

Figure 14. Frequency of control by the Animal Health Board (years between the same control polygon being treated) for the four regions where identical control polygons were used over time.

## 5.5 RESIDUAL-TRAP-CATCH INDICES AS INDICATORS OF CONSERVATION BENEFIT

Post-control monitoring data for the 2002/03 and 2003/04 years indicate that very low possum densities were achieved over much of the public conservation land that was controlled in the eight regions where we collected information (Figs 6B, 7B, 8B, 9B, 10B, 11B, 12B, 13B & 15). In 2002/03 and 2003/04, >62% and >78%, respectively, of the forest and scrub habitat in the treated public conservation lands had an RTCI  $\leq 2\%$ . We excluded Manawatu-Wanganui from the latter year's figures as only 40% of operations in that area achieved such a low average RTCI.

Possum numbers increase after each control operation, so the average possum density at each place, and therefore the possums' assumed impact on biodiversity values, depends on the frequency (and intensity) of control. The RTCIs described above represent possum density indices at the time, after any control operation (i.e. RTCI assessments are normally undertaken within several months of an area receiving treatment). Therefore, where control is undertaken infrequently (e.g. large areas of forest typically had a frequency of treatment of > 3 years), the average possum densities between control operations will be higher than the RTCI figures presented here.

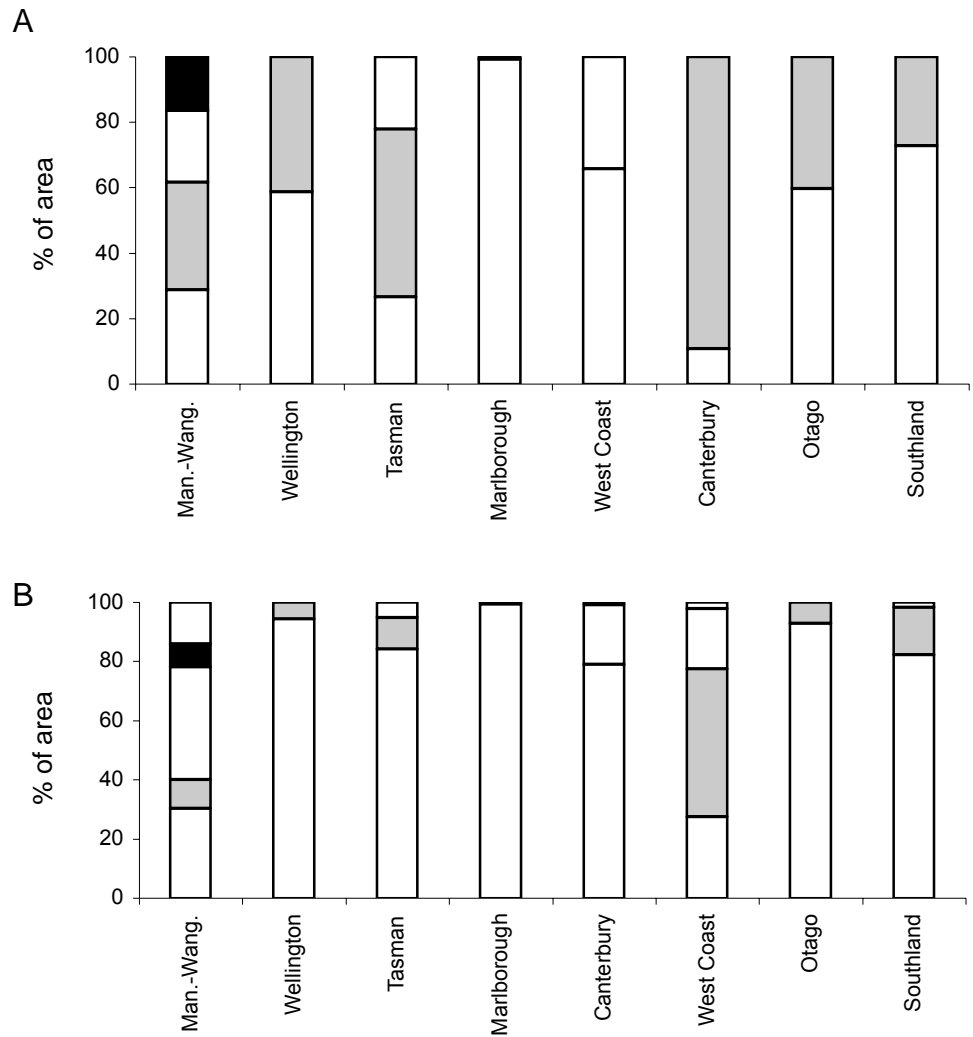


Figure 15. Percentage of the total area of forest and scrub habitat on public conservation lands within each of the RTCI categories (horizontal lines < 1%; grey 1-2%; downward-sloping diagonal 2-5%; black 5%; white unknown) that have received possum control in A. 2002/03 and B. 2003/04 financial years. The total area ( $\times 1000$  ha) per region is shown above each bar.

## 6. Discussion

This project is the first detailed summary of the area, location, type and frequency of AHB-funded possum control on public conservation lands. The combined total annual area of public conservation lands within AHB control operation boundaries in the eight regions over the period 2000/01–2003/04 ranged from c.250 000 ha to c.460 000 ha, with the majority of these areas having received two or more possum treatments. The absence of AHB control information, particularly from the Waikato and Hawke's Bay Regions, prevented the assessment of a national picture of AHB control on public conservation land.

Possums have direct impacts on forests, causing canopy defoliation that may result in tree death and compositional change in some forests (e.g. Rose et al. 1993; Pekelharing et al. 1998; Payton 2000; Sweetapple et al. 2002). They also prey on invertebrates (e.g. Cowan & Moeed 1987; Cowan 2001) and vertebrates (e.g. Innes 1995; Innes et al. 1996; Sadleir 2000). However, the significance and magnitude of indirect effects from possums (which may include modification of habitat for fauna, alteration of nutrient cycling and competition for food) are largely unknown (Veltman 2000).

