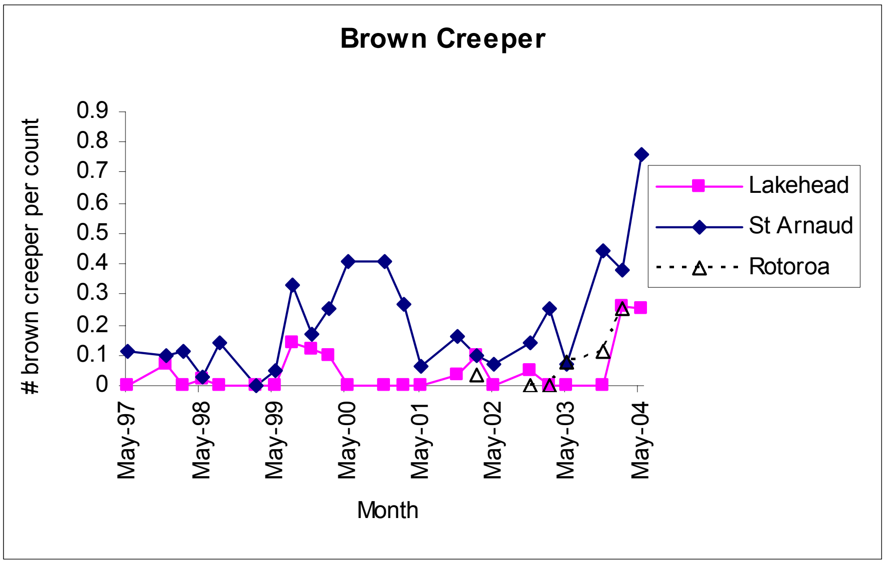
Silvereye numbers fluctuate similarly at the St Arnaud and Lakehead sites, with higher numbers detected at Lakehead in some years. Too many silvereyes are heard at Rotoroa to count, and this data has not been presented.

GRAPH 33. SILVEREYE MAY



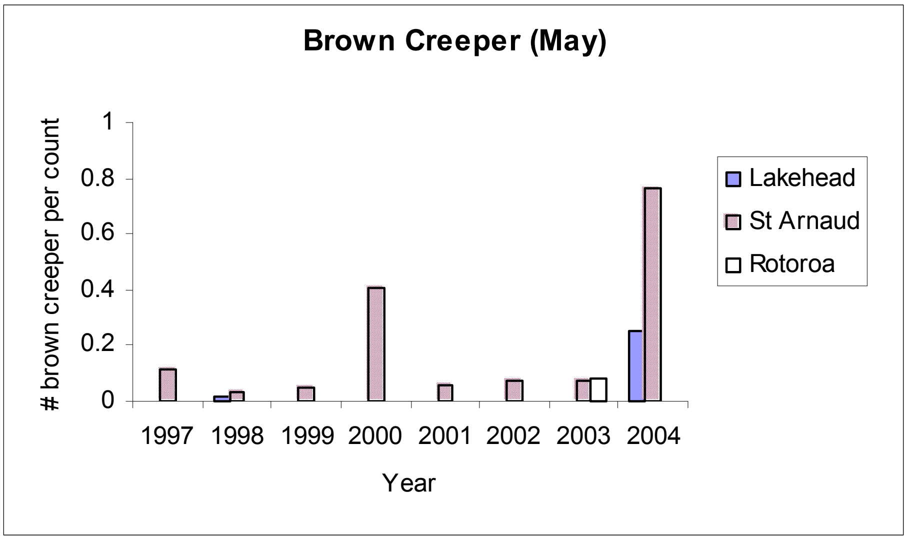
An increase in numbers detected in May counts is apparent at the St Arnaud and Lakehead sites in 2004.

GRAPH 34. BROWN CREEPER



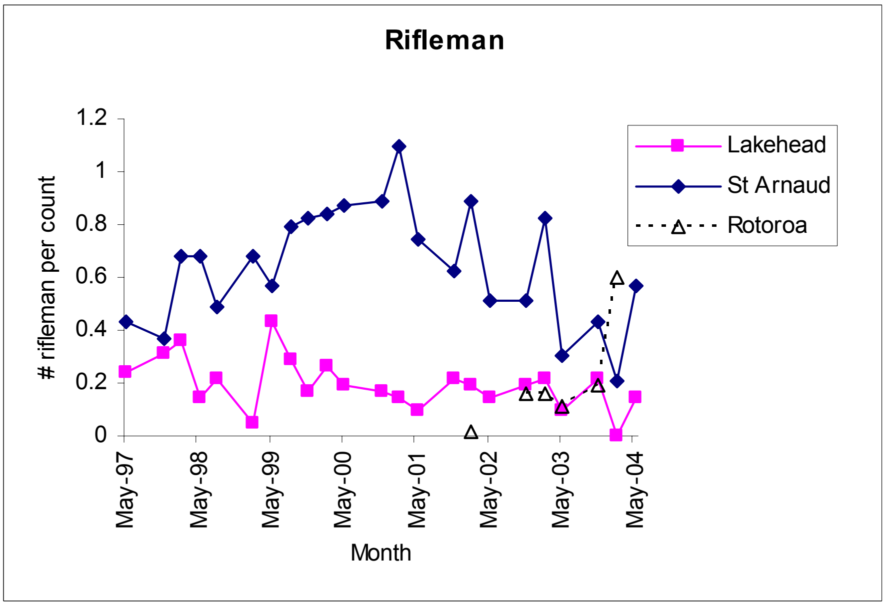
An increase in brown creeper was evident at all sites in 2004, however they were still absent from some counts at Lakehead.

GRAPH 35. BROWN CREEPER MAY



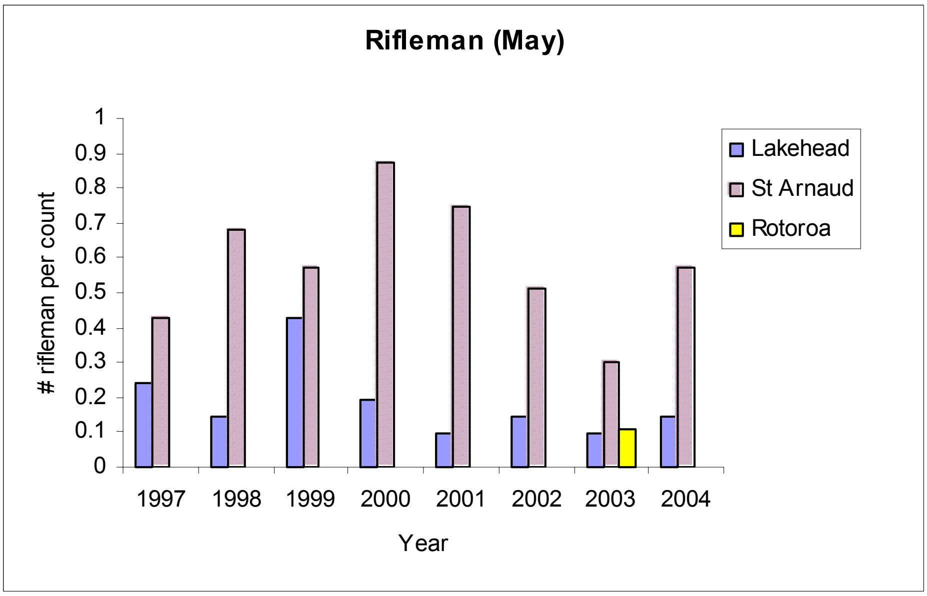
A substantial increase in brown creeper was evident in May 2004. This is probably due to a large flock of 15 birds seen on the St Arnaud line. Removing this flock from the analysis gives an average figure for May 2004 of 4.15 for St Arnaud, equal to the May 2000 St Arnaud figure, and still indicating a substantial increase in the 2004 year. Brown Creeper were detected at Lakehead in May for the first time since 1998.

GRAPH 36. RIFLEMAN



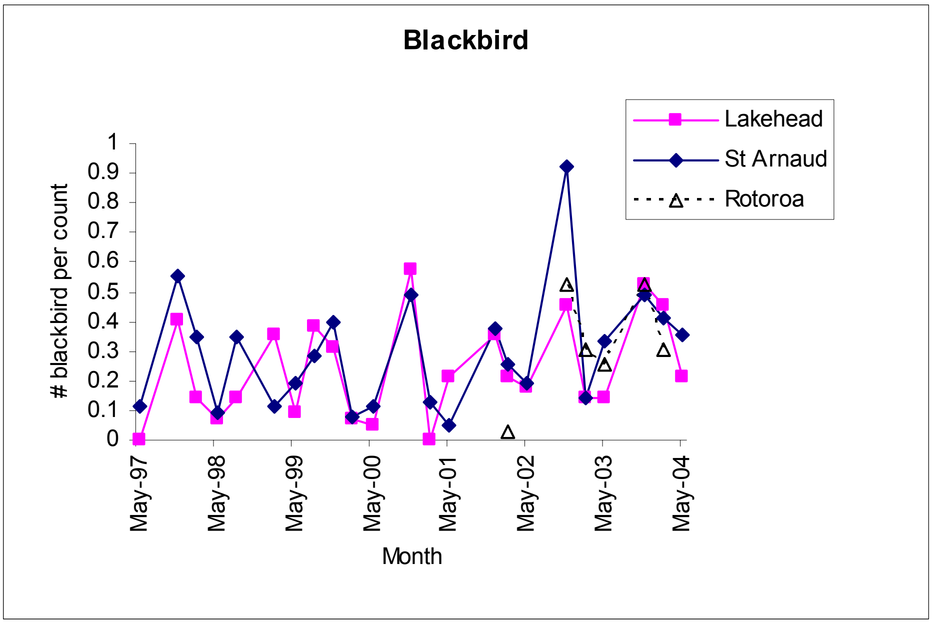
A period of increase is evident at the St Arnaud site from 1997-2000, followed by a period of decline. Numbers recorded at Lakehead are consistently low.

GRAPH 37. RIFLEMAN MAY



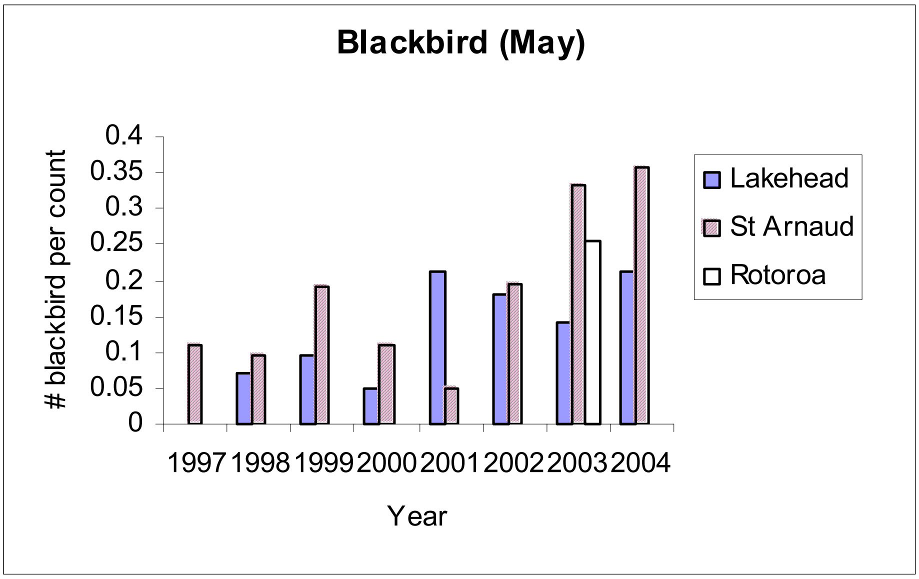
An increase in numbers detected in May counts is apparent at the St Arnaud site in 2004.

GRAPH 38. BLACKBIRD



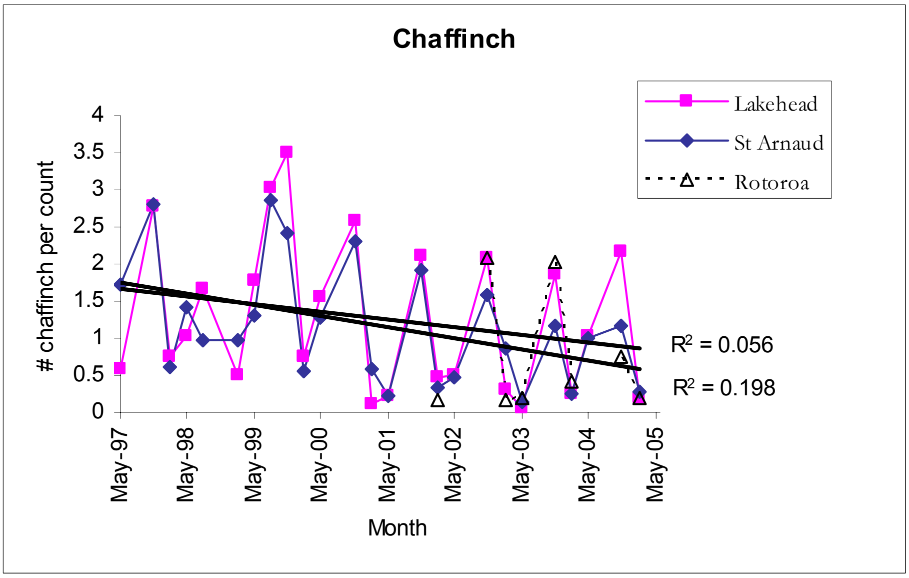
Similar fluctuations in blackbird abundance are apparent at St Arnaud and Lakehead, and recently at Rotoroa.

GRAPH 39. BLACKBIRD MAY



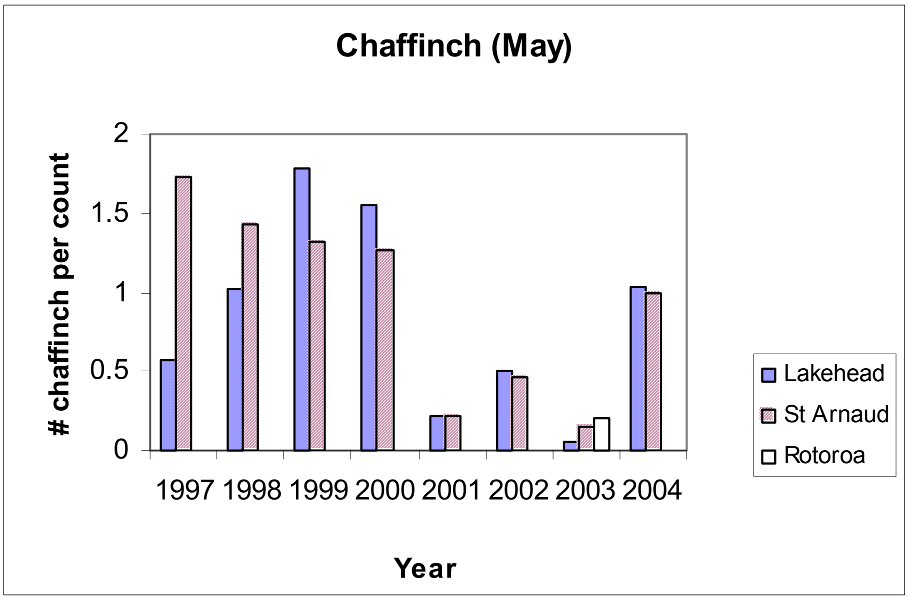
An increase in numbers detected in May counts is apparent at the St Arnaud and Lakehead sites in 2003 and 2004.

GRAPH 40. CHAFFINCH



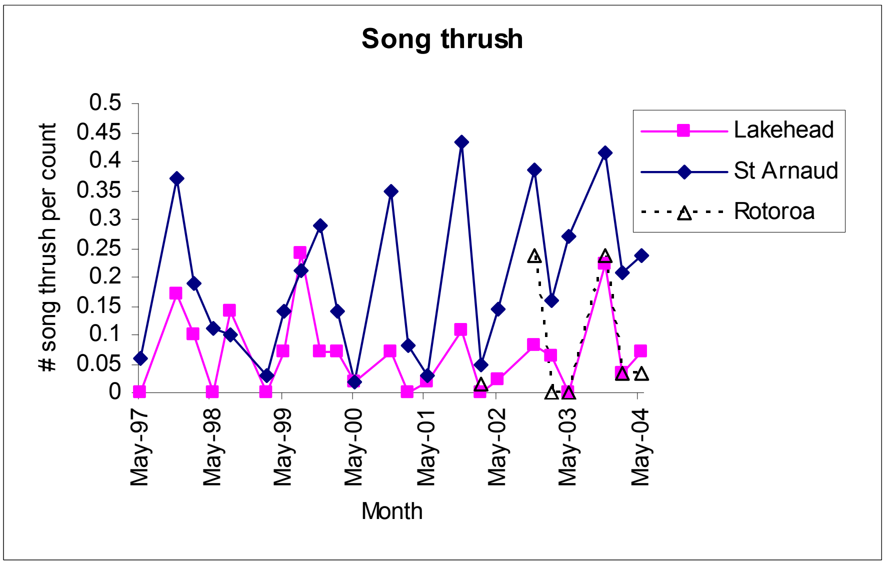
A general declining trend is suggested at St Arnaud and Lakehead. Counts at Rotoroa follow the same seasonal fluctuations as the Rotoiti sites.

GRAPH 41. CHAFFINCH MAY



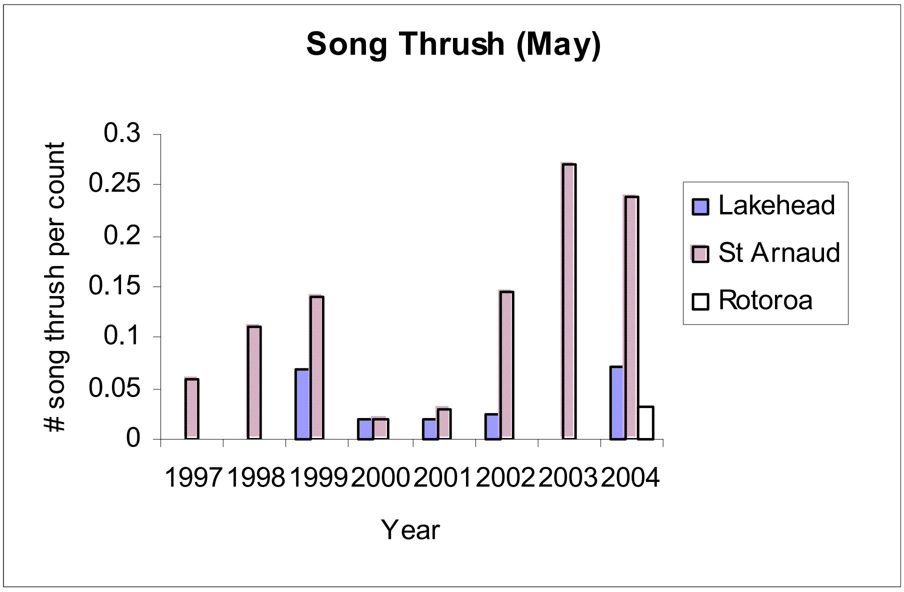
An increase in numbers detected in May counts is apparent at the St Arnaud and Lakehead sites in 2004.

GRAPH 42. SONG THRUSH



Song thrush numbers recorded fluctuate by season, more dramatically at St Arnaud and Rotoroa, with none detected some months at Lakehead and Rotoroa. A general increasing trend is evident at the St Arnaud site from May 2000.

GRAPH 43. SONG THRUSH MAY



An increase in numbers detected in May counts is apparent at Lakehead in 2004.

Other species detected in five minute bird counts, but in numbers too low to analyse are:

- Long-tailed cuckoo
- Shining cuckoo
- Goldfinch
- Hedge Sparrow
- Kaka
- Kea
- NZ falcon
- NZ pigeon
- NZ pipit
- Paradise shelduck
- Redpoll
- Skylark

St Arnaud site only:

- Greenfinch
- Australasian harrier
- Spur-winged plover

Rotoroa only:

- Kingfisher

South Island robins are also detected in the five minute bird counts, but this data is not analysed as their tendency to investigate people (especially in the RNRP project area where they are habituated to feed on mealworms offered by an observer) biases the data.

Discussion

The data has only been subject to simple analysis comparing trends in mean counts. There are several factors that influence numbers and activity that could be taken into account to provide a more detailed picture and sufficient counts have probably now been undertaken to examine some of these. One obvious factor is altitude. Averaging species that are only present higher up, such as brown creeper, across count stations at all altitudes is not an ideal representation. Another factor which may bias results is that the number of bellbirds heard in the lower part of the St Arnaud transect now dominate birdsong, making smaller birds (for example silvereye, tomtit) harder to hear. Looking for any different patterns in birds seen, not heard, would be one way of examining this issue. The smaller number of counts at Lakehead (14 compared to 21 at both St Arnaud and Rotoroa), resulting from the shorter distance to the top of the bushline there, means that comparing averages can be slightly misleading unless standard errors are also presented.

In general, May counts have been used to compare trends from year to year, as these are thought to represent most accurately numbers of birds recruited into the local populations following breeding. They are thus not influenced so much by breeding behaviour or differences in breeding season (for example longer breeding/late breeding, etc), with the possible exception of yellow-crowned parakeets which are capable of breeding all winter during a beech mast.

More analysis thus needs to be done on the data to establish the significance of trends observed.

Trends

The most noticeable feature of bellbird counts is the absence of February peaks in abundance on the St Arnaud line from December 2001 to February 2004, (see the RNRP 2002-03 Annual Report for discussion relating to this), and in 2004 the peak in conspicuousness in May at both sites. In previous years peak bellbird counts occur in February. The May 2004 count in the RNRP is higher than ever recorded for May and equal to 2000 and 2001 February counts. Work undertaken by Ceisha Poirot over the 2002-03 and 2003-04 breeding seasons (paper not available at time of writing), or altitudinal analysis may help explain trends observed. Research described in section 4.5.1.2 suggests that mistletoe pollination was good at St Arnaud this year which indicates a healthy bellbird population.

