



Environmental
Protection Authority
Te Mana Rauhi Taiao

Annual Report on the Aerial Use of 1080

For the year ended 31 December 2011



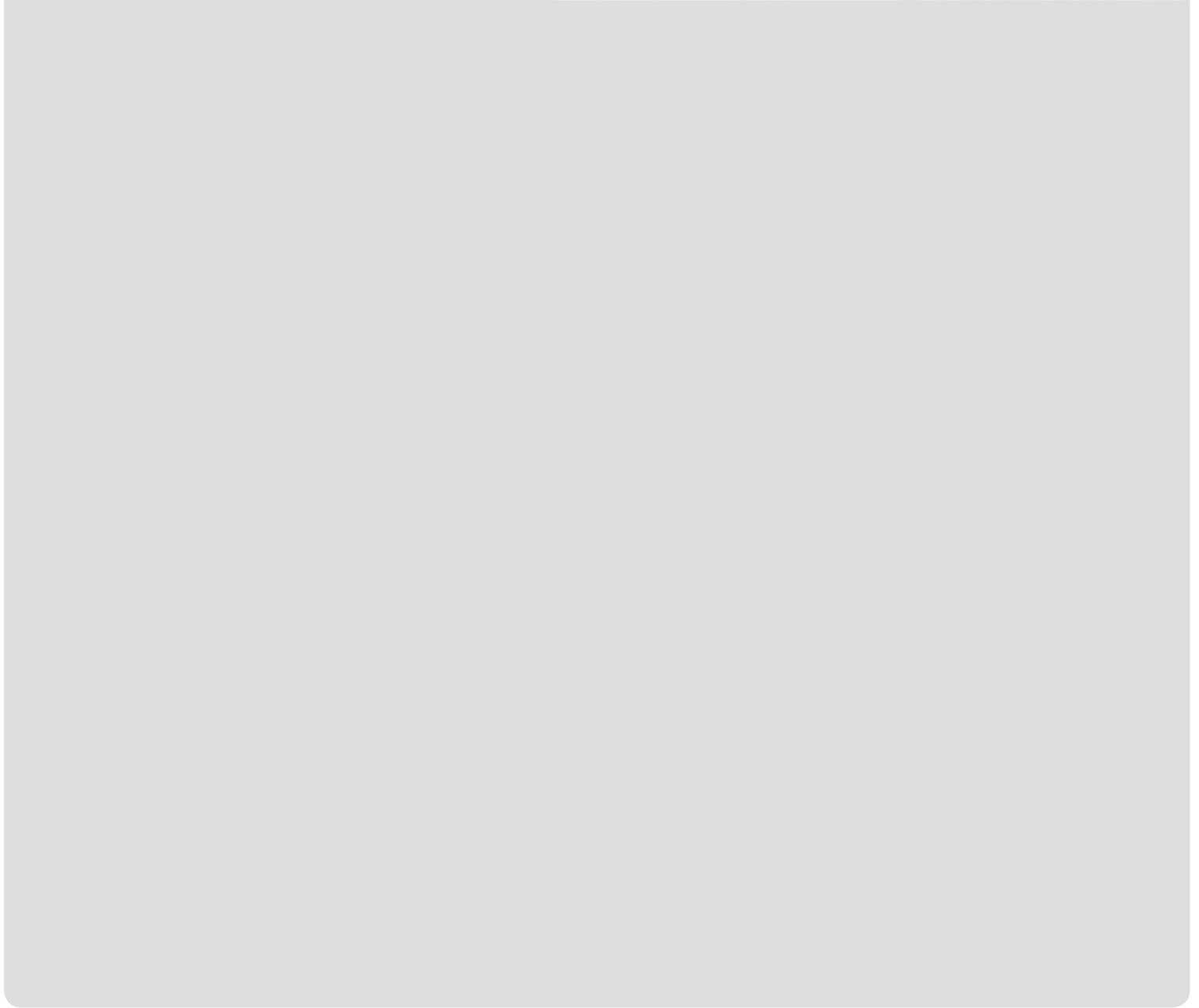
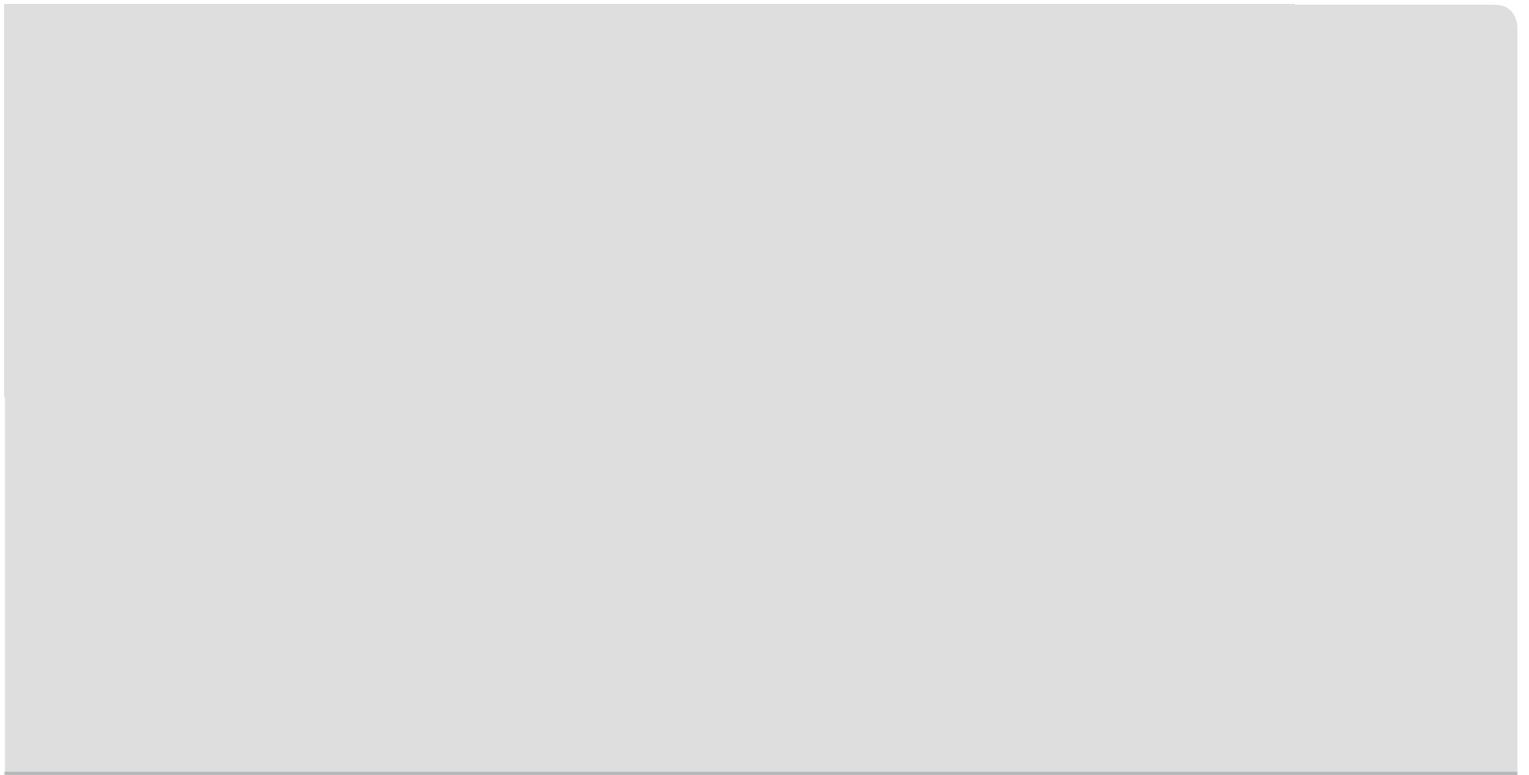


Table of contents

Executive summary	4
Introduction	5
Sectors that use aerial application of 1080 for pest control	5
Application information	8
Best practice guidance	9
Communication	9
Management of aerial 1080 operations	9
Aerial pest control operations	10
Post-operational reports	10
Monitoring	14
Incidents and public concerns	15
Research	21
Alternatives to the use of 1080	21
Improvements in the use of 1080	25

Executive summary

1080 is one of the most closely-monitored hazardous substances in New Zealand. This is the fifth annual report on the aerial use of 1080 since controls on its use were tightened in 2007. The main findings of the report are consistent with previous years. Highlights include:

- » The regime is generally working as intended. The benefits of using 1080 are being realised while risks are being minimised.
- » The controls for aerial operations are largely being followed and operators show a willingness to continually improve practices.
- » While most operations are incident free, more complaints and incidents were reported. This is due, in part, to more intensive auditing of operators and improved self-reporting.
- » There were 12 breaches of controls from operator oversights or accidents, up from six in 2010. There were 11 breaches caused by vandalism and interference by the public, down from 18 in 2010. No risks were identified from these breaches.

In the last five years we have seen progress in safely managing 1080 through research, development of industry standards and better communication. Operators have come under more scrutiny from enforcement and funding agencies through more intensive auditing and have improved their self-reporting. When we started monitoring 1080 in 2008, most incidents were initially reported by the public or other agencies, but now the majority of reports come from operators and funding agencies.

It is common for water to be tested to allay community concerns. Since 2008, we have reported on the results of nearly 450 water tests after aerial 1080 operations. Only four of the tests in water supply catchments detected 1080 and none exceeded the limit set to protect human health. The EPA expects that operators and regulatory bodies will continue to test water to verify that specific operations pose no risk to water supplies.

The Environmental Protection Authority received 49 reports of aerial 1080 operations in 2011, covering nearly 492,000 hectares. This year, more aerial 1080 operations covered a greater area than last year. However, the number of operations is comparable to that of previous years and the increase in area is likely due to the cycle of pest control operations rather than an overall increased use.

