Otago Regional Council

Notice of Meeting:

I hereby give notice that an ordinary meeting of the Otago Regional Council will be held on:

Date:	**Thursday 2 February 2023**
Time:	**9:00 AM**
Venue:	**Council Chamber, Level 2, Philip Laing House** **144 Rattray St, Dunedin**

The meeting will be livestreamed on the **Council's YouTube channel.**

Pim Borren
Interim Chief Executive Officer

Environmental Implementation Committee
PUBLIC AGENDA

MEMBERSHIP

Cr Bryan Scott	*(Co-Chairperson)*
Cr Kate Wilson	*(Co-Chairperson)*
Cr Alexa Forbes	
Cr Gary Kelliher	
Cr Michael Laws	
Cr Kevin Malcolm	
Cr Lloyd McCall	
Cr Tim Mepham	
Cr Andrew Noone	
Cr Gretchen Robertson	
Cr Alan Somerville	
Cr Elliot Weir	

Senior Officer:	Pim Borren (interim Chief Executive)
Governance Support Officer:	Liz Spector

Note: Reports and recommendations contained in this agenda are not to be considered Council policy until adopted.

TABLE OF CONTENTS

1. APOLOGIES

No apologies were received prior to publication of the agenda.

2. PUBLIC FORUM

No requests to speak to the Committee under Public Forum were made prior to publication of the agenda.

3. CONFIRMATION OF AGENDA

Note: Any additions must be approved by resolution with an explanation as to why they cannot be delayed until a future meeting.

4. CONFLICT OF INTEREST

Members are reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have.

5. MATTERS FOR CONSIDERATION

5.1. Rabbit Monitoring

Prepared for:	Environmental Implementation Comm
Report No.	OPS2251
Activity:	Governance Report
Author:	Sarah Irvine, Biosecurity Specialist; Murray Boardman, Performance and Delivery Specialist; Libby Caldwell, Manager Environmental Implementation
Endorsed by:	Gavin Palmer, General Manager Operations
Date:	2 February 2023

PURPOSE

[1] To report the findings of two external reviews of current ORC rabbit monitoring methodologies and tools, and progress with actions arising from those reviews.

EXECUTIVE SUMMARY

[2] The Regional Pest Management Plan 2019-2029 (RPMP) identifies feral rabbits as a pest animal to be managed under a sustained control programme. To implement a sustained control programme, and monitor the efficacy of this programme, ORC currently undertakes night count and day inspection monitoring. Opportunity for improvement to the programme and monitoring methodologies was identified in 2021. In addition, the establishment and facilitation of community rabbit programmes, to address rabbit management in peri-urban and urban areas, requires revision of current monitoring methodologies to be fit for purpose for smaller property areas.

[3] ORC commissioned two external reviews of the current ORC rabbit monitoring methodologies and tools and invited recommendations for improvement and development. These recommendations were synthesised alongside staff feedback and used to develop an action plan for night count and rabbit density monitoring; inspection and night count monitoring analysis; virology and serology; proneness and climate change; networking and engagement; and strategy and management.

[4] Implementation of this action plan is underway.

RECOMMENDATION

That the Environmental Implementation Committee:

1) ***Notes** this report.*
2) ***Endorses** the approach being taken to measure the effectiveness of the ORC sustained control programme for feral rabbits.*

BACKGROUND

[5] Plan Objective 6.4.6 of the *Otago Regional Pest Management Plan 2019-2029* (RPMP) states: *"Over the duration of the Plan, implement sustained control of feral rabbits to*

ensure population levels do not exceed Level 3 on the Modified McLean Scale in order to minimise adverse effects on production and environmental values within the Otago region."

[6] To measure the efficacy of controls, ORC monitors rabbit populations to: (1) Provide population trend data; (2) Establish if a control threshold has been reached and land occupiers comply with the rules of the RPMP.

[7] The current monitoring methods used are night counts, predominantly to provide population trend data, and day inspections (using the Modified McLean Rabbit Infestation Scale (MMS) (Appendix 1) to determine if a property is compliant with the feral rabbit rules in the RPMP.

[8] There is opportunity to improve monitoring methodologies to ensure they are more consistent and credible, and data collected is robust to inform future management efforts and measure efficacy of the control programme.

[9] In 2021, ORC initiated community rabbit programmes to engage property occupiers in peri-urban areas to undertake rabbit management. Current night count monitoring methodologies are not suitable for these areas as night count routes are between 10-20km long with sectors at 1km intervals and are therefore difficult to establish on smaller properties with obstructions, such as buildings. Historically, inspections using MMS have been undertaken on properties >4ha in size and there has been limited investigation into effectively using the MMS on properties <4ha. Therefore, development of new methodologies is required to monitor population trends, compliance, management prioritisation, and community programme efficacy on smaller properties in the peri-urban areas of Otago.

[10] In March 2022 the Implementation Committee requested that staff "*develop a credible methodology to measure effectiveness of the Pest Management Plan with regards to combatting the #1 pest in Otago (rabbits)*"[1].

DISCUSSION

[11] Two reports were commissioned in 2022 to review current ORC rabbit monitoring methodologies and tools and to provide recommendations to further develop the programme and improve monitoring methodologies.

a. *Review of Rabbit Management Initiatives: Addressing the rabbit problem in the Otago region*, Hannah Palmer, Place Group Environmental Planning, June 2022 (Appendix 2)
b. *Monitoring Rabbits in Otago*, John Parkes, Kurahaupo Consulting, August 2022 (Appendix 3).

[12] Recommendations from the reports were compiled and staff workshops were undertaken to synthesise and refine the report recommendations to ensure they were contextually relevant. An action plan was developed based on direction of the report recommendations and staff feedback. Implementation of the action plan is underway and detailed for the remainder of the 2022/23 year (Appendix 4).

[13] The following sections detail the approach and methodology.

[1] Resolution IMP22-102.

Night Count and Rabbit Density Monitoring

[14] Night count routes have been revised to establish more comprehensive regional coverage to monitor population trends across the region and identify priority areas[2]. Thirty-one proposed night count routes have been identified and landowner engagement, surveying, GPS marking, and mapping is scheduled for 2023 (Figure 1). This is an increase in routes from 17 in the 2022/23 financial year.[3] Historic routes, recommended for reinstatement, were assessed. Land use change, restricted access and reduced length resulted in only two of the historic routes still being suitable for night count routes (Kuriheka and Sutton).

[15]

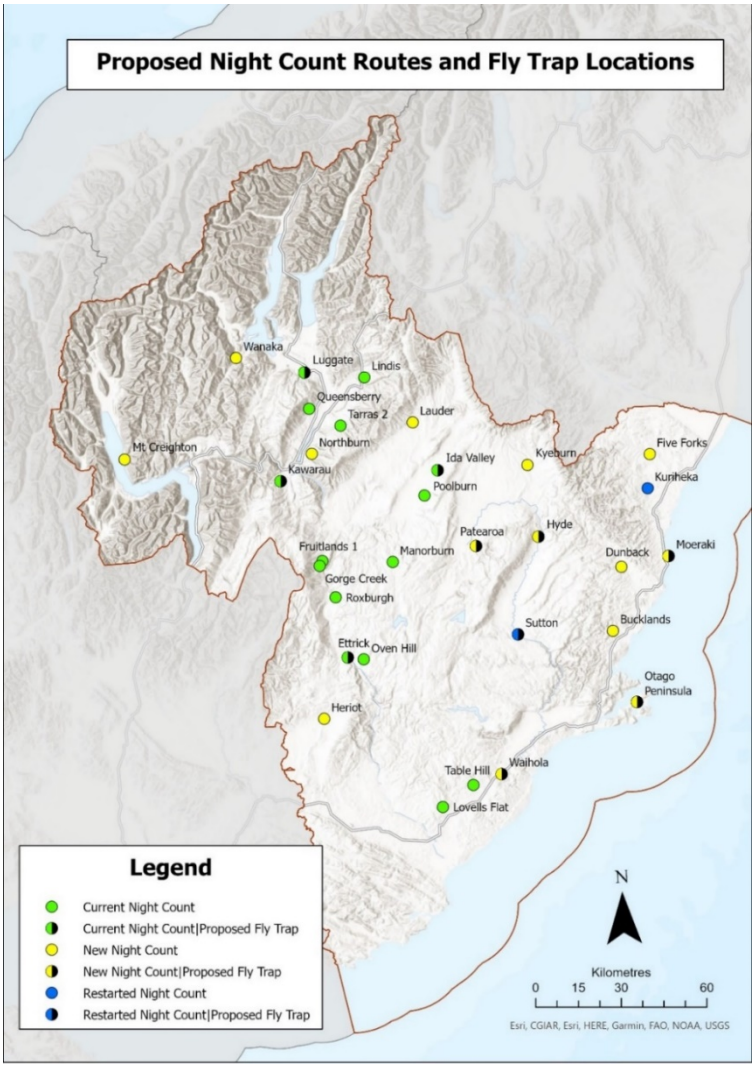


Figure 1: Map showing locations of rabbit night count monitoring routes from 2023 and proposed fly traps

[16] Night counts will be undertaken on all routes by ORC biosecurity staff in July/ August 2023. Revised, consistent procedures and data recording methods will be implemented to ensure that data is robust and fit for purpose.

[2] Names of current routes, and routes proposed for re-establishment, have been revised to ensure all route names reflect the geographic location to maintain landowner privacy.

[3] In reassessing coverage, two current routes will be discontinued from 2023 (Lower Lindis & Clifton)

[17] Inspection Data, using the MMS, will be used to provide evidence of changes to rabbit prevalence and distribution and provide information as to whether the Regional Pest Management Plan Objective 6.4.6, which states '*Over the duration of the Plan, implement sustained control of feral rabbits to ensure population levels do not exceed Level 3 on the Modified McLean Scale in order to minimise adverse effects on production and environmental values within the Otago region*', is being achieved.

[18] Research will continue to explore new methods for assessing rabbit densities on smaller properties (<4 hectares) in peri-urban and urban areas to monitor compliance, population trends, efficacy of the community programmes, support engagement, and inform priority areas for education and advocacy. For example, historically, ORC has used the MMS for formal compliance inspections only on properties >4 ha in size. However, best practice guidelines[4] for implementation of the MMS indicate that there is potential for the MMS to be an effective tool for properties >1ha. The effectiveness of using the MMS for properties between 1-4ha has not yet been trialled as other Councils are generally monitoring properties >4ha. ORC will implement a trial in May 2023 to investigate if use of the MMS on properties 1-4ha is effective, or if an alternative small block assessment tool and amendment to the RPMP rules would be required to address compliance on properties <4ha in peri-urban and urban community programme areas. In addition, ORC will implement a trial in May/June 2023 using thermal imaging systems to record rabbit numbers at photo points. This method will be used to collect data to support ORC in understanding population trends in community programme areas where night count monitoring is not feasible due to smaller property size and obstacles, such as buildings. Specific areas for trial are still to be determined.

Inspection and Night Count Monitoring Data for Analysis

[19] From 2023, annual night count and daytime inspection data will be analysed using statistical and spatial analysis methods to provide information regarding population trends across the region, percentage of properties that have become compliant with the rules of the RPMP and change in average MMS level across the region.

[20] Analysis of night count data 2006-2022 (Appendix 5) shows that rabbit densities are highly variable across Otago, especially with respect to their location. While some locations have definitive trends, other locations show densities that vary year-on-year. Broadly, the locations with increasing numbers are located at the northern end of Lake Dunstan, through Queensberry and Luggate. The locations with decreasing numbers are in South Otago, Ida Valley and the mid Clutha Valley. However, there are pockets where rabbit densities vary from the surrounding area (e.g., Ettrick).

[21] All night count and inspection data recorded from 2023 will be analysed and reported annually and uploaded to the ORC website (Pest Hub).

Virology/Serology

[22] Regular collection of serological[5] (immunity) data will cease. This decision was based on limited availability of required reagents, ineffective cost/benefit analysis, and serological

[4] Pest Rabbits: Monitoring and Control Good Practice Guidelines, National Pest Control Agencies, November 2012

[5] Serology identifies antibodies in blood serum of feral rabbits as an immune response to RHDV.

data being less relevant than virological[6] data used to track Rabbit Haemorrhagic Disease Virus (RHDV). Serological data collection will be reserved to measure rabbit immunity within an area prior to a potential release of any new future biological agent. This decision aligns with the actions of other councils.

[23] It is proposed that Fly trap monitoring, following Manaaki Whenua guidelines, will be implemented during 2023/24 to collect virological data to track RHDV within an area. It is proposed that regular fly trap monitoring routes be established along ten night count routes (Figure 1). These ten routes were selected, corresponding to night count routes, so data can be correlated to better understand the impact of RHDV on feral rabbit populations. In addition, there would be provision for investigation of isolated rabbit density/ population decline events on an as-required basis. PCR (polymerase chain reaction) testing of deceased rabbits can also be undertaken on an as-required basis to identify and inform of impact of RHDV on a population.

Proneness and Climate Change

[24] Changing climate, over the next century, is likely to increase pest species populations, such as feral rabbits, potentially resulting in greater impacts on agricultural production land (Otago Climate Change Risk Assessment, 2021)[7]. It was identified in the reports that impacts of climate change could present a risk to current rabbit management, control methods, and monitoring methods. For example, a reduced timeframe within which to implement control (current control methods are most effective over winter months during which time there is less natural feed available) may have significant operational impacts for land occupiers achieving compliance.

[25] There is provision within the programme for staff to keep current with relevant information and research to inform any potential future changes that may be required to mitigate effects of impacts of climate change on the sustained control programme for feral rabbits.

[26] The feral rabbit proneness mapping requires updating to ensure it is relevant. It is proposed that there is provision for climate change modelling built into revised mapping.

Networking and Engagement

[27] At a national level, networking and engagement has been initiated in communications with other regional/unitary councils, Manaaki Whenua, and Ministry for Primary Industries. Feral rabbits are generally not a high priority nationally, so ORC will be required to continue to lead and maintain this network.

[28] At an international level, networking and engagement has been initiated in communications with organizations in Australia. An information sharing network has been formed between ORC, Agriculture Victoria, and Victoria Rabbit Action Network. There is interest and momentum to increase this network during 2023 by inviting more Australian-based organizations and NZ councils. Ongoing regular meetings have been established.

Strategy and Management

[6] Virology detects RHDV either from feral rabbit tissue samples or from flies carrying the virus when they land on a trap.

[7] *Otago Climate Change Risk Assessment, Main Report*, Prepared for Otago Regional Council, Tonkin & Taylor Ltd, March 2021

[29] Results of monitoring data from both the rural and community rabbit programmes will be used to inform further development and improvement of the sustained control programme for feral rabbits and resourcing requirements.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[30] The programme and action plan are fully aligned to the requirement in the RPMP and measures the efficacy of the RPMP.

Financial Considerations

[31] Operational costs will apply but can be accounted for within the current biosecurity budget.

Significance and Engagement Considerations

[32] Not relevant.

Legislative and Risk Considerations

[33] Improved monitoring is being implemented to fulfil requirements of the Biosecurity Act 1993 and Regional Pest Management Plan.

Climate Change Considerations

[34] Impacts of climate change pose a potential risk to the efficacy of current management efforts. There is provision within the programme and action plan to keep current with relevant information and research to inform potential future changes to the programme. It is proposed that climate change modelling is incorporated into revision of future rabbit proneness mapping.

Communications Considerations

[35] An annual summary of monitoring data will be available publicly via the Pest Hub on the ORC website.

NEXT STEPS

[36] The feral rabbit action plan will be implemented to progress development and improvement of the ORC sustained control programme for feral rabbits and monitor efficacy of the programme.

ATTACHMENTS

1. Appendix 1 Modified Mc Lean Scale [**5.1.1** - 1 page]
2. Appendix 2 Review of Rabbit Management Initiatives Jun 22 [**5.1.2** - 48 pages]
3. Appendix 3 Monitoring Rabbits in Otago Aug 22 [**5.1.3** - 30 pages]
4. Appendix 4 Rabbit Programme Action Plan 2022-2024 [**5.1.4** - 8 pages]
5. Appendix 5 Rabbit Night Counts Analysis 2006 2022 [**5.1.5** - 9 pages]

Modified McLean Scale

The Modified McLean Scale (MMS) is a scale used by councils to determine rabbit levels. It helps with regulation to make sure landowners are managing rabbit numbers to a level set in the Pest Plan. Otago's Pest Plan has set the scale for Otago at a maximum of level 3.

As a rule of thumb, if you see groups of rabbit droppings less than 10 metres apart, there's a problem and you need to take action.

Scale	Rabbit infestation
1	No sign found. No rabbits seen.
2	Very infrequent sign present. Unlikely to see rabbits.
3	Pellet heaps spaced 10m or more apart on average. Odd rabbits seen; sign and some pellet heaps showing up.
4	Pellet heaps spaced between 5m and 10m apart on average. Pockets of rabbits; sign and fresh burrows very noticeable.
5	Pellet heaps spaced 5m or less apart on average. Infestation spreading out from heavy pockets.
6	Sign very frequent with pellet heaps often less than 5m apart over the whole area. Rabbits may be seen over the whole area.
7	Sign very frequent with 2-3 pellet heaps often less than 5m apart over the whole area. Rabbits may be seen in large numbers over the whole area.
8	Sign very frequent with 3 or more pellet heaps often less than 5m apart over the whole area. Rabbits likely to be seen in large numbers over the whole area.

Review of Rabbit Management Initiatives

Addressing the rabbit problem in the Otago region

Image: Otago Regional Council

Manaaki Whenua
Landcare Research

Otago Regional Council

Version: 1.0
Status: Final
Date: 21.07.2022

PLACE GROUP
environmental planning

Hannah Palmer

This report was authored by Hannah Palmer of Place Group Ltd. The following people kindly contributed to this report by agreeing to provide information to the author:

Otago Regional Council - Andrea Howard, Libby Caldwell, Richard Lord, Murray Boardman, Sarah Irvine, Simon Stevenson, Anna Ferguson.

Janine Duckworth - Manaaki Whenua - Landcare Research

A draft of this report was also formally reviewed by a number of other stakeholders who also provided valuable comments. Those reviewers were:

Manaaki Whenua - Landcare Research; Janine Duckworth - Senior Researcher
Otago Regional Council; Andrea Howard, Libby Caldwell, Richard Lord, Murray Boardman, Sarah Irvine, Simon Stevenson, Anna Ferguson.
Place Group Limited; Angus McKenzie - Director

Executive Summary

Otago Regional Council (ORC) biosecurity staff have commissioned this report to explore novel scientific and social science tools that could assist in strengthening rabbit management within the Otago region.

Following a comprehensive review of international rabbit management programmes, tools, research programmes, and recent literature, it was found that there are no novel scientific tools being utilised overseas that have not already been (at least) trialled by ORC. CSIRO in Australia has an active biocontrol research programme for rabbit management, although nothing is ready for immediate implementation.

Despite there being no new control tools available, the review provides several recommendations that could considerably strengthen existing rabbit management. The recommendations have been grouped into national and regional initiatives for easy reference and have been prioritised to assist with planning and implementation:

National level recommendations	Potential lead agency	Priority
Business Case		
Assess support amongst other Regional Councils for developing a National Business Case for Rabbit Management similar to that undertaken for Wallabies. A key component of the business case should be ensuring adequate funding for research to direct effective rabbit control efforts. This could be led by ORC.	ORC with support from other regional councils, MPI, DOC, LINZ and Manaaki Whenua	High
Research & Relationships		
Establish/strengthen the research relationship with Australian counterparts to ensure NZ biosecurity staff keep abreast of latest developments in rabbit management.	Manaaki Whenua	Med
Undertake further research to increase knowledge of the new RHDV2 strain, including its rate of spread and impacts.	Manaaki Whenua	High
Tools		
Explore the update or re-release of a rabbit management smartphone app similar to RabbitScan or Rabbit Tracker. This needs to be coupled with funding to allow sufficient publicity of the app to ensure its uptake.	MPI	Med

Regional recommendations	Lead	Priority
Oversight		
Establish a rabbit management programme within the Council which oversees the implementation of the following recommendations (including BAU).	ORC Biosecurity Team Leader & Manager Environmental Implementation	High
Funding and Resourcing		
Ensure the operational impacts of climate change on rabbit numbers and management are taken into consideration during annual and long term plan funding rounds. A reduced control window due to climate change may have significant operational impacts with scheduled control not able to be completed. To ensure all scheduled control can take place in a shortened time frame, increased investment in more staff, training and equipment (e.g. planes modified for rabbit control) will likely be required	ORC Biosecurity Team Leader	High
Consider establishing a dedicated role within the ORC biosecurity team to solely focus on rabbit management.	ORC Biosecurity Team Leader & Manager Environmental Implementation	Med
Advocacy		
Follow up with Sherman Smith of the Ministry for Primary Industries who is part of the NZRCG, and continue to advocate for the implementation of recommendations from the RHDV1-K5 Importation Lessons Learned paper.	ORC Biosecurity Team Leader	Med
Operations		
Consider adopting aerial strip sowing of 1080 across large areas of uniform terrain as best practice.	ORC Biosecurity Delivery Leads & Performance and Delivery Specialist	High
Develop a regional monitoring and surveillance programme which incorporates serum testing and fly trap monitoring to increase the effectiveness of targeted biocidal RHDV1-K5	ORC Biosecurity Delivery Leads & Performance	High

releases in semi rural and difficult to control local rabbit populations. This will also help inform research into anomalies such as Moeraki.	and Delivery Specialist	
Research		
Assess with Manaaki Whenua the feasibility and potential advantages/disadvantages of re-releasing the 95 MacKenzie Basin strain of RHDV, including the relevant approval process that would need to be followed.	ORC Biosecurity Delivery Leads	Low
Investigate the cause of low level of rabbit population knockdown in Moeraki and potential immunity to RHDV1-K5.	ORC Biosecurity Performance and Delivery Specialist	High
The impact of climate change on control tools, baiting strategies and resourcing for the Otago region, as well as on upcoming rabbit hotspots.	ORC Biosecurity Performance and Delivery Specialist	High
Research new methods for assessing rabbit densities (outside of MMS) in peri-urban and urban areas, and review RPMP rules and operational plan targets in relation to these areas. In the next iteration of the RPMP, inclusion of a rule around rabbit warrens could also be considered.	ORC Biosecurity Delivery Leads	Low
Data		
Update the rabbit proneness heatmap to take into account the effects of climate change in the region and to guide conversations around management decisions.	ORC Biosecurity Performance and Delivery Specialist	High
Policy		
Meet with ORC policy staff who work with the Resource Management Act 1991 (RMA) to: - Ensure that implications of RMA policy on biosecurity are taken into account when providing submissions and feedback on these processes. - Review the recently released draft Waitaki District Plan and formulate a position for submission on this plan. - Get assistance in establishing a regular forum with regional and district RMA planners to raise awareness of biosecurity and discuss challenges	ORC Biosecurity Team Leader ORC Biosecurity Principal Environmental Implementation	Med

and opportunities relating to rabbit management. - Work up a standard set of resource consent conditions in relation to rabbit management that could be applied to subdivision consents, and share these with District Council planners in the region.		
Communication and engagement		
Revise communication and engagement strategies to take account of latest developments in behaviour change research, and as outlined in this report. Also ensure that operational plan targets, the rationale for the RPMP programme, and how well the region is progressing towards rabbit management targets is communicated to and understood by the public. In addition, if adopting strip sowing of aerial 1080 as best practice, communication and engagement strategies should consider addressing reasons for low uptake by landholders and operators.	ORC Biosecurity Community Education Partnership Lead	High

Surveys, interviews and workshops with ORC biosecurity staff have ensured the thorough testing of these recommendations. It is suggested that as a next step, a plan to deliver on the key recommendations of this report, including consideration of budget and resourcing requirements for successful implementation is prepared.

1. Introduction

1.1. Purpose

In response to the ongoing rabbit problem in the Otago region, Otago Regional Council (ORC) is seeking recommendations to better manage feral rabbit populations in both rural and semi-rural areas of the Otago region.

The purpose of this report is to:

- Undertake a review of current scientific and social science tools used in Australia (and other relevant environs) to manage feral rabbit populations; and
- Outline recommendations for further investigation and potential implementation within the Otago region, with a view to widening the range of management methods that may be able to be used.

Note that the terms feral rabbit, wild rabbit and rabbit are used interchangeably throughout this report, but in all instances it is feral/wild rabbits that are the subject of findings and recommendations.

1.2. Scope

In addition to the above, ORC is particularly interested in potential biocontrol options for controlling rabbit populations in rural and semi-rural environments as well as exploring social/behaviour change responses to rabbit management. This review focuses on these options as well as others which are being utilised primarily in Australia.

1.3. Structure of the report

This report provides:

- A brief overview of the rabbit issue in Otago and the impacts rabbits are causing;
- Key findings from the review of literature, surveys and workshops, identifying where rabbit management in the Otago region could be strengthened;
- Recommendations on management initiatives that warrant further investigation;
- Next steps for ORC.

1.4. Methodology

To arrive at the recommendations presented in this report, the following steps were undertaken:

- A review of the following information sources to establish the most recent innovations in the field of rabbit management:

    - recent journal articles on rabbit management techniques and behaviour change programmes, and
    - research programmes led by CSIRO and Manaaki Whenua - Landcare Research.
    - General internet searches to pick up any innovative rabbit management tools that have not been documented in journal articles and/or formal research (see Bibliography).
- ORC biosecurity staff were invited to respond to a survey exploring the current rabbit management programme in the Otago region and any challenges/potential opportunities moving forward. A copy of the survey questions is contained in Appendix A.
- Two virtual workshops were held with key ORC biosecurity staff, and Janine Duckworth of Manaaki Whenua - Landcare Research. These workshops covered the following:
    - **Workshop 1:** Understanding the rabbit problem in Otago, locations of hot spots within the region, potential factors influencing population numbers and what methods/tools have been tried already and to what level of success, helping to inform recommendations for potential new methods.
    - **Workshop 2:** Presentation and testing the findings of the literature review on rabbit management initiatives to inform final recommendations.
- In addition to the above, the RHDV1-K5 importation lessons learned paper produced by Place Group on behalf of the New Zealand Rabbit Coordination Group (NZRCG) following the release of RHDV1-K5 has been reviewed to inform recommendations in relation to improving national resourcing and coordination. Contact was also made with biosecurity staff from Environment Canterbury to discuss key contacts within the NZRCG to help progress initiatives, and input regarding RHDV strains and RHDV monitoring and surveillance protocols was sought from Manaaki Whenua.

This report has also been peer reviewed by Janine Duckworth of Manaaki Whenua who has extensive research experience in biocontrol for rabbits.

2. Overview of the rabbit issue

2.1. A brief timeline of the rabbit problem

ORC have declared European rabbits (*Oryctolagus cuniculus*) as the number one pest in the Otago region. Imported in the 1800s as game, and as a meat and fur source, the European rabbit was one of the earliest mammalian pests to be introduced to New Zealand (Norbury and Duckworth, 2021; Department of Conservation, n.d).

Native to southern Europe and North Africa, European rabbits favour a dryland semi-arid climate, which the Otago region is well suited for. With favourable climatic conditions including grassland habitat at low altitudes, ample sun and low rainfall, and a lack of natural predators, Otago (Central Otago in particular) provides the perfect breeding ground for rabbits (Otago Regional Council, 2022).

The following excerpt from Te Ara[1] briefly outlines the rise of the rabbit population to plague proportions following introduction to New Zealand:

> *"A population of rabbits became established in the coastal sandhills between Invercargill and Riverton in the 1860s. In the early 1870s rabbits from this area began moving up the banks of the nearby rivers onto the inland plains. By 1875 they were established in Central Otago. By the early 1880s rabbits had spread to all parts of Otago and Southland and had begun to invade Canterbury. In the 1890s they overran the Mackenzie Country.*
>
> *In the South Island the first rabbit plague had peaked by 1895. After this, rabbit numbers remained high in the semi-arid region of Central Otago, but dropped markedly in other areas."*

Following importation, initially the establishment of wild rabbit populations was limited by lack of suitable habitat. However, the subsequent increase in pastoral farming over the years assisted spread and growth in numbers (DOC. n.d).

Internet searches have confirmed that Otago's rabbit problem still remains highly topical, with a multitude of news articles expressing landowner frustration at the destruction the pest wreaks across the landscape.

2.2. Impacts of rabbits

Regarded as primarily an agricultural pest, five main impacts can be attributed to rabbit infestation (DOC, n.d.), (ORC, 2022):

- **Competition for pasture** - 7 to 10 rabbits eat as much pasture as 1 ewe, affecting pastoral production, lambing rates, and livestock mortality.
- **Assisted spread of bovine tuberculosis** - rabbits provide a stable food source for mammalian predators carrying bovine tuberculosis.
- **Increased erosion** - burrows and scrapes cause extensive damage on erosion-prone soils, so much so that agricultural land can be rendered useless.
- **Threat to ecological values** - browsing on vulnerable native plant communities has meant that some areas once well covered with tussock, grasses and small shrubs – now have very little vegetation cover leaving them prone to soil erosion from wind and rain and invasion by weeds. Rabbits also provide a year-round food source to mammalian predators which are contributing to the extinction of many New Zealand native birds and animals.
- **Destruction of gardens and planting** - rabbits readily destroy gardens and eat tree seedlings and vegetables.

With the ability to breed from five months of age, a single female rabbit (doe) is able to produce 20-50 offspring in a year, with a litter of four or five kittens every six weeks. This means that if a female rabbit is born in early spring, it can be expected that she will produce young within the same breeding season (DOC, n.d). Such a high reproductive potential sees

[1] Peden, R. (2008) *'Rabbits - The spread of rabbits in New Zealand'*, Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/rabbits/page-1 (accessed 29 April 2022).

rabbit populations commonly increasing eight-to tenfold in one season (Peden, 2008). Does are also capable of adjusting litter sizes to food supply meaning that rabbit populations are capable of rebounding quickly from natural disasters or control pressures (DOC n.d).

3. Key findings - survey, literature review and workshops

The following sections outline the key findings from survey responses, our review of literature and feedback from the workshops. The survey was designed to guide the direction of the literature review by exploring the current rabbit programme, opportunities and challenges for rabbit management. The workshops provided an opportunity to test findings and further explore areas of interest that had been identified with ORC biosecurity staff.

3.1. Survey Responses

Survey participants had differing levels of biosecurity knowledge and understanding of rabbit management

To better understand feral rabbit management in the Otago region, a survey was sent to key biosecurity staff from the ORC Environmental Implementation team. Responses to survey questions highlighted differing views and knowledge/understanding of rabbit management amongst staff - likely due to varying roles/responsibilities within the team and level of experience with biosecurity.

Participants included:

- Manager Environmental Implementation - managerial role
- Team Leader of the Biosecurity Team - managerial role
- Delivery Lead Central Biosecurity - operational/field role
- Delivery Lead Coastal Biosecurity - operational/field role
- Principal Environmental Implementation - strategy role
- Community Education Partnership Lead - education role
- Performance and Deliver Specialist - data analyst role

It is important to note that rabbit management forms part of the wider biosecurity programme at ORC and at present there is no FTE dedicated solely to rabbit management within the council.

Rabbit hotspots

Central Otago and Wanaka have long been strongholds for high rabbit population densities. In recent years, biosecurity staff have identified what appears to be a number of new emerging hotspots outside of these areas. These new areas are primarily coastal and include spots within:

- Coastal Otago - down to just south of Dunedin

- Otago peninsula
- Moeraki
- Catlins
- Millers Flat
- Milton/Waihola
- Waikouaiti (inland, and previous hotspot)
- Shag Valley/Pig Route (near to Macraes, and previous hotspot)

Factors identified (outside of environmental and climatic factors) that could potentially be influencing the upswell in rabbit numbers at these locations include:

- Lack of previous control/management action from both land occupiers and ORC.
- Land use change - many large farms have been subdivided into smaller lifestyle blocks resulting in more landowners to coordinate to undertake rabbit control, an increase in social and economic barriers, and a limitation of control tools due to urbanisation.
- Management efforts being hindered/compromised by neighbouring occupiers/landowners who aren't undertaking control.
- Reluctance/inability to use vertebrate toxic agents (VTAs), or shoot rabbits.
- Community perception issues around safety of VTAs and night shooting that need addressing.
- Cost of control vs the lack of economic value associated with controlling rabbits (particularly in peri-urban areas).
- Lack of awareness in relation to when control should be undertaken and coordination in timing of effort.
- Perception that ORC alone should be managing rabbits.
- Land blocks that have multiple owners or trustees, complicating management/control initiatives.

Rabbit management tools

The following rabbit management tools have been used within the Otago Region. The relative success of each tool/method is dependent on the context in which it is used.

- Fumigation of burrows using Magtoxin
- Vertebrate toxic agents - 1080 and Pindone
- Biocontrol release - RHDV1-K5
- Rabbit stops (like small cattle stops - used at the Pisa Moorings subdivision)
- Rabbit proof fencing
- Ferreting
- Dogging
- Shooting
- Long netting
- Trapping
- Warren ripping
- Hand digging or blocking up burrows
- Rules within the ORC Regional Pest Management Plan

- Advocating for conditions on subdivision consents
- Community engagement

The above list has helped to direct our search of literature for novel rabbit management tools/methods, and to refine with ORC biosecurity staff where refinements to current practices could be made to improve rabbit management within the region.

Use of RPMP rules and RHDV1-K5 in achieving MMS 3

The Regional Pest Management Plan (RPMP) for Otago lists feral rabbits as a sustained control pest. Rules under this programme set the requirement to ensure rabbit populations do not exceed level 3 on the Modified McLean Scale (MMS)[2] and place the responsibility for control with the land occupier. ORC facilitates this programme by inspecting properties, undertaking advocacy and education, and enforcing rabbit control where appropriate. The 2021-2022 Operational Plan, which accompanies the RPMP, sets out ORC's role in more detail with an emphasis on monitoring feral rabbit trends, responding to complaints, and facilitating community-led action.

The RPMP became operative shortly after the first release of RHDV1-K5. Survey results show that the ORC Biosecurity team now believe reliance on the RPMP programme as it stands, coupled with strategic release of RHDV1-K5 is not enough to achieve the objective of maintaining feral rabbits at MMS 3 across the region. This indicates that some level of change, either within or outside of the RPMP, is likely required to achieve this objective.

It was also raised within the survey that additional tools to measure rabbit population densities in urban areas may be required, as the MMS was developed for broad-scale (i.e. rural) areas and is therefore not as well suited to estimating rabbit densities on peri-urban and urban landholdings.

Responsibility for rabbit control

The responsibility for rabbit management in Otago has changed numerous times over the decades from Rabbit Control Boards, to ORC, to land occupier responsibility, and some confusion remains over who is now responsible for control. Whilst community engagement programmes are addressing this confusion, there still appears to be a misconception amongst occupiers of smaller landholdings that ORC is responsible for rabbit control. This also appears to be true for people who have moved into the region and are unaware of the rabbit problem.

Survey results show that ORC biosecurity staff feel that this range of views could potentially be due to targets within the ORC Operational Plan not being effectively communicated or understood, and confusion for the layperson over which pests ORC undertakes direct control of, as this differs on a pest by pest basis in the RPMP. Staff, in their engagement with communities also see instances of people being unaware of RPMP rules and the obligations these place on them.

[2] See Appendix B for the Modified McLean Scale.

Whilst these observations are anecdotal, they highlight that effective communication and dissemination of information is still required on an ongoing basis to support rabbit management within the region.

Community engagement and barriers to effective rabbit management

ORC has considerably increased its efforts in community engagement to assist and educate land occupiers and community groups on rabbit management over the last 3 years. Despite this ramped up effort, there are still disparate community views over what successful rabbit management entails.

Of those communities that have been engaged with, ORC staff have noticed that often groups seek different outcomes in regards to rabbit management. Some desire eradication of rabbits across the region and for work to be undertaken by ORC, and others seek sustained control to MMS level 3 and just need a little support to fulfil their responsibilities under the RPMP. Views often vary depending on people's values and how they are being affected by rabbits. For example a station owner will likely experience a large financial loss if rabbits are left unchecked, whereas rabbits for a lifestyle block owner are more likely to be merely a nuisance. This indicates that the target audience is made up of segments, each of which have different capabilities, opportunities and motivations to undertake rabbit management.

Engagement methods employed by ORC to assist in behaviour change by increasing people's understanding of the issue and ability to undertake control include:

- Information on the ORC website
- Public meetings, drop-in sessions, social media and media releases
- One-on-one meetings between land occupiers and biosecurity staff
- Facilitation of community led programmes
- Letter drops
- Online surveys

Ahikā Consulting were contracted by ORC to provide programme design, stakeholder engagement and project implementation services for community-led pest control (rabbits) initiatives in Otago. Whilst a robust engagement plan was produced, a review of this plan in light of the most up to date international developments in community engagement, has identified opportunities to further strengthen the rollout of this plan by incorporating methods founded in behavioural psychology.

One component of successful engagement is the identification of barriers that prevent people from undertaking pest control. Potential barriers for land occupiers identified by ORC staff include the cost of control/access to control tools and not having the knowledge to plan a successful rabbit management programme for their landholding, or to recognise a growing rabbit problem. Other barriers include individual beliefs on the safety of control methods, and contractor capacity to assist with control operations. These will need to be addressed to effect behavioural change.

In answering the survey questions, ORC staff also identified several other barriers to achieving MMS 3 across the region. These included:

- District planning tools not being utilised to full effect in regards to managing land use change.
- Changes to the monitoring and surveillance programme to make it more robust.
- Inadequate funding for research at a national level to support direct control efforts.
- The inability for landholders to work together collectively to resolve a pest issue in an area made up of multiple landholdings.

3.2. Review of current scientific and social science tools for rabbit management

Survey results helped to refine the literature review by directing our search towards determining any novel control methods not yet tried by ORC, exploring tools being used overseas to implement behaviour change programmes specific to pest management, and identifying future research needs to strengthen rabbit management in the region. The following outlines our key findings of the literature review as well as discussion on these findings explored through the workshops where relevant.

3.2.1. Research and control tools

In reviewing literature on rabbit control tools, it was found that there are no novel methods being utilised overseas that have not already been (at least) trialled by ORC. Lots of research into potential new biocontrol tools is being undertaken, however nothing is ready for immediate implementation. Australian researchers are the most active in this area with the CSIRO biocontrol research programme encompassing:

- Understanding the fundamental biology of rabbit caliciviruses, how viral proteins interact with cellular proteins, and how host cells respond to infection (Urakova et al, 2017).
- Diagnostics and surveillance of rabbit caliciviruses and myxoma virus in Australia, understanding which viruses are active, when and where in Australia and how they interact with each other (Hall et al, 2018).
- Investigation of how different caliciviruses in Australia can be applied in a more strategic manner to maximise the outcome of rabbit biocontrol operations and further reduce rabbit impacts to agriculture and the environment (CSIRO, n.d.).
- Understanding the evolution of rabbit caliciviruses through time (Mahar et al, 2021).
- Understanding how RHDV2 infection differs from RHDV1 infection and looking at disease progression and welfare impacts (Hall et al, 2021).
- Development of a platform technology to accelerate and direct the natural evolution of RHDV. This is being done through the investigation of rabbit organoid systems (3D cell culture systems that mimic miniature organs) for growing and studying rabbit caliciviruses in vivo. The ultimate goal of this project is to be able to repeatedly select

tailored virus strains for subsequent virus releases, giving the virus the cutting edge to stay ahead in the co-evolutionary arms race with its host (Kardia et al, 2021).

- Pathogen profiling by metatranscriptomic sequencing to identify any potential new pathogens that could be explored in the context of wild rabbit management. This study did not elicit any new pathogens, however it did provide a validated approach to explore future mortality events of lagomorphs that may identify candidate novel biocontrols (Jenckel et al, 2022).
- Investigation of blowflies as a suitable surveillance method for rabbit (and potentially other livestock and human) viruses (Hall et al, 2019).

Whilst there are no new rabbit control tools on the immediate horizon, our review of literature did reveal new developments in the way some existing control tools can be applied.

A paper by Latham et al (2016) recommends refinement of sowing methods for aerial 1080 to control rabbits on agricultural land by using strip-sowing techniques instead of broadcast sowing. Whilst strip sewing is not new and has been in practice for many years, previously variable and often wider spacing has been used between strips (e.g. 150m) and this has resulted in variable efficacy (Duckworth, J., pers comm, 13 July 2022). The Latham et al paper clarifies the effective baited swath width for fixed-wing aircraft (24m - 12m either side of flight line) and helicopters (13m) to ensure access to baits by a high proportion of rabbits, and also recommends a reduction in sowing rates to 10-15kg/ha (down from 20-35kg/ha under broadcast sowing) (Latham et al, 2016).

This method does not result in any loss of efficacy over large areas of uniform terrain and could also result in potential medium-high cost savings over a 20 year farm management plan due to a reduction in sowing rates (10kg - 15kg vs 20 - 35kg per hectare) (Latham et al, 2016). Latham et al do note however that caution in applying strip-sowing control is recommended in areas where it may be difficult to align strips sufficiently to ensure all rabbits are able to encounter sufficient bait (i.e. to ensure that there are no gaps between baited areas of more than ~50 m) (Latham et al, 2016). This might be of particular concern in areas that are comparatively small (<100 ha), irregularly shaped, and/or where the terrain is broken and rugged (Latham et al, 2016).

The ongoing availability of 1080 for pest control is important because, in the post-RHD environment in New Zealand where population resistance to the disease is high, there are currently few other high-efficacy broad-scale tools for reducing high density rabbit populations (Latham et al, 2016). This new operational practice responds to the 2011 review of 1080 use in NZ by the Parliamentary Commissioner for the Environment which called for optimising the use of 1080 to minimise potential risks associated with the toxin (Parliamentary Commissioner for the Environment, 2011). Increased cost savings, and a reduction in sowing rates is likely to make the use of 1080 more socially acceptable (Latham et al, 2016).

However despite the above, the rate of adoption of the strip-sowing technique has been low. Potential barriers appear to be that operators are unwilling to change from what they know and are concerned that landowners may try to cut corners and not follow the recommended amounts and bait strip spacings (Duckworth, J., pers comm, 13 July 2022). It is

recommended that these barriers are addressed as part of any behaviour change programme.

3.2.2. Climate change

With climate change trending towards warmer winter periods, food availability for mammalian pests is becoming less scarce due to longer growing seasons. When food is not limited, susceptibility to anthropogenic control methods is reduced (Latham et al, 2015).

The optimal time to poison rabbits is outside of their main breeding season (which occurs in spring through to early summer) (Latham et al, 2015). In temperate regions, food availability is typically limited by low winter temperatures, and rabbit populations during this time are at their lowest. Consumption of baits during winter is high, achieving high kill rates (Latham et al, 2015). As winters warm and rainfall increases, if higher temperatures do not cause a moisture deficit grass continues to grow, resulting in increased food availability and a population of rabbits that are less likely to consume poison baits (Latham et al, 2015). The optimal control period therefore becomes restricted resulting in poor kill rates, and continued environmental and economic impacts as rabbit populations quickly rebound (Latham et al, 2015).

A reduced control window due to climate change may have significant operational impacts with scheduled control not able to be completed. To ensure all scheduled control can take place in a shortened time frame, increased investment in more staff, training and equipment (e.g. planes modified for rabbit control) will likely be required (Latham et al, 2015).

3.2.3. RHDV1-K5

Biocontrol agent RHDV1-K5 was released in 2018 and thought to be a potentially significant biological control tool for pest rabbits in New Zealand (Manaaki Whenua, n.d.). Following its release it was expected there would be improved knockdown in those areas where the current strain of RHDV is less effective. However, whilst initial knockdowns in rabbit populations did occur, subsequent knockdowns have not. This outcome has likely been due to a number of reasons and research is ongoing to determine a definitive cause.

