REPORT

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Prepared For: Compliance Committee
Prepared By: Selva Selvarajah, Director Resource Management, Don Robson and Steve Price, Technical Advisors, Regional Services
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Subject: Rabbit Control in the Otago Region

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1. Précis

The report provides more than a decade of information on rabbit control in the Otago Region. Given the new Regional Pest Management Strategy (RPMS) will be operational soon and the stringent requirement on land owners and occupiers to comply with the new Maximum Allowable Level (MAL) of three, by October 2012, a substantial amount of effort is required by the Council and land owners/occupiers to achieve full compliance.

Council will be using workshops, publicity and one-on-one meetings to inform the new RPMS requirement and process of approving, monitoring and enforcing the control programmes. Council will also be actively promoting secondary controls and poisoning where appropriate and ensuring successful poisoning programmes.

2. Background

History

It is a well known fact that rabbit has been a major pest animal in the Otago region, particularly in Central Otago for many years. It is also well known that rabbit competes with livestock for grazing and has significant effects on native fauna and flora. It has been estimated that 10-12 rabbits eat as much as one sheep. One of the key factors in rabbit population explosion is its ability to breed rapidly every six weeks with 4-5 kittens. Pre-Rabbit Calcivirus Disease (RCD) or Rabbit Haemorrhagic Disease (RHD) introduction it had been estimated that the loss to the primary industry has been 50 million dollars.

The European rabbit was introduced in New Zealand in the mid 1800s. Soon it was realised that rabbit was a pest animal. From 1876 various legislations have been introduced to control rabbit population (Rabbit Nuisance Act 1876, The Rabbit Control Act 1886, The Rabbit Nuisance Amendment Act 1947, The Agricultural Destruction Act 1967 and Biosecurity Act 1993). During this period millions of dollars of government subsidies, local government funding and private money have been spent on rabbit control.

Introduction of the Rabbit Haemorrhagic Disease Virus (RHDV) in New Zealand

Current rabbit control methods range from shooting, poisoning and fumigation. The two key poisons currently used in New Zealand are 1080 (sodium monofluoroacetate-$CH_2FCOONa$) and Pindone. 1080 is an easily biodegradable chemical once broken down does not leave any toxic or chemical residues in soil. Pindone is an anticoagulant

chemical which is as effective as 1080. Unlike 1080, it has less effect on non-target domestic species and has an antidote but it could leave soil residues. Successful poisoning requires good timing and sufficient good quality of bait. Carrots, cereal pellets and oats are the most widely used rabbit baits.

Despite decades of intensive control efforts rabbit remain a problem in areas of South Island high country. Elsewhere biological control in the form of myxomatosis has been an effective control tool since the early 1950's. Attempts to establish this disease in NZ in the 1950's was unsuccessful due to there being no natural insect vector to spread it. An application to establish it again using introduced rabbit fleas was rejected by the government. The discovery of RHDV in China and Europe as the cause of rabbit deaths prompted a joint research programme in 1989 between NZ and Australia with trial work began in March 1995 on Wardang Island off the Australian mainland.

In September 1995 RHDV escaped into mainland Australia. This resulted in all field trial termination in Australia. Around this period New Zealand farmers began to promote the introduction of RHDV as a biocontrol method in New Zealand. An RCD Applicant Group was formed with memberships from several regional councils (Hawke's Bay, Canterbury, Southland, Marlborough and Otago), Commissioner of Crown Lands and NZ Federated Farmers.

Following sufficient research on RHDV introduction and its pros and cons, the RCD Applicant Group applied to the Government to formally introduce RHDV in New Zealand. The group prepared a release strategy and operation plan which required regional councils to manage and supervise the release of RHDV in their respective regions. Crown Research Institutes were required to carry out research and monitoring. The group submitted an application under the Animals Act 1967 and to issue an import health standard under the Biosecurity Act 1993 to the Director General of Agriculture in June 1996. The group was convinced that the Government had access to sufficient information (several reports from Parliamentary Commissioner for the Environment, South Island reports and reports to Parliament) regarding rabbit problems and the risk of not importing the virus formally. The group devised a strategy based on government's decision to approve the introduction of RHDV and cautioned that a decision of 'no' might result in perpetual border control and surveillance by government and an unmanaged introduction of RHDV by accident or by illegal means in New Zealand. The application was declined by the Director General of Agriculture.

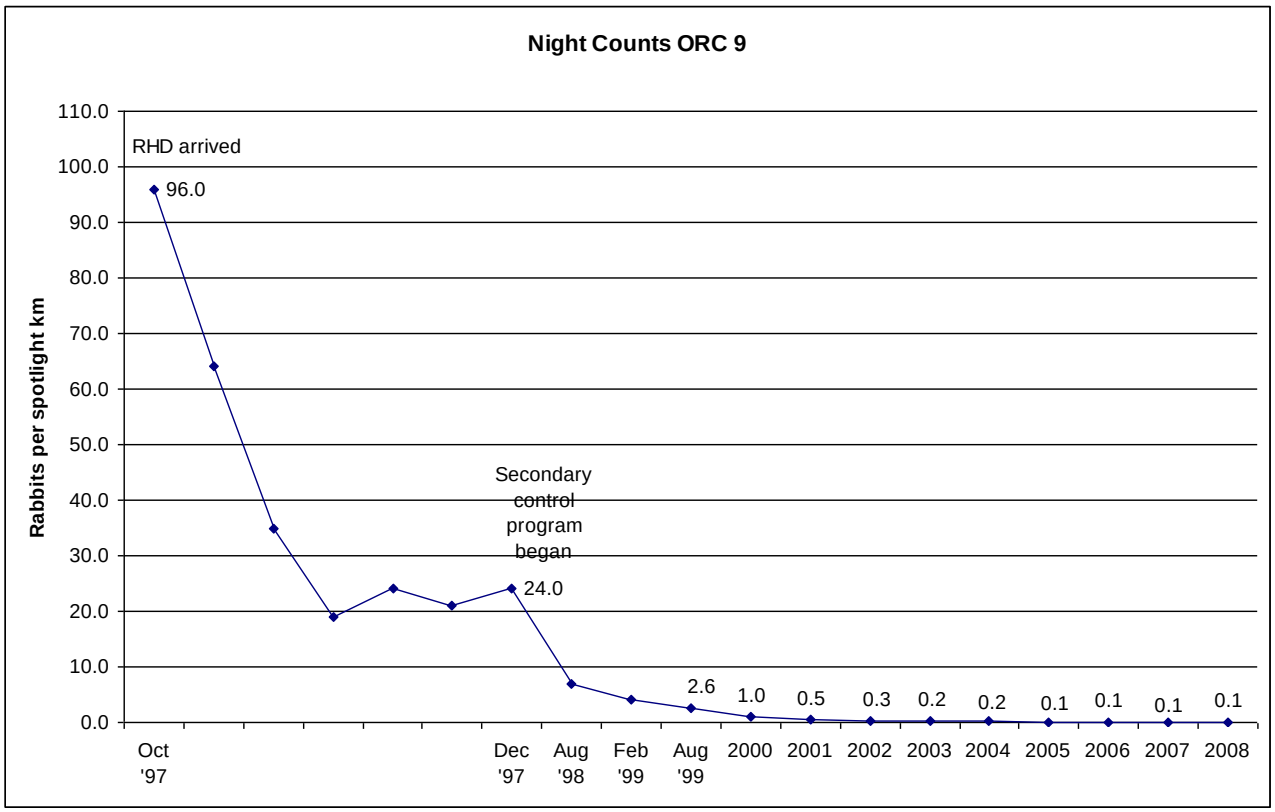
The illegal introduction of the RHDV into New Zealand occurred in 1997. Rabbits collected by the ORC Regional Services at Lowburn on 23 August 1997 were confirmed by MAF to have died from RHD. This was the first official confirmation that RHDV had been illegally introduced into New Zealand. It was of course already in the Mackenzie Basin. It was there in June 1997, but of course its presence was unknown to the authorities. Soon after the publicity received by the RHDV introduction many farmers began to release the virus actively on their farms.

For the active spreading of the virus the virus was obtained by picking up infected rabbits. The livers, hearts and lungs of rabbits were pureed in a food processor with added water. The resulting solution was strained and sprayed on baits such as oats. The baits were aerially or manually spread in rabbit infested areas.

Since the RHDV introduction there had been an immediate and dramatic decline in rabbit population. At this time Council commenced an intensive monitoring programme to assess the impact of RHDV on Otago's rabbit population. Within 1 to 2 months, generally a reduction of Modified McLean Scale (MMS) 1 was observed (e.g. where MMS was 5 prior to the RHDV introduction a level 4 was observed after the introduction). In some cases a drop from scale 7-8 to 2-3 was observed. The trend in decline could be measured either by night counts or MMS. Figure 1 illustrates the trend in rabbit population decline following the introduction of the RHDV.

An immediate monitoring and research report to Council in 1998 summed up *"…When RHDV was allowed to move naturally as biocontol, it spread unevenly and erratically, moving at up to six hundred metres per week and taking six to eight weeks to cover the study sites. Kill rates were very good, typically rating from fifty to ninety percent. By contrast, biociding (widespread baiting or virus application) gave poorer kills than natural spread with mortality ranging from less than twenty percent to forty persent. These poor kills probably resulted from a vaccination effect, introduced by rabbits eating degraded virus. In addition, after biociding more of the adult survivors were immune to RHD and more of these were female. This is likely to lead to faster re-population than after natural epidemics. Furthermore, more of their offspring will have temporary maternal immunity. Natural spread therefore clearly the preferred option. After the RHD epidemics, especially where mortality is poor, immune survivors should be removed by alternative methods of control before they have the opportunity to breed. This will retard population recovery and improve the effectiveness of the next epidemic. Overall, the high kills rates and coverage of the natural RHD epidemics were excellent results for a new biocontrol. The results of this extensive study suggest that RHD is likely to be a valuable addition to the current range of rabbit control tools in New Zealand…"*

Figure 1. Night Counts ORC 9 (Upper Manorburn).



Since the introduction of the RHDV, it has become an integral tool to control rabbit population in the Otago Region. The effects of RHDV had been studied and researched overseas and hence it was well known at that time that whilst RHDV had an immediate and significant impact on rabbit population, ongoing secondary controls were necessary to maintain the lowered rabbit population. This message was promoted by the Council then and has been a consistent message promoted to date. The report will discuss this in detail.

Council has conducted its own research through funding of a PhD project and regular monitoring of rabbit serum. Regular monitoring such as night counts and MMS levels have been complimentary to understand the effectiveness of the virus. The report will discuss this in detail.