Introduction

The reassessment of 1080 for use in pest control was completed by the Environmental Risk Management Authority (ERMA New Zealand) in August 2007. After careful consideration, the Authority concluded the benefits of using 1080 outweighed the adverse effects, and released its decision to allow the continued use of 1080 with additional controls. Recommendations were also made for the development of best practice guidelines, and for further research.

In reaching its decision, the Authority was mindful that the use of 1080 was a polarising issue about which many New Zealanders have deeply-held views. It recognised the importance of engagement through better communication and consultation with the public, local communities, Māori, and special interest groups. The Authority's decision outlined a new management regime for 1080 operations.

This is the fifth annual report since the release of the reassessment decision. It provides information on:

- » aerial 1080 operations that were carried out in the 2011 calendar year
- » research that was carried out up until July 2012.

This is the last report to be published in the current format. While most of the information contained in this year's report will still be made available, the Annual Report On The Aerial Use Of 1080 For the Year Ended 31 December 2012 will be published online. As well, the research section will be published separately, and reformatted to be more relevant to people who want to access further information.

Sectors that use aerial application of 1080 for pest control

Control of animal pests including possums, wallabies, rabbits, rats and stoats is carried out using both ground control and aerial application.

Ground control may include methods such as trapping, shooting or placement of various toxins in bait stations. The toxins, or vertebrate toxic agents, may include 1080.

Aerial application is the use of aircraft to distribute baits and is considered by users to be a key advantage where pest control is undertaken on rugged or remote land. In her 2011 report,¹ the Parliamentary Commissioner for the Environment also concluded that 1080:

- » can kill possums, rats and stoats in one operation
- » can knock back predators for a time, allowing populations of native species to increase
- » can be used quickly to protect birds and other animals at vulnerable times
- » is more cost-effective than ground methods in the majority of the conservation estate.

Different users carry out pest control operations with aerially-applied 1080 for different reasons. The sector groups that use aerial application of 1080 are:

- » the Animal Health Board
- » the Department of Conservation
- » regional councils
- » other land managers.

The Animal Health Board

The Animal Health Board (AHB) is responsible for managing and implementing the National Pest

¹ Parliamentary Commissioner for the Environment, June 2011; *Evaluating the use of 1080: Predators, poisons and silent forests.*

Management Strategy for Bovine Tuberculosis (TB) in New Zealand, under the Biosecurity Act 1993.

The TB strategy, which was approved by Government in 1998, was amended in 2004, and again in 2011. The strategy provides for measures to control TB in cattle and deer herds, and works in two ways:

- » disease control – aiming to control and contain the spread of the disease within cattle and deer herds
- » vector control – aiming to control and contain the wild animal species (in most cases possums) responsible for spreading the disease to cattle and deer.

The 2011 amendment introduced new objectives for eradicating TB from possums and other wildlife species across 2.5 million hectares of the approximately 10 million hectares where wildlife infection is present. Such eradication depends on sustained possum control to achieve low, even possum densities across large areas for long enough periods to break the cycle of possum-to-possum disease transmission.

The AHB uses a combination of ground control methods and aerially-applied 1080 in their strategy for containing and controlling possums. In 2011, approximately 344,000 hectares were treated using aerial application of 1080 (nine percent of the total area treated by the AHB in 2011), a similar-sized area to that reported in previous years.

The Department of Conservation

Possums and rats eat the eggs of native birds, attack their young and cause significant damage to native trees. In the absence of natural predators, possums and rats (as well as stoats and ferrets) have flourished and cause a great deal of damage to native animals and birds, and to the native forest environment.

The Department of Conservation (DoC) manages approximately 8.75 million hectares of conservation land. It uses a combination of ground control methods and aerial application of 1080 to:

- » improve the health of ecosystems by reducing the impact of browsing, competition and predation by possums and rats
- » protect threatened species from predators through direct control and targeted by-kill²
- » control rabbits.

DoC's total area under sustained management is about 1.8 million hectares.³ In 2011, approximately 451,000 hectares (25 percent) of this area was covered by animal pest control operations using both ground control and aerial methods (see Table 1).⁴ The department reported that of their 2011 total treatment area, approximately 127,000 hectares (28 percent) was treated using aerial application of 1080 – around 35,000 hectares less than in 2010.

Table 1: Department of Conservation animal pest control treatment area

AREA UNDER SUSTAINED MANAGEMENT (000 HECTARES)			AREA CONTROLLED 2011 CALENDAR YEAR (000 HECTARES)		
Rabbit control	Possum control	Rodents and mustelids	Rabbit control	Possum control	Rodents and mustelids
473	839	487	22	299	323 ⁵

² This is where scavenging pests are being controlled using secondary poisoning.

³ Not including the Chatham Islands and sub-Antarctic islands.

⁴ In 2010, approximately 457,000 ha was covered by animal pest operations. This was incorrectly reported as 623,000 ha in last year's report.

⁵ A significant proportion of the area of pest control was controlled for possums, rodents and mustelids. This means that the total area controlled is less than the sum of the areas controlled for different species.

Regional councils

Under the Resource Management Act 1991, regional councils are responsible for maintaining indigenous biological diversity in their regions. They are also required to manage pests under the Biosecurity Act 1993. The councils achieve these responsibilities through:

- » local regulation (for example regional pest management plans)
- » incentive and education schemes
- » direct (regional council-managed) control.

Where regional councils directly control animal pests they use a combination of ground control methods and aerial application of 1080. This control reduces the impact of browsing, competition and predation by possums, and protects threatened species from other pests.

Regional councils have a combined area under sustained management of approximately two million hectares and control pests over about 800,000 hectares annually.⁶ In 2011, these councils reported aerial applications of 1080 that covered approximately 5,000 hectares (0.6 percent) of the estimated annual treatment area.⁷

Other land managers

Farmers and land managers (such as Land Information New Zealand) use a combination of aerial application of 1080 and other rabbit control methods (for example shooting, ground-laid poisons) to reduce the effects of rabbits. This is done to meet the requirements of regional pest management plans or for production purposes.

In some areas – referred to as rabbit-prone land – the rabbit population is not curbed by natural

mechanisms and numbers can quickly increase, causing environmental effects such as:

- » a reduction in the diversity of plant species
- » an increased risk of erosion
- » a reduction in soil quality
- » adverse effects on indigenous and other fauna when predators of rabbits (such as cats and mustelids) target alternative prey⁸.

Large areas of the South Island are at risk from rabbits; approximately 380,000 hectares are considered extremely rabbit-prone, and about 630,000 hectares are considered highly rabbit-prone. Most of these areas are in Otago, Canterbury and Marlborough.⁹ In 2011, 1080 was aerially-applied for rabbit control over approximately 10,000 hectares (2.6 percent of the extremely rabbit-prone land) in areas of Otago and Canterbury.¹⁰ This is similar to the size of area reported for 2010.

Land managers (such as foresters) also use a combination of ground control methods and aerial application of 1080 to reduce the impact of browsing by possums in indigenous or production forests. In 2011, 1080 was aerially-applied over approximately 5,600 hectares for private conservation work and pest control research projects.

⁶ Data for regional councils as at 2006.

⁷ This does not include work done for the control of rabbits on behalf of other land managers.

⁸ See www.ecan.govt.nz/advice/your-land/plant-animal-pests/managing-animal-pests/pages/rabbits.aspx

⁹ Lough, RS 2009. *The Current State of Rabbit Management in New Zealand MAF Biosecurity Contract Report*, Wellington.

¹⁰ No aerial 1080 operations for rabbit control were reported for Marlborough in 2011

Application information

The pest management cycle for an area under sustained management spans several years. Every year parts of the area will be controlled by different methods at different times. This means that some parts of an area under sustained management will be treated by aerial application on a five- to seven-year cycle, while other areas may only ever be covered by ground control methods.

Table 2 shows a comparison between the data for total treatment areas over five years (2006 to 2011). This data provides a snapshot of the sizes of the areas treated by aerial application in the current year and has been reasonably consistent since 2008 when monitoring first started.

Table 2: Animal pest control treatment area (ooo ha)

	AHB	DOC	REGIONAL COUNCILS	OTHER LAND MANAGERS		TOTAL AREA
				RABBIT	POSSUM	
2006 Aerial treatment area (1080)	396	127	61 ¹¹	-	-	580
2008 Aerial treatment area (1080)	435	133	3	16	11	600
2009 Aerial treatment area (1080)	309	174	11	17	-	510
2010 Aerial treatment area (1080)	263	161	5	9	-	438
2011 Aerial treatment area (1080)	344 ¹²	127	5	10	6	492
2006 Total treatment area	5,004	136	800	-	-	5,900
2008 Total treatment area	3,630	260	-	-	-	3,900
2009 Total treatment area	3,404	430	-	2,431 ¹³	-	6,300
2010 Total treatment area	3,294	457 ¹⁴	-	2,431 ¹³	-	6,358
2011 Total treatment area	3,805	451	-	2,431 ¹³	-	6,687

A dash (-) signifies that there was no data available.

The Animal Health Board (AHB) conducts aerial 1080 operations over a considerably larger total area, and aerially-applies more 1080 than any other user. At the same time, the AHB used aerial 1080 over a relatively small proportion of their total treatment area (nine percent of the total treatment area being via aerially-applied 1080). This reflects that a significant proportion

of the AHB's treatment area includes farmland, with aerial 1080 being used on the fringes. By comparison, a significant proportion of DoC pest control occurs in more difficult forested terrain, resulting in more (28 percent) of DoC's pest control being carried out using aerially-applied 1080.

¹¹ Some Animal Health Board co-funded operations were included as regional council operations in 2006.

¹² Includes combined AHB + DoC operation of 31,500 Ha.

