Harnessing Community Opportunities to Achieve Large-Scale Possum Control in Rural New Zealand

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ABSTRACT: The brush-tailed possum is an introduced mammalian pest from Australia. This ubiquitous, nocturnal animal occupies every suitable habitat throughout New Zealand and causes over $40 million (NZD) per annum of direct damage to the country's economy. To this must be added the intrinsic values associated with possum damage to the conservation estate and native flora and fauna. Rural landowners arguably suffer the greatest effects of possums through grass loss resulting in competition with stock, and the possibility of bovine tuberculosis being spread by possums to farmed cattle and deer. In the upper North Island, the Waikato Regional Council (also known as Environment Waikato) has developed a fresh approach to working with rural landowners to achieve effective and sustainable possum control over large (20,000 ha plus) areas of private and government owned lands. There are currently 12 schemes managed, covering in total 155,000 ha and involving over 770 landowners. The procedure for implementing schemes is necessarily comprehensive but flexible enough to have seen seven modifications to the process since 1998. The process is constantly evolving to ensure that control remains effective and meets the expectations of scheme members and the Council. Environment Waikato, having secured a community mandate of at least 75% of support in each proposed area, undertakes and funds initial control to a predetermined residual trap catch density. Leaving landowners to maintain low possum numbers themselves through trapping, shooting, and poisoning techniques has not proved sustainable in the long-term. Now, maintenance work is carried out by professional contractors and funded by landowners through a targeted property rate (dollars per ha owned). Such an approach has produced significant results, better utilizes contractor time and expertise, and frees farmers up to concentrate on their core task of farming.

KEY WORDS: 1080, brush-tailed possum, community, control method, economic damage, guideline, integrated pest control, maintenance baiting, marsupial, New Zealand, pest control operator, poison, *Trichosurus vulpecula*, vertebrate pest control, Waikato Regional Council

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INTRODUCTION

The Possum Problem

The introduction of mammalian pests such as rabbits, stoats, ferrets, and possums to New Zealand has resulted in a unique and complex set of ecological and animal disease control problems to manage. For more than 50 years, the main response to these problems has been population control methods. These have mainly targeted the brush-tailed possum (*Trichosurus vulpecula*), first introduced from Australia in the mid-1800s in an attempt to develop the fur industry (Department of Conservation 2000).

Possums are versatile feeders and can exist on a wide variety of animal and vegetable matter, hence they are able to establish in many inhospitable parts of the country. Possums occupy 90% of mainland New Zealand and exist on 13 offshore islands. Densities range from 25 animals per ha in prime bush/pasture margins to 1 animal per 4 ha in South Island mountain beech forest. Medium to high densities extend across approximately 14% of New Zealand. Much of this is on Government (Crown) land administered by the Department of Conservation.

In the natural world, New Zealand is distinct. No other landmass of New Zealand's size has been isolated for such a long time– its separation from the super continent, Gondwana, occurred some 80 million years ago. As a result, New Zealand developed a set of plants and animals that are very different from those elsewhere. The only endemic land mammals are bats, and there are a range of flightless birds. The possum was one of 32 mammal species introduced (Hackwell 1999) and arguably causes the most widespread environmental and economic damage of any exotic invader to New Zealand.

Damage to Native Ecosystems

Possums are one of the major threats to the health and wellbeing of forests throughout New Zealand (Green 2004). They cause damage to native forests from the ground level to the canopy where, by concentrating on individual preferred species, they can kill trees by defoliation over several years. Browsing high in the canopy on fruits and flowers, possums are in direct competition with threatened birds, such as the kiwi (*Apteryx australis*), for dens, and they are known to destroy eggs and native invertebrates (weta and snails).

In vulnerable forests, many valleys have lost between 20-50% or more of their canopy trees. In severe situations, possums have caused the complete collapse of the canopy within 15-20 years. Tall forest is replaced by shrublands.

Impacts on Primary Production

The major impact of the possum on primary production is its role as the main vector of bovine tuberculosis (*Mycobacterium bovis*) in farmed deer and

cattle. In order to compete successfully in international export markets, New Zealand must satisfy its trading partners of high quality standards of bovine Tb inspection and certification and that control programs are in place. Failure to provide these could see trade embargoes on meat exports.