May counts for tomtits, rifleman, grey warbler, brown creeper, silvereye and chaffinch were all higher at St Arnaud in 2004 than in 2003. For some species (brown creeper, tomtit and chaffinch) this trend was evident at the Lakehead site as well. For song thrush this trend was evident at the Lakehead site only. Rifleman counts usually peak in February, however, as seen with bellbirds, in 2004 a peak was evident in May.

The higher counts observed in May 2004 could be due to increased breeding success, an extended or later breeding season, or altered behaviour or survival. To separate these factors is difficult. The predator control effort was similar to the previous year. Mustelid and wasp indices were also similar though rat indices were higher in 2004. However the weather was rather unusual this season: 2.7 times more rain than usual fell in February 2004 and temperatures were cooler than average by 3.8ºC (maximum) and 0.7ºC (minimum). Rainfall in March was 33% of the average and temperatures were cooler by about 1ºC. Rainfall in April was 11% of the average but temperatures were normal. May was warmer than usual by 1ºC (maximum) and 2ºC (minimum) with normal rainfall. (Weather data from daily climatologically observations taken by DOC St Arnaud for National Institute of Water and Atmospheric Research (NIWA), and monthly averages provided by the NZ Met service.

Given that these higher counts occurred for many species, including those like chaffinches and blackbirds which have not responded to changed pest numbers in the past, it seems that 'external' factors like weather were involved rather than our management. The next set of counts may help to confirm whether these factors led to changes in numbers or behaviour (resulting in increased conspicuousness).

Fantail numbers detected in bird counts still indicate no response to management. Numbers have not recovered from the decline observed at all sites in recent years.

Numbers of yellow-crowned parakeet in the RNRP are still down. There have been more parakeets detected at Lakehead than St Arnaud since 2002-03. Sample sizes are much smaller than this species than many others so it is harder to identify significant trends.

The most obvious trend in tui counts is that this species has not become a major component of the system in the presence of pest control. Some impact of pest control is suggested by their detection at all times of year at St Arnaud, with birds still apparently disappearing periodically at Lakehead.

For blackbirds and song thrushes an increase in numbers detected in the past two years is evident. This is especially obvious for song thrushes in February, when conspicuousness is traditionally lowest. Song thrushes were not absent from any counts at Lakehead this year.

Brown creeper appear stable, except for the May 2000 count. Flocking behaviour may have biased May 2000 data, when two relatively large groups were detected on the 22 May. The most obvious feature for brown creeper is the regular absence of this species at Lakehead. Only once has this species been absent from the RNRP counts, in February 1999, suggesting some benefit to brown creeper from pest control.

Recommendations

- Further analysis of data is required to fully interpret the results. The need for altitudinal analyses is especially important for species such as brown creeper and rifleman, which are generally found higher up. Analysis of other species above the noisy bellbird zone would be interesting to see if trends change as a result. Confidence intervals will be important.

- As much information as possible on biology/ecology and intra-specific interactions of species detected needs to be incorporated into the analysis.
- A detailed look at possible relationships between bird counts, rodent tracking indices (and, in future, mustelid tracking indices) and the change in Fenn™ trapping intensity needs to be undertaken.
- Rotoroa counts need to continue, these will be especially important when pest control work is initiated at this site (see draft RNRP Strategic Plan 2004 for long-term project goals, refer Appendix 6). Continued counts at all sites are important to establish trends.
- Future analysis of Lakehead counts needs to identify any effects from extending stoat control to cover this area in 2001-02.
- Research initiatives targeting specific species need to be encouraged, to augment understanding of trends observed for these species (eg. Ceisha Poirot's work).

4.1.2 Kaka (*Nestor meridionalis*) Monitoring

Objectives

- To assess the effectiveness of the current stoat control regime in protecting the local kaka population.
- To maintain a sample of females with live transmitters in the RNRP to complete outcome monitoring of stoat control.

Methods

Documentation of nesting success by locating nest sites, monitoring the outcome of all nesting attempts and determining causes of nest failure, were carried out as in previous years. Fur samples found around the entrances of two failed nests were sent to Craig Gillies for identification (carried out by Dan Purdey, research assistant, Science and Research Unit, Hamilton). Autopsy of carcasses was conducted by RNRP staff during a training session supervised by Craig Gillies. A sample of nine transmittered females of breeding age was monitored.

Survival and dispersal of eight fledgling females was monitored to add data to a kaka population model to assist interpretation of nesting success results.

The RNRP 2002-2003 Annual Report details the early failure of transmitters on adult female kaka nesting in the management area. Following on from this, mist-netting at three new and one old site to the north and south of the old RNRP core area was undertaken in 2003-2004 in an attempt to capture new females to add to the sample of transmittered birds. Mist-netting at nest sites was undertaken in an attempt to re-capture currently transmittered birds. The aim was to replace old transmitters with new, to maintain working transmitters on these birds so future nesting attempts could be monitored.

Minna Sarvala, an MSc student from the University of Turku, Finland, undertook a study looking at post-fledging behaviour of kaka. At the time of writing a final report for this work was still awaited.

Results

Nesting Success

This was the first real test of kaka breeding success in the extended stoat control regime, following a two year knockdown period. Kaka bred in the 2001-02 season, as the extended regime was being installed, without a knockdown period. Results in the 2003-2004 season are compared with the 2001-02 season bearing this in mind.

All nine females monitored attempted to breed in 2003-2004. Three of these birds nested outside the management regime, and these nests were banded with aluminium, all below the nest entrance, and two above the nest entrance, in an effort to prevent predators accessing the nests. One of these nests was also ringed with five stoat and rat traps, which were checked weekly by the Friends of Rotoiti. All these nests were successful.

Seven of the nine monitored birds (this number includes one bird that nested outside the regime earlier in the season) nested inside or on the periphery of the management regime, and these nests were left unbanded to test the Fenn™ trapping regime.

TABLE 12. KAKA NESTING SUCCESS, UNBANDED NESTS

SITE	BREEDING FEMALES	NESTING ATTEMPTS	SUCCESSFUL NESTS	% NESTING SUCCESS
2001 - 2002 Big Bush (non-treatment) [1]	7	8	0	0
2001 - 2002 RNRP	5	6	3	50[2]
2003 - 2004 RNRP	7	9	6	66

[1] This site is considered non-treatment in the 2001-02 year because Fenn™ trap lines were being established at the same time kaka started breeding, thus leaving no time for a knockdown of stoats in the area.

[2] This figure differs from the 2001-02 annual report because results from the RNRP core and north of the RNRP core have been combined for this table, as a more accurate comparison with the 2003-04 season.

The female chick in one of these nests failed to fledge and was found dead in the nest cavity with her head apparently stuck through a small hole above the nest entrance. There was evidence of rat scavenging on the carcass but no apparent kill marks. Autopsy results suggest she died of asphyxiation (M. Alley, pers. comm.).

TABLE 13. CAUSE OF KAKA NEST FAILURE, UNBANDED NESTS

(Note that 2001 - 2002 Big Bush data does not include the nest in which eggs failed to hatch, as this nest was protected by aluminium bands).

CAUSE OF NEST FAILURE	BIG BUSH 2001 - 2002	RNRP 2001 - 2002	RNRP 2003 - 2004
Female killed on nest	7[1]	0	0
Eggs eaten by predator	0	0	1[3]
Nestlings died due to non-predator cause	1	0	0
Nestlings killed by predator	0	3[2]	2[4]

1 All killed during laying or incubation, 2 during their second nesting attempts.

2 Two nests were lost to stoats (captured on video) and in the third case the predator was not identified and nestling carcasses never found, but a stoat is suspected due to the lack of evidence, suggesting caching.

3 Evidence suggests a possum was responsible for this (eggs crushed, possum fur around the nest entrance).

4 Evidence suggests a possum was responsible for one of the nest failures, and a stoat for the other (following autopsy of remains conducted at St Arnaud by RNRP staff and Craig Gillies, and identification of possum fur found around the nest entrance of one of the nests).

Fledgling Survival

The three successful nests outside the management area fledged seven chicks, of which two were female. The six successful nests inside the management area fledged seventeen chicks, of which six were female. All female fledglings had transmitters attached, in the hope that they will nest inside the management area in the future.

Of the eight female fledglings produced, one female dropped her transmitter (B-bands around the weak link on the harness were chewed open) just prior to two months post-fledging, one died of starvation shortly after fledging (M. Alley, pers. comm., following autopsy at Massey University) and one either dropped her transmitter or died hung up in a tree (transmitter and/or carcass are yet to be retrieved) one month post-fledging.

Of the six females for whom survival data to two months post-fledging is available, five survived, equating to 83.3% (cf. 66.7% in 2001-02 and 69% 1997-1999).

Mist-netting Operation

In September 2003 Pete Gaze and Ron Moorhouse set up three new mist-net rig sites in areas on the St Arnaud range where mist-netting has not been undertaken before. These sites were run in October 2003 on eight occasions. A fourth site was run on one occasion in October 2003. See Appendix 2 for mist-net effort and locations.

No female birds were caught in this operation. Two young males, fledged in the 2001-02 season were caught and their transmitters removed as it was felt they would not be needed for future monitoring.

Mist nets were set up at the nest sites of all nine birds monitored this season, following hatching and close-brooding of nestlings. Eight of these nine adult females were re-captured and their transmitters replaced with new units. It is hoped that a further three years of monitoring will now be possible.

Of the eight transmitters removed from birds, two were sent to Sirtrack for analysis to identify reason for failure. These two were 'clunking' as if their battery life was running out. The battery of one of these transmitters was dead on arrival at Sirtrack. The second tested as having full charge, and the transmission was received as a normal 'peep'. Following discussion with Phil Sargisson at Sirtrack, it appears that the second transmitter may have suffered a build up of salts on the battery, due to the duty cycle feature which prevents the battery running at full capacity, and eventually leads to early failure of the transmitter if salts are not knocked off. The remaining six transmitters were kept at St Arnaud, and transmission monitored weekly. Table 13 details the status of all transmitters removed from adult females in 2003-04 and retained in St Arnaud. Some transmitters continued to transmit 'clunks' occasionally after the dates given here.

TABLE 14. BATTERY LIFE OF TRANSMITTERS REMOVED FROM FEMALE KAKA (AS OF 30 JUNE 2004). EXPECTED LIFE = 66 MONTHS.

TX #	TX TYPE[1]	LIFE (MONTHS)	PRIOR USE (MONTHS)	DATE ON	LAST SIGNAL
88	20ppm (12/12)	41	-	19 January 2001	16 June 2004
48	20ppm (12/12)	41	-	13 December 2000	11 May 2004
45	20ppm (12/12)	38	-	19 February 2001	11 May 2004
86	20ppm (12/12)	41	2 weeks	14 December 2000	11 May 2004
09	20ppm (12/12)		-	23 January 2001	Working
24	20ppm (12/12)		-	1 May 2001	Working

[1] (ppm = pulses per minute; 12/12 = hours no/off [duty cycle])

Transmitter damage to birds was assessed before attaching new transmitters. One of the eight birds had a 2 x 1.2 cm bald patch where down and covets were worn away from transmitter contact, and a 2 mm^2 sore or abrasion which had healed (however the skin in the area was obviously new). The other seven birds all had bald patches despite differing fits of harness. It was decided that if an open sore was found a new transmitter would not be attached.

Discussion

Nesting success in the RNRP was lower this season (66%) compared to previous seasons (80%) in the presence of the original small-scale intensive Fenn™ trapping regime. Thus it appears that the less intensive, extended regime does not provide the level of protection that the intensive, small scale regime provided. However, results from 2003-04 are still very encouraging. In addition to recording a nesting success still much higher than previously found in non-treatment areas, no adult females were lost while nesting. This ensures that the population still has the capacity to increase even in the presence of the level of nest failure observed this season.

This season provides the first correlation in the RNRP between kaka nesting success and stoat tracking rates. Mustelid tracking rates in the RNRP from December 2002 to May 2004 remained below five percent of tunnels tracked, within the threshold recommended by Greene et. al. (2004), as providing most benefit to kaka populations. This threshold is acknowledged to be a guesstimate (Powlesland, pers. comm.). What is not known is how well the regime performs in years of very high stoat numbers. Fifteen nests have now been observed in the extended regime. It has been suggested that a total of thirty nests is needed to fully test it (after Moorhouse, 1998), preferably in the presence of a year of higher stoat numbers. This should allow a statistically sound comparison with the previous predator control regime based on trapping and toxins.

It is interesting to note that destruction of nests by stoats was less in 2003-04 compared with 2001-02, despite a much higher trapping rate for January, and a slightly higher trapping rate through February to April, in 2003-04.

Possums were a more significant predator of kaka nests 2003-04 than were stoats. The areas where kaka nests failed due to possums were areas under Animal Health Board (AHB) possum control (see Section 3.3, mustelid control, for outline of surrounding AHB operations). Tables 14 and 15 show target and actual possum residual trap catches (RTCs) for AHB operations during the 2003-04 season.

TABLE 15. UPPER MOTUEKA RTC RESULTS (MONITOR START DATE 10 JULY 2004) (AFTER SOUTHERN PEST MANAGEMENT 2004A)

STRATUM	TARGET RTC (%)	ACTUAL RTC (%)
Farmland	1	0
Forest/scrub	1	0.5
Bush/pasture	1	1
Overall (95% CI)	1	0.6

TABLE 16. TOPHOUSE RTC RESULTS (MONITOR START DATE 10 APRIL 2004) (AFTER SOUTHERN PEST MANAGEMENT 2004B)

STRATUM	TARGET RTC (%)	ACTUAL RTC (%)
Farmland	1	0.6
Forest/scrub	2	1.2
Bush/pasture	1	0.2
Overall (95% CI)		0.8

From 1997-2001 possums were not identified as significant predators of kaka nests inside the RNRP. During this time possum RTC indices ranged from 0.33% to 1.33% (RNRP Annual reports 1997 to 2001). Thus it seems that AHB targets are low enough to provide protection for nesting kaka, but that timing of control in 2003-04 (February – June 2004, at least three months after kaka had started nesting) was not early enough to protect kaka nests. AHB and DOC St Arnaud outcomes are compatible. Both organisations aim for similar possum RTC targets and aim to achieve this in the most cost-effective manner possible. Winter operations can maximise possum kill (for example Veltman & Pinder 2001) and such timing would reduce possum numbers just prior to kaka breeding and probably afford best protection for kaka from a one-off but annual (rather than continuous) operation. Thus a great opportunity exists to co-ordinate AHB operations to optimise both AHB and conservation outcomes.

Kaka fledgling survival rate seems to have increased with the extended regime, however more data is required to establish the trend.

Re-capture and re-transmittering of adult kaka is difficult, but achievable provided nest locations are known and terrain and vegetation allow establishment of rig sites. If working transmitters are maintained on all birds nesting within and on the periphery of the management regime it will be possible to also remove transmitters at the end of the study.

Recommendations

- Continue to monitor kaka nesting success in the presence of the current regime until 30 nesting attempts have been observed.
- Maintain working transmitters on adult females to allow for removal of transmitters at the end of the study.
- Establish better meshing of AHB and conservation outcomes.

4.1.3 Robin (*Petroica australis*) Monitoring

Objectives

- To assess the effectiveness of the rat control regime in protecting the local robin population.

Methods

Territory mapping was undertaken, as in previous seasons, using survey methods as set out by Powlesland (1997). The survey area is shown in Figure 14. All rat trapping lines in this area were used as transects. The survey was conducted four times at weekly intervals during September.

Casual sightings of robins in the RNRP core area were recorded throughout the year. This information is not presented, but over time may be treated as a rough index of robin numbers in the RNRP.

Results

Territory Mapping

A total of two robin pairs holding territories were detected in the survey area in 2003-04 (Table 17).

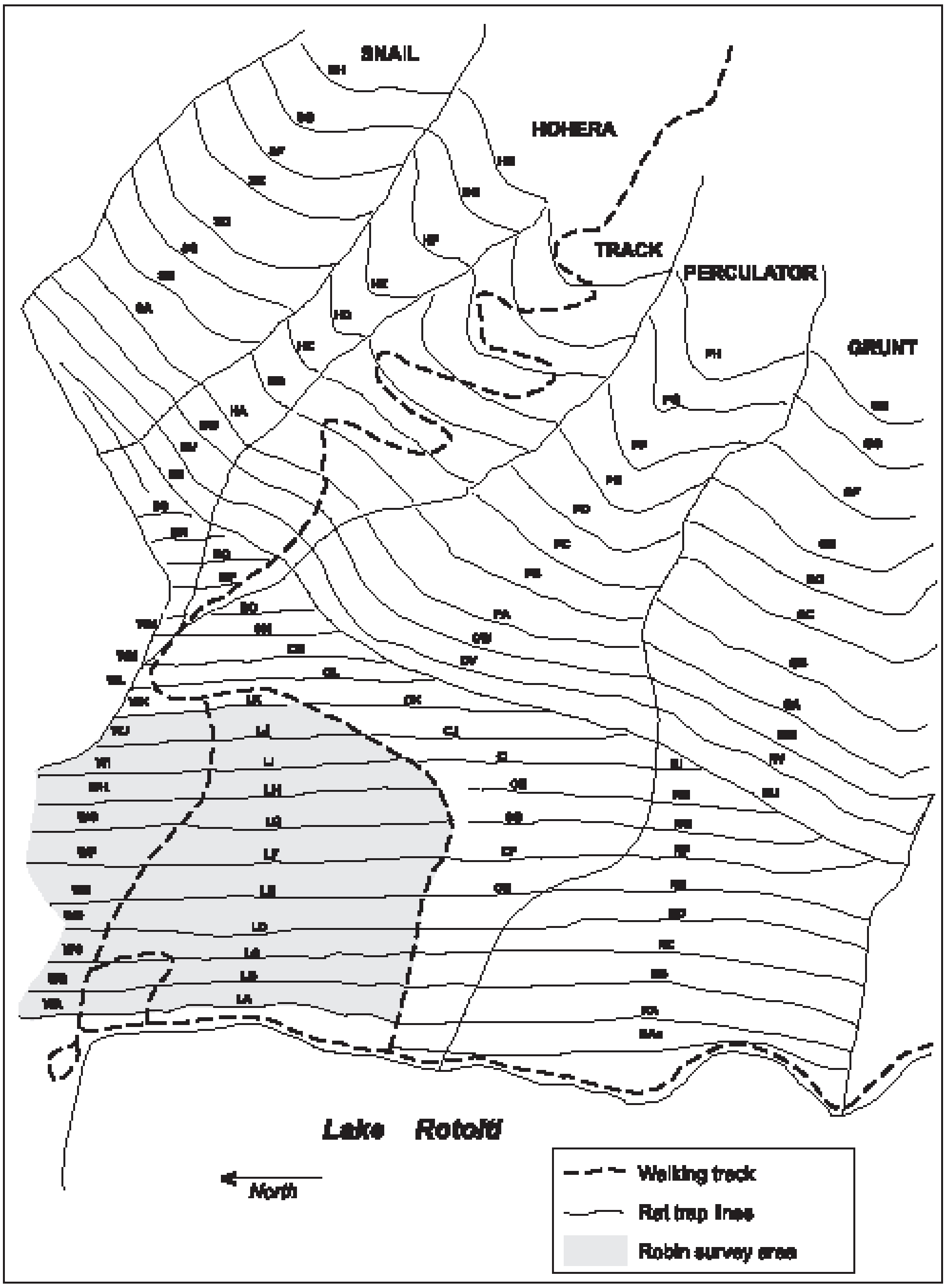
TABLE 17. NUMBERS OF ROBIN PAIRS HOLDING TERRITORIES IN SURVEY AREA

DATE	NUMBER OF PAIRS	SINGLE MALES	SINGLE FEMALES
August 1998 - February 1999	5	?	?
August 1999 - February 2000	5	?	?
September 2000 - February 2001	6	2	0
September - October 2001[1]	6	2	0
September 2002	2	2	1[2]
September 2003	2	1	1[2]

[1] Lower five lines in Water Tank block not surveyed in this year.

[2] Breeding status of this female (same bird) is uncertain. She was seen in the vicinity of a male in both years, but never exhibited positive pair-bond behaviour and is thus considered a single female by this data.

Figure 14 Robin survey area



Note that numbers differ from those in the 2001-02 report, to include pairs present in the lower five lines of the Water Tank block in 2000-01; and that 2001-02 was the first time Powlesland's protocol was followed for territory mapping.

One pair was observed feeding two fledglings later in the season.

Discussion

The number of robin territories held in the survey area has remained stable over the past two years. However, there seems to have been a total lack of recruitment between the two seasons, with no new birds taking up territories in areas of historical robin breeding activity.

Reduced nesting success and losses of adult female birds were apparent in 2000-2001 when rat tracking indices rose to 34% (Butler, 2003). At that point (December 2000) rat tracking indices in the lower block (where robin monitoring work is undertaken) were at 38.58%. Since rat trapping started in July 2000 rat tracking indices in the lower block have ranged from 2.5% (September 2000) to 46.5 (May 2004), with an average of 20.62% (cf. 0% to 9% with an average of 1.72% from May 1998 to May 2000). On 5 occasions the index rose to 32% or higher. Rat trapping at the current intensity has not reduced rat numbers enough in the RNRP to benefit robins.

Recommendation

- Continue robin territory mapping to monitor response to rodent control.

4.1.4 Falcon (*Falco novaeseelandiae*) Monitoring

Objective

To monitor nesting success of all pairs within the RNRP project area as a contribution to ecosystem health monitoring and incorporation into the wider Area Office falcon monitoring programme.

Methods

Location of breeding territories is identified during other work undertaken in the RNRP Project area, indicated by the aggressive behaviour of adult falcons. Location of nests is undertaken by ground searches following such observations. Nests are then observed at intervals throughout the season to determine outcome and identify predators.

Results

One falcon nest was found in the Rata block in the project area this season. Of a clutch of three, all eggs hatched producing one male and two females. All chicks were banded with metal bands only. The number fledged is unknown, but sightings suggest two fledged successfully.