¹³ Estimate based on an assumption that rabbit control takes place on land that has a rabbit-prone classification of "medium", "high" or "extremely high" (data sourced from Lough, 2009).

¹⁴ This was incorrectly reported as 623,000 ha in last year's report.

Best practice guidance

The reassessment decision for 1080 included recommendations that management practices for aerial application be standardised around best practice to ensure national consistency and further improve the way 1080 is used.¹⁵

Since 2008, best practice guidelines for communication and management of aerial 1080 operations have been published. These were the two key priorities identified in the 1080 decision for the development of best practice guidance.

Communication

The guideline outlines processes for consultation, notification, communication with various groups and individuals and for recording and handling complaints.

Management of aerial 1080 operations

The guidelines for managing aerial 1080 operations form a high-level document outlining the matters to be addressed once a decision has been made to undertake an aerial 1080 drop. The focus is on risk management at all stages of an aerial 1080 operation, which includes:

- » pre-operational planning, consultation and obtaining of consents and permissions
- » the practical preparation for carrying out the drop
- » the aerial 1080 operation itself
- » the post-operational monitoring, communication and reporting.

As the completion of these guidance documents has fulfilled the Authority's recommendations on development of guidance, we will not separately report on development of best practice guidance in future annual reports.

¹⁵ ERMA New Zealand's decision on the reassessment of sodium fluoroacetate (1080) and substances containing 1080: August 2007.

Aerial pest control operations

This section is divided into three parts. The first provides a synopsis of the data brought together through the mandatory post-operational reporting about the management of an aerial 1080 operation, including a communication overview and assessment of outcomes. The second looks at monitoring data collected, while the third section provides a synopsis of the reported incidents and public concerns and how the enforcement agencies and operators responded.

Operational managers are required to submit information after an aerial 1080 operation, including:

- » who undertook the operation and why
- » information about the 1080 formulations used and application rates
- » the location and size of the operation
- » monitoring information, including
 - water monitoring, if it was carried out in conjunction with the operation and
 - species monitoring, if it was carried out in conjunction with the operation
- » an assessment of the outcomes of the operation
- » an overview of the communication activities (consultation and notification), and the outcomes of that communication
- » an overview of any incidents and complaints related to the operation and the actions that resulted from those incidents and complaints
- » a map of the operational area.

Individual post-operational reports are available on our website at: www.epa.govt.nz

Post-operational reports

Operation management

The Environmental Protection Authority received reports for 49 aerial 1080 operations in the 2011 calendar year, covering approximately 492,000 hectares. The majority of this area was treated by the Animal Health Board (70 percent) and the Department of Conservation (26 percent). The remaining area was treated for rabbit, possum and wallaby control by regional councils and other land-managers.

Of the reported operations:

- » twenty-one were funded by the AHB
- » eight were funded by DoC
- » one was co-funded by DoC and the AHB
- » one was funded by a regional council
- » one was funded by a regional council, DoC and private landowners for biodiversity purposes
- » two were funded for research into pest control
- » fifteen were funded by other land managers for rabbit control.

There were four more aerial 1080 operations in 2011 (45 in 2010) over a treatment area approximately 11 percent larger (492,000 hectares versus 438,000 hectares for 2010). The AHB's aerial 1080 operations increased (22 in 2011 versus 17 for 2010) and DoC's decreased (nine in 2011 versus 12 for 2010).¹⁶ Both organisations reported a higher percentage of their total treatment areas having been controlled using aerial application of 1080. This indicates where each organisation is in their treatment cycle, rather than a change in treatment methods.

¹⁶ The number of operations include an AHB operation and two DoC operations which were co-funded with other agencies.

The 1080 formulations applied and application rates

All of the aerial possum and/or rodent control operations used 1080-laced cereal baits with a concentration of 1.5 grams of 1080 per kilogram of bait. Deer repellent-coated cereal baits were used in 11 of the 34 possum control operations. Carrot baits were not used on any possum control aerial operation in 2011.

All but one of the rabbit control operations reported using carrot baits laced with 1080 at the rate of 0.2 grams per kilogram of bait. The other operation used cereal baits laced with 0.4 grams of 1080 per kilogram of bait. The difference in the toxic concentration rate between rabbit and possum baits reflects the current assumptions about susceptibility and feeding patterns of rabbits. Research is being conducted to test these assumptions (see research section).

Bait application rates for possum and rodent control operations varied between 0.5 and three kilograms of bait per hectare, with rates for rabbit control varying between five¹⁷ and 30 kilograms of bait per hectare. The difference in application rates reflects the differences in pest numbers and feeding patterns between target species.

Despite the differences in toxic concentrations and application rates, the average application rate of the active ingredient (1080) was similar for both rabbit and possum control operations. The average active ingredient application rate for possum control operations was approximately 2.7 grams of 1080 per hectare. It was 4.9 grams per hectare for rabbits.

This data is comparable to that reported for previous years with both application rates being well within the maximum allowable rate of 30 grams of 1080 per hectare.

Location of operations

The number of aerial 1080 operations in each region, and the sectors using 1080, varies depending on the purpose of the operation, topography and land cover (see Table 3).

The regions with the largest number of aerial 1080 operations continue to be the West Coast and Otago. However, the reasons for the operations differ and so the areas treated also differ. The West Coast has 37 percent coverage of indigenous forest, and aerial application of 1080 for possum control is considered a key tool in possum and rodent control programmes. In Otago, most of the aerial 1080 operations were carried out for rabbit control and covered relatively small areas.

¹⁷ Using cereal baits.

Table 3: Aerial 1080 operations in each region (2008 – 2011)

Year	ANIMAL HEALTH BOARD				DEPARTMENT OF CONSERVATION				REGIONAL COUNCILS				OTHER LAND MANAGERS RABBIT & POSSUM				TOTAL AERIAL				AERIAL APPLICATION EACH REGION (000HA) ¹⁸			
	08	09	10	11	08	09	10	11	08	09	10	11	08	09	10	11	08	09	10	11	08	09	10	11
Bay of Plenty	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	2	1	1	-	47	11	4	-
Canterbury	1	1	-	-	1	1	-	-	-	-	1	-	9	12	5	7	11	14	6	7	26	24	9	10
Hawke's Bay	5	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-	5	5	3	3	52	79	24	17
Manawatu/Whanganui	5	-	-	4	3	2	1	1	-	-	-	-	-	-	-	-	8	2	1	5	56	41	3	120
Marlborough	3	3	2	-	-	1	-	-	-	-	-	-	-	-	-	-	3	4	2	-	59	28	26	-
Northland	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	2	-	14
Otago	2	3	-	1	-	3	-	-	-	-	-	-	5	4	10	9	7	10	10	10	13	38	5	8
Southland	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	1	-	1	1	8	-	25	5
Taranaki	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	2	-	1	-	2	-	35	-
Tasman	4	2	-	2	3	2	-	1	-	-	-	-	-	-	-	-	7	4	-	3	80	64	-	47
Waikato	5	2	3	5	1	3	2	-	2	1	1	1	-	-	-	1	8	6	6	7	64	30	75	64
Wellington	1	2	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	3	1	-	3	19	29	-
West Coast	14	9	7	6	4	5	6	5	-	-	-	-	1	-	-	1	19	14	13	12	183	175	204	208
TOTAL	41	28	17	22	14	18	11	8	3	2	2	1	16	16	15	18	74	64	45	49	600	510	438	492

A dash (-) signifies no operations reported.

Size of operations

The total area of combined pest control operations carried out in 2011 is estimated to be more than 6.6 million hectares.¹⁹ Within the 492,181 hectares treated by aerial application, the average size of aerial applications was about 10,000 hectares, with the largest application covering just over 52,000 hectares and the smallest 100 hectares. This is comparable to the sizes of operations previously reported.

The size of the operation can depend on the purpose and location of the operation. DoC and the AHB mostly carry out aerial 1080 operations to control possums and other predators over larger tracts of land. Bigger operations can increase the time it takes pest numbers to rebuild since fewer pests migrate into the

heart of the treated areas. The average size of aerial 1080 applications was 16,800 hectares for DoC and 15,300 hectares for the AHB.

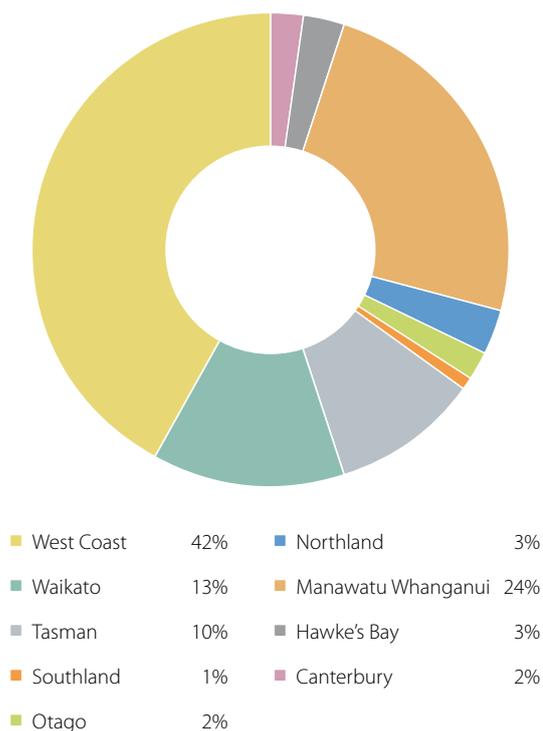
By comparison, the average size of aerial 1080 rabbit control operations undertaken by other land managers was 680 hectares.

Although Otago and Canterbury had comparatively large numbers of operations, the majority were small operations for rabbit control, resulting in small total areas treated compared with other regions (Figure 1). This is consistent with data presented in previous annual reports.

¹⁸ Numbers are rounded to nearest 1000 hectares.