The project has not formally assessed conservation benefits that may accrue from the AHB-control; however, about 60% of the public conservation lands on which the AHB conducted possum control within the last 4 years have RTCIs significantly below 5%. Such areas provide some indication of the likely benefit of AHB-funded possum control on public conservation lands. Generally, the fewer the possums, the less their impact. The limitation of assessing conservation benefits that may accrue from control based on RTCIs is that the relationship between possum density and their impacts is neither linear (Nugent et al. 2001) nor consistent for many native species and communities (e.g. Bellingham et al. 1999; Norton 2000; Payton 2000; Veltman 2000). For example, the RTCI required for protection has been shown to range from as low as 3% for mistletoe at Hauhungaroa (Sweetapple et al. 2002), <7–9% for Northern rata forest canopy at Waipoua (Payton et al. 1997), <10% for kohekohe at Motatau, and <25% for common broadleaf species at Matamateonga (Nugent et al. 2001). The results from these studies suggest that a reduction in possum densities to very low levels would protect the most vulnerable species or communities, thereby providing protection to other less vulnerable species and communities of the ecosystem (Warburton et al. 2005). However, there have been no robust assessments (i.e. with replication and non-treatment areas) of changes in 'natural character' (to use DOC's terminology) following AHB-funded possum control to validate the generalisation that fewer possums equals reduced impacts at these sites.

Potentially, there is considerable possum population monitoring and control operation information available, but its utility is limited by the difficulty in obtaining and then standardising the data, and by its inconsistent quality, particularly for data pre-2000/01. The quality of data collected for our study is also extremely variable between regions, with considerable inconsistency in the way details of control operations and related monitoring results had

been collated and stored over time. We believe that the AHB's new Vector Management Information System (VMIS) or a similar such system would ensure that information relating to possum control operations is recorded efficiently and appropriately. We recommend that as a minimum, the data categories surveyed in this project should be collated for all possum control operations.

At a strategic level, if further resources are to be invested in data collection, the aim should be to complete a picture of AHB-funded possum control on public conservation lands by obtaining recent data (e.g. from the Waikato and Hawke's Bay regions, which undertake significant areas of possum control but did not have their data collected in this project), rather than obtaining additional historical data from the regions already surveyed.