3. Regional Pest Management Strategies to Control Rabbits

Under the Biosecurity Act 1993 there have been three strategies relevant to rabbit control produced by the Council including the new strategy yet to be operational. The first strategy which was a separate Rabbit Pest Management Strategy had been operative in July 1996 and the second in September 2001.

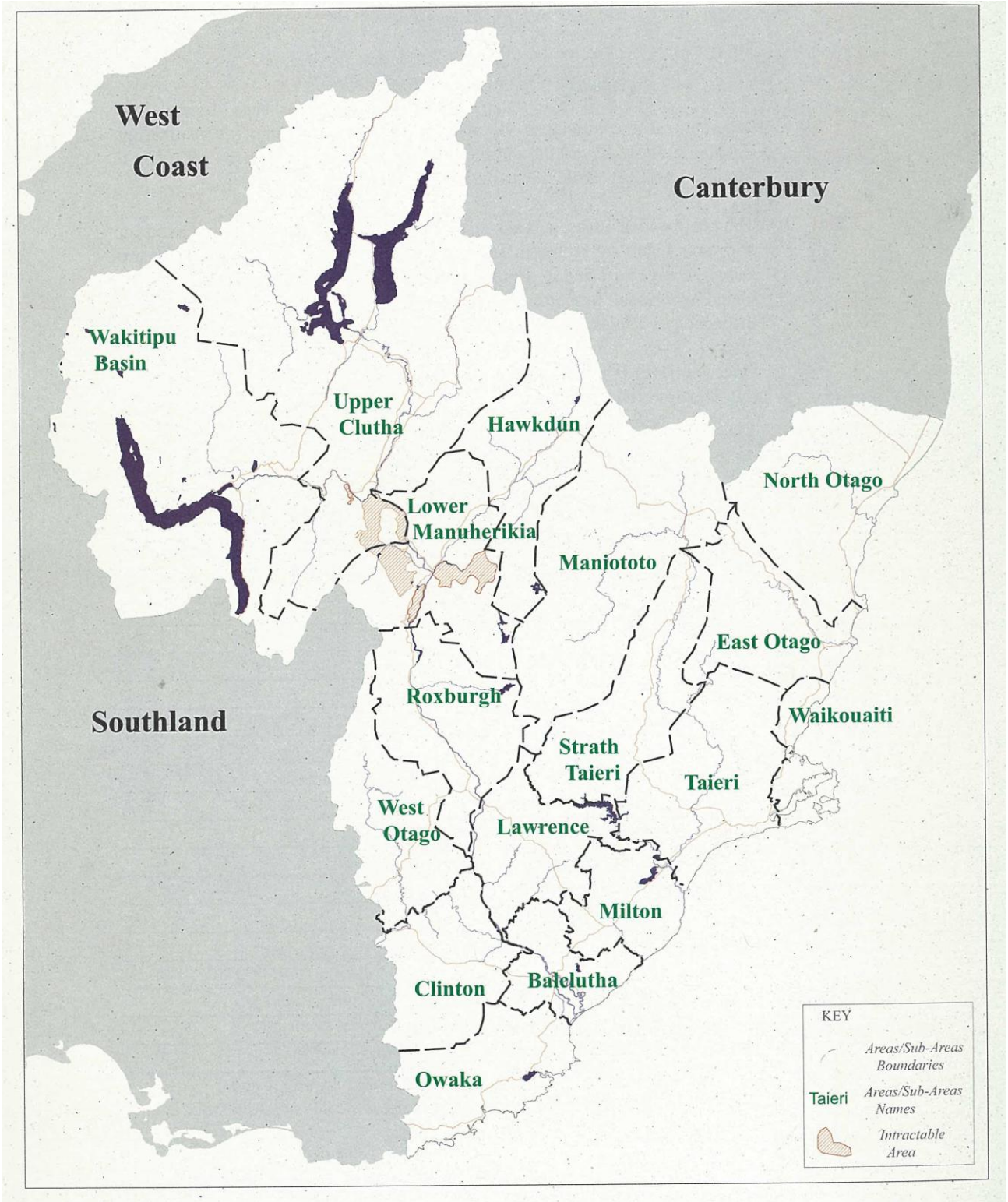
RPMS 1996

The first strategy set the highest tolerable MAL level as 6 (Table 1 and Figure 2). A special "intractable land" was identified to deal with a specific rabbit control issue. RPMS 1996 defines the intractable land as "*land where conventional rabbit control techniques are no longer achieving high success rates primarily due to bait avoidance (neophobia or 1080 sensing) which is either learned or inherited in the local rabbit population"*. Parts of Lower Manuherikia and Upper Clutha formed 'intractable land' in RPMS 1996. The highest MAL scale of 6 was accorded to this area.

Table 1. Maximum Allowable Levels (MAL) in Rabbit Management Strategy 1996. *(Populations above the MAL will result in Enforcement Action)*

Geographic Area	Sub Area	Maximum Allowable Level (Modified McLean Scale)
Central Otago	"Intractable"	6
	Upper Clutha	5
	Wakatipu Basin	5
	Lower Manuherikia	4
	Hawkdun	4
Maniototo		4
North Otago	All	3
East Otago	Peninsula	4
	Strath Taieri	5
	Waikouaiti	3
	Taieri	4
	East Otago	4
South Otago	Roxburgh	4
	Clinton	3
	West Otago	3
	Owaka	3
	Lawrence	3
	Milton	3
	Balclutha	3

Figure 2. Rabbit Control Compliance Geographic Area.



RPMS 1996 also had a boundary requirement of triggering rabbit control on a property that elected to have MAL level of 5 or 6 when an adjacent property MAL level is 2 scales lower.

Any rabbit control work was undertaken through special rates funding or owner/occupier funding. The special rate funded control was applicable in West Otago, Peninsula, East Otago, Owaka, Balclutha and Lawrence. The rates varied from $0.00 to $22.50/ha/yr. The special rating was based on difficulty factor (which was a combination of land class and rabbit numbers) and visit factor (number of visits in five years).

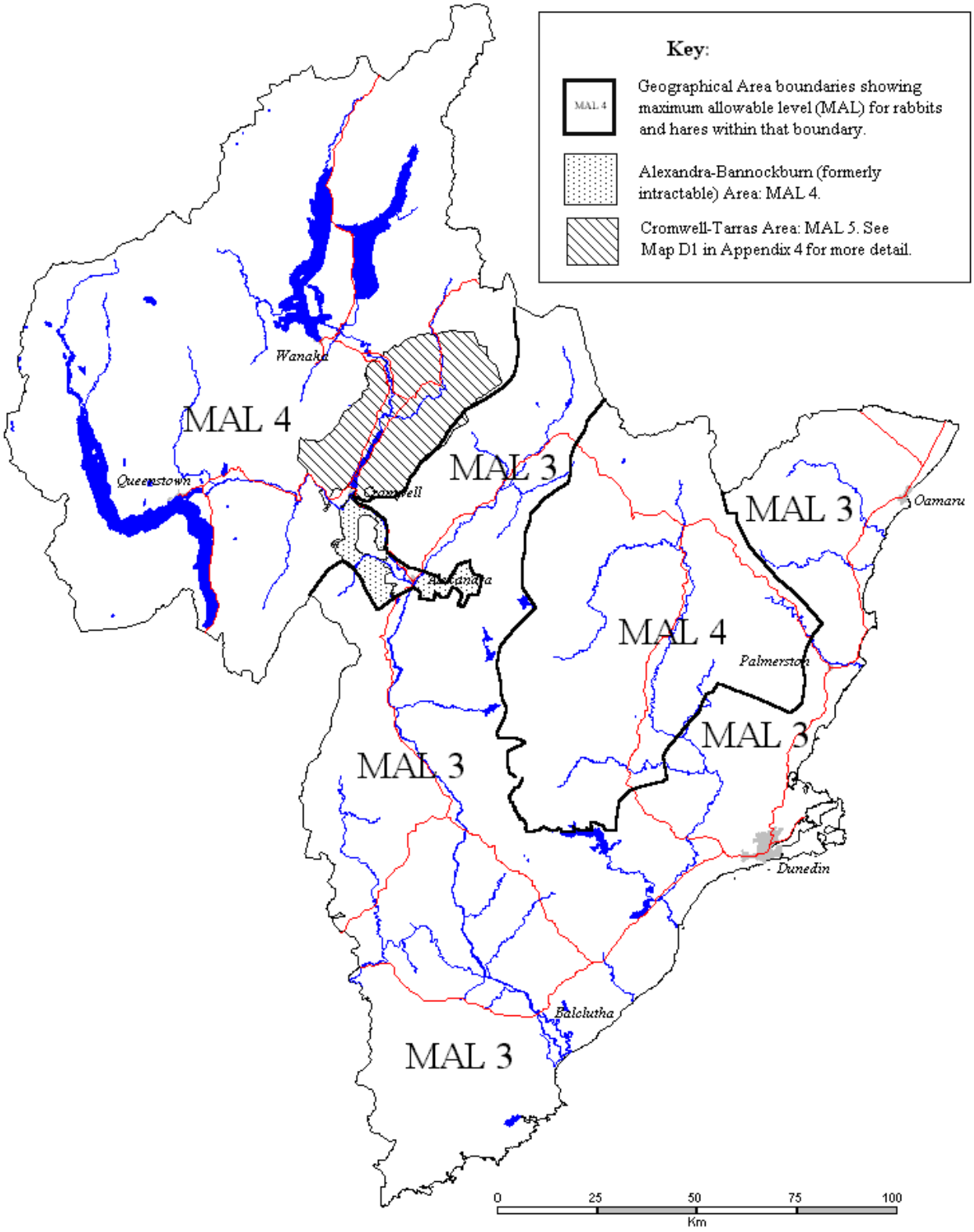
Exemptions to exceed MAL were also granted under special circumstances. Land owners/occupiers could apply to Council for allowing higher MAL than required in the RPMS. The exemptions were also applicable to boundary compliance.

RPMS 2001

RPMS 2001 was significantly different to RPMS 1996. One of the main reasons was that RPMS 1996 was developed before the introduction of the RHDV. By 2000 the impact of RHDV was well known and was varying within the rabbit infested areas and varying intensity of secondary controls had been adopted by land owners.

The 'intractable area' that had high level of infestation and MAL 6 status in RPMS 1996, had been zoned under MAL 4. Cromwell-Tarras areas that were outside the intractable area in RPMS 1996 were accorded a MAL 5 status (Figure 3). The boundary rule in RPMS 1996 had been eliminated in RPMS 2001. A simple rule replaced the extensive RPMS 1996 compliance requirements. No exemptions were given. All rabbit control work was expected to be land owner/occupier funded.