¹⁹ There is an additional unknown total area for privately-funded ground-based animal pest control.

Figure 1: Total area of aerial application in each region – 2011 (000 ha)



Communication

Good communication can reduce public concern and result in fewer incidents. The EPA expects to see a high level of communication (that is consultation and notification) with neighbours, affected groups and communities to an extent appropriate for each operation.

Consultation with Māori groups

Māori groups should be engaged as early as possible when an aerial 1080 operation is to be carried out on public land where the ongoing management by Māori of their cultural and natural resources may be affected by the operation.

Māori stakeholders were identified as having been consulted in 97 percent (29 out of 30) of the aerial operations that took place on public land in 2011. This represents a continuing improvement in the rate of consultation with Māori since 2008. Changes to operational plans as a result of consultation with Māori were not specifically identified for most operations. However, four operational reports stated that control methods, boundaries or species monitoring were changed as a result of consultation with Māori groups.

Consultation with hunting groups

Hunting groups should be engaged as early as possible when an aerial 1080 operation is to be carried out on public land where hunting is prevalent and likely to be affected by an application. Early engagement of these groups is especially important in recreational hunting areas,²⁰ and where commercial harvesting of animals for meat is prevalent.

Hunting groups were identified as having been consulted in 73 percent (22 out of 30) of the operations that took place on public land in 2011. This represents a continuing improvement in the consultation rate with these groups since 2008. Consultation with hunting groups resulted in 11 operations where deer repellent baits were used. Changes to baiting strategies or timing to reduce the impact on hunting opportunities were reported in other operations.

²⁰ The eight recreational hunting areas are Pureora, Kaimanawa, Aorangi, Lake Sumner, Oxford, Whakatipu, Blue Mountain and Kaweka.

Changes to operations as a result of consultation

Changes to operations as a result of consultation are considered an indicator of whether the consultation was effective. Twenty-six of the post-operational reports for the 2010 year included comments about changes to the operational plan as a result of consultation, including:

- » boundary changes (five operations)
- » changes as a result of concerns expressed by local iwi (four operations), including monitoring of species and exclusion of sensitive areas
- » timing changes to allow for others to manage effects (such as changes to stock grazing, granting hunting permits) (six operations)
- » the method of pest control was changed from aerial application of 1080 to ground control for parts of operations (four operations)
- » deer repellent was used (11 operations).

Notification

Notification takes place after consultation is completed. The purpose of notification is to inform affected parties of the timing and location of 1080 operations and other relevant details. Notification of certain types of incidents is also required.

Concerns about notification were forwarded to the EPA from operators, agencies or members of the public for three of the 49 aerial 1080 operations carried out in 2011. All of the concerns were investigated and one breach was found.

Implementation of the Communications Guideline for Aerial 1080 Operations

Operators are required to carry out consultation prior to applying for permission to use 1080 and to provide evidence of relevant consultation as part of

the application. Prior to granting a permission for an aerial 1080 operation, Public Health Units (PHUs) assess consultation against the *Communications Guideline for Aerial 1080 Operations*.²¹ The Ministry of Health reports the results of these assessments to the EPA.

The Ministry reported that 56 applications for aerial 1080 operations were assessed against this guideline in 2011. All of the applications met the requirements of the guideline and no permission was declined as a result of inadequate consultation. This is an improvement since the guidelines were introduced in 2009.

No deficiencies were found in the pre-operational communication process as a result of later investigations.

Monitoring

Water monitoring

Where a drinking water supply sources water from within the boundaries of an aerial 1080 operation, the local PHU may require water monitoring to be carried out before water intakes are reconnected. This is done to ensure that drinking water does not contain 1080 residues that breach the tolerable exposure limit (3.5 micrograms of 1080 per litre of water). The tolerable exposure limit is set at a level protective of human health.

Water monitoring may also be required in other water catchments as part of environmental monitoring for resource consents or carried out for research purposes. It may also be used to provide evidence of effects on water where PHUs are investigating concerns about alleged water contamination.

Post-operational water monitoring was carried out in 22 of the aerial 1080 operations undertaken in 2011, with 61 tests reported. The tests had a method detection limit of 0.1 micrograms of 1080 per litre.

²¹ See www.epa.govt.nz/about-us/monitoring/1080/Pages/Best-practice.aspx

No 1080 was detected in samples taken as part of post-operational water monitoring in drinking water catchments. However, two samples taken as part of environmental monitoring within a treatment area tested positive for 1080 detected at levels (0.1 and 0.3 micrograms of 1080 per litre of water) which were well below the tolerable exposure limit.

Species monitoring

The monitoring of plant and animal species is carried out to determine the need for pest control operations and their success. Species monitoring is not a mandatory requirement for 1080 operations, but where monitoring is carried out, operators must report the results to the EPA.

Pre-operational monitoring of pest species was carried out in 29 (75 percent) of the aerial 1080 operations undertaken in 2011. All rabbit control operations were monitored prior to aerial operations; two (25 percent) DoC operations had pre-operational monitoring of pest species, and eight (38 percent) AHB operations were monitored for pest numbers prior to control.

Post-operational monitoring of pest species was carried out on 27 (55 percent) of the aerial 1080 operations in 2011. For all but one (96 percent) of the monitored operations, the operators reported meeting their stated target results for pest control.²²

Monitoring of non-target species was carried out on seven operations to determine the effects of 1080 on them. Species monitored included dogs, kea, kaka, tomtits, native trees, native snails and native birds. This monitoring is often done as part of the research into the use of 1080 and is summarised further in the research section of this report.

Incidents and public concerns

The EPA is advised of complaints, incidents and activities associated with 1080 use in three ways:

- » the public registering their concerns – a member of the public contacts us to express concerns about particular 1080 operations or related practices
- » incident reporting – an operator or agency contacts us to express concerns about particular 1080 operations or related practices
- » media monitoring – we learn through our media monitoring service of incidents or concerns reported in the news.

Incidents related to specific operations are reported in post-operational reports. The reports for the 2011 operations are available on our website at: www.epa.govt.nz

Since 2008, there have been some improvements to industry and enforcement agency practices which have meant that operators have greater accountability when conducting aerial 1080 operations.

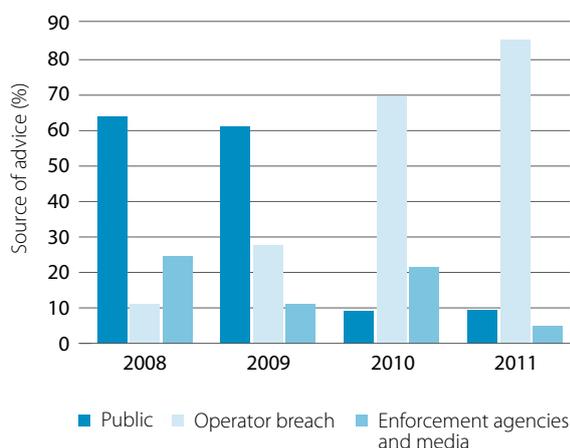
For example, the way in which permissions are granted has been improved to provide greater clarity to both users and enforcement agencies. This includes clearer conditions on permissions and better mapping of boundaries and exclusion zones. Industry have also developed standard operating procedures which give clearer direction to operators about compliance requirements.

As well, enforcement agencies and funding agencies have increased their resources into responding to public concerns, auditing against controls, permission conditions and standard operating procedures. This has led to improved response to complaints and incidents, as well as improved detection of breaches.

²² Target results vary based on methods of monitoring and are included in the post-operation reports available on the EPA's website: www.epa.govt.nz/about-us/monitoring/1080/

There has also been a significant change in the way that the EPA is initially advised of incidents and complaints. In 2008 and 2009, the majority of incidents were initially reported by the public, enforcement agencies and media. This has steadily shifted to operators self-reporting complaints and incidents as they become aware of them (Figure 2).

Figure 2: Source of advice of Incidents and public concerns reported to the EPA



Overview of incidents and public concerns

There were 43 incidents and concerns reported to the EPA for 2011, an increase on previous years (Figure 3). Most of the reported incidents and concerns (85 percent) originated from self-reporting by operators and funding agencies.

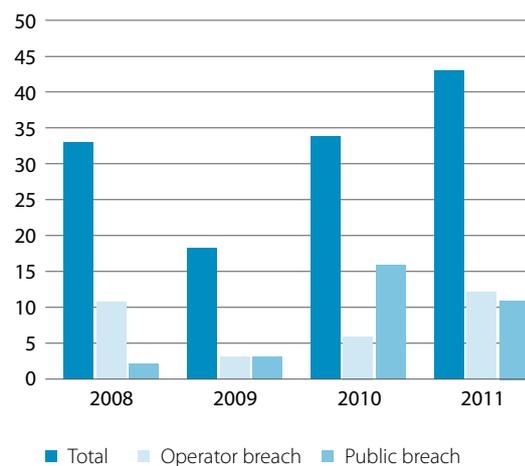
All reports were investigated. They revealed:

- » an increase in the number of breaches²³ by operators (11 in 2008, three in 2009, six in 2010 and 12 in 2011)
- » a decrease in breaches by the public (three in 2009, two in 2008, 16 in 2010 and 11 in 2011).

²³ A breach is a non-compliance with HSNO controls or other legal requirements.

²⁴ The total number of incidents and public concerns is more than the combined breaches shown. Not all investigations revealed breaches.

Figure 3: Incidents and public concerns reported to the EPA²⁴



All but one (11 of 12) of the operator breaches related to incidents on seven operations where aircraft applied or spilled baits outside the area allowed by permission conditions (misapplications). In some instances these breaches were compounded by failing to report to all of the required parties within the 24-hour limit required by the controls. It is not clear whether the increase in reports of misapplications has come about because of improved auditing and reporting by enforcement and funding agencies, whether there has been a 'real' increase in misapplications or a combination of both.