Possums are highly susceptible to bovine Tb, and the disease is self-sustaining in their populations. The infection is spread by direct contact between animals. Possums can travel long distances nightly through forest to feed on pasture, and they pass the disease to other possums and to cattle, which lick or sniff open lesions that contain bovine Tb bacteria. It is believed that the disease will die out in possum populations if numbers are kept very low– below a 5% residual trap catch index (RTCI) (Eason 2002).

The impacts of possums on pastoral farming, horticulture, and forestry are of secondary significance to bovine Tb. However, 8 possums are equivalent to 1 stock unit (sheep). Hence, 2 or 3 possums per ha on farmland can represent a significant loss of production (Green 2004). Possums can cause extensive damage to new plantations of *Pinus radiata*. Effects on horticultural production are widespread but seasonable, patchy, and poorly documented. The loss in agricultural production by possums is estimated at over $40 million (New Zealand dollars) annually (Bartrum 1999).

Managing Possums – Strategies, Policies, and Methods

Possums cannot be eradicated from the country using current technologies. The general national goal is a reduction of possum numbers to levels where both damage to native ecosystems and the bovine Tb threat are minimized.

Many agencies and individuals undertake possum control for their own objectives. Three groups of agencies undertake the majority of control work (Green 2004):

***Animal Health Board* (*AHB*)** is the agency responsible for the eradication of bovine Tb from farmed cattle and deer herds and wild animals, under the Bovine Tb National Pest Management Strategy (NPMS). Over $55 million (NZD) is spent annually controlling wildlife sources of the disease (possums, ferrets, deer, and pigs) on 7.8 million ha of land. In most cases, regional councils manage vector control programs on behalf of the AHB. The NPMS objective is to reduce infected herds to 0.2% annual period prevalence by 2012/13.

***Department of Conservation* (*DOC*)** is responsible for possum control on public conservation land, approximately 30% of New Zealand's land area. DOC spends about $14 million (NZD) annually on possum control, but the area under sustained management for possums is only 15-18% of the total conservation lands administered (less than 1 million ha). Resources are limited, so control efforts are selective and usually involve significant control efforts on other pest species (rats and mustelids) impacting on the priority control sites.

Regional Councils manage possums for a mix of economic and conservation reasons on private land. This work is implemented under regional pest management strategies (RPMS's), developed under the Biosecurity Act 1993, and complements AHB and DOC programs. Many synergies are achieved by the agencies working co-operatively. In broad terms, over $75 million (NZD) is spent annually on possum control in New Zealand, on over 9 million ha.

Several techniques have been developed to control possums in New Zealand. Some, like Compound 1080 (sodium monofluoroacetate), have been tried, tested, and refined many times over the years. Other methods are new and experimental. Effective possum control operations rely on a combination of several methods:

- Poisons
  - 1080 (aerial and ground applications)
  - cyanide
  - brodifacoum
  - cholecalciferol
  - phosphorus
- Trapping and hunting
- Exclusion fences

POSSUM CONTROL IN THE WAIKATO REGION

The Waikato Region

The Waikato Region covers 2.5 million ha (25,000 km^2) in the central North Island of New Zealand. The region's economy is vitally dependent on agriculture, forestry, mining, and energy. Dairy farming is the predominant farming land use. The population of the region is approximately 360,000. Rural landowners make up almost 9% (31,000) of the population.

The Waikato Regional Council (trade name: Environment Waikato) manages and protects land, air, water, soil, coastal, and geothermal resources. The regional boundaries are based on water catchment areas. Environment Waikato's mission is to manage the sustainable use of these resources, and work with the community to benefit present and future generations. Biosecurity (plant and animal pest) management is one of Environment Waikato's key activities.

The Waikato Regional Pest Management Strategy

Possums are declared pests in the Waikato Regional Pest Management Strategy (RPMS). This means that Environment Waikato has legal authority to assist landowners and communities to control possums, direct landowners to control possums in certain circumstances, and powers to acquire funding from ratepayers to undertake control work for regional benefit (Waikato Regional Council 2002). Environment Waikato undertakes possum control for a variety reasons. Primarily, the council acts as bovine Tb vector manager for the region and implements possum control programs on behalf of the Animal Health Board.