Figure 3. Rabbit MAL Requirements in the RPMS 2001.



RPMS 2009

RPMS 2009 will be operational soon. The new rules (Rule 5.2.4) are as follows:

(i) On land where under the Regional Pest Management Strategy for Otago 2001, the maximum allowable level for rabbits and hares was greater than 3 on the modified McLean Scale and where the level on that land exceeds 3 on the modified McLean Scale at the commencement of this strategy, then the occupier must have an approved control programme to ensure a reduction in combined rabbit and hare infestation to a level of 3 or less on the modified McLean Scale by 1 October 2012, or such longer time as the Otago Regional Council may, in its discretion, approve.

(ii) On all other land (not being land in 5.2.4(i)), occupiers must ensure that rabbit and hare numbers are maintained at or less than a level of 3 on the modified McLean Scale. If rabbit and hare numbers exceed the maximum allowable level of 3 on the modified McLean Scale, the occupier must have an approved control programme to ensure reduction of combined rabbit and hare infestations to a level of 3 or less on the modified McLean Scale by 1 October 2012.

(iii) Where an approved control programme is required:

- *(a) The occupier must submit a written control programme to the Otago Regional Council for approval.*
- *(b) The written control programme must be submitted within two months of a written requirement being made by the Otago Regional Council.*
- *(c) The written control programme must contain an objective to reduce combined rabbit and hare infestations to a level of 3 or less on the modified McLean Scale and include a description of:*
  - *(1) Methods to be used to achieve the objective; and*
  - *(2) Areas to be treated with those methods; and*
  - *(3) The timetable for use of those methods.*
- *(d) The Otago Regional Council will grant approval of a written control programme, if it is satisfied that the programme is reasonably capable of achieving the objective, having regard to:*
  - *(1) The nature and characteristics of the land that exceeds a maximum allowable level of 3 on the modified McLean Scale;*
  - *(2) The nature and use of surrounding land;*
  - *(3) The potential for rabbit and hare dispersion;*
  - *(4) The risks to the environment and land production from rabbit and hare infestation;*
  - *(5) The practicality of available control methods on the land.*
- *(e) Control programmes for adjoining properties must be compatible or jointly undertaken where a lack of rabbit barriers exists.*

(iv) An occupier must implement an approved control programme for the occupier's land.

Any breach of Rule 5.2.4(iii)(b) and Rule 5.2.4(iv) is an offence under Section 154(r) of the Biosecurity Act 1993 and may result in default work under Section 128 of the Act. This means that if occupiers do not have an approved control programme, or fail to implement their approved control programme, the Otago Regional Council may at its discretion undertake such rabbit and hare control work as necessary and recover costs from the occupier.

The sale, breeding, release and commercial display of these organisms is restricted by Sections 52 and 53 of the Biosecurity Act 1993.

RPMS 2009 is substantially different to its predecessors. Two areas being identified as MAL areas; (a) areas with >MAL 3 under RPMS 2001 and currently exceeding MAL 3 are required full compliance of MAL 3 or less by October 2012; (b) other areas are required to maintain rabbit numbers below MAL 3 at all times but if exceeded compliance is required by October 2012.

The compliance activity is triggered by Council sending formal written requirements to land owners/occupiers to provide a control programme. The control programme has to be submitted within two months of the written request by Council. The control programme will be approved by Council under certain criteria (5.2.4.d). Failing to provide a control programme or implementation of the approved control programme will result in Council undertaking work and at the cost of the land owner/occupier.

4. Rabbit Haemorrhagic Disease (RHD)

RHD or RCD is caused by rabbit calcivirus or RHD virus (RHDV) which is both highly lethal and specific to rabbits. RHDV causes rapid developments of blood clots in organs such as lungs, heart and kidneys. The rabbit death occurs in about 30-40 hours as a result of heart and respiratory failure. To date there have been no reports of linking the virus to human disease hence the virus is not considered as a public health risk. There is no evidence that RHDV switch hosts.

The arrival of RHDV brought huge benefits to the Otago Region. While there has been a natural immunity it is still a very effective tool in the suite of rabbit control agents. RHD continues to be a major cause of death thus playing a very important role in rabbit population control. As in the past there have been, and are currently, outbreaks of rabbits that require human intervention.

Council monitoring to date comprised of; (a) serum or virus resistance monitoring; (b) night counts; and (c) maximum allowable number (MAL).Whilst all three monitoring methods are complementary to each other they serve different purposes.

5. Rabbit Serum Tests

5.1 Introduction

The rabbit serum collection programme, as part of Council's RHD monitoring programme continues to provide important information for the management of rabbits in Otago. As part of the Council's monitoring of RHD in Otago, rabbit serum samples are taken from ten long-term monitor sites during March-April, these sites vary in size from a few hundred, to thousands of hectares.

Analysis of the serum collected allows determination of the levels of immunity to RHDV that the rabbit populations have at these sites thus helping the Council evaluate how effective the virus currently is throughout the Otago Region, and enables predictions as to its level of impact in the future.

5.2 Rabbit Serum Test Methods

Blood serum samples are obtained by shooting the rabbit and immediately inserting a needle through the chest wall and withdrawing about 2 ml of blood from the heart using a syringe. An eyeball is removed to allow processing later of the eye lens to determine the rabbits age. Also recorded for each rabbit are its sex, breeding status, and body condition (using an index of the amount of kidney fat). The aim is to collect a sample of 30 rabbits from each RHD monitor site.

After these are collected the blood is centrifuged to separate out the serum which is frozen and sent to Wallaceville Research Centre to be analysed using the Cappuci competitive ELISA test. The level of RHDV antibodies in each serum sample is determined and allows interpretation as to whether that rabbit is susceptible, that is would it have died if exposed to the RHDV, or was immune, meaning it had sufficient levels of antibodies to have survived exposure to RHDV, both in the past and in the future had it not been shot.

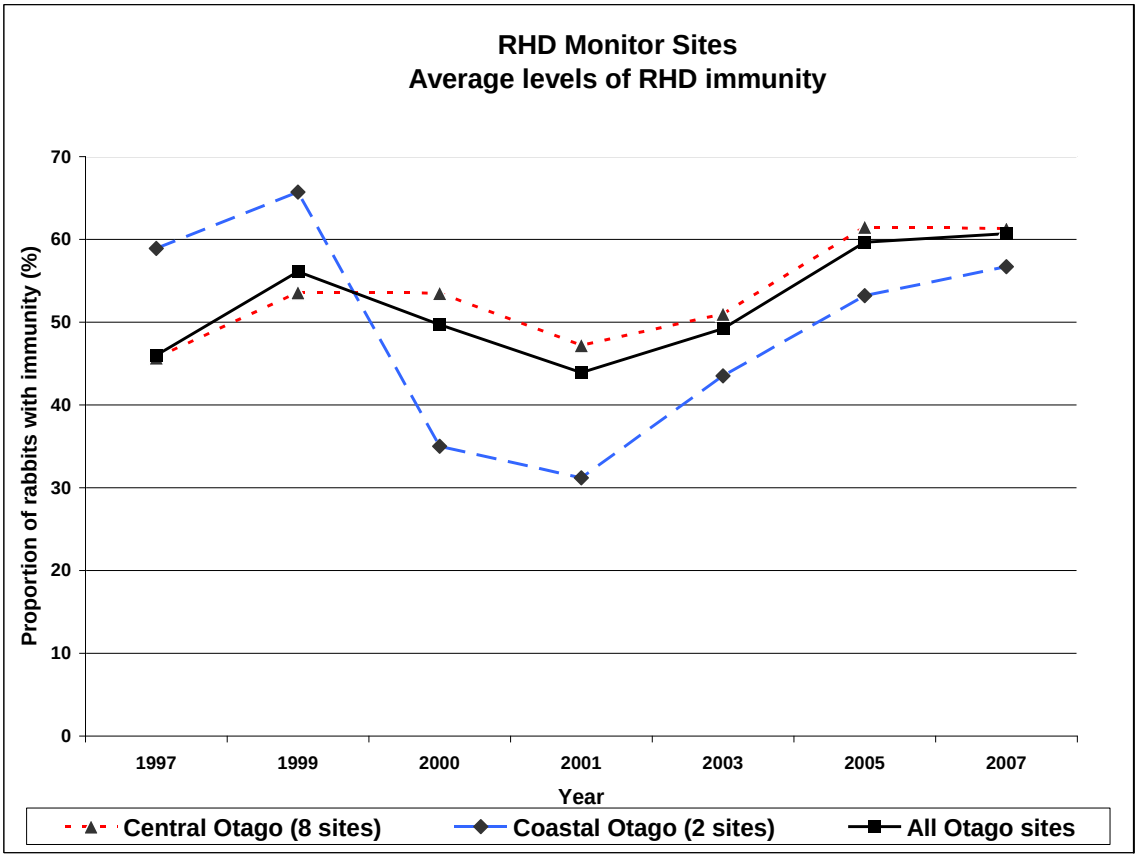
The autopsy data collected for each rabbit was analysed to see if any strong relationships existed between antibody levels and the variables such as age, sex or body condition.

5.3 Rabbit Serum Test Results for 2007 and Discussion

The proportion of rabbits at the ten monitor sites, with antibody levels sufficient to confer immunity varied from 12% through to a high of 79% with an average of 61%. The average is similar to the previous sample taken in 2005 of 59.5%. Both are well above the 2003 figure of 49% and the 42% obtained in 2001 (Figure 4). It appears that the immunity have levelled off at around 60%, which is similar to other rabbit prone areas of the South Island.

The figure also shows the variation in numbers of immune rabbits over past samplings with a break down of Central Otago sites and Coastal/Lowland sites. However the sample size for the South Otago site (ORC 12) was only seven in 2007 so there is insufficient data to draw any conclusions about this site or to make comparisons with South Otago data from previous years. This small sample also means that for 2007 the Dunback site (ORC 4) is the only “Coastal/Lowland” representative.