There was a general lack of institutional memory of possum control operations throughout the regions surveyed, which is a common problem for pest control operators (see Reddiex et al. 2004). Consistency in standards of reporting possum control operations and collating and storing data between the AHB and DOC would enable seamless integration of control and possum population information for these two key organisations involved in possum control on public conservation lands (Fraser et al. 2004). There would be obvious benefit to DOC in obtaining information on AHB-funded possum control operations on public conservation lands; in addition, this data collection would also provide DOC with information on what is happening in terms of possum management in privately-owned areas adjacent to DOC-managed land.

The data collected during this project are held at Landcare Research, and provide a robust foundation for identifying potential study sites for future research that may address questions on the biodiversity benefits of AHB-funded possum control.

## 7. Conclusions

- The AHB has controlled possums over c. 800 000 ha of public conservation lands in recent years, of which about 655 000 ha has received  $\leq 3$  years of control over the 4–11-year period that data were collected.
- Over the period 2000/01–2003/04, on public conservation lands, the total area of forest habitat receiving possum control per year ranged from c. 156 000 ha to c. 314 000 ha; and of scrub habitat, c. 14 000 ha to c. 45 000 ha.
- Generally, immediate post-control densities of possums have been very low (less than 1% RTCI) and have rarely exceeded 5% RTCI. Although it has not been measured, it is likely that conservation benefits have accrued from such low possum densities.
- It was not possible to determine which areas presently receiving possum control should continue to receive control once the AHB halts its efforts from this report. Such decisions would be based on an independent assessment of the values at risk in each area relative to one another and to sites on public conservation lands already controlled by DOC or regional councils for biodiversity reasons.

## 8. Recommendations

- The Animal Health Board (AHB) and/or vector managers need to collate and store data from possum control operations and any associated monitoring in a way that is both accessible to managers and amenable to future meta-analysis. Such information ideally should be recorded on a permanent database, include information on the type and cost of possum control carried out, the resulting RTCI levels obtained, and be linked with spatial data on the control location.
- To speed up the data collection process and to ensure accurate and complete responses, future studies of this nature should consider building into the project the cost of data provision for surveyed organisations.
- Appropriately designed experiments are required to improve understanding of possum density-impact relationships, and the benefit of AHB-funded possum control on public conservation lands bearing in mind the many indirect effects that are likely to be involved.

## 9. Acknowledgements

This project was funded by the Department of Conservation (Science Investigation No. 3514) and the Animal Health Board (Project No. R-80595). We thank the following organisations, and staff within those organisations, for providing the information on AHB-funded possum control operations that was used in this report: Horizons Regional Council, Greater Wellington Regional Council, Southern Pest Management, Marlborough District Council, West Coast Regional Council, Environment Canterbury and Environment Southland. We also thank Caroline Thomson, Brian Karl, Keven Drew and Kerry Borkin for carrying out fieldwork in Southland, Wendy Weller for word processing, Christine Bezar for editing, and Dave Morgan for comments on drafts of this report.

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# Appendix 1

## FIELD STUDY ON CONSERVATION BENEFITS OF POSSUM CONTROL BY THE ANIMAL HEALTH BOARD

### Introduction

The Department of Conservation (DOC) commissioned Landcare Research to undertake a study to determine the ecological benefits of Animal Health Board (AHB)-funded possum control on land administered by DOC. This appendix presents the results from a single study site in Southland that was sampled prior to the objectives of the project being modified, and hence no formal analyses have been undertaken. For information on the project experimental design, including rationale for selection of response variables and sample sizes, see Reddiex & Parkes (2003).

### Methods and results

Two response variables (foliar canopy condition of palatable indicator species, and bird activity) were assessed at one paired site (i.e. one site that had received annual possum control for over 5 years, and one that had not received possum control) in February 2003 in Southland. The possum control site was located in the Catlins Forest Park (west of Waikawa Harbour), while the no-possum-control site was located to the north in the Waikawa Valley. An objective comparison of the vegetation at the 'paired' study sites was undertaken by analysing historical Recce plots held in the National Vegetation Survey database. This analysis confirmed similar vegetation composition between the two treatment areas.

In the possum control area, possum numbers have been monitored annually and the residual trap catch index (RTCI) calculated. The RTCI was found to be <5% for at least 4 years prior to the study. In contrast, RTCIs in the no-possum-control area ranged from 22% to 47% over the period 1999/2000–2001/02. In February 2003, we assessed possum abundance at the no possum control area using the standard National Possum Control Agencies protocols (National Possum Control Agencies 2001). This gave an RTCI of 11.4% from 10 randomly located monitoring lines. There was anecdotal evidence that possums had been privately harvested from this area in recent years.