Current unpublished research has shown that there are a number of strains of RHDV circulating in New Zealand rabbit populations including RHDV1-Czech, RHDV2 and the benign RCV-NZ1 (Duckworth, J., pers comm, 1 June 2022). This means that those rabbits that have had prior exposure to these virus strains and have survived, now have antibodies protective against RHDV and are immune to subsequent RHDV infections.

RHDV2 kills off young rabbits, but may be killing all ages of naive rabbits at a lower rate meaning that a bigger proportion of the population becomes immune to RHDV2 and survives to breed. Further research to increase knowledge of the new RHDV2 strain, including its rate of spread and impacts is needed (Duckworth, J., pers comm, 1 June 2022). One thing that is known is that the RHDV2 strain in New Zealand is not the same as the RHDV2 circulating in Australia.

Rabbits acquire immunity due to (Norbury and Duckworth, 2021):

- Exposure to RHDV1-Czech at a young age (rabbits <8-9 weeks survive exposure)
- Maternal antibodies in utero or via lactation (protect up to ~8-10 weeks)
- Surviving infection with normally lethal dose (<1-5%)
- Cross-protection from antibodies following infection with benign, non-pathogenic rabbit calicivirus (eg. RCV–NZ1)
- Genetic changes in the virus or the rabbit

In addition to the above, there is anecdotal evidence that the benign RCV-NZ1 strain may have affected the efficacy of RHDV1-K5 (Duckworth, J., pers comm, 1 June 2022). Initially it was thought that RCV-NZ1 would act in a similar manner to the Australian version of the benign calicivirus (RCV-A1) and therefore RHDV1-K5 would be more effective than the RHDV1-Czech strain. However when rabbits were challenged with RHDV1-K5 and RHDV1 Czech strains, the following results were recorded:

	Percentage of rabbits surviving RHDV challenge	
	RHDV1 K5	RHDV1 Czech
Naïve Rabbits	0% (0 of 7)	0% (0 of 7)
Prior exposure to benign RCV-NZ	100% (7 of 7)	57% (4 of 7)
Australian Trial Results: Prior exposure to benign RCV-A1	25%	50%

The New Zealand benign RCV strain (RCV-NZ1) provided partial cross-protection against RHDV1 Czech and, unexpectedly, was completely protective against RHDV1 K5. This may explain why RHDV1 K5 failed to compete against RHDV1 Czech and did not persist, leaving RHDV2, and RHDV1 Czech as the lethal strains circulating in wild rabbit populations. RCV-A1 is not present in New Zealand (Duckworth, J., pers comm, 1 June 2022). This challenge study was undertaken on a small scale, and further monitoring is needed to verify results, however it provides an insight as to why RHDV1-K5 may not be working as expected, and can help guide management decisions about the future application of RHDV1-K5 as a biocide.

The success of RHDV-based rabbit biocontrol depends on a number of factors including:

- Population density and season
- Susceptibility due to age
- Immunity due to prior exposure to lethal rabbit calicivirus strains (RHDV1 Czech/K5 or the new RHDV2 strain)
- Partial immunity due to benign rabbit calicivirus (RCV-NZ1)

To help increase the effectiveness of targeted RHDV1-K5 releases, development of a regional monitoring and surveillance programme incorporating serum testing and fly trap

monitoring was discussed with workshop participants. Sampling of carrion flies through fly trap monitoring provides an effective surveillance field tool for monitoring lagovirus spread and circulation at a landscape scale, which in turn can help to guide more effective rabbit management programs (Hall et al, 2019). Manaaki Whenua can undertake multiplex assays to detect various RHDV strains in the liver of dead rabbits and circulating in carrion flies and provide information on which RHDV viruses are present or absent in an area. Once this information is known, serum testing of rabbits for RHDV antibodies can further inform a potential response by helping determine the proportion of rabbits susceptible to a RHDV biocide operation or a natural outbreak e.g. the proportion of naive rabbits.[3] It is possible that RHDV1-K5 could be introduced at key times in populations where immunity to RHDV is low, to strategically suppress rabbit populations.

It was noted in the workshops that Moeraki and some peri-urban areas have experienced low levels of kills despite baits laced with RHDV1-K5 being eaten. Moeraki has never had a fly trap monitoring network (Stevenson, S., pers comm. 20th May 2022). Serum testing for antibodies and fly trap monitoring could help inform research in these areas to determine the potential cause of this anomaly. Running multiplex assays is expensive with four samples costing approximately $1200, however if monitoring on a regular basis with a larger throughput of samples, there is potential to automate some of the process which would assist with bringing costs down. At present, Manaaki Whenua are equipped to run 8-10 samples at a time (Duckworth, J., pers comm, 1 June 2022).

95 MacKenzie Basin Strain of RHDV

Research undertaken in 2012 to determine lethality of RHDV strains, showed that the '95 MacKenzie Basin' strain of RHDV was the most lethal strain in New Zealand (at that point in time). This strain killed 100% in an average time to death of 39.9 hours. The aim of the research was to find a strain that killed "quickly and humanely" (Price, 2015). While more than 24 wild strains of RHDV1 Czech had been detected by Manaaki Whenua, only nine were tested because of resource limitations (Price, 2015).

The MacKenzie Basin strain could be locally released again, however approval from the Environmental Protection Authority may be required, and this is something that would need to be investigated (Duckworth, J. pers comm, 1 June 2022).

[3] AgResearch is currently the only organisation running RHDV antibody assays as a commercial service. This service is currently on hold as AgResearch has run out of reagents. Importation of test kits has not been possible for the last 2 years due to a lack of international flights to bring frozen freight on dry ice from Italy to New Zealand. International freight may soon be possible, but freight costs have skyrocketed to ~$6000 per shipment. This is a problem worldwide. As the reagent kits expire after a couple of years, it would be extremely useful for AgResearch to have a reliable estimate of the number of samples the councils wish to have tested each year to determine if there is sufficient demand for testing so that the service would be cost effective. To date, AgResearch testing has used RHDV1 antibody kits which may cross-react and also detect RHDV2 antibodies. This would have to be confirmed. There are also now specific RHDV2 antibody reagents available from the Italian manufacturer. Manaaki Whenua Landcare Research's most recent results indicate that RHDV1 Czech and RHDV2 seem to be the main strains circulating (Duckworth, J. Pers Comm, 21 June 2022).

3.2.4. Monitoring and surveillance for RHDV strains - digital tools

The review also revealed a variety of tools such as the app RabbitScan - a free resource for landholders, landcare groups, community groups, local councils, professional pest controllers and biosecurity groups (FeralScan, n.d.) to assist with citizen science in Australia.

The app helps users to:

- Develop a property or local area map of rabbit activity to guide control efforts.
- Work together with neighbours to undertake coordinated control.
- Notify local community or landholder groups about rabbit activity and disease presence.
- Send alerts to nominated people, such as neighbours or biosecurity authorities

The app which is part of the Australian FeralScan programme supported by Centre for Invasive Species Solutions, Australian Wool Innovation Ltd, NSW Department of Primary Industries, FeralScan and PestSmart, also helps communities track the spread of RHDV1-K5 by:

- Prompting users to record details of dead rabbits including uploading images of rabbits affected by virus and disease for easy ID.
- People can also submit tissue samples from dead rabbits with suspected RHDV. Users click a sample button and are sent a free postage-paid sampling kit with full instructions for sampling and sending. Once samples are confirmed a digital map is updated, and the person who sent the sample is notified with accurate information of what virus is affecting rabbits in their area or control site, which is valuable information for management planning.

RabbitScan was looked into some time ago for potential rollout within New Zealand, however the cost for the app at the time was estimated at approximately $3 million, and didn't receive sufficient buy-in. A New Zealand version of the app called Rabbit Tracker was created, and was used at the time of the RHDV1 K5 release. However it had relatively limited functionality and didn't take off due to insufficient funding for publicity and lack of training resources like those developed for Australian land managers (Duckworth, J., pers comm, 1 June 2022).

The use of GIS to produce heatmaps identifying rabbit prone land within the region was also discussed in the workshops. Murray Boardman noted that the current heatmap for Otago was done some time ago and requires updating, particularly to take account of the potential impacts of climate change and land use changes (irrigation, vineyards and subdivision). Manaaki Whenua could assist ORC with this project as they have the GIS layers available, but would need data from ORC on rabbit densities on different land types (Duckworth, J. pers comm, 1 June 2022). Once the heatmap is updated, it could be used as part of the monitoring and surveillance programme informing conversations and management decisions around potential hotspots, district planning levers, and the next iteration of the RPMP.

3.2.5. District plan levers for rabbit management

Several levers exist within the District Planning under the Resource Management Act 1991 (RMA) which may complement regional rabbit management efforts under the Biosecurity Act 1993 (BSA). Survey responses highlighted that ORC has previously tried to advocate (unsuccessfully) for consent conditions to be placed on a large subdivision consents in Wanaka to curb increases in the rabbit population that inevitably follow the urbanisation of pastoral land.

Other options beyond requesting specific consent conditions that could be explored under the RMA to support rabbit management include:

- Developing a set of consistent rules that could be inserted into District Plans through the plan review or private plan change process. Zoning could also be explored based on identification of rabbit prone land and appropriate land uses.
- Establishment of a regular biosecurity forum with District Planners (and ORC policy planners) to discuss challenges and opportunities for biosecurity and how different land uses impact on biosecurity objectives. This may also increase information sharing regarding opportunities to participate in impending District Plan reviews that the ORC Biosecurity Team may not otherwise be aware of.

District Plans are legally required to undergo a review every 10 years. The table below highlights which plans within the region are coming up for review:

District Council	**District plan due for review?**
Queenstown-Lakes	Has gone through review process, part way through appeals
Central Otago	Operative in 2008, overdue for review
Clutha	Operative in 1998, overdue for review
Dunedin City	Has gone through review process, part way through appeals
Waitaki	In the process of review, notification of informal draft **1 June 2022**

The Waitaki District Plan is currently in the process of being reviewed, and this represents an opportunity for ORC Policy and Biosecurity staff to be involved. If ORC wishes to request changes to the other district plans outside of their respective review cycles, private plan changes would need to be initiated, and costs borne by ORC rather than the district councils.

Hines et al (2019) also note that amending legislation to promote desired behaviours and prohibit undesired behaviours, and working towards achieving legislative consistency across all areas that influence the performance of the desired behaviour is an important component of pest management.

3.2.6. Behaviour change programmes - engagement tools

Workshops with ORC biosecurity staff highlighted that there are still some perception issues within communities regarding rabbit management that require addressing. The council is receiving political pressure from the non-rural sector to manage the rabbit problem, and barriers to participating in rabbit management remain for some segments of the target audience. Occasionally ORC also has to deal with misinformation regarding rabbit issues and/or control.

Our review of literature revealed that there are several ways to help strengthen communication and engagement programmes to overcome these issues, based on techniques used in behavioural psychology. Most of the information, strategies and tools provided below are drawn from Australian resources and can be used to inform engagement strategies moving forward.

It is important to keep in mind that when implementing behaviour change programmes, placing top down pressure on communities to take action should be avoided unless supporting resources to enable and empower communities to carry out the desired action are provided. Doing so risks feelings of antagonism and can have negative implications for community/government relationships (Howard et al, 2016).

Behaviour selection framework

With limited budget and resources, it is important to ensure that energy invested into engagement is going to have the desired end result. Most behaviour change interventions fall down by trying to change the wrong behaviours or too many behaviours at once (Hines et al, 2019). Keeping communication goals clear, specific and framed as concrete behavioural outcomes will help shape interventions and provide a base for programme evaluation (Hines et al, 2019). An example of a communication goal could be to "Increase the number of rural landholders undertaking rabbit control in Central Otago by 2024". Once the goal has been identified, working out where to focus effort and funding to effect the most change is an important next step. McKenzie-Mohr (2011) provides a useful tool called the 'behaviour selection framework' which can help with this prioritisation process.

The behaviour selection framework requires different behaviours to be rated based on the **impact** of the behaviour on tangible ecological, economic, social and public health outcomes, the **probability of adoption**, and the proportion of the target population currently engaged in the behaviour **(penetration)**. This information is then used to calculate the projected effectiveness of each behaviour by multiplying: *impact x adoption probability x (1 - penetration)* (Hines et al, 2019).

A general rule of thumb is to design engagement interventions that target high impact behaviours that have a reasonably high probability of being adopted, and are not already being undertaken by most of the target audience (Hines et al, 2015).

Target audience segmentation

The threat of pests to the environment, biodiversity and people's livelihoods is often well publicised and well known by target audiences. However, despite this, it remains difficult to get 100% land occupier participation in pest control activities recommended by experts (Mcleod et al, 2019). A recent case study which surveyed 731 rural landholders in rural western Australia and their participation in control activities to manage invasive mammals, found that over half of the respondents had not participated in any activities over the previous 12 months (McLeod et al, 2019). The study found a range of reasons for non-participation and highlighted that within the target audience existed six subgroups, each with distinctive psycho-graphic profiles:

- *Unaware, unskilled and unmotivated*
- *Aware but unskilled and doubtful*
- *Unskilled and time poor*
- *Disinterested*
- *Skilled but dismissive*
- *Capable but unmotivated*

These results, obtained using latent profile analysis, demonstrate that engagement specialists should not treat non-participating landholders as a single homogeneous group (McLeod et al, 2019). Non-participators differ considerably in terms of their capabilities, opportunities, and motivations, and require targeted engagement strategies informed by these differences (McLeod, 2019). The key reason for undertaking target audience segmentation is to help better allocate available resources, focus strategies and messages and increase the likelihood of influencing permanent behaviour change (Slater, 2006), thereby increasing the success of rabbit management.

It is important to acknowledge that trying to change human behaviour is a complex process, and learning which engagement methods work best for different audience segments will be iterative (McLeod et al, 2019). There are several good starting points for understanding attributes which can be used for undertaking audience segmentation, including the COM–B method (Michie et al, 2014), and segmentation based on stages of change - or the *'Transtheoretical Model'* (Prochaska et al, 1992) (as cited in McLeod et al, 2019).

The COM-B method is founded on understanding the causes that lead landholders to engaging in desirable behaviours (drivers), in this case pest management, or those that prevent them engaging in the activity (barriers) (Hine et al, 2019). Drivers and barriers can be grouped into three main types:

"Capability - Do landholders have the relevant knowledge, skills and physical capacity to engage in the target behaviour? Do they know the best management strategies? Are they physically able to hunt, trap and bait?

Opportunity - Are situational conditions present to support the behaviour? Are relevant laws and other support structures in place? Are appropriate control technologies such as baits, ejectors and viruses readily available?

Motivation - Are landholders sufficiently motivated to take action? Are they aware a problem with invasive animals exists in their region? Do they possess the right combination of values, attitudes and beliefs to inspire action?" (Hine et al, 2019, p. 12).

The Transtheoretical Model of behaviour change recognises that change is gradual, and as people change their behaviour they progress through five distinct stages (Hines et al, 2019, pg. 13):

1. *Pre-contemplation – where they are not considering change.*
2. *Contemplation – where they are beginning to think about change.*
3. *Preparation – where they make a personal or public commitment to change in the near future.*
4. *Action – where they are actually changing their behaviour.*
5. *Maintenance – where they are maintaining the changed behaviour.*

Each stage requires a different goal, and therefore different intervention strategies. Hines et al, (2019) provide a good overview of intervention/engagement strategies for people at different stages of the Transtheoretical Model, or those with different drivers and barriers to engaging in the target behaviour. The table below has been adapted from Hines et al (2019) providing examples of engagement goals for people at each of the five stages.

Stage	**Engagement goals**
1. Pre-contemplation (Not ready)	Engage interest in rabbit issue and increase awareness and knowledge of problem.
2. Contemplation (Getting ready)	Requires further motivation to engage in behaviour. Could be achieved by highlighting pros and cons, or giving feedback from community members already responding to rabbit issue.
3. Preparation (Ready)	Focus on increasing confidence and self efficacy. Use engagement strategies that reinforce beliefs that change is possible, and that enhance knowledge and skills related to rabbit management.
4. Action (Making change)	Provide real-time support and advice, consider mentorships, training days, community champions.
5. Maintenance (Keeping up change)	Provide feedback on progress, acknowledgement of achievements, constructive advice for continuous improvements. Get commitment from landholders to engage in a specified behaviour. Commitments work best when they are voluntary, written down, publicised (with permission), and followed up to see if any further assistance can be provided. A good resource can be found here:

	https://www.toolsofchange.com/en/tools-of-change/obtaining-a-commitment/ Follow up with reminders and prompts to ensure timely performance of desired behaviours. These should be specific e.g. push notifications stating 'remember to lay pindone in paddock 6 tomorrow'. A good resource can be found here: https://www.toolsofchange.com/en/tools-of-change/prompts/

Undertaking quantitative target audience segmentation involves statistical analysis, however there are options for using qualitative approaches (depending on project goals) that may be more cost effective. Slater (2006) in their paper on health audience segmentation, describes how to undertake segmentation on a shoestring budget. They note that a well designed survey, gleaning information from published literature on the issue, speaking with key people who are active within the community to gain personal insight into drivers and barriers for different groups, and listening to target audiences are easy ways to undertake effective segmentation at low cost (Slater, 2006).

There is no one correct way to undertake audience segmentation, and the approach will depend on available expertise, goals, financial resources and time constraints (Hines et al, 2019), however the benefits of doing so will always outweigh the costs (Slater, 2006).

Delivering key messages

When disseminating information as part of an engagement programme, it is important to consider how messages will be framed for maximum impact, who is best to deliver the messages so they don't fall flat, and what communication tools to use and when in the process to use them to encourage the behaviour you want to see. Each of these factors is briefly discussed below, with further detail contained in Hines et al (2015).

Communication tools	Key points
Framing messages	Message framing involves presenting an issue in a way that achieves a desired interpretation and results in the message being noticed, processed and acted upon. Before selecting a frame it is important to know your audience so you can choose a frame that matches audience values and concerns. • Different frames might be needed for different target audience segments. • The most relevant frames to pest animal management are: ○ Consequence frames

	■ Highlighting consequences of not taking action - match these to values e.g. financial loss, potential impacts on mental health, environmental loss. The converse can also be used. ○ Locally relevant frames ■ Frame as a local issue happening within the community to increase the audience's sense of connection to the issue. ○ Now vs future frames ■ Present the problem as 'happening now' and highlight short term consequences of inaction to overcome the psychological phenomenon of 'temporal discounting'. ○ Fear appeals ■ Fear can be an important driver of behaviour change. Strong fear appeals lead to greatest behavioural change when coupled with concrete advice about how to avoid, reduce or eliminate the threat. ■ If fear appeal is not coupled with tangible things people can do to address the issue, risk creating defensive responses such as denial and disengagement - two outcomes best avoided.
Choosing messengers wisely	Audience trust is integral to getting people to take messages on board. In the absence of trust, key messages relating to pest management will be dismissed or ignored. Choosing the right messenger is one way to foster trust. Apply the following key principles in selecting messengers: ● Make sure the messenger is 'likeable', people are put off by messages delivered in an arrogant, cocky or indifferent manner. ● Choose someone who can easily communicate complicated technical information in terms familiar to the layperson. ● Select someone who is similar in demographic to the target audience and who shares similar behavioural characteristics. Avoid messengers who might be perceived as outsiders. ● Choose messengers who are engaged, have a concern for managing wild rabbits and are genuinely committed to solving the problem.

	• Messengers should display honesty and integrity - avoid telling audiences what they want to hear, acknowledge complexity and uncertainty and avoid over-promising. This builds trust. • Different messengers may be required for different audience segments.
Using intrinsic and extrinsic values in communication through deep framing	There are two competing types of values relevant to social and environmental issues - 'intrinsic values' and 'extrinsic values'. • Intrinsic values focus on care and cooperation for the greater good. • Extrinsic values focus on activities and outcomes related to power and achievement. • Deep framing involves developing messages that operate at the level of values, priming values we want to promote. • Draw audience attention to intrinsic values. Emphasise themes like community, cooperation and helping in key messages. Avoid priming extrinsic values. • Avoid mention of extrinsic values related to wealth, personal status and self-interest. In conversation, reframe responses to promote intrinsic values and ignore others.
Using descriptive and injunctive social norms to encourage desirable behaviours	Social norms influence behaviour based on how others behave. They help people determine what is normal, expected or correct. Descriptive norms describe how others behave. Injunctive norms describe what others *should* be doing. • Most people follow the crowd. Use descriptive norms to encourage others to follow suit. E.g. If you want more landholders to bait at a certain time, suggest that most farmers in the area are baiting at this time. • Only use descriptive norms if most people are actually carrying out the desired behaviour, as if not - seeing that most others are not acting creates normative pressure towards inaction. • Use injunctive norms to emphasise what is valued. E.g. praising a landholder for their efforts in rabbit management in a local community newsletter is a good example of an injunctive norm. A case study demonstrating the use of social norms to improve rabbit management is outlined below: *"The Granite Creeks Project group in Victoria has used several methods to gently apply peer pressure and establish new social norms to improve rabbit management. A degree of peer pressure*

	has been used to drive the message, *"rabbit management is a community issue and it needs to be dealt with at a community level".* *Associated with this message is a new norm that government officers work with community and, vice versa, community actively engage with government officers. 'Relationship' is now a central factor for obtaining effective rabbit management.* *A new norm has also developed in the community that people deserve to be fined if they don't engage with their community in rabbit management. This pressures those who don't comply to lift their game or suffer the consequences of production and biodiversity loss, and potential litigation."*
Engaging audiences using narratives	Narratives can be an effective way of reframing scientific knowledge in a way that draws an audience in by tapping into their values and beliefs. The narrative approach allows communicators to unleash their creative instincts and emotionally engage their audiences through compelling characters and storylines. Stories that match personal values and pre-existing beliefs often resonate with people. Recent neuroscience indicates that people's brains react similarly when reading about an experience and actually living the experience (Mar, 2011). This suggests that stories can engage audiences in a fundamentally deeper way than standard scientific writing. ● Ensure narratives are presented in story format with a beginning, middle and end. ● Match storylines to audience values (see target audience segmentation). ● Use a single metaphor to emphasise a point and keep things simple. ● Do not use extended metaphors. ● Metaphors are most effective when used early in the engagement process as this affords the opportunity to shape subsequent engagement. ● Use familiar language.
Encouraging rational thinking	There are two types of systems thinking when it comes to decision-making, system 1 - which is automatic and subconscious, often based on gut feel; and system 2 which is

	rational, analytic, slow, largely free of emotion and logical. Situational factors can prompt people towards system 1 or 2 types of thinking. Understanding how these systems work and how they influence decision-making is critical to crafting persuasive messaging. ● System 1 thinking is often employed when audiences are uninterested or distracted. Here, people use cognitive shortcuts to make decisions and often base these on how much they like the person delivering the message, whether they're perceived as credible, what others think of the message, and how the message makes them feel. ● Wherever possible encourage system 2 thinking through strong, credible and reasoned arguments for change. System 2 thinking promotes long term behaviour change. ● Understanding audience motivation, and selecting message frames which resonate with the target audience will also assist with system 2 thinking. ● Avoid solely relying on system 1 strategies (e.g. emotionally engaging messaging that is intellectually empty). System 1 strategies such as choosing likeable messengers and eliciting positive emotions are recommended, however these should be incorporated with system 2 strategies which encourage longer term behaviour change.
Debunking myths and misinformation	In pest management, deeply entrenched (and often misguided) views are sometimes encountered. Accurate information is required to debunk myths and misinformation, and it is important to understand how people process new information, how existing knowledge is modified, and how current worldviews and beliefs can undermine rational, clear thinking. Below are some key pointers for ensuring that the right information gets through to target audiences: ● Do not repeat myths in messaging. When myths are repeated they become more familiar and are more likely to be believed. It is recommended to avoid the myth entirely. If this cannot be done, only acknowledge the myth after the correct information has been provided. ● If directly acknowledging a myth, be very clear about why the information is incorrect. ● In debunking myths, keep messaging concise, engaging and easy to understand. Less is more. Use images

	liberally to emphasise core facts and arguments. • Beware of pre-existing worldviews and confirmation bias. People often seek out information that aligns with their worldview, and spend significant time composing counter arguments. For those who hold deeply entrenched views, it may be impossible to change their mind. Effort (and money) may be better spent focussing on engaging target audience segments that are undecided or hold moderate views. This again highlights the importance of target audience segmentation. • If deeply entrenched groups must be engaged, select message frames that match with their pre-existing world views and beliefs.

Getting information into the community - how are others doing it?

Several methods for distributing information have been mentioned in this review. However, below is a brief list of key ways biosecurity teams in Australia are getting information out to target audiences, and coordinating community led rabbit management. It should be noted that methods need to be matched to engagement interventions and target audience segments as part of an engagement programme.

Method	**Further information**
Technology • Push notifications • Smartphone Apps • Videos/YouTube clips • Website • E-mail • Phone • Online management toolkit • Social media • Virtual Extension Officer	Short video clips can be an effective way to demonstrate how to bait or undertake other control methods. Smartphone apps can help with mapping rabbit densities, damage, and track knockdowns - an important citizen science tool. Online management toolkits are a way to provide all information in one place, including videos, field guides, factsheets and who to contact for further assistance. A good example can be found here: https://pestsmart.org.au/toolkits/european-rabbits/ Social media can quickly extend the reach of information and create two-way dialogue. However, beware of the platform becoming an echo chamber.

	The Victorian Rabbit Action Network (VRAN) has set up a Virtual Extension Officer - a new interactive tool designed to help landholders manage 3 of Victoria's worst invasive species – gorse, serrated tussock and rabbits. More information can be found here: https://vran.com.au/resources/
Print media • Glovebox guides • Adverts • Newsletters • Articles • Fridge magnets • Window stickers • Pledge cards • Fact sheets	Fridge magnets, window stickers and pledge cards can act as reminders and commitments for people to carry out an action.
In person • Practical field/demonstration days • Community champions • Mentoring programmes • Consultative services • Pint of Science events • Drop in sessions • Workshops/open days • Local community action groups facilitated by Council	These methods primarily focus on upskilling people and building capacity. VRAN offers consultative services to assist individuals, organisations or groups to ensure people are getting the most out of their rabbit management program. Services available include: • Strategic support in the development of rabbit management strategies or integrated best practice rabbit management plans. • Facilitation and presentation services at community workshops or demonstration days. • Onsite training in specific rabbit management control methods. Pint of Science events aim to deliver interesting and relevant talks on the latest science research to the public – in cafes, pubs and bars. The events provide a platform which allows people to discuss research with the people who carry it out, no prior knowledge of the subject is required. Further information can be found here: https://pintofscience.nz/about/

	Community champions are those who are knowledgeable in the subject area, reside within the community of interest, and have the trust of both the community and council as providing credible information and assistance.
Other • Bait delivery and subsidisation schemes • Competitions • Incentive schemes • Victorian Rabbit Action Network (VRAN Cooperative governance model)	Bait delivery and subsidisation schemes can be used to break down barriers for those who are motivated to undertake control but are limited by time and financial resources. Competitions between catchments/districts/towns etc can be used to incentivise communities to take action/participate in rabbit management programmes. However, beware of behaviour returning to status quo once the competition ends (Hines et al, 2019). Incentive schemes can promote rapid behaviour change, and are useful if resources are available. However beware that incentives rarely change intrinsic motivation and behaviour can revert when the incentive runs out. Generous incentive schemes may also result in high uptake quickly exhausting funding, and therefore require careful planning and management (Hines et al, 2019). <u>VRAN</u> The Victorian Rabbit Action Network (VRAN) was established in 2014 as a vehicle to reframe the collective thinking about the Rabbit problem and how it can be managed. A one-stop shop for all things rabbits, VRAN is a facilitating entity founded on the belief that rabbit management can only be improved by bringing everyone together - citizens, institutes, organisations, and government (Woolnough et al, 2020). Everyone has something to bring to the table, whether it be different experiences, knowledge, expertise and insights - bringing together those who do not normally work together promotes learning, creativity and innovation for individuals

	and across the group. VRAN facilitates this process by providing the strategic mechanism to bring community voices and experiences into the design and development of programmes, ensuring that objectives spanning all domains (economic, environmental, social, cultural) are considered (Woolnough et al, 2020). Communities are empowered through enabling more integrated, inclusive and constructive politics among the spectrum of those involved. In addition, resilience and effectiveness of rabbit management programmes are enhanced by building social capacity, bringing local knowledge and experience to bear, changing institutional structures and processes, and shifting to shared decision making (Woolnough et al, 2020).

Evaluation of behaviour change programmes

It is important to incorporate evaluation into behaviour change programmes to determine the effectiveness and cost-effectiveness (ROI) of interventions. This step should be budgeted for upfront in communication and engagement strategies, and involve the use of rigorous methods to determine whether the program works, including: treatment and control groups, random assignment, and statistical tests to rule out chance as an explanation for results (Hines et al, 2019).

Assessing the impact of communications on behaviour (not just awareness or attitudes), and where possible linking behaviour change to environmental impacts is also an important component of evaluation. By adopting a scientific mindset, the results of evaluation contribute to a loop of continuous learning and improvement (Hines et al, 2019).

Monitoring and evaluating the impact of social media campaigns can also be easily incorporated into an overall evaluation strategy. Many free online evaluation tools are available to organisations to assist with this, such as Google for Nonprofits, including Google Analytics, Facebook Insights, Twitter Analytics, Twitalyzer, Cool Social, and Bitly (Alter et al, 2017).

3.3. National and regional resourcing and coordination

At the national level, the NZRCG appears to have lost momentum. Following the successful importation and release of RHDV1-K5, a lessons learned paper was prepared for the NZRCG highlighting recommendations for taking rabbit management forward at a national level. Immediate next steps identified in this paper, included:

- To establish a clear mandate and identify and define the roles and responsibilities within the group.
- Establish formal and ongoing funding streams for the management of the NZRCG and its projects.
- Identify key stakeholders and their representatives and implement an ongoing communication programme focused on rabbit management.
- Report on the outcomes of RHDV1 K5 introduction and potential implications of RHDV2.
- Identify future projects and a programme of work to improve rabbit control nationally.
- Identify consultants and contractors to support and deliver the programme as required.

These recommendations were discussed with workshop participants from ORC and it was noted that staff had recently followed up with MPI on the above actions and were yet to receive an update on progress. In addition to the above, ORC staff highlighted that maintaining relationships with Australian counterparts will be important to ensure New Zealand biosecurity staff are across latest research developments, and that increased funding of New Zealand based research will be integral to the success of rabbit management. These issues need to be addressed at a national level and options for doing so could be explored through a national business case. To start this process, it is recommended that Otago Regional Council contacts other regional councils facing similar rabbit issues to understand the level of interest in progressing a national business case.

At a regional level, to strengthen the ORC rabbit management programme, the idea of a dedicated staff member to solely focus on rabbit management and drive innovation was raised by workshop participants. This role would incorporate a large field component, and potential responsibilities could include:

- Developing a regional monitoring and surveillance programme incorporating serum testing and fly traps
- Experimenting with new technology and methods e.g. thermal equipment, night counts and drones to develop best practice guidance
- Investigating additional tools outside of MMS to assist with enforcement under the RPMP
- Investigating trapping in urban areas - there is anecdotal evidence that a community member traps for harvest and is getting good rabbit numbers (Bowman, R. pers comm, 20th May 2022).
- Running community demonstration days to share developments in new technologies or best practice.

3.4. Regional research priorities

The following regional research priorities for ORC were identified in the workshops:

- Investigating the cause of low level of rabbit population knockdown in Moeraki and potential immunity to RHDV1-K5.

- The impact of climate change on control tools, baiting strategies and resourcing for the Otago region, as well as on upcoming rabbit hotspots.

If budget is not available within current funding levels, these priorities should be considered in the next Long Term Plan funding round.

4. Recommendations

The following recommendations have been made on the basis of the information contained in this report to strengthen rabbit management on both national and regional fronts. It is anticipated that any developments from the implementation of recommended actions will be shared across councils and agencies (where relevant) to encourage advancements in best practice.

Recommendations have been grouped for easy reference:

National level recommendations	Potential lead agency	Priority
Business Case		
Assess support amongst other Regional Councils for developing a National Business Case for Rabbit Management similar to that undertaken for Wallabies. A key component of the business case should be ensuring adequate funding for research to direct effective rabbit control efforts. This could be led by ORC.	ORC with support from other regional councils, MPI, DOC, LINZ and Manaaki Whenua	High
Research & Relationships		
Establish/strengthen the research relationship with Australian counterparts to ensure NZ biosecurity staff keep abreast of latest developments in rabbit management.	Manaaki Whenua	Med
Undertake further research to increase knowledge of the new RHDV2 strain, including its rate of spread and impacts.	Manaaki Whenua	High
Tools		
Explore the update or re-release of a rabbit management smartphone app similar to RabbitScan or Rabbit Tracker. This needs to be coupled with funding to allow sufficient publicity of the app to ensure its uptake.	MPI	Med

Regional recommendations	Lead	Priority
Oversight		
Establish a rabbit management programme within the Council which oversees the implementation of the following recommendations (including BAU).	ORC Biosecurity Team Leader & Manager Environmental Implementation	High
Funding and Resourcing		
Ensure the operational impacts of climate change on rabbit numbers and management are taken into consideration during annual and long term plan funding rounds. A reduced control window due to climate change may have significant operational impacts with scheduled control not able to be completed. To ensure all scheduled control can take place in a shortened time frame, increased investment in more staff, training and equipment (e.g. planes modified for rabbit control) will likely be required	ORC Biosecurity Team Leader	High
Consider establishing a dedicated role within the ORC biosecurity team to solely focus on rabbit management.	ORC Biosecurity Team Leader & Manager Environmental Implementation	Med
Advocacy		
Follow up with Sherman Smith of the Ministry for Primary Industries who is part of the NZRCG, and continue to advocate for the implementation of recommendations from the RHDV1-K5 Importation Lessons Learned paper.	ORC Biosecurity Team Leader	Med
Operations		
Consider adopting aerial strip sowing of 1080 across large areas of uniform terrain as best practice.	ORC Biosecurity Delivery Leads & Performance and Delivery Specialist	High
Develop a regional monitoring and surveillance programme which incorporates serum testing and fly trap monitoring to increase the effectiveness of targeted biocidal RHDV1-K5 releases in semi rural and difficult to control local rabbit	ORC Biosecurity Delivery Leads & Performance and Delivery	High

populations. This will also help inform research into anomalies such as Moeraki.	Specialist	
Research		
Assess with Manaaki Whenua the feasibility and potential advantages/disadvantages of re-releasing the 95 MacKenzie Basin strain of RHDV, including the relevant approval process that would need to be followed.	ORC Biosecurity Delivery Leads	Low
Investigate the cause of low level of rabbit population knockdown in Moeraki and potential immunity to RHDV1-K5.	ORC Biosecurity Performance and Delivery Specialist	High
The impact of climate change on control tools, baiting strategies and resourcing for the Otago region, as well as on upcoming rabbit hotspots.	ORC Biosecurity Performance and Delivery Specialist	High
Research new methods for assessing rabbit densities (outside of MMS) in peri-urban and urban areas, and review RPMP rules and operational plan targets in relation to these areas. In the next iteration of the RPMP, inclusion of a rule around rabbit warrens could also be considered.	ORC Biosecurity Delivery Leads	Low
Data		
Update the rabbit proneness heatmap to take into account the effects of climate change in the region and to guide conversations around management decisions.	ORC Biosecurity Performance and Delivery Specialist	High
Policy		
Meet with ORC policy staff to: - Ensure that implications of RMA policy on biosecurity are taken into account when providing submissions and feedback on these processes. - Review the recently released draft Waitaki District Plan and formulate a position for submission on this plan. - Get assistance in establishing a regular forum with regional and district RMA planners to raise awareness of biosecurity and discuss challenges and opportunities relating to rabbit management. - Work up a standard set of resource consent	ORC Biosecurity Team Leader ORC Biosecurity Principal Environmental Implementation	Med

conditions in relation to rabbit management that could be applied to subdivision consents, and share these with District Council planners in the region.		
Communication and engagement		
Revise communication and engagement strategies to take account of latest developments in behaviour change research, and as outlined in this report. Also ensure that operational plan targets, the rationale for the RPMP programme, and how well the region is progressing towards rabbit management targets is communicated to and understood by the public. In addition, if adopting strip sowing of aerial 1080 as best practice, communication and engagement strategies should consider addressing reasons for low uptake by landholders and operators.	ORC Biosecurity Community Education Partnership Lead	High

5. Next Steps

To strengthen rabbit management within the Otago region the following next steps are recommended:

- Preparation of a plan to deliver on the key recommendations of this report, including consideration of budget and resourcing requirements for successful implementation.

Place Group Ltd are happy to assist with the above, and our staff have a broad range of expertise in the biosecurity field including:

- Navigating legislative change and approval processes under the Hazardous Substances and New Organisms, Biosecurity, and Resource Management Acts
- Biosecurity and resource management policy development
- Development of national business cases using the Better Business Case framework
- Development and delivery of community engagement strategies.
- Project management services.
- ToP trained facilitators.

6. References

Alter, T., Bridger, J., Frumento P., Miller M., & Polley E, (2017). *Using Information Technology to Enhance Community Engagement.* PestSmart Toolkit Publication. Centre for Invasive Species Solutions, Canberra, ACT

Department of Conservation. (n.d.). *Rabbits: Animal Pests.* https://www.doc.govt.nz/nature/pests-and-threats/animal-pests/rabbits/

Duckworth, J. (n.d.) *Rabbit caliciviruses for biological control of rabbits in New Zealand – the good, the bad and the useful.* https://www.landcareresearch.co.nz/assets/Events/Link-series/Rabbit_calciviruses_biological_control_rabbits.pdf

FeralScan. (n.d.) *RabbitScan.* https://www.feralscan.org.au/rabbitscan/default.aspx

Hall, R. N., Huang, N., Roberts, J., & Strive, T. (2019). Carrion flies as sentinels for monitoring lagovirus activity in Australia. *Transboundary and emerging diseases*, *66*(5), 2025–2032. https://doi.org/10.1111/tbed.13250

Hall, R., Mahar, J., Read, A., Mourant, R., Piper, M., Huang, N, Strive, T. (2018). A strain-specific multiplex RT-PCR for Australian rabbit haemorrhagic disease viruses uncovers a new recombinant virus variant in rabbits and hares. *Transboundary and Emerging Diseases.* https://doi.org/10.1111/tbed.12779

Hall, R., King, T., O'Connor, T., Read, A., Arrow, J., Trought, K., Duckworth, J., et al. (2021). Age and Infectious Dose Significantly Affect Disease Progression after RHDV2 Infection in Naïve Domestic Rabbits. *Viruses*, *13*(6), 1184. MDPI AG. Retrieved from http://dx.doi.org/10.3390/v13061184

Hine, D., Please, P., McLeod, L., & Driver, A. (2014). *Behaviourally Effective Communications for Invasive Animals Management: A Practical Guide.* Canberra, Australia: Invasive Animals Cooperative Research Centre.

Hine, D., McLeod, L., & Driver, A. (2019). *Designing behaviour change interventions for invasive animal control: A practical guide.* Canberra, Australia: Centre for Invasive Species Solutions.

Howard, T., Thompson, L., Alter, T., Frumento, P. (2016). *Community action for wild dog management.* PestSmart publication, Invasive Animals Cooperative Research Centre, Canberra, Australia.

Jenckel, M., Hall, R., Strive, T. (2022). Pathogen profiling of Australian rabbits by metatranscriptomic sequencing. *Pre-print bioR ✗ iv*. https://doi.org/10.1101/2022.02.15.480619

Kardia, E., Frese, M., Smertina, E., Strive, T., Zeng, X., Estes, M., Hall, R. (2021). Culture and differentiation of rabbit intestinal organoids and organoid-derived cell monolayers. *Sci Rep* 11, 5401. https://doi.org/10.1038/s41598-021-84774-w

Latham, D., Latham, C., Cieraad, E., Tompkins, D., Warburton, B. (2015). Climate change turns up the heat on vertebrate pest control. *Biol Invasions (2015) 17:2821–2829.* DOI 10.1007/s10530-015-0931-2.

Latham, D., Latham, C., Nugent, G., Smith, J., Warburton, B. (2016) Refining Operational Practice for Controlling Introduced European Rabbits on Agricultural Lands in New Zealand. *PLoS ONE 11 (6): e0158078.* doi:10.1371/journal.pone.0158078

Mahar, J., Jenckel, M., Huang, N., Smertina, E., Holmes, E., Strive, T., Hall, R. (2021). Frequent intergenotypic recombination between the non-structural and structural genes is a major driver of epidemiological fitness in caliciviruses, *Virus Evolution, Volume 7, Issue 2, December 2021*, veab080, https://doi.org/10.1093/ve/veab080

Manaaki Whenua. (n.d.). *'Rabbit biocontrol in New Zealand RHDV1-K5',* Manaaki Whenua - Landcare Research, https://www.landcareresearch.co.nz/discover-our-research/biosecurity/animal-pest-management/rabbit-biocontrol-in-new-zealand-rhdv1-k5/ (accessed 7 June 2022).

McLeod, L., Hine, D. (2019). Using audience segmentation to understand nonparticipation in invasive mammal management in Australia. *Environmental Management (2019) 64:213-229.* DOI https://doi.org/10.1007/s00267-019-01176-5.

McKenzie, A. (2018). *Lessons Learned: Importation and release of Rabbit Haemorrhagic Disease Virus (K5 variant) (RHDV1 K5) into New Zealand.* Report for the New Zealand Rabbit Coordination Group.

McKenzie-Mohr, D. (2011). *Fostering sustainable behavior: An introduction to community-based social marketing (3rd ed). Step 1: Selecting behaviors (11-20).* Gabriola Island: New Society Publishers. http://www.cbsm.com

Michie, S., Atkins, L., West, R. (2014). *The behaviour change wheel. A guide to designing interventions.* Silverback Publishing, UK.

Norbury, G., Duckworth, J. (2021). European rabbit *Oryctolagus cuniculus*. In *The Handbook of New Zealand Mammals*. 3rd edn. (Eds CM King and DM Forsyth) Family Leporidae, pp. 131-146. CSIRO Publishing, Melbourne.

Otago Regional Council. (n.d.). *Rabbits.* https://www.orc.govt.nz/managing-our-environment/pest-hub/animals/rabbits

Parliamentary Commissioner for the Environment. (2011). *Evaluating the use of 1080: Predators, poisons and silent forests.* Retrieved from https://www.pce.parliament.nz/media/1689/pce-1080-2017-web.pdf

Peden, R. (2008) *'Rabbits - The spread of rabbits in New Zealand',* Te Ara - the Encyclopaedia of New Zealand, http://www.TeAra.govt.nz/en/rabbits/page-1 (accessed 29 April 2022).

Price, M. (2015, September 29). MacKenzie RHD strain most lethal. *Otago Daily Times*. https://www.odt.co.nz/regions/queenstown-lakes/mackenzie-rhd-strain-most-lethal

Prochaska, J., DiClemente, C., & Norcross, J. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist, 47*(9), *1102–1114.* https://doi.org/10.1037/0003-066X.47.9.1102

Slater, M (2006). Segmentation on a shoestring: Health audience segmentation in limited-budget and local social marketing interventions. *Health Promotion Practice, 7, 170-173*

Urakova N, Strive T, Frese M (2017) RNA Dependent RNA Polymerases of Both Virulent and Benign Rabbit Caliciviruses Induce Striking Rearrangement of Golgi Membranes. *PLoS ONE 12 (1)*: e0169913. doi:10.1371/journal.pone.0169913.

Woolnough, A., Hull, L., Reid, M., Adams, L., Kleinert, H., Alter, T. (2020). Community-led approaches can lead to better outcomes for management of European Rabbits Oryctolagus cuniculus and other invasive species. *The Victorian Naturalist* (Vol 137(6)., pp 210-218). The Field Naturalists Club of Victoria.