The RPMS was developed under the Biosecurity Act 1993. The Act allows the development of pest control strategies specific to each region, provided that the organisms declared pests pass cost benefit analysis tests and that a robust public consultation process has taken place.

There are two key possum control programs under the RPMS:

- ***Key Ecological Sites* (*KES*)** – a 'site-led' initiative concerned with protecting and enhancing ecologically significant areas that are in private ownership. These sites are scattered throughout the region and range in size from 5 to 5,600 ha. The areas include wetlands and rare forest remnants. Possum (and other pest) control is carried out to minimize specific threats to each site. Fencing to keep out stock and education/ monitoring programs are also developed with landowners. There is no legal compulsion for landowners to be part of this program. Pest control in KES is funded 100% by the Council.
- ***Community Possum Control Schemes* (*CPCS*)** – a 'pest-led' initiative where Environment Waikato is reactive to landowner (farmer) requests for large-scale possum control assistance (up to 20,000 ha). Schemes typically cover open farmland, shelterbelts, scrub, and dense bush and invariably involve a large number of diverse landowners. The Council funds all initial control in these scheme areas to predetermined levels. Annual maintenance work is carried out by professional contractors. Funding of maintenance work is obtained from scheme landowners through targeted property rates, and Environment Waikato manages landowner consultation, contracts, rating, and monitoring requirements. There are binding requirements on all landowners in identified areas if a 75% threshold of support is obtained.

Regional Links to the National Pest Management Strategy

The bovine Tb program has been operated by Environment Waikato since 1989. However, as the Animal Health Board achieves its regional targets and eradicates bovine Tb from possum and ferret populations, it will withdraw large-scale possum control from areas declared to be free of the disease. Figure 1 shows the decreasing trend in infected herds over the last 5 years in the region.

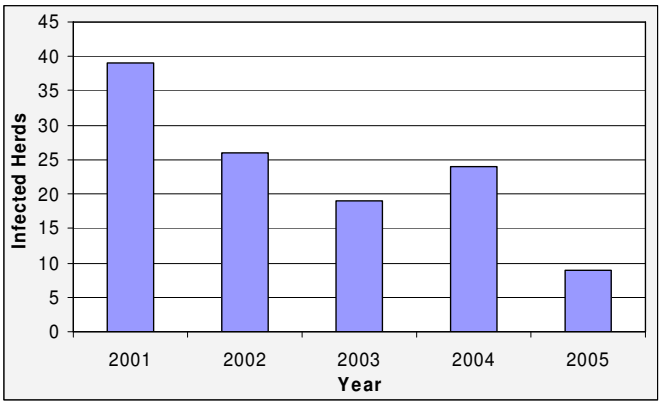

Figure 1. Trend in infected cattle and deer herds in the Waikato Region, 2001 to 2005 (Source: Animal Health Board).

In 1994, there were over 200 infected herds in the region. A rapid improvement in herd status has occurred in 11 years, to the point where the region is very likely to achieve national bovine Tb control targets before 2012/2013.

As the bovine Tb targets are achieved in individual operational areas, Environment Waikato is surveying each community, asking landowners if they wish to join the CPCS format of managed possum control, carried out under the RPMS. It is important to "maintain the gains" made over the last 11 years in these areas, as possum densities have been held very low over this period.

The cost of continuing with maintenance possum control is small compared with starting in a new area or starting over at a later date. It is not clear to what extent possum control under the NPMS has benefited biodiversity. However, reports by Reddiex *et al*. (2005) and Brown and Urlich (2005) directly documented the effects of bovine Tb vector control on biodiversity. They concluded that aerial 1080 operations, in particular, achieved very high possum kills, and when repeated on a 3- to 4-year cycle made a major contribution to biodiversity enhancement.

In the next 5 years, 100,000 ha of bovine Tb control will cease in the region in 10 main areas. The challenge being faced by Environment Waikato is to replace government- and industry-led and funded possum control with sustainable, community-led and funded possum control primarily for conservation purposes.