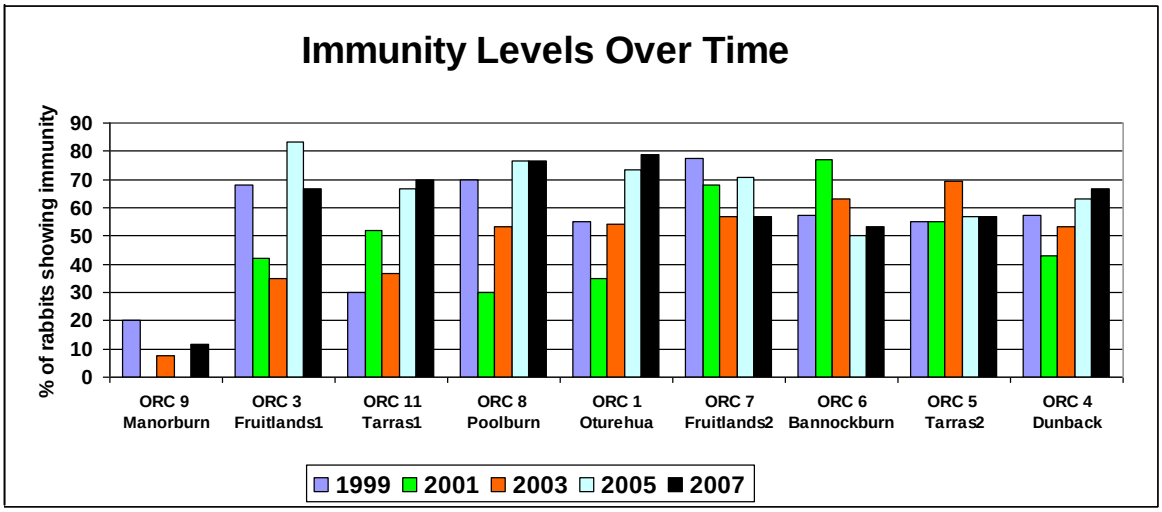
Figure 4. The average resistance levels recorded at the ten long term monitor sites since serum sampling has been undertaken.



The Upper Manorburn site (ORC 9), as in previous years, had an immunity level well below all other sites. When looking at the remaining sites the range is much narrower, with all lying between 53% and 79% (Figure 5).

For five of the sites the results are very close to their previous level in 2005, two showed a significant drop and two a rise.

Figure 5. The RHD resistance levels at each of the long-term monitor sites for 2007 together with results from past years.



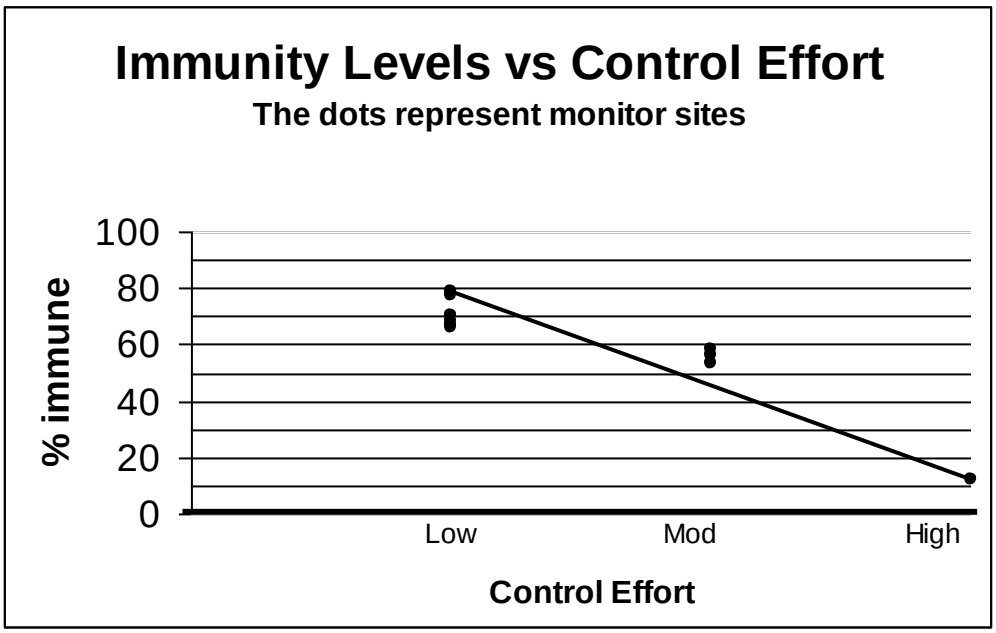
It is important to note that Council's field monitoring of RHD shows that the virus is still playing an important role in destroying rabbits.

As there is only data for one site outside the prone lands this year, the following discussion relates principally to inland Otago. The serum results need to be interpreted with caution. RHD antibody levels alone may not give the full picture to what is happening in the field. Resistance must be considered with other factors such as rabbit densities and rabbit control practices. For example if the virus has passed through an area just prior to serum sampling, it is likely that a high level of resistance is recorded due to most of the susceptible (i.e. non immune) rabbits having just died from the virus leaving mainly resistant rabbits to be sampled.

In an effort to minimise such events sampling has been done in early autumn, a time when virus activity has historically been low. However, while in the early years of the virus epidemics were district wide, in recent years virus activity is more localised such as at the farm or several farm level. Also the timing of these epidemics is less well defined now.

Past serum results, including the Lough report 'Review of ORC RHD Data 2001' have shown a strong link between regular effective secondary control and low (or decreasing) RHD immunity levels. The long-term monitor sites provide a range in the levels of secondary control input and in rabbit densities. The last serum report in 2005 showed a graph with a trend line showing strong correlation to immunity levels at the ten sites versus the amount of rabbit control effort being put in by the landholders.

Figure 6. Effects of Control Efforts on Immunity Level.



The ORC 9 monitor site is the only site where secondary control is at high levels (Figure 6) and as in previous surveys it continues to provide strong evidence that immunity in rabbit populations can be kept at very low levels with high amounts of human control input. However, when grouping sites according to control efforts similar relationship could not be derived since there were insufficient data points to give robust statistical information.

The Council's rabbit monitoring programmes, including the 2005 serum report, have documented the virus's stabilised impact throughout much of Otago, and made recommendations for increased human control. In response, most landholders have increased their level of rabbit control, with varying results. For some the increase has not been sufficient to stop increasing rabbit numbers, others are only keeping pace with rabbit increases and some others have been able to reduce rabbit numbers.

The 2005 serum report noted increased rabbit densities in urban/peri-urban areas throughout Central Otago. This trend has continued. From large reductions in rabbit numbers at the time of the virus's introduction, they have remained low until the last few years almost entirely due to the virus, as no control work was being done in these areas due to the lack of suitable or permitted methods.

Using the autopsy data and serum results, relationships were looked for to see if certain groupings using age (juveniles ≤26 weeks, adults >26 weeks and those over 2years old), sex or body condition stood out as being strongly resistant or susceptible. However because of the high laboratory cost for the serum analysis, sample size for each site had to be kept to the minimum while still providing a statistically valid result at the site level. This precluded further analysis of the variables listed above, at site level, and even when grouping the sites there was often insufficient data to give results that were statistically significant. For the same reason statistical comparisons with previous years data was limited.

However the 2007 data did show the same trends as other years with males showing slightly higher levels of immunity and subsequently the sex ratio being in favour of males. With the 2007 data showing the highest recorded level of resistance a comparison was made with the data collected in 2001 when the lowest levels of RHD resistance was recorded. This was to see if the increase in resistance could be attributable to a particular group based on gender or age. Figure 7 shows that there was no significant differences in age structures.

The 2001 data showed a typical progression in the proportion of immune animals with increasing age groups, 38% for juveniles, 44% for adults and 59% for animals over two years of age. This is what would be expected, as the older the rabbit the more likely it was to be immune and hence be alive. When we look at the 2007 data we find that 50% of the juveniles and 66% of the adults are resistant, with no change in the proportion in the over 24 month group. So it is within these two age groups that immunity levels have risen. Some researchers have proposed that the reason for the increasing immunity levels in rabbit populations is due to an increasing proportion of older (>24 months) rabbits since serology data from throughout New Zealand show highest immunity levels in this age group. The Otago data do not support this suggestion of a demographic shift as there has been no significant change in the proportion of rabbits lying within this age group in our sampling since 2001 (Figure 7).

Figure 7. Comparison of Age Structure Between Years 2001 and 2007.

RHDV continues to be an effective biological control agent in controlling rabbits in many parts of Otago thus benefiting Otago region environmentally, economically and socially. However, a full reliance on virus had neither been anticipated nor been promoted by the RCD Applicant Group. As stated in the official application to import RHD into New Zealand, the maximum benefit would be gained by using conventional control methods alongside RHD. As it has in past years, Council needs to continue promoting the need for landholders to continue with the use other control methods.

The ongoing collection of rabbit serums, to determine RHD immunity levels, allows the Council to continue to add to its comprehensive and valuable database on the virus. This knowledge will allow better understanding of the impact, or lack of impact, the virus is having in the field and what changes are required in rabbit management practices to attain the greatest benefits.

The serum results do highlight that those monitor sites which have effective secondary control programmes in place have the lower immunity levels. Shooting targets mainly adult rabbits, the majority of whom are immune. This in effect reduces the proportion of resistant rabbits in a population which in turn allows higher RHD mortality rates when the virus is active. The results from this monitor strongly suggest that if other control methods are used by landholders to keep rabbit numbers low such as shooting

or fumigation then the virus is able to play an important part in maintaining the low population. Landholders who took advantage of the massive initial impact of the RHD in the first couple of years after its arrival by implementing control programmes, using principally night-shooting, that have kept rabbits at low levels continue to receive significant help from RHD. In general, low resistance levels together with low rabbit densities, is the situation that gives landholders the greatest benefits from the virus.

The factors that favour an epidemic outbreak are still speculative and it appears that a number of them have to be present to allow an outbreak to occur. The presence of flies and insects, moisture after a dry spell, and of course numerous susceptible rabbits are usually key factors. Temperature seems less critical as outbreaks occur in cool spring and autumn conditions as well as during mid summer temperatures.

There have been changes in the timing of these outbreaks since the virus's arrival. During the early years of RHD there were large "wave-like" epidemics that killed rabbits over wide areas. These occurred regularly between November and December and in April-May. The autumn outbreak was often the most pronounced.

In recent years there has been a tendency for the first epidemics to occur round August. This is too early for an effective knockdown as the majority are young rabbits. At this age they still carry maternal antibodies which confer resistance to the virus. After this exposure these rabbits are then resistant for the rest of their life and if female pass on maternal antibodies to their young. There is often small epidemics in December, February and Autumn. However these epidemics are much more localised and usually on a small scale, typically affecting a few farms at a time.

In summary, epidemics have moved from "wave-like" epidemics affecting large areas e.g. all Central Otago that regularly occurred twice a year at set times, to the current situation where epidemics are much more sporadic and localised.