7. Bibliography

The following websites/pages were also viewed in preparing this report.

Ministry for Primary Industries

https://www.mpi.govt.nz/dmsdocument/16870-The-current-state-of-rabbit-management-in-New-Zealand-Issues-options-and-recommendations-for-the-future

The Guardian newspaper

https://www.theguardian.com/uk/2010/apr/27/scottish-island-overrun-rabbits

United States Department of Agriculture

https://wildlifedamage.cals.wisc.edu/wp-content/uploads/sites/289/2020/10/Rabbit.pdf

Stuff.co.nz

https://www.stuff.co.nz/otago/127074033/residents-take-up-arms-in-central-otago-as-rampant-rabbits-ruin-land#:~:text=A%20plague%20of%20rabbits%20has,costing%20landowners%20thousands%20of%20dollars.

thenews.co.nz

https://www.thenews.co.nz/news/rabbits-almost-gone/

Evergreen rabbit control - United Kingdom

https://www.evergreenrabbitcontrol.co.uk/methods-of-rabbit-control/ferreting-for-rabbits/

Australian Government - Rabbit Threat Abatement Plan

https://www.awe.gov.au/sites/default/files/documents/tap-rabbit-2016.pdf

Conservation Science and Practice - Journal of the Society for Conservation Biology

https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/csp2.12639

Pest Smart

https://pestsmart.org.au/wp-content/uploads/sites/3/2021/03/CISS-Glovebox-Guide-Rabbit-web.pdf

Government of Western Australia

https://www.agric.wa.gov.au/baits-poisons/rabbit-control-options?page=0%2C1

CSIRO

https://research.csiro.au/rhdv/

Invasives action tool

https://actiontool.invasives.com.au/dashboard/

Victorian Rabbit Action Network

https://vran.com.au/resources/

8. Appendix A - Survey Questions

9. Appendix B - Modified McLean Scale

Modified McLean Scale

The Modified McLean Scale (MMS) is a scale used by councils to determine rabbit levels. It helps with regulation to make sure landowners are managing rabbit numbers to a level set in the Pest Plan. Otago's Pest Plan has set the scale for Otago at a maximum of level 3.

As a rule of thumb, if you see groups of rabbit droppings less than 10 metres apart, there's a problem and you need to take action.

Scale	Rabbit infestation
1	No sign found. No rabbits seen.
2	Very infrequent sign present. Unlikely to see rabbits.
3	Pellet heaps spaced 10m or more apart on average. Odd rabbits seen; sign and some pellet heaps showing up.
4	Pellet heaps spaced between 5m and 10m apart on average. Pockets of rabbits; sign and fresh burrows very noticeable.
5	Pellet heaps spaced 5m or less apart on average. Infestation spreading out from heavy pockets.
6	Sign very frequent with pellet heaps often less than 5m apart over the whole area. Rabbits may be seen over the whole area.
7	Sign very frequent with 2-3 pellet heaps often less than 5m apart over the whole area. Rabbits may be seen in large numbers over the whole area.
8	Sign very frequent with 3 or more pellet heaps often less than 5m apart over the whole area. Rabbits likely to be seen in large numbers over the whole area.

Monitoring rabbits in Otago

John Parkes

Kurahaupo Consulting

Contract Report 2022/25

Produced for:

Otago Regional Council

August 2022

Contents

Part A: Spotlight count indices and other methods to measure rabbit abundance

1. Objective

To assess the merits of rabbit night counts and, where needed, provide recommendations to strengthen a rabbit night count programme.

2. Brief history of rabbit control

The history of rabbit management in New Zealand is well summarised by Norbury & Duckworth (2021), Gibb & Williams (1994), and that in Otago by Rosson (1993). In summary, rabbit control has moved from largely landowner-funding in the early decades of rabbits' invasion of New Zealand, to the more-organised control with the formation of the Rabbit Destruction Council (later the Agricultural Pests Destruction Council) and Rabbit Boards from 1947. The policy then was one of eradication, but this goal was never practical (e.g., Howard 1959) and was finally abandoned in 1971. The goal was 'zero rabbits' so presence/absence was all that was logically required to monitor success.

However, more nuanced targets for rabbit population densities were needed once the goals changed from 'zero' rabbits, as landowners became primarily responsible for rabbit control, and as Regional Councils became responsible for the oversight (and regulation) of rabbit management after 1989 (Rosson (1993). This required better monitoring and was also driven by wider factors such as:

- The extent of taxpayer and ratepayer funding.
- The need to assess or improve the efficacy of major control operations (e.g., Nugent et al. 2012; Latham et al. 2016). In the past, large-scale control operations, largely using aerial baiting with 1080, were conducted by regional or national agencies. However, these are less common nationally since control has devolved onto landowners.
- The need to measure the efficacy of new biocontrol agents (Parkes et al. (2002).
- The need for evidence of the economic costs and benefits and actual impacts on the biomass and composition of the vegetation, e.g., under the Rabbit and Land Management Programme and later by Norbury & Norbury (1996) and Scroggie et al. (2012).

Current control of rabbits in Otago is the responsibility of landowners with the Otago Regional Council setting the regulations that allow control to be enforced under the Regional Pest Management Plan as an instrument under the national Biosecurity Act 1993. Regional Councils assess thresholds for rabbit abundance, using the Modified McLean Scale (MMS). An MMS score above the threshold set in the Plan obliges landowners to control rabbits numbers.

Many Regional Councils also monitor the abundance of rabbits using spotlight count indices which apparently began in 1980 often as part of Ministry of Agriculture research projects, by the need to assess the effectiveness of the Rabbit and Land Management Programme (1990

– 1995) and the efficacy of rabbit haemorrhagic disease virus (RHDV) since 1997 (Table 1). Current spotlight routes in most regions seem to have been a continuation of those set up to assess RHDV. The most extensive use of spotlight count indices has been in Canterbury with nearly 2500 km of routes across all sub-regions (Table 1). Since 2006, these counts were made from motorbikes on single nights in spring by a single contractor (Excell Biosecurity).

Table 1. Spotlight count indices used by other regional/district councils.

Region	Sub-region	Number of routes	Total length (km)	Start and end year[1]
Canterbury Regional Council	Mackenzie Basin	34	538.0	1990 – present
	Omarama	16	222.2	1990 – present
	Kurow	24	383.6	1990 – present
	South Canterbury	21	221.8	1993 – present
	Ashburton	6	108.3	1993 – present
	Plains	8	160.2	1993 – present
	Banks Peninsula	8	141.4	1994 – present
	Ashley	7	136.7	1993 – present
	Waikari	21	262.3	1993 – present
	Amuri	29	313.4	1993 – present
	Kaikoura	4	102.2	1991 – present
	Total	**178**	**2490.1**	
Marlborough District Council	---	**13**	***unknown***	1990 – 2016
Hawke's Bay Regional Council	---	**23**	**472**	1995 – 2017

3. Purpose of spotlight count indices

Spotlight counts provide an objective index of abundance of rabbits and may be used to:

(a) Assess annual patterns or trends in rabbit populations by measuring set routes at set times of the year and analyse the results by property (e.g., to assess the more-continuous conventional control over time or changes in land-use), or by the averages and variances across various regional areas (e.g., to monitor the efficacy of biocontrol agents or to inform policy decisions). The issue here (and shown in Appendix 1) is there are often no long-term trends in the index (up or down), but rather either stability, pulses, or occasional collapses in the index. These can be difficult to interpret unless they coincide with some control event (see below).

(b) Answer more specialist research questions about the progress of an epidemic when frequent counts (e.g., monthly) combined with serological data from shot samples can determine the proportion of the population killed (from the short-term change in spotlight indices) and the proportions either not challenged by the virus and challenged but survived – to be shot and tested for antibodies.

[1] Some routes began under the R&LMP and many have continued until the present. Other regions have conducted ad hoc spotlight counts but generally with no long-term sequences

(c) Provide abundance indices for other small mammals such as hares, wallabies, ferrets, feral cats and possums that may be of interest in Regional Pest Management Strategies. The abundance of many of these pests is driven by the abundance of the rabbits as competitors or prey (Norbury et al. 2002), so one option to managing them is to manage the rabbits. Such data has been collected by ORC irregularly and analysis is out of scope for this report. However, it would be useful for wider ORC biosecurity goals to ensure a consistent record is maintained in the future.

(d) Determine the percent kill achieved by some major control operation by measuring the route(s) just before and just after the control event. The statistical power to detect any changes determines the design of such counts – large changes are easily demonstrated with fewer routes and fewer repeat surveys, while small changes are difficult to demonstrate with spotlight indices.

The purpose of the current ORC spotlight routes is to use the index to show the patterns (or trends where these are clear) by property or site as well as to use the averages and variances in counts across sites and various regional areas to inform or defend more general policy decisions made by the Regional Council.

Identifying the causes of observed changes in spotlight indices and by implication the changes in rabbit populations is difficult. Four current and one future general causes of change are likely to be involved in the mix of causes:

- The extent of conventional rabbit control conducted on the properties covered by the route. This information is not routinely recorded by ORC but might be inferred to have occurred if the Modified McLean's Scale (MMS) indices assessed by ORC (as regulator) had triggered control action. Note: a MMS of about 3 coincides with a spotlight count index of about 5 rabbits/km (Bolton 2010).
- Changes in land use along the route.
- The changing efficacy of rabbit haemorrhagic disease viruses (see Part B).
- Changes is the relationship between rabbits are their predators (see Reddiex 2004).
- It is possible that changes in the climate, particularly rainfall, will make areas more or less suitable for rabbits either by altering the vegetation to favour or disadvantage rabbits, or indirectly by increasing juvenile rabbit mortality in wet springs via, in particular, coccidiosis (Bull 1953).

It would help interpretation if the landowners involved with the spotlight route were surveyed each year on the extent and nature of any conventional rabbit control they conducted. Changes in land use are sometimes noted in the ORC spotlight count records and this could be made as an explicit requirement for the monitor.

Interpreting the impact of changes in RHD would require, as a minimum, ongoing serology and age structure of the population - plus the research information from Landcare Research. Ideally, these data should have been collected from rabbits autopsied in the same area as the spotlight counts but in general this has not been the case in Otago in recent years. A regional 'average' has been interpreted but this approach risks missing the patchiness of both rabbit

population age structures and the patchiness of epidemics, e.g., the disease appears not to be active at some sites or every year.

4. Technical protocols

The National Pest Control Agencies best practice guidelines for monitoring rabbits using spotlight count indices (NPCA 2021) have a set of rules that attempt to standardise the way the counts are made to limit the many factors that affect rabbit visibility and behaviour. These guidelines are generally reiterated in Appendix B of ORC's review of night counts (Boardman 2021). Canterbury Regional Council monitors rabbits on 178 spotlight routes (Table 1). Their contractor uses a sealed beam spotlight (100 watt, but this seems variable as 30 watt is also recommended) mounted on the observer's helmet and connected to the trail-bike's 12 volt battery with a detachable plug to allow the observer to dismount when required. LED lights have been tried but they are much heavier and so hard to sustain over many hours (D. Hunter, pers. comm.).

Some best practice guidelines included in Canterbury Regional Council's contracts for their monitors include:

- Using the same observer on each route over the years – where possible.
- Avoid counting on nights with high winds or rain.
- Only one route per observer per night is to be counted.
- Count the route in the same direction each survey.
- Counts to be taken in the first four hours of darkness.
- The speed of travel for the motorbike should not exceed 20 km/h.

I will not repeat the details of the NPCA guidelines here but will address each issue within the guidelines, as required by the terms of reference of this report, with justifications using what data are available where necessary.

4.1 Time of year and frequency of measurement

Most ORC routes are now surveyed once a year in winter or early spring (June to September). This timing is chosen to avoid the lambing season which is generally October – November in the high country. Darkness also falls earlier in the night in winter so counting can start earlier and last longer – in summer it does not get dark enough for spotlighting until after 2200h. The timing is also after the recruitment pulse of young rabbits. Young rabbits remain in their natal nest until they are about 3 weeks old, and juvenile (runners) remain around the natal site and are less likely to be seen than fully-grown rabbits (and shot for the serological samples) for several months. The last young of the breeding season are recruited into the population by early January (Figure 1) and are old enough to behave as adults and be countable by the time of the spotlight counts in winter. The young born at the start of winter are generally too young to be active and seen in spotlight counts – they are, for example, rarely included in winter-shot samples. The counts are therefore a baseline for the population size.

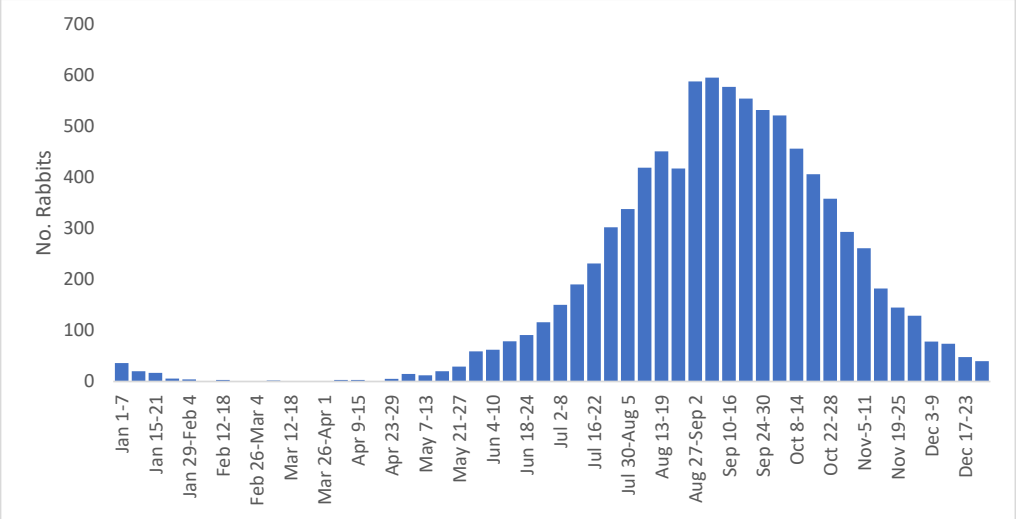


Figure 1: Number of rabbits born per week taken from 8921 juvenile rabbits sampled from Otago, 1990 – 2021 (J. Parkes, unpubl. data). The birth date of juvenile rabbits is calculated from the weight of their eye lens (Myers & Gilbert, 1968)

There are probably seasonal patterns in count indices as recruitment and natural mortality wax and wane. However, these are often masked by control events, especially of broadscale poisoning which is usually done in autumn through winter (NPCA 2021), and by RHD epidemics which are usually most intense in autumn (J. Parkes, unpubl. data and see Part B). No datasets of spotlight counts have been made by season or month at sites in the absence of these masking factors but whether such a research project should be of interest to ORC is a moot point.

There is no strong case for increasing the frequency of measuring the spotlight routes from the annual surveys in winter/early spring, at least under the current general purpose of the monitoring. In fact, there is a stronger case to decrease the frequency of the surveys, especially at routes with very low rabbit abundance indices (routes 3, 6-10, 13-16), by monitoring them less often – perhaps every second or third year – and only increase any frequency again if rabbit numbers start to increase. This would allow new routes (or previously abandoned routes) to be added (at no extra cost, if funds are a constraint) and improve the regional assessments (see section 5).

4.2 Number of nights counted

The ORC spotlight protocol uses the average count taken over two nights (three nights in earlier counts) generally on successive nights. The NPCA best practice recommendations are that 'only one count should be carried out per route per survey' – presumably meaning a survey is only a single night (NPCA 2021) and this is also suggested in Boardman (2021) and is current practice in Canterbury. Some rationale for selecting multiple or single nights is:

(a) Different purposes of the spotlight index

Surveying over multiple nights may be desirable when the aim is to compare changes in the spotlight index before and after a control event and with a non-treatment area as an experimental control. Several studies have shown the standard index with only a few nights of counting has the power to detect moderate to large changes in rabbit populations (e.g., Caley & Morley 2002) but poor power to detect smaller changes (e.g., Montague & Arulchelvam 1995).

Baddeley (1985), on advice from Bell & Williams from MAF, recommended counts over four nights. This was to estimate percent kills in rabbit control operations (by implication a major operation such as aerial baiting). The design also included similar measurements in a non-control area, i.e., eight counts in total. Frampton & Warburton (1994) recommended at least three, and preferably up to six, successive counts per route to achieve 'acceptable precision' in the estimated index. However, when the purpose of the index is to show more general patterns in rabbit abundance over time it may be only counts on a single night are adequate and the saved effort more usefully used to increase the number of routes surveyed.

(b) Variability between nights

A preliminary analysis of the variability in counts of routes surveyed on 2 and 3 successive nights (data from the ORC's routes 1998-2021), and 4 and 5 nights within a month (data from Williams & Robson 1985 from the Western Pest Destruction Board region in the North Island) is presented (Table 2).

The results hint at a decline in rabbits observed in subsequent nights, although this is not statistically significant. Such a decline might be expected if the first night was selected because weather conditions were ideal while the chance of such optimal conditions on subsequent nights is more likely to be lower.

Table 2: Variability of spotlight counts with nights each route was sampled.

Nights counted	Mean no. rabbits counted per night	Number routes	Coefficient of variation (%)
ORC 2 successive[2]		286	18.8
Night 1	94.3		
Night 2	92.3		
ORC 3 successive		200	10.9
Night 1	50.9		
Night 2	50.2		
Night 3	47.5		
4 over a month	15.6	42	22.8
5 over a month	11.9	19	29.9

The results show the variability in counts (the coefficient of variation) is decreased with increasing the number of successive nights counted from two to three, but increases as the

[2] Includes the first two nights of the 3-night subset

counts are taken over longer time frames. Presumably, much of the nightly variation is due to different weather conditions (wind, rain, cloud cover, etc) affecting rabbit behaviour.

The spotlighting itself does not appear to affect the rabbits. If it made rabbits more wary (leading to fewer sightings on subsequent nights) we would expect the counts to reflect this. However, there is no evidence that this occurs. Among the 2-night counts, the numbers seen on the first night were not significantly higher than those on the second night (55% versus 45%: χ^2= 1.38, P = 0.24).

The patterns in the 16 routes currently monitored by ORC make sense. The indices in successive years are generally consistent, there are few erratic outlier years, and most abrupt decreases can be related to changes in the control regime at the property or to changes in land-use as areas are irrigated and/or changed more intensive horticulture and cropping.

(c) Spotlight index versus actual rabbit density

The spotlight count index is not likely to be linear against actual rabbit densities across all rabbit densities because the index is said to saturate at high rabbit densities (Fletcher et al. 1999). However, this is not a problem under the current low to modest densities on the routes in Otago (Appendix 1). Even if rabbit populations should irrupt and reach very high densities, the signal from spotlight count indices that this has occurred would still be clear – just not an accurate measure of the scale of the change.

4.3 Route length

The spotlight index is expressed as rabbits seen/km or per route. A problem arises when the length of the route is not consistently recorded, or changes with no explanation.

The critical factor is the total route length so this needs to be measured carefully either by using an odometer on the ground or by measuring the map-distance using GPS (e.g. Appendix 3). Most routes are divided into marked sections for ease of counting, especially when rabbit numbers are high. Note: regular maintenance of route markers might be advisable especially if the frequency of monitoring is extended as suggested in section 4.1. The sum of these sections has also been used to estimate the length of the route, but this can give unclear results when the records amalgamate sections or delete parts of the route with no explanation, or if the exact route across a section is not consistent, e.g., there are no farm tracks to follow or there are changes in personnel between years.

Changes in rabbit abundance may occur when the habitat changes along the route, i.e., crops replace grassland, areas are irrigated, stocking rates and species change. Noting which sections of the route have changed can help in interpreting the count indices – which is one reason to make the routes' sections coincide with likely boundaries for such habitat changes, e.g., fence lines, paddocks, or topography, rather than a simple 1 km distance.

4.4 Routes versus tenure boundaries

Ideally each spotlight route should be within a single tenure. This may help with relating changes in the index to any different control strategies deployed on individual properties. This appears to be the case for most of the current routes – and is one reason Route 10 (Fruitlands) is often divided into two sub-routes for analysis (Russell and Dunbier). Older routes monitored

by ORC and R&LMP sometimes traversed several properties which complicated interpretation at the property level, but not when all routes are pooled by region. This is less of a potential issue once RHDV arrived as the 'treatment' was basically universal and not based on the need or enthusiasm for control by the landowner.

This ideal becomes difficult when property sizes are small and, at least for very small properties, alternative methods to index rabbit abundance may be more suitable (Section 6).

5. Past, present and possible future spotlight routes

Spotlight count indices apparently began in Otago in about 1980 with 164 routes being monitored. The R&LMP monitored 31 routes between 1990 and 1995. Landcare Research monitored two routes between 1994 and 2003. The latter results for the Landcare Research route on Earnscleugh Station in a route above Lake Dunstan are shown in Appendix 1 to compare the spotlight indices in the 1990s with current indices. However, the data for most earlier routes is unavailable or lost. ORC began to count along 27 routes starting in various years after 1998, of which 16 have continued (Table 3, Figure 2; Appendix 1).

The rationale for route selection has changed over time. The 1980 routes were set up to achieve a wide coverage across the region to inform Pest Destruction Boards. For example, the East Otago Pest Destruction Board set up routes in areas where no control was undertaken, i.e., in less prone areas, to check that rabbit numbers remained low, and their 'no-control' decisions were justified. The R&LMP routes were to assess the efficacy of that programme's actions on selected properties in the most rabbit-prone areas, the Landcare Research routes to measure the efficacy of RHDV at sites, and the ORC routes post 1998 were also to assess the effects of RHDV (and conventional control) at the sites and later to give an objective measure of general trends in rabbit populations across wider regions.

Most of the current routes are located in rabbit-prone areas (Appendix 2) with only three routes in the south-east (14 – 16) in areas mapped as lower proneness. The four abandoned routes in the north-east south of Oamaru are also in lower proneness areas. ORC notes that the map in Appendix 2 is dated and predicting rabbit densities based on its parameters (largely soil type) does not take account of many major land-use changes since the map was developed in the early 1980s (Kerr et al. 1986). In other words, the definition of 'rabbit-prone land' as a predictor of the potential or rabbits to reach various densities if left uncontrolled needs to be reconsidered. Today's land managers have better spatial databases and more sophisticated mapping and analytical tools to allow more fine-scale definitions of 'rabbit proneness' to direct decisions on where monitoring such as spotlight indices should be deployed.

Identifying the routes is an issue especially when long-term trends are being analysed. Route numbers are unique to each 'study' while sites are sometimes named by geographic location, sometimes by the property name and sometimes by the property owner - which may change, or the route may cross several tenures. Note: the variable names used for the routes in Figure 2 with those used for serology sites in Figure 4.

The ORC has the opportunity to reconsider the number and locations of its spotlight index system, especially if it reduces the number of nights surveyed within each session and extends

surveys to a biennial or triennial frequency for routes with consistent, stable, low indices of rabbit density. The current and historic spotlight routes, some suggested new routes and any 'matching' sites where serology samples are taken are shown in Table 3).

Table 3: Current and suggested spotlight routes.

Route Name	District	Current rabbit density[3]	Suggested monitoring frequency	Nearest serology site name
Current ORC Spotlight routes (1998 - 2021)				
Route 1: Lake McKay	Queenstown Lakes	High	Annual	Wanaka Stn.
Route 2: Queensberry	Queenstown Lakes	High	Annual	
Route 3: Timburn	Central Otago	Low	Biennial	Lindis Crossing
Route 4: Jolly	Central Otago	High	Annual	Ardgour
Route 5: Trevathan	Central Otago	High	Annual	Lindis Cross/Maori Pt.
Route 6: Kawarau	Central Otago	Low	Biennial	Bannockburn
Route 7: Cresslea	Central Otago	Mod.	Annual	Cresslea
Route 8: McKnights	Central Otago	Low	Biennial	Merino Ridges
Route 9: Manorburn	Central Otago	Low	Biennial	Galloway
Route 10: Fruitlands	Central Otago	Low	Annual	Fruitlands/Gorge Creek
Route 11: Haughton	Central Otago	Low	Annual	Roxburgh
Route 12: Gem Lake	Central Otago	High	Annual	Island Block/Perkins
Route 13: Wrights	Central Otago	Low	Biennial	Island Block/Perkins
Route 14: Proudfoot	Clutha	Low	Biennial	
Route 15: Bloxham	Clutha	Low	Biennial	Hillend
Route 16: Table Hill	Clutha	Low	Biennial	Milton
Historic ORC spotlight routes (1998 -). *Note: these and new sites have no recent data on which to base a frequency of monitoring*				
Glencoe	Queenstown Lakes			Morven Ferry
Enfield	Waitaki			
Mt Dasher	Waitaki			
Herbert	Waitaki			
Hyde	Waitaki			
Jones	Central Otago			
Sutton	Central Otago			
Lone Star	Central Otago			
Smailes	Clutha			
Suggested new spotlight routes				
Lauder	Central Otago			
Patearoa	Central Otago			
Motatapu	Queenstown Lakes			
Otago Peninsula site	Dunedin			Penguin Place
Coastal site	Waitaki			Moeraki
Lake Dunstan	Central Otago			Older LCR serology

[3] Based on whether the counts shown in Appendix 1 are above or below the level that might trigger ORC's regulatory interest

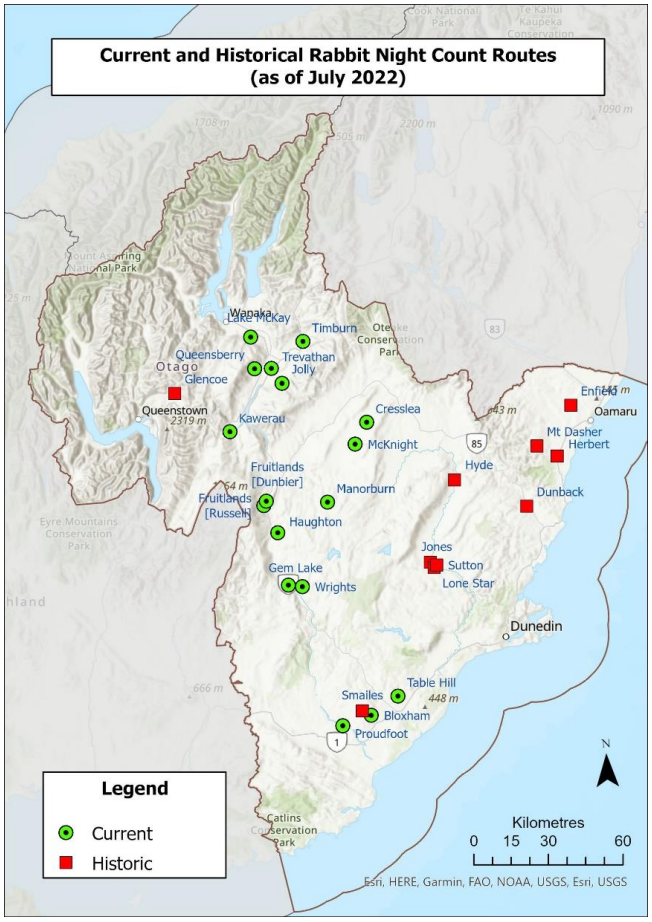


Figure 2: Location of current and recently halted spotlight routes in Otago.

Spotlight count indices and MMS indices (and night shooting indices) all index rabbit densities. The indices can be roughly aligned (Table 3). However, they are used for different purposes, sample at different spatial patterns and scales and presumably have different relationships with actual rabbit densities and habitat types that affect, for example, visibility. Nevertheless, the rough equivalents in Table 4 do give an indication of, for example, the expected MMS if a spotlight route has a certain index.

Table 4: Equivalence of three indices of rabbit densities (after Bolton 2010).

Spotlight Count Index	Modified McLean Scale	Rabbits shot by one person/night
0 – 1.5	1 – 2	<20
1.6 – 2.5	2	30 – 75
2.6 – 5	2 – 3	76 – 150
5.1 – 6	3 – 4	151 – 250
6.1 – 12	4	250 – 400
12.1 +	4 – 5	401 +

Spotlight count indices give an objective measure of rabbit abundance along each route. However, extrapolating the results to a whole property or averaging the results by region is riskier as the routes may not adequately sample a property and are not located at random across the region. Nevertheless, the averages (Figure 3) show patterns over time that coincide with known major perturbations in rabbit control – and so make sense. The Modified McLeans Scale index measures rabbit sign and is a more subjective measure of rabbit abundance. It gives a more complete measure than spotlight counts of the state of rabbits on a property because it allows a wider survey coverage. However, there is no standard way to extrapolate such results to the whole region. The catch-per-unit index can be used to give an overview of rabbit abundance across a region, e.g., from the Easter Bunny Shoot data collected since 1990 (Rouco et al. 2014).

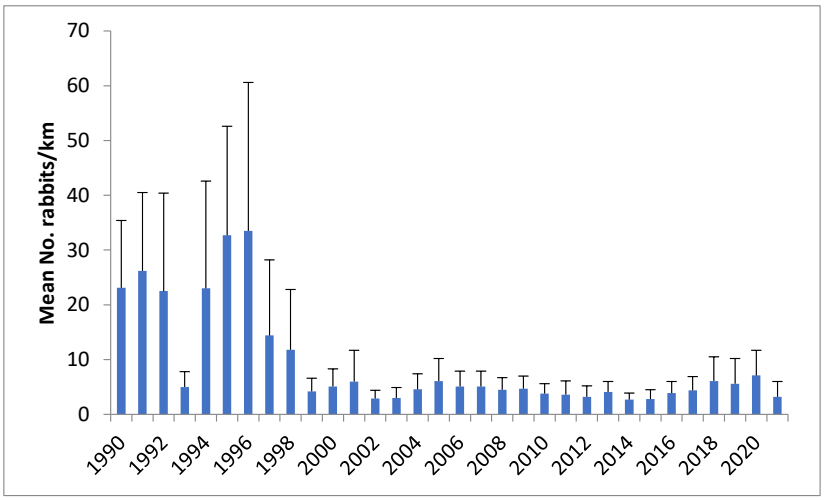


Figure 3: Mean number of rabbits (with SE) per spotlight route in Otago, 1990 to 2021.[4]

Six current routes have indices that indicate potential problems (based on equivalent MMS indices). The other 10 current routes have low to very low rabbit numbers. It appears the current conventional control regimes and/or RHDV are successfully managing rabbits at these sites so a 'watching brief,' is all that is required. I note all or most of these 10 routes are in historically rabbit-prone areas and therefore the risk of an irruption on the population is always present.

Which of the historic or new spotlight routes should be monitored depends on ORC's goals and budget. I assume that the main rationale for the spotlight survey is to provide a regional overview of the status of rabbits and the risks they pose should their numbers begin to return to historic high levels. In this case, coverage is an important consideration. In contrast, if the

[4] The data before 1998 comes from a few routes (mostly on Earncleugh Station – the rest of the earlier data is not accessible). The data post 1998 are all from ORC's routes 1 – 16 (see Appendix 1) plus a few of the ORC historic routes

rationale is simply to focus on sites of interest (from ORC or from the landowner) then sample size per se is of interest – the more routes the better.

If ORC was starting anew to select routes it would be ideal to locate routes in some random way, albeit stratified with more routes in the extreme and high proneness classes and fewer in the lower proneness classes of land (Appendix 2). This would allow more robust extrapolation to the sub-regional and regional levels. It is too late now for a fully randomised design as the 'costs' to abandon the current routes outweigh the benefits of statistical purity. Therefore, coverage is the deployment sought.

I recommend some pragmatic 'rules' to add routes to the portfolio.

- The ORC should not abandon any of the current 16 routes it monitors. It should continue with annual counts on the six routes where the spotlight indices are classed as high or moderate. These indices are all above the equivalent MMS indices that would trigger ORC's regulatory interest, and without some active management (or improved efficacy of RHDV) may result in an eruption of rabbits at the site.
- The frequency of counts on the current routes with low indices should be extended initially to biennial counts and then to triennial counts if the indices remain low.
- It makes sense to match some new spotlight routes with the 13 sites where rabbits are currently autopsied and their serological status measured – assuming future serology is practical (see Part B). The four eastern sites (Dunback, Moeraki, Penguin Place and Creighton Park) are candidates. The Moeraki site has had no evidence of RHD judging by the lack of any seropositive animals in 2017 and 2021 (see Part B). It would be interesting to see what effect this absence has had on rabbit numbers.
- Monitoring sites at Moeraki and Penguin Place, in particular, also extends the regional coverage to these eastern coastal areas.
- The eight routes initially counted by ORC but subsequently abandoned should be considered. The routes in the north-east (Enfield to Lone star in Figure 4) would expand the coverage intent of an expanded spotlight monitoring system. The cluster of sites (Jones, Sutton and Lone Star) should be reduced to a single site – unless there are particular reasons why the landowners wish to restart counts on their properties.
- Table 3 and Figure 4 also notes some new routes suggested by ORC staff or myself for consideration.
- New routes should as far as possible be on single land tenures and the route lengths can be flexible, i.e., shorter routes than the current average are acceptable.
- Decisions on the frequency of counts on the historic or new sites can be adaptive and based on the rabbit densities in the first new survey, i.e., the same adaptive way the survey frequencies for the current 16 sites are proposed – annual when the index exceeds about 5 rabbits/km and biennial or triennial if the indices remain at low levels.
- A portfolio of routes of between 25 – 30 routes will give adequate coverage of the region, i.e., the 16 or 17 current routes, 6 or 7 routes that ORC once monitored, and 4 to 6 new routes.

The regional annual average spotlight index reflects (a) the high index in 1990 (and by assumption before that year) that was (b) reduced to low levels by 1994 by the R&LMP, but (c) rapidly increased again until once landowners had to fund control then (d) RHDV arrived in late 1997 and have kept the average index at low to modest levels thereafter (Figure 3). This is strong evidence that RHDV has continued to kill many rabbits and along with whatever conventional control landowners have been conducting has been, on average, a success in Otago.

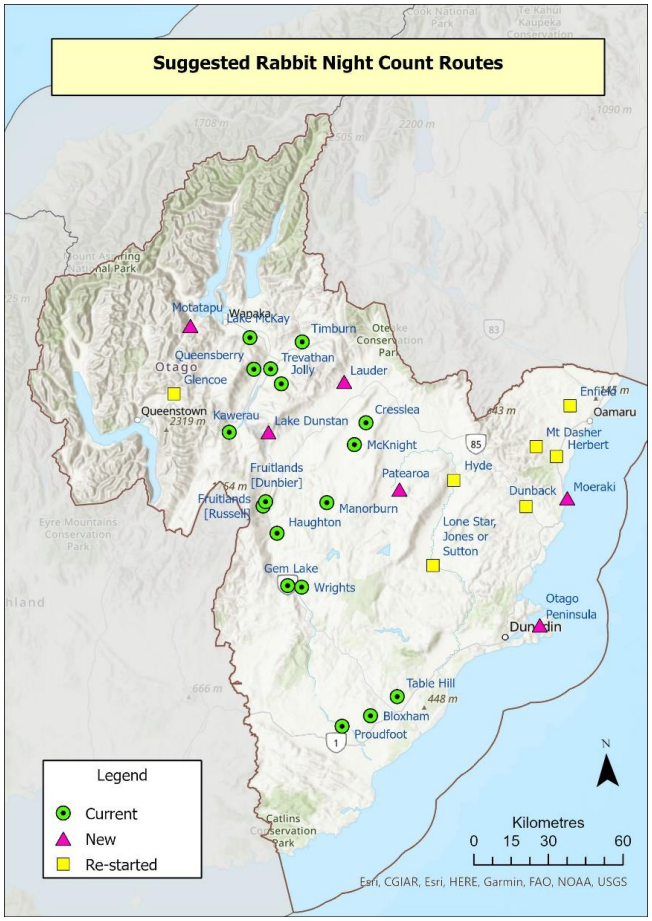


Figure 4: Location of suggested spotlight routes in Otago.

6. New technologies

6.1 Camera traps

Latham et al. (2012) have described a method using fixed cameras to assess changes in rabbit numbers caused by aerial 1080 poison operations in Otago – such operations are now rare. However, the method may be useful to assess annual trends in areas where spotlight routes are difficult to establish (see below). The cameras took a photo when triggered by an infra-

red device when operating at night. This study recommended using at least six cameras and suggested they be deployed for at least five days, in this case before and after the control operation, to obtain adequate power to detect changes. Three indices were used to assess rabbit abundance – number of photos with rabbits per camera, number of rabbit images per camera and number of rabbits per photo. The latter index takes the most time to analyse.

Such a method could also be used to assess annual trends in populations but is likely to detect only large changes in abundance at a site between years. The system would be useful in areas where the standard spotlight routes are difficult to establish, e.g., areas with many smaller properties such as life-style blocks and in peri-urban areas. However, ORC would need to conduct some trials to set the specific protocols – ideally first in areas with current spotlight routes to cross reference results between the two indices.

6.2 Thermal detection systems

There are several tools that could be used to detect and count rabbits along the routes. The simplest would simply use thermal cameras to count the rabbits instead of the current white-light spotlight. Simultaneous counts of rabbits and other small mammals were made from a thermal device (FLIR Scout III 640; the highest resolution camera available in Australia for under A$10,000) and a 100-Watt spotlight in and arid habitat in Australia. The thermal cameras increased the counts of rabbits by 23% (i.e., the sum of the counts by both methods) but did not increase the swath width covered. The authors suggested the lower detection probability from spotlighting was due to the observers missing animals that had no eye-shine (McGregor et al. 2021). Both counts are indices and there seems little to favour the use of one over the other.

The future, however, does hold options for more efficient survey methods using drones. Most trials reported have attempted to count large mammals (dugongs and elephants) in the daytime – so not much relevance to rabbits in New Zealand. So far as I know there has been only one trial reporting on the use of thermal cameras mounted on drones to monitor small mammals at night in New Zealand. Warburton & Gormley (2021) used DJI Matrice Quadricopters with FLIR Tau 2 640 × 412-pixel resolution and 19 mm lens video cameras flown at c.60 m altitude to measure the percent kill of Bennett's wallabies after a 1080 poison operation in the Makenzie Basin. The devices also detected rabbits (B. Warburton, pers. comm.). The results were interesting, but the authors noted they were not confident in identifying the species when reviewing the videos, suggesting higher resolution cameras may be needed. The current costs for drones were about three times those if the cameras were mounted on a small helicopter.

The Department of Conservation has been testing drones with thermal cameras and artificial intelligence systems to analyse the data on rabbits in the Mackenzie Basin. No results have been published. Normal cameras (rather than thermal) might be suitable for flights at dawn and dusk but getting the timing right to account for variable diurnal behaviour of rabbits might require research.

7. Recommendations

- ORC should conduct spotlight counts on a single night on its routes to assess major changes in rabbit densities. If care is taken to select nights with similar weather (no rain, no high winds, maybe least moonlight) as far as possible, the variability between years and sites will be minimised. In practice the rule should be not to conduct counts on the 'worst' nights.
- To achieve a consistent result, ORC should consider using a single contractor to measure its spotlight routes. A tender process that first required evidence of capacity to cover all routes before the price is considered is good practice in major projects. The alternative is to use ORC staff but with training to ensure a standardised method and reporting system.
- The frequency of surveys on routes with low counts should be increased to once every two years initially, or once every three years if numbers remain low, and only increase to annual counts if numbers show a large increase.
- The resources saved by the above reductions in effort could be used to increase the number of spotlight routes to include more lower-prone sites (see section 5).
- In general, the 16 current routes should be continued at annual or biennial frequencies and some pragmatic rules to extend the coverage are suggested in section 5.
- At places where spotlight routes are difficult to establish, trials to test camera trap indices could be established. Peri-urban or life-style blocks are candidate areas. Some of these trials might also be conducted at current spotlight routes (high and low-density sites) to cross-reference the two indices.
- ORC need to collect, curate and store the information on its spotlight routes and the data collected in a central system. Route names, locations and lengths and the spotlight/vehicle systems used need to be consistent.
- A formal protocol for all to follow, i.e., expanding on the NPCA best practice, and training on best practice and record-keeping if several staff (or contractors) are employed to conduct the surveys needs to be in place.
- The data recorded on field sheets, paper copies and electronic databases needs to be capable of cross-validation when required.
- Added value can be achieved by consistently recording other mammal pests seen along the routes.
- The use of aerial survey methods, e.g., using drones, requires considerable research before it can be used as an operational option.

Part B. Serology and trends in immunity to rabbit haemorrhagic disease

1. Objective

To assess the merits of rabbit virology sampling programme as part of a proactive biosecurity strategy.

2. Purpose of autopsy and serology data

The other main rabbit monitoring programme has been to sample rabbits for the presence of antibodies to rabbit haemorrhagic disease to measure the persistence and efficacy of the virus as a biocontrol agent (e.g., Parkes et al. 2002). To interpret the results, the age and sex of the rabbits (at a minimum) must also be collected and matched with the serological data.

This monitoring programme began in 1997 across most regions in eastern New Zealand under the past commitment of regional councils to the original application to import the virus led by ORC. Landcare Research also conducted a few autopsy/serology projects as part of its research programme in Otago and North Canterbury. In recent years only Otago (Table 5, Figure 5) and other eastern councils have continued to sample and test the antibody state of rabbits – up to 2021 in Otago, up to 2019 in Hawke's Bay, up to 2018 in Canterbury and up to 2017 in Marlborough. It is not clear why councils stopped testing but in any event the testing agency (AgResearch) has run out of the reagents required for the ELISA tests and does not seem to be easily able to import new supplies to test for both RHDV1 and RHDV2 variants of the virus.

ORC has autopsied and tested the age-related antibody status of rabbits at about 31 sites since 1997, albeit with much of the data lost (Table 5). Eleven sites (Kawarau/Bannockburn, Dunback, Fruitlands, Bendigo, Merino Downs, Lindis Crossing, Manorburn/Galloway, Gorge Creek, Cresslea, Ardgour and Hillend) have been sampled annually up to about 2001 and thereafter biennially with the last being in 2021. Sampling at the other 20 sites has been more infrequent.

Table 5. Serology sampling in Otago. For the proportions that tested seropositive see section 3. Note: it would be useful if ORC can find the missing serology data and autopsy data.