Monitoring of foliage condition of canopy tree species and bird activity was undertaken on ten randomly located 1-km transects in each treatment area at the same time possum abundance was assessed. Foliage condition was assessed at 20-m radius plots at the start, and every 100 m along each transect. Foliage cover was measured on a 10-point scale (ten 10% classes from 5% to 95%), and crown dieback and possum browse on a 5-point scale (0, 1–25, 26–50, 51–75, and >75%) (see Payton et al. 1999). There was no clear trend in canopy cover of the six palatable canopy species between sites receiving

possum control and those not receiving possum control (Table A1.1). The no-possum-control area had a significantly higher proportion of trees with sign of browse than the area receiving possum control but, in most instances, the percentage browse was small.

The activity of forest birds was assessed using five-minute bird counts (Dawson & Bull 1975) at 200-m intervals along the transects. All birds heard calling or seen were recorded. Counts were made by two observers, each alternating between sites on successive days, in relatively wind- and rain-free conditions to minimise variation, including observer bias, and the changing conspicuousness of birds according to time of day and weather. Independent pairs of observers surveyed both treatment sites on the same day to reduce any effect of weather on the results. There was a clear trend that indices of bird activity (particularly of frugivorous species) were higher in the sites that have been receiving possum control (Table A1.2).

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TABLE A1.1. MEAN FOLIAR COVER INDICES (FCI; WITH STANDARD ERROR) AND PERCENTAGE BROWSE FOR ALL TREES SAMPLED IN THE POSSUM CONTROL AND NO-POSSUM-CONTROL AREAS.

	POSSUM CONTROL				NO-POSSUM-CONTROL			
	SAMPLE SIZE	MEAN FCI (%)	SE	BROWSE (%)	SAMPLE SIZE	MEAN FCI (%)	SE	BROWSE (%)
<i>Fuchsia excorticata</i>	50	64.0	1.8	0.0	59	59.7	2.0	33.9
<i>Pseudopanax simplex</i>	70	62.1	1.4	0.0	52	56.9	1.6	26.9
<i>Pseudopanax crassifolius</i>	24	57.3	3.6	0.0	31	63.9	1.7	0.0
<i>Weinmannia racemosa</i>	69	82.4	5.9	0.0	66	73.1	1.1	0.0
<i>Pseudopanax colensoi</i>	68	61.5	1.4	0.0	65	63.3	1.2	11.1
<i>Aristotelia serrata</i>	52	58.8	1.6	0.0	50	59.0	1.7	32.0
<i>Podocarpus ballii</i>	26	24.0	3.8	3.8	16	56.9	3.7	12.5
<i>Metrosideros umbellata</i>	63	74.9	0.9	0.0	1	75.0	0.0	0.0

TABLE A1.2. MEAN NUMBER OF BIRDS (WITH STANDARD ERROR) PER 5-MINUTE BIRD COUNT IN POSSUM CONTROL AREAS ( $n = 54$  COUNTS) AND NO-POSSUM-CONTROL AREAS ( $n = 53$  COUNTS) IN SOUTHLAND.

SPECIES	COMMON NAME	POSSUM CONTROL		NO-POSSUM-CONTROL	
		MEAN NUMBER PER 5 MINUTES	SE	MEAN NUMBER PER 5 MINUTES	SE
<i>Antbornis melanura</i>	Bellbird	3.69	0.22	2.64	0.13
<i>Rhipidura fuliginosa</i>	Fantail	0.26	0.08	0.17	0.05
<i>Gerygone igata</i>	Grey warbler	0.96	0.11	0.60	0.09
<i>Hemiphaga novaeseelandiae</i>	New Zealand pigeon	0.87	0.18	0.09	0.04
<i>Petroica macrocephala</i>	Tomtit	1.06	0.09	1.00	0.09
<i>Moboua novaeseelandiae</i>	Brown creeper	0.69	0.17	1.08	0.23
<i>Zosterops lateralis</i>	Silvereye	1.65	0.26	0.60	0.12
<i>Carduelis carduelis</i>	Goldfinch	0.02	0.02	0.08	0.05
<i>Carduelis flammea</i>	Redpoll	0.50	0.17	0.19	0.06
Unknown		0.04	0.04	0.00	-
<i>Eudynamys taitensis</i>	Long-tailed cuckoo	0.00	-	0.06	0.04
<i>Turdus merula</i>	Blackbird	0.17	0.05	0.00	-
<i>Prosthemadera novaeseelandiae</i>	Tui	0.07	0.05	0.00	-
<i>Gymnorhina tibicen</i>	Australian magpie	0.02	0.02	0.00	-
<i>Ninox novaeseelandiae</i>	Morepork	0.02	0.02	0.00	-
<i>Prunella modularis</i>	Hedge sparrow	0.02	0.02	0.00	-
<i>Acanthisitta chloris</i>	Rifleman	0.06	0.04	0.00	-
<i>Cyanoramphus</i> spp.	Parakeet species	0.00	-	0.00	-