Recommendation

- Continue monitoring falcon nests found inside the RNRP project area to compliment other outcome monitoring tasks and augment the Area Office falcon monitoring programme. In time a picture of how falcon are responding to predator management in the RNRP Project area will be built up.

For more detail on the Area Office falcon monitoring programme see DOC file: NHS-03-13-02 and Appendix 6.

4.2 NON-WASP INVERTEBRATE MONITORING

Objectives

- To document the beneficial impacts of the control of wasps on the populations of the native insects that make up their prey.
- To examine changes in invertebrate communities across time and pest control treatments.

Methods

Malaise traps used for result monitoring of wasp activity also yield samples suitable for outcome monitoring of wasp control. Twenty traps at the Rotoiti treatment site and ten and six respectively at Lakehead and Rotoroa non-treatment sites are open from November to May and samples collected fortnightly. Wasps are counted and removed and the remainder of the sample stored in 70% ethanol.

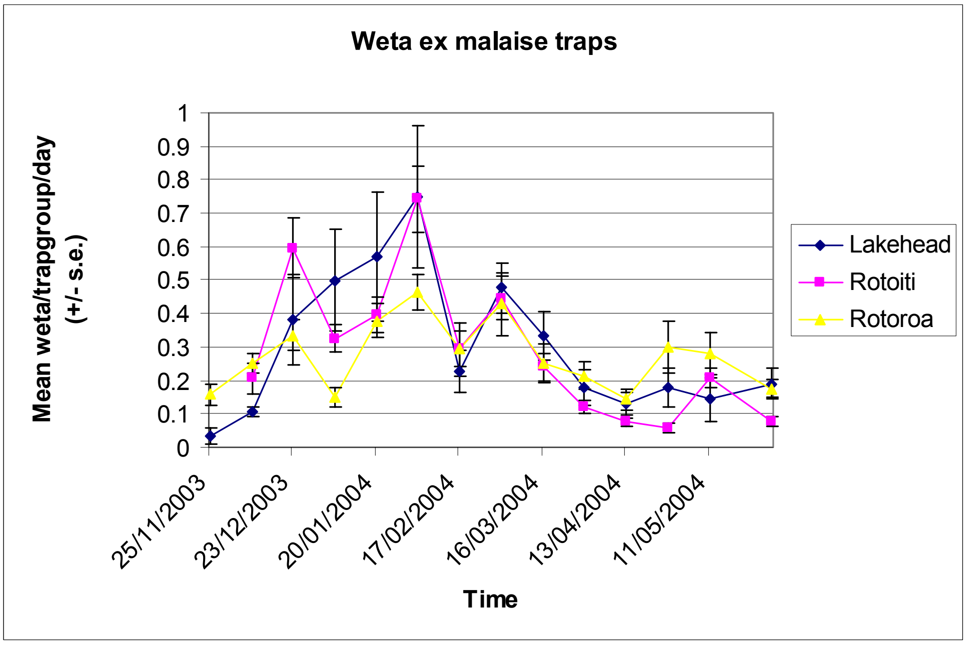
Additionally this season weta, bumblebees, and honeybees were removed and stored separately. Weta have been proposed as indicators of ecosystem health as they are negatively affected by a range of pest animals both vertebrate and invertebrate. Honeybees and bumblebees were removed for the work of a research student (Alexandra Kappeler, Swiss Federal Institute of Technology).

To assess response of invertebrates to wasp control insects belonging to ten indicator groups (A, B and C guild Tachinidae (bristle-flies), and seven Tipulidae (craneflies)) were separated, sorted and counted from a sub-sample of material collected in malaise traps by contract entomologist Rachel Standish (2003) following methodology of Sandlant (2003) and the key of Toft and Dugdale (1997). Biomass analyses for sub samples of malaise traps from this season and previous years were undertaken by Richard Toft, Landcare Research.

Results

Although weta were removed from samples this season, and retrospectively from samples of previous seasons, only the 2003-2004 has associated data. All weta are presented together. These samples have not been sorted to species, sex, and age or size class.

GRAPH 44. WETA EX MALAISE TRAPS



Discussion

Insects belonging to indicator groups were not assessed for outcome monitoring as results to date have been relatively inconclusive in showing a benefit to these animals from wasp reduction; the effect of poisoning was ambiguous and other factors, primarily weather, had the effect of making wasp activity similar across treated and non-treated sites. In addition the toxin used in 2004 is not preferred and will be discontinued as soon as possible.

However this season offers the opportunity to examine how indicator groups may behave in the presence of relatively low wasp numbers at both non treatment sites during the traditional peak season.

Weta will require analysis by species, sex, and age or size class, and possibly across years before any conclusions can be drawn.

4.3 LIZARD SURVEY AND MONITORING

Objective

To record changes in lizard populations in the Friends of Rotoiti rat-trapping area and identify cause of change.

Methods

Two transects of 20 pitfall traps each were established in November 2002 to measure changes in lizard populations in the Friends of Rotoiti rat-trapping area. One transect surveys Ward Street in St Arnaud, and the second surveys the Black Hill area near West

Bay (Figure 15). Traps were run by Terra Dumont, a member of the Friends of Rotoiti. Bad weather during the 2003-04 summer resulted in the December and March monitor periods being dropped. Four consecutive days trapping were achieved in February 2004.

All lizards caught in pitfalls were marked on the top of the head with xylene-free silver pen. Captures were measured (snout-vent length), and presence/absence of tail regeneration and recaptures were noted. Daily temperature and rainfall data were collected for the monitoring period.

Results

TABLE 18. SUMMARY OF TOTAL LIZARD CAPTURES (RE-CAPTURES EXCLUDED) ON THE FRIENDS OF ROTOITI PITFALL TRAPPING TRANSECTS

(Data differs from that in the 2002-03 report because figures have been corrected for species)

YEAR	MONTH	DATES OPEN	MAX TEMP RANGE °C	TOTAL RAINFALL MM	WARD STREET	BLACK HILL		
					O. nig. pol.[1]	*O. nig. pol.*	*O. lin.*[2]	*O. inf.*[3]
2002	Nov -Dec	30-11-3-12	22-23.2	1.7 (3rd)	2	2	0	0
2003	Feb	6-9	20.8-25.5	0	26	10	0	4
2003	Mar	8-11	21.7-22.3	1.8 (11th)	6	3	0	7
2004	Jan[4]	2-5	24.0-31.0	0	25	8	1	15

[1] *Oligosoma nigriplantare polychroma* Common skink

[2] *Oligosoma lineoocellatum* Spotted skink

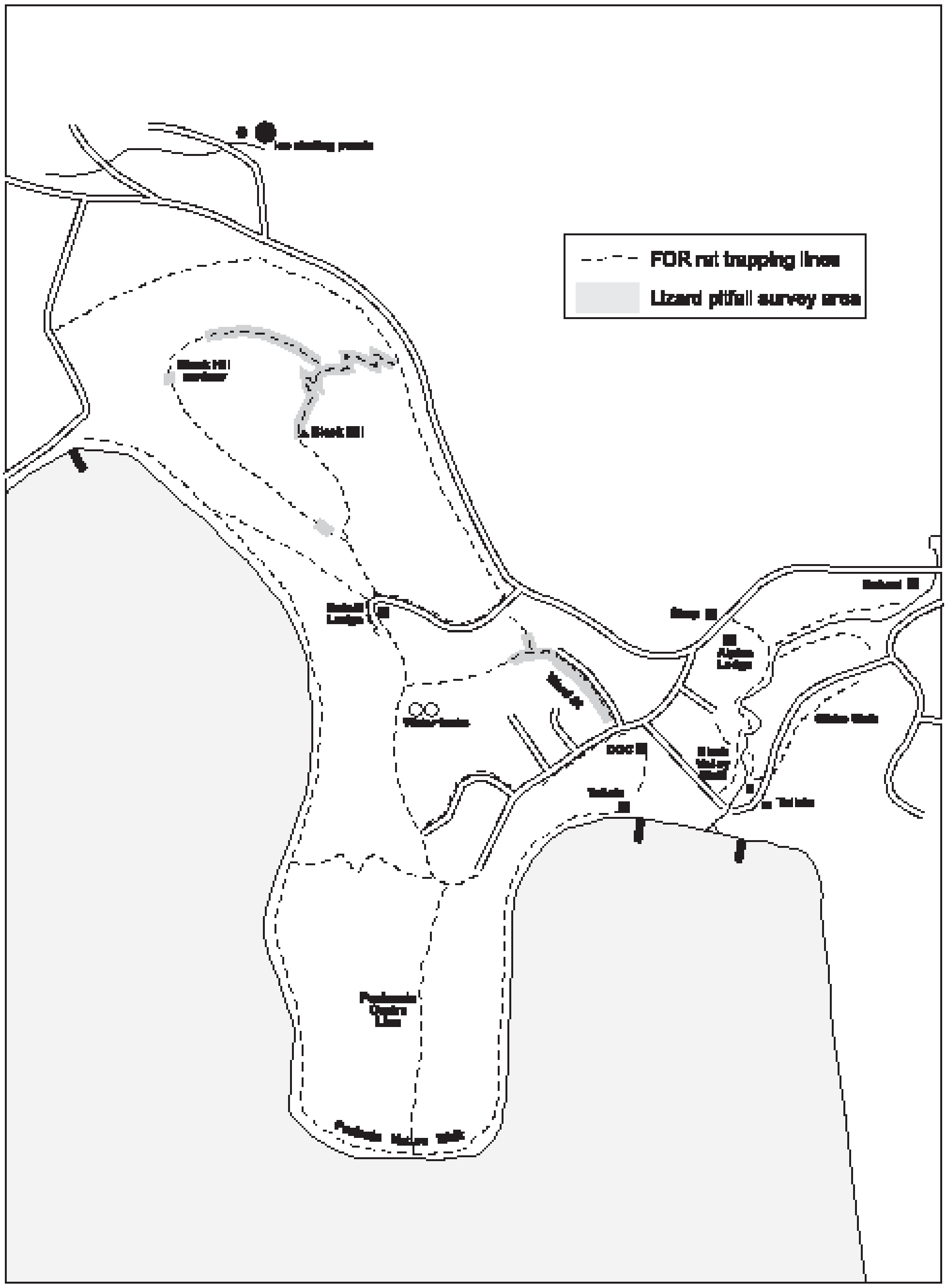
[3] *Oligosoma infrapunctatum* Speckled skink

[4] Traps closed on 7 January due to staff illness, however the 6 and 7 January were overcast and drizzly, with 26.4 mm rain falling over that period, so effective trapping period is considered to be the 2-5 January.

Discussion

Little can be concluded from the two year's data presented here. More data is required to establish trends.

Figure 15 Friends of Rotoiti rat trapping and lizard pitfall area



Compiled by ... Business Services, Nelson/Marlborough Conservancy

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Recommendations

- Friends of Rotoiti pitfall trapping should continue on an annual basis as a useful programme for identifying lizard species present, identifying population trends and as an education tool.
- Lizard work should remain a low priority for RNRP staff, given that a useful RNRP monitor population has not been identified and to get significant results more hours than are available need to be invested to the work. If time allows, work should focus on identification of lizard species and populations in the RNRP area.

4.4 SNAIL MONITORING

No snail monitoring work was planned for the 2003-2004 season. Monitoring will not be undertaken again until autumn 2007.

4.5 PLANT AND VEGETATION MONITORING

4.5.1 RNRP Mistletoe – possum control outcome monitoring

Objectives

- Monitor the health of selected plants within the treatment and non-treatment areas, to test the hypothesis that the apparent decline is the result of possum browse
- Record the anticipated recovery of the mistletoe population with sustained possum control
- Use mistletoes to monitor possum presence/impact within the treatment area.

Methods

Further plants continue to be located in the course of other work in the treatment area and non-treatment sites. All plants monitored have been tagged and a standard set of data collected from each, including measurements and an assessment of browse using the Foliar Browse Index methodology (Payton et al., 1997). This concurs with the internal document 'Best practice for survey and monitoring of Loranthaceous mistletoe. Such recording will continue on an annual basis with all new plants to be tagged and baseline measurements taken until a suitable sample (30+) is obtained for each species.

Results

No mistletoe monitoring was undertaken this year. This was dropped from the work plan as a response to other pressures negatively affecting the project and team.

Discussion

Mistletoe health is a primary measure of possum control outcomes. In the current regime of possum trap catch indices on a triennial cycle it is imperative that any change in floral values attributable to changes in possum activity be detected as early as possible. The Technical Advisory Group meeting recommended that this work be a priority. It was also suggested that mistletoe monitoring could fulfil a greater role than possum control outcome monitoring and serve as an indicator of ecosystem health. Non treatment data would be required for this.

4.5.2 Mistletoe Pollination Studies

In January 2003 David Kelly and Jenny Ladley (University of Canterbury) and Alastair Robertson (Massey University) examined mistletoe (*Peraxilla tetrapetala*) pollination and fruit set at RNRP as part of ongoing studies relating these measures to predator control. RNRP was selected as mustelid and rodent control are established. This work was replicated in 2004.

Method

Incidence of bird-opened flowers is measured by "% pink", the percent of all ripe flowers which are not yet opened. With good bird attention this should be low. Fruit set was examined across three treatments: 'bagged'- allows only self pollination and no bird pollination, natural - bird and insect visited; and hand-pollinated - a measure of maximum potential fruit set. Pollination index is natural pollination as percentage of potential (hand).

Results

TABLE 19. PERAXILLA TETRAPETALA FRUIT SET

(Kelly, Ladley & Robertson, unpublished data, 2004)

YEAR	2003	2004
Hand pollinated	60.8%	49.6%
Natural pollination	36.7%	45.1%
Bagged	4% [1]	4.2%
Pollination index	57.5%	90.1%
Percent pink	5.0%	4.6%

[1] No data. Nominal value based upon observations at several sites over several years.

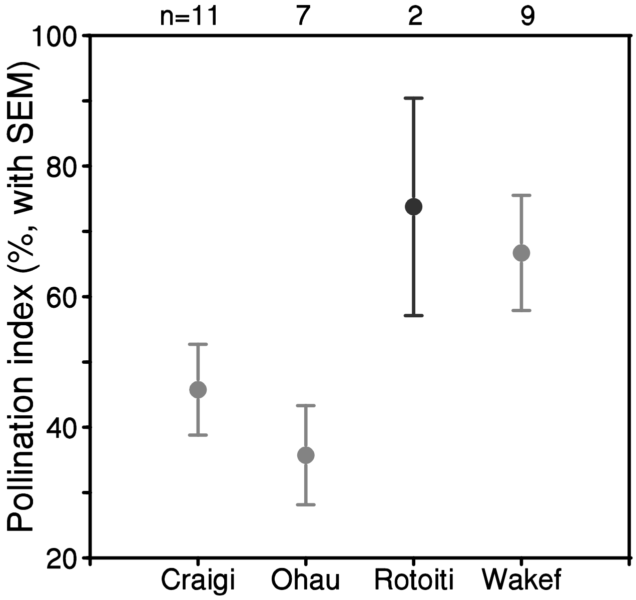
Discussion

The higher pollination index of 2004 can be considered very good.

The low % pink values may indicate good visitation rates, though because sampling was a bit late in both years the means are based on small samples. The pollination index in 2004 is very good. The only caveat on this is that the pollination index averaged over all available years is not very different at RNRP (n=2, mean = 73.8%) from that for

Peraxilla colensoi at Wakefield (n=9, mean = 66.7%) where the plants are in farmland and no significant pest control is undertaken.

GRAPH 45. *PERAXILLA* MISTLETOE POLLINATION INDICES



(Kelly, Ladley & Robertson, unpublished data, 2004)

It may be that the presence of tui at both Nelson sites (compared to never observed at the more southerly sites at Craigieburn and Ohau) contributes to the high pollination success at RNRP. Year to year variation makes it hard to generalise with only two years of data at RNRP.

4.5.3 Pittosporum patulum

Pittosporum patulum is an endangered South Island endemic species subject to browse by deer and possums.

Objective

- To use *Pittosporum patulum* to monitor possum presence/impact within the treatment area and to document improved growth and survival of seedlings in response to possum control.

Methods

As for mistletoes, though details of measurements taken differ. Monitoring is planned for December to coincide with flowering.

Results

No work was undertaken in this programme this year. This has occurred the past three seasons.

Discussion

Principal reason for non achievement of this task is the December monitoring period coincides with wasp control planning and both tasks are assigned to the same Ranger. Wasp planning takes precedence as it is time bound and a key task for the project. It was recommended at the Technical Advisory Group meeting that *Pittosporum patulum* be delegated to other staff so that these work programmes do not conflict.

4.5.4 Foliar Browse Index

Objective

Foliar browse analyses are used to detect responses to herbivore control in relatively abundant, browse-sensitive and herbivore palatable plants.

Methods

A standard methodology developed by Landcare Research was used (Payton et al., 1997). Marked trees were re-assessed annually. Species monitored have been reduced to *Raukawa simplex* as the most possum sensitive of the previous suite examined, unless possum activity increases dramatically (Paton et al 2004).

Griselinia littoralis is monitored for ungulate outcome monitoring, with its canopy density a 'health' measure.

Results

No work was undertaken in this programme this year.

Discussion

Foliar Browse Index of *Raukawa simplex* along with mistletoe monitoring is a primary measure of possum control outcome monitoring. In the current regime of possum trap catch indices on a triennial cycle it is imperative that any change in floral values attributable to changes in possum activity be detected as early as possible.

Monitoring of *Griselinia littoralis* should be retained as it is our only form of ungulate outcome monitoring.

4.5.5 Beech Seeding

Objectives

- The periodic seeding of beech is the primary determinant of the population cycles of rodents and mustelid, and for native invertebrates and birds such as kaka in this forest.
- Monitoring of beech seedfall allows the placement of each annual seed event, and subsequent response, in an historical context.

Method

Twenty x 0.28m² funnel shaped seed traps are used to collect seed and litter fall from canopy between 1 March and 30 June at each Mt Misery (Rotoroa) and RNRP. Seed is separated from litter, sorted to species and tested for viability.

Results

Beech seedfall analysis had not been completed at time of writing. It appears that a moderate to heavy seedfall occurred, dominated by red beech (*Nothofagus fusca*). Most seed was observed by field staff to fall relatively late (May) and this is reflected in the collection with a greater volume of seed apparent in the second of two collections (end April to end June).

Discussion

The 2004 seedfall, whilst un-quantified at the time of going to press, can be expected to contribute a reasonable energetic input to the ecosystem. Red beech seedfall makes the greatest energetic contribution of the beech species due to the high biomass and quality of the endosperm. Seed quantity appears to be in the order of magnitude of hundreds of seeds per square metre (Maitland, pers. obs) and not the thousands that result from a full beech mast event.

To effectively examine relationships between beech seedfall and rodent response it would be useful to convert beech seedfall to energetic contribution. Presently beech seedfall is expressed as total viable seed per square metre, and does not express composition by species, which affects energetic input.

4.5.6 Tussock Seeding

Objective

- Seeding of tussock is used as a good indication of the intensity of beech seeding that can be expected in the same year, although the relationship is not mathematically perfect.

Methods

Two species of tussock are monitored over a 1000m transect at Mt Misery (200 counts) and a 500m transect at RNRP (100 counts). (For the full methodology refer Appendix 6)

Results

No tussock counts were undertaken this year.

5. Reintroductions - Roroa/Great Spotted Kiwi (*Apteryx haastii*)

This year marked a particular milestone for the project with the first reintroduction of a species lost from the area – the roroa or great spotted kiwi (*Apteryx haastii*). This is described in detail from planning through to implementation. It is anticipated that the following information and the dispersal monitoring outcomes from the 2004-05 business year will be incorporated into a stand-alone report on the roroa reintroduction, to be produced in 2005.

5.1 BACKGROUND

5.1.1 Great Spotted Kiwi Biology and Conservation

Great spotted kiwi are a large grey mottled kiwi (Apterygidae) endemic to New Zealand's South Island. As with all kiwi species, adult females are larger than adult males. There can be considerable size difference between birds from different sites, most likely due to climatic difference (as described by Bergmann's Rule). Female great spotted kiwi can reach 4.5kg weight in cool upland areas, making them the largest kiwi; however males are usually no heavier than 3kg (Worthy and Holdaway 2002). All kiwi species are more or less nocturnal probers of litter and soil, feeding mostly on invertebrates; however great spotted kiwi appear to consume more seeds and leaves than other kiwi species (McLennan and McCann 1991).

The great spotted kiwi is an avian example of a K-strategist breeder, apparently capable of producing no more than one chick per year. Most of what is known about great spotted kiwi breeding biology is the result of McLennan and McCann's 1987-1990 work at the Saxon study area (Gouland Downs) and Kahurangi Point, Northwest Nelson. Male and female great spotted kiwi form long-lasting monogamous pair-bonds; and females lay a single egg between mid-winter and mid-summer. Females will seldom replace an egg if it fails during incubation. The male incubates the egg during the day and part of the night, but the female incubates for about five hours during the night while the male takes time off to feed. Incubation is difficult to observe as great spotted kiwi do not tolerate disturbance at the nest site, and are inclined to abandon the nest. Males may smash the egg when humans approach the nest too closely during the early stages of incubation. The egg is incubated for about 70 days before hatching (McLennan and McCann 1991).

Great spotted kiwi utilize a variety of forest, scrub and grassland habitats from warm lowlands to the cool alpine zone[1]. In Northwest Nelson great spotted kiwi frequently eat earthworms, beetles, centipedes and spiders; and a wide range of other invertebrates are eaten less frequently. Seeds and leaves are eaten often, and great spotted kiwi may be the most vegetarian of kiwi species (McLennan and McCann 1991). There are three extant populations of great spotted kiwi, collectively estimated in 1996 to comprise some 22,000 individuals (Robertson 2003). The largest great spotted kiwi population is in Northwest Nelson, between Golden Bay and the Buller River, which was estimated to comprise some 10,000 – 11,000 individuals in the north, and some 2,000 – 3,000 individuals in the south. The next largest population is in the Paparoa Ranges south of the Buller River. This population was estimated to comprise some 6,300 individuals during the 1990s (McLennan and McCann 2002). The Buller River flows between the southern Northwest Nelson birds and the Paparoa Ranges; and it is generally considered that this voluminous river operates as a barrier between the populations. The smallest great spotted kiwi population is the Arthurs Pass - Hurunui population straddling the Southern Alps. This population was estimated to comprise about 3,000 individuals (McLennan and McCann 2002).