Year	No. sites sampled	No. samples with any seropositive rabbits	No. rabbits tested	Notes
1997	6	5	321	Most ORC data has no matching serology
1998	10	10	272	Most ORC data has no matching serology
1999	9	9	221	Most ORC data has no matching serology
2000	26	25	692	
2001	21	20	644	Some ORC data has no matching serology
2002	6	6	144	
2003	11	11	307	
2004				None sampled

2005	9	9	257	
2006				None sampled
2007	6	6	159	Some ORC serology data missing
2008				None sampled
2009	9	9	261	
2010				None sampled
2011	10	10	252	
2012				None sampled
2013	13	12	367	
2014				None sampled
2015	11	11	342	
2016	2	2	61	
2017	17	16	464	
2018	13	13	392	Serology data but no autopsy data
2019				
2020				
2021	11	10	314	

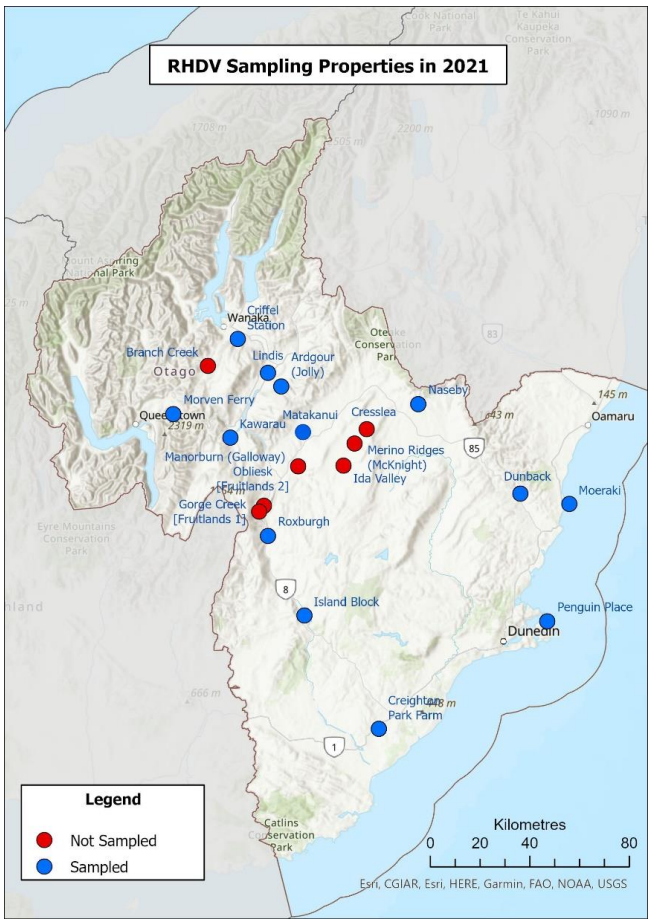


Figure 5. Location of recent ORC sites where rabbits were autopsied and blood sera tested for antibodies to RHDV

3. Background to serology

The antibody and immune status of rabbits sampled (i.e., shot and blood sera tested for antibodies to RHDV1) falls into one of four categories:

- Seropositive (i.e., with antibodies in their blood) indicating they had been challenged with the virus and survived to be shot sometime later. Note: very young rabbits may be seropositive but with maternal antibodies from their mother – thus the ideal sampling season of autumn when there are very few rabbits younger than 9 weeks present.
- Viremic (i.e., with active virus in the blood). This shows as very high reading in the test but there are very few such rabbits sampled as most will die in a few hours.
- Seronegative and susceptible (i.e., with no antibodies in their blood) indicating either the rabbit was never challenged with the virus or see below. Note: very young rabbits are resistant to RHDV and do not seroconvert when challenged orally.
- Seronegative but immune (i.e., with no current antibodies in their blood). Rabbits that survive infection and seroconvert lose their antibodies after several months (Parkes et al. 2002). These animals remain immunised and survive any future challenge.

Thus, sampling during or soon after epidemics give the best indication of the immune status of rabbits that survive the epidemic – generally this period is in autumn. That is, testing in autumn picks up the seropositive animals and minimises the seronegative but immune class.

The rule of thumb as to what is seropositive is the ELISA test gave a percent inhibition of over 50% at the 1:40 dilution (Zheng & Parkes 2011). Therefore, testing at greater dilutions is not essential. Very few rabbits achieved this level before RHDV arrived in spring 1997 (O'Keefe et al. 1998) and the few that did test positive were thought to be evidence of a pre-existing benign calicivirus – since confirmed.

On this point, New Zealand now has four rabbit caliciviruses – the pre-existing benign RCV, the Czech strains of RCDV1 and their descendants released from Australia in 1997, a new version of this strain RHDVa-K5 imported and released in 2018, and a novel calicivirus (Hall et al. 2021) that kills both rabbits and hares RHDV2 that appeared in New Zealand 2018 and may be becoming the dominant strain at least judging by preliminary PCR tests on blowfly carriers of the virus Landcare Research, unpubl. data).

ELISA tests on sera can apparently, by using different reagents imported from Italy, distinguish between the pre-existing benign virus, the RHDV1 strains that have evolved from the 1997 release including the RHDV1-K5 version, and the novel RHDV2 (S. Gupta, pers. comm.). I note the RHDV2 strain in New Zealand is slightly different from similar strains in Australia so the ability of ELISA tests developed in Italy to detect antibodies to the New Zealand strain would need to be confirmed, as would any cross-reactivity in the test results between the various strains.

The seropositive cases in the 2021 Otago sample are indicative that the rabbits had been exposed to RHDV1 or perhaps the RHDV1-K5 virus and survived, but this provides no information on the effect of the new RHDV2 virus – except that the lower proportions of young surviving after challenge, i.e., with antibodies to RHDV1 (Figures 6, 7) implies RHDV2 may have killed some of these young that have evolved resistance to RHDV1.

The first problem is that importing new reagents from Italy is expensive, partly because of the need to keep the reagents on dry ice, a more recent imposition by the airlines. This and the current 'market' for their use in New Zealand being limited increases the cost especially if reagents to test for antibodies to all strains are required, i.e., the current cost of $30/rabbit is likely to increase. The second problem is that understanding the evolving immunity of rabbits via testing for antibodies in surviving animals needs to distinguish between what type of calicivirus was involved. This question seems to require a research project before any operational monitoring is justified as it remains unclear whether RHDV2 overcomes rabbits that have evolved resistance to RHDV1 (as evidenced in Figure 6), or have caught RHDV1 and survived with immunity.

4. Some key results from the ORC serology

There is strong evidence that rabbits were evolving resistance to RHDV1. The proportion of young of the year (i.e., born between May and January (Figure 1) that were shot and tested in February – May, i.e., after evidence of active RHDV epidemics), that were seropositive was increasing up to 2018 (Figure 6). A regression model of the data up to 2018 suggested the annual increase was about 1.55% for all New Zealand (Parkes et al. unpubl. data). While there are gaps in the annual data for Otago (Figure 7), the pattern appears similar.

This increase appears to have halted and declined after 2018 but this is indicated by only two samples from Hawke's Bay (in Figure 6 for 2019) and for Otago (Figures 6 & 7). Nevertheless, the result is interesting as it was after 2018 that the new calicivirus RHDV2 appeared in New Zealand and it is known to be particularly lethal to rabbits (Hall et al. 2021).

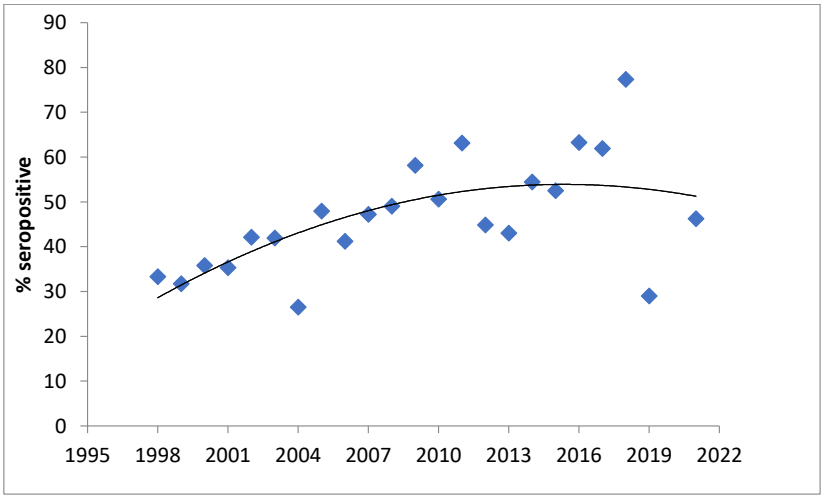


Figure 6: Percent of juvenile rabbits with antibodies to RHDV1, 1998-2021 for all regions in New Zealand

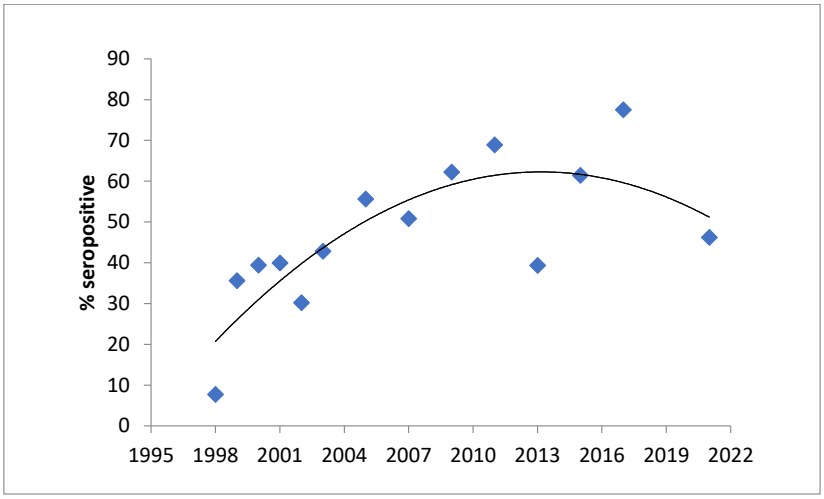


Figure 7: Percent of juvenile rabbits with antibodies to RHDV1 for Otago

A high and increasing proportion of adult rabbits in annual samples that are seropositive is expected (Figure 8). This is simply a reflection of the increasing immunisation of the juveniles during their first epidemic (Figure 6), and an accumulation of older rabbits that pass through with challenge and survive many (annual) epidemics. This figure sends no signal about the evolution of rabbits or the virus.

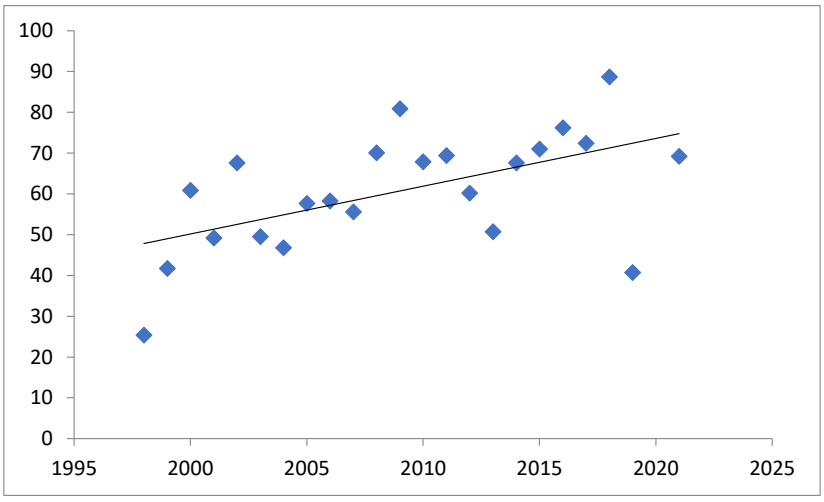


Figure 8: Percent of adult rabbits with antibodies to RHDV1 for all New Zealand regions

5. Recommendations

- Serological testing for RHDV1 antibodies in wild rabbits does not by itself provide information on the efficacy of the biocontrol. Tests for antibodies to both RHDV1 and RHDV2 will be required to interpret the causes of rabbit abundance that relate to the virus.

- A national perspective would be of most value and require cooperation between regional councils and Crown Research Institutes. ORC should initiate a discussion between councils to advance this national approach.
- Sampling is best done in autumn and testing of young rabbits (born since the previous winter) gives the most useful results.
- Given a regional (and cross-council) analysis gives the best results, it is not necessary to obtain large samples from each site – or test them all in the year sampled.
- Irrespective of future serological monitoring, one way to assess the spread of the strains of calicivirus is by looking for the virus itself. PCR tests on dead rabbits or of blowflies is the method being researched to do this (see Landcare Research's current research programme).
- Councils and/or AgResearch should keep past sera samples, particularly those since 2018, to act as baselines if a research project is begun.
- As with spotlight route data, ORC needs to curate and hold its serological data in a central system. It would be worth tracing the lost data and recording results in a consistent way.

Main Conclusions

Spotlight counts provide an objective measure of the abundance of rabbits over time at each site sampled, and with some caution of the annual trends in abundance at a regional level.

Interpreting changes in such indices (cause and effect) is more difficult. Several factors may drive changes in rabbit abundance (the extent of local conventional control, the efficacy of the biocontrol viruses, land-use changes and potentially in the longer-term climate changes). From a practical point of view, only the extent/intensity of conventional control can be managed if spotlight indices show unacceptable population sizes.

The intrinsic rate of increase of rabbits has been estimated at between 1.21 and 2.77 (quoted in Hone 1999), i.e., up to a 16-fold annual increase. Parkes et al. (2008) observed rates of increase in the Mackenzie Basin before RHDV and with no subsidies for landowner control of 0.56 (a finite rate of 1.75 per year). Once RHDV1 arrived, this rate declined to 0.06 (a finite rate of 1.06 per year). The implication is that conventional control does slow the growth of rabbit populations and RHDV1 on top of conventional control has kept many rabbit populations in check (see Figure 3).

Of these potential causes of change in rabbit abundance it appears RHDV1 has been the most important. However, with evolving rabbits and new strains of the virus the importance of the biocontrol might change. Therefore, continuing with serological monitoring (for both RHDV1 and RHDV2) will be desirable to allow future interpretation of measures of rabbit abundance. This is best done at a national scale with all major eastern Regional Councils and in collaboration with research and testing agencies such as Landcare Research and AgResearch. The research process required is:

- Confirm that cELISAs can distinguish between RHDV1 strains and the New Zealand version of RHDV2.
- Confirm that AgResearch can import the necessary reagents to do these tests, and what they will cost.
- Agree on a sampling strategy (autopsy and sera collection) between regional councils to get some national coverage.
- Explore how to integrate the current measures of spread of RHDV2 (from dead rabbits and blowfly PCR tests) done by councils and Landcare Research with the expanded serology.

Some other potential causes of changes in rabbit abundance might be explored by surveying the extent and nature of landowners' conventional control at the spotlight route properties, and noting major land-use changes as they occur along each route.

Acknowledgements

I thank Murray Boardman and ORC staff for helpful comments on drafts of this report, and Dave Hunter of Excell Biosecurity for advice on spotlight counting.

References

Baddeley CJ (1985). Assessments of wild animal abundance. FRI Bulletin No. 106, Forest Research Institute, Christchurch.

Boardman M (2021). Review into rabbit night counts. Unpubl. report to ORC.

Bolton N (2010). Appendix 3. The use of night-vision equipment in pest and predator control. Pp. 61-67. In: Murphy E, Crowell M, Henderson W (eds.). Workshop proceedings: improving efficiency of rabbit eradications on islands. Invasive Animals Cooperative Research Centre, Canberra, Australia.

Caley PA, Morley CG (2002). Assessing growth rates of European rabbit populations using spotlight transect counts. *The Journal of Wildlife Management 66*: 131-137.

Fletcher DJ, Moller H, Clapperton BK (1999). Spotlight counts for assessing abundance of rabbits (*Oryctolagus cuniculus* L.). *Wildlife Research 26*: 609-620.

Frampton C, Warburton B (1994). Methods for monitoring rabbit populations: a review. Landcare Research Contract Report: LC9394/77.

Gibb JA, Williams JM (1994). The rabbit in New Zealand. Pp. 158-204. In: Thompson HV, King CM (eds.). The European rabbit: the history and biology of a successful colonizer. Oxford University Press.

Hall RN, King T, O'Connor T, read AJ, Arrow J, Trought K, Duckworth J, Piper M, Strive T (2021). Age and infectious dose significantly affect disease progression after RHDV2 infection in naïve domestic rabbits. *Viruses 13*: doi.org/10.3390/v13061184.

Hone J (1999). On rate of increase (*r*): patterns of variation in Australian mammals and implications for wildlife management. *Journal of Applied Ecology 36*: 709-718.

Howard WE (1959). The rabbit problem in New Zealand. DSIR Information Series 16.

Kerr IGC, Williams JM, Ross WD, Pollard JM (1986). The classification of land according to degree of rabbit infestation in Central Otago. *Proceedings of the NZ Grasslands Association 48*: 65-70.

Latham ADM, Nugent G, Warburton B (2012). Evaluation of camera traps for monitoring European rabbits before and after control operations in Otago, New Zealand. *Wildlife Research 39*: 621-628.

Latham ADM, Latham MC, Nugent G, Smith J, Warburton B (2016). Refining operational practice for controlling European rabbits on agricultural lands in New Zealand. *PLOS One*. Doi:10.1371/journal.pone.0158078.

McGregor H, Moseby K, Johnson CN, Legge S (2021). Effectiveness of thermal cameras compared to spotlights for counts of arid zone mammals across a range of ambient temperatures. *Australian Mammalogy* doi.org/10.1071/AM20040.

Montague TL, Arulchelvam M (1995). Analysis of rabbit monitoring data (1990 – 1995) and implications for future rabbit monitoring strategies. Landcare Research Contract Report LC9596/38.

Myers K, Gilbert N (1968). Determination of age of wild rabbits in Australia. *Journal of Wildlife Management 32*: 841-849.

Norbury GL, Duckworth JA (2021). *Oryctolagus cuniculus*. Pp. 131-159. In: King CM, Forsyth DM (eds.). The handbook of New Zealand mammals, 3rd edn. CSIRO Publishing, Melbourne.

Norbury G, Heyward R, Parkes J (2002). Short-term ecological effects of rabbit haemorrhagic disease in the short-tussock grasslands of the South Island, New Zealand. *Wildlife Research 29*: 599-604.

Norbury DC, Norbury GL (1996). Short-term effects of rabbit grazing on a degraded short-tussock grassland in central Otago. *New Zealand Journal of Ecology 20*: 285-288.

NPCA (2021). A5: Pest rabbits monitoring and control good practice guidelines. National Pest Control Agencies, Wellington.

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

O'Keefe JS, Tempero JE, Atkinson PH (1998). Sero-epidemiological studies of rabbit calicivirus disease (RCD) in Central Otago rabbit populations in late 1997. Unpubl. AgResearch report.

Parkes JP, Norbury GL, Heyward RP, Sullivan G (2002). Epidemiology of rabbit haemorrhagic disease (RHD) in the South Island, New Zealand, 1997–2001. *Wildlife Research 29*: 543-555.

Parkes JP, Glentworth B, Sullivan G (2008). Changes in immunity to rabbit haemorrhagic disease virus, and in abundance and rates of increase of wild rabbits in Mackenzie Basin, New Zealand. *Wildlife Research 35*: 775-779.

Rosson L (1993). Pest management in Otago. *New Zealand Journal of Zoology 20*: 267-269.

Rouco C, Norbury G, Ramsay D (2014). Kill rates by rabbit hunters before and 16 years after introduction of rabbit haemorrhagic disease in the southern South Island, New Zealand. *Wildlife Research 41*: 136-140.

Scroggie MP, Parkes JP, Norbury G, Reddiex B, Heyward R (2012). Lagomorph and sheep effects on vegetation growth in dry and mesic grasslands in Otago, New Zealand. *Wildlife Research 39*: 721-730.

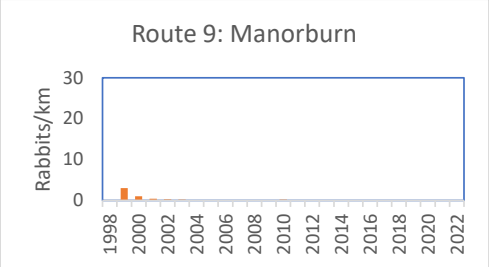
Warburton B, Gormley A (2021). Percentage kill of an aerial 1080 operation against Bennett's wallabies as measured using thermal camera counts from a UAV. Landcare Research Contract report LC4082.

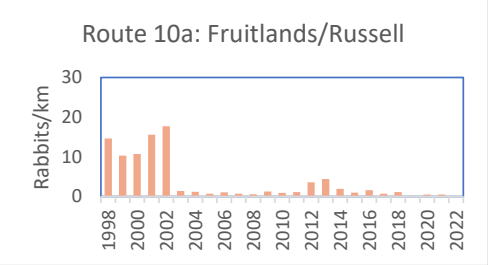
Williams JM, Robson DL (1995). Rabbit ecology and management in the Western Pest Destruction Board. MAF Agricultural Research.

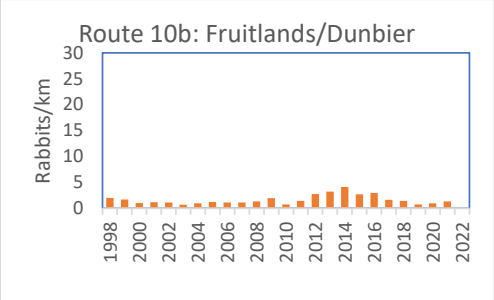
Zheng T, Parkes JP (2011). Rabbit haemorrhagic disease: advantages of cELISA in assessing immunity in with rabbits (*Oryctolagus cuniculus*). *Veterinary Microbiology 153*: 387-392.

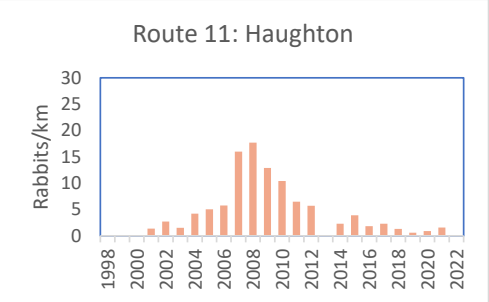
Appendices

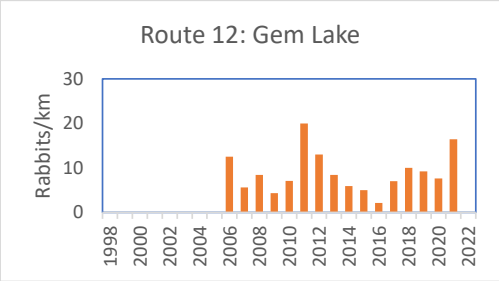
Appendix 1: Rabbit spotlight abundance indices in 17 routes monitored by ORC since 1998. The names are as per Figure 2.

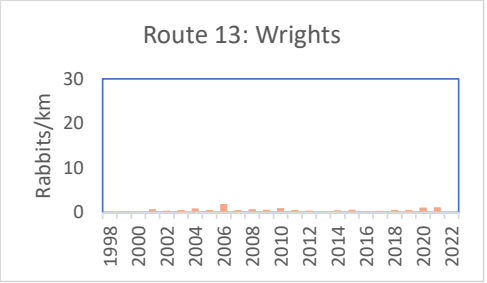

Route 9: Manorburn
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

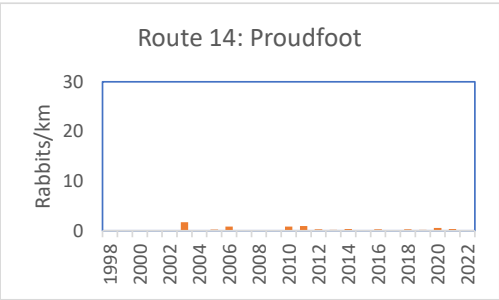

Route 10a: Fruitlands/Russell
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

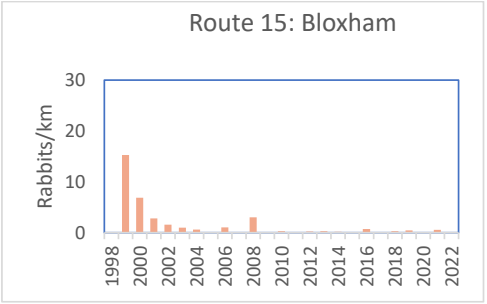

Route 10b: Fruitlands/Dunbier
Rabbits/km
0
5
10
15
20
25
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

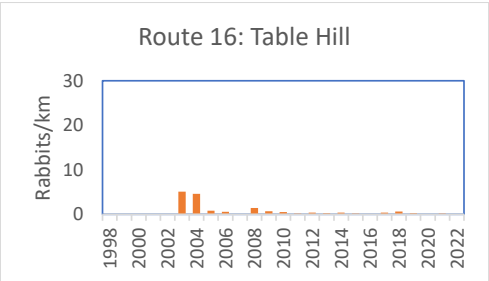

Route 11: Haughton
Rabbits/km
0
5
10
15
20
25
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

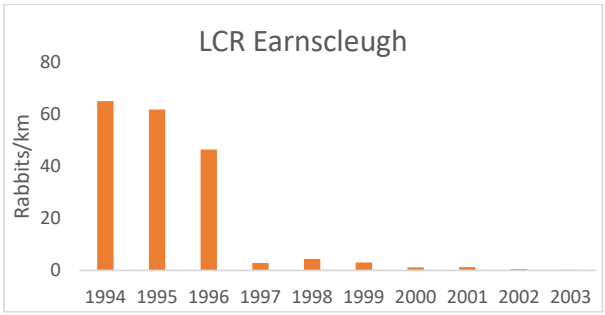

Route 12: Gem Lake
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022


Route 13: Wrights
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

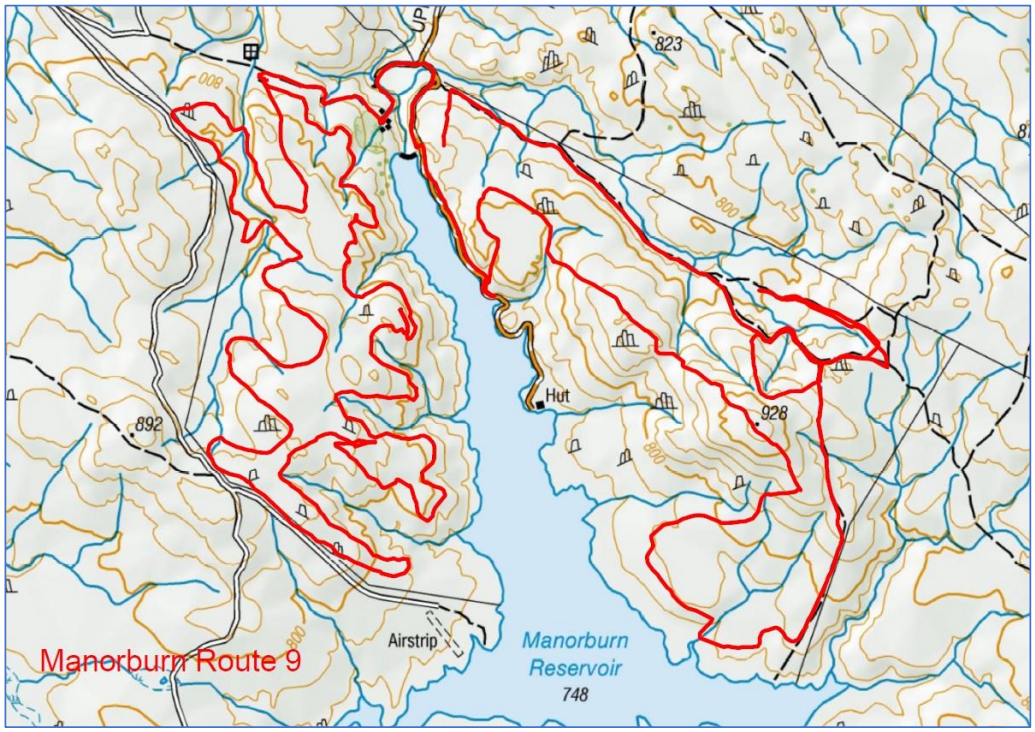

Route 14: Proudfoot
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022


Route 15: Bloxham
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

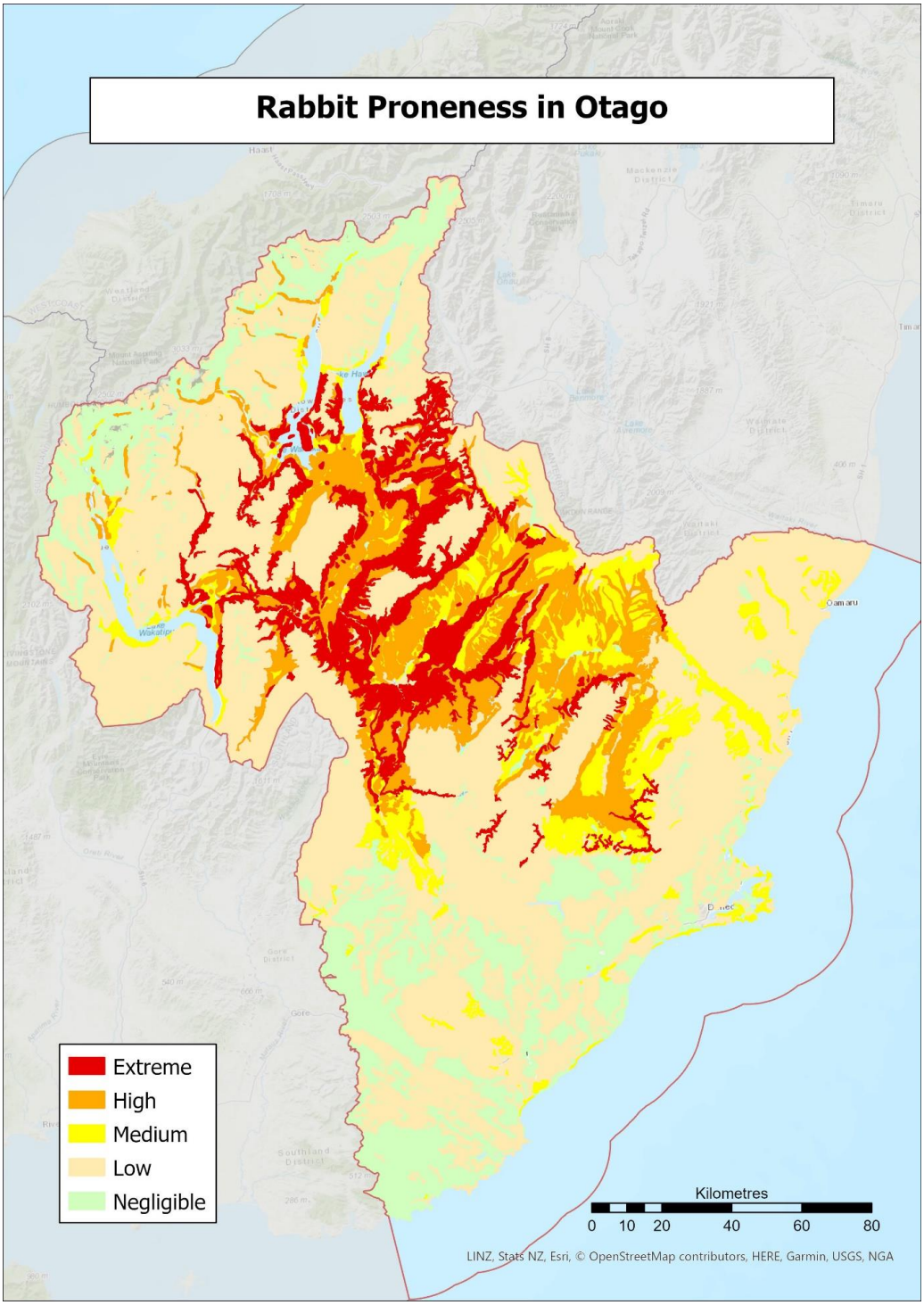

Route 16: Table Hill
Rabbits/km
0
10
20
30
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022



Appendix 2: An example of a mapped route



Appendix 3: Rabbit prone land classes



Action Plan – Rabbit Monitoring & Programme Development

Background: Two reports were commissioned to review ORC's current rabbit monitoring programmes for both rural monitoring and community-led programme areas. This table is a summary of the combined recommendations from *"Monitoring Rabbits in Otago" John Parkes, Kurahaupo Consulting, August 2022 (JP) and "Review of Rabbit Management Initiatives" Hannah Palmer, Place Group Environmental Planning, June 2022 (PG),* information from staff feedback and workshops, and proposed actions with completion dates.

<table>
<tr><th>Summary of Recommendations</th><th>Actions</th><th>Responsibility</th><th>Notes</th></tr>
<tr><td colspan="4">Night Counts and Rabbit Density Monitoring</td></tr>
<tr><td>Night Count Routes
Portfolio of 25-30 routes to provide adequate regional coverage
– 16 current routes (Retain)
– 6-7 routes historical routes that ORC has previously monitored (Re-establish)
– 4-6 new routes (Establish)

All routes should be on single land tenures

Align routes with current serology locations, if possible

Include Moeraki and Otago Peninsula in new routes to provide for better regional coverage (JP)</td><td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Schedule a biosecurity team workshop to decide on proposed night count routes in line with recommendations</td><td>Completed Nov 2022</td></tr>
<tr><td>Confirm proposed night count routes in line with recommendation
• Retain 15 current routes
• Re-establish 2 historic routes
• Establish 14 new routes
• Total: 31 Proposed routes (Appendix 5)</td><td>Completed Dec 2022</td></tr>
<tr><td>Survey all 31 proposed night count routes and confirm they are effective and achievable</td><td>28th Feb 2023</td></tr>
<tr><td>All confirmed routes established, marked, GPS'ed and mapped</td><td>30th April 2023</td></tr>
</table>
</td><td>Biosecurity Delivery Lead – Coastal Otago/ Biosecurity Lead Central Otago/ Biosecurity Specialist</td><td></td></tr>
<tr><td>Ensure routes have landowner support and/or agreements (JP)</td><td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Investigate legal considerations around night count routes on private property and other council agreements/ MOUs with property owners</td><td>Completed Nov 2022</td></tr>
<tr><td>Landowner agreement (based on template supplied by legal team) drafted for feedback at Biosecurity Team workshop (access, route maintenance and Health and Safety requirements addressed)</td><td>Completed Dec 2022</td></tr>
<tr><td>Landowner agreement finalised with feedback</td><td>31st March 2023</td></tr>
<tr><td>Landowner agreement signed by all landowners of new and established night count routes</td><td>31st May 2023</td></tr>
</table>
</td><td>Biosecurity Delivery Lead – Coastal Otago/ Biosecurity Lead Central Otago/ Biosecurity Specialist</td><td></td></tr>
</table>

<table>
<tr>
<td>Frequency of counts should depend on rabbit densities with threshold around 5 rabbits/km (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Agree on annual frequency of routes.
- Annual: median[1] ≥ 5 rabbits/km
- Biennial: median[2] < 5 rabbits/km
- Triennial: maximum[3] < 5 rabbits/km
New or restarted routes will automatically be annual for, at least, the first five years.</td><td>Completed Oct 2022</td></tr>
<tr><td>Following completion of first round of night counts, future frequency determined using 5 rabbits/km threshold</td><td>30th August 2023</td></tr>
</table>
</td>
<td>Performance & Delivery Specialist</td>
<td></td>
</tr>
<tr>
<td>Night counts should be a single night rather than over two successive nights (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>All night count routes during 2023 carried out over single night</td><td>July/ August 2023</td></tr>
</table>
</td>
<td>Biosecurity Delivery Lead – Coastal Otago/ Biosecurity Lead Central Otago</td>
<td></td>
</tr>
<tr>
<td>Improve data collection and management practices
- Too much historical data has been lost which impacts on analysis
- Implement consistency in route names and lengths
- Data has not been regularly analysed once collected (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Names of current routes revised (geographical)</td><td>Completed Jul 2022</td></tr>
<tr><td>Analysis of current night count data (Appendix 6)</td><td>Completed Oct 2022</td></tr>
<tr><td>Biosecurity workshop to provide feedback for development of night count procedure</td><td>Completed Dec 2022</td></tr>
<tr><td>Written procedure developed and finalized</td><td>28th February 2023</td></tr>
<tr><td>GIS layer of all route maps created</td><td>30th June 2023</td></tr>
<tr><td>Implement training programme and quality assurance programme</td><td>30th June 2023</td></tr>
</table>
</td>
<td>Performance & Delivery Specialist/ EI Team Leader/ Biosecurity Specialist</td>
<td></td>
</tr>
<tr>
<td>Potential use of a single contractor to ensure quality outcomes or retain in-house with training to ensure standardised method (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Investigate potential engagement of contractor to undertake annual night counts</td><td>Completed Oct 2022</td></tr>
<tr><td>Investigate feasibility of developing consistent procedures, utilisation of consistent equipment, and upskilling ORC staff to continue to undertake night counts</td><td>Completed Nov 2022</td></tr>
<tr><td>Decision made to implement revised procedures and upskill ORC staff to undertake night count routes and reassess management options after completion</td><td>Completed Dec 2022</td></tr>
<tr><td>Prepare management options following completion of night counts 2023.</td><td>30th September 2023</td></tr>
</table>
</td>
<td>Performance & Delivery Specialist/ EI Team Leader</td>
<td></td>
</tr>
</table>

[1] Median of the five most recent counts
[2] Median of the five most recent counts but at least one count is greater than 5 rabbits/km
[3] Maximum of the five most recent counts (i.e. all last five counts are less than 5 rabbits/km)

<table>
<tr>
<td>Equipment needs to be consistent, e.g. spotlight systems and vehicles (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Audit of current equipment</td><td>28th Feb 2023</td></tr>
<tr><td>Investigation of equipment required based on best practice guidelines completed</td><td>31st Mar 2023</td></tr>
<tr><td>Procurement plan for equipment (if required)</td><td>31st May 2023</td></tr>
</table>
</td>
<td>EI Team Leader/ Biosecurity Delivery Lead – Coastal Otago/ Biosecurity Lead Central Otago</td>
<td></td>
</tr>
<tr>
<td>For peri-urban/life-style blocks, consider the use of trail cameras (JP)

Aerial survey methods (e.g. drones) requires more research (JP)</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Investigate use of thermal systems using photo points for peri-urban programmes [4]</td><td>Completed Nov 2022</td></tr>
<tr><td>Investigate with other Councils and the wider rabbit network, the feasibility of using Modified McLean Scale (MMS) to effectively monitor properties 1-4ha for compliance</td><td>Completed Dec 2022</td></tr>
<tr><td>Thermal imaging system updated for monitoring peri-urban environments</td><td>Completed Dec 2022</td></tr>
<tr><td>Investigate DOC trials of thermal imaging system/ drones in McKenzie Basin</td><td>28th February 2023</td></tr>
<tr><td>Implement peri-urban programme monitoring using thermal system and upskill staff</td><td>31st May 2023</td></tr>
<tr><td>Implement trial for effective use of MMS on properties 1-4ha.</td><td>31st May 2023</td></tr>
</table>
</td>
<td>Biosecurity Specialist</td>
<td>Standard night count procedure is not suitable for peri-urban environments due to smaller property size.

Other Councils have only used MMS on properties >4ha.</td>
</tr>
<tr>
<td>Research new methods for assessing rabbit densities (outside of MMS) in peri-urban and urban areas, and review RPMP rules and operational plan targets in relation to these areas. In the next iteration of the RPMP, inclusion of a rule around rabbit warrens could also be considered.</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Develop a small block assessment tool</td><td>Completed Jun 2022</td></tr>
<tr><td>Network with other Councils regarding monitoring of properties <1ha (small block)</td><td>Completed Nov 2022 communications ongoing</td></tr>
<tr><td>Implement trial for effective use of MMS on properties 1-4ha</td><td>31st May 2023</td></tr>
<tr><td>Trial small block assessment tool</td><td>July 2023</td></tr>
</table>
</td>
<td>EI Team Leader/ Biosecurity Specialist</td>
<td>A Small block assessment tool has been developed by BBS and peer reviewed. To be trailed if MMS trial results for minimum property size of 1-4ha is not sufficient</td>
</tr>
<tr>
<td colspan="4">Inspection and Night Count Monitoring Data Analysis</td>
</tr>
<tr>
<td>Assess inspection data to provide evidence on changes to rabbit prevalence and distribution[5].</td>
<td>
<table>
<tr><th>Action</th><th>Completion Date</th></tr>
<tr><td>Finalise statistical and spatial analysis methods</td><td>June 2023</td></tr>
<tr><td>Regular analysis and reporting of inspection data</td><td>Initiated and Ongoing</td></tr>
</table>
</td>
<td>Performance & Delivery Specialist</td>
<td>Key metrics: 1. percentage of re-inspected properties that have become compliant; 2. change in</td>
</tr>
</table>

[4] Hidden Hills Community Programme Area baseline rabbit population monitoring undertaken using thermal camera and photo points (mapped) July 2022

[5] This section was not covered by the two reports, rather is an integral part of our current regulatory role. It is efficient to utilise inspection data as a form of monitoring effectiveness of implementation.