# Appendix 2

## EXAMPLE SURVEY FORM

### CONSERVATION BENEFITS OF AHB-FUNDED POSSUM CONTROL ON DOC LAND

EXAMPLE

<b>Region</b>	Canterbury		
<b>Control area name</b>	Waitohi Okuku Gorge		
<b>Control operation name</b>	Waitohi Okuku Gorge 2003		
<b>Size of the control area (in ha)</b>	7081	HA	THIS IS THE SIZE OF THE AREA OF POSSUM HABITAT BEING CONTROLLED, <b>NOT</b> THE SIZE OF THE OVERALL MANAGEMENT UNIT
<b>How have the control area details been supplied?</b>	Electronic GIS file <sub>M</sub>	Paper map <sub>P</sub>	
<b>Polygon identifier - VM</b>	Waitohi03	<b>Polygon identifier - Landcare</b>	Landcare use only

<b>Type of control operation?</b>	TICK ONE BOX	Maintenance <sub>M</sub>	Initial <sub>I</sub>
<b>If the type of control was 'Maintenance', what habitats were controlled?</b>	TICK ONE OR MORE BOXES	Forest-pasture margin <sub>M</sub>	Farmland <sub>F</sub>
		Forest buffer strip <sub>S</sub>	Forest block <sub>B</sub>
<b>If the maintenance control included a 'forest buffer strip', what was the average width?</b>			- <sub>M</sub>

<b>What type of control was used?</b>	TICK ONE OR BOTH	Aerial <sub>A</sub>	Ground <sub>G</sub>
<b>AERIAL CONTROL</b>		<b>GROUND CONTROL</b>	
<b>Size of area (in ha)</b>	5988	HA	
<b>Control start date</b>	06/03	MM/YY	
<b>Control finish date</b>	07/03	MM/YY	
<b>Type of bait used</b>	Carrot		
TICK ONE BOX	Cereal (pellets)		
	Other		
<b>Was pre-feeding used?</b>	Y/N	N	
<b>Was GPS used?</b>	Y/N	Y	
<b>Sowing rate for toxic baits</b>	4	KG/HA	
<b>Toxin used</b>	1080		
<b>Toxic loading</b>	0.08%		
<b>Was there an RTCI target?</b>	Y/N	Y	
<b>If 'Yes', what was the target RTCI?</b>		2%	
<b>Was post-control monitoring done?</b>	Y/N	Y	
<b>If 'Yes', what was the mean RTCI?</b>		0.8%	
NOTES:			

<b>Method of control used</b>	Traps	
TICK ONE OR MORE BOXES	Poison	
	Traps and poison	
<b>If poison was used, what was the bait/toxin?</b>	TICK ONE OR MORE BOXES	
1080 pellets	1080 carrots	
1080 gel	Cyanide paste	
Feratox	Feracol	
Brodifacoum	Campaign	
<b>If poison used, was pre-feeding done?</b>		Y
<b>Was there an RTCI target?</b>	Y/N	Y
<b>If 'Yes', was the target RTCI?</b>		2%
<b>Was post-control monitoring done?</b>	Y/N	Y
<b>If 'Yes', what was the mean RTCI?</b>		1.7%
NOTES:		

# Appendix 3

## SUMMARY OF THE GENERAL CHARACTERISTICS OF CONTROL OPERATIONS ON PUBLIC CONSERVATION LAND

TABLE A3.1. DETAILS OF AERIAL POSSUM CONTROL OPERATIONS FOR ALL SURVEYED REGIONS COMBINED FOR THE PERIOD 2000/01-2003/04.