No risks to public health were identified by any of the misapplications. However, we continue to work with funding agencies and operators to ensure that practices are improved.

Incident summaries

This section contains information on the incidents, objections and compliance issues reported to the EPA, which relate to aerial 1080 operations in 2011 (by region – north to south).

WAIKATO

Operation: 2011 Central King Country

Date received: March 2011

The operator forwarded the EPA and the Public Health Unit (PHU) a complaint that 1080 had been found on a neighbour's farm track in the treatment area. An enforcement officer investigated and found that there was a misapplication, but that this was unlikely to have caused a risk to public health. The officer provided compliance advice to the operator.

Operation: 2011 Turangi 2A

Date received: April 2011

There were three alleged incidents reported for this operation:

- » The operator forwarded the EPA and the PHU complaints from two separate dog owners that their dogs had been poisoned. An enforcement officer investigated and found that the signage was adequate in both instances and that the people had taken their dogs past the signage. In one instance, a third party had failed to add a required advisory to a forestry permit. The officer provided compliance advice to the operator.
- » The operator forwarded the EPA a complaint that a single bait had been found on the tray of a bulldozer driver's ute. When the operator investigated, it was found that the vehicle was parked under tree canopy in the treatment area during the operation even though the driver had been notified of the operation.

Operation: 2011 Tihoi 3A, 3B

Date received: May 2011

A hunting group alleged that the consultation carried out by the operator had not met the requirements of the *Communications Guidelines for Aerial 1080 Operations*. The PHU had assessed the operation

prior to the permission being granted and had determined that the consultation met the requirements of the guidelines.

Operation: Hatepe Sector 4

Date received: May 2011

Two separate protest incidents were related to this operation:

- » Members of the public spray-painted anti-1080 slogans on the walls of a local forest trust building.
- » Members of the public removed warning signs from the operational area and erected them in a different area. The Police investigated, but did not find the person(s) responsible.

Operation: 2011 Whenuakite

Date received: September 2011

Two separate protest incidents were related to this operation:

- » A man was charged with assault after an incident at a public meeting where he was reported to have punched the chairperson of the local conservation board.
- » A member of the public distributed posters featuring the image of the local conservation board and the words "Dog killer wanted for crimes against dogs and the spreading of 1080". The Police investigated the threats contained in the posters and were unable to find the person(s) responsible.

Operation: 2011 Whenuakite

Date received: February 2012

The operator reported that several baits had been found outside the treatment area. The incident was investigated by several agencies, and it was found that baits were likely to have fallen off the bucket during a turn outside the treatment area.

Operation: 2011 Waitomo 1A**Date received:** December 2011

There were five allegations of stock poisoning reported for this operation:

- » Dead sheep were found on two adjacent properties with the owners alleging that the deaths were caused by 1080 poisoning. In these instances, samples from the animals were tested and no 1080 was detected.
- » Sheep escaped from an adjacent property into the treatment area. Samples were taken and 1080 was detected. The matter was settled between the parties.
- » In two separate incidents, pigs escaped from neighbouring properties into the treatment area and accessed baits. In both cases samples were taken from the pig carcasses and tested positive for 1080 residues. The matter was settled between the parties.

HAWKE'S BAY**Operation:** 2011 Waitara Valley**Date received:** September 2011

An enforcement officer from the local PHU audited the operation and found that several of the signs that were required to be erected had not been erected. The operator was given compliance advice by the officer.

MANAWATU – WHANGANUI**Operation:** 2011 Papaiti**Date received:** June 2011

The operator forwarded a complaint that dead stock had been found near an unfenced boundary on an adjacent property. An investigation found pellets by the stock and the carcasses tested positive for 1080. GPS flight lines showed that the aircraft had stayed within the operational boundary, but no other explanation for the location of the pellets was found.

Operation: 2011 Kia Wharite**Date received:** November 2011

The operator reported a misapplication of approximately 2km where the pilot stated that he was attempting to contact the pilot of another aircraft he had seen in the area and must have "knocked the switch". The misapplication was not reported to all of the required authorities within the statutory timeframe. An enforcement officer of the local PHU investigated and found that the remoteness of the area meant that no risk to public health had been created by the overfly. The operator was given compliance advice.

TASMAN DISTRICT**Operation:** 2011 Waingaro**Date received:** March 2011

GPS tracking showed that baits had been applied outside of the permitted area. The misapplication was not reported to all of the required authorities within the statutory timeframe. The operator was given compliance advice by an enforcement officer of the local PHU.

WEST COAST

Operation: 2011 Blue Spur

Date received: July 2011

There were three incidents and two allegations of non-compliance related to this operation:

- » A member of the public was arrested for trespass when he was found at the back of a building during a protest outside the DoC offices.
- » There was a series of sign thefts. The thefts were reported to the Police, but the person(s) responsible was not found.
- » Protestors attempted to access the loading site while 1080 was being applied. Police were called and the protestors were removed from the area.
- » The operator investigated an allegation that baits had been found on a mountain bike track. It was found that the track had been cleared in accordance with permission conditions and that the complainant had entered the private land without permission.
- » A member of the public alleged that the operator had breached Civil Aviation rules while applying 1080. The Civil Aviation Authority investigated and did not find any compliance issues.

Operation: 2011 Hukarere and Kopara

Date received: September 2011

There were three incidents and one alleged non-compliance related to this operation:

- » A member of the public slashed a tyre on one of the operator's vehicles.
- » Warning signs were repeatedly removed from the operational area.
- » A member of the public alleged that helicopters had over-flown a camp which was excluded from the operational area. Checks of the flight lines confirmed that no over-flight had occurred.

- » The operator notified the EPA that GPS tracking showed that baits had been applied to a road that was required to be excluded from aerial application. The misapplication was not reported to all of the required parties within the statutory timeframe. The operator was given compliance advice.

Operation: 2011 Moana North

Date received: September 2011

There were two complaints reported in relation to this operation:

- » A member of the public contacted the operator and alleged that their dog had been poisoned by 1080. An investigation by the operator found that the dog was likely to have been poisoned, but that the dog's owner had not followed the specific advice given to them about controlling their dogs after the operation.
- » A member of the public found baits on a disused forestry road. An investigation found that the road had not been required to be excluded from the operation.

Operation: 2011 Okarito/ Waitangitoana

Date received: September 2011

The operator notified the EPA that the spinner on the bucket had been accidentally turned on while the pilot was returning to the loading site. The misapplication was reported as required. An enforcement officer from the local PHU determined that a breach of permission conditions had occurred, but that no risks to health had been created.

Operation: 2011 Okarito/ Waitangitoana

Date received: September 2011

There were two complaints reported in relation to this operation:

- » A farmer had alleged that several cattle had died of 1080 poisoning. The cattle were tested for 1080 and

no 1080 was detected. An investigation found that the cattle were likely to have died from tutu poisoning.

- » A member of the public alleged that a resource consent condition had been breached. An investigation by the council found that the condition had been complied with.

Operation: 2011 Inangahua East

Date received: September 2011

There were four reported incidents in relation to this operation:

- » In two separate incidents, members of the public walked past warning signs with their dogs and the dogs were poisoned.
- » A member of the public collected toxic baits and took them to a meeting. The operator advised the person that they were not allowed to be in possession of the baits and the baits were disposed of.
- » Baits were found on a road that had previously been cleared. Information was passed on to the Police in relation to potential placement of baits by members of the public. The person(s) responsible was not found.
- » Warning signs were repeatedly removed from the operational area. The operator replaced the signs.

Operation: 2011 Buller South

Date received: September 2012

A member of the public contacted the media and alleged that his dog had been poisoned by 1080. The operator had samples from the dog tested and no residues were found. The man alleged that a second dog was subsequently poisoned, but refused to allow samples to be taken.

CANTERBURY

Operation: 2011 Muzzle station

Date received: July 2011

A bait line was flown 90 metres beyond the area permitted by the permission for the operation. The misapplication was not reported to all of the required authorities within the statutory timeframe. The operator was reminded of reporting requirements. No further action was taken.

Research

In 2007, the Environmental Risk Management Authority released its decision on the reassessment of 1080. It stressed the importance of more research into alternative methods of pest control and sought government support to develop a research programme.

This section informs on research related to 1080 use prior to July 2012. There are three distinct areas:

- » alternatives to the use of 1080
- » improvements to the use of 1080
- » other research related to 1080 use.

Many of the research projects are ongoing, as collection of data over an extended period is necessary to draw informed conclusions. The title of each research project in this section is prefaced “New” or “Update” showing whether the project started in the period covered by this report, or a previous one. A summary of the numbers of projects in each research area is in Table 4 (below).

Table 4: Summary of research projects in this section

	NEW PROJECT	UPDATE ON EXISTING PROJECTS
Alternatives to the use of 1080 (two new, 15 updates)		
Alternative toxins		
Extending the use of toxins already in use in New Zealand	1	8
Seeking registration in New Zealand for toxins currently used overseas	-	2
Consideration of new toxins	1	5
Improvements in the use of 1080 (three new, 15 updates)		
Reducing amounts of 1080 used	1	6
Effects of the use of deer repellent	2	
Effects of aerially-applied 1080 on bird populations		6
Effects of possum control on trees		3
Other research (two new, five updates)		
	2	5

Alternatives to the use of 1080

This section includes research into the use of alternative toxins, new traps and vaccines.

Research on alternative toxins

This research can be divided into three sections:

- » extending the application of toxins already in use in New Zealand
- » seeking registration in New Zealand for toxins currently used overseas
- » the consideration of new toxins.

Extending the application of toxins already in use in New Zealand

Update: Cholecalciferol – an alternative to 1080 for aerial application?

AHB ref: R-50691 and R-50691-01

An outcome of the 2008 Animal Health Board (AHB) project (R-50691) was that cereal baits containing cholecalciferol (KOLEE) might be a suitable alternative to 1080 for aerial application.