<table>
<tr><td></td><td></td><td></td><td>average MMS grade over region (and FMU)</td></tr>
<tr><td>Provide insights into the trends from night count for relevant stakeholders</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>Prepare report on night counts for management, council and participating landowners (to 2022)</td><td>Completed Dec 2022 (for review)</td></tr><tr><td>Prepare report on night counts for management, council and participating landowners (>2023)</td><td>Annual</td></tr></table></td><td>Performance & Delivery Specialist</td><td>Analysis of 14 night count routes completed in 2022</td></tr>
<tr><td colspan="4">Virology/ Serology</td></tr>
<tr><td>National co-ordination between Crown Research Institutes & regional councils would provide the most value (JP)</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>ORC to initiate discussion between councils to advance a national approach (MPI)</td><td>Initiated and Ongoing</td></tr></table></td><td>EI Team Leader</td><td>EI Team Leader met with MPI and representatives of councils. Action from MPI within 12 months:
- alignment of MMS
- better guidance on night count data collection consistency
- networking on a national level</td></tr>
<tr><td>Assess the spread of calicivirus by looking for the virus itself (JP)

Develop a regional monitoring and surveillance programme which incorporates serum testing and fly trap monitoring to increase the effectiveness of targeted biocidal RHDV1-K5 releases in semi-rural and difficult to control local rabbit populations. This will also help inform research into anomalies such as Moeraki (PG)</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>Assess feasibility of setting fly traps along selected night count routes (Costs and protocols)</td><td>Completed Dec 2022</td></tr><tr><td>Discuss with Manaaki Whenua PCR tests on dead rabbits or from flies landing on fly traps</td><td>Completed Dec 2022</td></tr><tr><td>Source protocols for use of fly traps for virology monitoring</td><td>Completed Dec 2022</td></tr><tr><td>Trial of Fly traps</td><td>Initiated Dec 2022 (awaiting results from Manaaki Whenua)</td></tr><tr><td>Decide on night count routes suitable for fly trap monitoring</td><td>Completed Dec 2022</td></tr><tr><td>Decision regarding use/ network of fly traps</td><td>31st Jan 2023</td></tr></table></td><td>Biosecurity Specialist</td><td></td></tr>
<tr><td>Better management of serological data (JP)</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>Investigate feasibility of continued collection of serological data</td><td>Completed October 2022</td></tr><tr><td>Collate and analyse historical serological data</td><td>30th June 2024</td></tr></table></td><td>Performance & Delivery Specialist</td><td>Decision made to not continue with collection of serological data unless required for the potential release of a new biocontrol agent in the future (limited</td></tr>
</table>

			availability of reagents; other councils are no longer collecting serological data; costs; immunity data is less relevant than tracking the virus itself)
Undertake further research to increase knowledge of the new RHDV2 strain, including its rate of spread and impacts (JP)	**Action** / Engage with Manaaki Whenua who will be undertaking the research — **Completion Date** / Initiated and Ongoing	Biosecurity Specialist	
Follow up with the Ministry for Primary Industries who were part of the NZRCG, and continue to advocate for the implementation of recommendations from the RHDV1-K5 Importation Lessons Learned paper (PG)	**Action** / Maintain relationship and connection with MPI and Manaaki Whenua[6] — **Completion Date** / Initiated and Ongoing	Biosecurity Specialist	
Investigate the cause of low level of rabbit population knockdown in Moeraki and potential immunity to RHDV1-K5.	**Action** / PCR testing of deceased rabbits for virus — **Completion Date** / Completed Aug 2022	Biosecurity Delivery Lead – Coastal Otago	Manaaki Whenua tested samples collected from two rabbits that showed signs of haemorrhage on autopsy. Both tested negative for all strains of the virus that Manaaki Whenua could test for. Reason for cause of population knock down unknown.
Proneness and Climate Change			
Revise the rabbit proneness map which is 40+ years old (JP) Update the rabbit proneness heatmap to take into account the effects of climate change in the region and to guide conversations around management decisions (PG)	**Action** / Engage external contractor or GIS team to revise and develop rabbit proneness mapping and provision for climate change modelling to inform future decision making — **Completion Date** / 30th June 2023	EI Team Leader/ Biosecurity Specialist	No other councils have up-to-date proneness data

[6] NZRCG has been disestablished

Ensure the operational impacts of climate change on rabbit numbers and management are taken into consideration during annual and long-term plan funding rounds. A reduced control window due to climate change may have significant operational impacts with scheduled control not able to be completed. To ensure all scheduled control can take place in a shortened time frame, increased investment in more staff, training and equipment (e.g. planes modified for rabbit control) will likely be required (PG)	**Action** / **Completion Date** Keep up-to-date with information and research, interrogate relevant modelling, and connect with ORC Internal Climate Change Working Group to ensure relevant knowledge is accessed to inform future programmes. — Initiated and Ongoing	Biosecurity Specialist	
The impact of climate change on control tools, baiting strategies and resourcing for the Otago region, as well as on upcoming rabbit hotspots (PG)	**Action** / **Completion Date** Keep up to date with information and research and interrogate relevant modelling. — Initiated and Ongoing Implement community engagement/ education as needed — As required Provision for climate change modelling in proneness mapping — 30th Jun 2023	Biosecurity Specialist	
Networking and Engagement			
Assess support amongst other Regional Councils for developing a National Business Case for Rabbit Management similar to that undertaken for Wallabies. A key component of the business case should be ensuring adequate funding for research to direct effective rabbit control efforts. This could be led by ORC (PG)	**Action** / **Completion Date** Initiate discussion at national biosecurity working group meeting around rabbits and connect with MPI — Completed Oct 2022 Ongoing	EI Team Leader	Generally rabbits are not a high priority nationally so this would ORC led
Establish/strengthen the research relationship with Australian counterparts to ensure NZ biosecurity staff keep abreast of latest developments in rabbit management (PG)	**Action** / **Completion Date** Initiate discussion with Australian counterparts — Initiated and Ongoing	EI Team Leader	**Regular meetings established** with Jason Wishart (Biosecurity Manager/ Agriculture Victoria) and other Australian counterparts to knowledge share and to increase networking.
Explore the update or re-release of a rabbit management smartphone app similar to *RabbitScan* or *Rabbit Tracker*. This needs to be coupled with funding to allow sufficient publicity of the app to ensure its uptake (PG)	**On hold – low priority**		

Revise communication and engagement strategies to take account of latest developments in behaviour change research. Also ensure that operational plan targets, the rationale for the RPMP programme, and how well the region is progressing towards rabbit management targets is communicated to and understood by the public. In addition, if adopting strip sowing of aerial 1080 as best practice, communication and engagement strategies should consider addressing reasons for low uptake by landholders and operators.	**Action**: Community engagement **Completion Date**: Initiated and Ongoing	Community Coordinator – Biosecurity/ Communications	
Strategy & Management			
Establish a rabbit management programme within the Council which oversees the implementation of the following recommendations (including BAU) (PG)	**Action**: Development underway, but will need formalisation after actions undertaken **Completion Date**: 31st January 2024 (Draft programme available)	Principal Advisor – EI/ Biosecurity Specialist	
Consider establishing a dedicated role within the ORC biosecurity team to solely focus on rabbit management (PG)		EI Manager/ Principal Advisor - EI	Two Community Co-ordinator – Biosecurity roles filled to manage community-led rabbit programme and support education/ advocacy and community behaviour change
Meet with ORC policy staff to: - Ensure that implications of RMA policy on biosecurity are taken into account when providing submissions and feedback on these processes - Review the recently released draft Waitaki District Plan and formulate a position for submission on this plan - Get assistance in establishing a regular forum with regional and district RMA planners to raise awareness of biosecurity and discuss challenges and opportunities relating to rabbit management - Work up a standard set of resource consent conditions in relation to rabbit management that could be applied to subdivision consents, and	**Action**: Engage with ORC policy staff **Completion Date**: Completed July 2022 **Action**: Progress engagement with TAs **Completion Date**: To be progressed in line with other priorities	Principal Advisor – EI/ Community Coordinator – Biosecurity	

<table>
<tr><td>share these with District Council planners in the region (PG)</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Control Methods & Operations</td></tr>
<tr><td>Consider adopting aerial strip sowing of 1080 across large areas of uniform terrain as best practice (PG)</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>Remain up-to-date with relevant control methods and communicate them via our Pest Hub</td><td>Initiated and Ongoing</td></tr></table></td><td>Biosecurity Specialist/ Communications</td><td>ORC does not undertake direct control</td></tr>
<tr><td>Assess with Manaaki Whenua the feasibility and potential advantages/disadvantages of re-releasing the 95 MacKenzie Basin strain of RHDV, including the relevant approval process that would need to be followed (PG)</td><td><table><tr><th>Action</th><th>Completion Date</th></tr><tr><td>Establish and maintain relationship with Manaaki Whenua</td><td>Completed Oct 2022 and Ongoing</td></tr></table></td><td>Biosecurity Specialist</td><td>Manaaki Whenua advised no releases of new biocontrol agents or re-releases planned - To be reviewed depending on availability</td></tr>
</table>

Trend Analysis of Rabbit Night Count Routes (2006-2022)

Prepared by Dr Murray Boardman, Performance and Delivery Specialist, Environmental Implementation

Introduction

[1] Monitoring of rabbit populations has three key purposes. Firstly, under a control programme, to estimate percent kill after control has been implemented. Secondly, to provide assessment of rabbit population trends. Finally, to assess whether a population threshold has been reached.

[2] There are two primary methods of rabbit monitoring

a. Compliance inspections: This is a method to assess the prevalence of rabbits using the Modified McLean Rabbit Infestation Scale 2012, typically referred to as the 'Modified McLean Scale' (MMS). The MMS is well suited to determine whether a population threshold has been reached. Due to this it is an effective means for rules-based applications. While the MMS can provide complementary data for trend analysis, it is not linearly related to rabbit population density.
b. Night counts: These provide an assessment of trends in the rabbit population and the kill rate after a control programme. However, they are limited in assessing whether a threshold has been reached. While trend monitoring using night counts provides a more sensitive measure, it is also more resource heavy than using the MMS.

[3] This report focuses on the night count analysis, with specific emphasis on trend analysis.

Field Method

[4] The specific methodology of night counts is outlined in NPCA (2012)[1]. Key aspects are:

a. As the name infers, night counts are undertaken at night when rabbits are more likely to be outside their burrows, normally in the first three hours of darkness.
b. Routes are monitored over the winter/spring to provide an understanding of baseline numbers prior to the main breeding season.
c. Routes are predetermined and representative of both the rabbit population and the habitat. Routes are divided into 1 kilometre sections to aid counting.
d. Typically, night counts are done from a moving vehicle (e.g. motorcycle) however, counts can be done by foot when terrain is difficult.
e. Rabbits are observed at night using a spotlight to sweep across the predetermined route. Count numbers and other relevant details are recorded on the field card.
f. Counts are done in weather conditions that favour rabbit feeding or general rabbit activity. Counts are avoided during snow and heavy rain to prevent underestimation of prevalence.

[5] For this analysis period, 17 night counts were regularly used in Otago (Figure 1).[2]

[1] NPCA. (2012). Pest rabbits: monitoring and control good practice guidelines. National Pest Control Agencies, Wellington, New Zealand

[2] Historically, the number of routes has exceeded 30 but much of the raw data has been lost over the years.

[6] Counts are normally conducted over two nights. These are normally successive nights, however sometimes the second night may be non-successive (e.g. weather delays).

[7] Data from the field cards are transferred to a spreadsheet for analysis.

Limitations

[8] Route lengths are not always consistent, especially for historical routes (i.e. pre-2012). More recently, routes are divided into smaller sections to aid counting with section lengths being, approximately, one kilometre (NPCA, 2012). However, this practice is likely to have been variable for historic routes. For consistency, the one-kilometre sector length has also been adopted for historical counts. The key implication of this decision is that it will, most likely, overestimate the historical rabbit densities.

[9] Data quality has been a challenge in the past. Some field cards (including scans) from the past cannot be located and presumed lost. Overall, some 41% of data has missing cards since 2006, hence the analysis can only rely on electronic data. When cards are missing, it is not possible to verify the electronic data. Due to this, the available electronic data has been treated as being representative of the survey undertaken.

[10] Furthermore, some data are missing (12.5%) between 2006-22. This happens when:

a. field cards and electronic data were not available for the route/year
b. routes were not counted for various reasons (e.g. weather, Covid, operational decisions)

[11] Due to these limitations, the analysis should be treated pragmatically rather than being an absolute assessment.

Analysis

[12] The analysis was taken from 2006 until 2022, as this provided the most consistent data for trend analysis to allow for a comparison between routes.

[13] To be included in the analysis, a minimum data criterion of 10 years was applied. These did not need to be consecutive years.

[14] For annual analysis requirements, the nominal date being set at 1-Sept each year (as the majority of night counts are undertaken in winter/spring).

[15] Trend analysis was undertaken using Time Trends Software[3] employing the Mann-Kendall and Sen Slope tests.

[3] https://www.jowettconsulting.co.nz/home/time-1

Discussion

[16] Overall, rabbit night counts are variable in both trend direction and trend confidence. Eight routes (47%) show a decrease in rabbit densities, while there is a spread in how much confidence that can be applied to each trend.

[17] Five routes (29%) show they are likely to have average baseline rabbit densities greater than the Regional Pest Management Plan rules.

[18] Broadly, the routes with increasing numbers are located at the northern end of Lake Dunstan, through Queensberry and Luggate. The routes with decreasing numbers are more likely in South Otago, Ida Valley and the mid Clutha Valley. However, there are pockets where rabbit densities vary from the surrounding area (e.g. Ettrick). This could be to be related to different approaches in control practices.

Route Locations[4]

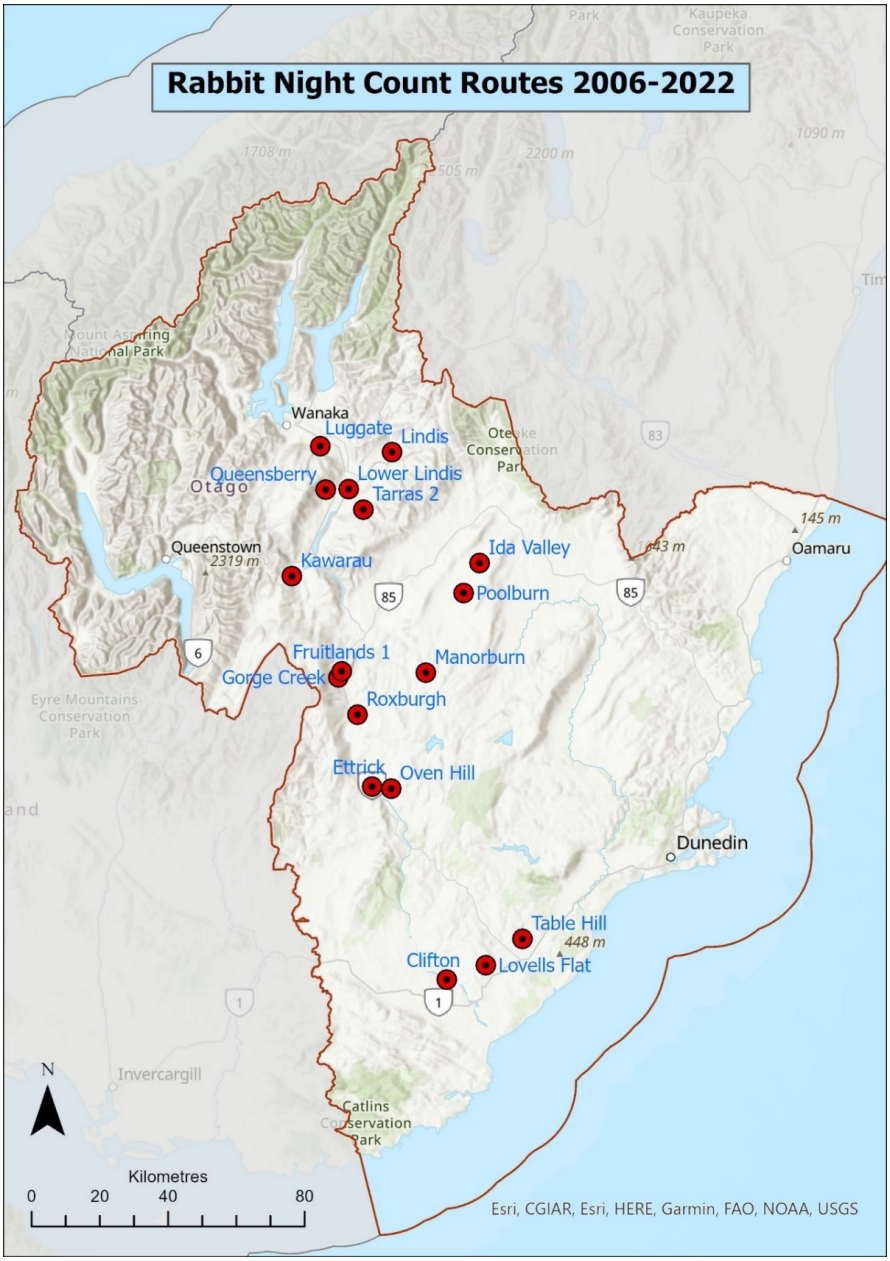
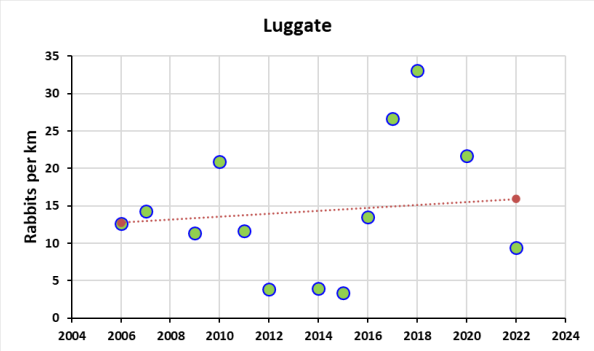


Figure 1: Night Count Routes in Otago 2006-22

[4] In December 2022, it was agreed that all routes (current and new) would be named after a geographical feature or locality. This was to ensure consistency in naming and to ensure privacy of route properties. Consequently, the route names listed in earlier publications may differ from those used after December 2022.

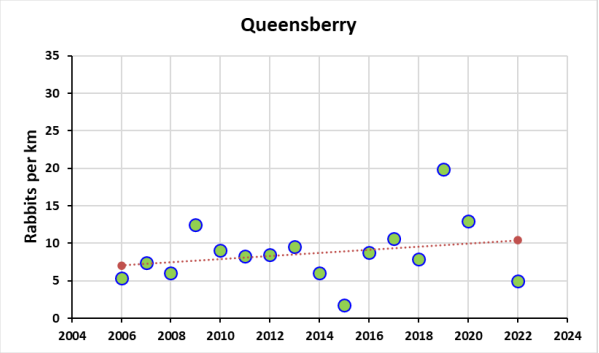
Graphs and Key Statistics of Rabbit Night Count Routes



Period: 2006-2022
Sample Size: 13
Average: 14.3 rabbits per km
Equivalent MMS from Average: 4-5

Night count route is likely to have an average rabbit density ***greater than RPMP rules***

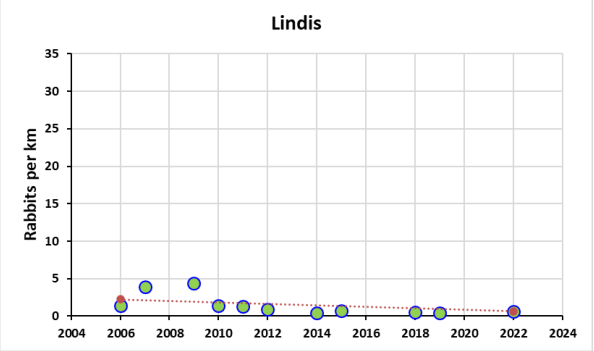
Median annual slope:[5] 0.20
Trend Confidence: Increasing trend about as likely as not (probability = 0.66)



Period: 2006-2022
Sample Size: 16
Average: 8.7 rabbits per km
Equivalent MMS from Average: 4

Night count route is likely to have an average rabbit density ***greater than RPMP rules***

Median annual slope: 0.21
Trend Confidence: Increasing trend possible (probability = 0.84)

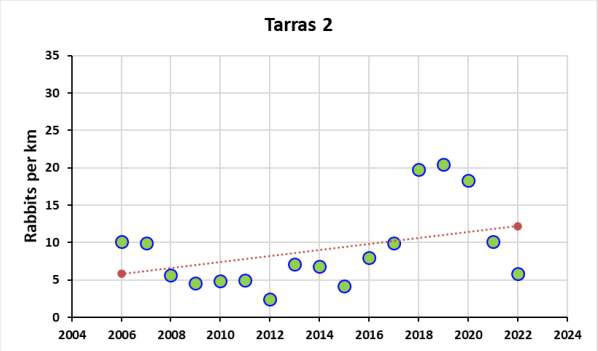


Period: 2006-2022
Sample Size: 11
Average: 1.5 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

Median annual slope: -0.10
Trend Confidence: Decreasing trend virtually certain (probability = 1.00)

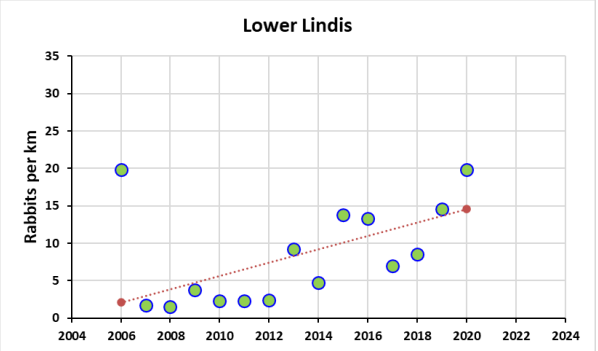
[5] Note: Trendline is based on median annual slope (Mann-Kendall and Sen) and not linear regression.



Period: 2006-2022
Sample Size: 17
Average: 9.0 rabbits per km
Equivalent MMS from Average: 4

Night count route is likely to have an average rabbit density ***greater than RPMP rules***

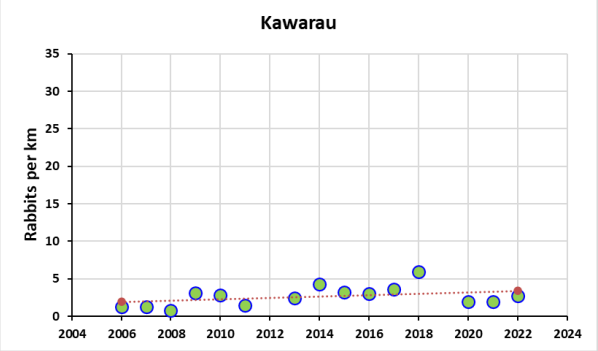
Median annual slope: 0.40
Trend Confidence: Increasing trend possible (probability = 0.92)



Period: 2006-2020
Sample Size: 13
Average: 8.3 rabbits per km
Equivalent MMS from Average: 4

Night count route is likely to have an average rabbit density ***greater than RPMP rules***

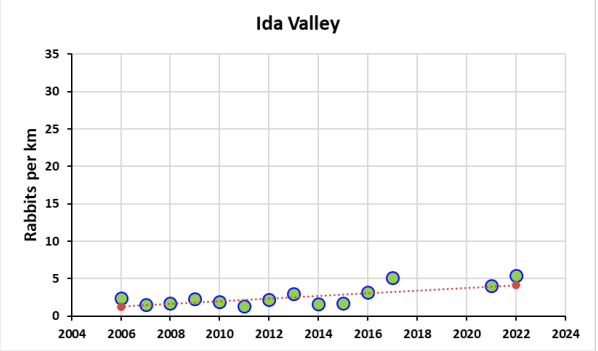
Median annual slope: 0.89
Trend Confidence: Increasing trend very likely (probability = 0.99)



Period: 2006-2022
Sample Size: 15
Average: 2.7 rabbits per km
Equivalent MMS from Average: 2-3

Night count route is likely to have an average rabbit density ***less than RPMP rules***

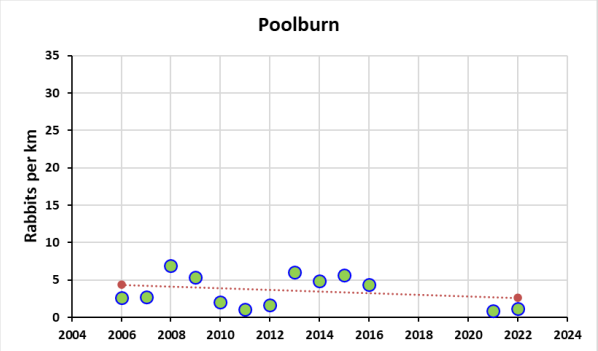
Median annual slope: 0.09
Trend Confidence: Increasing trend possible (probability = 0.95)



Period: 2006-2022
Sample Size: 14
Average: 2.7 rabbits per km
Equivalent MMS from Average: 2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

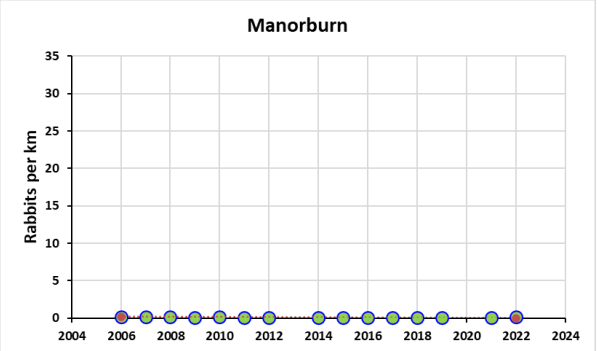
Median annual slope: 0.18
Trend Confidence: Increasing trend very likely (probability = 0.99)



Period: 2006-2022
Sample Size: 13
Average: 3.5 rabbits per km
Equivalent MMS from Average: 2-3

Night count route is likely to have an average rabbit density ***less than RPMP rules***

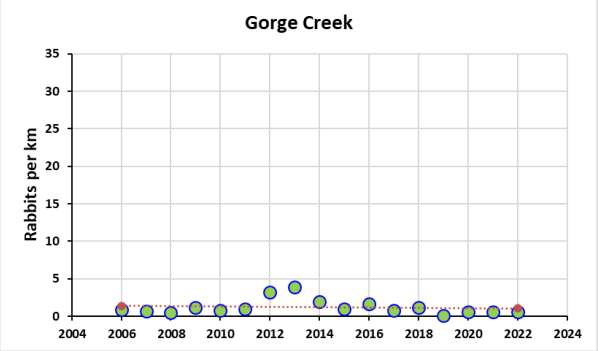
Median annual slope: -0.11
Trend Confidence: Decreasing trend possible (probability = 0.86)



Period: 2006-2022
Sample Size: 15
Average: 0.1 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

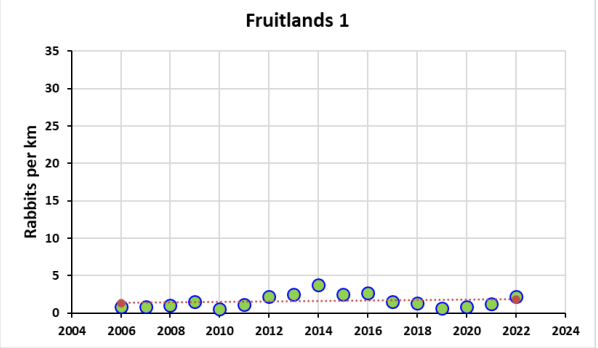
Median annual slope: -0.01
Trend Confidence: Decreasing trend very likely (probability = 0.99)



Period: 2006-2022
Sample Size: 17
Average: 1.2 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

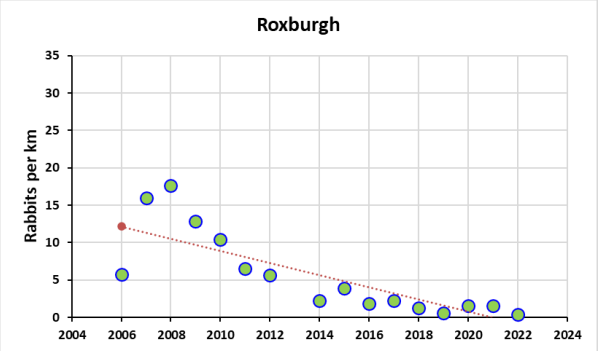
Median annual slope: -0.02
Trend Confidence: Decreasing trend possible (probability = 0.84)



Period: 2006-2022
Sample Size: 17
Average: 1.6 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

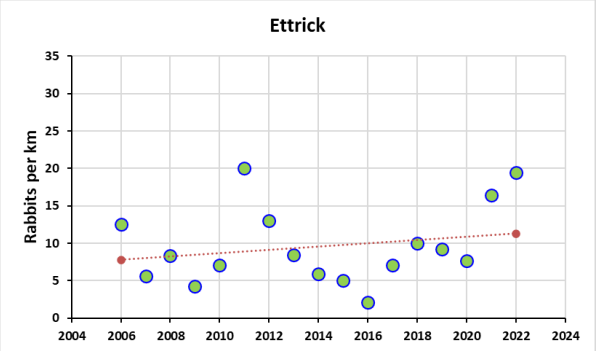
Median annual slope: 0.03
Trend Confidence: Increasing trend about as likely as not (probability = 0.81)



Period: 2006-2022
Sample Size: 16
Average: 5.7 rabbits per km
Equivalent MMS from Average: 2-3

Night count route is likely to have an average rabbit density ***less than RPMP rules***

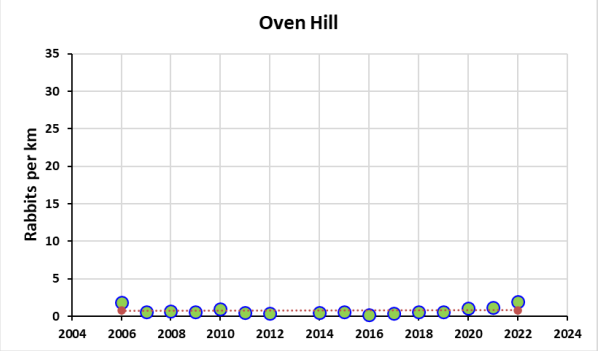
Median annual slope: -0.81%
Trend Confidence: Decreasing trend virtually certain (p = 1.00)



Period: 2006-2022
Sample Size: 17
Average: 9.5 rabbits per km
Equivalent MMS from Average: 4

Night count route is likely to have an average rabbit density ***greater than RPMP rules***

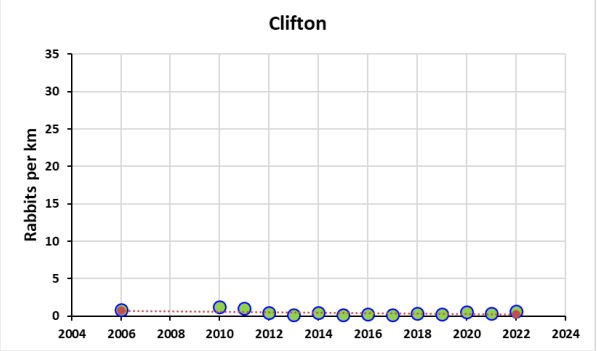
Median annual slope: 0.22
Trend Confidence: Increasing trend about as likely as not (probability = 0.81)



Period: 2006-2022
Sample Size: 16
Average: 0.8 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

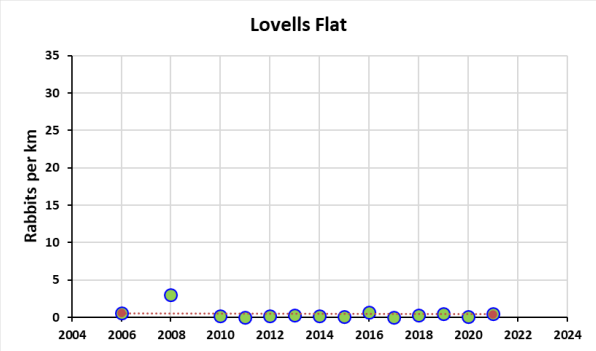
Median annual slope: 0.00
Trend Confidence: Trend unlikely (probability = 0.61)



Period: 2006-2022
Sample Size: 14
Average: 0.5 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

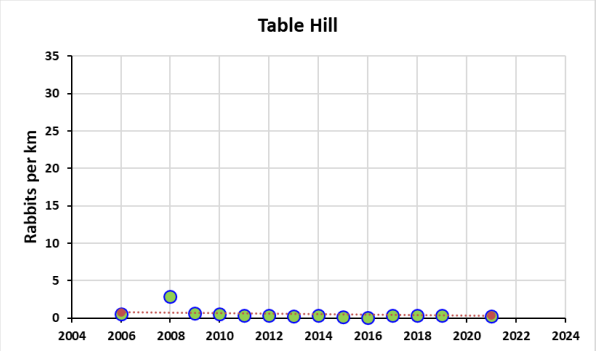
Median annual slope: -0.03%
Trend Confidence: Decreasing trend possible (probability = 0.84)



Period: 2006-2021
Sample Size: 14
Average: 0.5 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

Median annual slope: -0.01
Trend Confidence: Decreasing trend about as likely as not (probability = 0.73)



Period: 2006-2021
Sample Size: 14
Average: 0.5 rabbits per km
Equivalent MMS from Average: 1-2

Night count route is likely to have an average rabbit density ***less than RPMP rules***

Median annual slope: -0.03
Trend Confidence: Decreasing trend very likely (probability = 0.99)

5.2. National Wilding Conifer Control Programme

Prepared for:	Environmental Implementation Comm
Report No.	OPS2261
Activity:	Governance Report
Author:	Gavin Udy, Project Delivery Specialist National Programmes; Libby Caldwell Manager Environmental Implementation
Endorsed by:	Gavin Palmer, General Manager Operations
Date:	2 February 2023

PURPOSE

[1] To update Council on central government's funding of the National Wilding Conifer Control Programme (NWCCP).

EXECUTIVE SUMMARY

[2] Wilding conifers pose a serious pest issue in New Zealand which, if left uncontrolled, will spread and out-compete native plants, reduce native animal habitat, reduce water yield, limit productive land use, increase wildfire risk and permanently alter landscapes. The negative impacts of wilding conifer infestation and spread if left uncontrolled have been well documented[8,9] by the Ministry for Primary Industries (MPI) and the NWCCP.

[3] The NWCCP was established by MPI in 2016 and aims to prevent the spread of wilding conifers and progressively remove these pest species from vulnerable landscapes within New Zealand. Regional councils deliver wilding conifer control on behalf of MPI.

[4] MPI and the ORC are parties to a funding agreement in relation to the NWCCP for Otago. The Agreement records the terms on which MPI will distribute funding to ORC for operations during 2020-2024, and the terms on which ORC will apply the funding and ensure that activities are carried out (by either itself or through others), in each case, for the purpose of the NWCCP.

[5] The NWCCP has been a highly successful example of a nationally coordinated partnership approach delivered jointly by central and local government with the goals of collaboratively preventing the spread of wilding conifers and efficiently containing or eradicating established areas by 2030.

[6] Since 2020 a total of 114 jobs have been created and 184,160 hectares of wilding conifers cleared in Otago through the investment made by the NWCCP, ORC, programme partners[10] and landowners.

[8] Ministry for Primary Industries. (2014). The right tree in the right place: New Zealand Wilding Conifer Management Strategy 2015–2030.
[9] Wyatt, S. (2018). Benefits and Costs of the Wilding Pine Management Programme Phase 2, Ministry for Primary Industries (Sapere Research Group*)*

[10] Central and local government, and community groups,

[7] MPI has advised that the total annual budget for the NWCCP will become $10 million, inclusive with an indicative operational budget of approximately $8 million from 2023/24 onwards. This is a significant reduction in funding compared to the past three years where $22.5 million was provided for the 2022/23 financial year. Consequently, MPI will not be able to maintain the current control programme required to meet all outcomes in the New Zealand Wilding Conifer Management National Strategy (National Strategy).

[8] MPI have indicated the total annual budget of $10 million for the NWCCP will continue until at least 30 June 2026, with approximately $8 million available for operations annually. The level of national funding from 1 July 2026 onwards is currently unclear. The baseline operational funding proposed by MPI is insufficient to maintain the gains and progressively contain wilding conifers across New Zealand.

[9] To maintain the gains made through the NWCCP in Otago, operational funding of approximately $2 million is required in the 2023/24 financial year.

[10] The indicative allocation from the NWCCP for operations in Otago for the 2023/34 financial year is $1,070,000. This amount is less than was originally expected when the programme commenced where the amount for the 2023/24 financial year was expected to be $1,969,855. The level of NWCCP funding for Otago for outyears has yet to be determined by MPI.

[11] In Otago, based on the current understanding of investment requirements, there is a shortfall in funding of $900,000 for the 2023/24 financial year to be able to maintain the gains and continue to progressively contain wilding conifers. Further work is underway to identify the funding needs for future years.

[12] Without continued investment and intervention, achieving long term sustainable wilding conifer for the region is not attainable. Wilding conifers will re-invade cleared areas and continue to spread across vulnerable parts of Otago.

RECOMMENDATION

That the Environmental Implementation Committee:

1) ***Notes** this report.*
2) ***Notes** the significant reduction in National Wilding Conifer Control Programme funding from 2023-24 onwards.*
3) ***Endorses** ORC's support of Te Uru Kahika in advocacy for continued central government funding of the National Wilding Conifer Control Programme.*

BACKGROUND

[13] Wilding conifers pose a serious pest issue in New Zealand which, if left uncontrolled, will spread and out-compete native plants, reduce native animal habitat, reduce water yield, limit productive land use, increase wildfire risk and permanently alter landscapes. The negative impacts of wilding conifer infestation and spread if left uncontrolled have been well documented by the MPI.

[14] In 2014/15 MPI led the development of a New Zealand Wilding Conifer Management Strategy (National Strategy). This was developed with a cross-sector working group which included regional councils alongside the Department of Conservation, Land Information New Zealand, Federated Farmers, New Zealand Defence Force, Scion Research, district

councils, the New Zealand Forest Owners Association, and others including community groups.

[15] The National Strategy was developed in response to a 2011 report[11] by Pacific Eco-Logic Ltd which identified that despite the collective efforts of central government, local government and land holders, wilding conifers were still spreading at an accelerating rate of more than 5% each year. If left unchecked, these trees would cover 20% of New Zealand by 2030[12].

[16] The National Strategy has the aim to 1) collaboratively prevent the spread of wilding conifers and 2) efficiently contain or eradicate established areas of wilding conifers by 2030. The National Strategy provides the platform and strategic direction for the NWCCP.

[17] The National Wilding Conifer Control Programme (NWCCP) was established by the MPI in 2016 and aims to prevent the spread of wilding conifers and progressively remove these pest species from vulnerable landscapes within New Zealand. Regional councils deliver wilding conifer control on behalf of MPI.

[18] MPI and ORC are currently parties to a funding agreement in relation to the NWCCP. The Agreement records the terms on which MPI will distribute funding to ORC for operations during 2020-2024, and the terms on which ORC will apply the funding and ensure that activities are carried out (by either itself or through others), in each case, for the purpose of the NWCCP.

[19] The NWCCP has been a highly successful example of a nationally coordinated partnership approach delivered jointly by central and local government with the goals of collaboratively preventing the spread of wilding conifers and efficiently containing or eradicating established areas by 2030.

[20] Since 2020 a total 114 jobs have been created and 184,160 hectares of wilding conifers cleared in Otago through the investment made by the NWCCP, ORC, programme partners[13] and landowners. The annual investment secured since 2020 is shown in **Figure 1** and total investment share in **Figure 2**. It is noted that the investment secured for 2023/24 is indicative and is subject to change from MPI.

[11] Froude, V.A. 2011. Wilding conifers in New Zealand: Beyond the Status Report, Pacific Eco-Logic Ltd (December 2011)
[12] https://www.wildingpines.nz/about-wilding-pines/national-strategy/
[13] Central and local government, and community groups,

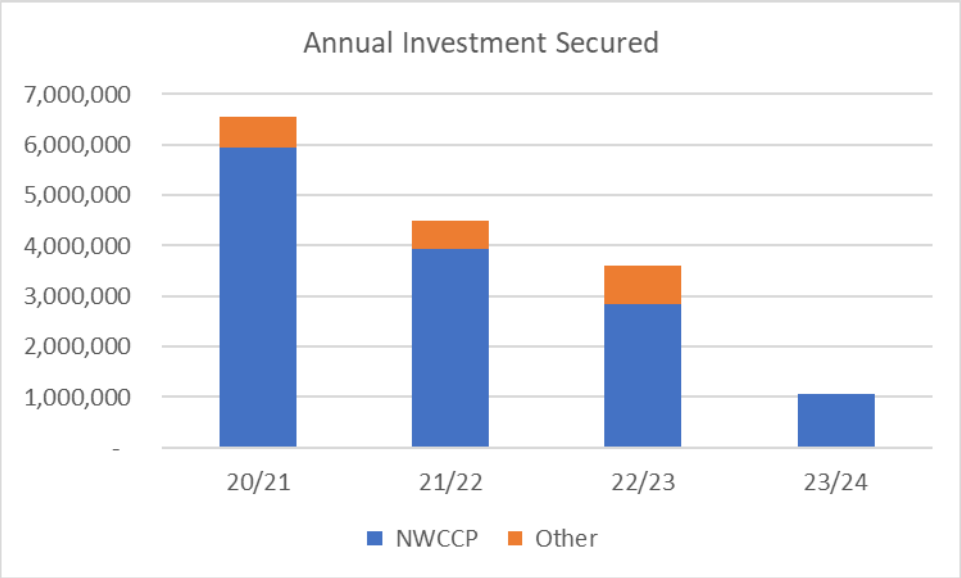


Figure 1 Annual investment secured to control wilding conifers in Otago since 2020

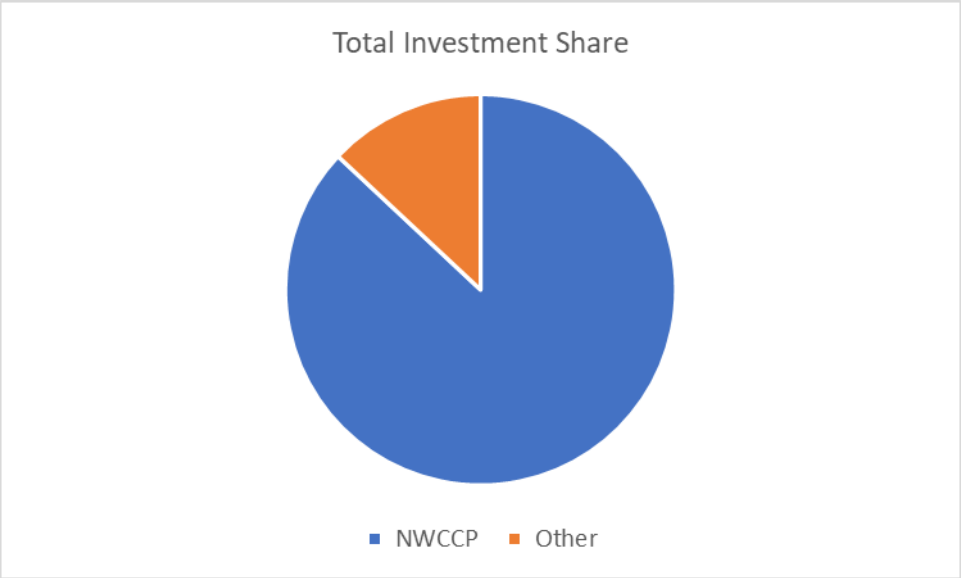


Figure 2 Total investment share in wilding conifer control in Otago since 2020

[21] From 2020/21 the NWCCP has provided $12.7M of funding under the Jobs for Nature Programme towards wilding conifer control in Otago. Programme partners and landowners have contributed a further $1.9 million towards control and maintenance work in addition to the NWCCP funding received. Table 1 shows the proposed and actual funding received for controlling conifers from the NWCCP, and the indicative funding for the 2023/24 financial year.

Table 1. Indicative and Actual NWCCP Funding for Otago 2020-2024

Location (MU)		Proposed[14]	Actual	Indicative	Subtotal

[14] Funding levels proposed in 2020 for the four-year programme.

2020/2021 (Y1)		$5,901,729	$5,939,810	-	$5,939,810
2021/2022 (Y2)		$3,803,455	$3,943,455	-	$3,943,455
2022/2023 (Y3)		$2,398,450	$2,852,458	-	$2,852,458
2023/2024 (Y4)		$1,969,855	-	$1,070,000	$1,070,000
Total (2020-24)		$14,073,489	$12,735,723	$1,070,000	$13,805,723

[22] To maintain the gains made through the NWCCP in Otago approximately $2 million is required in the 2023/24 financial year, as originally proposed, and shown in Table 1.

[23] Indicative regional funding proposed by MPI for 2023/24 is set out below in Table 2. This is based on the level of NWCCP funding received by each region since 2016 i.e., pro-rata.

Table 2. Indicative NWCCP regional funding for 2023/24

Region	Pro-rata funding
Northland	250,000
Bay of Plenty	90,000
Waikato	96,000
Horizons	384,000
Marlborough	1,080,000
Tasman	190,000
Canterbury	3,580,000
Otago	1,070,000
Southland	760,000
Total	**7,500,000**

DISCUSSION

[24] MPI has advised that the total annual budget for the NWCCP will become $10 million, inclusive of an indicative operational budget of approximately $8 million from 2023/24 onwards. This is a significant reduction in funding compared to the past three years and means MPI will not be able to maintain the current control programme required to meet all outcomes in the National Strategy.

[25] MPI have indicated that annual funding of $10 million for the NWCCP will continue until at least 30 June 2026. The level of funding from 1 July 2026 onwards is currently unclear.

[26] **Figure 3** and **Figure 4** below show maps of active management units across New Zealand. These maps show where funding has been provided for wilding conifer control through the NWCCP. This current financial year there is 22.5 million of NWCCP funding allocated to operations. MPI's reduction in funding to $8 million will reduce the amount of control work and maintenance that is undertaken.

[27] **Figure 5** below shows the Otago region split into management units and shows which management units are active with control work being undertaken.

[28] The indicative operational budget for Otago for the 2023/24 financial year is $1,070,000. The level of NWCCP funding for Otago for outyears has yet to be determined.

[29] For the 2021-31 Long Term Plan it was assumed that $1,970,000 was to be allocated to wilding conifer control and maintenance work and this was included in the budgets for the 2023/24 financial year. A reduction in budgets for this work means that less work will be delivered.

[30] To maintain the gains already made through the NWCCP in Otago approximately $2,000,000 is required in 2023/24, as originally proposed, and detailed in Table 1 above.

[31] The baseline funding proposed is insufficient to maintain the gains and progressively contain wilding conifers across New Zealand.

[32] With the proposed funding from the NWCCP from MPI being reduced, there will be a loss of experienced and qualified workforce in the wilding conifer space as the industry will need to readjust the type of work they deliver, meaning that skillsets will be lost.

[33] MPI have advised that with the funding reduction no Community Partnership Projects will be funded and therefore any gains made in this space will be lost. Otago currently has two Community Partnership Projects – the Kakanui and Maungatua/Mill Creek projects which have received a combined total of $270,000 of NWCCP funding over three years. The Community Partnership Projects are a separate fund set up through the NWCCP to support community involvement in wilding conifer control and to improve public awareness of the wilding conifer problem.

[34] MPI have advised that no new Management Units (existing active management units are shown in **Figure 3**, **Figure 4** and **Figure 5** below) will receive programme funding as a result of the reduction in funding.

[35] In Otago, there is a shortfall in funding of $900,000 (as shown in Table 1) to be able to maintain the gains and continue to progressively contain wilding conifers. Maintenance needs are based on actual NWCCP funding received and control work completed.

[36] Without continued investment and intervention, achieving long term sustainable wilding conifer management for the region is not attainable. Wilding conifers will re-invade cleared areas and continue to spread across vulnerable parts of Otago.