CONTROL DETAILS		PERCENTAGE OF OPERATIONS (%)	NUMBER OF OPERATIONS*
Bait type	Carrot	6.5	62
	Pellet	93.5	62
Pellet type	16 mm	25.0	24
	20 mm	75.0	24
Toxin = 1080		100	78
Toxic sowing rate	1 kg/ha	1.8	57
	2 kg/ha	43.9	57
	3 kg/ha	50.8	57
	4 kg/ha	3.5	57
Toxic loading	0.08 mg/kg	0.0	60
	0.15 mg/kg	100	60
Post-control monitoring undertaken		98.0	64

\* Operations where detailed control information was supplied only.

TABLE A3.2. DETAILS OF GROUND POSSUM CONTROL OPERATIONS FOR ALL SURVEYED REGIONS COMBINED FOR THE PERIOD 2000/01-2003/04.

CONTROL DETAILS		PERCENTAGE OF OPERATIONS (%)	NUMBER OF OPERATIONS*
Control type	Traps	88.4	491
	Poison	91.0	491
Poison type	1080 pellets	22.5	448
	1080 carrot	0.9	448
	1080 gel	0.0	448
	1080 paste	4.0	448
	1080 apple	0.0	448
	Cyanide paste	24.3	448
	Feratox®	90.8	448
	Feracol®	22.3	448
	Campaign®	1.6	448
	Brodifacoum	9.4	448
Post-control monitoring undertaken		99.4	724

\* Operations where detailed control information was supplied only.

# Appendix 4

## CLASSIFICATION OF LAND COVER DATABASE VERSION 2 HABITAT CATEGORIES

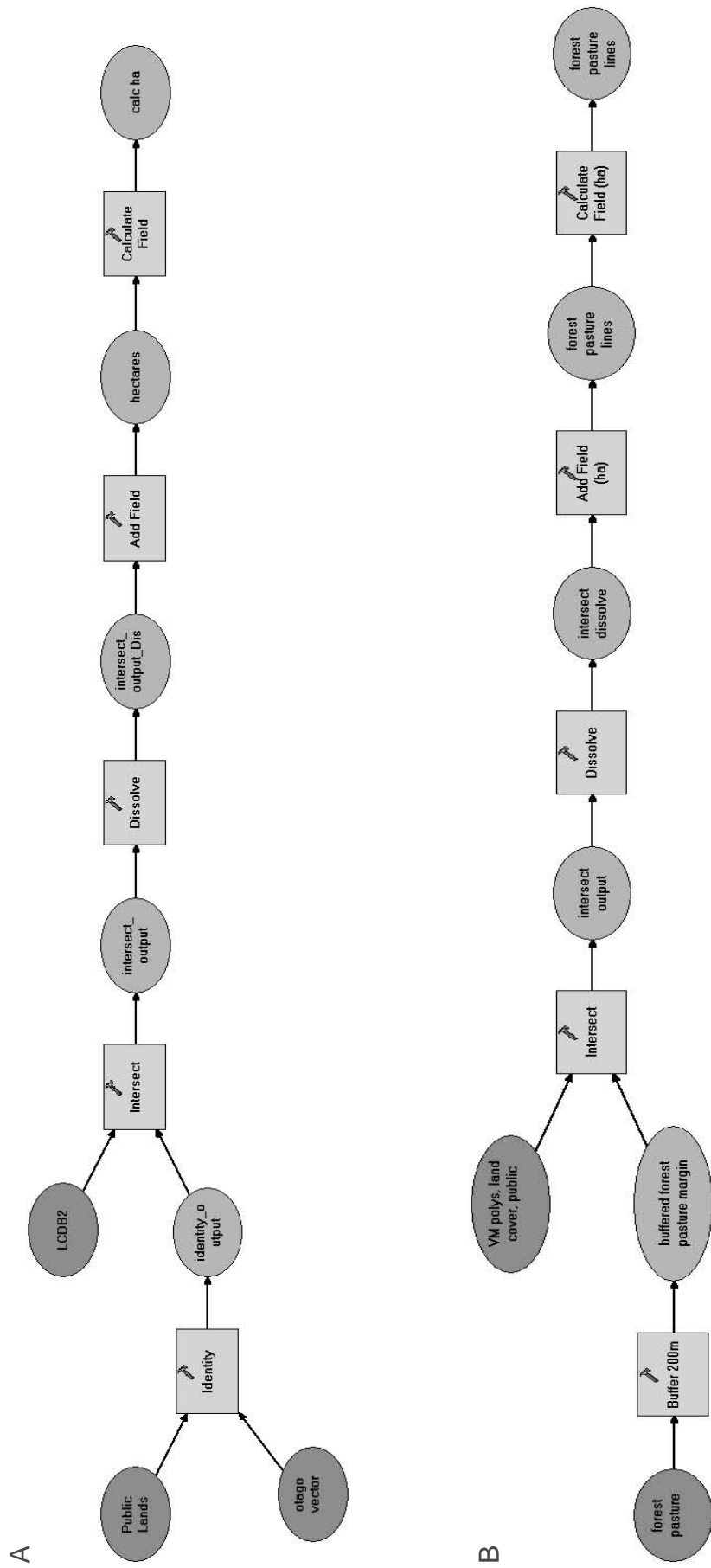
Classification of Land Cover Database Version 2 (LCDB2) habitat categories into habitat categories used in this project (LCDB2 data supplied by Ministry for Environment, July 2004).