Field observations record that the rate of recovery of poisoned rabbit populations is much slower than seen prior to the arrival of RHDV. The limited data collected by Council suggests that rabbit populations that have very high levels of immune rabbit can be "reset" to where the RHD is effective, by the use of poisoning. On a lower scale, regular control by night-shooting such as the Manorburn RHD monitor site may be achieving the same situation, as the proportion of immune rabbits at this site is regularly under 20%.

While RHD is currently providing less help to many landholders than in previous years, it still provides significant benefits where landholders maintain effective control programmes which, together with RHD, keeps rabbits at low levels. As pointed out in a Council report in 2001, if the practice of biociding had been avoided in 1997 and managed to target biociding the populations with low immunity and relied heavily on natural spread, the RHDV would have had significant impact on the Otago's rabbit population.

Rabbit serum monitoring conclusions: "*The arrival of RHD brought huge benefits to the Otago Region by significantly impacting on pre-RHD rabbit population. Council's monitoring indicates the importance of human intervention in the control of rabbits and, in many cases that the level of this intervention will need to be increased to*

compliment the virus's impact. RHD is still an ***important*** *component in the goal of maintaining rabbits at low and stable densities in Otago."*

6. Night Counting

6.1 Introduction

Night counting is a method used to determine rabbit trends and has been used in New Zealand since the late 1960s. The method is used at well established surveillance sites. These sites are situated throughout the region so that trends in rabbit densities can be determined for various localities throughout Otago. The annual round of night counts has been completed for the 2008 year and the data for inland and coastal Otago are presented in this report.

6.2 Method

The method involves travelling along a set marked route on a motorcycle using a spotlight to count the rabbits seen in the light beam. The counts are repeated over two or three nights of good weather.

Count route sites are selected so that the various levels of rabbit proneness, topography and vegetation found in Otago are represented. A site can be made up from a single property but often includes several. It is important that various rabbit control programmes are represented in the surveillance work, from landholders with very effective programmes through to those with no human input.

The night counts are carried out annually in the late winter/early spring, the period when rabbit numbers are at their most stable. This provides a good indication of the potential breeding population at the start of the main rabbit breeding season.

The count routes for the long term monitoring of Otago rabbits were reviewed in 2005/06, prior to the counting programme. A new route was established in Luggate to provide information in an area not represented in historical night counts. However it is an area where rabbit population levels have been of concern to Council over recent years.

The night count routes in Hillend and Table Hill, South Otago were also re-established to give a trend of what could be happening post virus. Some of the older count routes (established over 15 years ago) no longer give a true representation of rabbit numbers due to such variables as location, farm type, management, or as is often the case, because they have been developed into horticulture or lifestyle blocks making them impractical to night count.

The principal reason for additional sites is to get a wider representation of Otago rabbit populations. It is also an attempt to avoid localised events over-influencing the results of the monitoring programme. A typical "event" is a winter poison operation where poisoning occurs within a count route. As a result rabbits counted subsequently drop off dramatically along that route, but may not represent the area as a whole.

In 2008 the Hillend route was altered due to many new fences being erected across the route as a result of farm reorganising. The Table Hill route was reactivated, with the

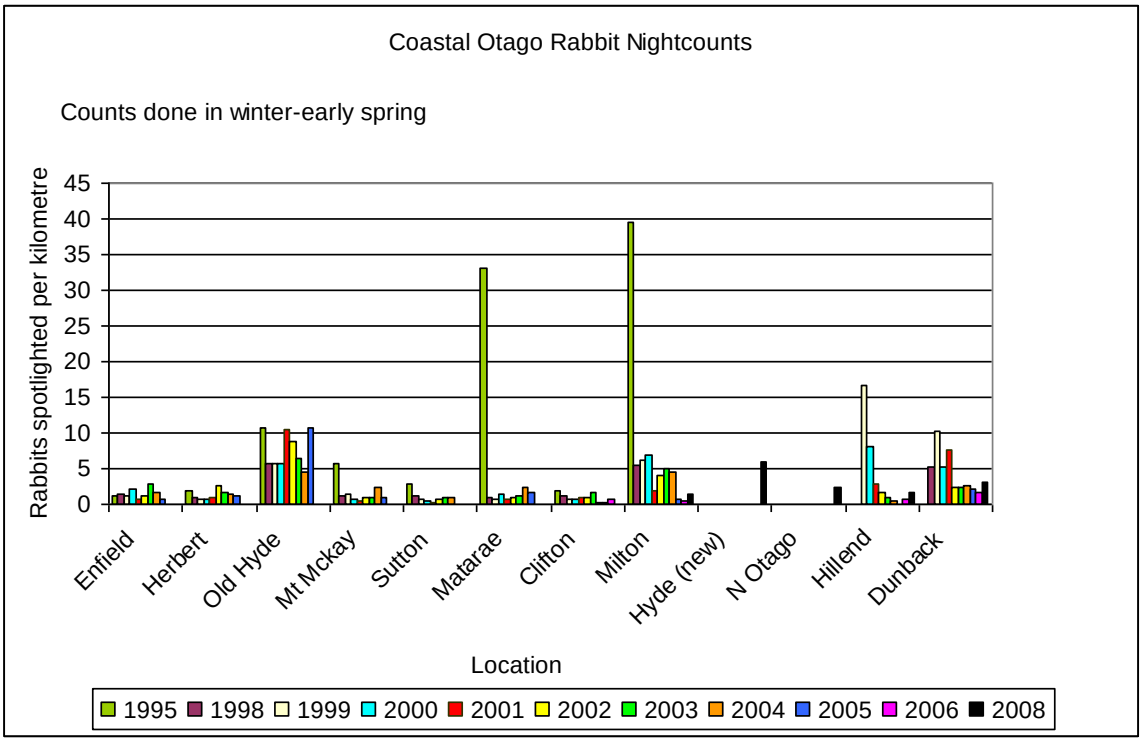
start and finish points known, but the content of the route needed to be reinstated from historical records.

6.3 Results for 2008 Night Counts and Discussion

Count data is available for 17 count routes throughout Otago. However, the count route in Clifton was not completed as lambing and unusually wet conditions prevented the route being monitored.

Rabbit numbers, however, have increased on the Hillend site from one rabbit per spotlight kilometre to 3/spkm (Figure 8). The Hillend night route was modified due to the improvements made on the farm which changed the way the route could be ridden. This trend is also the same with the Table Hill route in Milton.

Figure 8. Coastal Otago Night Counts.



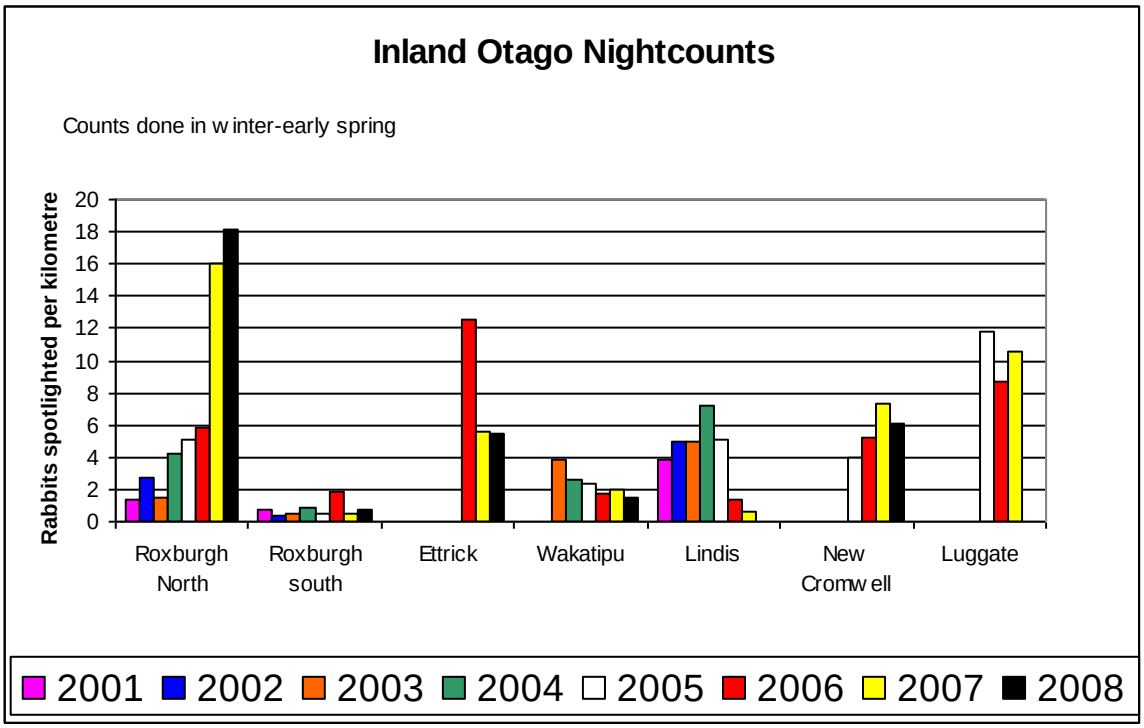
6.4 Coastal Rabbit Sites

The results in Figure 8 show a slight rise in rabbit numbers in coastal Otago. There are no archival figures to give a trend as yet for the new night route activated in Hyde. These figures come after a very wet winter and early spring on the coast. No poisoning or rabbit work has been done on the coast since the introduction of RHDV and numbers of rabbits per kilometre appear to be low. Note that these counts were done before the breeding season.

6.5 Inland Monitoring Sites

Latest count results show a similar result to the previous year albeit slight variances in rabbit numbers (Figure 9). There was no data available for the Lindis and Luggate sites in 2008.

Figure 9. Inland Otago Night Counts.



Data from the Teviot Valley (Roxburgh, Ettrick) reflects the farm management practices and rabbit control programmes which is why there is a significant difference at these sites.

The count result for the Roxburgh North site shows an increase in rabbit numbers. This count route represents the more highly rabbit prone land in the Roxburgh area.

6.6 RHD Monitor Sites

The results in Figure 10 show for most monitoring sites there have been decreases in some sites yet increases in others, notably the ORC 3, ORC 4, ORC 8 and ORC 12 sites. No change occurred with ORC 9 which continues with very low densities.

Figure 10. RHD Monitoring Sites Night Counts.