[37] Maintaining the current gains on their own will not achieve long term sustainable management of wilding conifers. Ongoing progressive control and containment is also required to prevent the spread from seed sources that are still present in the region. The benefits of control and protection are clear and greatly outweigh the costs (benefit ratio nationally is 38:1).[15]

[38] Large areas of Otago can be transitioned back to landowner responsibility after initial control and two maintenance sweeps (with 3-5 years between initial control and each maintenance sweep). Areas of dense or moderate infestation may require more input as

[15] Sally Wyatt, "Benefits and Costs of the Wilding Pine Management Programme Phase 2," Ministry for Primary Industries, *Sapere Research Group,* (November 2018)

will areas where inappropriately planted conifers will require investment to transition to less spread-prone species.

[39] Ongoing investment in the short-medium term will enable critical maintenance and control work to continue, whilst also working to transition cleared areas back to landowners. This will allow long-term sustainable management to be achieved.

[40] Without adequate investment through to 2030 (the timeframe of the New Zealand Wilding Conifer Management Strategy), there is a major risk that the NWCCP will not succeed in achieving its objectives, despite the significant investment and gains that have been made over the past six years. Without ongoing financial support, there is a risk that the NWCCP fails to deliver lasting protection of indigenous biodiversity, productive land use, landscape, and freshwater values from wilding conifer spread.

[41] Te Uru Kahika (the regional/unitary council sector) is advocating for ongoing central government funding of the NWCCP. Letters have been sent to Minister of Biosecurity and MPI from Te Uru Kahika (Appendix 1) and Environment Canterbury (Appendix 2) to express the support for ongoing central government funding for the NWCCP to maintain the gains made in this programme. The response letter to Environment Canterbury is also included (Appendix 3). It is recommended that ORC continue to support this advocacy via Te Uru Kahika.

[42] The Wilding Pine Network has also provided advocacy for ongoing central government funding for the NWCCP (Appendix 4, 5 and 6).

[43] A cost-benefit analysis will be progressed by ORC. This work will build on what was provided as part of the NWCCP in 2020 and will provide a better understanding of the investment requirements and benefits for Otago and what is needed to deliver the programme going forward within Otago. Further, a Wilding Conifer Strategy for Otago is currently in development.

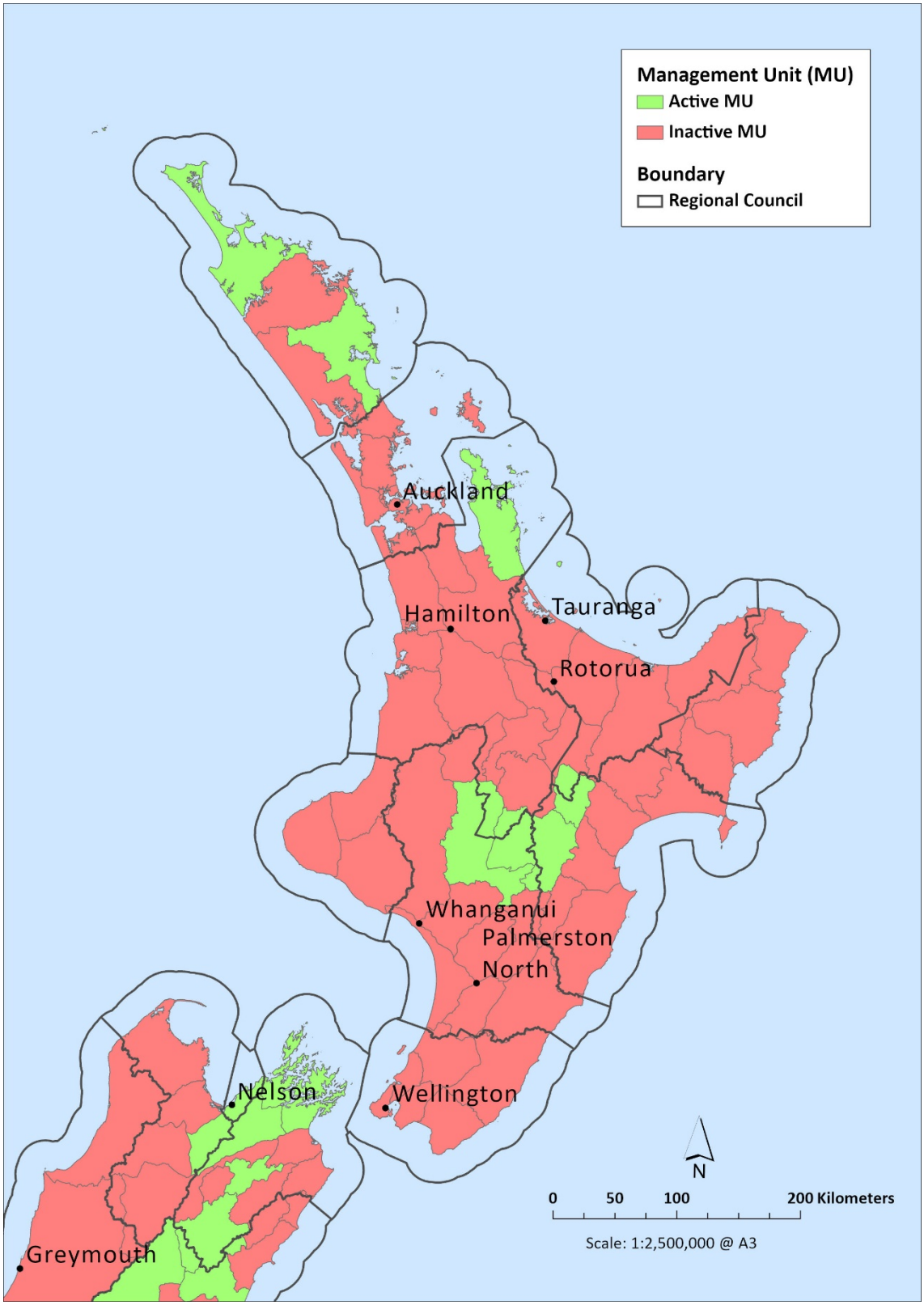


Figure 3 NWCCP - North Island Management Units

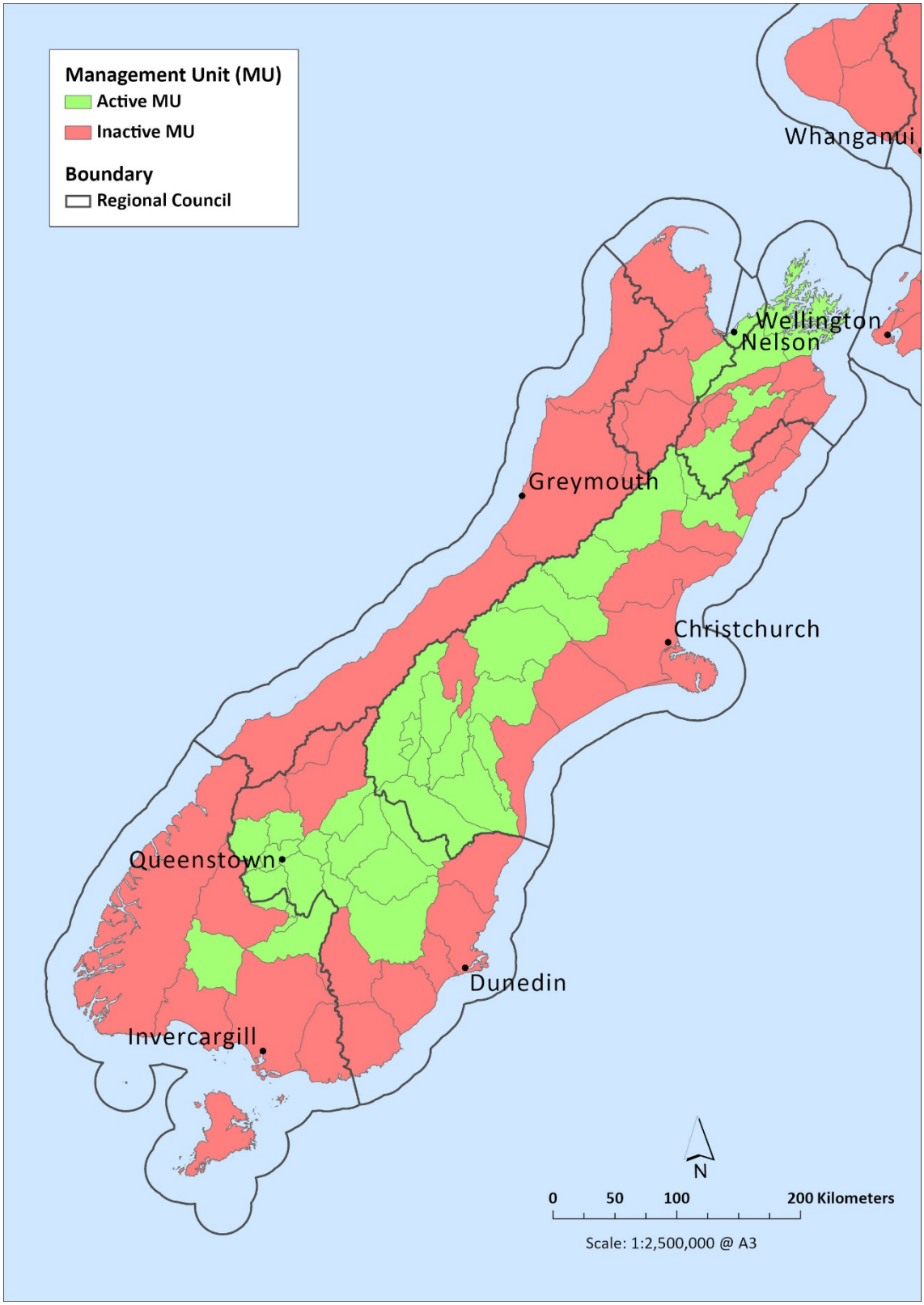


Figure 4 NWCCP - South Island Management Units

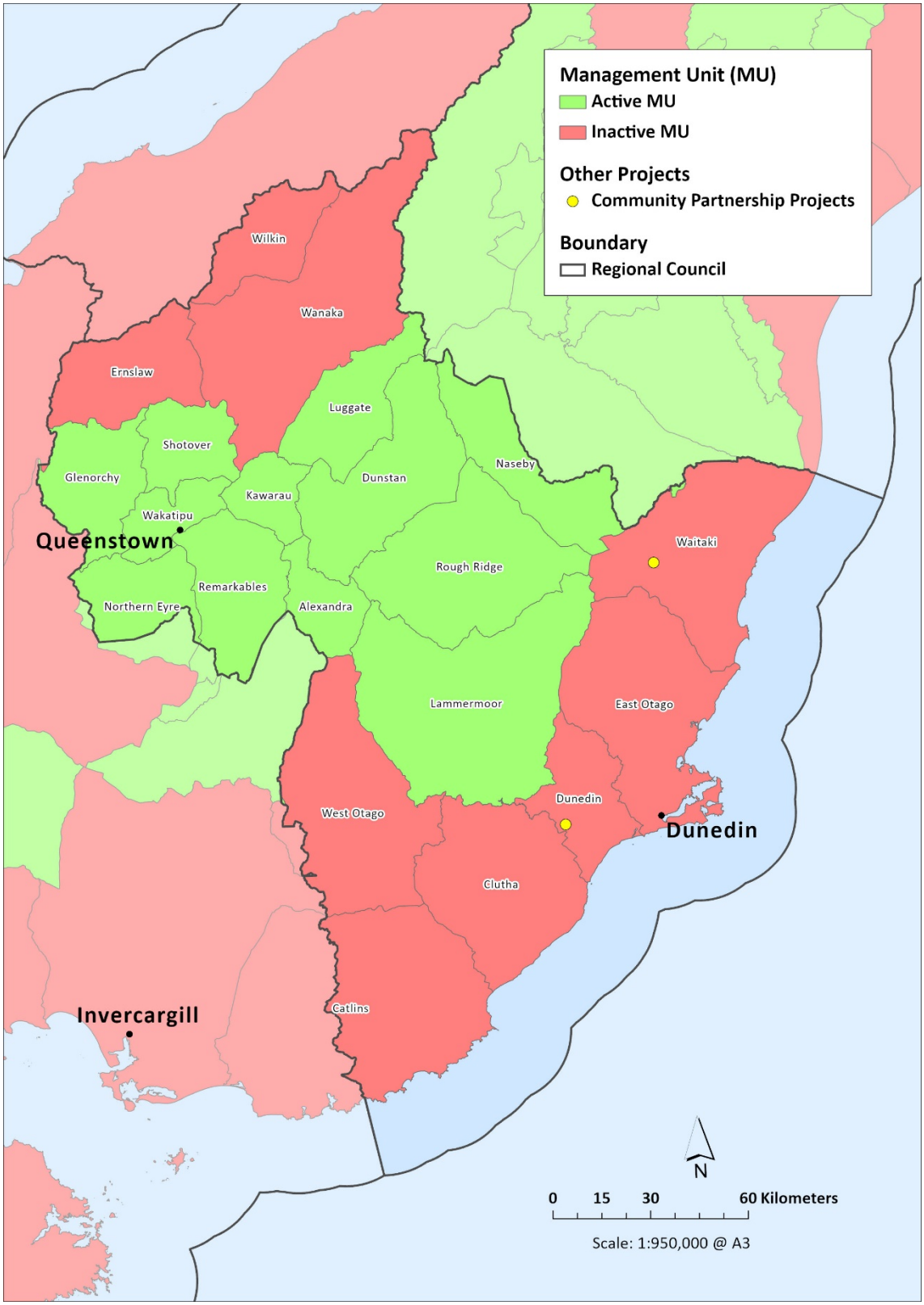


Figure 5 NWCCP - Otago Management Units and CPP

CONSIDERATIONS

Strategic Framework and Policy Considerations

[44] The NWCCP for Otago aligns with the objectives in the RPMP (Regional Pest Management Plan) to progressively contain and reduce the geographic extent of wilding conifers within the Otago region.

Financial Considerations

[45] Operational costs for wilding conifer control service delivery applies in Otago. As there is a reduced funding pool and therefore a reduction in funding available for the Otago region as part of the NWCCP, the programme will not be delivered to the extent originally envisaged unless other funding sources are found to continue the full delivery of this programme.

[46] Landowners have contributed financially towards the completion of work on their properties, with an expectation that NWCCP funding will be available to complete the maintenance required and deliver lasting protection from the impact of wilding conifers on indigenous biodiversity, productive land use, landscape, and freshwater values. The reduction in NWCCP funding risks losing most of the gains made since the programme began and the financial contribution that landowners have made.

Significance and Engagement

[47] Not applicable.

Legislative and Risk Considerations

[48] In some instances, the RPMP rules relating to wilding conifers may need to be applied earlier than expected to occupiers who have had previous funding through the NWCCP. If the RPMP rule is applied where maintenance works were anticipated by landowners there is a risk that this is an unforeseen expectation.

Climate Change Considerations

[49] Climate change is widely regarded as one of the greatest challenges facing ecological systems in the coming century. Climate change therefore poses risks to the impact of wilding conifers in Otago through factors such as the establishment of new species, changes in the status of current populations and shifts in introduction pathways.

Communications Considerations

[50] Communication to key stakeholders about the national funding situation and the impacts this has on Otago will occur through the Regional Coordination Group for Wilding Conifers.

NEXT STEPS

[51] Connection and co-ordination with Te Uru Kahika to advocate for continued central government funding of the National Wilding Conifer Control Programme will continue.

[52] Communication to key stakeholders about the national funding situation and the impacts this has on Otago will occur at the next Regional Coordination Group for Wilding Conifers meeting (February 2023).

ATTACHMENTS

1. Letter from RSG Chair to Minister O' Connor National Wilding Conifer Control Funding [**5.2.1** - 1 page]
2. 2022-10-04 Letter from Chair Hughey to Minister for Primary Industries Wilding conifer funding FINAL [**5.2.2** - 2 pages]
3. 22-2490 Letter to Jenny Hughey [**5.2.3** - 1 page]
4. Grant Roberston Averting the next biosecurity disaster [**5.2.4** - 3 pages]
5. Stuart Nash letter 11122# [**5.2.5** - 4 pages]
6. Letter to Richard Bowman [**5.2.6** - 1 page]

Te Uru Kahika Regional and Unitary Councils Aotearoa

17 January 2023

Hon Damien O'Connor
Minister of Biosecurity, Ministry for Primary Industries - Manatū Ahu Matua
Charles Fergusson Building
34-38 Bowen St, Pipitea
Wellington 6011 Email: d.oconnor@ministers.govt.nz

Dear Minister

Support for ongoing investment in the National Wilding Conifer Control Programme

The regional and unitary councils of Aotearoa wish to express our strong support for ongoing central government funding of the National Wilding Conifer Control Programme.

This Programme is a highly successful example of a nationally coordinated partnership approach delivered jointly by central and local government, to address an invasive weed issue of national significance. The Regional Sector values the achievements of this programme, to date, and wants to ensure we maintain the gains made recently against this invasive pest.

As you are aware, the Programme funding from central government will soon reduce to a $10m baseline funding level, meaning there is a risk that the Programme may not achieve its objectives long-term despite the significant investment made over the past six years. Without adequate ongoing budget, the gains made over recent years may be lost and many areas cleared of exotic conifers may revert.

Maintenance sweeps must occur at three-yearly intervals after the initial control, to remove emerging trees before they reach coning age. After the third maintenance sweep it should be within the ability of individual landowners or regional communities collectively to undertake maintenance control, without central government funding.

Programme expenditure for the last three years ranged between $23-46 million per year, and it would be prudent to continue funding at this level for a few more years to ensure we maintain the gains. The regional sector requests ongoing funding for this high-profile programme, preferably through to 2030, to ensure long-term success. We acknowledge the Regional Sector will also need to continue to provide regional contributions, funded through our council LTPs, and continue the Sector's regional facilitation and programme delivery role.

Yours sincerely

DOUG LEEDER
CHAIRMAN
REGIONAL SECTOR
LGNZ

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636
200 Tuam Street
PO Box 345
Christchurch 8140
www.ecan.govt.nz/contact

04 October 2022

Hon Damien O'Connor
Minister of Biosecurity, Ministry for Primary Industries - Manatū Ahu Matua
Charles Fergusson Building
34-38 Bowen St, Pipitea
Wellington 6011

Email: d.oconnor@ministers.govt.nz

Dear Minister

Support for ongoing investment in the National Wilding Conifer Control Programme

I am writing to voice Environment Canterbury's strong support for ongoing central government funding of the National Wilding Conifer Control Programme (NWCCP).

To date, the NWCCP has been a highly successful model of a nationally coordinated, partnership approach to address an invasive weed issue of national significance. The programme has made substantial progress, while also creating jobs and providing training opportunities in our rural communities.

Environment Canterbury is concerned that, without adequate investment through to 2030 (the timeframe of the New Zealand Wilding Conifer Management Strategy), there is a major risk that the NWCCP will not succeed in achieving its objectives, despite the significant investment and gains that have been made over the past six years. Without ongoing financial support, we risk failing to deliver lasting protection of indigenous biodiversity, productive land use, landscape, and freshwater values from wilding conifer spread.

If NWCCP funding is reduced too soon—before we have completed sufficient initial and maintenance control rounds—we risk losing most of the gains we have made since the programme began.

I note with concern your recent press release (15 September), which stated that nationally 37 per cent of known infestations have undergone one round of control work and 33 per cent have undergone two phases of control, and that this means that "in these areas…efforts can shift to stopping re-infestation over the next few years - which is progressively less costly."

Gaining initial control of wilding infestations is a first step. If appropriate maintenance control sweeps are not completed, we will never break the cycle of wilding conifer regrowth and achieve enduring control.

Contact: Zoë Buxton, Senior Strategy Advisor. Phone: 03 367 7388. Email: zoe.buxton@ecan.govt.nz.

Maintenance sweeps must occur at three-yearly intervals after the initial control, to control emerging trees before they reach coning age. The first maintenance sweep is often almost as costly as the initial control. Costs generally reduce with subsequent sweeps.

Provided we have controlled the seed source, we believe most areas will require up to three maintenance sweeps, before the seed bank is exhausted and emerging trees remain at minimum. We can then transition previously infested land back to landowners for long-term management: by this stage, ongoing maintenance requirements should be within the landowners' ability and budgets to control themselves, without government funding.

Wilding conifer infestations and spread in Canterbury are still beyond the ability of landowners to manage on their own. Environment Canterbury is managing the operational delivery of the NWCCP across 16 active management units, covering over 2.8 million hectares of vulnerable landscapes and ecosystems. Most areas have had one maintenance sweep. Some are still receiving a mix of initial and first maintenance round treatment, particularly where infestations are dense or costly to control.

We are confident that with adequate funding through to 2030, we can secure the investment made in the 16 active management units to date. We are very happy to work with the Ministry for Primary Industries to develop costings for the work required to deliver NWCCP objectives in this timeframe. We note that additional funding would also be needed to allow work to occur in portions of other, non-active management units that remain in desperate need of control.

Environment Canterbury is extremely appreciative of the investment made by central government in the NWCCP so far. We are committed to continuing to work closely with the Ministry for Primary Industries to ensure the NWCCP delivers enduring benefits for our environment, economy, and people.

To this end, we urge you to prioritise and advocate for appropriate funding of the NWCCP through to 2030, to ensure the long-term success of the programme. We are very happy to provide further information or comment to support the Ministry for Primary Industries in any funding discussions or bids.

Yours sincerely

Jenny Hughey
Chair

Hon Damien O'Connor
MP for West Coast-Tasman
Minister of Agriculture
Minister for Biosecurity
Minister for Land Information
Minister for Rural Communities
Minister for Trade and Export Growth

MIN22-0707

Jenny Hughey
Chair
Environment Canterbury Regional Council
Zoe.buxton@ecan.govt.nz

Dear Jenny

Thank you for your correspondence of 4 October regarding on-going support for the National Wilding Conifer Control Programme (the Programme). Please accept my apologies for the delay in responding.

Firstly, I would like to acknowledge the importance of Environment Canterbury as a partner in the Programme. Your organisation has done great work advocating for, and managing, the operational delivery of the wilding conifer control in your region.

Since 2016 the Government has invested $140 million nationally into wilding conifer control through the Programme. I acknowledge that Environment Canterbury also contributes a significant amount of local funds and efforts to wilding control, as part of the collaborative approach to this issue. The progress made through efficient use of these funds is a credit to Environment Canterbury and your local partners.

I can confirm a current government commitment to ongoing baseline funding of $10 million per annum from July 2024. While this is a greater level of baseline funding than has previously been committed to the Programme, I acknowledge that more funding will be required to maintain current control efforts and achieve our longer-term goals for wilding conifer control. We need all of the programme partners to step up and explore additional funding sources so that we can lock in the significant gains made to date.

As I said at the Wilding Pine Conference in September, I share your and others' concerns about the need to maintain the progress that has been made, and address areas not yet being controlled. I will continue to advocate strongly for the importance of this programme and the need for ongoing resourcing by the crown and other parties. In this vein, I hope Environment Canterbury will place a high priority on regional wilding conifer funding during the next review of the council's Long Term Plan.

Yours sincerely

Hon Damien O'Connor
Minister for Biosecurity

Private Bag 18041, Parliament Buildings, Wellington 6160, New Zealand
+64 4 817 8715 | d.oconnor@ministers.govt.nz | beehive.govt.nz

Wilding Pine Network ADVOCACY ADVICE ACTION

12 December 2022

Hon Grant Robertson

Deputy Prime Minister and Minister of Finance

Parliament Buildings

Wellington

Re Funding for wilding conifer control

Dear Grant

The Wilding Pine Network (https://wildingpinenetwork.org.nz/) would like to ask you what the Government will do to prevent another major biosecurity disaster from occurring. This will come about if New Zealand does not take the current national Wilding Conifer Control Programme through to a timely and effective completion.

The benefits of achieving this are presented in a cost benefit analysis commissioned by MPI in 2018, prepared by the Sapere Research Group. https://www.wildingpines.nz/assets/Documents/MPI-Long-Term-Management-Wilding-Conifers-Cost-Benefit-Analysis.pdf It states:

> "The CBA demonstrates that the Intermediate option for Phase 2 is sufficient to markedly roll back the area occupied by wilding conifers and 'turn the tide'. It will achieve a net benefit of $6.1 billion (net present value), a benefit ratio of 38:1" (over the next 50 years).

The Programme led by the Ministry of Primary Industries is supported by DOC, LINZ, DOC, and MoD as well as by local government agencies, the agricultural and forestry industry sectors, NGOs and over 24 community-led trusts and groups throughout New Zealand. The $137M of public funding that has been invested since 2016 in control to stop wilding spread nationally has been remarkably successful.

Many of the community groups in Queenstown, Central Otago, Mid Dome – Southland, the Mackenzie country, Craigieburn, South Marlborough, the Marlborough Sounds, Abel Tasman as well as in central North Island are starting to see the wilding tide turn (Fig.1.) At last, they have been able to remove trees faster than they have been spreading and the battle lines are being steadily pushed forward.

Hundreds of thousands of hectares of extremely vulnerable high country in Otago, Canterbury and Marlborough land have had scattered trees removed and these areas are now effectively protected from further spread and infill. With the momentum created over the last six years the national programme should be well on the way to achieving its 'wilding free landscapes' goal by 2030.

Unfortunately, the funding provided by Government in 2020 will run down in 2024 to a baseline of $10M a year. (Fig. 2.) This will mean that a highly successful programme which has now established wilding control across much of New Zealand will lose its momentum.

Web: www.wildingpinenetwork.org.nz
Email: Chair: Richard@wildingpinenetwork.org.nz
Coordinator: jo.ritchie@wildingpinenetwork.org.nz

It will have to move from a proactive attacking mode into a defensive stance focussed on holding to as many of the gains made to date as it can against the exponential spread and growth rates of the remaining wilding conifers.

The reduction in funding means experienced field staff and highly efficient contracting companies which are now operating at a very effective level will have to be laid off. It will also lower the morale of all those individuals and organisations who have passionately supported the control work over the last two decades. If additional funding of around $15M/annum could be found for the next 10 years, it is likely that the national wilding programme would be completed in an effective and orderly way. (Fig. 2.) If this cannot be found, then then in a decade or more, with the exponential spread rates of wildings (which could likely be exacerbated by the recent rapid proliferation of largely unregulated carbon plantations), it could cost hundreds of millions of dollars to claw back the lost ground.

New Zealand's history is littered with biosecurity mistakes and lost opportunities that have cost us dearly. Wilding conifers do not have to be another of these. The Parliamentary Commissioner for the Environment has recognised the potential for this to occur in the October 2022 report Environmental reporting, research, and investment - Do we know if we're making a difference?

> "Crown funding from Budget 2020 will drop significantly in 2024, but wilding conifers on the ground will not wait for the funding to catch up. Without adequate ongoing spending, there is a genuine risk that the gains, and funding, will be wasted as the wildling conifers will simply reinvade. The National Wilding Conifer Control Programme has forecast that over $200 million is required out to 2031 to control 95% of known infestations. Separate recent modelling has estimated that at least $400 million will be needed to remove all known wilding conifer infestations if action is taken now and costs are not deferred into the future. Any delays will see costs increase."

While we recognise that this is a biosecurity issue and as such is the responsibility of the Minster for Biosecurity, we believe it is imperative that there is a wider understanding and appreciation of the long term threat posed by wilding conifers to New Zealand's economy and environment.

We would be very grateful if you as the Minister of Finance could explain what the Government will do to prevent a major biosecurity disaster which could be caused by the uncontrolled spread of wilding conifers across New Zealand over the next few decades.

Yours sincerely

Richard Bowman

Chair

Wilding Pine Network

Web: www.wildingpinenetwork.org.nz
Email: Chair: Richard@wildingpinenetwork.org.nz
Coordinator: jo.ritchie@wildingpinenetwork.org.nz

Wilding Pine Network

ADVOCACY
ADVICE
ACTION

Fig. 1. Showing the spectacular progress made with wilding conifer control over six years in the Craigieburn-Flock Hill area of Canterbury. (Photos Nick Ledgard)

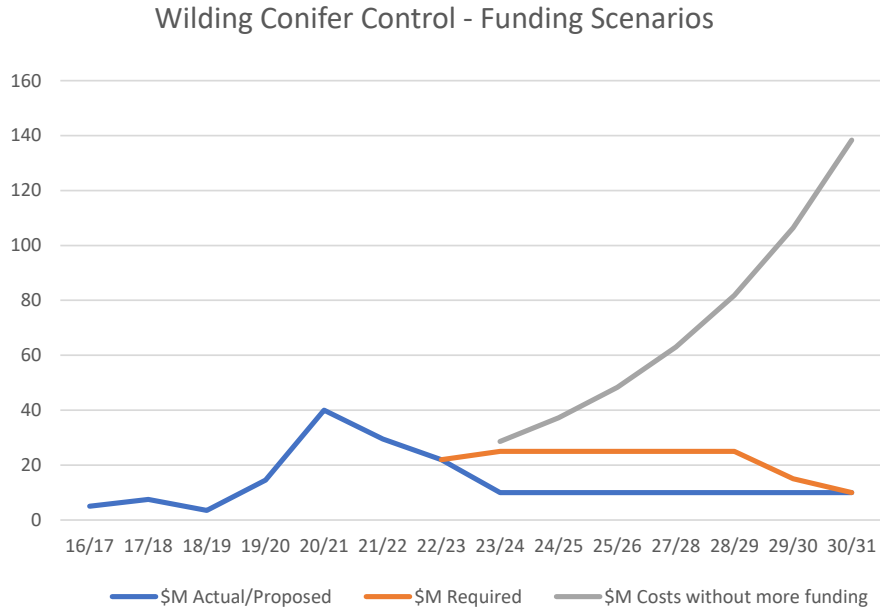


Fig. 2 Graph showing current and proposed national expediture (blue), the additional funding required to complete the programme (orange) and the projected cost of control if additional funding is not found (grey).

Web: www.wildingpinenetwork.org.nz
Email: Chair: Richard@wildingpinenetwork.org.nz
Coordinator: jo.ritchie@wildingpinenetwork.org.nz

Wilding Pine Network

ADVOCACY
ADVICE
ACTION

Stuart Nash
Minister for Forestry
Parliament Buildings

Wellington 2nd November 2022

Re National Wilding Conifer Control Programme

Kia Ora Minister Nash

The Wilding Pine Network, representing a wide range of stakeholders including 24 community-based wilding control groups across New Zealand, urges you to support the continued resourcing of the National Wilding Conifer Control Programme. It is critical that this resourcing is maintained at a level which not only protects the significant investments that have been made to date but also allows the programme to be taken to a satisfactory conclusion over the next decade.

Since the National Wilding Conifer Control Programme began in 2016 over $105M has been used to stop the spread of wilding conifers. This has resulted in 70% (2.2 million hectares) of the total known infestation area nationally (more than 2.5 million hectares) receiving at least one round of control work. We have attached a copy of our information pack which contains more detail about the wilding conifer programme and its benefits.

We see that the unchecked spread of wilding conifers in future will impact on your portfolio of responsibilities. Specifically:

1. Wilding conifer spread, and infestation poses a significant cost on production forestry in New Zealand. The industry recognises the problem and is acting as and where it can to deal with unwanted spread from production forests. If the wilding spread threat from legacy plantings as well as from planted forests is not managed effectively now it will impose a significant remedial cost on the industry. These costs can be avoided in future by taking effective preventative wilding control action now.

2. There is the potential that the combination of production forestry, carbon forestry and wilding spread could see between 11.2 to 18.2% of New Zealand's land area covered in exotic trees by 2050. Modelled scenarios in the Afforestation and Deforestation Intentions Survey, 2021 suggest that exotic forest afforestation could total around 2.8 million hectares over 2022–2050, with the majority managed as

Wilding Pine Network - c/- 200 Tuam St Christchurch Central, Christchurch 8011

> exotic carbon forests. Carbon forestry presents particular risk in relation to wilding trees because unlike production forestry trees are not harvested and left to mature and are often planted in steeper or wind prone areas where the movement of seed is exacerbated.

We suggest that this increased land area in exotic trees which includes the exacerbated spread of wildings has the potential for the government, forestry industry and investors to lose the social licence for increased exotic plantings. The public are becoming increasingly aware of the scale of the wilding tree problem as demonstrated by the increasing involvement of communities, iwi, landowners and land managers in the active advocacy and removal of wilding species.

We know from experience to date that this is a problem that we can successfully manage but it needs funding at a consistent level for some time to achieve this.

> *"Without adequate ongoing spending, there is a genuine risk that the gains, and funding, will be wasted as the wildling conifers will simply reinvade. The National Wilding Conifer Control Programme has forecast that over $200 million is required out to 2031 to control 95% of known infestations.48 Separate recent modelling has estimated that at least $400 million will be needed to remove all known wilding conifer infestations if action is taken now and costs are not deferred into the future.49 Any delays will see costs increase."* Parliamentary Commissioner for the Environment - Environmental Reporting, Research and Investment Report, Oct 2022.

At the levels of national funding currently proposed from 2023 on it will not be possible to provide the necessary maintenance control or to expand into areas of wilding conifer infested land outside of the current programme. It will result in significant loss of momentum in the national programme and will force reductions in the highly effective contractor workforce. It will also erode the extraordinary partnership with community, iwi, local, regional, and national government, landowners, and land managers (farming and forestry) that is at the heart of the current success of the national wilding pine programme.

In 2018 MPI commissioned a cost benefit analysis of the national wilding conifer control programme prepared by the Sapere Research Group. This clearly demonstrated the benefits of early and effective management of wilding conifers. It showed that if not managed wilding conifer impacts will result in net losses of $5.3 billion to the New Zealand economy over the next 50 years. Much of this loss is due to reduced water yields in wilding infested catchments

impacting on hydroelectric power generation and agricultural production. It also estimates an overall benefit-cost ratio of between 38:1 and 42:1 for every dollar invested in controlling wilding infestations and preventing the spread. The report makes a compelling case to continue investment in the programme by allowing it to reach completion over the next decade. If this is not done and wilding spread continues as it has then New Zealand runs the risk of making a very costly biosecurity mistake which will require billions of dollars to remedy in future.

The 2018 cost benefit report has been recently updated and was referred to by Minister O'Connor at the September 2022 Wilding Pine Conference. This we understand refines, improves and confirms the predictions made in the 2018 report. Unfortunately, this has not yet been released to the public. It is essential in our view that it is released so that its findings can be used to demonstrate to decision makers and the wider community that the reduction in funding to $10 million per annum from 2023 will quickly reverse the significant gains made.

We realise that funding decisions are very difficult for New Zealand at the present time because of the effects of Covid and other domestic and international issues. However, the stakeholders in wilding conifer control are willing to work with you an any way we can and to explore every option available to ensure that this extremely important economic and environmental programme does not lose its momentum and is able to achieve its long-term goal of 'wilding free landscapes in Aotearoa'.

We suggest that a solution to the funding reduction and one which would support the social licence for continued exotic plantings would be the allocation of ongoing funding from the Climate Change Emergency Response Fund. Resources from the fund should be used to make provision to deal with unwanted wilding spread from existing and future plantings. This would offset the unintended impacts created by exotic forest planting particularly for carbon forestry as there is a direct correlation with the potential of wilding spread from these forests.

In closing we ask for your response to the following questions:

How is the government proposing to deal with the increased wilding risk from carbon forestry?

What opportunity is there to use r the Climate Change Emergency Response Fund to continue wilding control?

Wilding Pine Network - c/- 200 Tuam St Christchurch Central, Christchurch 8011

Wilding Pine Network

ADVOCACY
ADVICE
ACTION

We look forward to your response.

Yours sincerely

Richard Bowman
Chair of the Wilding Pine Network
P: 021 784 975
E: Richard@nzwildingconifergroup.org

Example of successful wilding conifer control in the Craigieburn area of Canterbury carried out under the guidance of the Waimakariri Ecological and Landscape Restoration Alliance (WELRA).

Hon Damien O'Connor

MP for West Coast-Tasman

Minister of Agriculture
Minister for Biosecurity
Minister for Land Information
Minister for Rural Communities
Minister for Trade and Export Growth

MIN22-0743

15 DEC 2022

Richard Bowman
Chair
Wilding Pine Network
Richard@nzwildingconifergroup.org

Dear Richard

Thank you for your correspondence of 2 November to Hon Stuart Nash regarding the National Wilding Conifer Control Programme (the Programme). Your letter has been passed on to me for response as the matters you raise fall within my portfolio responsibilities as Minister for Biosecurity. Please accept my apologies for the delay in responding.

Firstly, I would like to acknowledge the important work the Wilding Pine Network does to raise awareness of the impact of wilding conifers, and the support that the Network provides to communities in their efforts to carry out control work.

You have asked how the Government is proposing to deal with the increased wilding risk from carbon forestry. The Government has recently consulted on changes to the National Environmental Standards for Plantation Forestry (NES-PF). This consultation sought feedback on proposals to expand the scope of the NES-PF to include exotic carbon forests, to assess the location of exotic carbon forests and plantation forests, and to address some of the findings of the Year One Review of the NES-PF. The submission period recently closed on 18 November; I hope you had a chance to provide your feedback through that mechanism.

You have also asked whether it is possible to fund wilding conifer control through the Climate Change Emergency Response Fund (CERF). For Budget 22, the CERF was focussed on prioritising initiatives and programmes that would deliver on the Government's first Emissions Reduction Plan. I acknowledge that the Programme has been identified as an action in the Government's National Adaptation Plan which supports the Emissions Reduction Plan by outlining the Government's current efforts to help build climate resilience.

As I said at the Wilding Pine Conference in September, I share your and others' concerns about the need to maintain the progress that has been made, and address further areas not yet being controlled. I will continue to advocate strongly for the importance of this Programme and the need for ongoing funding from the government and the beneficiaries of wilding conifer control.

Yours sincerely

Hon Damien O'Connor
Minister for Biosecurity

Private Bag 18041, Parliament Buildings, Wellington 6160, New Zealand
+64 4 817 8715 | d.oconnor@ministers.govt.nz | beehive.govt.nz

5.3. Biosecurity Operational Plan 23/24

Prepared for:	Environmental Implementation Committee
Report No.	BIO2203
Activity:	Environmental: Land
Author:	Libby Caldwell, Manager Environmental Implementation Murray Boardman, Performance and Delivery Specialist
Endorsed by:	Gavin Palmer, General Manager Operations
Date:	2 February 2023

PURPOSE

[1] To seek approval of the 2023-2024 Biosecurity Operational Plan.

EXECUTIVE SUMMARY

[2] ORC's Otago Pest Management Plan 2019-2029 (RPMP) was adopted in November 2019. The RPMP details the plants and animals that are declared pests in the Otago region, explains why they are pests, and outlines how each pest will be managed over a ten-year period.

[3] An Operational Plan is required under Section 100B of the Biosecurity Act 1993 to detail the nature and scope of activities the Council intends to undertake in the annual implementation of the RPMP. For reasons of operational efficiency, the Operational Plan aligns with Council's financial year (1 July to 30 June). The Operational Plan details the range of activities that will be undertaken by Council on the implementation of pest control across the five management programmes. The proposed Operational Plan continues the commitment of the biosecurity work as approved in the ORC 2021-31 Long Term Plan[16].

[4] The 2023-2024 Biosecurity Operational Plan consolidates the progress made under the previous two Operational Plans (2021-22 and 2022-23). This plan progresses the following operational areas:

a. Actively continue property inspections for compliance of pest management rules, for both private and public (territorial authority and Crown-owned or controlled) land.
b. Continue the focus on the five regional pest priorities (Exclusion pests, Rabbits, Wallabies, Wilding conifers and Lagarosiphon).
c. Continue business improvement outcomes to ensure the effective delivery of the 2023-24 Operational Plan.

[5] The Operational Plan continues the implementation of the national programmes addressing wallabies and wilding conifers, supports the objectives of Integrated Catchment Management (ICM) and supports community groups (e.g., site-led programmes, community rabbit programmes and wilding conifer control groups).

[16] https://www.orc.govt.nz/plans-policies-reports/corporate-plans-and-reports/long-term-plan-ltp

[6] The proposed 2023-2024 Biosecurity Operational Plan is attached. A comparison document is also included to highlight the differences between the proposed Plan and the current Biosecurity Operational Plan 2022-2023.

RECOMMENDATION

That the Committee:

1) ***Notes** this report.*

2) ***Recommends Council approval of** the Otago Regional Council's Regional Pest Management Plan 2023-2024 Biosecurity Operational Plan and authorises the Chief Executive to make minor subsequent changes and error corrections to the 2023-2024 Biosecurity Operational Plan in consultation with the Co-Chairs of the Environmental Implementation Committee.*

3) ***Notes** that a copy of the Otago Regional Council's Regional Pest Management Plan 2023-2024 Biosecurity Operational Plan will be provided to the Minister for Biosecurity.*

4) ***Notes** that staff will report back to Council any response from the Minister for Biosecurity.*

DISCUSSION

Regional Pest Management Plan

[7] In November 2019, the Otago Regional Council adopted the Otago Regional Pest Management Plan 2019-2029 (RPMP).

[8] The RPMP details the range of regulatory and non-regulatory mechanisms the Council will utilise for effective biosecurity leadership in Otago over the next 10 years. It contains pest control programmes, objectives and rules to manage pests that cause harm to the wellbeing of Otago's people, economy and environment.

[9] The 2021-2031 Long Term Plan provided a large increase in funding for Council's biosecurity function. Due to this, biosecurity staffing levels have increased and opportunities to better meet our obligations under the Biosecurity Act 1993 and to support others to comply with the RPMP rules and wider biodiversity goals.

Regional Pest Management Plan – Operational Plan

[10] To deliver on the objectives of the RPMP, the Biosecurity Act (Section 100B), requires an Operational Plan be prepared. The Operational Plan outlines the activities the Council intends to undertake to achieve the objectives the RPMP.

[11] The Operational Plan must be consistent with the current RPMP. Consequently, the Operational Plan cannot introduce any new objectives, rules, or regulatory tools. Due to this, there is no statutory requirement to consult the community on the preparation of the Operational Plan.

[12] The Operational Plan is required to be accessible to the public and reviewed annually. The Operational Plan can either be formally rolled over or revised to account for progress made and changes in implementation focus.

[13] As required by the Biosecurity Act, the Council is required to evaluate progress against the deliverables and key performance indicators as listed in the Operational Plan within 5 months from the end of the financial year.

[14] A review of performance against the current 2022-2023 Biosecurity Operational Plan will be provided to Council by the end of September 2023.

[15] ORC must provide a copy of the operational plan to the Minister for Biosecurity. This is required under section 100B of the Biosecurity Act.

2023-2024 Biosecurity Operational Plan

[16] The Operational Plan prepared by ORC provides details on how the intentions of the RPMP will be met through specific deliverables (actions), performance measures and targets. For reasons of operational simplicity and efficiency, the Operational Plan has been developed to align with Council's financial year (1 July to 30 June).

[17] The 2023-2024 Biosecurity Operational Plan builds on the 2022-2023 Biosecurity Operational Plan. Changes have been made to improve efficiency and effectiveness and to ensure deliverables keep pace with progress.

[18] This Operational Plan is submitted to Council at this time to inform the preparation of the Draft 2023-24 Annual Plan and to provide detail that sits behind the Annual Plan.

[19] The Operational Plan continues to focus biosecurity implementation through five management programmes used to manage plant and animal pests in Otago:

- Exclusion
- Eradication
- Progressive Containment
- Sustained Control
- Site-led

[20] As for the 2022-2023 Operational Plan, the five management programmes are supported by shared field and administrative approaches. This shared approach simplifies deliverables yet provides flexibility to analyse and report on different pest species.

[21] This Operational Plan is the current iteration of the multi-year programme that was consulted on and approved as part of the current Long-term Plan. The 2023-2024 Operational Plan consolidates and enhances progress whereas the previous two plans were more focussed establishing good practice and implementing new systems and processes.