The historic and prehistoric distribution of great spotted kiwi is not well described. The historical record of great spotted kiwi distribution is sparse, and it is not always clear which kiwi species is being referred to. The fossil record of great spotted kiwi distribution has not been reviewed, and the correct identification of great spotted kiwi bones is difficult because there is considerable overlap in size between great spotted kiwi bones and brown kiwi bones, and there are no apparent qualitative differences between them (Worthy and Holdaway, 2002.). Although large kiwi bones (i.e. larger than little spotted kiwi) are common in the cave deposits of western and northern South Island, only some (notably all those from sub-alpine sites on Mount Arthur and Mount Owen) are outside the known size range for brown kiwi bones, and are thus probably great spotted kiwi bones (Worthy and Holdaway, 2002).

The great spotted kiwi is classified as a category 5 (gradual decline) chronically threatened species (Hitchmough 2002). This conservation ranking is assigned to moderate to large populations experiencing a small to moderate rate of decline. Qualifiers relating to the great spotted kiwi conservation ranking are HI (human induced) and RF (recruitment failure). The main agent of decline is likely to be stoats, which prey on kiwi chicks weighing less than 1000 grams. Predation by stoats is known to seriously impact on recruitment of juvenile brown kiwi, and there is no reason to suppose that great spotted kiwi chicks could resist stoat attacks. Very few great spotted kiwi chicks have been encountered by kiwi workers. Stoats are widespread in the South Island, but may not be abundant in the western uplands where great spotted kiwi are most common. Known threats to adult kiwi include dogs, possum traps, motor vehicles and vegetation clearance.

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[1] Great spotted kiwi have been recorded on a range of land environments, as defined in the Ministry for the Environment and Landcare Research "Land Environments of New Zealand" (LENZ) classification system. Great spotted kiwi have been recorded on Level II Land Environments E4, F1, F5, H1, K1, M1, M2, O1, O2, O3, P1, P2, P3, P5, P6 R1 (Source: kiwi records from Department of Conservation "Bioweb - casual observations" database; LENZ analysis, Geraldine Moore, Department of Conservation Nelson). The Bioweb data is only a subset of all great spotted kiwi distribution records, and great spotted kiwi are likely to be found on a number of additional land environments.

In the 1990s McLennan and McCann's work suggested that there may be upland refugia where great spotted kiwi densities are relatively stable, but that great spotted kiwi are most likely in decline in lowland areas (McLennan and McCann 1991; McLennan and McCann 2002). This model has found acceptance amongst kiwi workers, and monitoring in the Saxon study area on the Gouland Downs (an upland area) has shown that the local great spotted kiwi density is relatively stable, and that there has been some population turnover and recruitment (Hugh Robertson pers. comm.). While great spotted kiwi populations may be stable in some upland areas, there is little known about rates of decline across the whole range of the species.

There are no conservation programmes focussed specifically on protecting great spotted kiwi; however great spotted kiwi are offered a level of protection in the Hurunui Mainland Island (Southern Alps population); and forthcoming Operation Ark predator control projects may also benefit the Southern Alps population of great spotted kiwi. From 1997 to 2000 the Department of Conservation's Hokitika Area Office attempted a pilot study to determine the outcomes of nine apparent great spotted kiwi breeding attempts in the Taramakau Valley (Southern Alps population). Improvements were made to monitoring methods during the course of the study, but the most optimistic result from the study was that no more than one third of the potential breeding opportunities could have resulted in a chick being hatched. No information was gathered about chick and juvenile survival, which are the most vulnerable stages of the life cycle (Eastwood 2002).

5.1.2 Historical Distribution of Kiwi in Relation to RNRP

Kiwi have been missing from the vicinity of the RNRP recovery area for some decades, and the RNRP translocation team has found no reliable historic references to kiwi at Lake Rotoiti. In October 2001 David Butler wrote a paper documenting historical records of kiwi distribution in the vicinity of present day Nelson Lakes National Park surrounding districts. Butler concluded that Nelson Lakes is within the previous range of little spotted kiwi, and that little spotted kiwi would be a candidate for reintroduction to the RNRP recovery area. Large kiwi were also present between Lakes Rotoiti and Rotoroa in historical times, with the most useful description being of "large grey kiwis – often seen in daylight" in the Buller/Glenhope area in the 1920s. It seems likely that this is a reference to great spotted kiwi. Sub-fossil kiwi bones have been found in a deposit on the Red Hills, fourteen kilometres north-east of St Arnaud. The deposit included bones of little spotted kiwi and those of a larger kiwi. The larger bones have not been DNA tested, and could belong to either brown kiwi or great spotted kiwi. No other sub-fossil bone deposits have been found near the RNRP recovery area. The advice of one palaeontologist was that three kiwi taxa are likely to have been present about present-day Nelson Lakes National Park in prehistoric times: little spotted kiwi, great spotted kiwi, and a species of brown kiwi (Trevor Worthy pers. comm. to Dave Butler). In modern times, great spotted kiwi is the species that can be found closest to the RNRP recovery area, some 50km to the west.

5.1.3 Reasons for Undertaking a Great Spotted Kiwi Translocation to RNRP Mainland Island

One of the RNRP's key restoration objectives is to reintroduce recently depleted species. The RNRP strategic plan identifies several avian taxa including kiwi as candidates for reintroduction. The first transfer of great spotted kiwi to RNRP is a milestone in the project's history, as this is the first attempt at reintroducing a species into the RNRP recovery area. Kiwi almost constitute a guild of their own (Worthy and Holdaway 2002); and returning kiwi to RNRP is a step towards restoring ecosystem functions and processes that were lost as a result of pest pressures and localized extinctions in honeydew beech forests.

The long-term goal for kiwi recovery is to maintain and, where possible, enhance the current abundance, distribution and genetic diversity of kiwi (Robertson 2003). The translocation of great spotted kiwi to the RNRP recovery area will, if successful, contribute to achieving this goal by increasing the distribution of great spotted kiwi within the species' likely former range. The establishment of a great spotted kiwi population within the RNRP recovery area would offer a greater level of security to the species by bringing a great spotted kiwi population under sustained conservation management.

The current attempt at translocating great spotted kiwi is ground-breaking because there are no documented accounts of great spotted kiwi translocations into the wild, and there is no existing best practice method for establishing new populations. The results of this translocation can contribute to the development of a best practice method for establishing new great spotted kiwi populations. Great spotted kiwi are relatively abundant at the present time, but current abundance is not a guarantee of future abundance. While translocation is not critical to great spotted kiwi conservation in the short term, it may become an important technique for conserving the species in the future. As areas within the former range of great spotted kiwi are brought under sustained conservation management, it may become increasingly important to establish great spotted kiwi populations in those areas, particularly if great spotted kiwi populations decline in unmanaged areas.

The establishment of a great spotted kiwi population within the RNRP mainland island is also expected to benefit great spotted kiwi conservation through research, education and advocacy. If a population is successfully established within the RNRP mainland island, this will be the most accessible great spotted kiwi population under sustained conservation management. This accessibility will enable the population to be regularly monitored in great detail. The RNRP translocation team aspires to make a substantial contribution to knowledge about great spotted kiwi breeding biology, management requirements and the application of management techniques. The Rotoiti Nature Recovery Project may also prove to have an important role as a provider of education opportunities for people and groups interested in great spotted kiwi; and may adopt a regional role in advocating for kiwi conservation in general.

All of the benefits that may accrue from this translocation are only possible because of RNRP's restoration goal. At the present time, great spotted kiwi are not regarded as sufficiently threatened to receive single-species conservation effort, and there are no other great spotted kiwi populations currently under intensive conservation management. While the RNRP translocation team cannot predict what the management requirements for great spotted kiwi populations will be in the future, the team does predict that some of the knowledge gained from the current great spotted kiwi translocation will be applicable.

5.1.4 Previous Attempts at Establishing New Kiwi Populations

The RNRP translocation team has found no documented accounts of wild-to-wild great spotted kiwi translocations being undertaken in the past, although seven pairs transferred from Nelson to Little Barrier Island in 1915 failed to establish (Heather and Robertson 1996).

A series of wild-to-wild translocations of 39 North Island brown kiwi during the early 1980s, from Northland to the northern Waitakere Ranges west of Auckland, apparently failed to establish a population (MacMillan 1990). The translocated kiwi were not radio-tagged and the fate of the translocated birds is not known.

Six captive-reared North Island brown kiwi were released into forest adjacent to Mount Bruce National Wildlife Centre, Wairarapa in December 2003. One of the kiwi died as a result of misadventure in February 2004, but the remaining five have remained near the release area.

Boundary Stream mainland island has established a founder population of more than twenty North Island brown kiwi in a mainland island area using juvenile kiwi hatched from eggs collected in the Kaweka Ranges. (Mainland Island Hui draft minutes 2004). The collection and hatching of kiwi eggs, and raising chicks in predator-free environments - known as operation nest egg (ONE) - has been used to increase production and recruitment of brown kiwi, and is generally used to supplement existing populations. ONE has not been trialled on great spotted kiwi.

5.1.5 Choice of Source Population, and Development of the Translocation Proposal

In November 2001 the RNRP translocation team introduced the idea of a kiwi translocation to a meeting of kiwi workers and Kiwi Recovery Group members at St Arnaud. The RNRP translocation team had not yet determined the most appropriate kiwi species to reintroduce into the RNRP recovery area, although it had considered that little spotted kiwi and great spotted kiwi were possible candidates. The Kiwi Recovery Group advised the RNRP translocation team that a great spotted kiwi translocation would be supported over a little spotted kiwi translocation, firstly because great spotted kiwi were receiving no intensive management anywhere; and secondly because little spotted kiwi are vulnerable to stoats at adult weights, whereas adult great spotted kiwi would be more likely to resist predation if the level of stoat control within the RNRP recovery area was insufficient to allow successful kiwi breeding in the first instance.

The RNRP translocation team considered that a wild-to-wild translocation of adult great spotted kiwi would be the most direct and potentially cost-effective method to attempt in the first instance. There is only a very small captive population of great spotted kiwi, and it would not be currently possible to establish a great spotted kiwi population from captive sources. Although ONE had been used to procure kiwi chicks to establish a founder population of North Island brown kiwi at Boundary Stream mainland island, ONE has not been attempted with great spotted kiwi. The RNRP translocation team considered that the lower annual productivity of great spotted kiwi and the species' flightiness at the nest would most likely mean that ONE would be difficult to apply to great spotted kiwi, and that attempting to use ONE to establish a great spotted kiwi population would be experimental and relatively resource-intensive, with no guarantee of success. A wild-to-wild translocation of adult great spotted kiwi would also be experimental and involve a level of risk, but was considered to potentially be a less complicated and more cost-effective method than ONE.

Between November 2001 and March 2003 Paul Gasson wrote a draft operational plan to transfer four or five pairs of adult great spotted kiwi to the RNRP recovery area. The plan aimed to collect, transfer and release all four or five pairs of kiwi in as short a timeframe as practicable. This would maximise the chances of social contacts between pairs being formed or maintained, which would hopefully encourage the kiwi to remain together and within the RNRP recovery area rather than dispersing into unmanaged areas. The first draft of the operational plan was presented at a kiwi practitioners' hui at Rotorua on 24 March 2003, where it was reviewed by kiwi workers and Kiwi Recovery Group members.

Between March 2003 and February 2004 the RNRP translocation team produced three further drafts of the operational plan, and circulated various drafts amongst Department of Conservation Conservancy offices and iwi within the current range of great spotted kiwi. A paper was also produced to facilitate selection of the source location: "Options for sourcing a founder population of great spotted kiwi (*Apteryx haastii* / Roroa) for translocation to the Rotoiti Nature Recovery Project". The options paper reviewed the results of Department of Conservation discussions to January 2004, and identified a number of source location criteria that the RNRP translocation team regarded as either essential or desirable. A number of sites that had been suggested as potential source locations during the course of Department of Conservation discussions were assessed against those criteria.

The RNRP translocation team favoured taking the kiwi from a high-density upland site rather than a marginal site. Firstly, the impact on the viability of the local population would be less severe than if the birds were taken from a marginal site; secondly the collection of four or five pairs in the short timeframe specified in the operational plan would be much more practicable in an area of high kiwi density. The options paper specified that the source location must support a moderate to high kiwi density (greater than two pairs of kiwi per square kilometre) and must have the capacity to continue to support kiwi after the removal of four or five pairs. Other characteristics considered to be essential were:

- Suitable terrain for catching kiwi (flat or moderately sloped country with some open areas).
- A buffer distance from public huts and tramping tracks to preserve visitor experience.
- A buffer distance from established kiwi monitoring or study sites to avoid impacting on existing programmes.

The sites that appeared most likely to sustain a take of eight to ten great spotted kiwi were upland sites in northwest Nelson. The options paper concluded:

"The West Coast/Tai Poutini Conservancy – while supportive of the operational plan – would prefer that the initial translocation involved great spotted kiwi sourced from within Nelson/Marlborough Conservancy. The Gouland Downs area is the best known high-density great spotted kiwi site in Nelson/Marlborough Conservancy, although particular care would need to be taken to avoid impacting on visitor experience and the existing great spotted kiwi study programmes. Subject to consultation with Department of Conservation and iwi stakeholders, the north-eastern Gouland Downs, in the vicinity of Corkscrew Creek, is the preferred option from the RNRP translocation team's perspective."

Some 800ha of tussock-covered down lands and bush-covered slopes about Corkscrew Creek, north of the Heaphy Track, appeared particularly suitable for a great spotted kiwi collection operation.

The Maori authority (manawhenua) for Golden Bay and the north-eastern Gouland Downs is Manawhenua ki Mohua. During February 2004 representatives from the RNRP translocation team met with the Manawhenua ki Mohua management committee to discuss the translocation proposal. The management committee indicated support for the translocation of four or five pairs of great spotted kiwi to the RNRP recovery area, and discussed a range of ways that the mana and kaitiatitanga of Manawhenua ki Mohua could be recognised through the translocation. Following that meeting Manwhenua ki Mohua wrote to the Department of Conservation in support of the proposed translocation, and identifying the role that Manawhenua ki Mohua would have with respect to the translocation. Manawhenua ki Mohua provided the names for the individual kiwi that were transferred. The individual names (Mohua, Onetahua, Te Matau, Tai Tapu, Kahurangi, Awaroa, Takaka, Rameka, Tata and Wainui) are drawn from place names within the rohe of Manawhenua ki Mohua.

During February and March 2004 the RNRP translocation team also consulted with Iwi who have an interest in the RNRP recovery area. The translocation proposal was circulated to Ngati Apa, Ngati Rarua, Te Ati Awa, Ngati Tama, Ngati Koata, Ngati Toa Rangatira ki Manawhenua, Ngati Kuia and Rangitane. RNRP translocation team members offered to visit representatives from each Iwi to present and discuss the translocation proposal. Representatives from all but the latter two accepted the offer. None of the consulted Iwi objected to the proposed translocation. Although there was a small amount of concern expressed at the uncertainty of the outcome for the translocated kiwi, and one group sought assurance that there was sufficient funding for the project, there was substantial support for the RNRPs' goals, and for the translocation to proceed.

The proposed operational plan, the site options paper and the results of consultation were all used to support a formal translocation proposal, which was produced and assessed in terms of the Department of Conservation's Standard Operating Procedure (SOP) for the Translocation of New Zealand's Indigenous Terrestrial Flora and Fauna. In March 2004 the Department of Conservation's Nelson/Marlborough Conservator approved the RNRP translocation team's proposal to translocate four or five pair of great spotted kiwi from the Gouland Downs to the RNRP recovery area.

5.2 ECOLOGICAL IMPACT AND RISK ASSESSMENTS

5.2.1 Impact on Viability of the Source Population

Before deciding to take great spotted kiwi from the wild, the RNRP translocation team had a responsibility to consider the potential impact on the source population. Ideally great spotted kiwi would be sourced at a sustainable rate, where loss of individuals from the population is balanced by recruitment of new individuals into the population. Any take that threatened the source population's viability would be unacceptable.

Although great spotted kiwi populations are considered to be gradually declining across their range, great spotted kiwi population monitoring in the Saxon study area has shown that the kiwi population is reasonably stable on the Gouland Downs. The cool, wet environment of the Saxon study area is considered to support relatively low stoat numbers except perhaps in beech mast years (MacLennan and McCann 1991); and periodic large-scale possum control operations, using aerially broadcast 1080 poison, may enhance kiwi recruitment on the Gouland Downs by killing predators that scavenge dead possums (secondary poisoning). There appears to be a modest level of great spotted kiwi population turnover, indicating that a low level of adult mortality is (or almost is) balanced by a low level of recruitment. If the great spotted kiwi population is self-sustaining on the Gouland Downs, then the removal of some kiwi from the source area may in time be balanced by recruitment of young kiwi into the vacant territories, and a low level of take may be sustainable. Not enough is known about juvenile great spotted kiwi recruitment and survival to guarantee that this would be the case, but it is a possibility.

Alternatively, it is possible (but not considered inevitable) that predation of kiwi chicks by stoats may be a significant pressure on great spotted kiwi inhabiting the Gouland Downs, and that there may be insufficient recruitment of young kiwi into the population to replace any loss of adult kiwi. If this level of predation is occurring on the Gouland Downs, then the local great spotted kiwi population will decline without conservation management: the ongoing viability and extent of the northwest Nelson great spotted kiwi population would be determined by the effectiveness and extent of predator control to be undertaken in future years. In this context, the loss of four or five pairs through translocation would contribute to the attrition of the northwest Nelson great spotted kiwi population.

The northwest Nelson great spotted kiwi population comprises some thousands of birds and, in numeric terms, the loss of ten great spotted kiwi from the population would be relatively minor. As a geographical component of Northwest Nelson, the Gouland Downs support a high density of great spotted kiwi (about four pairs per square kilometre (McLennan and McCann 1991) and the removal of ten birds from the source area will leave some hundreds of birds remaining on the Gouland Downs. The RNRP translocation team concluded that the translocation of four or five pairs of great spotted kiwi from the Gouland Downs in 2004 would be of little or no consequence to the Northwest Nelson great spotted kiwi population at a functional level, and would not impact on the viability of a future *in situ* great spotted kiwi management project at the Gouland Downs. This argument was accepted by those who granted the translocation approval.

5.2.2 Risk of Translocation Failure Resulting from Incomplete Ecological Knowledge

The Department of Conservation manages a range of human-induced threats and ecological pests within the RNRP recovery area, including the agents of decline and threats to kiwi identified in the Kiwi Recovery Plan 1996-2006. Nevertheless, incomplete knowledge about great spotted kiwi ecology and vulnerability to predators meant that some outcomes of the translocation could not be accurately predicted, and the translocation would involve an unknown level of ecological risk.

The RNRP translocation team identified two main areas of ecological uncertainty facing the establishment of a founder population of great spotted kiwi in the RNRP recovery area:

- The potential for adult kiwi dispersal from the recovery area was unknown
- The vulnerability of juvenile great spotted kiwi to predation within the RNRP recovery area was unknown.

High levels of dispersal or predation could prevent a founder population of great spotted kiwi from establishing in the RNRP recovery area.

Some stakeholders also questioned the capacity of the habitats in the RNRP recovery area to support a great spotted kiwi population, thus great spotted kiwi habitat requirements and food availability in RNRP are discussed below. The risk of pathogen transfer is also discussed below, as the RNRP translocation team had reason to deviate from the ideal model of health screening and quarantining individuals prior to releasing them at a new site.

5.2.3 Dispersal of Great Spotted Kiwi from the RNRP Recovery Area

The RNRP translocation team considered there was a risk that great spotted kiwi might disperse from the recovery area. Any great spotted kiwi that dispersed from the recovery area might not be effectively monitored or managed by RNRP field staff, and would not benefit from intensive pest control in the RNRP recovery area. There has been no previous monitoring of great spotted kiwi dispersal from a release site; hence the translocation team had no ability to estimate the level of risk involved or to predict the pattern of dispersal. Opinions of different kiwi workers varied on whether the kiwi would remain within the recovery area once released.

The RNRP translocation team proposed that the dispersal of kiwi from the recovery area might be limited through releasing a substantial group of kiwi in a short timeframe. This would maximise the chances of social contacts between kiwi being formed or maintained, which would hopefully encourage the kiwi to remain together within the RNRP recovery area rather than dispersing into unmanaged areas. The operational plan aimed to release four or five pairs of great spotted kiwi into the recovery area within a period not exceeding seven days.

The operational plan also specified a procedure for managing great spotted kiwi dispersal from the RNRP recovery area. The procedure was designed to balance the advantages of non-intervention (accumulation of additional dispersal data, and minimal handling of wild birds) against the obvious benefits of returning/relocating dispersed kiwi to an appropriate secure location. Kiwi dispersal would be monitored up to certain temporal and geographical limits, whereupon the dispersing kiwi would be relocated. After ten months of monitoring, the RNRP translocation team would relocate any kiwi that had failed to settle into the RNRP recovery area or certain other protected areas. Relocation would be into the RNRP recovery area if a critical number of kiwi were remaining within the RNRP recovery area or the adjacent Friends of Rotoiti predator control area. Otherwise relocation would be to an alternative secure site, to be decided in consultation with the Kiwi Recovery Group and iwi stakeholders. At any time, any kiwi that dispersed further than the Department of Conservation's St Arnaud Area boundary would be relocated.