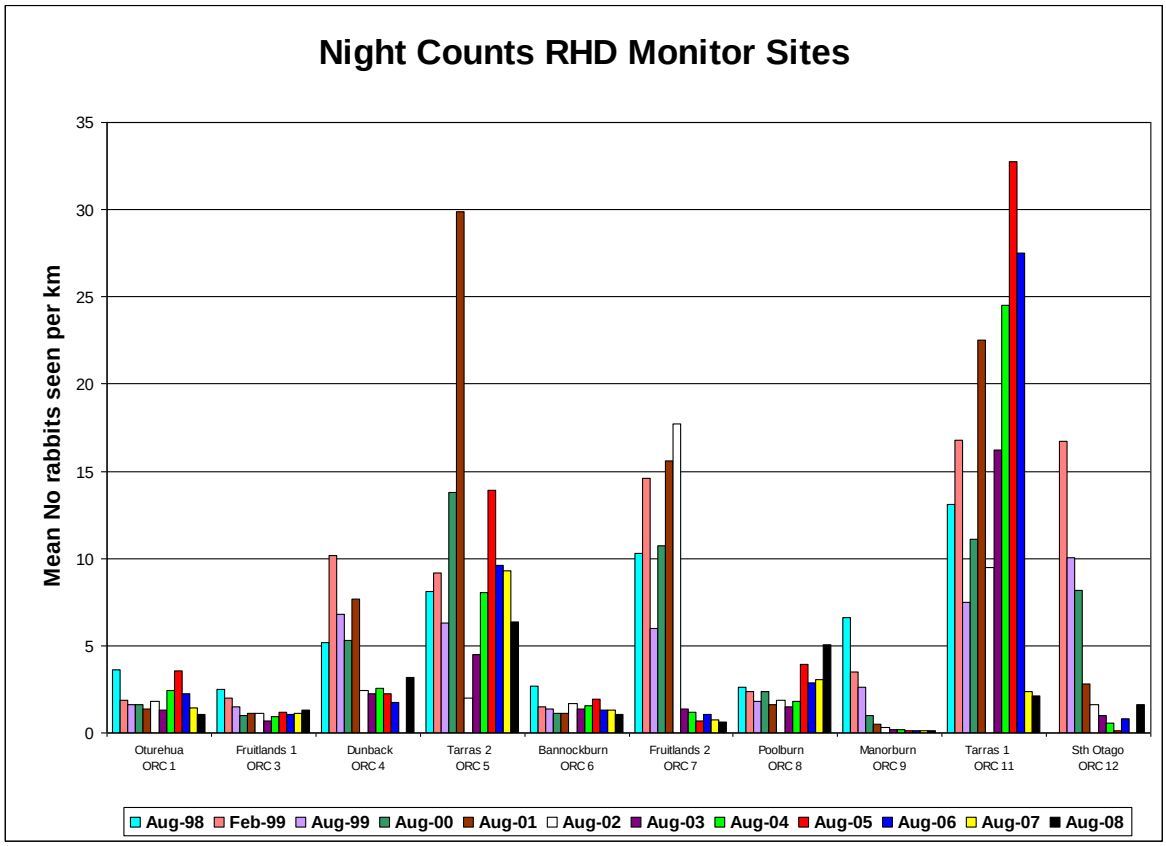
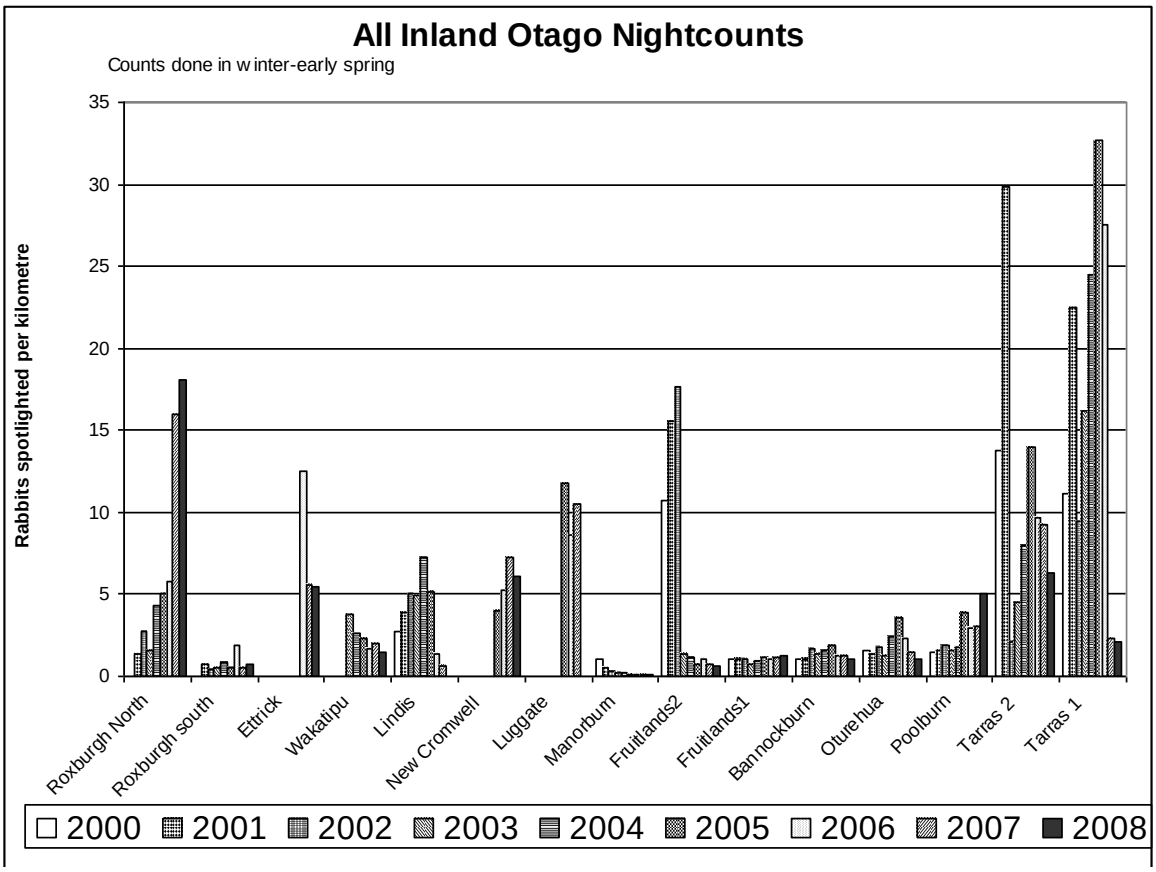


Figure 11. Combined RHD and Long Term Monitoring Sites in Inland Otago.



The range of rabbits spotlighted per kilometre between sites is to be expected given that the monitoring sites cover a wide range of rabbit prone country and differences in landholder's commitment to on farm rabbit control. This broad range of results, shown in Figure 8, from 0.1 rabbits seen per km through to just over 18 rabbits per km, allows Council staff to record the impacts of various factors operating in rabbit management. Factors include the breeding season, RHD, different control practices, the frequency of applying these methods and changes to rabbit habitat, e.g. there is a strong correlation between the amount of control work undertaken and the number of rabbits counted.

This ranges from sites such as Manorburn (0.1 rabbits counted per km) where an intensive night shooting and gassing programme has been in place, through to Roxburgh North (just over 18 rabbits counted per km) where little effective control is undertaken. Many of the night count sites receive what could be termed as "moderate control" (usually gassing, night shooting or aerial shooting) which involves one or two passes over the property annually. These properties show up in the 1-3 rabbits per km range on the graphs and represent the majority of Otago properties at the time of year when the night counts were undertaken.

It appears that this level of control input allows RHD to have a helpful impact on lowering rabbit numbers, so when combining these two mortality factors, rabbit numbers are able to be kept at low to moderate levels and compliant with the current RPMS rules.

Roxburgh North and Poolburn sites reflect an increase in rabbit numbers in winter-early spring. This reflects a general rise in rabbit numbers by many properties in Central Otago. Many of these property owners will need to increase their level of secondary control or plan to carry out poisoning operations in winter 2009.

Tarras 1 and 2 reflect rabbit numbers where control work on these properties occurred in 2008 with subsequent decreases in rabbit levels.

Most Otago count sites currently have low to moderate rabbit populations and are representative of the majority of properties in the region. The principal factors contributing to low rabbit levels are effective secondary control programmes, RHD, and the various agents that cause natural mortality in rabbit populations. However on many properties in Central and North Otago there has been a general rise in rabbit numbers. The principal reason is the decline in secondary control.

Night counting conclusions: *"Night counts provide a good overview of rabbit levels in Otago. This allows the Council to advise landholders of appropriate control measures that will need to be undertaken to prevent or stop breaches of the RPMS. The counts show rabbit levels ranging from very low levels through to low to moderate levels up to some populations that will require poisoning in 2009. The properties that kept rabbit numbers at manageable levels achieved this through secondary control programmes. Many landholders must increase their level of secondary control."*

7. MAL Survey

7.1 Introduction

MALs equate to the corresponding number on the Modified McLean Scale (Table 2). This scale provides an index of rabbit density based on the amount of fresh rabbit faecal pellets present on the ground together with numbers of rabbits seen. This monitoring method yields more accurate results. The information is critical to monitor compliance with RPMS and study rabbit population changes and effectiveness of any control methods.

7.2 Method

Any land known to have, or suspected of having high rabbit numbers had been inspected. This was based on the knowledge of both the staff of Regional Services and the Compliance Unit. Criteria such as the rabbit proneness of the land and the landholders land and rabbit management practices are also used when selecting properties to inspect.

The observer does a ride-through survey, scoring rabbits seen and rabbit sign (see McLean chart below). The method somewhat subjectively interprets what is seen and puts individual areas into broad classes. The key to success is to use a single observer and subdivide the farm or control area into blocks within which the McLean score is likely to be consistent. This is more useful than a single 'mean' score for an entire farm. Each assessment should be done at the same times of day and year and under similar weather conditions.

The McLean scale may not be used to estimate a percentage reduction. It can be used to identify a trigger level for control i.e. when rabbit numbers shown by the scale are too high. This assumes the relationship between the McLean score and rabbit impact is known, so that a particular McLean score reflects rabbit numbers that are or soon will be causing significant damage.

Sampling must be thorough enough for the results to be as accurate (i.e. pest density or change is estimated correctly) and as precise (i.e. the +/- in the estimate is small) as possible with least amount of effort (cost). To achieve this, the different habitats in a particular farm or management area must be sampled to ensure that all habitats are adequately represented in the survey. When using the McLean scale all major habitat types and areas with different rabbit control histories must be scored.

Monitoring data from control operations can be used in the property pest plan to help estimate the timing of repeat operations. By using known rabbit reproduction and survival rates, it is possible to estimate when a population will return to a pre-control level. Systematically collected monitoring data can highlight specific areas where control operations have failed or been less successful. These can then be targeted for additional control work or identified for earlier repeat control as part of a long term property pest plan.