The Current Position

As of January 1, 2006, there were 12 community possum control schemes in various stages of planning or implementation. In total, they cover 155,000 ha and involve over 770 landowners. Two of the 12 schemes are former bovine Tb control areas, where the transition was made in 2004/2005 from Crown-funded to local community and Environment Waikato-run and funded.

Five schemes still exist from the period 1998-2001, when Environment Waikato supported self-help landowner control schemes, where monitoring was rudimentary and modern technology (e.g., differential global positioning systems) was not widely available. Attempts are being made to transfer 2 'poorly performed' of the 5 schemes into a new, rated area scheme format, rather than rely on landowners doing the work themselves. Satisfactory results are being achieved to date in the other 3 schemes.

Of the remaining 5 schemes, 3 are areas that have never had bovine Tb control previously, and the communities have adopted the new rated area scheme format, while another 2 areas are in the transition planning phase as part of the winding back of the AHB program.

Regardless of the background and history of these communities, very strong landowner support has been demonstrated. The damage inflicted by possums clearly unites people to a common cause. Environment Waikato has pressure to expand the program and incorporate new areas as demand increases. Added to this is the desire of many communities in previous bovine Tb areas to become part of the program.

Experience in operating the current schemes has shown Environment Waikato that the best results are obtained using dedicated professional contractors and

undertaking performance-based control, rather than leaving it up to landowners to undertake their own control work. New Zealand farmers have a strong, independent will to do things themselves. The challenge facing Environment Waikato is to educate farmers to accept that the self-help possum control format must change, while still retaining their inputs and local knowledge to co-operatively manage possums in a smarter and more effective way.

WORKING WITH COMMUNITY GROUPS AND FORMING PARTNERSHIPS

Engaging with Landowners

One of Environment Waikato's main roles is to work with communities over a whole range of resource management issues. Despite having a number of dedicated landowners and excellent relationships with scheme steering groups, the vast majority of landowners are apathetic when it comes to decision making. Possum control is no exception.

Environment Waikato's role in possum control is to act as overseer, often lead decision maker, and educator of communities. For proposed possum control schemes, a number of steps are used in the planning phase.

Quantifying the possum problem is the first important step. "Possums eat grass, which equates to loss of production, which leads to reduced income" is a key message. Comparing possum densities between areas is a second key message to get across at the outset of scheme planning. A possum monitoring protocol adopted nationally (National Possum Control Agencies 2005) allows comparisons in possum densities anywhere in the country, as long as operators follow the protocol.

Every scheme has influential landowners– whether they occupy large land holdings or are politically motivated. Environment Waikato endeavors to obtain initial feedback on the likely level of support, and any other specific issues to the area, from these key people. Key landowners become important, when landowner steering groups are formed, to voice issues raised and to communicate to the wider scheme members.

As a regional council, Environment Waikato must remain neutral, provide sound advice to steering groups, and have robust processes in place. Not only does possum control need to be effective, it also needs to be sustainable in the long term. The critical control period is the first 3 to 5 years.

A rule in the RPMS covers the inevitability of not all landowners agreeing to a proposal. In order that schemes do proceed, a 75% support threshold is required from a survey of all potential scheme members, regardless of property size. If this threshold is obtained, then the rule becomes binding on all landowners in the identified scheme area (Waikato Regional Council 2002).

Environment Waikato realizes that it is important to offer incentives to new groups joining the program. All initial possum control is 100% funded by the Council. This 'breaks the back' of the problem and allows maintenance work to be undertaken at a lower cost to the landowners. A permanent control infrastructure is put in place by pest control operators (bait stations, predominantly). Monitoring, contract management, and steering group liaison are funded annually by Environment Waikato. Over a 3-year period, the overall split in costs between the regional council and landowners in each scheme works out in favour of scheme members.

Process for Establishing Large-Scale Possum Control Schemes

A 7-step process is currently used by Environment Waikato to implement new community possum control schemes, whether they are bovine Tb operations that have ceased, or new proposals from other parts of the region. The original CPCS procedure was developed in 1998.