[22] This Operational Plan supports the wider work of Integrated Catchment Management (ICM) and the work of community groups, such as site-led programmes.

[23] The plan continues the inspections, night counts (increased from 17 to a proposed 31)[17] and community engagement for rabbits. It also continues progress made through the implementation of strategies that have been prepared in previous years such as for wilding conifers and Russell lupins.

[17] *Rabbit Monitoring*, prepared for 2 February 2023 meeting of the Environmental Implementation Committee, Report No. OPS2251, 2 February 2023.

[24] The National Wilding Conifer Control Programme funding received from the Ministry for Primary Industries (MPI) will decrease in the 2023-24 financial year[18]. For the current year ORC are receiving $2,852,458 in funding. It is proposed by MPI that for the wilding conifer programme in 2023-24 Otago will receive $1,070,000. The 2023-2024 Operational Plan takes account of this significant reduction in funding. Following the 2023-24 funding year it is proposed by MPI that the funding will cease.

[25] Feedback is regularly received from staff and lessons learnt have been adopted in the proposed 2023-2024 Biosecurity Operational Plan. Lessons included:

a. Ensuring deliverables are practical and consistent against progress.
b. Revising some KPIs to ensure they align to the RPMP.

[26] The focus on the 2023-2024 Biosecurity Operational Plan include:

a. Actively continue property inspections for compliance of pest management rules, for both private and public (territorial authority and Crown-owned or controlled) land.
b. Continue the focus on the five regional pest priorities (Exclusion pests, Rabbits, Wallabies, Wilding conifers and Lagarosiphon).
c. Continue business improvement outcomes to ensure the effective delivery of the 2023-24 Operational Plan.

[27] The proposed 2023-2024 Biosecurity Operational Plan is attached. A comparison document is also included to highlight the differences between the proposed Plan and the current Biosecurity Operational Plan 2022-2023.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[28] The Operational Plan does not set policies or objectives as those have already been set in the RPMP that has been adopted by Council. The Operational Plan must be entirely consistent with the RPMP in that it cannot introduce any new objectives, rules, or regulatory tools. The Minister is not required to approve the Plan but may disallow all or part of it if they believe that it is inconsistent with the RPMP.

Financial Considerations

[29] The 2023-2024 Biosecurity Operational Plan is based on the 2021/2031 Long Term Plan programme and budget. The Draft 2023/24 Annual Plan allows for the delivery of the proposed Operational Plan. If there are amendments made to the Annual Plan that affect biosecurity activity, then there may be a requirement to amend the Operational Plan to reflect this. The amended Plan would be brought to Council for approval and then provided to the Minister.

Significance and Engagement

[30] There is no statutory requirement to consult with the community on the details of the Operational Plan.

Legislative and Risk Considerations

[18] *National Wilding Conifer Control Programme*, prepared for 2 February 2023 meeting of the Environmental Implementation Committee, Report No. OPS2261, 2 February 2023.

[31] The Otago Regional Council's Regional Pest Management Plan 2023-2024 Biosecurity Operational Plan has been prepared in accordance with the Biosecurity Act 1993. The 2023-2024 Biosecurity Operational Plan is a legislative requirement of the Act.

[32] As noted above, if there are amendments made to the 2023-2024 Annual Plan that affect biosecurity activity then there may be a requirement to amend the 2023-2024 Operational Plan to reflect this. The amended Plan would be brought to Council for approval and then provided to the Minister.

Climate Change Considerations

[33] Climate change is widely regarded as one of the greatest challenges facing ecological systems in the coming century. Climate change therefore poses risks to biosecurity through factors such as the establishment of new pests, changes in the status of current pests and shifts in introduction pathways.

Communications Considerations

[34] Council will disseminate biosecurity priorities, strategies and actions via the usual communications channels and will undertake more active community education and advocacy on the RPMP. The 2023-2024 Biosecurity Operational Plan will be available on the website for public access.

NEXT STEPS

[35] The next step is to provide a copy of the Operational Plan to the Minister for Biosecurity. As noted above, the Minister is not required to approve the Plan but may disallow all or part of the plan if they believe that it is inconsistent with the RPMP.

[36] Once approved by Council, the full Operational Plan and details of key actions for the forthcoming financial year will be disseminated to the public and other key stakeholders, noting that some activities are dependent on decisions made on the 2023-2024 Annual Plan.

ATTACHMENTS

1. Biosecurity Operational Plan 2023 24 [**5.3.1** - 22 pages]
2. Comparison Biosecurity Operational Plan 22 23 and 23 24 [**5.3.2** - 32 pages]

Biosecurity Operational Plan 2023-2024

Implementing the Otago Regional Pest Management Plan 2019-2029

Executive Summary

Under the Biosecurity Act (1993), the Otago Regional Council (ORC) is the regional management agency responsible for biosecurity and pest control. To achieve this regulatory function, the ORC has developed the *Otago Regional Pest Management Plan 2019-2029* (RPMP) which sets rules for land occupiers to control pests to set levels. This Biosecurity Operational Plan annualises the objectives of the RPMP for the 2023-2024 financial year.

The ORC engages with occupiers and landowners who are ultimately responsible for pest management. To achieve practicable biosecurity outcomes, the ORC undertakes inspections (to ensure compliance with rules), monitoring (to determine the effectiveness of control) and surveillance (identifying new issues and trends). The ORC undertakes advocacy and education around pest threats, pathways of pest spread and the provision of advice. Furthermore, the ORC delivers national programmes for the management of nationally significant pests (wallabies and wilding conifers).

This work is supported by close engagement with allied organisations involved in implementing and funding biosecurity across the region, including the Ministry for Primary Industries (MPI), Land Information New Zealand (LINZ), the Department of Conservation (DoC), Kāi Tahu, other councils and community groups.

Under the RPMP, pest management is classified into five programmes.

1. **Exclusion pest programme:** to prevent the establishment of six high threat pest plants in the region.
2. **Eradication pest programme:** to proactively eradicate spiny broom, Bennett's wallaby and rooks from the region.
3. **Progressive containment pest programme:** to contain or reduce the geographic distribution of 11 pest plants (or groups of plants) across the region.
4. **Sustained control pest programme:** to enforce ongoing control of rabbits and five widespread pest plants to reduce their impact.
5. **Site-led pest programmes:** listed pests are managed as deemed appropriate for the values of the stated location.

This Operational Plan is the final iteration under the current Long-Term Plan and is a continuation of the same approaches. Where necessary, changes have been made from the previous 2022-23 Operational Plan based on lessons learnt to improve efficiency and effectiveness.

As part of the continuation, this Operational Plan retains the priority pests from the previous Operational Plans, covering one programme and four pests:

- Exclusion pest programme
- Feral rabbits
- Bennett's wallaby
- Wilding conifers
- Lagarosiphon

The exclusion programme and four pests are of concern to local communities and have heightened adverse effects (current or future) on environmental, economic and social grounds.

Table of Contents

Version Control

Version #	Date	Event/Changes made
1	2 February 2023	To Environmental Implementation Committee for approval

Cover Photo

Lake Wanaka, from Glen Dene Ridge Track (Photo Credit: Richard Lord)

1. Introduction

1.1 Background

Under the Biosecurity Act 1993, the Otago Regional Council (ORC) developed the *Regional Pest Management Plan 2019-2029* ('**the RPMP**'). The RPMP is a statutory document that lists specific pests which have the greatest adverse effect on the environment and economy within Otago. In order to control, or eliminate, such adverse effects, the RPMP establishes rules that are legally enforceable. This provides a framework for the effective management of declared pests in the Otago region over the next decade. The RPMP sits alongside the non-statutory ORC Biosecurity Strategy which focuses on the wider biosecurity issues including the collaboration with stakeholders to manage pests.

The key purpose of the RPMP is to outline how the identified pests will be managed to reduce or remove their threat to the environmental (e.g. ecosystem or species), economic (e.g. farming/forestry) and cultural/social (e.g. Māori and human health) values of the region. The RPMP allows the council to use relevant advice, service delivery, regulatory enforcement and funding provisions as provided by the Biosecurity Act.

The RPMP identifies 30 plants (or groups of plants) and 11 animals (or groups of animals) as pests. Except for specified pests, where the ORC may coordinate or undertake direct control, the responsibility for pest control rests with occupiers and landowners.

The responsibility of the ORC focuses on advocacy and education, supported by inspections, monitoring and surveillance. As the designated Management Agency under the Biosecurity Act, the ORC enforces the RPMP rules to ensure occupiers and landowners are aware of and meet their obligations for pest management on their properties by adhering to RPMP rules. In addition, the ORC delivers national programmes for the management of nationally significant pests (wallabies and wilding conifers). This is further supported through various community groups that are actively involved in pest management (e.g. wilding conifer trusts, Predator Free Dunedin, community rabbit programmes).

1.2 Operational plan purpose, duration and linkages

Under the Biosecurity Act, the ORC is required to prepare an annual Operational Plan that implements the RPMP. The Operational Plan is a publicly available document and is reported on each year to Council.

This document *(the 2023-2024 Biosecurity Operational Plan)* outlines the nature, scope and priority activities that ORC intends to undertake for pest management across the Otago region for the financial year 1st July 2023 through to 30th June 2024.

The Operational Plan presents what will be delivered during the 2023-2024 financial year in terms of focus areas and the associated actions to implement the RPMP. For context, it is important the Operational Plan is read in conjunction with the RPMP. The ORC Biosecurity and Biodiversity Strategies and wider catchment management planning also provides additional context to the Operational Plan.

2. Summary of Regional Pest Management Plan

2.1 Pest management programmes

The RPMP is implemented through five pest management programmes[1], as summarised below. The pests listed under each programme are given in Table 1.

1. **Exclusion:** The objective is to ensure specific pests that are present in New Zealand do not become established in Otago. Under Section 100V of the Biosecurity Act, there is provision to implement emergency controls for any incursion of a new pest that are not listed in the RPMP.
2. **Eradication:** The objective is to eradicate identified pests from the areas where they occur in the region. Eradication involves reducing the infestation of the pest to zero density.
3. **Progressive Containment:** The objective is to contain and reduce the geographic spread of the listed pests to specific areas. Containment arises where the pest is at high densities in specific parts of the Otago region, but in low densities or limited range in other parts. While eradication is not feasible, it is realistic to contain the pest from spreading to other 'clear' parts of the region.
4. **Sustained Control:** The objective is for ongoing control of the listed pests to reduce their impacts and spread to other properties. The focus is to manage the densities of the pests to ensure they do not reach a level where they cause significant environmental impact. Sustained control is a strategy for pests with a wide geographical spread that they cannot feasibly be eradicated.
5. **Site-led:** The objective is to exclude, or eradicate, from identified locations or to contain, reduce or control within those places.

2.2 Methods of Action – how pest management will be carried out

The ORC achieves pest management outcomes through the following methods and provision of resources. Table 1 outlines which pest and programmes are related to each method.

1. **Advocacy and education:** ORC will provide education, advice and information to landowners and/or occupiers and the public about the impacts of pests and pathways (vectors) of pest spread and appropriate methods of control. The ORC will ensure land occupiers are informed of their responsibilities under the RPMP. This activity also includes contributing to research and cost-sharing with other agencies and developing/promoting 'good practice' around control methods aimed at pest management contractors and occupiers who are required to act.
2. **Inspection, monitoring and surveillance:** Regular property inspections ensure that RPMP rules are being adhered to. The focus is to achieve voluntary compliance first before enforcement action is initiated. Monitoring is carried out to determine effectiveness of control and to understand trends of infestations. Surveillance activities focus on protecting the region from the incursion of new pests.

[1] As prescribed by the National Policy Direction for Pest Management 2015.

3. **Collaboration:** ORC works with landowner/occupier groups and central and local government agencies to develop consistent approaches for the effective management of pests. This includes Land Information New Zealand (LINZ), Department of Conservation (DoC), Ministry of Primary Industries (MPI), neighbouring regional councils and community groups like Predator Free Dunedin, and wilding conifer trusts.
4. **Requirement to Act** *(regulation)***:** RPMP rules are the 'backbone' of the pest management. These rules require identified pests to be controlled to specified standards or levels. Failure to comply with RPMP rules can lead to enforcement action by ORC.
5. **Service delivery:** This is achieved through the delivery of national programmes (wildings and wallabies) and the provision of direct control where special expertise is required that is beyond the capability of the land occupier to arrange. Service delivery includes providing appropriate control tools (e.g. traps, spraying, shooting) and the approved release of biological control agents.

2.3 Regional Focus Programmes

Continuing from the previous Operational Plans, there is a focus on one pest programme and four pests. The focus on these pests is due to their high community interest, environmental impact, economic impact, supporting national programmes and the need to invest in long-term sustained action. Table 1 provides further details of the specific pests.

Table 1: Focus area pests

Pest	Programme	Reason to Prioritise
Exclusion Pests	Exclusion	Exclusion of pests not established in Otago is a critical responsibility of the RPMP. To ensure new pests are excluded there is a need to develop and implement a proactive surveillance approach. This will identify pathways of potential spread (e.g. product movement).
Feral rabbits	Sustained Control	Feral rabbits generate significant ecosystem damage to the environment and production systems within Otago. Feral rabbits terraform a landscape. The Ministry of Primary Industries estimate production-related losses exceed $50 million per year, on top of control expenses of $25 million. Other losses include destruction of habitat for indigenous flora and fauna, changes to landscape value and impacts on social activities.
Bennett's wallaby	Eradication	Wallabies are an ever-present threat due to their high numbers in neighbouring South Canterbury. As wallabies present a significant threat to the ecosystem and a production risk to the economy, it is imperative that they are prevented from establishing a foothold in Otago.
Wilding conifers	Progressive containment	Wilding conifers interfere with ecosystems where they can shade out native species. This has consequential effects on the wider environment, especially water availability. From a social perspective, they interrupt Otago's iconic landscape and present a fire risk to farmlands and communities. If not controlled, they will significantly

		change the landscape, hydrological cycle and conservation values, especially high country, tussock grasslands and alpine catchments.
Lagarosiphon	Site-led programme	Lagarosiphon is an aquatic plant pest that threatens the aquatic environment. It is fast growing, displacing and shading out aquatic native plants. Thick areas of lagarosiphon disturb water flows and cause localised deoxygenation of water changing the aquatic ecosystem for animals. Lagarosiphon blocks water bodies, resulting in negative visual effects, reduces recreational activities and chokes water supply intakes. If lagarosiphon is left uncontrolled, large beds can form and wash ashore, leaving an unpleasant heap to decay.

2.4 Operational Plan Reporting

As the lead management agency, ORC is responsible for reporting on activities and progress during the year. The ORC is required by Section 100B of the Biosecurity Act 1993 to *"prepare a report on the operational plan and its implementation not later than 5 months after the end of each financial year".* This report is provided to the Minster of Biosecurity and is made available to the public through reporting to Council and on ORC's website.

Hawkdun Range (Photo Credit: M. Boardman)

3. Pest Management Activities to Enact the RPMP

3.1 Exclusion pest programme

Regional Focus Programme

The exclusion pest programme is to prevent the establishment of a specified pest that is present in New Zealand but not yet in the Otago region which could have potential adverse effects on economic well-being and environmental values. While the RPMP lists six exclusion pests, under Section 100V of the Biosecurity Act, there is provision to implement emergency controls for any incursion of a new pest that are not listed in the RPMP.

Objective

Over the duration of the Plan, preclude establishment of African feather grass, Chilean needle grass, egeria, false tamarisk, hornwort and moth plant within the Otago region to prevent adverse effects on economic well-being and environmental values.

Deliverable	KPI	Target
Engage with neighbouring regional councils on exclusion pest threats	# of meetings with neighbouring regional councils on exclusion pest threats	6
Develop surveillance plans for the six exclusion pest species as a component of the incursion pest response plan[2]	Exclusion pest management and surveillance plans covering the six identified exclusion pests finalised by 31 May 2024	6
If the presence of an exclusion pest (or other unwanted pests) is confirmed, response actions completed as per the incursion response plan	% of actions completed within the required timeframes as set out in the incursion pest response plan for each confirmed sighting (as assessed by checklist)	100%

3.2 Eradication pest programmes

The eradication programme focuses on three pest species in the region. They belong in this programme as their infestation levels are considered low enough for eradication to be feasible in the long-term. The pests include one marsupial (Bennett's wallaby), a bird (rook) and a plant (spiny broom). Implementation of management programmes for each pest is described separately in the following subsections due to the different approaches taken.

[2] This was referred to as the "exclusion pest response plan" in the 2022-23 Biosecurity Operational Plan. The name change reflects the purpose of the response plan which is to cover any unwanted pests, not just the listed exclusion pests, if their presence has been confirmed.

3.2.1 Bennett's wallaby

Regional Focus Programme

Objective

Reduce all infestations of Bennett's wallaby to zero levels within the Otago region to prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Prompt response to all reported sightings of wallabies	% of sightings inspected within 3 working days of receiving the sighting report	90%
	% of sightings inspected within 10 working days of receiving the sighting report	100%
Collaborate with and participate in the national wallaby programme	% of Operational Advisory Group meetings attended	100%
	Fulfil requirements of MPI funding agreement	100%
	# of wallaby R+D trials supported	2
Engage with Environment Canterbury on Wallaby control	# of meetings or visits with Environment Canterbury on wallaby control	6

3.2.2 Rooks

Objective

Reduce all infestations of rooks to zero levels within the Otago region to prevent adverse effects on economic well-being and the environment.[3]

Deliverable	KPI	Target
Inspect all known rookery locations	% of known rookery locations inspected	100%
If there is a confirmed sighting of a rook, undertake necessary control action	Control action is commenced within 3 working days of confirmed rook sighting.	100%

3.2.3 Spiny broom

Objective

Reduce all infestations of spiny broom to zero levels within the Otago region to prevent adverse effects on economic well-being and the environment.[4]

[3] Historically rookeries have been known to exist in South Otago, Strath Taiari and the Maniototo.

[4] Previous Spiny Broom infestations have been identified in the Waihola, Chain Hills and Brighton areas.

Deliverable	KPI	Target
Undertake inspections for spiny broom at known locations and surveillance at surrounding areas.	% of known locations (13) inspected and surrounding areas† surveyed for spiny broom	100%
If there is a confirmed sighting of spiny broom, undertake necessary control action	Control action is commenced within 5 working days of confirmed sighting of spiny broom	100%

† See glossary for definition of location, known location and surrounding areas.

3.3 Progressive containment pest programmes

The 11 pest plants (or groupings of plants) in this programme are reasonably well established in the region. While eradication is unlikely, it is an aim of the RPMP that pest densities can be progressively reduced.

3.3.1 Wilding conifers

Regional Focus Programme

Objective

Progressively contain and reduce the geographic extent of wilding conifers within the Otago Region to minimise adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Undertake inspections for wilding conifers at locations guided by the regional wilding conifer strategy	# of properties inspected for wilding conifer compliance	100
Collaborate with and participate in the national wilding conifer programme	% of Operational Advisory Group meetings attended	100%
	Fulfil requirements of MPI funding agreement	100%
Implement regional wilding conifer strategy	% of actions from the regional strategy commenced within specified due timeframes	100%
Support regional partnerships through funding community control groups.[5]	Funding disbursed as per agreement	100%

[5] Currently partnerships are with Whakatipu Wilding Conifer Control Group and Central Otago Wilding Conifer Control Group.

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.2 African love grass

Objective

Progressively contain and reduce the geographic distribution or extent of African love grass at known locations[6] within the Otago region to minimise or prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Undertake inspections for African love grass at known infestation locations and surveillance in surrounding areas	% of known locations (20) inspected and surrounding areas surveyed for African love grass	100%
If there is a confirmed sighting of African love grass, undertake necessary control action	Control action is commenced within 5 working days of confirmed sighting of African love grass	100%

3.3.3 Nassella tussock

Objective

Progressively contain and reduce the geographic distribution or extent of nassella tussock at known locations[7] within the Otago region to minimise or prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Inspect known locations for nassella tussock and undertake surveillance in surrounding locations	% of known locations (38) inspected and surrounding locations surveyed for nassella tussock	100%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.4 Old Man's Beard

Objective

Progressively contain and reduce the geographic distribution or extent of old man's beard within the Otago region to minimise or prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target

[6] Previous and current African Love Grass infestations around Earnscleugh, Clyde, Omakau, Queensbury and Pisa Moorings.

[7] Current Nassella Tussock infestations are identified around Roxburgh/Alexandra (Galloway and Knobby Range areas – approx. 32,000 ha); lower Cardrona Valley (Deep Creek to Riverbank Road – approx. 4,500 ha); Lower Waitaki Valley (Georgetown and Tussocky/Ridge Roads – approx. 4,100 ha).

Undertake re-inspections for Old Man's Beard to ascertain compliance	% of non-compliant properties re-inspected for Old Man's Beard	100%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.5 Spartina and six containment pest plants

Objective

Progressively contain and reduce the geographic distribution or extent of bomarea, boneseed, bur daisy, cape ivy, perennial nettle, spartina[8] and white-edged nightshade within the Otago region to minimise or prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Undertake re-inspections for spartina and the six containment plants to ascertain compliance	% of non-compliant properties re-inspected for spartina or any one of the six containment plants	100%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4 Sustained control pest programmes

This programme covers well-established legacy pests that are present across Otago and many regions of New Zealand. Although eradication isn't viable, opportunities exist to prevent spread from infested areas to clear areas and to reduce 'externality impacts' on adjoining occupiers' values where those adjoining occupiers are motivated to undertake control.

3.4.1 Feral rabbits

Regional Focus Programme

Objective

Implement sustained control of feral rabbits to ensure population levels do not exceed Level 3 on the Modified McLean Scale in order to minimise adverse effects on production and environmental values within the Otago region.

Deliverable	KPI	Target
Undertake rabbit inspections to determine compliance	# of rabbit inspections outside a community programme	>250

[8] Spartina containment focuses on Waikouaiti, Karitane and Te Hakapupu/Pleasant River Estuaries.

	% of non-compliant properties re-inspected for rabbit compliance	100%
Continue engagement with community rabbit programmes[9] to check progress in rabbit management	# of engagements with community rabbit programme either through re-inspections or continued support	12
Monitor trends in rabbit densities	# of rabbit night count routes completed and analysed[10]	>30
	# of fly traps locations monitored and analysed	10
	Report on analysis of historical serological data completed by 30 June 2024	1
	Update rabbit proneness map completed by 31 March 2024	1
	# of R+D trials to enhance rabbit monitoring instigated	2
Support community initiatives through Sustainable Rabbit Management Funding	Funding round is oversubscribed with eligible applications	Yes/No
Advocate and engage with territorial authorities and Crown agencies on rabbit management[11]	# of territorial authorities and Crown agencies engaged on rabbit management	8

Note: Any compliance actions are covered under 4.1 Compliance and Enforcement Actions.

3.4.2 Gorse and broom

Objective

Implement sustained control of broom and gorse to ensure land that is free of, or being cleared of, broom and gorse does not become infested (primarily in Central Otago and Queenstown Lakes districts) in order to prevent adverse effects on production values and economic well-being.

Deliverable	KPI	Target
Inspect gorse and broom free areas for gorse and broom infestation, including the use of remote sensing.	% of non-compliant properties re-inspected in gorse and broom free areas	100%

[9] Hidden Hills, Albert Town, Lake Hayes, Gibbston, Queensberry, Moeraki, Otago Peninsula and Clyde.

[10] Currently there are 17 night count routes. Under the Rabbit Monitoring Plan it is planned there will be 31 routes. The final number is yet to be confirmed until routes are formally surveyed and access agreements in place.

[11] Namely MPI, DoC, LINZ and Territorial Authorities [WDC, DCC, CDC, CODC, QLDC]

Advocate with occupiers and landowners on new gorse and broom free areas that come into effect in 2024	# of community meetings delivered on new gorse and broom free areas	4

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4.3 Russell Lupin

Objective

Implement sustained control of the extent of Russell lupin and wild Russell lupin within specified distances from waterways and property boundaries to preclude establishment of wild Russell lupin and to prevent adverse effects on environmental values.

Deliverable	KPI	Target
Implement regional strategy on Russell lupin including communications plan	% of actions completed by due date as described in the Russell lupin strategy	100%
Undertake inspections in high-risk areas[12]	# of high-risk areas inspected for Russell lupin	6

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4.4 Nodding thistle and Ragwort

Objective

Implement sustained control of nodding thistle and ragwort on rural zoned land within specified distances of property boundaries throughout the Otago region to prevent their spread in order to minimise adverse effects on production values and economic well-being.

Deliverable	KPI	Target
Undertake re-inspections for nodding thistle and ragwort to ascertain compliance	% of non-compliant properties re-inspected for nodding thistle and ragwort	100%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

[12] As listed in the RPMP, at risk areas are: Dart, Rees, Matukituki, Makarora, Hunter and Shotover (downstream of Arthurs point) river catchments.

3.5 Site-led pest programmes

The RPMP site-led programme is about protecting the environmental values at several named sites from the ravages of multiple pests. As a result, the management programme focuses on specific threats to each site and provides for the control of many pests, often those that are not managed elsewhere in the region (e.g. possums, rats).

The RPMP establishes four site-led programmes. For the Operational Plan three of them, Otago Peninsula, West Harbour-Mount Cargill and Quarantine and Goat islands (all within Dunedin City) are grouped, as the same six pest plant species and 15 pest animal species are managed generically across all three places. The fourth site-led programme concerns the LINZ-led management of lagarosiphon (oxygen weed), where different controls are implemented in different lakes. New site-led programmes will be considered via the RPMP in the future.

3.5.1 Otago Peninsula, West Harbour – Mount Cargill and Quarantine and Goat Islands

Objective

Otago Regional Council will take a lead role in supporting community groups and agencies in bringing about the desired levels of environmental protection to these sites [Otago Peninsula (9,000 ha), West Harbour-Mt Cargill (12,500 ha) and Quarantine and Goat Islands].[13]

Deliverable	KPI	Target
Confirm site-led programmes around Otago Harbour	Site-led programme plan (including each site-led location) reconfirmed by 31 July 2023	3
Site-led programme plan implemented	% of actions implemented within defined timeframes for 2023-2024	100%

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.5.2 Lagarosiphon

Regional Focus Programme

Objective

To support LINZ in controlling lagarosiphon in the region's rivers and lakes by:

- Preventing its establishment in Lake Wakatipu and other regional water bodies
- Progressively reducing its spread in Lake Wanaka and the Kawarau River
- Undertaking sustained control in Lake Dunstan

[13] Refer to RPMP Objectives 6.5.4, 6.5.5 & 6.5.6 respectively for Otago Peninsula, West Harbour-Mt Cargill and Quarantine and Goat Islands

Deliverable	KPI	Target
Joint planning with LINZ and other stakeholders	# of meetings attended with LINZ and other stakeholders	4
Support LINZ in the management and control of lagarosiphon	Funding disbursed as per agreement	100%
Undertake summer monitoring of water users at designated sites[14]	# of interactions in the 'Check, clean, dry' programme	650
Undertake monitoring and inspections of lagarosiphon at designated water bodies that are not the responsibility of LINZ	# of lagarosiphon monitoring visits at priority water bodies[15]	18
	# of lagarosiphon inspections at secondary water bodies	>40

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.6 Integrated programmes

While the RPMP has five defined programmes, aspects of these programmes are interconnected especially through linkages to biodiversity outcomes and associated common analysis. For this Operational Plan, the integration between programmes is an important consideration.

3.6.1 Biodiversity Integration

A principal outcome of pest management is to enhance indigenous biodiversity, which informs the prioritisation of biosecurity activities. This is achieved by focusing on high biodiversity focus areas, and their surrounds, that should be safeguarded.[16] (Note: The deliverables in this sub-section cover non-rabbit pests. For rabbit management, refer to Section 3.4.1).

Deliverable	KPI	Target
Undertake pest inspections to progress biodiversity outcomes	# of pest inspections undertaken[17]	1,500
Pest inspections support high biodiversity focus areas and their surrounds	% of pest inspections undertaken in high biodiversity focus areas and their surrounds	40%

[14] Lakes Dunstan, Wanaka or Roxburgh, and the Clutha/Mata-Au and Kawarau Rivers.

[15] Moke Lake; Manorburn, Poolburn, Butchers, Conroys, Falls, Fraser Dams, Albert Town stormwater detention ponds and Bullock Creek sites.

[16] As informed by Leathwick J.R. (2020). Indigenous biodiversity rankings for the Otago region. Report prepared for the ORC.

[17] This is in addition to any inspections listed elsewhere in this Operation plan for specific pests

3.6.2 Shared Pest Programmes

Aspects of biosecurity have common approaches that apply across the five RPMP programmes. These deliverables focus on the monitoring and analysis of pests.

Deliverable	KPI	Target
Re-inspect all non-compliant properties within set timeframes	% of non-compliant inspections re-inspected within set timeframes[18]	100%
Develop and implement a density monitoring plan of specific plant species[19]	# of density monitoring visits undertaken	20
Undertake monitoring of pest plant bio-control release sites[20]	# of monitoring visits to pest plant bio-control release sites	20
Undertake visits to nurseries and pet shops to advocate and inspect for biosecurity compliance	# of nurseries and pet shops visited	10
Undertake an advocacy and education programme to encourage awareness as to public responsibilities to pest management	% of deliverables enacted from the advocacy and education programme.	100%

3.6.3 Pest Programme Engagement

The management of pests is wider than the ORC. Due to this, it is essential to engage with partners and stakeholders to promote and action biosecurity outcomes. This engagement is to explain the rules as they pertain to these agencies, to advocate for their increased action and for the agencies to outline their work programmes

Deliverable	KPI	Target
Engage with crown agencies and territory authorities on pest management[21]	# of communication engagements with listed agencies at least once annually	10
Support and educate occupiers, landowners and community groups to undertake best practice pest control	# of community events attended to support best practice pest control	12
Collaborate with neighbouring regional councils	# of collaborations with neighbouring regional councils	4

[18] Timeframes to achieve compliance for plant pests is three months from the inspection with the exception of Old Man's Beard which is six weeks between Oct-Feb. A re-inspection is undertaken within three weeks of this timeframe being expired.

[19] Namely, African Love Grass, Old Man's Beard, Nassella Tussock, Spartina, Russell Lupin

[20] Namely for various bio-controls for Ragwort , Gorse, Broom, Old Man's Beard, Nodding thistle

[21] Namely MPI, DoC, LINZ, KiwiRail, Waka Kotahi, Territorial Authorities [WDC, DCC, CDC, CODC, QLDC]

Collaborate with Kāi Tahu on biosecurity issues and support them to be involved in biosecurity initiatives	# of collaborations with Kāi Tahu on biosecurity issues	2
Support schools with key messages, information and tools relating to biosecurity	# of school programmes attended to provide awareness on biosecurity	10

4. RPMP Administration

4.1 Compliance and Enforcement Actions

As the RPMP is a rules-based approach to pest management, there is need to ensure actions are taken to ensure compliance. The specific approach to compliance and enforcement is covered in the ORC Biosecurity Compliance and Enforcement Policy. To achieve this, the following actions will be delivered.

Deliverables	KPI	Target
Effective administration of compliance and enforcement		
Provide occupiers and landowners with the declared pest status following an inspection	% of occupier/landowner advised of inspection status within three weeks of the inspection	75%
	% of occupier/landowner advised of inspection status within six weeks of the inspection	100%
Continued non-compliance, as confirmed by enforcement criteria, is addressed through issuing a Notice of Direction	% of eligible non-compliant properties issued with a Notice of Direction within 20 working days after re-inspection	100%
Pest enquiries[22] are responded to in a timely manner as appropriate to the risk of the pest	% of exclusion pest enquiries responded to within 24 hours	100%
	% of eradication pest enquiries responded to within three working days	100%
	% of all pest enquiries responded to within 10 working days	100%

[22] Enquiries are defined as either 'reports, sightings, notifications and complaints'

5. Glossary

For the purposes of this operational plan, the following definitions are provided. Further definitions can be found in the RPMP and the ORC Biosecurity Compliance and Enforcement Policy.

Boundary: refers to a line or surface in a geographical space the delineates the horizontal or vertical extent of a land parcel.

Compliant: refers to when a rule in the RPMP is adhered to.

Default Action: means work undertaken by the management agency to carry out pest control when a 'Notice of Direction' or 'Compliance Order' has not been complied with by an occupier, under section 128 of the BSA. The management agency can then recover costs and expenses reasonably incurred under section 129 of the BSA.

Known location: refers to a location that has a historical or current record of the pest being present. For ease of monitoring, a known location can include a buffer radius of up to 50 metres.

Inspection: means a site visit (normally defined by a property) to determine compliance to RPMP rules undertaken by a warranted officer as authorised under the Biosecurity Act 1993.

Landowner: has the same meaning as occupier in the Biosecurity Act 1993.

Land Parcel: is a unique area of land, identified by the cadastral survey plan showing the legal boundaries, location, dimensions and area, along with the unique legal description (appellation).

Location: refers to a geographical point on the surface of the earth. This will typically be identified by the GPS co-ordinates of northing and easting. For New Zealand, most common projections are the New Zealand Traverse Mercator or World Geodetic 1984).

Management agency: has the same meaning as in the Biosecurity Act 1993, specifically *"means the body specified as the management agency in a pest management plan or a pathway management plan".* For the purposes of the RPMP and Operational Plan, Otago Regional Council is the management agency for pests to be controlled in the Otago region.

Modified McLean Scale: this scale assesses rabbit population levels (see RPMP, Appendix 2).

Monitoring: means work undertaken to determine the trend and prevalence of a pest. This will normally be in-person but can use remote sensing tools.

Notice of Direction (NOD): means the actions required and notice issued pursuant to section 122 of the Biosecurity Act 1993. A NOD can require a person to take action to address pest plant or animal problems or to comply with a rule in an RPMP.

Occupier: see landowner.

Non-compliance: refers to any breach in a RPMP rule. Non-compliance is liable for enforceable under the provisions of the BSA. For clarification, a breach of a RPMP rule does not have to be widespread across a property and may relate to a single location (or a defined area) within a property. Due to the potential of spread, the whole property is deemed non-compliant even if the infestation is localised.

Operational plan: means a plan prepared by the Management Agency under Section 100B of the Act.

Pest: has the same meaning as in the Biosecurity Act 1993: *"an organism specified as a pest in a pest management plan."*

Property: For the purposes of this plan, a property is an extent of land that is either [1] under unique ownership (whether individual, joint, partnership or corporate) or [2] is managed as a single operational entity. A property can be made up of one or more adjoining land parcels (see land parcel).

Surveillance: means work undertaken to determine the status (presence) of pest species. This can be in-person or use remote sensing tools.

Surrounding area: means a wider area surrounding a pest infestation. This is variable depending on context of the pest but, at a minimum, includes all adjoining properties to the property with the pest infestation. A property is considered adjoining even if it is separated by a road, paper road, waterway or easement. A designated surrounding area does not prevent pest inspections from being carried out in non-surrounding areas.

Water body: means fresh water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

Wilding conifer: wilding conifers are any introduced conifer tree, including (but not limited to) any of the species listed in Table 3 of the RPMP.

Zero level/zero density: where the pest is not detectable in an area, however the pest may continue to appear afterwards due to plant seed sources or animal migration from an unmanaged area.

Biosecurity Operational Plan

~~2022~~-2023-2024

Implementing the Otago Regional Pest Management Plan 2019-2029

Executive Summary

Under the Biosecurity Act (1993), the Otago Regional Council (ORC) is the regional management agency responsible for biosecurity and pest control. To achieve this regulatory function, the ORC has developed the *Otago Regional Pest Management Plan 2019-2029* (RPMP) which sets rules for land occupiers to control pests to set levels. This Biosecurity Operational Plan annualises the objectives of the RPMP for the ~~2022-~~2023-2024 financial year.

The ORC engages with occupiers and landowners who are ultimately responsible for pest management. To achieve practicable biosecurity outcomes, the ORC undertakes inspections (to ensure compliance with rules), monitoring (to determine the effectiveness of control) and surveillance (identifying new issues and trends). The ~~Furthermore, the~~ ORC undertake~~stakes a lead role in~~ advocacy and education around pest threats, pathways of pest spread and the provision of advice. Furthermore, the ORC delivers national programmes for the management of nationally significant pests (wallabies and wilding conifers).

This work is supported by close engagement with allied organisations involved in implementing and funding biosecurity across the region, including the Ministry for Primary Industries (MPI), Land Information New Zealand (LINZ), the Department of Conservation (DoC), Kāi Tahu, other councils and community groups.

Under the RPMP, pest management is classified into five programmes.

1. **Exclusion pest programme:** ~~the intermediate outcome is~~ to prevent the establishment of six high threat pest plants in the region.
2. **Eradication pest programme:** ~~the intermediate outcome is~~ to proactively eradicate spiny broom, Bennett's wallaby and rooks from the region.
3. **Progressive containment pest programme:** ~~the intermediate outcome is~~ to contain or reduce the geographic distribution of 11 pest plants (or groups of plants) across the region.
4. **Sustained control pest programme:** ~~the intermediate outcome is~~ to enforce ongoing control of rabbits and five widespread pest plants to reduce their impact.
5. **Site-led pest programmes:** ~~the intermediate outcome is that the~~ listed pests are managed as deemed appropriate for the values of the stated location.

This Operational Plan is the final iteration under the current Long-Term Plan and is a continuation of the same approaches. Where necessary, changes have been made from the previous~~**Priority Pests**~~

~~The~~ 2022-23 Operational Plan based on lessons learnt to improve efficiency and effectiveness.

As part of the continuation, this~~2023 Biosecurity~~ Operational Plan retains the priority pests from the previous Operational Plans~~Plan~~, covering one programme and four pests:

- Exclusion pest programme
- Feral rabbits
- Bennett's wallaby
- Wilding conifers
- Lagarosiphon

The exclusion programme and four pests are of concern to local communities and have heightened adverse effects (current or future) on environmental, economic and social grounds. ~~Consequently, they require a significant investment in resources to either control or prevent their spread.~~

Table of Contents

Version Control

Version #	Date	Event/Changes made
1	2 February 2023 ~~29 June 2022~~	To Environmental Implementation Committee for approval ~~Council submission and Approval~~

Cover Photo

Lake Wanaka, ~~View~~ from Glen Dene Ridge Track ~~Maungatua~~ (Photo Credit: Richard Lord) ~~*G. Golling)*~~

1. Introduction

1.1 Background

Under the Biosecurity Act 1993, the Otago Regional Council (ORC) developed the *Regional Pest Management Plan 2019-2029* (‘**the RPMP**’). The RPMP is a statutory document that lists specific pests which have the greatest adverse effect on the environment and economy within Otago. In order to control, or eliminate, such adverse effects, the RPMP establishes rules that are legally enforceable. This provides a framework for the effective management of declared pests in the Otago region over the next decade. The RPMP sits alongside the non-statutory ORC Biosecurity Strategy which focuses on the wider biosecurity issues including the collaboration with stakeholders to manage pests.

The key purpose of the RPMP is to outline how the identified pests will be managed to reduce or remove their threat to the environmental (e.g. ecosystem or species), economic (e.g. farming/forestry) and cultural/social (e.g. Māori and human health) values of the region. The RPMP allows the council to use relevant advice, service delivery, regulatory enforcement and funding provisions as provided by the Biosecurity Act.

The RPMP identifies 30 plants (or groups of plants) and 11 animals (or groups of animals) as pests. Except for specifieddesignated pests, where the ORC may coordinate orand undertake direct control, the responsibility for pest control rests with occupiers and landowners.

The responsibility of the ORC focuses on advocacy and education, supported by inspections, monitoring and surveillance. As the designated Management Agency under the Biosecurity Act, the ORC enforces the RPMP rules to ensure occupiers and landowners are aware of and meet their obligations for pest management on their properties by adhering to RPMP rules. In addition, the ORC delivers national programmes for the management of nationally significant pests (wallabies and wilding conifers). This is further supported through various community groups that are actively involved in pest management (e.g. wilding conifer trusts, Predator Free Dunedin, community rabbit programmes).

1.2 Operational plan purpose, duration and linkages

Under the Biosecurity Act, the ORC is required to prepare an annual Operational Plan that implements the RPMP. The Operational Plan is a publicly available document and is reported on each year to Council.

This document *(the 2023-2024 Biosecurity Operational Plan 2022-2023)* outlines the nature, scope and priority activities that ORC intends to undertake for pest management across the Otago region for the financial year 1st July 20232022 through to 30th June 20242023.

The key purpose of this Operational Plan presentsis to identify what will be delivered during the 2022-2023-2024 financial year in terms of focus areasprioritisation and the associated actions to implement the RPMP. For context, it is important theessential that this Operational Plan is read in conjunction with the RPMP. The ORC Biosecurity and Biodiversity Strategies and wider catchment management planning also provides additional, as well as the supporting context toof the Operational PlanBiosecurity Strategy.

~~An important linkage with this Operational Plan is the increasing integration with biodiversity outcomes and wider catchment management planning.~~

2. Summary of Regional Pest Management Plan

2.1 Pest management programmes

The RPMP is implemented through five pest management programmes[1], as summarised below. The pests listed under each programme are given in Table 1.

1. **Exclusion:** The objective is to ensure specific pests that are present in New Zealand do not become established in Otago. Under Section 100V of the Biosecurity Act, there is provision to implement emergency controls for any incursion of a new pest that are not listed in the RPMP.
2. **Eradication:** The objective is to eradicate identified pests from the areas where they occur in the region. Eradication involves reducing the infestation of the pest to zero density.
3. **Progressive Containment:** The objective is to contain and reduce the geographic spread of the listed pests to specific areas. Containment arises where the pest is at high densities in specific parts of the Otago region, but in low densities or limited range in other parts. While eradication is not feasible, it is realistic to contain the pest from spreading to other 'clear' parts of the region.
4. **Sustained Control:** The objective is for ongoing control of the listed pests to reduce their impacts and spread to other properties. The focus is to manage the densities of the pests to ensure they do not reach a level where they cause significant environmental impact. Sustained control is a strategy for pests with a wide geographical spread that they cannot feasibly be eradicated.
5. **Site-led:** The objective is to exclude, or eradicate, from identified locations or to contain, reduce or control within those places.

2.2 Methods of Action – how pest management will be carried out

The ORC achieves ~~practicable~~ pest management outcomes through the following methods and provision of resources. Table 1 outlines which pest and programmes are related to each method.

1. **Advocacy and education:** ORC will provide education, advice and information to landowners and/or occupiers and the public about the impacts of pests and pathways (vectors) of pest spread and appropriate methods of control. The ORC will ensure land occupiers are informed of their responsibilities under the RPMP. This activity also includes contributing to research and cost-sharing with other agencies and developing/promoting 'good practice' around control methods aimed at pest management contractors and occupiers who are required to act.
2. **Inspection, monitoring and surveillance:** Regular property inspections ensure that RPMP rules are being adhered to. The focus is to achieve voluntary compliance first before enforcement action is initiated. Monitoring is carried out to determine effectiveness of control and to understand trends of infestations. Surveillance activities focus on protecting the region from the incursion of new pests.

[1] As prescribed by the National Policy Direction for Pest Management 2015.

3. **Collaboration ~~with others~~:** ORC works with landowner/occupier groups and central and local government agencies to develop consistent approaches for the effective management of pests. This includes Land Information New Zealand (LINZ), Department of Conservation (DoC), Ministry of Primary Industries (MPI), neighbouring regional councils and community groups like Predator Free Dunedin, and wilding conifer trusts.

4. **Requirement to Act** *(regulation)*: RPMP rules are the 'backbone' of the pest management. These rules require identified pests to be controlled to specified standards or levels. Failure to comply with RPMP rules can lead to enforcement action by ORC.