Annual assessments of rabbit densities throughout a farm provide a regular check on the rabbit status in relation to observed impacts (i.e. pasture damage). Eventually, accurate trigger levels for control, an integral part of property pest plans, can be

determined. This information is crucial if rabbits are to be cost effectively maintained at densities below those at which cause significant impact.

A regular monitoring programme will also "track" the recovery of populations after control. Thus, if recovery is faster than anticipated, the manager (or landowner) can schedule control when it is appropriate for specific areas of the farm.

Table 2. Modified McLean Scale.

1	No sign. No rabbits seen.
2	Very infrequent sign seen. Unlikely to see rabbits.
3	Sign infrequent with (buck) heaps more than 10 metres apart. Odd rabbit may be seen.
4	Sign frequent with some heaps more than 5 metres apart. Groups of rabbits may be seen.
5	Sign very frequent with heaps less than 5 metres apart in pockets. Rabbits spreading.
6	Sign very frequent with heaps often less than 5 metres apart over the whole area. Rabbits may be seen over the whole area.
7	Sign very frequent with 2-3 heaps often less than 5 metres apart over the whole area. Rabbits may be seen in large numbers over the whole area.
8	Sign very frequent with 3 or more heaps often less than 5 metres apart over the whole area. Rabbits likely to be seen in large numbers over the whole area.

7.3 MAL Monitoring Results and Discussion

Just over 10,600 hectares were found to be exceeding their MAL, which apart from 300 hectares in East Otago (MAL 3-4), and 40 ha in North Otago (>MAL 3), were all located in Central Otago. The total area of land in breach equates to just under 0.4% of the land occupied by rabbits in Otago. No land was identified as exceeding its MAL in South Otago, West Otago, nor on the Taieri Plains, around Dunedin or on the Otago Peninsula. All of this land has a MAL of 3.

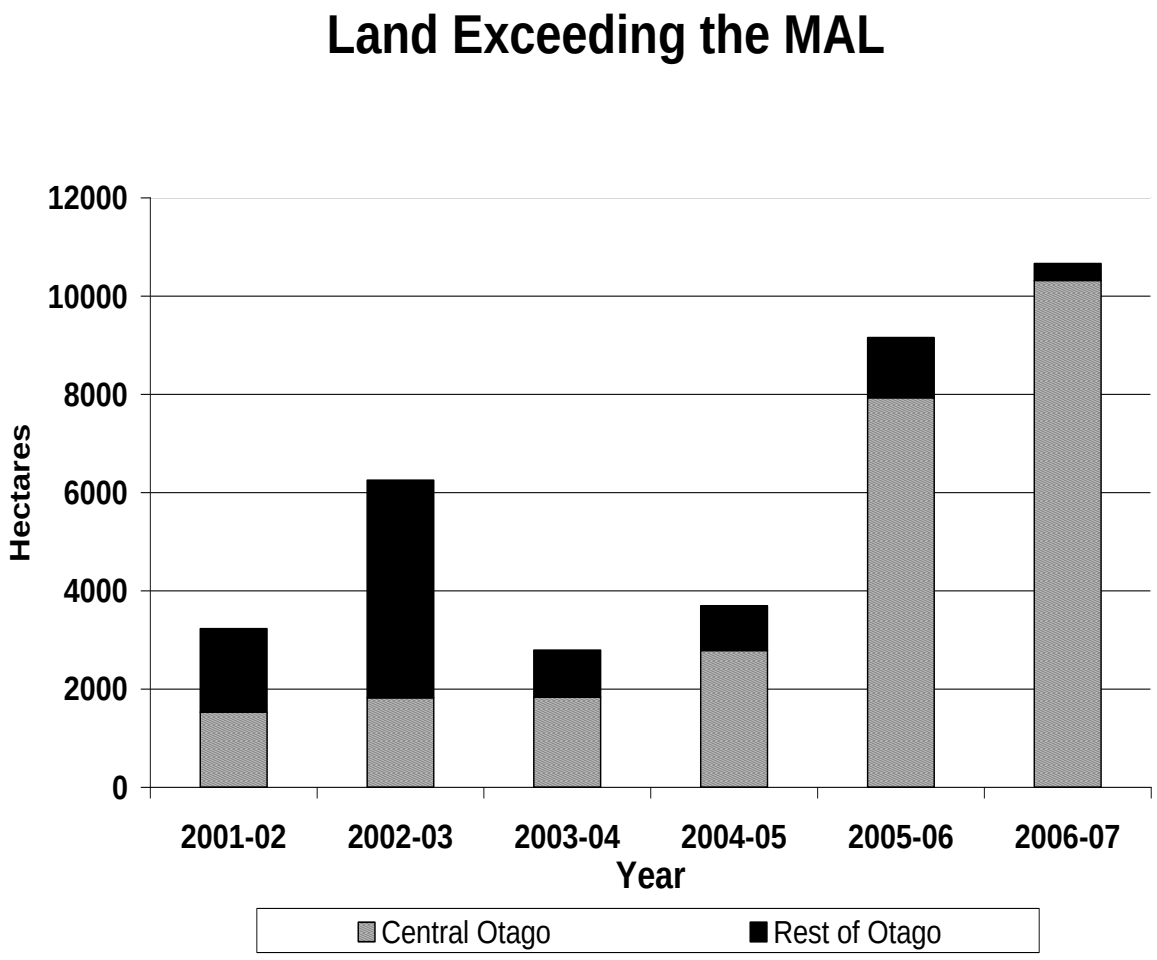
This continues a trend seen in the previous three surveys, of an increasing amount of land in breach and reflects the general consensus that rabbit numbers are on the increase and are currently at their highest levels since the RHDV arrived in the spring of 1997.

While the last breeding season was good for rabbits, with rainfall allowing the normal season to extend well into late summer, the principal reason for increasing rabbit numbers is the decreasing impact that RHD is having in parts of inland Otago.

Effective secondary control programmes will enable other landholders to bring rabbit levels down to those allowed in the RPMS. As expected, most exceedences in the region are on the rabbit prone lands of Central Otago, up from 9200 ha last year to 10660 ha this year (Figure 12). This latest figure includes 4500 ha lying

within the Maniototo Pest Management Ltd area. As in previous years, the largest area in breach within Central lies in the Upper Clutha area with the Tarras, Luggate and Lowburn areas accounting for most of land involved. Land lying adjacent to the Kyeburn River and to the east of Waipiata accounts for the Maniototo land that is in breach.

Figure 12. MAL Trend.



It is very encouraging to see that no land in coastal Otago was identified as exceeding its MAL. The beneficial impact of RHD is still evident in these parts of Otago. Many of these areas reported the virus passing through prior to December and again in late summer. For many landholders this amount of mortality is sufficient to maintain rabbits at low levels. For others, on land more suitable to rabbits, some secondary control work has been required to prevent rabbit numbers rising.

In contrast to inland Otago, natural rabbit mortality is much higher on the coast. The higher rainfall and subsequent water logged soils results in significant numbers of young rabbits drowning in their burrows (stops). Long wet vegetation means diseases such as coccidiosis are also prominent in causing deaths particularly rabbits less than 6 months old. These factors, together with the impact of RHD and the good rabbit control programmes that most properties implement, would be the main reasons for the stable low rabbit populations.

As noted in previous rabbit density survey reports, the fact that many landholders in inland Otago allow their rabbits to sit at the MAL level means that in a "rabbit favourable year", as just experienced, their rabbit numbers quickly rise to levels where the only viable control option is a poisoning operation. This situation is most obvious in the district with the MAL level set at 5.

All land identified in last year's survey had the rabbits reduced to the allowed levels by poisoning or secondary control programmes. In 2007, agreement has been reached with a small number of landholders to have a control programme spread over two years in order to meet their MAL obligations. This is only granted under certain conditions such as, that the remaining rabbits are contained with good barriers to prevent any spread, and that the majority of land requiring poisoning is poisoned this winter, etc.

As previous survey reports have emphasised, the majority of landholders do not exceed their MAL. The Council's message for the need to continue with effective secondary control programmes to enhance and supplement the benefits that RHD provides, has been heeded by most landholders. However some landholders need to monitor their rabbits more closely and adjust their secondary control programmes accordingly.

Council staff continue to work in a proactive manner with landholders in rabbit prone areas, enabling identification of rabbit densities that are at close to or above their MAL as soon as possible. Staff assist in development of control programmes and provide clear guidelines on when work should be undertaken and what is required to ensure compliance with the strategy and hence sustainable management of the effected land.

This latest survey has shown an increase in the amount of land in Central Otago with rabbits exceeding their MAL, a trend seen over the last four years. While this increase is of concern, to put it in perspective, the total land area in breach of their MAL level equates to just under 0.4% of the land occupied by rabbits in Otago.

The 2008 survey indicates that the mild winter and the good growing spring season of have contributed to the increased numbers of rabbits now noticeable in rabbit prone areas. Queensberry-Luggate Areas and Ardgour Valley in place exceed MAL 5. Pigroot, North Otago, Cardrona Valley, Gibbston Valley, areas of Wanaka Hawea Basin, East and West Roxburgh, Ettrick to the SE are in excess of MAL 4.

When the new RPMS comes into force, by October 2012 the entire region is required to comply with MAL 3. As expected, most breaches in the region are on the rabbit prone lands of Central Otago (approx 20,000 ha in Upper Clutha area with the Tarras, Luggate and Lowburn areas). Some pockets of the Maniototo Pest Management catchment will be in breach, with a management plan in place to control any breaches having been written. The Maniototo Pest Management Co. has some poisoning operations set to progress in winter of 2009. Land lying adjacent to the Kyeburn River and to the east of Waipiata accounts for the Maniototo land which is in breach.

About 2500 ha in North Otago has serious breaches through the Pig Root. One hundred hectares of Moeraki Lighthouse area has been identified with rabbit problems

exceeding MAL 3. About 1500 ha has been identified in St Bathans area. In the Springvale area, Alexandra, most of the lifestyle blocks in this area are exceeding MAL 3 with some pockets with MAL 5. The area from Alexandra to Clyde along the Clutha River is in excess of MAL 3 in places. Earnscleugh from Conroys Rd through to Clyde apart from Earncleugh Station is in breach of MAL 3 in pockets. Northburn Station at the Leaning Rock end has 20 ha in breach. The Cromwell end of Northburn Station including Contact Energy land is in breach of MAL 3 when last inspected before the end of 2008. From Cromwell through to the Lindis on the east side will be in breach of MAL as this area was previously set at MAL 5. Cromwell through to Luggate/Wanaka basin will be well over MAL 3. Cardrona Valley, Roxburgh/Teviot Valley, Ettrick-west side and Taieri Hills and Outram will also be exceeding MAL 3.