The process has been modified seven times, as of March 1, 2006. This reflects changes in Council policy, political influences regarding funding inputs, and flexibility required as a result of law changes, but most importantly experience gained of what works and doesn't work in practical terms in the field.

Table 1 summarises the process, which is divided into 3 phases: planning and consultation, initial control,

Table 1. Summary of process for establishing large scale possum schemes in the Waikato region.

Steps	Phase 1 - Determining an Area and Gauging Interest
1 Initial discussions	- Identify broad possible area - Engage key landowners - Community meeting
2 Establish landowner steering group	- Confirm scheme boundary - Terms of reference agreed - Mandate for feasibility study
3 Undertake feasibility study	- Pre-operational monitoring - Quotes/plans requested from contractors - One-on-one landowner survey **75% mandate required**
4 Control decision made	- Environment Waikato budgets and plans work programme
	Phase 2 - Implementing Initial Control Work
5 Initial control implemented	- Confirm contractor and contract - Permission to enter land obtained - Control carried out to achieve targets
6 Monitoring and reporting	- Independent monitor to ascertain results - Scheme newsletter/media releases
	Phase 3 – Ongoing Maintenance Responsibilities
7 Maintenance control implemented	- Rates struck annually for funding - Contractor retreats initial areas - Independent monitoring to ascertain results

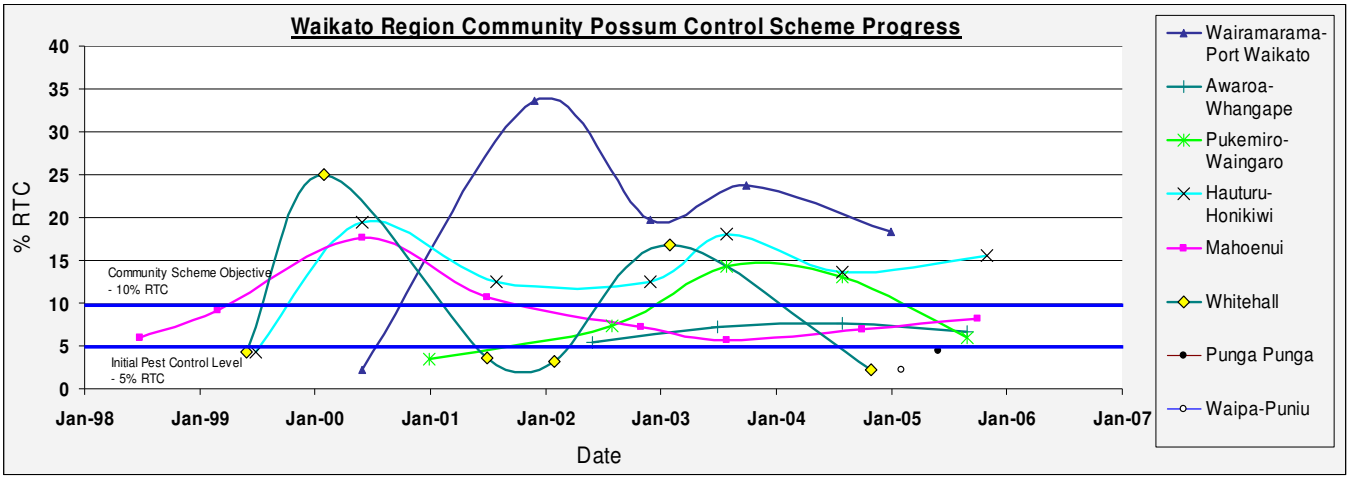

Figure 2. Residual trap catch results from 8 community possum control schemes in the Waikato region, 1998 to 2006.

and maintenance control. Each step requires unique skills to implement and varying levels of interaction with community members. Newsletters are developed to inform communities at critical stages of both planning and implementation.

DISCUSSION

Figure 2 illustrates progress in scheme implementation since 1998, when the first scheme commenced. The graph shows results for 8 of the 12 schemes only, as the other 4 schemes have yet to receive initial control work.