The RNRP translocation team considered that if the translocated kiwi dispersed over substantial distances and in different directions, monitoring and recapture of all the kiwi could be a slow and difficult process. It was conceivable that at ten months after the release, the translocation team would be searching large areas for kiwi transmitter signals, perhaps using an aircraft to locate them. It was also conceivable that in a worst-case scenario, kiwi transmitter batteries could be exhausted before all of the kiwi were found and relocated in accordance with the procedure for managing dispersal. Therefore the team decided to use transmitters programmed with a "duty cycle" to extend the transmitter battery life. The transmitters would be active for twenty hours each day and inactive for four hours from 1:00am to 05:00am (NZ standard time). The duty-cycle and a pulse-rate of 30 pulses per minute would extend the battery life out to two years. The transmitters can be re-programmed to be active full-time if this becomes necessary in the future.

While the RNRP translocation team considered that there was an un-quantified risk of great spotted kiwi dispersing from the release area, it was considered appropriate to take that risk in order to address that lack of knowledge. Should dispersal prove to be a real phenomenon, a procedure was in place to manage the consequences.

5.2.4 Adequacy of Predator Control

Adult great spotted kiwi are likely to be able to resist attacks from stoats and cats due to their large body size, but great spotted kiwi chicks may be vulnerable to predation by stoats and cats. A high level of kiwi chick predation could result in failure of a founder population to establish in the RNRP recovery area. Sustained predator control is undertaken across the RNRP recovery area; however the RNRP translocation team cannot accurately predict the level of great spotted kiwi chick survival and recruitment that would occur under the current predator control regime.

Mustelid monitoring (tunnel tracking) has shown that mustelid tracking rates are significantly lower within the RNRP recovery area than in the non-treatment area at Lake Rotoroa (Matt Maitland pers. comm.). Kaka nesting success is being used as an outcome monitoring measure to demonstrate the success of mustelid control in the recovery area; and this has shown that kaka breeding attempts have a significantly greater chance of succeeding within the RNRP recovery area than outside the recovery area (Matt Maitland pers. comm.). It appears possible that the mustelid control regime within the RNRP recovery area is already sufficient to protect kiwi chicks across more than 5000ha during non-beech mast years. The predator control regime would be more likely to fail to protect kiwi chicks in beech mast years when predator numbers are higher.

The RNRP translocation team considered that there are options for increasing the level of protection for great spotted kiwi chicks either within RNRP, or in a crèche environment. In the short term, creching chicks in a secure enclosure or on an island is likely to be the most practical technique for protecting great spotted kiwi chicks and enhancing founder population growth. Increasing the level of mustelid control in the RNRP recovery area would be disadvantageous in the short term, because it would most likely impact on the current outcome monitoring programme. Kaka do not breed every year; and in order to test and review the success of the current predator control regime, RNRP staff are likely to have to continue to monitor at least 15 more kaka breeding attempts in future breeding seasons (Genevieve Taylor pers. comm.).

If the current predator control regime proves inadequate to protect great spotted kiwi chicks, then it is likely that in the medium or long term RNRP would adopt superior predator control techniques, following the collection and review of a sufficient body of kaka and kiwi outcome monitoring data. It is also feasible that in the future, mustelid control could be intensified across an additional and contiguous 5000ha in the Friends of Rotoiti mustelid control area on the eastern side of the St Arnaud Range, or that additional areas could be brought under more intensive predator control.

While there is a risk that some kiwi chicks may be predated within the RNRP recovery area in the course of kaka and kiwi outcome monitoring, the RNRP translocation team concluded that predation is unlikely to seriously impact on the establishment of a founder population of great spotted kiwi in the RNRP recovery area. If the risk of kiwi chick predation materialises, the project will be able to respond with an appropriate chick protection or predator control method for enhancing chick survival and founder population establishment.

5.2.5 Habitat Requirements and Food Availability

Moving a species into unsuitable or low-quality habitat may result in the species failing to establish. By referring to the Land Environments of New Zealand classification system, the translocation team saw that the environmental characteristics of the RNRP recovery area fall within the range of environments currently occupied by great spotted kiwi[2].

The historical and prehistoric records suggest that at least one large kiwi species was present in the districts surrounding RNRP, but the evidence is not strong enough to provide certainty that great spotted kiwi did or can thrive in the RNRP recovery area. While the RNRP translocation team considered that the environmental conditions in the RNRP recovery area would be suitable for great spotted kiwi, there was some uncertainty about how well the translocated birds would adapt to a new set of

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[2] Level IV Land Environments E4.2a, P1.1b, P1.2d and P2.1a occur within the RNRP recovery area, and environments K1.1c and P5.2a occur on public conservation land immediately adjacent to the recovery area. These level IV land environments are used by great spotted kiwi elsewhere in the South Island (Source: Kiwi records from Department of Conservation “Bioweb - casual observations” database; LENZ analysis, Geraldine Moore, Department of Conservation Nelson)

circumstances. The team had observed a range of potential prey items in RNRP[3], but considered that the individual birds' capacity to locate and utilise the available prey items was beyond the team's capacity to predict.

The RNRP translocation team canvassed the opinions of several kiwi experts, and the prevailing view was that as a family, kiwi are generalists within their guild. Kiwi have demonstrated an ability to cope with substantial changes in environment and food resources: for example, Okarito brown kiwi / Rowi are routinely transferred between Okarito Forest on the South Island's West Coast and Motuara Island in the Marlborough Sounds as part of the Rowi recovery programme. A preliminary study of translocated little spotted kiwi (*Apteryx owenii*) suggested that managers need to give minimal weight to soil fauna comparison when determining the translocation suitability of new sites (Girardet 2000). Great spotted kiwi are known to utilize a variety of invertebrate and vegetable food resources, and there is no evidence that great spotted kiwi would be less adaptable than brown kiwi or little spotted kiwi.

While it appeared reasonably likely that great spotted kiwi would be able to live and exploit food resources within the RNRP recovery area, the team considered it most likely that birds collected from a similar physical environment would adapt to the translocation more readily than birds collected from a substantially different environment. Great spotted kiwi sourced from upland areas would have experience with snow and heavy frost, whereas lowland birds may find the montane and alpine conditions in the RNRP recovery area more stressful.

The RNRP translocation team concluded that there was a very low risk that the RNRP recovery area might be unsuitable habitat for great spotted kiwi, and that there was a low level of risk that the translocated kiwi would fail to successfully exploit the food resources in the RNRP recovery area. The most direct way to answer questions about habitat suitability and great spotted kiwis' ability to adapt to the habitat would be to attempt an experimental translocation. This would either give further support to the prevailing view that kiwi are adaptable generalists within their guild; or would conversely provide new evidence to question that view.

5.2.6 Pathogen Transfer

There is a risk of accidentally transferring microbial disease whenever wildlife is transferred from one location to another. The consequences of transferring kiwi infected with *Salmonella*, *Yersinia* or *Coccidia* to the RNRP recovery area could be severe for a small founder population of great spotted kiwi. Small populations are inherently vulnerable to stochastic events such as disease, and an outbreak of disease could result in the failure of the translocation.

Diseases can be identified and controlled by undertaking preliminary health screening and quarantine. Health screening would involve taking diagnostic samples from individual kiwi prior to the transfer, and using the results of the samples to determine which individuals to accept or reject for translocation. Quarantine would involve collecting and holding the translocated birds in special facilities for a predetermined length of time, until they can be tested and declared free of disease.

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[3] Pill millipedes, spiders, weta, amphipods, cicada, beetles and cockroaches have all been observed in the RNRP recovery area.

The RNRP translocation team considered that preliminary health screening at the source location would most likely impede the subsequent collection and transfer operation. Great spotted kiwi can become flighty as a result of capture and handling, and some individuals - including radio-tagged kiwi - quickly learn to avoid recapture. It was considered important that the collection/transfer/release period be as short as possible, in order to limit kiwi dispersal from the recovery area. The RNRP translocation team decided to avoid handling any kiwi at the source location prior to the transfer, in order to increase the likelihood of the collection operation resulting in the swift procurement and transfer of four or five pair of great spotted kiwi.

The RNRP translocation team also estimated that the benefits of quarantining the kiwi prior to their release in the RNRP recovery area would most likely be outweighed by the costs. Special facilities would be required to suitably contain and provide for all ten great spotted kiwi in captivity, and the effect of quarantine on the kiwi could not be accurately predicted. Quarantine is a useful procedure for controlling the movement of disease from one population to another, but the RNRP recovery area did not yet contain any kiwi that could be adversely affected by disease. Quarantine will be a more important consideration with respect to subsequent translocations if kiwi become established within the RNRP recovery area.

Rather than identifying and controlling disease in kiwi prior to the transfer, the RNRP team decided that it would be reasonable to accept some risk of accidentally transferring diseased kiwi to the RNRP recovery area, if it could be confirmed that the level of risk was low. The health of transferred individuals could also be verified by diagnostic sampling. Diagnostic sampling would not prevent diseased individuals from being accidentally transferred into the RNRP recovery area, but the results could be used to identify disease in order that it can be managed post-transfer.

In order to confirm that the likelihood of accidentally collecting and transferring diseased kiwi was low, the RNRP translocation team referred to recent health data from a nearby (approximately seven kilometres distant) representative sample of birds from the same contiguous great spotted kiwi population. During March 2004 a team of Department of Conservation kiwi workers collected great spotted kiwi population and health data from the Saxon study area on the north-western Gouland Downs. No pathogens were detected in any of the blood smears or cloacal swab collected during the March 2004 operation (Hugh Robertson pers. comm.). The RNRP translocation team considered that the health of great spotted kiwi at the Saxon study area would be representative of great spotted kiwi health at Corkscrew Creek, and concluded that there was only a low risk of accidentally collecting and transferring diseased kiwi from the latter site.

5.2.7 Risk vs. Benefit Statement

The RNRP translocation team concluded that the minor impact that the proposed translocation would have on the source population of great spotted kiwi would be an acceptable price to pay for the knowledge gains expected to result from the translocation. Regardless of the success or failure of great spotted kiwi to establish within the RNRP recovery area, the translocation would reveal new information about great spotted dispersal from a release site, and possibly much more besides.

The successful establishment of a great spotted kiwi population within the RNRP recovery area would have substantial conservation gains, including the ecological enrichment of a restoration site, increased knowledge about great spotted kiwi, and increased security for the species. The RNRP translocation team acknowledged that there was a level of risk that great spotted kiwi would fail to establish within the RNRP recovery area, but the team concluded that the potential benefits of the translocation justified some risk taking.

5.2.8 Pre-transfer Kiwi Surveys at Source Area

Prior to the collection operation, kiwi call counts were used to determine relative abundance (call rate) and distribution of kiwi within and adjacent to the Corkscrew Creek source area. The call rate/relative abundance result will be used as a baseline against which to measure the great spotted kiwi population's ability to repopulate the source area. Changes in the distribution of great spotted kiwi within the source area can also be used as a measure of kiwi repopulation of the source area; but the primary reason for determining the distribution of great spotted kiwi in the source area was to identify potential kiwi capture sites.

5.2.9 Call Counts

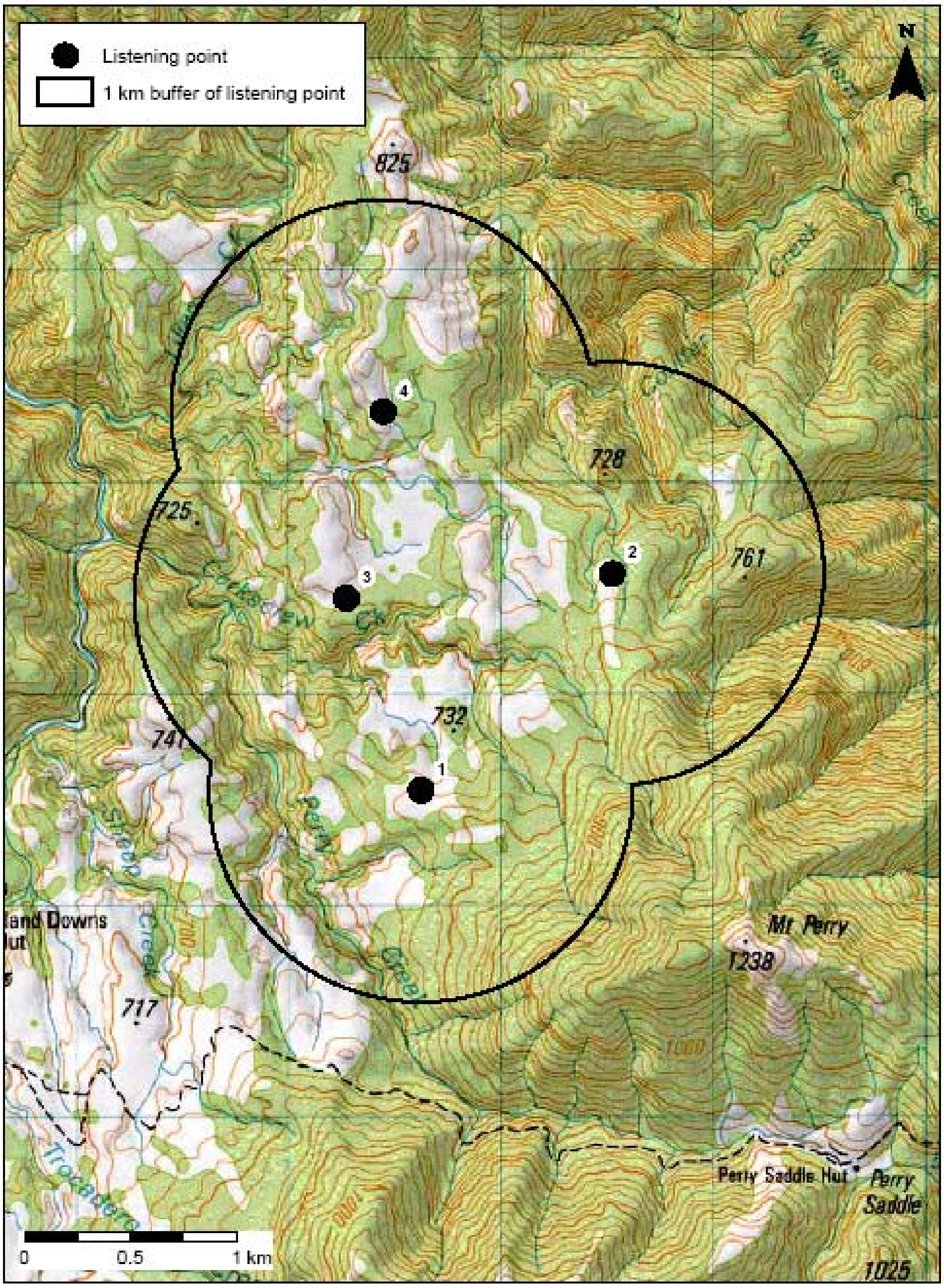
Kiwi call rates (calls/hour) can be used to determine the relative abundance of kiwi, but cannot be used to estimate the absolute numbers of kiwi present, because not all birds call. There is a good correlation between kiwi call rates and kiwi density in high density populations, but the relationship is not as good at low population densities (Robertson et al 2003).

Four listening stations were established within the Corkscrew Creek source area. The listening stations were selected to provide optimum coverage of the area that kiwi would be collected from. Where possible, the listening stations were established on high points where there were few impediments to the passage of sound reaching the listening station. The four listening stations define an irregular quadrangle with a long axis (approximately north-south) of 1.84 km and a short axis (approximately east-west) of 1.29km. The stations were separated by an average distance of 1.3km (range, 920 metres to 1.84km). Weather conditions have a strong influence on the distances and directions that kiwi calls can be detected from. Kiwi can be heard calling up to one and a half kilometres away in ideal listening conditions (Robertson et al. 2003) and the area effectively surveyed would vary considerably from night to night, depending on conditions. Assuming that all calls within 1km of each listening station would be heard, the area effectively surveyed would be approximately 853 hectares. Taking into account the limitations imposed by terrain, such as incised gullies and steep slopes facing away from the listening stations, the area effectively surveyed is more likely to be about 500 hectares. There was considerable overlap of the one kilometre putative listening radiuses around each listening point. (Figure 16)

The survey effort was divided unequally between April and May: Seventeen and a half hours of survey effort occurred over three nights in the week preceding the new moon in April; and three hours of survey was undertaken on 10 May, nine days prior to the new moon. The intended sampling method was for a surveyor to be stationed at each of the four listening stations for a two hour period on each of three consecutive nights in April. Several imperatives meant that the survey could not be undertaken in such a tidy fashion. Training requirements and the need for route marking to kiwi listening stations produced time constraints during the April survey. The first night of the April survey was used to demonstrate the call count method to survey team members; and counts only occurred at one listening station, for a period of one and a half hours. Each of the other three listening stations was surveyed for an additional hour in May, to more evenly distribute the amount of effort spent at each listening station. The second and third listening nights in April went according to plan, and each listening station received two hours of survey effort on each night. Survey team members were trained and judged competent in identification of male and female great spotted kiwi calls, in taking bearings using a magnetic compass, and in recording kiwi call data onto Kiwi Call Scheme cards. Each team member only spent one night at a given listening station, so that each listening station was eventually surveyed by three different people.

Call counts commenced no earlier than one hour after sunset, and largely occurred within the first four hours of darkness. All team members' wristwatches were synchronised, and team members were in VHF radio contact, but radios were turned off during the counts. By mutual agreement on the second night of the April survey, team members had a ten minute break between the first and second hours of counting to allow time for comfort and refreshments; however one team member misunderstood the agreement, and continued counting through the first and second hours without a break, thus finishing ten minutes earlier than the others. This would not introduce any bias into the survey, as each count from each listening station is effectively an independent sample. Surveyors used standard Kiwi Call Scheme cards to record the sex of each kiwi heard, time of the call, magnetic bearing of the call in relation to the listening station, and estimated distance between the calling bird and the listening station. During the course of the survey period, a standard was adopted of recording the time that each kiwi call ended, but this was not specified until the May survey.

Figure 16 **Listening points and estimated coverage, Corkscrew Creek source area, 2004**



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

G/Projects/st arnaud/rnrp annual report 2004/fig 16 listening points

TABLE 20. KIWI CALL SURVEY RESULTS

DATE	SUNSET[1] (APPROX)	LISTENING STATION	LISTENING START TIME	LISTENING PERIOD	NUMBER OF KIWI CALLS	WIND/NOISE/COVERAGE
13 April 2004	17:53	1	20:30	1hr 30min.	12	Calm/none/wide
14 April 2004	17:51	1	19:00	2 hr	29	Calm/none/wide
14 April 2004	17:51	2	19:00	2hr	27	Light/none/wide
14 April 2004	17:51	3	19:00	2hr	15	Calm/none/medium
14 April 2004	17:51	4	19:00	2hr	33	Light/none/wide
15 April 2004	17:49	1	19:00	2hr	12	Moderate/slight/wide
15 April 2004	17:49	2	19:00	2hr	7	Moderate/slight/wide
15 April 2004	17:49	3	19:00	2hr	6	Strong/moderate/medium
15 April 2004	17:49	4	19:00	2hr	7	Strong/slight/edium
10 May 2004	17:17	2	21:00	1hr	4	Moderate/slight/medium
10 May 2004	17:17	3	21:00	1hr	9	Light/slight/medium
10 May 2004	17:17	4	21:00	1hr	0	Moderate/moderate/wide

[1] Sunset data estimated from Collins 2004 A42 Diary. Data available for 10 April, 17 April and 8 May.

The considerable overlap of the one kilometre putative listening radiuses around each listening station meant that some kiwi calls could be counted from more than one listening station. This overlap may have increased the accuracy of the result with respect to the source area, by reducing the effects of bias (e.g. observer bias or bias imposed by localised noise or topographical conditions). In effect, the overlapping areas were independently sampled from more than one listening station; and bias affecting one station may not have affected others. Overlapping listening radiuses may be beneficial in relatively small areas of particular interest such as the Corkscrew Creek source area; but there would be no benefits in unnecessarily overlapping listening radiuses when surveying larger areas for relative abundance of kiwi. The total number of kiwi calls heard from the listening stations (161 calls) was divided by the total amount of survey effort (20.5 hours) to give a call rate of 7.85 calls/hour.

5.2.10 Territory Mapping

Data from the call count survey was used to estimate the density and locations of kiwi territories within the Corkscrew Creek source area. Three different territory maps were drawn using data collected on 14 April (first and second hours mapped separately) and 15 April (first and second hours mapped together).

Kiwi calls heard during the period in question were plotted onto a topographical map. The magnetic bearing of each kiwi call was converted to a true bearing, and then drawn onto a topographical map as a vector originating from the relevant listening station. The length of the vector was scaled to the estimated distance of the call from the observer. At the end of the vector, the call was plotted as ♂ (male) or ♀ (female) depending on the type of call. Vectors were also labelled with the time at which the call was heard.

The data plotted on the resulting maps proved to be difficult to interpret. There were frequent cases of calls of a particular sex kiwi being heard from different listening stations during the same minute; but the spatial correspondence of the calls plotted on the maps was variable and it was often difficult to judge whether calls heard from different listening stations at the same time related to the same bird or to different birds. Poor spatial correspondence between calls heard at the same time could be an artefact of observer error in estimating the direction and/or distance of calls. It was suspected that observer error had lead to individual calls being plotted at more than one position on the map: effectively an overestimate in the number of individual calls heard during the survey.

In order to avoid overestimating the number of individual kiwi calls heard in the source area, the translocation team decided to give priority to time (rather than estimated location) of kiwi calls as the attribute that determined whether different records should be attributed to a single calling event. However, another possible source of error was that some observers may have registered slightly different times during one kiwi call sequence. A male great spotted kiwi call sequence usually comprises 13-21 whistles (McLennan and McCann 1991) and a call sequence is likely to span from a quarter to half a minute. Observers may have recorded a time at the beginning or end of a kiwi call sequence, or during the sequence. Greater accuracy in this respect would have improved the translocation team's ability to determine when calls heard by different observers should be attributed to the same calling event. This potential source of error was not recognised until after the April call counts. During the May call counts, observers registered the time at which kiwi calls ended, as this was a more specific time. The end of the call was chosen rather than the beginning, because it allows time for observers to recognise the call and consult their watches. Also, some observers may not recognise a distant kiwi call until it has been underway for a few seconds; whereas once a call is recognised it is often quite obvious when it ends.