MAL survey conclusions: *"MAL surveys continue to provide this Council with good information that enables it to determine trends in rabbit densities, and levels of MAL compliance. These in turn will assist in identifying problem areas, and where rabbit problems are likely to occur so allowing appropriate action to be taken. Once the new RPMS is operative an estimated 25,000 ha will be exceeding MAL 3 – the new RPMS level".*

8. Procedures for RPMS 2009 Implementation

As stated before new strategy will require full compliance by October 2012. Council has to request and approve any rabbit management plan from landowners/occupier to make sure the plan is workable and will meet the objective of reducing rabbit/hare numbers down to MAL 3 or below. There will be a large financial impact on those farmers that are presently on MAL 4 or MAL 5 now that they are required to do work to lower rabbit numbers to MAL 3. This will mainly have an impact on those in North Otago, Tarras, Cromwell and Alexandra areas. Also lands in the Roxburgh, Wanaka, Cardrona and Queenstown-Lakes areas will be required to do work this winter as initial poisoning programmes will be the only efficient and cost effective method to adequately control rabbits to an acceptable level of MAL 3.

The following steps are considered necessary for a smooth transition from RPMS 2001 to 2009 and effective implementation of RPMS 2009: That Council,

1. develop guidelines for land owners/occupiers to prepare control programmes;
2. develop guidelines or educations materials for land owners currently under MAL 3;
3. develop monitoring/surveillance and reporting strategy and enforcement procedures and associated delegations for breaches of rules 5.2.4(iii)(b) and 5.2.4(iv);
4. develop and implement plans for effective rabbit poisoning;
5. develop control programme approval procedures and associated delegations;
6. make publicity and hold workshops to discuss RPMS 2009 and guidelines on control programmes and council enforcement procedures; and
7. identify land owners and occupiers within areas under Rule 5.2.4(i) including identification of clusters of landholding requiring same level of control and send requirement to submit individual control programme or combined control programmes.

9. A Range of Rabbit Control Techniques and Costs

When considering which method to use for controlling rabbits a number of factors are important. Listed below are the pros and cons for various methods and toxins (Table 3).

Table 3. Rabbit Control Techniques and Costs.

Method	Pros	Cons
1080 Carrot - Aerial ~$80/ha	Can be used on all terrain types. Can be used on all infestation levels. Environmentally friendly poison.[2] Very effective. Allows good bait coverage. Low labour costs on large scale ops.	Expensive. Only able to be used in winter. Not suitable where boundaries are critical or irregular. Requires suitable weather for flying. Requires suitable airstrip for fixed wing work, handy to the block. Subject to more stringent MOH and HSNO conditions, particularly around houses, waterways and public areas. Acceptability issues with sections of the general public. Risk of non target deaths (stock, deer, dogs etc). Requires minimum of 12 hours free of rain after toxic application. No effective antidote for toxin.
Pindone Carrot - Aerial ~$100/ha	Able to be used on all terrain types. Good where public resistance to 1080 exists. Quick return of ground for restocking. Very low risk of non-target deaths. Less stringent MOH conditions for use than for 1080. Low labour costs on large scale ops. Ideal for small landholdings and peri-urban properties. Antidote available for toxin.	Very expensive. Not suitable for high rabbit levels e.g. >MMS 5. Not as effective as 1080. Much longer persistence in the environment and risk of residues in bodies animals/stock who have ingested sub lethal doses. Requires airstrip for fixed wing work, handy to block. Requires suitable weather for flying. Low tolerance to rain. Can only be used in winter. Birds susceptible to the toxin.
1080 Carrot - Ground mechanical bait layer ~$65/ha	Suitable for use on flat to rolling country. Cheaper than aerial carrot. Suitable for all rabbit infestation levels. Allows accurate bait placement around boundaries, housing, waterways, etc.	Higher labour costs. Not suitable for steeper country or areas with poor vehicle or motorcycle access. Requires good coverage of all habitat areas. Requires a skilled operator to achieve good results.

	Uses less bait per hectare than aerial. Fewer weather issues during application	Can only be used in winter. No effective antidote for toxin. Requires minimum of 12 hours free of rain after toxic application.
Pindone Carrot - Ground mechanical bait layer ~$75/ha	Suitable for use on flat to rolling country. Cheaper than aerial carrot. Allows accurate bait placement around boundaries, houses, waterways, etc. Low risk of non-target deaths e.g. low toxicity to domestic pets. Quick return of ground for restocking. Ideal for small landholdings and peri-urban properties. Antidote available for toxin.	Very expensive. Not suitable for steeper country or areas with poor vehicle or motorcycle access. Not suitable for high rabbit levels. Longer persistence in the environment. Low tolerance to rain. Requires a skilled operator to achieve good results. Not as effective as 1080. Winter only method. Birds susceptible to toxin.
1080 Carrot - Ground hand laid ~$85/ha	Suitable for use around small infestations. Able to be used on all terrain types.	Not suitable for large scale infestations. High labour costs. Difficult to achieve good coverage on rough or scrubby terrain. Winter only method. No effective antidote for toxin. Requires minimum of 12 hours free of rain after toxic application.
Pindone Carrot – Ground hand laid ~$95/ha	Suitable for use around small infestations. Able to be used on all terrain types. Able to be supplied to landowners- no licence required. Low risk of non-target deaths e.g. low toxicity to domestic pets.	Not suitable for large scale infestations. High labour and toxin costs. Not as effective as 1080. Persistence issues for environment. Winter only method. Birds susceptible to toxin.
1080 Oats Aerial ~$80/ha	Suitable for all terrain types. Suitable for all infestation levels. Fits in well with pastoral grazing management. Quicker return of land for restocking than carrot.[1] Environmentally friendly poison.[2]	Expensive bait and operation costs. More bait preparation required. Not as effective as 1080 carrot. More stringent MOH conditions. Requires minimum of 12 hours free of rain after toxic application. No effective antidote for toxin. Restricted to late summer/autumn only. Rabbits can be fickle to eating oats. Bait preparation time and equipment required is greater than for carrot.

1080 Oats – Ground mechanical bait layer ~$75 hand laid ~ $85	Suitable for smaller infestations on flat to rolling ground. Suitable for all levels of rabbit infestation. Quicker restocking than carrot.[1] Able to be used in late Summer/Autumn. Environmentally friendly poison.[2]	Expensive bait costs. Expensive labour costs. Requires a skilled operator to achieve good results. Bait preparation time and equipment required is greater than for carrot. Requires minimum of 12 hours free of rain after toxic application. No effective antidote for toxin. Restricted to late summer/autumn only. Rabbits can be fickle to eating oats.
Fumigation with Magtoxin or Cynogas ~$45/ha ~$0.80/warren /burrow DIY	Suitable for all terrain types. Able to be carried out at all times of the year. Suitable for unskilled staff. Effective if done systematically and followed up. No destocking of land required. No risk of non-target deaths.	Only suitable for small scale operations. High labour costs. High fumigant costs. Needs to be done thoroughly to be effective. Best done as a follow-up to or in conjunction with other control work. Not effective when MMS >4.
Nightshooting, Motorcycle or Portable MC ~ $4/ha Small lifestyle block ~ $150 Portable ~ $10/ha	Effective if done correctly and regularly. Suitable for flat to rolling country with good motorcycle or vehicle access. No destocking of land required. Can be done at any time of the year.	Requires skilled operator to be effective. Not suitable for large scale infestations or steep terrain. Must be done regularly and thoroughly. Not effective when MMS >4 or 5.
Dog and Gun Small lifestyle block ~ $200	Effective on small pockets of rabbits in cover where poisoning, shooting or fumigation are not an option. Can be done at any time of the year No destocking of land required. Enjoyable activity.	Requires a skilled operator and good dogs to be effective. Not suitable on large scale problems or extensive areas of scrub or cover. Not effective when MMS >4.
Day Shooting ~ $10/ha Small lifestyle block ~ $150	Good for removing small numbers of rabbits that are not able to be controlled with other methods. Can be done at any time of the year. No destocking of land required.	Limited effectiveness. Requires a skilled operator to be effective. Not effective when MMS >4.

Trapping Cost extremely variable Small lifestyle block ~ $200	Good for removing small numbers of rabbits that are not able to be controlled with other methods. Can be done at any time of the year. No destocking of land required.	Limited effectiveness -best done in conjunction with other methods. Not effective when MMS >3. Requires a skilled operator to be effective. Domestic pets are at risk. Viewed as in-humane by general public and SPCA. Labour intensive.
Helicopter shooting ~$15/ha/yr	Only effective method where coverage with a vehicle or M/C is limited due to terrain etc. Effective where vegetative cover harbors rabbits requiring the animal to be flushed out using helicopter. Very effective method with skilled shooters and pilots. Can be done at any time of the year. No destocking of land required. Best results when complimented with other control methods.	Only effective if rabbits levels below MMS 5. Relatively costly e.g. ~$15/ha /yr (maintenance control only). Requires assistance from other methods or the regular presence of RHDV.
Pindone pellets $30/ha $20/ha DIY	No licence required when applied in bait stations. Low cost method. Use all year. Suitable for small holdings. No destocking of land required. Low risk of non-target deaths e.g. low toxicity to domestic pets. Antidote available.	Low rates of acceptance in Central Otago. Suitable for low rabbit infestations only. Risk to passerines eating crumbling bait.

Costs described in Table 3 are approximate. They can vary due to size of block or land involved, rabbit densities, distance from depot, terrain and changes to estimated costs for materials such as poison, bait, fuel (avgas & diesel).

10. Conclusion

In the past 15 years Council had a significant role in controlling rabbit population in the Otago Region. The strengths of Council's role have been monitoring, rabbit control contract works, leadership, research, advisory, and co-operation/collaboration with land owners/occupiers.

RHDV had a significant and immediate impact on rabbit population in Otago. As predicted a level of immunity was always expected after the introduction of the virus. It is clear from Council's monitoring and research RHDV will continue to be a *complementary and passive* tool to control rabbit numbers in Otago. Poisoning and

secondary control methods have *always* been considered as effective and long term *active* tools in controlling rabbit population.

When the new RPMS is operational there will be a large amount of land area (in excess of 25,000 ha) requiring rabbit control through Council approved control programmes. Council need to work with farmers and make comprehensive preparation for the effective implementation of RPMS 2009 as identified in Section 8 of this report and transition to the RPMS 2012 target. There is a lot of hard work ahead for Council and land owners/occupiers in the next three years and years to come.

11. Recommendation

That this report be received and noted.

Selva Selvarajah
Director Resource Management