HABITAT CATEGORY IN THIS STUDY	LCDB2 HABITAT CATEGORY
Forest	Afforestation
	Broadleaved/indigenous hardwoods
	Deciduous hardwoods
	Forest harvested
	Indigenous forest
	Other exotic forest
	Pine forest—closed canopy
	Pine forest—open canopy
Scrub	Gorse and broom
	Grey scrub
	Manuka and/or kanuka
	Matagouri
	Mixed exotic shrubland
	Subalpine shrubland
	Orchard and other perennial crops
Pasture/other	Alpine gravel and rock
	Built-up area
	Coastal sand and gravel
	Dump
	Estuarine open water
	Fernland
	Flaxland
	Herbaceous freshwater vegetation
	Herbaceous saline vegetation
	Lake and pond
	Landslide
	Low-producing grassland
	Major shelterbelts
	Orchard and other perennial crops
	River
	River/lakeshore gravel/rock
	Short-rotation cropland
	Surface mine
	Transport infrastructure
	Urban parkland/open space

# Appendix 5

## GIS APPROACH USED TO CALCULATE AREA OF CONTROL

The Geographic Information Systems (GIS) approach used to calculate:  
A. the area of forest and scrub that had received possum control on public conservation lands when the habitat type 'forest block' was deemed to be treated, and B. area of forest within 200 m of a forest-pasture margin that had received possum control on public conservation lands when the habitat type 'forest buffer' or 'forest-pasture margin' was deemed to be treated.





# Appendix 6

## TOTAL AREA OF CONTROL OPERATIONS IN SURVEYED REGIONS

TABLE A6.1. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE MANAWATU-WANGANUI REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1999/00	134 096	20 311			19 438	489	19 438	489
2000/01	366 931	32 609			29 446	1774	29 446	1774
2001/02	847 642	103 995	15 019	696	77 558	4177	92 577	4873
2002/03	793 567	105 241	9313	325	85 698	6639	95 011	6964
2003/04	841 719	106 826			98 441	4829	98 441	4829

TABLE A6.2. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE WELLINGTON REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1993/94	5926	5897	5627	200			5627	200
1994/95	31 158	28 002	25 707	2068			25 707	2068
1995/96	17 701	3429	2349	944			2349	944
1996/97	14 082	9557	8869	458			8869	458
1997/98	33 425	15 577	11 895	1475			11 895	1475
1998/99	16 965	12 731	10 324	413			10 324	413
1999/00	15 895	7037	6269	193			6269	193
2000/01	28 122	14 038	11 362	1294	271		11 633	1294
2001/02	29 562	13 090	11 419	1440			11 419	1440
2002/03	20 206	13 145	11 445	610			11 445	610
2003/04	34 391	13 452	8675	650	3117	13	11 792	663