Early self-help schemes had a target of 10% residual trap catch index (RTCI). After effective initial control, landowner maintenance results generally exceeded this goal, even 1 year after initial control. Some schemes have experienced a 'rollercoaster' ride, but by midway through 2005, most RTCI results were trending downwards. The first two rated maintenance schemes returned results below 5% RTCI, as is guaranteed to each community that agrees to be bound by the new format.

Contractor Maintenance versus Landowner Maintenance

All new community groups established are required to have maintenance work carried out by professional contractors through a property rating approach. This policy shift is due to the failures of some schemes to achieve their 10% RTCI performance targets through landowners attempting their own control work.

The earlier landowner maintenance schemes, while providing satisfaction to a number of landowners who liked to control their own possums, often failed to achieve targets due to a few landowners not fulfilling their obligations. A time-consuming enforcement process has been used for non-compliance. However, difficulties can arise when the NPCA monitoring protocol is applied for small properties (under 20 ha) with little or no possum habitat.

Landowners are generally reliant on fewer effective control options. The use of 1080 is restricted and is not available for individual landowners. Therefore, a 10% RTCI target is more realistic, which reduces the overall effectiveness of the scheme. In these earlier schemes, Environment Waikato still funds scheme facilitators to work with landowners to develop control plans and supply bait at reduced cost, but not to do any physical control work. This is expensive for each scheme, and funding would be better utilized employing contractors to do the work directly.

The more recently (post-2003) implemented rated maintenance schemes have professional possum control operators carrying out work. They are on performance-based contracts (generally 5% RTCI or lower), hence results are guaranteed.

Control work is standardized and the whole scheme area is treated in one control operation, rather than spread throughout the year as farmer time permits under the self-help format. This new approach means that no enforcement work is necessary, and the peer pressure needed to be exerted at times on recalcitrant members is redirected to contract management issues and scheme performance, which makes for better neighborhood relations.

Rated maintenance schemes do not result in separate invoicing and debt collection, as payment is received as part of the annual Council rating revenue process. The perception of greater costs being borne by scheme members is valid, and another separate rate on property is not always favorably received. Overall, the quality of the work and the subsequent outcomes outweigh these negative perceptions.

CONCLUSION

Environment Waikato is making tremendous progress on possum control in the Waikato region. The bovine Tb control program has been particularly successful, and the Council is on track to eradicate bovine Tb from the region by 2011. This will be a significant accomplishment. However, there is a risk of being a victim of this success.

Over the last 17 years, millions of possums have been killed in the fight against bovine Tb. A fortunate fringe benefit has been the increase in biodiversity in those targeted areas. However, as the threat of bovine Tb declines, so will government funding to control possums.

The transition from bovine Tb control to an alternative program is underway. Since 2003, approximately 15,000

to 20,000 ha of land per annum (one new large-scale scheme) has been added to the existing program. The process of achieving community buy-in is constantly refined and modified to reflect changing political climates and technological advances.

It is being signaled in long-term Council planning that in the next 10 years, a high degree of integration will occur in possum control. The bovine Tb program will wind back gradually, and community input through possum control schemes will be further encouraged. Biodiversity objectives will become more important, along with achieving better protection of upper river catchment areas, through concurrent and sustained goat and possum control. The role of the Crown, as a significant regional landowner, provides an extra and critical dimension to the future success of the program.

It is feasible that within 20 years the entire region could be under a sustainable possum control program. The current work program is progressing towards achieving this vision. Developing a funding mechanism that incorporates individual and regional economic benefit apportionments will require complete commitment from the Council and the Government to support this regional vision.

While funding is possibly the biggest strategic challenge to achieve the vision, a number of other parameters need to be considered. Research into biological control techniques is well underway, and the Council will utilize these methods as they become available. The continued availability of appropriate toxins, such as 1080, is crucial to the success of this vision. Compound 1080 is currently the only control method that, when applied from the air, provides rapid and effective control over large areas of steep and rugged terrain.

Finally, while collaboration from neighbouring regions and key partners, such as the Department of Conservation, is necessary for success, it is the landowners of the Waikato region who will ultimately decide in which direction the program will proceed, at what pace, and how much they are prepared to pay for possum control.

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