A registration application for the bait was made to the Ministry of Agriculture and Forestry (now the Ministry for Primary Industries) and the Environmental Protection Authority has decided grounds exist for a reassessment to consider aerial application. A field trial to determine the efficacy of aerially-applied KOLEE in summer 2011 revealed a kill rate of approximately 60 percent. This project has been completed and reported to AHB.

Update: Low dose cholecalciferol bait for possums and multi-species control

AHB ref: R-80706

Contracted by: Animal Health Board (AHB)

Carried out by: Connovation Ltd

A new formulation of Feracol, containing less cholecalciferol, was shown to kill possums effectively and humanely.

This project has been completed and HSNO approval was obtained in February 2011. Registration of this product was approved in June 2012.

Update: Environmental fate of toxicants used for mouse, rat and possum control

DoC ref: 3863

To determine toxin breakdown of baits containing diphacinone (RatAbate Paste) and coumatetralyl (Racumin Paste) and estimate potential risks to non-target species.

A report is expected to be completed in 2012.

Update: Diphacinone and coumatetralyl persistence in deer

DoC ref: 4128

To determine the effects on deer from residues of sub-lethal doses of diphacinone and coumatetralyl.

Three deer were sub-lethally dosed with diphacinone and three with coumatetralyl.

Research is now complete; results were published in the *Proceedings of the European Vertebrate Pest Management Conference* in 2011 and a paper has been accepted for publication in *New Zealand Journal of Ecology*.

Update: Diphacinone persistence in livestock

DoC ref: 4029

To determine the potential residues of diphacinone in non-target species.

Residue analysis was completed; results were published in the *Proceedings of the European Vertebrate Pest Management Conference* in 2011 and a paper has been accepted for publication in the *New Zealand Journal of Ecology*.

Update: Extending the registration of Feratox to include the control of Bennett's wallabies

Contracted by: Connovation Ltd in association with Ecan

Carried out by: Connovation Ltd and Ecan

To provide data to support the registration of Feratox as an alternative to 1080 for the control of Bennett's wallabies.

Field work was completed in June 2010. Registration documents have been filed with the New Zealand Food Safety Authority and the product was approved for use in early 2012. The research has been published in two journals.

Update: Updated toxicology review paper on 1080

AHB ref: R-80704

A toxicology review paper was submitted to the *New Zealand Journal of Ecology* 35 (1).

Update: Establishing baseline concentrations of cholecalciferol in animals

Department of Conservation and Lincoln University

To establish baseline levels of cholecalciferol in animals to distinguish between natural concentrations and any raised concentrations in poisoned non-target species.

A publication is in the final stages of preparation and will be submitted later in 2012.

Eason, C.T., Fairweather, A., Arthur, D., Eason, C.M.F., Elder, P.A. reference background normal concentrations of cholecalciferol in animals.

New: Researching safe and effective use of zinc phosphide paste baits for controlling possums

AHB ref: R-80628-06

Contracted by: Connovation Ltd

To demonstrate safe and effective use of zinc phosphide paste bait in the hands of New Zealand pest control professionals. Field trials were started in June 2012 and will be ongoing in 2012/13.

Seeking registration in New Zealand for toxins currently used overseas

Update: Underpinning zinc phosphide use in New Zealand

AHB ref: R-80628-04

Contracted by: Animal Health Board

Carried out by: CE Research Associates

To complete a review paper for a peer-reviewed science journal that comprehensively covers all key areas of chemistry, toxicology, ecotoxicology, environmental toxicology and fate, non-target impact, and efficacy and welfare of zinc phosphide relevant to use in New Zealand.

This paper has been accepted for publication.

Eason, C.T., Ross, J. Blackie, H.M and Fairbrother, A. (Accepted for publication in 2013) "A review of the toxicology and ecotoxicology of zinc phosphide in relation to its use as a pest control tool in New Zealand" *New Zealand Journal of Ecology*. Volume 37, 2013.

Update: Development of a solid bait containing zinc phosphide

AHB ref: R-80628-05

Contracted by: Connovation Ltd

To develop a cereal bait containing zinc phosphide.

Initial cage trials have been completed. Further cage and field trials are planned in 2012/13.

Consideration of new toxins.

This research covers the innovation of new toxins as alternatives to 1080.

Update: Secondary poisoning trials with humane red blood cell toxins for possums

AHB ref: 80701-02

Cage trials with sodium nitrite have shown it does not cause secondary poisoning of dogs, cats or birds.

This project has been completed and dossiers on these studies will be used to assist registration.

A publication will be submitted in 2013.

Update: Humane red blood cell toxins for feral pigs

Regional councils and Connovation Ltd

Pen trials of humane new toxins for feral pigs that do not cause secondary poisoning of dogs have been completed and efficacy data was obtained.

This contract has been completed and registration dossiers have been submitted to the EPA.

Update: Humane red blood cell toxins for rodents

Connovation Ltd

The research is ongoing and several novel candidate rodenticides have been identified with further cage and field trials planned for 2012/13.

Update: Pest control for the 21st century

MSI ref: LINX 0902

Contracted by: Ministry of Science and Innovation

Carried out by: Lincoln University, Connovation Ltd, University of Auckland and University of Otago

To enhance stoat and rodent control. The research targets a new generation of rodenticides based on methaemoglobinaemia, natural toxins and carbon monoxide-releasing molecules and seeks to extend the utility of PAPP in predator control.

Welfare has been confirmed through national and international collaboration. Results underpinning the registration of new toxins for animal pest control are being generated in 2012. Registration of PAPP for stoats and feral cats is complete. New pest control products – including toxins, baits, lures and delivery systems – are being researched for rodents, stoats, ferrets and feral cats.

Update: Staying proactive and reducing non-target risk

AHB ref: R-80683-01

Contracted by: Animal Health Board

Carried out by: CE Research Associates

To clarify New Zealand-based non-target research and testing requirements for new vertebrate toxic agent product registrations for possums and TB vectors.

A paper has been submitted:

Eason, C., Fairweather, A., Ogilvie, S., Blackie, H. (2012 submitted). A review of recent non-target toxicity testing of vertebrate pesticides: establishing generic guidelines.

Update: Aerial application of a new toxin in solid bait for possum control

AHB ref: R-80701-03

Contracted by: Animal Health Board

Carried out by: Connovation Ltd

To advance an alternative to 1080 for aerial control by completing cage trials on a new solid bait containing sodium nitrite and completing field trials to generate efficacy data for possums.

Initial cage trials and several small scale field trials have been completed; further cage and field trials are planned in 2012/13.

New: Primary poisoning risk to non-target species and fate of sodium nitrite in baits for possum control

AHB ref: R-80628-09

Contracted by: Connovation Ltd

To determine the risk of sodium nitrite and sodium nitrite baits to bird species and weta and determine the period of time that sodium nitrite paste and solid bait remain toxic whilst in a Philproof bait station and on the ground.

Fate trials for solid and paste baits are complete and trials to determine the risk to bird species and weta are ongoing in 2012/2013.

Improvements in the use of 1080

Reducing amounts of 1080 used

Update: Low-cost aerial baiting

AHB ref: R10710

High possum and rat kills have been achieved using cluster sowing of 1080 bait at rates as low as 167 grams per hectare and have led to setting operational specifications for DoC (rat-focused) and AHB (possum-focused) aerial baiting.

The new specifications were replicated in trials in 2011, and pest reductions were similar between cluster/strip sowing and standard broadcast sowing.

Further trials are planned for 2012 and 2013. A final contract report will be submitted to the AHB in September 2013.

Update: Halving the cost of ground control

AHB ref: 10721

To reduce the cost of ground control and make it more competitive with aerial operations by:

- 1) determining the efficacy and costs of using aerially-sown pre-feed baits followed by ground application of 1080 and cholecalciferol baits
- 2) developing an ultra-low-cost detect-and-eliminate approach combining control, monitoring and proof-of-freedom possum surveillance for scrubby farmland
- 3) identifying patch size and density below which TB cannot persist and therefore identify areas which would not require control.

Objectives one and two are ongoing and objective three has been completed. For objective one a suitable site has been selected and two blocks of around 200 ha each will be treated, with 1080 pellets in one block, and Kolee (cholecalciferol) pellets in the other. Two replicate trials will be undertaken.

Results from the completed objective three suggest approximately three possums need to be present and in contact (that is, have overlapping home ranges) for a probability of 0.01 that TB will persist at a prevalence of two percent. When the probability of persistence is increased to 0.05, ten possums per patch are needed, some of which will have overlapping home ranges.

A final contract report will be submitted to the AHB in December 2013, a manuscript will be submitted in 2014 and findings will be presented to industry workshops.

Update: Achieving multi-pest control by pre-feeding with non-toxic baits

DoC ref: 4914

To measure rates of repopulation by rats after aerial 1080 operations.

A database now holds repopulation data for 26 case studies which cover a variety of operations in various ecological contexts. The data will shape managers' expectations with respect to windows of relief from rat predation on threatened species when aerial 1080 is used. The data will also help develop computer simulation models over the next year. In addition, project 4914 has funded further experimentation on sowing rates and bird repellent.

Results have been submitted at various seminars and workshops and a manuscript is being prepared.

No official work has been conducted on this project as its funding ceased from June 2011. However, measurement of the recovery of rodent and stoat populations after aerial 1080 control, which commenced in 4914, was continued at selected sites using other DoC funds. The database now contains information on the recovery of these pests after pre-fed aerial 1080 baiting for over 30 case studies. The studies cover a range of forest types, from upland South Island beech forests to lowland North Island podocarp forests. These data help develop conceptual and computer simulation models for guiding predator

control strategies across the country. An attempt to synthesise these results into a functioning spatial computer simulation program will be made in 2013.