For each call count period in question, a matrix was made, listing every single time (hour/minute/seconds) that a call was recorded, which listening stations(s) the call was registered at, and the sex of the kiwi call. Times were in descending chronological order in the left column; listening stations one to four headed columns two to five; and the sex (♂ or ♀) of every kiwi call was entered into the resulting matrix. Given that different observers may have assigned slightly different times to one call, those that were considered to be close enough in time to be the same call (i.e. not separated by more than a minute) were grouped together unless there was compelling evidence to suggest that there was more than one individual kiwi involved (e.g. different sexes were heard, two same sex calls originated from substantially different directions, or two same-sex calls were registered concurrently by one observer). Duets were useful in this analysis, as it was often very clear when different observers were hearing the same pair of kiwi calling. The resulting groupings enabled the translocation team to estimate a minimum number of individual calls of each sex that were heard during the period in question, without counting one call more than once.

By referring back to the maps of plotted call locations, the translocation team was able to estimate some approximate areas where calls originated from, and to assign each of the minimum number of individual calls heard to a spatial area. Some of the calls fell into apparent spatial clusters, and others were clearly outside those clusters. Territorial boundaries were postulated and drawn between the clusters and outliers, and three different territory maps were consequently drawn. The three maps suggested that there was a minimum of eight to ten different great spotted kiwi territories clustered within the approximately 500 hectares adequately surveyed around the four listening points. Several more distant territories were also identified.

5.3 TRANSFER OPERATION METHODS

5.3.1 Great Spotted Kiwi Collection Methods

The transfer operation was timed to occur outside the known breeding season for great spotted kiwi, in order to avoid unnecessary impact on breeding kiwi or their offspring. It was also considered that long autumn nights would benefit the translocated kiwi by providing increased feeding time within the RNRP recovery area. The collection period lasted for six days, from Thursday 13 May to Wednesday 19 May 2004, during which several consignments of kiwi were transferred to the RNRP recovery area. The first transfer was scheduled to coincide with a midday ceremony at St Arnaud on 15 May. In order to increase the likelihood of kiwi being available for transfer on the designated day, kiwi collection began about 42 hours prior to the scheduled transfer time.

Collection of great spotted kiwi involved a field team of up to ten people working within the source area during the collecting period. On some nights the field team divided into smaller catching teams, and there were up to three catching teams working concurrently. Catching teams varied in size from two to seven people. The catching teams maintained close radio contact during the catching operation, and planned each night of catching to ensure that the same numbers of male and female kiwi were collected.

The territory maps resulting from the call count survey were used to identify prospective kiwi catching areas. The preferred targets for collection were natural pairs of adult kiwi, but an adult male and female from different sites were acceptable. If both members of a natural pair were not captured on the same night, the field team artificially paired the available male and female kiwi into a compartmentalised transfer box, ready for transfer in the morning. The mates of dispatched birds were targeted for capture on subsequent nights. This approach meant that individual kiwi did not experience prolonged waits at base camp while their mates remained uncaught. It also meant that some natural pairs were artificially reconfigured.

Catching teams employed different kiwi catching methods, depending on the skills and experience of the teams (for an overview of best practice methods for catching kiwi, refer to Robertson et al 2003). Four certified kiwi dogs were on site, one of which was used for catching kiwi at night. The other three dogs were used to search for kiwi spoor or birds during the daytime.

5.3.2 Kiwi Processing: Measuring, Marking and Diagnostic Sample Collection

Once at base camp, kiwi were processed if skilled staff were present; otherwise processing was left until the morning when the full compliment of field staff were in camp. Processing involved weighing, measuring and marking the bird, and taking diagnostic samples. External health examinations were also undertaken. Birds were weighed before transmitters were fitted, and weights were expressed to the nearest ten grams. Bill length, tarsus width, tarsus length and tarsus depth were all measured to the nearest tenth of a millimetre.

Marking the kiwi involved radio-tagging each bird with a Sirtrack radio transmitter and leg-banding each bird with a numbered metal band. A unique colour combination of reflective adhesive tape was applied to each leg-band. The transmitters were programmed with a mortality mode: the normal pulse rate is 30 pulses per minute, but the rate changes to 60 pulses per minute if the transmitter is inactive for 24 hours. The transmitters also have a "duty cycle" (20 hr on/4 hr off) to conserve battery life. Each transmitter was set to be inactive from 01:00 am to 05:00 am NZ standard time.

Diagnostic samples were taken from each great spotted kiwi prior to the release. The results of the tests were used to verify the health of the individuals that had been transferred. Blood smears were prepared from great spotted kiwi blood collected at Corkscrew Creek base camp and at St Arnaud. The smears were examined by New Zealand Veterinary Pathology Limited, who reported on white blood cell counts, thrombocyte numbers and morphology, and red cell appearance and red cell parasites. Two whole blood samples were also processed by New Zealand Veterinary Pathology Limited. Capillary tubes of blood were collected and centrifuged to determine packed cell volume and total protein (serum protein) for each kiwi. One cloacal swab was taken from each great spotted kiwi before the bird was dispatched from Corkscrew Creek base camp, and some additional swabs were taken at St Arnaud. Faecal samples were collected from six transport containers (transfer boxes or canvas bags) for culture.

5.3.3 Kiwi Containment Methods

Kiwi were contained in transfer boxes at the Corkscrew Creek base camp. Each transfer box measured approximately 100cm long, 50cm wide and 45cm high, and an internal divider separated each box into two kiwi compartments measuring approximately 50cm x 50cm x 45cm. A ventilation opening (covered by gauze mesh and a ventilation cover) was cut into each of the three external walls of each compartment, and the compartments were lined with closed cell foam. The foam emitted a strong chemical smell when it arrived from the supplier, and the boxes required several days of airing and exposure to sunlight before the smell from the foam diminished. Each transfer box had a pair of lids which hinged on the back wall and latched shut at the front.

The procedure for placing a kiwi into a compartment required two people: one to observe and control the kiwi, and the other to lower and secure the lid. When the lid is nearly closed, the person observing and holding the kiwi withdraws the arm that is holding the bird, and effectively loses sight and control of the bird at the final moment of lowering the lid. Transfer boxes containing kiwi were stored under cover and off the ground in a portable PVC-covered bivouac during the night, but were moved to open shaded sites during the daytime.

In order to keep them hydrated, the first pair of kiwi – who were held for the longest period – were offered earthworms. Approximately one cup of worms was placed on the floor lining in a corner of each compartment on the night of capture, and a similar amount again the following day.

5.3.4 Kiwi Transportation Methods

Great spotted kiwi were transported from capture sites to the Corkscrew Creek base camp in canvas bags or cardboard pet boxes. Cardboard boxes were suitable for transporting kiwi over short distances, whereas bags were more convenient over longer distances and rougher terrain.

Each consignment of kiwi was flown from the Corkscrew Creek base camp directly to St Arnaud in a helicopter. The helicopter could comfortably carry two transfer boxes plus observers. The operational plan allowed for driving birds from the helicopter base near Wakefield to St Arnaud in order to reduce costs, but in practice the budget was able to cover the cost of flying directly to St Arnaud. The flight time from Corkscrew Creek base camp to St Arnaud was approximately 45 minutes. After being checked at St Arnaud, the birds were boated south on Lake Rotoiti to the RNRP recovery area, and then carried uphill by field staff and volunteers on foot to specific release sites.

The first two pairs were transferred in plywood transfer boxes; however one of the first kiwi to be transferred suffered an injury inside one of the transfer boxes (refer below) and a decision was made to transfer subsequent consignments of kiwi in canvas bags held by field staff sitting in the helicopter and boat.

5.3.5 Kiwi Release Methods

Ten release burrows were prepared within the RNRP release area. The ten burrows were clustered into pairs at five different release sites labelled K1 to K5. Each release site was no more than a few hundred metres from Lake Rotoiti's eastern shore, but there was alongshore separation of 600-800 metres between sites. Paired burrows were separated by about twenty metres. The reason for pairing burrows and separating release sites was to allow naturally or artificially paired kiwi to remain in relatively close contact with one another, without being uncomfortably close to other pairs.

Each burrow was an artificial or pre-existing cavity in the ground, made large enough to accommodate an adult great spotted kiwi. A plywood cover was made for each burrow, to contain the kiwi until nightfall. It was considered possible that uncontained great spotted kiwi could disperse during the daytime, and that natural or artificial pairings might not survive this dispersal.

Great spotted kiwi were placed into their respective burrows during the daytime. Fieldworkers returned to the burrows at about 18:15, approximately an hour after sunset, to remove the plywood covers, thus allowing the kiwi to depart the release burrows. (Figure 17)

5.4 TRANSFER OPERATION MONITORING AND RESULTS

5.4.1 Great Spotted Kiwi Collection

Two people with one kiwi dog accounted for half of the kiwi caught, and achieved this result in only two nights work. Teams of four or more people accounted for the remainder of birds caught.

Despite the presumed naivety of the great spotted kiwi at the source location, the birds did not always prove easy to attract to the capture sites. Some kiwi would approach a capture site but would remain under cover where they were difficult to catch, or they would not approach until the catching team had abandoned the site. One team found that it was possible to catch great spotted kiwi by leaving one or two people stationed at a capture site while most of the team departed. Evidently the kiwi were wary of approaching the site when the whole group was present, but were curious enough to investigate the site when the group had apparently left the site. One or two people remaining behind could then "ambush" the kiwi.

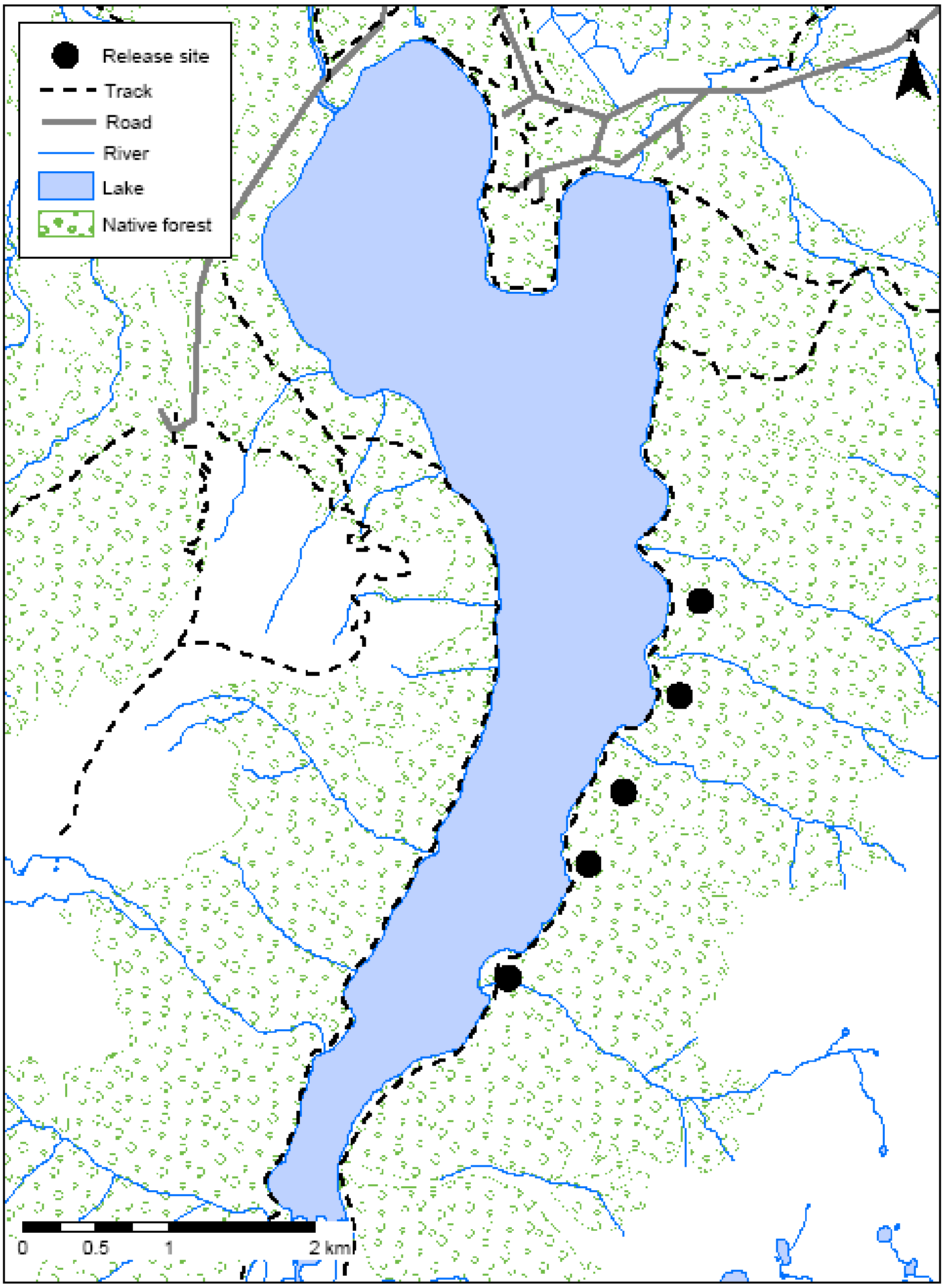
On one occasion when a catching team attempted to hold a female kiwi near the capture site while resuming catching, the captured bird reacted violently to the broadcasted kiwi calls. The catching team then decided that it would be better to send a person back to base camp with the captured kiwi.

Ten kiwi comprising five males and five females were collected. Eight of the kiwi were considered to comprise four previously established natural pairs. One male was collected without his natural mate, who evaded the catching team despite being seen. One female was collected without a mate. Neither the territory mapping exercise nor the experience of the field team suggested that this female had a natural mate. (Figure 18)

5.4.2 Great Spotted Kiwi Containment

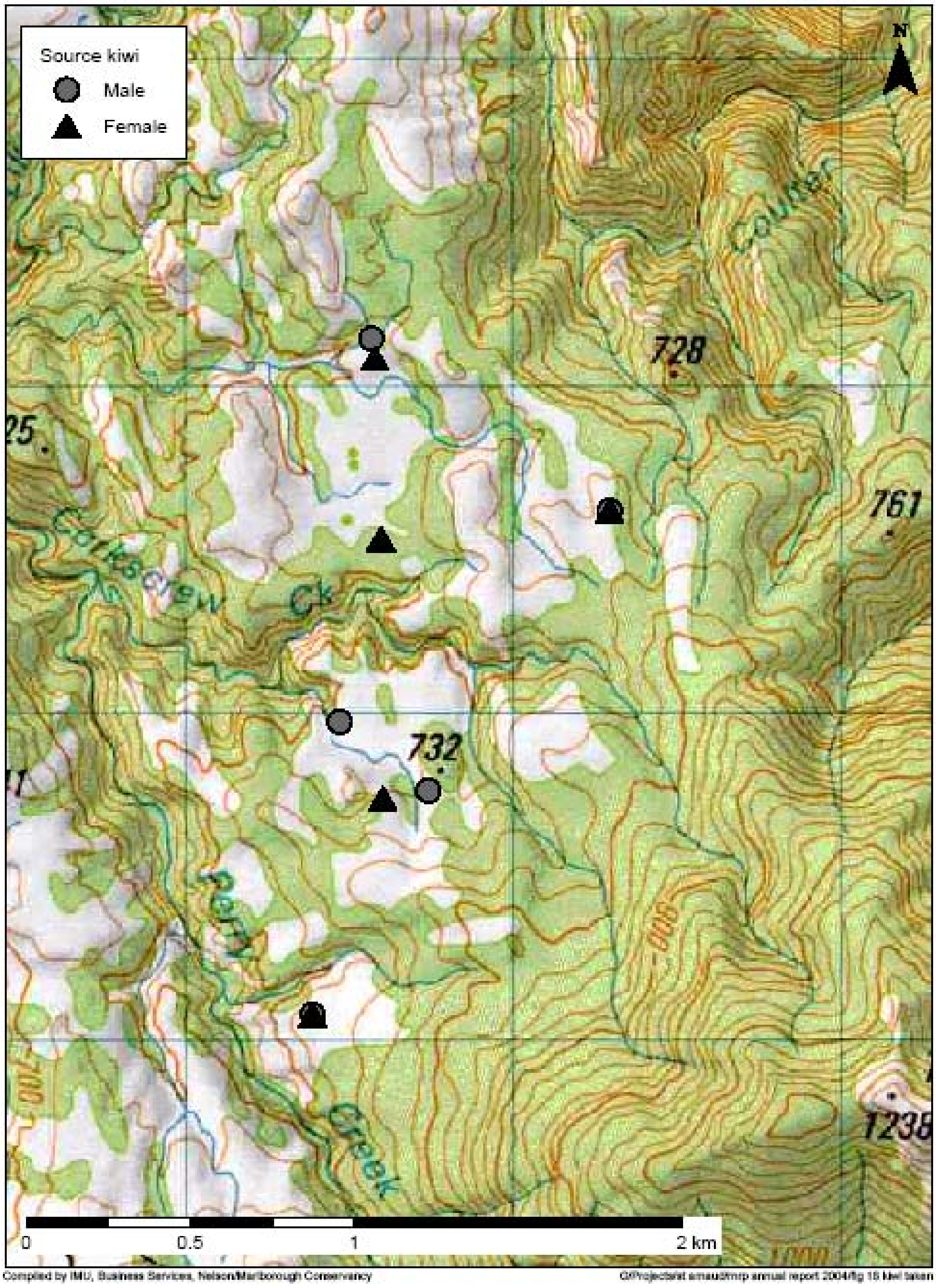
The first pair of kiwi was collected 40¼ hours to 38½ hours prior to the first transfer, and were held at the base camp for a full solar day following the night of capture. The kiwi were checked and processed during the afternoon, and worm supplies were replenished. Both of the first pair consumed the majority of the earthworms placed in their compartments during the first night they were held at base camp. It was noted that the air temperature inside the transfer box felt warm when it was opened in the afternoon, and that birds being kept for a whole solar day would benefit from additional (perhaps adjustable) ventilation. Heavy frosts prevailed overnight throughout the collection period, and all of the occupied boxes that were opened in the mornings appeared to have low to moderate air temperatures, although this was not measured using a thermometer.

Figure 17 ***A. baastii* release sites, Rotoiti Nature Recovery area, May 2004**



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

Figure 18 **Locations of *A. haastii* collected from Corkscrew Creek source area, May 2004**



The female of the first pair was injured in the transfer box, most likely as the hinged lid was being closed following processing. The kiwi was found with about one centimetre of the upper bill tip missing on arrival at St Arnaud. A close inspection of the transfer box revealed a small piece of bill keratin sitting on the top edge of the back wall. It seems likely that the kiwi turned its bill up and inserted it into the narrowing crevice between the back wall and the descending lid at the moment when the kiwi handler relented control of the bird and withdrew the controlling arm from the box. Field staff noted that the bird was active in the box overnight, but interpreted the activity as a healthy will to escape, rather than a sign of physical trauma. It is possible, but seems far less likely, that the injury occurred inside the box later during the bird's confinement. When the lid was closed, a permanent 1mm gap (wide enough to slide a NZ five cent piece into, but not wide enough to allow a NZ 10 cent piece) existed between the lid and the top edge of the back wall. It seems unlikely that a kiwi could squeeze its bill into such a narrow gap.

Once the problem with the injured bill had been identified and reported back to the field team, the team attempted to make the transfer boxes safer by covering the hinge gap with a broad strip of plastic adhesive tape. It is doubtful whether this plastic strip could have prevented the same type of accident from occurring: although the tape covered the gap when the box lid was fully open (and the bird fully controllable) it folded into the crevice as the lid was closed, thus lining the crevice, but not covering it. Similar hinged-lid boxes have been used for transferring kiwi in the past without the same type of mishap being reported.

All other kiwi were transferred during the daytime following their respective nights of capture, and were held at base camp for an average of 13 hours and 23 minutes, including transport time from capture site to camp (range: 10 hours – 16.5 hours), and no other injuries occurred.

5.4.3 Great Spotted Kiwi Transportation

The field team were alerted to the injury of the female kiwi (but not the precise cause of the injury) shortly after the kiwi's arrival at St Arnaud during early afternoon on 15 May. The field team decided to limit the kiwis' exposure to transfer boxes, in case the injury had happened in transit. Boxes were necessary for holding kiwi overnight, but not for actually transporting them. The last three pairs of kiwi were transported in canvas bags carried by field staff and volunteers.

Five pairs of great spotted kiwi were transferred in four consignments. The first consignment on 15 May comprised two pair of kiwi in two transfer boxes; the second consignment (later the same day) comprised one pair of kiwi in canvas bags. One pair was transferred in canvas bags on 17 May; and another (also in canvas bags) on 19 May.

5.4.4 Release Monitoring and Results

Reconfiguration of Pairs

Four pairs of great spotted kiwi and a single male were released over five days. On Saturday 15 May one natural pair, one artificial pair and one single male (mate of the injured female) were released. On Monday 17 May one artificial pair was released. One natural pair was released on Wednesday 19 May. The two artificial pairs (15 and 17 May) included a natural pair that was split apart as a result of capture on different nights. The female was the first to be transferred: she was artificially paired with a male whose mate avoided capture. The female's natural mate was collected two days later, and was artificially paired with a female who apparently had no natural mate.

Kiwi Behaviour at Release Burrows

Video cameras were installed inside three of the release burrows. One camera was enabled to transmit images directly to a monitor at the Department of Conservation's St Arnaud visitor centre. This allowed images from the release burrow to be viewed in real time, but not recorded. Two more cameras were linked to video recorders which simultaneously recorded activity inside a pair of burrows assigned to a natural pair on the final release night, 19 May.