TABLE A6.3. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE TASMAN REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
2000/01	56 602	19 110	16 601	1385			16 601	1385
2001/02	80 181	22 774	13 606	2780	1		13 607	2780
2002/03	230 208	115 568	90 430	13 215			90 430	13 215
2003/04	245 555	137 908	108 432	14 504	1554	697	109 986	15 201

TABLE A6.4. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE MARLBOROUGH REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1997/98	11 803	153	18	92			18	92
1998/99	47 943	709	226	228			226	228
1999/00	90 225	2878	1845	567			1845	567
2000/01	124 132	3062	1802	378			1802	378
2001/02	157 884	9171	2905	2473			2905	2473
2002/03	212 043	11 629	4289	2445	35	5	4324	2450
2003/04	193 767	11 219	3126	2654	151	82	3277	2736

TABLE A6.5. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE WEST COAST REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1993/94	13 185	11 055	10 257	554			10 257	554
1994/95	179 382	63 315	51 318	2804			51 318	2804
1995/96	211 101	72 453	33 973	26 339			33 973	26 339
1996/97	189 111	36 853	16 900	5886			16 900	5886
1997/98	192 355	36 145	18 704	3516			18 704	3516
1998/99	189 933	35 625	21 314	277			21 314	277
1999/00	215 282	54 207	35 317	3793			35 317	3793
2000/01	198 153	37 593	20 993	1226			20 993	1226
2001/02	219 407	55 598	31 953	8121			31 953	8121
2002/03	215 605	55 430	30 128	10 198			30 128	10 198
2003/04	205 390	45 417	23 635	6743			23 635	6743

TABLE A6.6. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE CANTERBURY REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1996/97	29 929	43			3	9	3	9
1997/98	80 127	1351	475	408			475	408
1998/99	269 236	32 583	4523	7	1039	1607	5562	1614
1999/00	378 254	36 191	5498	2549	890	1401	6388	3950
2000/01	448 034	30 681	4863	20	181	101	5044	121
2001/02	333 208	14 232	468	83	161	110	629	193
2002/03	641 254	19 118	1238	74	93	33	1331	107
2003/04	489 583	35 135	2412	1610	4858	5926	7270	7536

TABLE A6.7. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE OTAGO REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1996/97	76 850	188	7		34	3	41	3
1997/98	69 497	1031	450		7		457	0
1998/99	292 553	10 005	3439	710	188	11	3627	721
1999/00	448 117	27 843	15 101	2851			15 101	2851
2000/01	560 971	30 448	16 557	1123	128	33	16 685	1156
2001/02	669 701	45 980	22 503	3298	128	33	22 631	3331
2002/03	1 004 722	84 597	46 293	6652	128	33	46 421	6685
2003/04	935 453	45 701	9479	2053			9479	2053

TABLE A6.8. TOTAL AREA (ha) OF CONTROL OPERATIONS IN THE SOUTHLAND REGION, THE AREA OF PUBLIC CONSERVATION LANDS (PCL) WITHIN THAT AREA, AND THE AREA OF FOREST AND SCRUB CONTROLLED ON PUBLIC CONSERVATION LANDS (KNOWN AREA = HABITAT TYPES RECORDED AS KNOWN IN THE SURVEY; POTENTIAL AREA = HABITAT TYPES UNKNOWN IN THE SURVEY).

YEAR	TOTAL AREA OF CONTROL OPERATIONS (ha)	TOTAL AREA OF CONTROL OPERATIONS (ha)	POSSUM CONTROL ON PCL (ha)					
			KNOWN AREA CONTROLLED		POTENTIAL AREA CONTROLLED		COMBINED KNOWN AND POTENTIAL AREAS	
			FOREST	SCRUB	FOREST	SCRUB	FOREST	SCRUB
1997/98	159 071	30563			27 070	770	27 070	770
1998/99	662 979	95 500			51 779	8688	51 779	8688
1999/00	533 016	70 605			44 742	4307	44 742	4307
2000/01	696 362	82 002	59 700	5439	3528	1114	54 228	6553
2001/02	804 249	81 157	51 729	5630			51 729	5630
2002/03	549 458	57 782	30 707	3580	4694	1662	35 401	5242
2003/04	535 454	59 994	37 944	2030	1709	1483	39 653	3513

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