Update: Better aerial baiting systems and strategies

AHB ref: R-10727

Contracted by: Animal Health Board

Carried out by: Landcare Research

To design, manufacture and field test a prototype sowing bucket for aerial GPS-controlled baiting at low application rates.

The GPS-controlled bucket has been further refined and is used operationally. The software has been modified to shut off automatically when approaching an exclusion zone. Further field work to refine the automated on-off sowing system and to assess the efficacy of simultaneous pre-feeding with toxic baiting was delayed until winter 2012. A contract report will be submitted to the AHB when the project is completed in June 2013.

Update: Effect of rat interference on possum kill during aerial 1080 poisoning

AHB ref: R-10729

Contracted by: Animal Health Board

Carried out by: Landcare Research

To determine whether the presence of high rat numbers reduces the percentage of possums killed when 1080 bait is aerially-applied at much lower rates than current practice.

In four areas, rat populations were experimentally reduced by 16 to 75 percent to test whether possum kills would be highest in the area with the fewest remaining rats. However, after aerial 1080 poisoning at just 0.25 kilograms per hectare, no possums were detected in any block. In the second stage of this project, reduction in rat populations prior to possum

control did not appear to have any effect on efficacy to possums when bait was sown at levels ≤ 0.7 kg/ha.

Nonetheless, there remains circumstantial evidence from other trials suggesting that moderate or high rat densities may sometimes adversely affect possum control efficacy. The absence of any evidence of a rat interference effect in this study suggests that if such an effect is real, it is unlikely to involve bait depletion or interference. It may be, for example, that high rat density sometimes occurs at the same time as high availability of high quality foods for possums that affects possums' willingness to accept bait. If so, high rat abundance may provide a correlative indication of an increased (but idiosyncratic) risk of possum control failure. A contract report to the Animal Health Board was finalised in 2012.

Update: Mouse behavioural resistance to 1080

Contracted by: Foundation for Research Science and Technology

Carried out by: Landcare Research

To test whether a micro-encapsulated 1080 formulation would delay absorption so that mice would eat a lethal dose.

Data from an initial trial confirmed this material did not impair palatability or affect uptake compared with the RS5 1080 pellets alone. The result was 100% mortality (compared with ~25 percent from earlier formulations). Further trials were conducted and pre-feeding with a non-toxic surrogate sodium acetate increased the efficacy of 1080 bait against mice, particularly in the day following presentation. However when this trial was repeated, sodium acetate did not appear to have any effect on efficacy, and further trials are required to determine if a non-toxic surrogate and/or encapsulation has a definitive effect or not.

New: Effect of thermogenic compounds on bait acceptance and progression of 1080 poisoning in possums

AHB ref: R-10723-01

Contracted by: Animal Health Board

Carried out by: Landcare Research

Laboratory trials have identified a thermogenic compound acceptable to possums in cereal pellet bait, which also produced increased metabolic rate after ingestion. Possums ingesting the compound and 1080 in bait subsequently spent less time in states associated with pain or distress and had a reduced time to death, compared with possums ingesting bait containing 1080 alone.

These results show potential for a low-cost, non-toxic bait additive that can demonstrably reduce the welfare impacts in possums controlled by 1080 baiting. Further research including trials with rodents is planned to develop this concept to a field testing stage.

Effects of the use of deer repellent

Update: Deer repellent and 'spot' sowing effects on non-target species during aerial 1080 poisoning

AHB ref: R-10743

Contracted by: Animal Health Board

Carried out by: Landcare Research NZ Ltd

To determine whether using Epro deer repellent and aerial 'spot' sowing of 1080 baits in a highly aggregated manner results in an increased by-kill of deer and birds, and whether the efficacy of the proprietary deer repellent (Epro Deer Repellent [EDR]) now registered for use on aerially-delivered 1080 baits was affected by aggregating bait.

In 2011 the first replicate was completed in the Hauhungaroa Ranges. No dead deer were found in the areas treated with EDR bait whereas 15 were found in the systematic searches where standard bait

was used. Only 11 dead birds were found and six of these had no detectable 1080 residue. Bird counts indicated no significant changes in bird populations due to poisoning. Overall, aggregated baiting showed no difference in non-target impact compared with standard baiting. Results have been reported to the AHB in June 2012. Further replication is planned in 2013-14.

Update: Green Epro deer repellent (GEDR) use on RS5 cereal pellets

AHB ref: R-80568-07

Contracted by: Animal Health Board

Carried out by: Epro Ltd

To confirm the palatability to possums of GEDR on RS5 cereal pellets and the effectiveness of GEDR in repelling farmed deer from eating baits.

The first trial found that intensively-farmed red deer hinds ate very little of either cereal bait options. Farmed red stags ate all the non-repellent RS5 cereal bait but none of the RS5 bait with GEDR coating. In the game park, very little of either the standard non-repellent RS5 bait or the RS5 bait with GEDR coating was eaten.

The second trial found that there was no difference in the palatability of non-toxic RS5 cereal baits with GEDR compared with RS5 cereal baits without GEDR for caged possums.

This indicates that GEDR-coated RS5 1080 cereal bait should not affect possum kill, but would reduce non-target deer kill. As a consequence of both this study and a related one on attractiveness of the GEDR-coated baits to birds, the EPA has approved the use of the repellent on RS5 baits. This project has been completed and reported to the AHB.

Effects of aerially-applied 1080 on bird populations

Update: Effects on kea populations

AHB ref: R-80716, DoC ref: 4012

To:

- » measure the survival of kea under a new baiting protocol designed to minimise risk
- » measure nest survival and age-specific survival for kea with respect to predator control including 1080
- » conduct census counts of adult female kea within a defined study.

The period 1 July 2011 to 30 June 2012 saw substantial improvement in the assessment of risk to kea from aerial 1080 baiting. Survival data from 58 radio-tagged kea were added to the dataset used to assess risk. The dataset supports the notion that risk varies between forest types and is higher in the lowland podocarp forests of Westland than in upland beech forests. Measures of benefits to kea nest survival resulting from aerial 1080 predator control were also undertaken.

An experiment in Westland provided very strong support for the notion that kea nest survival is boosted by aerial 1080 predator control in those forests, but the boost was not sufficient after one year to compensate for the bykill that occurred there. In upland beech forests, there is also evidence of a boost to nest survival but the level of nest survival achieved was not as great as in Westland. This may simply be due to sampling error as sample sizes in upland beech forests are as yet very small.

Alternatively, achieving stoat control with aerial 1080 in upland beech forest requires more attention to timing with respect to forest seeding biology. Rodents are present only in sufficient numbers to transmit poison to stoats at certain phases of the beech mast cycle. Attention was not paid to these in our study areas, where stoat control 1080 drops funded by the AHB is of secondary importance to possum control.

The project has been extended for one further year to measure the residual effect of aerial 1080 predator control in Westland, and to boost sample sizes in upland beech forests. The deadline for final reporting has accordingly been extended until winter 2013.

Update: Operation Ark

DoC ref: 3815

To:

- » assess and improve the effectiveness of best-practice stoat and rat control in protecting endangered forest birds, such as the mohua (yellowhead) and yellow-crowned parakeets, in beech forests
- » determine ecological damage thresholds for the impact of rats and stoats on endangered birds in beech forests.

No further progress has been made this year. The final report is expected to be completed June 2013.

Update: Safety of use of pre-feed in aerial 1080 possum control for tomtit populations

DoC ref: 4140

Contracted by: Department of Conservation

Carried out by: Department of Conservation

To monitor tomtit survival during pre-feed operations. Bird counts are conducted before and after 1080 operations.

Moreporks and kaka have been fitted with radio transmitters and are monitored using fixed-wing aircraft. Measurements are made on an opportunistic basis whenever there is a pre-fed 1080 operation in a place with plenty of tomtits and with suitable staffing available. No data has been collected this year.

Update: Ecological outcomes for birds of aerial 1080 baiting for pest control

DoC ref: 4116

Contracted by: Department of Conservation

Carried out by: Department of Conservation

To monitor bird population dynamics at three sites where predators are controlled by aerial 1080 application.

Bird populations will be measured using song recorders and five-minute call counts. Focal species will be rifleman and possibly kaka.

Three study sites have been chosen: Lake Paringa, Tennyson Inlet and the Operation Kaka field site in the Tararuas. Bird counts, nesting success and survival of rifleman, kaka, weka, and morepork have been monitored for up to three years. There were two 1080 drops within the study area near Paringa, one in the Tararuas and none yet in Tennyson Inlet. No 1080-associated deaths have been recorded for kaka, riflemen or moreporks that were monitored through 1080 drops in South Westland.

A few native forest bird species are significantly more abundant in those parts of the Paringa study area that have been regularly treated with aerial 1080 than in those that have never been treated. No bird species are significantly less abundant in the treated area.

Improved nesting success has been observed amongst kaka and riflemen immediately after 1080 operations. Field work for this project will be completed by June 2015, with a final report submitted by June 2016.

Update: Protocols for and priority list of data-deficient bird species for 1080 mortality studies

DoC ref: 4143

Contracted by: Department of Conservation

Carried out by: Department of Conservation

DoC staff have developed protocols and priorities for quantifying bird mortality during an aerial 1080 operation. A draft manuscript has been prepared and will be submitted in 2013.

Update: Comparative bait preference in captive kea

AHB ref: R-80744

Contracted by: RMB Consultants

To determine whether captive kea prefer RS5 or Wanganui No. 7 cereal bait, and whether they prefer bait to which deer repellent has been added.

Kea showed a stronger preference for Wanganui No. 7 pellets over RS5 pellets, therefore RS5 bait should be used where kea are present. Kea displayed no preference for cereal baits with added deer repellent, but did prefer plain carrot bait over carrot bait with added deer repellent. This project is complete and has been reported to AHB.