The real time video link to St Arnaud allowed the RNRP translocation team to observe a male great spotted kiwi in his release burrow on the first release night, 15 May. Although the cover was removed from the burrow entrance at 18:15 (approximately an hour after sunset) the kiwi remained inside his burrow for some hours, at least until 23:00. During the first few hours of watching the video monitor, observers at St Arnaud noted that the kiwi was shuddering, and this was interpreted as a symptom of stress. Between 22:30 and 23:00 the kiwi became relatively active and was seen stretching and yawning. The burrow was empty when observers checked the monitor on the following morning at 06:00.

A male kiwi video-taped in his release burrow on 19 May was very active, apparently attempting to escape, over about eight minutes following his placement into the burrow in the early afternoon. He was subsequently active from 16:10 to 16:21, briefly active at 17:27; and also active from 17:52 until the burrow was opened at 18:13. It appeared likely that if the burrow entrance had not been physically blocked, he may have departed from the burrow at any of these times. Some shuddering, perhaps a symptom of stress, was recorded during the second male's confinement in his release burrow. At 18:13 when the burrow entrance was unblocked, he responded by moving deeper into burrow and lowering his head and bill to the ground, evidently attempting to hide. This position was held for some twenty minutes until a weta walked across the kiwi's back and heralded a seven minute period of active probing. The bird's activity level decreased from about 18:40, but at 19:07 the male left his burrow, although he apparently remained near the burrow entrance for some minutes, judging by camera shake seen on the video footage.

Simultaneous video footage of an adjacent female's burrow showed that in the hours prior to the unblocking of the burrow entrance, she was less active than the male: she slept from the time she was placed into the burrow until 18:03, when she began probing inside the burrow. Minimal shuddering was observed during her confinement. The female departed the burrow immediately after the entrance was unblocked at 18:13. At 19:19 a kiwi was video taped inside the female's burrow. Although a leg band is clearly visible in the video footage, it is difficult to be certain which leg the band is on. It appears likely to be on the right leg, which suggests that the visitor to the female's burrow is the male kiwi, who had departed his own burrow a few metres away only twelve minutes prior to the sighting in the females burrow.

At other release sites, field staff removing the burrow covers observed that one of the female kiwi appeared to be active in her burrow prior to the cover being removed; and telemetry appeared to indicate that she left her burrow within the ten minutes after the cover being removed. One male kiwi appeared to remain inside his release burrow over twenty minutes of observation, another remained inside the burrow over thirty minutes of observation, but another male left his release burrow about ten minutes after the cover was removed. No “victory calls” were heard by field staff removing the burrow covers.

5.4.5 Diagnostic Sample Results

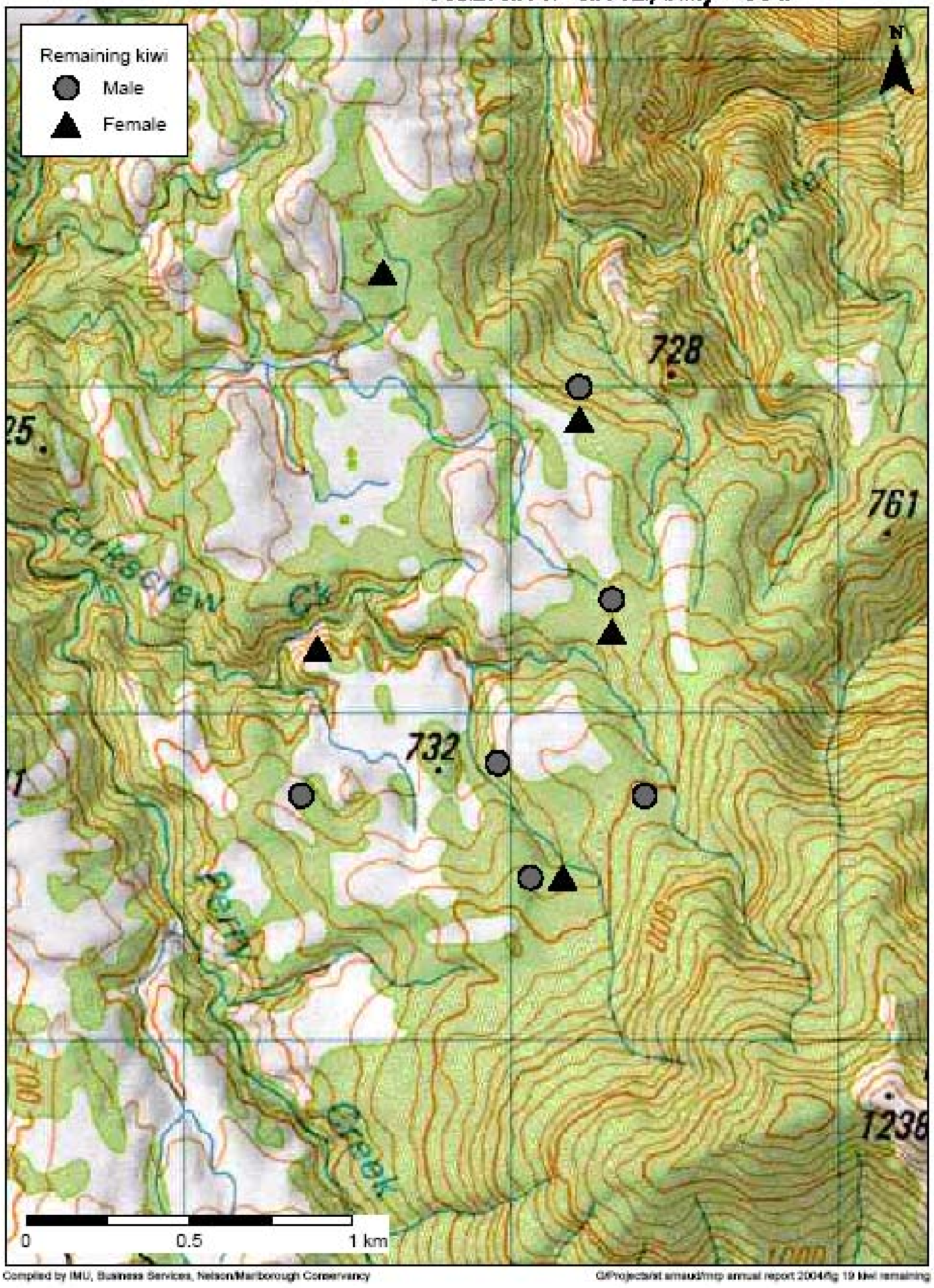
Diagnostic sampling did not reveal any pathogens or blood parasites in any of the kiwi collected. A fuller discussion of diagnostic sample results, including haematology, will appear in the translocation technical report to be completed in 2005.

5.4.6 Post-collection Kiwi Distribution at Corkscrew Creek Source Area

During the collection operation the field team heard and saw additional kiwi to those that were collected. Some of the kiwi were birds that had not been caught because they proved unresponsive or evasive, and others had not been targeted because they were less accessible than others. At the end of the operation, the field team pooled their knowledge and formed a consensus on the approximate locations of individual kiwi known to be remaining in the source area. The estimated locations of the remaining birds were plotted on to a map of the source area. A minimum of eleven individuals (three presumed pairs, three additional males and two additional females) were considered to be remaining within the 500 hectare source area.

The minimum number of kiwi considered to be remaining in the source area (eleven), plus kiwi collected from the source area (ten) totals twenty-one individuals. Sixteen of those birds evidently are or were grouped into eight male-female pairs. Five others (three males and two females) were not known to have mates. The kiwi distribution and abundance data gained during the collection operation more or less corroborates the territory maps that were produced prior to the collection operation. Both exercises suggest that there was a minimum of eight resident pairs or territories within the source area prior to the collection operation. These estimates are considered to be conservative, and one of the territory maps suggested a minimum of ten territories. (Figure 19)

Figure 19 **Estimated locations of *A. haastii* remaining after collection operation, Corkscrew Creek, May 2004**



5.5 OUTCOME MONITORING OF THE TRANSLOCATION

5.5.1 Outcome Monitoring Method

Dispersal Monitoring

Prior to the transfer, the RNRP translocation team did not know what pattern and extent of dispersal would occur. Three research objectives were identified:

Determine how far, how soon, and in what direction great spotted kiwi disperse from the release area, and whether there is any pattern of dispersal.

Determine whether pair bonds survive the transfer.

Determine the preferred habitats for great spotted kiwi translocated to RNRP.

Radio telemetry was used to estimate the approximate locations of great spotted kiwi subsequent to their release in the RNRP recovery area. Telemetry monitoring was undertaken on most week days between the release and the end of June 2004.

On each monitoring day, field staff or volunteers visited a series of predetermined locations on the eastern and western shores of Lake Rotoiti. At each of the locations a TR4 telemetry receiver and Yagi aerial were used to search for signals from each of the individually recognisable kiwi transmitters. Whenever a transmitter signal was identified, the observer attempted to determine the angle of the signal in relation to the observer, using the telemetry equipment to determine the direction of greatest signal strength, and a magnetic compass to define the bearing. Signal detectability varied considerably between observer locations; and the observer discounted weak or unreliable signals such as might have been influenced by topographical features. At least two reliable compass bearings (from two different locations) were sought in relation to each transmitter signal.

The approximate position of each transmitter was estimated by plotting the relevant observer locations and corresponding compass bearings on a topographical map: the transmitter was considered to be more or less at the intersection of two or more reliable bearings. The estimated locations of kiwi were recorded on an excel spreadsheet, from which distribution maps can be electronically generated.

5.5.2 Outcome Monitoring Results

Dispersal Monitoring Results

No great spotted kiwi had dispersed from the RNRP recovery area by the end of June 2004. One female was more mobile than the other kiwi, and during June 2004 she travelled north to Kerr Bay near St Arnaud, then south to near Lakehead Hut at the south end of Lake Rotoiti, but did not leave the RNRP recovery area.

Although individual kiwi did not necessarily remain associated with the release burrows or release partners at their initial release site, at the end of June 2004 the overall distribution of kiwi in the recovery area, excluding the female reported above, more or less coincided with the pattern of release, i.e. no significant dispersal had been observed.

Dispersal monitoring and analysis is ongoing, and dispersal monitoring results will be reported more fully in the translocation technical report to be completed in 2005. (Figure 20)

5.6 FUTURE TASKS FOR GREAT SPOTTED KIWI MANAGEMENT

5.6.1 2004-05

Breeding Monitoring – July 2004 to February 2005

- Weekly telemetry checks of males' locations during the breeding season.

Dispersal Monitoring

- Officially finishes in March 2005. Occasional (e.g. monthly) telemetry checks of male and female locations will be undertaken in the non-breeding season.

Post–release Health Checks – May 2005

- Check transmitter attachments, replace if necessary.
- Check general condition and weight of all adults.
- Collect diagnostic samples.

Staff Training – May 2005

- At least one RNRP staff member should become proficient at applying transmitters (chick/juvenile/adult).

5.6.2 2005-06

Breeding Monitoring - July 2005 to February 2006

- Weekly telemetry checks of males' locations during the breeding season (July-February).

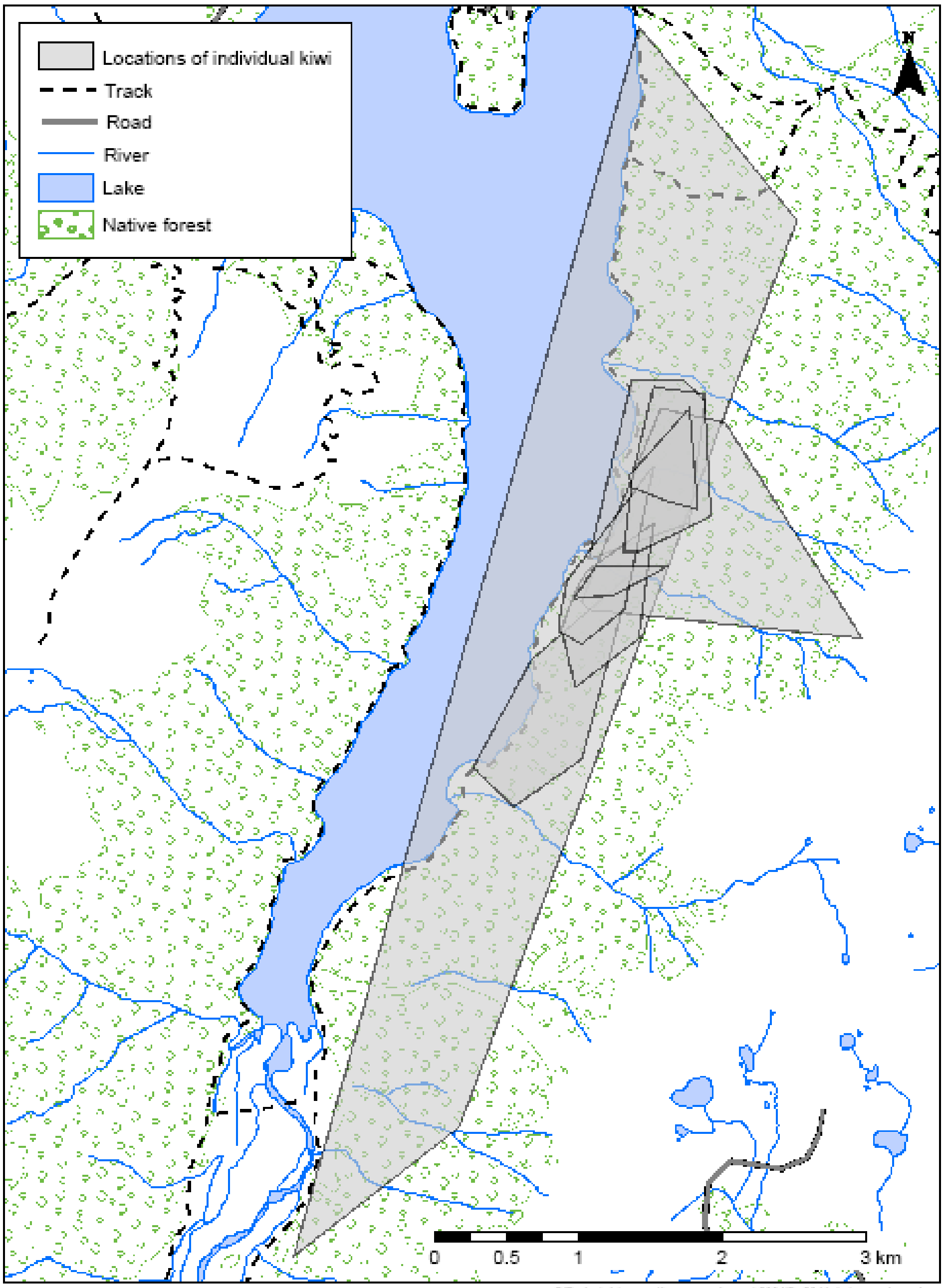
Breeding Management

- Seek further advice on the application of other methods to enhance the founder population e.g. temporarily removing chicks to a predator-free location.

Future Translocations

- If the 2004 translocation is defined as successful (refer to operational plan for definition), then the RNRP translocation team should begin working towards a supplementary translocation in autumn 2006.

Figure 20 ***A. haastii*** **dispersal, Rotoiti Nature Recovery area, to 30th June 2004**



Compiled by IMU, Business Services, Nelson/Marlborough Conservancy

6. Advocacy and Education

6.1 OBJECTIVES

The project's third overall objective is:

"*To advocate for indigenous species conservation and long-term pest control, by providing an accessible example of a functioning honeydew beech forest ecosystem, so a large number of people can experience a beech forest in as near-to-pristine condition as possible*".

The advocacy and education programme is working towards this, and has identified five aims as follows:

Develop a high public profile for the project, enhancing opportunities for its key message to be put across.

Develop and seek opportunities to express the key message that the conservation of indigenous species requires the control of pests. The use of poisons, shooting and traps are currently the only practical options for this control.

Develop opportunities to involve the St Arnaud and wider community in the project.

Extend the work of the project into the St Arnaud area through the involvement of its community.

Develop opportunities for schools to contribute to the project and achieve education outcomes at the same time.

6.2 DEVELOPING AND MAINTAINING PROJECT PROFILE

6.2.1 Spreading the Message

The Rotoiti Nature Recovery Project is readily accessible to visitors. The Bellbird and Honeydew Walks within the original core area at Kerr Bay offer all weather tracks with a series of detailed panels about many aspects of the project. Returning visitors often comment on the increased bird song and presence of native wildlife around the village and the tracks through the RNRP area. The presence of kiwi in the last few months of the year has increased interest and there have been several reports from members of the public of hearing kiwi calls.

The potential threat of dogs to the newly released kiwi was recognised and additional advocacy effort was put in to reiterate the exclusion of dogs from the national park. As well as taking opportunities through media releases, new 'kiwi zone/no dogs' signs were erected at likely entry points to the area where kiwi were present. The threat was highlighted by two dog incidents within a week of the release of the last birds. In the worst case a dog was taken for a walk in the vicinity of the release site. This has been followed up and a prosecution is likely. The second incident involved a lost pig dog though this was some considerable distance form the kiwi. No similarly concerning incidents have occurred since.

The ever increasing number of 'mainland island' type projects outside the department's management (both on and off private land), provide testimony to the inspiration that the early departmentally-managed projects have provided. RNRP staff also provided technical support to several community groups involved in mainland restoration work such as the Friends of Flora group.

RNRP staff participated in the Departments annual mainland island hui held at the Boyle River (Lewis Pass) at which individuals from a number of groups outside the Department were exposed to the work going on at Rotoiti.

A paper was invited for the 'Offshore and Mainland Islands' symposium of the 3rd International Wildlife Management Congress to be held in Christchurch, December 2003. An abstract for this was submitted and accepted (Maitland and Butler 2003, refer Appendix 6).

6.3 COMMUNITY LIAISON

Ongoing community support is vital to the long-term future of the project. We continue to aim to keep the community informed through regular (at least monthly) contributions to the local newsletter, and indirectly through the media, and offer opportunities for more in-depth contact through talking to groups, providing guided walks and opportunities for 'hands on' involvement through involvement with the Friends of Rotoiti (refer Section 6.5 Volunteer Involvement).

6.3.1 Revive Rotoiti Newsletter

Two editions of Revive Rotoiti (Appendix 4) were published in the year (winter 2003, autumn 2004, June 2004). The autumn and June editions focussed on the upcoming, and completed, great-spotted kiwi transfer. The newsletters (including photocopies of back-issues) are available in the Nelson Lakes National Park Visitor Centre. The distribution list has remained stable over the last year, totalling over 520, however the print run has increased to 1500 as more are being distributed from the visitor centre.

6.3.2 Meetings

Project information has been supplied regularly to meetings of the St Arnaud Community Association, the Rotoiti District Community Council and community forums held by the Department in Nelson.

6.4 MEDIA LIAISON

There was significant media interest and liaison with the media around the transfer of great-spotted kiwi.

In the print media, local papers Nelson Mail and the Leader produced the most stories. The Leader included a full feature on the transfer through the eyes of Matt Lawry, a reporter (for the Leader) and an announcer for local radio station, Fresh FM, who was both at the day of the first release and visited the capture site over night. It is not known exactly how far the media interest extended outside the region though it is known that aspects of the transfer were covered by The Press, The Dominion and the New Zealand Herald. The transfer of Mohua, with her damaged bill, to Massey University and subsequent rehabilitation, has been reported on at regular intervals by the Manawatu Standard. The only issue of concern around involvement of the print media was an incident on the day of the first release where a photographer from the Nelson Mail used a high speed flash in close proximity of one of the kiwi as it was being put in its burrow. This caused great consternation among all those present (including other media) as they had been briefed specifically about not using their flashes.

Fresh FM, a regional access radio station, was particularly interested and supportive of the transfer. They conducted a series of interviews with key stakeholders including staff, Friends of Rotoiti, iwi and sponsors before and during the event. A two part series has been recorded (but as yet not aired) which will feature the transfer event and then the transfer operation. Several other radio stations followed up on the initial press release.

6.5 EDUCATION PROGRAMMES

6.5.1 Secondary and Tertiary Education

Groups given talks on the project in 2003-2004 included:

- Nelson Girls College
- Newlands College
- Marlborough Girls College
- Marlborough Boys College
- Waimea College
- Nayland College
- Motueka High School
- Queen Charlotte College
- Golden Bay School
- Hamner Springs School
- Havelock School
- Collingwood School
- Tapawera School

- Nelson Marlborough Institute of Technology (NMIT) Trainee Ranger class

A talk was given at Rotoiti Lodge every week in term time. Four staff were involved in this activity. 858 secondary school students were given the power-point presentation at Rotoiti Lodge.

Groups given guided walks round the project site were:

- Youth Nelson
- Ecoquest
- Waimea College
- Nayland College
- Nelson Girls College
- Marlborough Girls High School
- Bohally Intermediate
- Nayland College
- Nelson Marlborough and Westland Conservation Boards
- St Barnards School, Wellington
- NMIT Trainee Rangers

The total number of people given guided walks around the project in 2003-04 was 565. Most of these were Year 12 biology and geography students doing NCEA unit standards on conservation and resource management.

Walk and talk numbers were slightly down on 2002-03. This is largely due to the reduction in community groups requesting talks in the year.

6.5.2 Primary School Resource Kit

Most primary schools that visited in 2003-04 used the resource kit to plan their trips. They are still requesting a staff member to give an introductory talk to their classes, but are otherwise largely self-guiding. Kits were given out to three primary schools from outside the Nelson/Marlborough region.

6.6 VOLUNTEER INVOLVEMENT

6.6.1 RNRP Volunteers

RNRP received 170 volunteer work days this year from the following:

- 18 individuals gave a total of 110 days work.
- One week long visit by NMIT Trainee Ranger classes doing 60 days work in total.
- Two Conservation Corp group visits.

Individuals volunteering doubled from 2002-03. Several of these were involved with the great spotted kiwi transfer.

(Note - This does not include the Friends of Rotoiti hours)

6.6.2 Friends of Rotoiti

The Friends of Rotoiti (FOR) community group was set up in 2001. Its objectives are to provide opportunities for the community to be involved in pest control, species monitoring and re-introductions and for individuals to receive training from the Department in best practice techniques in these areas. In this year there were two organised training days for all group members. All new members are trained by either staff or experienced volunteers on their first day. The group conducts rat trapping in the village, 'filling the gap' between the old core and the new rat control area at Duckpond Stream and also run a Fenn™ trap line up the Wairau Valley and from Six Mile road to the top of the Rainbow Skifield, and from the Buller Bridge to Mt Robert Car Park. Predator control methods are identical to RNRP techniques, with the frequency of trap checking also the same where possible. Results in Sections 3.2 and 3.3.

Friends of Rotoiti had over 70 members at the end of 2003. The number is necessarily vague as some of the "members" are representatives of groups such as the 50+ tramping club, and Forest and Bird, may bring up to ten volunteers on a day.

The Friends of Rotoiti did 177 volunteer days of work over the 2003-04 period.

Involvement in the kiwi transfer by long serving members included releasing birds to burrows and opening burrows at night.

6.7 VISITOR SERVICES

No major activity took place in this area. Nelson Lakes National Park Visitor Centre staff continued to distribute information about the project. Most requests for information come from school and tertiary students.

7. Research

Following is a list of projects funded or assisted by the project to differing levels.

Alexandra Kappeler, Swiss Federal Institute of Technology, logistical support for pilot study on response of bumblebees and honeybees to wasp control (field and lab work complete, report awaited).

Carl Wardhaugh, University of Canterbury MSc, awarded an RNRP Research Scholarship in 2002-2003 and logistical support for study on interactions between the sooty beech scale, host trees and introduced wasps (final year, report awaited).

Ceisha Poirot, University of Canterbury MSc, awarded an RNRP Research Scholarship in 2002-2003 and logistical support for study on bellbird breeding success and time budgets (final year, report awaited).

Dave Kelly and Jenny Ladley (University of Canterbury) and Alastair Robertson (Massey University), logistical support for national research on mistletoe flower opening and pollination in areas with and without predator control.

Dominic Hartnett, awarded an RNRP Research Scholarship in 2003-04 for study investigating the importance of the honeydew resource to native invertebrates in the beech forest ecosystem (ongoing).

Eric Spurr, Landcare Research, contribution of carcasses for profiling persistence of Brodifacoum in selected pest species (final year, report awaited).

Fraser Maddigan and Elaine Murphy, Science and Research, DOC, contribution of carcasses for national stoat diet analysis (final year, report awaited).

Graeme Sandlant and Rachel Standish, Landcare Research Nelson, contribution of malaise samples for analysis of indicator groups of invertebrates as a response to wasp control (ongoing).

Mike Sim, Auckland University MSc, awarded an RNRP Research Scholarship in 2003-04 for study testing for effects of pest control in *Nothofagus* forest on ground dwelling invertebrates (ongoing).

Minna Sarvala, University of Turku, Finland, MSc, contribution of funds and logistical support for research on post-fledging behaviour of kaka (field work complete, report awaited).

Sarah Spalding, University of Otago, Wildlife Management Diploma, logistical support for survey on rodent control techniques used by landowners in St Arnaud, as contribution to Eric Spurr's work (report received).

The RNRP has also provided a research site for Landcare Research, Nelson and Lincoln, to undertake research into the impacts of mice and wasps on soil chemistry and soil microbes and invertebrates in a honeydew beech forest. Project infrastructure was set up this year, and data will be gathered over the next three years. This work is supervised by David Wardle.

8. Project Management

8.1 BUDGET

TABLE 21. 2003-04 BUSINESS PLAN BREAKDOWN BY MAIN TASKS

ACTIVITY	STAFF HOURS [1]	OPERATING COSTS ($$)	TEMPORARY WAGE COSTS ($$)
Predator management	1313	820	35076
Wasp control	348	1750	8360
Management of rodents	660	300	20674
Vegetation monitoring	306	400	800
Native fauna monitoring	584	0	11215
Small mammal monitoring	352	400	2400
Project management	1523	3000	2160
Reintroductions	688	5600	0
Possum control	56	800	7125
Ungulate control & monitoring	168 [2]	1600 [2]	0
Research support	100	800	0
Advocacy	548	6703	0
TOTAL	6646	$22,173	$87,810

[1] Does not include volunteer effort (refer Section 6.5 Volunteer Involvement).

[2] Planned but not carried out.

8.2 STAFFING

- Brian Paton, Programme Manager Biodiversity, 50% RNRP
- Matt Maitland, Project Supervisor
- Genevieve Taylor, A2 Ranger
- James McConchie, A1 Ranger
- Andrew Taylor, 2 year temporary A1 Ranger
- Jasmine Braidwood, 6 month A1 Ranger
- Dan Chisnall, 6 month A1 Ranger

Others that contributed business-planned hours were:

- John Wotherspoon, Programme Manager Community Relations
- Kimberley Parlane, Community Relations A2 Ranger
- Paul Gasson, Biodiversity A2 Ranger (Assets)
- Anthonie Knevel 1 year temporary A2 Ranger (Threats)
- Dave Seelye, Biodiversity A2 Ranger (Threats/Assets)

8.3 TECHNICAL ADVISORY GROUP

The RNRP Technical Advisory Group continues to contribute valuable input in providing advice to the project team. The advisory group meet formally once a year, prior to business planning, to review the previous years' work and provide recommendations for the coming year. Technical Advisory Group members in 2003 were:

- Jacqueline Beggs, Landcare Research, Nelson
- Peter Wilson, Landcare Research, Nelson
- Eric Spurr, Landcare Research, Lincoln
- David Kelly, Canterbury University
- Graeme Elliot, Biodiversity Recovery Unit
- Dave Butler, Private Consultant

There is also a standard invite to the National Technical Co-ordinator (Mainland Islands).

Pete Gaze, Mike Hawes and Martin Heine, technical support staff from Nelson/Marlborough Conservancy, also attend the annual meeting.

(For a file reference for the minutes of the meeting held on 22-23 April 2004, see Appendix 6)

8.4 SKILL SHARING

The following opportunities were taken advantage of:

Matt Maitland

- Attended the D'Urville Island stoat workshop at French Pass.
- Presented a paper (co-written by Dave Butler) to the 3rd International Wildlife Management Congress conference on "multi species pest control offers hope for South Island kaka". (A reference for the power-point presentation can be found at Appendix 6)
- Assisted the Friends of Flora with planning a wasp control operation.

- Assisted Northern Regional Office of the Department of Conservation with wasp toxin issues.
- Gave advice to many individuals, organisations, and DOC Area Offices for wasp control.

Kimberley Parlane, John Wotherspoon, Matt Maitland, Genevieve Taylor and Jimbo McConchie

- Support to Friends of Rotoiti.

Paul Gasson

- Great spotted kiwi monitoring in the Saxon (Gouland Downs) with S&R.

An opportunity for cat management skill sharing with Trounson Kauri Park was not realised.

Although accurate records for information transfer were not kept, numerous requests are received from internal and external sources across a variety of pest control and monitoring programmes. The project has agreed to a formalised method of recording these requests and these will be reported on next year. This is part of Chris Jacobson's research on adaptive management and technology transfer which she is doing through Lincoln University.

9. Acknowledgements

This year's results represent a significant team effort. Twelve Departmental staff worked on the project from time to time from the St Arnaud Area office, supported by others from the Nelson/Marlborough Conservancy, Regional and Head Offices. These people have been joined by an increasing number of dedicated volunteers and in particular we would like to acknowledge the expanding effort of the Friends of Rotoiti. All should be acknowledged for their efforts and enthusiasm.

The very nature of the project and the openness of the Departmental team have lead to the involvement of many scientists and others from outside the Department, both as members of our Technical Advisory Group and in other capacities. These people have helped provide knowledge and intellectual backing. Thanks to David Butler for editorial assistance with this report.

The project has enjoyed the goodwill and support of the people of the local area. Iwi from Te Tau Ihu, particularly Ngati Apa, have also lent their support. It is also appropriate to single out Phillip and Fiona Borlase and thank them for their continued support and for providing access through their farm adjacent to the national park.

Comprehensive mainland restoration projects like this differ from many of the other projects the Department undertakes, in that there is never a break in the field programme. There is a requirement to keep a measure of pest control and monitoring going throughout the year. Acknowledgement must also be given to all those staff who toiled in the field during inclement weather, particularly all the effort that went into replacing the failing transmitters on the female kaka.

The reintroduction of nine great spotted kiwi to the RNRP represents a significant milestone for the project and would not have been possible without the support of many individuals and organisations. Thank you to the Bank of New Zealand Kiwi Recovery Trust; iwi of Te Tau Ihu, particularly Manawhenua ki Mohua; Kiwi Recovery Group; Massey University veterinarians and Shell Wildlife Fund; RNRP staff and volunteers; DOC and private kiwi workers and dogs from across the country; and media and public who welcomed the birds to their new home.

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Appendix 1

CAT TRAP LOCATIONS

TRAP CODE	PHYSICAL LOCATION CODE	NORTHING	EASTING
LECT 1	LEF 56-57	2497510	5932605
LECT 2	LEF 68	2497292	5931525
LECT 3	LEF 75	2497398	5931016
LECT 4	LEF 92	2497279	5929587
KBCT 1	BBF 49	2497421	5933391
KBCT 2	BBF 49	2497368	5933359
DPCT 2	DPS 2	2496631	5934937
DPCT 4	DPS 4	2496693	5935026
DPCT 6	DPS 6	2496800	5935075
LHCT 1	LHF 7	2495256	5925725
CWCT 1	Coldwater hut	2494725	5926119
AWCT 1	AWF 21-22	2494511	5935376
MRCT 1	PNW 50	2495094	5933759
CNCT 1	CN 8	2498783	5932562
CMCT 1	CM 1	2498674	5932067
BZCT 1	BVS 36	2498838	5934854
HZCT 1	HBC 10	2502344	5935361
MBCT 1	MBF 34	2494714	5937703
SZCT 1	SBF 18	2500127	5933027

CAT KILL TRAP LOCATIONS AND PERIOD SET

TRAP REFERENCE	LOCATION (GR. MAP N29)	PERIOD SET	TOTAL TRAP NIGHTS (UNCORRECTED)
AWCT 1	945 353	1/07/03 – 30/06/04	366
AWCT 4a	944 356	25/02/04 – 30/06/04	149
AWCT 4b (Timms)	944 356	27/02/04 – 30/06/04	147
BZCT 1	988 348	1/07/03 – 30/06/04	366
CMCT 1	986 320	1/07/03 – 30/06/04	366
CNCT 1	987 325	1/07/03 – 30/06/04	366
CWCT 1	947 261	1/07/03 – 30/06/04	366
DPCT 6	968 350	1/07/03 – 30/06/04	366
HZCT 1	023 353	1/07/03 – 30/06/04	366
KBCT 1	974 333	1/07/03 – 30/06/04	366
KBCT 2	973 333	1/07/03 – 30/06/04	366
LECT 1	975 326	1/07/03 – 30/06/04	366
LECT 2	972 315	1/07/03 – 11/03/04	255
LECT 3	973 310	1/07/03 – 30/06/04	366
LECT 4	972 295	1/07/03 – 30/06/04	366
LHCT 1	952 257	1/07/03 – 30/06/04	366
MBCT 1	947 377	1/07/03 – 30/06/04	366
MRCT 1	950 337	1/07/03 – 29/06/04	365
SZCT 1	001 330	1/07/03 – 30/06/04	366

LIVE TRAP LOCATIONS AND PERIOD SET

TRAP TYPE	# TRAPS	LOCATION (GR, MAP N29)	PERIOD SET	TOTAL TRAP NIGHTS (UNCORRECTED)
Havahart™	5	951 338 – 946 352	8/09/03 – 12/09/03	20
Havahart™	5	970 336 – 968 338	1/10/03 – 10/10/03	45
Small Havahart™	3	970 336 – 968 338	4/10/03 – 10/10/03	18
Havahart™	5	952 262 – 952 254	16/06/04 – 25/06/04	30

Appendix 2: Mist Netting Effort

GENERAL MIST NETTING EFFORT

DATE	SITE	EFFORT	# BIRDS CAUGHT
16/10/03	Hubcap 7	4	0
17/10/03	Hubcap 7	2	0
20/10/03	TTU 3	1hr 50min	0
21/10/03	TTU 3	2hr	0
22/10/03	RAa3	3hr 45min	0
23/10/03	RAa3	2hr 30min	0
24/10/03	RAa3	2hr 10min	0
29/10/03	RAa3	2hr 50min	2 males
3/11/03	Totara	2hr	0

Rig locations:

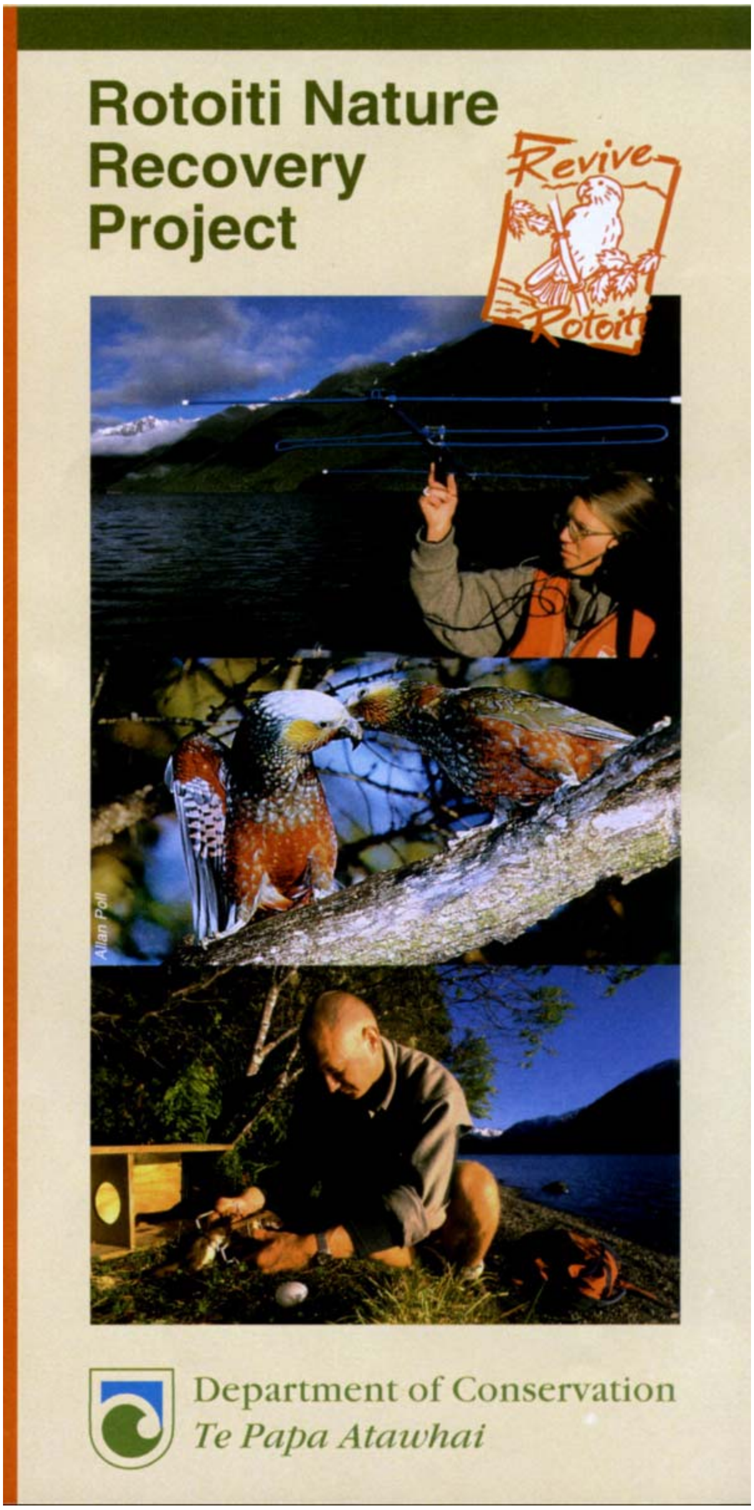
Hubcap 7 GR 022 355

TTU 3 GR 008 339

RAa3 GR 974 309

Totara GR 980 305

Appendix 3: RNRP Brochure



Appendix 4: Revive Rotoiti Newsletter

Revive Rotoiti

Appendix 5: Operational Field Manual Contents

The Operational Field Manual is a folder that is available for field staff to reference in the Area Office. It contains hard copies of prescriptions and instructions for specific tasks. It is arranged in numerical order according to business plan task codes.

7405 126 210 PREDATOR MANAGEMENT

- Mustelid control and monitoring: an overview document
- Sketch of Fenn™ cover design
- Sketch of Fenn™ trap set
- Fenn™ trapping data sheet masters

7405 126 220 WASP CONTROL AND MONITORING

- Wasp Poison Decision Maker. Scanned version: dme:\\staao-8221
- Non-toxic wasp count protocol
- Wasp strip plot transect map RNRP
- Malaise collection and sorting methods at: dme:\\staao-5976
- Malaise/honeydew suppliers list
- Malaise trap location maps: RNRP, Misery, Lakehead
- Malaise trapping data sheet master
- Honeydew sampling protocol (refractometer method)
- Honeydew location map and instructions filter paper method
- Honeydew tree location map

7405 126 230 RODENT MANAGEMENT

- Rat trap checking prescription at: dme:\\staao-6809
- Rat trapping data sheet master: dme:\\staao-5757
- RNRP core grid map S:\Camera|Mainland Island\maps\core grid.bmp
- Rat trap information sheet (includes photos of tunnels set): dme:\\staao-7222

- Rat trap cover cutting pattern sketch, scanned version: dme:\\staao-7352
- Snap trapping database instructions. Printed from screens from Citrix database St Arnaud Snap Trapping
- Rodent snap trapping for monitoring instructions RNRP and Rotoroa
- Cunningham and Moors rodent paper with identification features and protocol for calculating snap trap index
- Protocol for tissue sampling and testing for Vertebrate Pesticides. G.R.G. Wright, Landcare Research

7405 126 310 VEGETATION MONITORING

- RNRP vegetation monitoring synopsis
- Mistletoe monitoring protocol Kerr Bay and RNRP. See also: dme:\\wscco-22338
- Tussock counts protocol Misery and RNRP. See also: dme:\\staao-1869
- Beech seed collection and analysis instructions: dme:\\staao-6352
- Equipment list for two 20x20 plots

7405 126 320 FAUNA

- Lizard survey protocol and data sheet
- Robin monitoring protocol
- Snail monitoring protocol
- Kaka monitoring protocol

7405 126 330 MONITORING OF SMALL MAMMALS

- Rodent monitoring documents with line locations and written instructions for setting tunnels, analysis results and suppliers. Requires updating but useful as guide
- TT (Tracking Tunnel) line locations (including treatment types, hazards, best combinations): dme:\\staao-9073
- Maps for tracking tunnel lines: Rotoroa A-D (with notes), Lakehead, Big Bush rat area, RNRP core
- Sketch diagram for galvanised 1m possum proof tracking tunnel
- TT ink and paper preparation (ferric/tannic method)
- TT field data sheets: dme:\\staao-9063

- TT rodent and mustelid data sheets Rotoiti and Rotoroa from dme:\\staao-8614
- TT excel calculator: instructions for and from dme:\\staao-8614
- TT rodent and mustelid synopsis sheets
- TT guide to prints: dme:\\hamro-20234
- TT protocol for SRU investigation sites dme:\\hamro-66179 Note – some variance from protocol noted on hard copy
- TT protocol for field from dme:\\hamro-66179 with variances

7405 126 100 RNRP MANAGEMENT

- Etrex settings
- Maps
- Project codes and task managers dme:\\staao-6740
- Business planning calendar tables
- Iwi contact list
- Acetate map grids for estimating area
- Mainland Island Draft reporting guidelines dme:\\hwkco-18884
- Memorandum of Understanding – Borlase farm access dme:\\staao-9230

7405 126 240 POSSUM MANAGEMENT

- NPCA trap catch protocol for field operatives
- Kill trap line and trap locations
- Kill trap data sheets: dme:\\staao-8725
- Wax tag spreadsheets: dme:\\staao-9067

7405 126 250 UNGULATE MANAGEMENT

- Deer, chamois, hare protocol, including stomach sampling: dme:\\staao-4224
- Hunter return sheet: dme:\\staao-6256

7405 126 500 RESEARCH SUPPORT

- RNRP request for research proposals with research needs: dme:\\nelco-32119

Appendix 6: Internal Department of Conservation Documents

(DOC computer document reference numbers in brackets)

1. RNRP Strategic Plan 1998 (staao-10245)
2. RNRP Feratox Field Trial 2004 (staao-9934)
3. RNRP Operational Plan 2003-04 (staao-8999)
4. RNRP Wasp Poison Decision Maker (staao-8221)
5. RNRP Wasp Finitron Preparation Prescription 2004 (staao-10105)
6. RNRP Wasp AEE 2003-04 (staao-9781)
7. Draft RNRP Strategic Plan - review of 1998 plan (staao-9591)
8. Falcon nesting data (staao-7290)
9. Tussock Count RNRP (staao-1869)
10. Maitland 3rd International Wildlife Congress Abstract (staao-8837)
11. RNRP Advisory Group Minutes April 2004 (staao-10340)
12. RNRP 3rd International Wildlife Management Congress Presentation (staao-9758)
13. Trans-GSK Source Options (staao - 9921)
14. Trans-GSK-Operational Plan (staao -8844)
15. Trans-GSK Proposal (staao -8331)
16. RNRP Honeydew Post Statistician (staao-9009)

Department of Conservation's Translocation of New Zealand's Indigenous Terrestrial Flora and Fauna SOP. QD number NH1042 (wgnro-13668)

Best Practise for Survey and Monitoring of Loranthaceous Mistletoe (wscco-22338)