Effects of possum control on trees

Update: Meta-analysis of the tree canopy

DoC ref: 3811

To help DoC make decisions on which possum control regime to use. This project was completed in 2009 and is being prepared for submission to a journal in 2012.

Update: Quantifying gains in natural character

DoC ref: 3670

To assess the benefits of extensive possum control to 'conservation condition', in this case related to tree canopy health and mortality.

The condition of plants at sites subjected to infrequent possum control (four- to seven-year frequency) was compared with no possum control and frequent possum control. Data from the three study sites (Coromandel, Haast and Northern Urewera) indicated high mortality for some palatable tree species at some untreated sites. Unpalatable tree species did not appear to be affected. A manuscript and report has been submitted:

Gormley, A.M. Holland, E.P., Pech, R.P., Thomson, C., Reddiex, B. (Submitted). Impacts of an invasive herbivore on indigenous forests. *Journal of Applied Ecology*.

Update: Ecological outcomes for plants from aerial 1080 operations

AHB ref: R-80733

Contracted by: Animal Health Board

Carried out by: Landcare Research

To determine the rate at which trees die under a regime of possum control using aerial 1080 compared with no control, by re-measuring tagged trees at Haast, Coromandel and Northern Urewera and analysing tree survival rates in blocks that have and have not received possum control.

The results showed that extensive possum control was effective in reducing possum browse on preferred tree species. This leads to an increase in foliage cover and a decreased probability of tree mortality. The study provides evidence that extensive possum control can result in significant conservation benefits to susceptible tree species. While AHB's objective is to eradicate TB from wild and domestic animals from 2.5 million hectares by 2026, it will also require that low possum densities are sustained over extensive areas of New Zealand's conservation estate. The findings from this study indicate that in these areas AHB control will provide measurable conservation benefits to tree species susceptible to possum browse. This project has been completed and reported to AHB.

Other research

Update: The palatability and efficacy of baits held in storage

Contracted by: Animal Control Products

Carried out by: Landcare Research

To assess the storage life of No. 7 and RS5 pellets by testing palatability, cinnamon content, 1080 content and efficacy (percent mortality achieved) of stored baits, at two-monthly intervals.

The concentration of 1080 remained stable over the 13-month trial in both bait types, but cinnamon levels had declined by about 50 percent after five months for No. 7, and seven months for RS5. Palatability of toxic No. 7 baits declined after seven months, but efficacy was still 70-90 percent over the 13-month trial. Palatability of toxic RS5 baits declined to around 10 g at 13 months. Mortality was either 90 or 100 percent until baits were 10 months old, but dropped to 70 percent in the final trial after 13 months in storage.

Product labelling should indicate a 'likely' storage life of baits of one year from manufacture (that is, a slightly conservative recommendation) in appropriate storage conditions, with advice that bait should be destroyed earlier if signs of infestation are observed.

Update: Small mammal control

Contracted by: Foundation for Research Science and Technology

Carried out by: Landcare Research

To:

- » reduce the cost of and the amount of 1080 bait sown during aerial 1080 rabbit control operations
- » determine the extent to which anticoagulant residues are accumulating in wildlife
- » determine if rodents in New Zealand are developing genetic resistance to anticoagulants.

In winter 2011, five experimental treatments were trialled and kill rates compared with those for current standard practice. The experimental treatments were as effective at killing rabbits as standard practice, but were 25–50 percent cheaper. In winter 2012, these practices were further refined by manipulating flight path spacing and the amount of bait sown per hectare. The next step is to disseminate results to practitioners and landowners.

Outputs from this project are:

Nugent G, Twigg LE, Warburton B, McGlinchy A, Fisher P, Gormley AM, Parkes JP 2012. Why 0.02%? A review of the basis for current practice in aerial 1080 baiting for rabbits in *New Zealand Wildlife Research* 39: 89–103.

Latham ADM, Nugent G, Warburton B. Evaluation of wildlife cameras for monitoring European rabbits before and after control operations in Otago, *New Zealand Wildlife Research* (publication recommended subject to minor revisions).

Update: Strategic technologies for multispecies pest control

Contracted by: Ministry of Science and Innovation

To:

- » reduce the cost of aerial and ground control of possums and rats
- » reduce the welfare and environmental impacts of pest control
- » reduce public opposition to pest control.

A fixed-wing Cresco aircraft has been re-engineered to apply 1080 bait at very low rates previously achievable only by high-cost helicopters. This has reduced flying costs by up to 70 percent with the added benefit of a significant reduction in the carbon footprint of such operations. Pending the results of a replicate trial in winter 2012, low-cost, fixed-wing sowing of aerial bait could become the new *modus operandi* for pest control over large areas of forest beyond 2012.

Research on reducing the welfare and environmental impacts of pest control has been undertaken to assess the effect that a synergist with a currently registered toxin has on efficacy and welfare. If this research proves successful a new formulation will be available for ground control, and potentially for aerial application.

After modification of the original published protocols, the microsomal binding assay has been fully established, and dose response curves based on inhibition of vitamin K have been generated for six anticoagulants. Assays are underway with brodifacoum and warfarin to confirm that competitive binding occurs between different anticoagulants.

A thermogenic compound with the potential to significantly decrease the welfare impacts of 1080 poisoning has been identified in trials with captive possums. Laboratory trials to further investigate this potential bait additive were undertaken with wild-caught ship rats.

Concentrations of the compound in pellet bait acceptable to possums were not highly accepted by rats. While lowering the concentration of the compound in bait improved acceptance, this was not to the point where there was comparable palatability to standard food. In working toward a pellet bait suitably acceptable to both rats and possums, the next step is to investigate encapsulation of the compound to mask its bitter taste.

To reduce public opposition to pest control, a working group has identified potential community groups to work with. This should result in improved dialogue and increased involvement of communities in pest management decision-making. Two conference presentations have been made.

Update: TB eradication – effectiveness and cost of alternative operational strategies

AHB ref: R-10731

Contracted by: Animal Health Board

To compare the cost-effectiveness of different strategies for confirming the eradication of TB from wildlife hosts.

The work conducted in the north eastern Hauhungaroa range was written up as a full report and the research was presented to a series of workshops convened by AHB during September 2011. Work is continuing in the Hauhungaroa Range to determine whether chewcards can provide a simple and reliable way of estimating the percentage reduction during the combined control and surveillance (for TB) of possum populations already at low density. If so, the percentage reductions will provide a direct estimate of the surveillance sensitivity provided by the operation, which in turn can be used in models to calculate the probability of TB freedom in the surveyed population. All field work will be completed by May 2013 and reported to the AHB in June 2013.

Modelling the probable concentrations of 1080 in the environment following aerial 1080 drops

Update: OECD test 307: Aerobic transformation of 1080 in soil

AHB ref: R-10695

Using protocols described by OECD Guideline 307, the rate of degradation and transformation products of 1080 in soil was measured in a laboratory study to accredited GLP standards.

Degradation rate was assessed in three New Zealand soil types under different temperature (five, 10 or 20°C) and soil moisture (35 percent or 60 percent water-holding capacity) conditions. Radioactively-labelled 1080 was added to soil microcosms, with sampling and analysis protocols for soil, soil extracts and evolved

CO₂ established using liquid scintillation counting and liquid chromatography – mass spectrometry.

Degradation products of 1080 and their rates of formation were similar in the three soil types. The major degradation pathway was through microbial mineralization to the hydroxyl metabolite, hydroxyacetic acid. Temperature, rather than soil type or moisture content, was the most important influence on the rate of degradation where soil treatments incubated at 20°C displayed a more rapid loss of residues than lower-temperature treatments. Degradation time (DT50) of 1080 in the three soils varied from six to eight days at 20°C, 10 to 21 days at 10°C and 22 to 43 days at 5°C. This study is now completed with a final report submitted to the AHB and publication in a peer-reviewed international science journal is planned.

New: How humane are our pest control tools?

Contracted by: MAF BNZ Operational Research, reference (09-11326)

Carried out by: Landcare Research and Animal Welfare Science and Bioethics Centre, Massey University

This project applied a recently-developed Australian assessment framework to produce a ranking of the relative welfare impacts of lethal control methods – including 1080 – used for vertebrate pest management in New Zealand.

The main applied advantage of the framework is to enable grading of welfare impacts using a combination of available (in some cases very limited) scientific and operational information and expert group judgement. The welfare impact of 1080 was ranked as intermediate for all species considered (possums, rodents, mustelids, rabbits). The suggestion that the neural effects of 1080 result in a progressive reduction in the level of consciousness, and therefore reduced durations of negative experiences, was identified as one requiring further research.

New: R-10753 - Maintaining low possum and rat densities

Contracted by: Animal Health Board

Carried out by: Landcare Research

This project aims to determine whether using low-intensity aerial 1080 poisoning applied at two-year intervals can maintain lower possum and rat densities over a four- to five-year period than conventional five-yearly broadcast poisoning, at less or no greater cost, and to determine whether the abundance of small birds and weta is increased using the higher-frequency but lower-intensity of control.

Possum, rat, small bird and weta trends will be measured over five years in four blocks. Outcomes between two 1080 poisoning treatments (that is, two blocks aerially-poisoned in winter 2011 only and two blocks aerially-poisoned in winter 2011 and winter 2013) will be compared.

At this stage, possum, rat and bird monitoring has been undertaken in all four blocks pre- and immediate-post winter 2011 in a poison operation as part of another project, and again in late summer/autumn 2012. Weta monitoring commenced in May 2012. No results are yet available.

For more information about these research projects, see:

- » Animal Health Board: <http://tbfree.org.nz>
 - » Department of Conservation: www.doc.govt.nz
 - » Connovation Ltd: www.connovation.co.nz
 - » Landcare Research: www.landcareresearch.co.nz
-