5. **Service delivery:** This is achieved through the delivery of national programmes (wildings and wallabies) and the provision of direct control ~~In some cases,~~ where special expertise is required that is beyond the capability of the land occupier~~, or coordinated control gives benefits~~ to arrange. ~~a specific area, direct control (service delivery) may be undertaken by the ORC.~~ Service delivery includes providing appropriate control tools (e.g. traps, spraying, shooting~~chemicals~~) and the approved release of biological control agents.

2.3~~Table 1: Pests listed in RPMP and associated Methods of Action~~

Pest	Advocacy and education	Inspections, monitoring & surveillance	Collaboration with others	Requirement to Act	Service delivery
~~Exclusion~~					
~~African feather grass~~	✓	✓	✓		
~~Chilean needle grass~~	✓	✓	✓		
~~Egeria~~	✓	✓	✓		
~~False tamarisk~~	✓	✓	✓		
~~Hornwort~~	✓	✓	✓		
~~Moth plant~~	✓	✓	✓		
~~Eradication~~					
~~Bennett's wallaby~~	✓	✓	✓	✓	✓[1]
~~Rooks~~	✓	✓	✓	✓	✓[1]
~~Spiny broom~~	✓	✓	✓	✓	✓[1]
~~Progressive containment~~					
~~African love grass~~	✓	✓	✓	✓	✓[1]
~~Nassella tussock~~	✓	✓	✓	✓	
~~Old man's beard~~	✓	✓	✓	✓	
~~Spartina~~	✓	✓	✓	✓	✓[2]
~~Six containment plants[4]~~	✓	✓	✓	✓	✓[2]
~~Wilding conifers~~	✓	✓	✓	✓	✓[3]
~~Sustained control~~					
~~Gorse and broom~~	✓	✓	✓	✓	
~~Nodding thistle & ragwort~~	✓	✓	✓	✓	
~~Russell lupin~~	✓	✓	✓	✓	
~~Feral rabbits~~	✓	✓	✓	✓	
~~Site-Led~~					

Pests contextual to Identified Locations	For site-led programmes, pests are contextual to the geographical areas. Pests of concern are identified in the RPMP and listed in the site-led annual project plans. Site-led project plans are formally part of this Operational Plan.

[1] ORC will facilitate direct control where agreed with occupiers.
[2] ORC will facilitate direct control, only where access, spraying or safety issues require expert involvement.
[3] ORC will facilitate or undertake direct control as required, and alongside established groups.
[4] The six containment plants are: Bomarea, Boneseed, Bur daisy, Cape Ivy, Perennial nettle, White-edged nightshade

2.3 Progress of the RPMP

The RPMP is a 10-year plan. The biosecurity space is dynamic, with changes occurring within the 10 years due to environmental and ecological conditions and as a result of the actions undertaken to implement the RPMP and Biosecurity Strategy. In addition, significant increase in funding has been afforded to biosecurity activities under the 2021-31 Long Term Plan. This has reshaped the capacity to deliver programmes.

This Operational Plan builds on the lessons from the previous year, with the following emphasis:

- Stronger integration with catchment management and biodiversity outcomes to guide biosecurity programmes more strategically.
- A greater emphasis on the analysis and assessment to evaluate the progress and effectiveness of biosecurity programmes.
- Continuation of engagement and co-ordination with occupiers and landowners around feral rabbits, especially in peri-urban areas and lifestyle blocks.
- Exploring other potential pests (e.g. marine)
- Implementing updated operating procedures to ensure compliance as provided through the Biosecurity Act.
- Strengthening compliance administration for all pests, especially rabbits.
- Increase wilding conifer engagement, inspections, compliance, and monitoring.
- Increase wallaby surveillance and liaison with neighbouring councils.
- Continue the adoption of new technology and approaches to improve data collection and analysis of activities in real time.

2.4 Regional Focus Programmes Prioritisation of Pest Control

Continuing from the previous Operational Plans, there is a focus on one pest programme and four pests. The focus on these pests is due to their high community interest, environmental impact, economic impact, supporting national programmes and the need to invest in long-term sustained action. Table 1 provides further details of the specific pests.

Table 1: Focus area pests The continuing lessons of pest management across the region have identified one programme and four pests that will be prioritised in the 2022-2023 delivery period. These priority pests are the same as the previous year to enable a greater embedding of outcomes. These pests, and the reasons for prioritisation, are identified in Table 2. Prioritisation of these pests provides a heightened focus, which is supported through greater resourcing and management oversight.

~~Table 2: List of priority pests for 2022-2023~~

Pest	Programme	Reason to Prioritise
Exclusion Pests	Exclusion	Exclusion of pests not established in Otago is a critical responsibility of the RPMP. To ensure new pests are excluded there is a need to develop and implement a proactive surveillance approach. This will identify pathways of potential spread (e.g. product movement).
Feral rabbits	Sustained Control	Feral rabbits~~, arguably,~~ generate ~~the most~~ significant ecosystem damage to the environment and production systems within Otago. Feral rabbits terraform a landscape. The Ministry of Primary Industries estimate production-related losses exceed $50 million per year, on top of control expenses of $25 million. Other losses include destruction of habitat for indigenous flora and fauna, changes to landscape value and impacts on social activities.
Bennett's wallaby	Eradication	Wallabies are an ever-present threat due to their high numbers in neighbouring South Canterbury. As wallabies present a significant threat~~environmental~~ to the ecosystem and a production risk to the economy, it is imperative that they are prevented from establishing a foothold in Otago.
Wilding conifers	Progressive containment	Wilding conifers interfere with ecosystems where they can shade out native species. This has consequential effects on the wider environment, especially water availability. From a social perspective, they interrupt Otago's iconic landscape and present a fire risk to farmlands and communities. If not controlled, they will significantly change the landscape, hydrological cycle and conservation values, especially high country~~, and~~ tussock grasslands and alpine catchments.
Lagarosiphon	Site-led programme	Lagarosiphon is an aquatic plant pest that threatens the aquatic environment. It is fast growing, displacing and shading out aquatic native plants. Thick areas of lagarosiphon disturb water flows and cause localised deoxygenation of water changing the aquatic ecosystem for animals. Lagarosiphon blocks water bodies, resulting in negative visual effects, reduces recreational activities and chokes water supply intakes. If lagarosiphon is left uncontrolled, large beds can form and wash ashore, leaving an unpleasant heap to decay.

2.~~4~~5 Operational Plan Reporting

~~Pest management activities are undertaken through a mix of council staff, other agencies, contractors and volunteers.~~ As the lead management agency, ORC is responsible for reporting on activities and progress during the year. The ORC is~~ORC audits information received from various sources and reports that information and progress against the targets set out in this Operational Plan through an RPMP Annual Report, as~~ required by Section 100B of the Biosecurity Act 1993 to *"prepare a report on the operational plan and its* ~~. ORC also reports to Council~~ *implementation not later than 5 months after*~~performance, including~~ *the end of each financial year".* This report is provided to ~~instances staff~~

~~have used~~ the Minster of Biosecurity and is made available to~~powers in~~ the public through ~~RPMP to enforce rules or act on default.~~

~~For some pests within the RPMP, management is led by an external another agency. For example, LINZ is the lead agency for lagarosiphon management and national pest programmes cover wilding conifer and wallabies. In these instances,~~ reporting to Council and~~funders~~ on ORC's website~~progress is a joint responsibility~~.

Hawkdun Range (Photo Credit: M. Boardman)

~~The implementation and monitoring of this Operational Plan will be collated each month with targets tracked cumulatively (year-to-date). Reporting will be aggregated quarterly and annually for Council reports, which may include recommendation of changes for future management of identified, and/or potential, pests.~~

3. Pest Management Activities to Enact the RPMP

3.1 Exclusion pest programme

Regional Focus Programme~~Priority~~

The exclusion pest programme is to prevent the establishment of a specified pest that is present in New Zealand but not yet in the Otago region which could have potential~~prevent~~ adverse effects on economic well-being and environmental values. While the RPMP lists six exclusion pests, under Section 100V of the Biosecurity Act, there is provision to implement emergency controls for any incursion of a new pest that are not listed in the RPMP.

Objective

Over~~To prevent~~ the duration of the Plan, preclude establishment of ~~non-established pests in the Otago region, with a specific focus on six pests (all plants):~~ African feather grass, Chilean needle grass, egeria, false~~Egeria, False~~ tamarisk, hornwort~~Hornwort~~ and moth~~Moth~~ plant within the Otago region to prevent adverse effects on economic well-being and environmental values.~~.~~

Deliverable	KPI	Target
Engage with neighbouring regional councils on exclusion pest threats	# of meetings with neighbouring regional councils on exclusion pest threats	6
Develop surveillance plans for the six exclusion pest species as a component of the incursion pest response plan[2]	Exclusion pest management and surveillance plans covering the six identified exclusion pests finalised by 31 May 2024	6
If the presence of an~~Develop and implement~~ exclusion pest (or other unwanted pests) is confirmed, response actions completed as per the incursion response plan	% of actions completed within the required timeframes as set out in the incursion~~Exclusion~~ pest response plan for each confirmed sighting (as assessed~~approved~~ by checklist)~~Council by 30th March 2023~~	100%~~1~~

3.2 Eradication pest programmes

[2] This was referred to as the "exclusion pest response plan" in the 2022-23 Biosecurity Operational Plan. The name change reflects the purpose of the response plan which is to cover any unwanted pests, not just the listed exclusion pests, if their presence has been confirmed.

The eradication programme focuses on ~~is restricted to~~ three ~~contrasting~~ pest species in the region. They belong in this programme as their infestation levels are considered low enough for eradication to be feasible in the long-term. The pests include one marsupial (Bennett's wallaby), a bird (rook) and a plant (spiny broom). Implementation of management programmes for each pest is described separately in the following subsections due to the different approaches taken.

3.2.1 Bennett's wallaby

Regional Focus Programme~~Priority~~

Objective

Reduce all infestations of Bennett's wallaby to zero levels~~density, and prevent further spread,~~ within the Otago region to prevent adverse effects on economic well-being and the environment.

Deliverable	KPI	Target
Prompt response to all reported sightings of wallabies	% of sightings inspected within 3 working days of receiving the sighting report	90%
	% of sightings inspected within 10 working days of receiving the sighting report	100%
~~Surveillance plan for wallabies implemented~~	~~Quarterly reporting to relevant Council committee showing progress against the surveillance plan~~	4
Collaborate with and participate in the national wallaby programme	% of Operational Advisory Group meetings attended	100%
	Fulfil requirements of MPI funding agreement	100%
~~Analyse wallaby surveillance data and make recommendations for future management~~	# of wallaby R+D trials supported~~Report to Council by 31st December 2022~~	21~~1~~
Engage with Environment Canterbury on Wallaby control	# of meetings or visits with Environment Canterbury on wallaby control	6

3.2.2 Rooks

Objective

Reduce all infestations of rooks to zero levels~~density~~ within the Otago region to prevent adverse effects on economic well-being and the environment.[3]

[3] Historically rookeries have been known to exist in South Otago, Strath Taiari and the Maniototo.

Deliverable	KPI	Target
Inspect all known rookery locations~~, including the immediate surrounding areas~~	%# of known rookery locations inspected	100%~~50~~
If there is a confirmed sighting of a rook, undertake necessary control action	Control~~If rooks are sighted, control~~ action is commenced~~completed~~ within 3 working days of confirmed rook sighting~~the inspection~~.	100%

3.2.3 Spiny broom

Objective

Reduce all infestations of spiny broom to zero levels~~density~~ within the Otago region to prevent adverse effects on economic well-being and the environment.[4] ~~and economy, focusing on the Waihola, Chain Hills and Brighton areas.~~

Deliverable	KPI	Target
Undertake inspections for spiny broom at known locations and surveillance at surrounding areas~~potential locations~~.	%# of known ~~and potential~~ locations (13) inspected and surrounding areas† ~~/~~surveyed for spiny broom	100%~~20~~
If there is a confirmed sighting of spiny broom, undertake necessary control action	Control~~If spiny broom is sighted, control~~ action is commenced~~completed~~ within 5~~10~~ working days of confirmed sighting of spiny broom~~the inspection~~	100%

† See glossary for definition of location, known location and surrounding areas.

3.3 Progressive containment pest programmes

The 11 pest plants (or groupings of plants) in this programme are reasonably well established in the region. While eradication is unlikely, it is an aim of the RPMP that pest densities can be progressively reduced.

3.3.1 Wilding conifers

Regional Focus Programme~~Priority~~

Objective

[4] Previous Spiny Broom infestations have been identified in the Waihola, Chain Hills and Brighton areas.

Progressively contain and reduce the geographic extent of wilding conifers within the Otago Region to minimise adverse effects on economic well-being and the environment. ~~and economy.~~

Deliverable	KPI	Target
Undertake inspections for~~Support landowners to identify~~ wilding conifers at locations guided by the regional wilding conifer strategy	# of properties inspected for~~landowners provided with~~ wilding conifer compliance~~identification guides~~	100
~~Develop a regional strategy on wilding conifers including communications plan~~	~~Strategy adopted by Council by 1st March 2023~~	~~1~~
Collaborate with and participate in the national wilding conifer programme	% of Operational Advisory Group meetings attended	100%
	Fulfil requirements of MPI funding agreement	100%
Implement regional wilding conifer strategy	% of actions from the regional strategy commenced within specified due timeframes	100%
Support regional partnerships through funding community control groups.[5]~~Whakatipu Wilding Conifer Control Group and Central Otago Wilding Conifer Control Group~~	Funding disbursed as per agreement	100%

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.2 African love grass

Objective

Progressively contain and reduce the geographic distribution or extent of African love grass at known locations[6]~~sites (around Earnscleugh, Clyde, Omakau, Queensbury and Pisa Moorings)~~ within the Otago region to minimise or prevent adverse effects on economic well-being and the environment. ~~and economy.~~

Deliverable	KPI	Target
Undertake inspections for African love grass at known infestation locations and surveillance in surrounding areas~~at potential locations~~	%~~#~~ of known ~~and potential~~ locations (20) inspected and surrounding areas ~~/~~surveyed for African love grass	100%~~20~~

[5] Currently partnerships are with Whakatipu Wilding Conifer Control Group and Central Otago Wilding Conifer Control Group.

[6] Previous and current African Love Grass infestations around Earnscleugh, Clyde, Omakau, Queensbury and Pisa Moorings.

If there is a confirmed sighting of African love grass, undertake necessary control action	Control~~If African love grass is sighted, control~~ action is commenced within 5~~10~~ working days of confirmed sighting of African love grass~~the inspection~~	100%

3.3.3 Nassella tussock

Objective

Progressively contain and reduce the geographic distribution or extent of nassella tussock at known locations[7] within the Otago region ~~and reduce the geographic distribution~~ to minimise or prevent adverse effects on economic well-being and the environment ~~and economy~~.

Deliverable	KPI	Target
Inspect known locations for nassella tussock and undertake surveillance in surrounding locations~~, including the use of remote sensing where applicable~~	%~~#~~ of known locations (38) inspected and surrounding locations surveyed for nassella tussock	100%~~38~~
	~~% of locations re-inspected for nassella tussock that are free of the pest~~	~~50%~~

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.4 Old Man's Beard

Objective

Progressively contain and reduce the geographic distribution or extent of old man's beard within the Otago region to minimise or prevent adverse effects on economic well-being and the environment~~. and economy.~~

Deliverable	KPI	Target
Undertake re-inspections for Old Man's Beard to ascertain compliance	% of non-compliant properties re-inspected for Old Man's Beard ~~that are free of the pest~~	100~~50~~ %

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.3.5 Spartina and six containment pest plants

[7] Current Nassella Tussock infestations are identified around Roxburgh/Alexandra (Galloway and Knobby Range areas – approx. 32,000 ha); lower Cardrona Valley (Deep Creek to Riverbank Road – approx. 4,500 ha); Lower Waitaki Valley (Georgetown and Tussocky/Ridge Roads – approx. 4,100 ha~~).)~~

Objective

Progressively contain and reduce the geographic distribution or extent of bomarea, boneseed, bur daisy, cape ivy, perennial nettle, spartina[8] and white-edged nightshade within the Otago region to minimise or prevent adverse effects on economic well-beingthe environment and the environmenteconomy.

Deliverable	KPI	Target
Undertake re-inspections for spartina and the six containment plants to ascertain compliance	% of non-compliant properties re-inspected for spartina or any oneanyone of the six containment plants that are free of the pest(s)	10050%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4 Sustained control pest programmes

This programme covers well-established legacy pests that are present across Otago and many regions of New Zealand. Although eradication isn't viable, opportunities exist to prevent spread from infested areas to clear areas and to reduce 'externality impacts' on adjoining occupiers' values where those adjoining occupiers are motivated to undertake control.

Non-compliance for nodding thistle, ragwort and Russell Lupin will be analyzed and managed under the 3.6.2 Shared Pest Programme and 4.1 Compliance and Enforcement Actions.

3.4.1 Feral rabbits

Regional Focus ProgrammePriority

Objective

Implement sustained control of feral rabbits to ensure population levels do not exceed Level 3 on the Modified McLean Scale in order to minimise adverse effects on production and environmental values within the Otago region.

Deliverable	KPI	Target
Prioritise properties for rabbit inspections	List of properties to be prioritised for rabbit inspections	1

[8] Spartina containment focuses on Waikouaiti, Karitane and Te Hakapupu/Pleasant River Estuaries.

Undertake rabbit inspections[9] to determine ~~and expect~~ compliance	# of ~~rural~~ rabbit inspections outside a community programme	>250
	% of non-compliant properties ~~that are~~ re-inspected for rabbit compliance~~within set timeframes~~[10]	100%
~~Monitor trends in rabbit densities~~	~~# of rabbit night counts completed~~	~~16~~
Continue engagement with~~Revisit~~ community rabbit programmes ~~areas~~[11] to check progress in rabbit management~~assess continued compliance~~	# of engagements with community rabbit programme either through~~properties~~ re-inspections or continued support~~inspected~~	12~~>250~~
Monitor trends in~~Maintain engagement with community-led~~ rabbit densities~~programmes~~	# of ~~community-led~~ rabbit night count routes completed and analysed[12]~~programmes where feedback has been provided~~	>30~~8~~
	# of fly traps locations monitored and analysed	10
	Report on analysis of historical serological data completed by 30 June 2024	1
	Update rabbit proneness map completed by 31 March 2024	1
	# of R+D trials to enhance rabbit monitoring instigated	2
Support community initiatives through Sustainable Rabbit Management Funding	Funding round is oversubscribed with eligible applications	Yes/No
Advocate~~Analyse rabbit inspection~~ and engage with territorial authorities~~monitoring data~~[13] and Crown agencies on rabbit ~~make recommendations for future~~ management[14]	# of territorial authorities and Crown agencies engaged on rabbit management~~Report to Council by 30th June 2023~~	8~~1~~

Note: Any compliance actions are covered under 4.1 Compliance and Enforcement Actions.

~~[9] These inspections relate to inspections that are undertaken outside a defined community rabbit programme area.~~

~~[10] Timeframes for occupier/owners to achieve compliance from an inspection is six months between May-Dec and three months between Jan-Apr. The re-inspection is to be undertaken within three weeks of this timeframe being expired.~~

[11] Hidden Hills, Albert Town, Lake Hayes, Gibbston, Queensberry, Moeraki, Otago Peninsula and Clyde.

[12] Currently there are 17 night count routes. Under the Rabbit Monitoring Plan it is planned there will be 31 routes. The final number is yet to be confirmed until routes are formally surveyed and access agreements in place.

~~[13] Dependent on the outcome of a current review, this analysis may also include trends in rabbit virology resistance.~~

[14] Namely MPI, DoC, LINZ and Territorial Authorities [WDC, DCC, CDC, CODC, QLDC]

3.4.2 Gorse and broom

Objective

Implement sustained control of broom and gorse to ensure land that is free of, or being cleared of, broom and gorse does not become infested (primarily in Central Otago and Queenstown Lakes districts) in order to prevent adverse effects on production values and economic well-being.

Deliverable	KPI	Target
Inspect gorse and broom free areas for gorse and broom infestation, including the use of remote sensing.	% of non-compliant properties re-inspected ~~in~~for gorse and~~/or~~ broom ~~are~~ free areas~~of the pest(s)~~	100~~75~~%
Advocate with occupiers and landowners on new gorse and broom free areas that come into effect in 2024	# of community meetings delivered on new gorse and broom free areas	4

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4.3 Russell Lupin

Objective

Implement sustained control of the extent of Russell lupin and wild Russell lupin within specified distances from waterways and property boundaries to preclude ~~further~~ establishment of wild Russell lupin and to prevent adverse effects on environmental values.

Deliverable	KPI	Target
Implement~~Develop a~~ regional strategy on Russell lupin including communications plan	% of actions completed by due date as described in the Russell lupin strategy ~~finalised by 1st March 2023~~	100%~~1~~
Undertake inspections in high-risk areas[15]	# of high-risk areas inspected for Russell lupin	6

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.4.4 Nodding thistle and Ragwort

Objective

[15] As listed in the RPMP, at risk areas are: Dart, Rees, Matukituki, Makarora, Hunter and Shotover (downstream of Arthurs point) river catchments.

Implement sustained control of nodding thistle and ragwort on rural zoned land within specified distances of property boundaries throughout the Otago region to prevent their spread in order to minimise adverse effects on production values and economic well-being.

Deliverable	KPI	Target
Undertake re-inspections for nodding thistle and ragwort to ascertain compliance	% of non-compliant properties re-inspected for nodding thistle and ragwort	100%

Note: Further compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.5 Site-led pest programmes

The RPMP site-led programme is about protecting the environmental values at several named sites from the ravages of multiple pests. As a result, the management programme focuses on specific threats to each site and provides for the control of many pests, often those that are not managed elsewhere in the region (e.g. possums, rats).

The RPMP establishes~~Includes~~ four site-led programmes. For the Operational Plan three of them, Otago Peninsula, West Harbour-Mount Cargill and Quarantine and Goat islands (all within Dunedin City) are grouped, as the same six pest plant species and 15 pest animal species are managed generically across all three places. The fourth site-led programme concerns the LINZ-led management of lagarosiphon (oxygen weed), where different controls are implemented in different lakes. New site-led programmes will be considered via the RPMP in the future.

3.5.1 Otago Peninsula, West Harbour – Mount Cargill and Quarantine and Goat Islands

Objective

Otago Regional Council will take a lead role in supporting~~Support~~ community groups and ~~other~~ agencies in bringing about~~to protect~~ the desired levels~~ecological integrity~~ of environmental protection to these sites [~~the~~ Otago Peninsula (9,000 ha), West Harbour-Mt Cargill (12,500 ha) and Quarantine and Goat Islands].[16]~~islands as defined in the project plan.~~

Deliverable	KPI	Target
Confirm site-led programmes around Otago Harbour ~~surrounds~~	Site~~ORC Action Plan for each site~~-led programme plan (, including each site-led location) reconfirmed~~timeframes, confirmed~~ by 31 July 2023~~30th September 2022~~	3

[16] Refer to RPMP Objectives 6.5.4, 6.5.5 & 6.5.6 respectively for Otago Peninsula, West Harbour-Mt Cargill and Quarantine and Goat Islands

SiteORC Action Plans for site-led programme planprogrammes implemented	% of actions implemented within defined timeframes for 2023-2024	10090%
Support provided (financial and/or non-financial) to site led programmes to protect indigenous biodiversity	# of success stories highlighting improvement of indigenous biodiversity at site-led programmes	6

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

3.5.2 Lagarosiphon

Regional Focus ProgrammePriority

Objective

To support LINZ in controlling lagarosiphon in the region's rivers and lakes by:

- Preventing its establishment in Lake Wakatipu and other regional water bodies
- Progressively reducing its spread in Lake Wanaka and the Kawarau River
- Undertaking sustained control in Lake Dunstan

Deliverable	KPI	Target
Joint planning with LINZ and other stakeholders	# of meetings attended with LINZ and other stakeholders	4
Support LINZ in the management and control of lagarosiphon	Funding disbursed as per agreement	100%
Undertake summer monitoring of water users at designated sites[17] *(subject to continued funding from MPI)*	# of interactions in the 'Check, clean, dry' programme	650
Undertake bi-annual monitoring and inspections of lagarosiphon at designated water bodies[18] that are not the responsibility of LINZ	# of lagarosiphon monitoring visits at prioritydesignated water bodies[19]	18
	# of lagarosiphon inspections at secondary water bodiesReport to Council by 30th June 2023	>401

Note: Any compliance actions are covered under 3.6 Integrated Programmes and 4.1 Compliance and Enforcement Actions.

[17] Lakes Dunstan, Wanaka or Roxburgh, and the Clutha/Mata-Au and Kawarau Rivers.

[18] Moke Lake; Manorburn, Poolburn, Butchers, Conroys, Falls, Fraser Dams, Albert Town stormwater detention ponds and Bullock Creek sites.

[19] Moke Lake; Manorburn, Poolburn, Butchers, Conroys, Falls, Fraser Dams, Albert Town stormwater detention ponds and Bullock Creek sites.

3.6 Integrated programmes

While the RPMP has five defined programmes, aspects of these programmes are interconnected especially through linkages to biodiversity outcomes and associated common analysis. For this Operational Plan, the integration between programmes is an important consideration.

3.6.1 Biodiversity Integration

A principal outcome of pest management is to enhance indigenous biodiversity, which informs the prioritisation of biosecurity activities. This is achieved by focusing on high~~highly representative~~ biodiversity focus areas, and their surrounds, that should be safeguarded.[20] (Note: The deliverables in this sub-section cover non-rabbit pests. For rabbit management, refer to Section 3.4.1).

Deliverable	KPI	Target
~~Identify highly representative biodiversity areas on which to prioritise pest inspections.~~	~~A set of biodiversity layers for GIS analysis~~	~~1 set of GIS layers~~
Undertake pest inspections to progress biodiversity outcomes	# of pest inspections undertaken[21]	1,500
Pest inspections support high~~focus on highly representative~~ biodiversity focus areas and their surrounds	% of pest inspections undertaken in high~~highly representative~~ biodiversity focus areas and their surrounds	40~~60~~%

[20] As informed by Leathwick J.R. (2020). Indigenous biodiversity rankings for the Otago region. Report prepared for the ORC.

[21] This is in addition to any~~excludes rabbit~~ inspections ~~which are~~ listed elsewhere in this Operation plan for specific pests~~under Section 3.4.1.~~

3.6.2 Shared Pest Programmes

Aspects of biosecurity have common approaches that apply across the five RPMP programmes. These deliverables focus on the monitoring and analysis of pests. ~~(Note: The deliverables in this sub-section cover non-rabbit pests. For rabbit management, refer to Section 3.4.1).~~

Deliverable	KPI	Target
Re-inspect all non-compliant properties within set timeframes	% of non-compliant inspections re-inspected within set timeframes[22]	100%
Develop and implement a~~Undertake~~ density monitoring plan of specific plant species[23]	# of density monitoring visits undertaken	20
Undertake monitoring of pest plant bio-control release sites~~vectors~~[24]	# of monitoring visits to pest plant bio-control release sites	20
Undertake visits to nurseries and pet shops to advocate and inspect for biosecurity compliance~~Integrate historic plant inspection data in current pest maps of spiny broom, nassella tussock, gorse and broom and spartina~~	# of nurseries and pet shops visited~~Current pest map includes historic data (as layers) for spiny broom, nassella tussock, gorse and broom and spartina.~~	10~~1~~
Undertake an advocacy~~Analyse~~ and education programme to encourage awareness as to public responsibilities to~~assess trends from~~ pest ~~inspections, density monitoring and bio-control data and make recommendations for future~~ management	% of deliverables enacted from the advocacy and education programme.~~Report to Council by 30th June 2023~~	100%~~1~~

3.6.3 Pest Programme Engagement

The management of pests is wider than the ORC. Due to this, it is essential to engage with partners and stakeholders to promote and action biosecurity outcomes. This engagement is to explain the rules as they pertain to these agencies, to advocate for their increased action and for the agencies to outline their work programmes

Deliverable	KPI	Target

[22] Timeframes ~~for occupier/owner~~ to achieve compliance for plant pests is three months from the inspection with the exception of Old Man's Beard which is six weeks between Oct-Feb. A~~The~~ re-inspection is ~~to be~~ undertaken within three weeks of this timeframe being expired.

[23] Namely, African Love Grass, Old Man's Beard, Nassella Tussock, Spartina, Russell Lupin

[24] Namely for various bio-controls for Ragwort , Gorse, Broom, Old Man's Beard, Nodding thistle

Engage with crown agencies and territory authorities on pest management~~interagency organisations~~[25]	# of communication engagements with listed agencies at least once annually	10
Support and educate occupiers, landowners and community groups to undertake best practice pest control	# of community events attended to support best practice pest control	12
Collaborate with neighbouring regional councils	# of collaborations with neighbouring regional councils	4
Collaborate~~Engage~~ with Kāi Tahu on biosecurity issues and support them to be involved in biosecurity initiatives	# of collaborations~~meetings~~ with Kāi Tahu on biosecurity issues	2
Support ~~enviro~~ schools ~~programme~~ with key messages, information and tools relating to biosecurity	# of ~~enviro~~ school programmes attended to provide awareness on biosecurity	10~~16~~

[25] Namely MPI, DoC, LINZ, KiwiRail, Waka Kotahi, Territorial Authorities [WDC, DCC, CDC, CODC, QLDC]

~~**Upper Manuherikia East Branch** *(Photo credit: Richard Ewans)*~~

4. RPMP Administration

4.1 Compliance and Enforcement Actions

As the RPMP is a rules-based approach to pest management, there is need to ensure actions are taken to ensure compliance. The specific approach to compliance and enforcement is covered in the ORC Biosecurity Compliance and Enforcement Policy. To achieve this, the following actions will be delivered.

Deliverables	KPI	Target
Effective administration of compliance and enforcement		
Provide occupiers and landowners with the declared pest status following an inspection	% of occupier/landowner advised of inspection status within three weeks of the inspection	75%
	% of occupier/landowner advised of inspection status within six weeks of the inspection	100%
Continued non-compliance, as confirmed by enforcement criteria, is addressed through issuing a Notice of Direction	% of eligible non-compliant properties issued with a Notice of Direction within 20 working days after re-inspection	100%
Pest enquiries[26] are responded to in a timely manner as appropriate to the risk of the pest~~Analyse the effectiveness of compliance and enforcement actions and make recommendations for continual improvement~~	% of exclusion pest enquiries responded to within 24 hours~~Report to Council by 30th June 2023~~	100%~~1~~
	% of eradication pest enquiries responded to within three working days	100%
	% of all pest enquiries responded to within 10 working days	100%

[26] Enquiries are defined as either 'reports, sightings, notifications and complaints'

4.2 Biosecurity Operational Plan Administration

For the administration of this operational plan, two key deliverables are listed.

Deliverables	KPI	Target
Revise the Biosecurity Operational Plan		
Review and, if needed, revise the Biosecurity Operational Plan annually as required by the BSA	Biosecurity Operational Plan for 2023-24 approved by Council by June 2023.	1 approved plan
Responsiveness to Pest Enquires[27]		
Pest enquires are responded to in a timely manner as appropriate to the risk of the pest	% of exclusion and eradication pest enquiries responded to within 24 hours and three working days, respectively	100%
	% of all pest enquiries responded to within 10 working days	100%

[27] Enquiries are defined as either 'reports, sightings, notifications and complaints'

~~Glendu, Lake Wanaka~~ ~~*(Photo Credit: Libby Caldwell)*~~

5. Glossary

For the purposes of this operational plan, the following definitions are provided. Further definitions can be found~~A fuller glossary is given~~ in the RPMP and the ORC Biosecurity Compliance and Enforcement Policy.

Boundary: refers to a line or surface in a geographical space the delineates the horizontal or vertical extent of a land parcel.

Compliant: refers to when a rule in the RPMP is adhered to.

Default Action: means work undertaken by the management agency to carry out pest control when a 'Notice of Direction' or 'Compliance Order' has not been complied with by an occupier, under section 128 of the BSA. The management agency can then recover costs and expenses reasonably incurred under section 129 of the BSA.

Known location: refers to a location that has a historical or current record of the pest being present. For ease of monitoring, a known location can include a buffer radius of up to 50 metres.

Inspection: means a site visit (normally defined by a property) ~~work undertaken~~ to determine compliance to RPMP~~RPM~~ rules undertaken by a warranted officer as authorised under the Biosecurity Act 1993.

Landowner: has the same meaning as occupier in the Biosecurity Act 1993.

Land Parcel: is a unique area of land, identified by the cadastral survey plan showing the legal boundaries, location, dimensions and area, along with the unique legal description (appellation).

Location: refers to a geographical point on the surface of the earth. This will typically be identified by the GPS co-ordinates of northing and easting. For New Zealand, most common projections are the New Zealand Traverse Mercator or World Geodetic 1984).

Management agency: has the same meaning as in the Biosecurity Act 1993, specifically~~:~~ *"means the body specified as the management agency in a pest management plan or a pathway management plan"*. For the purposes of the RPMP and Operational Plan, Otago Regional Council is the management agency for pests to be controlled in the Otago region.

Modified McLean Scale: this scale assesses rabbit population levels (see RPMP, Appendix 2).~~)~~

Monitoring: means work undertaken to determine the trend and~~in the~~ prevalence of a pest. This will normally be in-person but can use remote sensing tools.

Notice of Direction (NOD): means the actions required and notice issued pursuant to section 122 of the Biosecurity Act 1993. A NOD can require a person to take action to address pest plant or animal problems or to comply with a rule in an RPMP.

Occupier: see landowner.

Non-compliance[28]**:** refers to any breach in a RPMP rule. Non-compliance is liable for enforceable under the provisions of the BSA. For clarification, a breach of a RPMP rule does not have to be widespread

[28] ~~Note: this definition is not listed in the RPMP rather it is defined in the ORC Biosecurity Compliance and Enforcement Policy.~~

across a property and may relate to a single location (or a defined area) within a property. Due to the potential of spread, the whole property is deemed non-compliant even if the infestation is localised.

Operational plan: means a plan prepared by the Management Agency under Section 100B of the Act.

Pest: has the same meaning as in the Biosecurity Act 1993: *"an organism specified as a pest in a pest management plan."*

Property: For the purposes of this plan, a property is an extent of land that is either [1] under unique ownership (whether individual, joint, partnership or corporate) or [2] is managed as a single operational entity. A property can be made up of one or more adjoining land parcels (see land parcel).

Surveillance: means ~~survey~~ work undertaken to determine the status (presence) of pest species. This can be in-person or use remote sensing tools.

Surrounding area: means a wider area surrounding a pest infestation. This is variable depending on context of the pest but, at a minimum, includes all adjoining properties to the property with the pest infestation. A property is considered adjoining even if it is separated by a road, paper road, waterway or easement. A designated surrounding area does not prevent pest inspections from being carried out in non-surrounding areas.

Water body: means fresh water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

Wilding conifer: wilding conifers are any introduced conifer tree, including (but not limited to) any of the species listed in Table 3 of the RPMP.

Zero level/zero density: where the pest is not detectable in an area, however the pest may continue to appear afterwards due to plant seed sources or animal migration from an unmanaged area.

5.4. ECO Fund - Funding available, criteria and assessment panel for March 2023 round

Prepared for:	Environmental Implementation Committee
Report No.	OPS2252
Activity:	Governance Report
Authors:	Richard Ewans, Partnership Lead – Biodiversity; Anna Molloy, Principal Advisor Environmental Implementation; Libby Caldwell, Manager Environmental Implementation
Endorsed by:	Gavin Palmer, General Manager Operations
Date:	2 February 2023

PURPOSE

[1] To seek approval for the funding available for Incentives Funding and minor changes to ECO Fund processes and administration (including revised Terms and Conditions) for the March 2023 round; and request a new ECO Fund Councillor assessment panel be convened for the new Council triennium.

EXECUTIVE SUMMARY

[2] The ECO Fund is Otago Regional Council's (ORC) annual contestable community environmental fund and supports community driven projects that protect, enhance and promote Otago's environment. Applications for the 2022/2023 financial year will be taken during March 2023.

[3] Total funding available in the 2022/23 Annual Plan for the March 2023 round is $568,000. This is comprised of core ECO Fund budget of $328,000 and additional contestable community Incentives Funding provided for 2021-31 Long Term Plan priorities for: sustained rabbit management ($150,000), native planting after plant pest removal ($30,000), native planting for water quality ($30,000), and biodiversity enhancement of protected private land ($30,000). The Incentives Funding will be assessed and administered using ECO Fund processes.

[4] Minor changes to ECO Fund processes and administration (including criteria, terms, and conditions) are to be implemented to improve efficiency and efficacy. The changes more clearly define and delineate eligibility criteria and Terms and Conditions. Minor changes to the prioritisation/ranking process (assessment criteria) make impact and effectiveness type attributes contribute more to final scores. Online forms (similar to the Application Form) are being created for Expressions of Interest, Accountability (Final) Reports and Progress Reports.

[5] The March 2023 round will be the first of the new council triennium. Therefore, a new Councillor assessment panel is recommended to be convened. It is recommended that the panel is comprised of three councillors (including a chair), and a mana whenua representative.

RECOMMENDATION

That the Environmental Implementation Committee:

1) ***Notes*** *this report.*
2) ***Recommends Council approval of*** *the funding available including changes to Incentives Funding allocations outlined in Table 1 for the March 2023 round (Option 2).*
3) ***Recommends Council approval of*** *revised assessment criteria and Terms and Conditions outlined in Table 3 and Attachments 1, 3 and 4 for the March 2023 round (Option 2).*
4) ***Appoints*** *three Councillors to form an ECO Fund assessment panel for the 2022-2025 triennium.*

BACKGROUND

[6] The ORC's ECO Fund supports work that protects and enhances Otago's environment and enables community driven environmental activities. The ECO Fund was established by the Otago Regional Council (ORC) in July 2018 with the first round being open in September 2018. It replaced the Environmental Enhancement Fund (EEF) which started in June 2016.

[7] The April 2022 round of the ECO Fund included administration of additional targeted funding to support 2021-31 Long Term Plan priorities (Incentives Funding). This was approved by Council on 23 February 2022. The Incentives Funding mechanism enables existing budget for environmental community and partnership priority work streams to be allocated to community and landowner projects through a robust prioritisation process.

[8] The ECO Fund (including Incentives Funding) has funded 100 projects (from 232 applications) totalling $1,190,125 (out of $4.03 million requested) over 8 rounds. Most rounds are oversubscribed by a factor of 3. Prior to ECO Fund the EEF granted just over $375,000 to 17 projects from a total of 22 applicants.

[9] Following an in-depth review in February 2022[19], some significant changes were made to ECO Fund processes and administration. One round has been held since the February 2022 review (in April 2022).

[10] An internal review of the April 2022 round was undertaken by staff in late 2022. Feedback from applicants and other participants in the process (assessment and administration) was discussed and has informed the changes detailed in this paper.

DISCUSSION

Funding available for March 2023 round

[11] Total funding available in the current 2022/23 Annual Plan for the March 2023 round is $568,000. This is comprised of core ECO Fund budget of $328,000 and additional contestable community Incentives Funding totalling $240,000.

[12] The core ECO Fund budget for March 2023 includes $38,000 of residual funds from the April 2022 round due to a grantee being unable to uptake their approved grant.

[13] The April 2022 round was the first to include additional Incentives Funding to support 2021-31 Long Term Plan priorities. Council approved administration of this funding using ECO Fund processes on 23 February 2022.

[19] *ECO Fund Review*, Report to 23 February 2022 meeting of Otago Regional Council, Report No. OPS2204.

[14] For the March 2023 round Incentives Funding is also provided for priorities identified in the 2021-31 Long Term Plan. The funding levels and categories have been adjusted based on the staff internal review. All Incentives Funding is within existing budget in the current 2022/23 Annual Plan for each type of activity. The Incentives Funding will be assessed and administered using ECO Fund processes.

[15] Funding levels and categories of Incentives Funding for the April 2022 and March 2023 rounds are described in Table 1 below:

Table 1 – Summary of changes to Incentives Funding between April 2022 and March 2023 rounds.

Category	Amount 2022	Amount 2023	Note for March 2023 funding levels
Sustained rabbit management	$100,000	$150,000	Increased from $100,000 to reflect increased engagement in rabbit programme region wide.
Native planting after plant pest removal	$50,000	$30,000	Scope broadened (from just wilding pines) and amount available decreased based on significant undersubscription in April 2022 round.
Native planting for water quality	$30,000	$30,000	No change.
Biodiversity enhancement of protected private land	$0.00	$30,000	New category to support landowners being proactive in protecting biodiversity to maintain and enhance biodiversity on their properties. Currently, individual landowners cannot access ECO Fund.

[16] The 'Native planting after wilding conifer removal' Incentives Funding category was undersubscribed in the April 2022 round. Feedback suggested this was due to a lack of awareness among key groups working in this space and because the groups are primarily focussed on control as a first priority. Therefore, for the March 2023 round, the amount available has been reduced, and the scope for the 'Native planting after plant pest control removal' category was broadened from just wilding pines so it could also include native plantings after control of other plant Pests and Organisms of Interest listed in the Regional Pest Management Plan (RPMP). These form dense canopies and reinvade quickly post-control such as gorse, broom and sycamore. Priority will be given to listed Pests. This aligns better with ORC strategic biosecurity objectives in the RPMP. Staff have also been raising awareness of this funding category among the key wilding conifer groups.

[17] The new Incentives Funding category 'Biodiversity enhancement of protected private land' is intended to support landowners that are proactive in protecting and enhancing indigenous biodiversity who currently cannot access ECO Fund. Private land refers to land not in public ownership i.e., freehold and/or Māori-owned land. For clarity, it does not include Public Conservation Land, council reserves, LINZ-administered land e.g., Crown Pastoral Lease, or Pamu (Landcorp). Protected private land could include QEII covenants, Ngā Whenua Rāhui (NWR) kawenata and Significant Natural Areas (SNAs) scheduled in District or Regional Plans.

[18] Support for indigenous biodiversity initiatives on private land is limited in Otago. Landowners in some districts can access contestable environmental funding through some Otago Territorial Authorities, but are either competing with community groups

(e.g., Dunedin City Council Biodiversity Fund $80,000 per annum) or for relatively small amounts of funding (e.g., Waitaki District Council Biodiversity Funding $30,000). QEII contestable funding is limited, being allocated nationally and available for 5,000 covenants. Department of Conservation contestable funding is unavailable for individual landowners.

[19] The 'Biodiversity enhancement of protected private land' Incentives Funding category aligns with 2021-31 Long Term Plan statements and priorities for biodiversity shown in Table 2 below. The strategic alignment with New Zealand's national biodiversity strategy is also provided in Table 2.

Table 2 – Strategic fit for 'Biodiversity enhancement of protected private land' Incentives Funding category.

Strategic document	Actions
Te Mana o Te Taiao – Aotearoa New Zealand Biodiversity Strategy 2020	Councils try to make biodiversity protection more economically attractive for landowners using a variety of tools (rates relief, funding, technical expertise sharing, etc).
	Funding and support for landowners, iwi and hapū, and communities to carry out fencing, pest management and biodiversity restoration.
	Some funding is provided by regional councils to support iwi, hapū and whānau projects and work (eg nurseries, landscape-scale restoration).
	Through NWR kawenata, whānau and hapū are able to establish collaborative relationships with the Crown, iwi, local and regional councils, DOC, PF2050, Kiwi for Kiwi and other active guardians of nature.
Otago Regional Council 2021-31 Long Term Plan – Biodiversity and Biosecurity	What we do – "We promote and support community and farmer initiatives to protect and enhance Otago's biodiversity and ecosystems."
	Performance measures - "Actions listed in the Biodiversity Action Plan (BAP) are prioritised and progressed."
Otago Regional Council Biodiversity Action Plan 2019	Develop and run pilot studies for a voluntary programme that supports land users to protect, maintain or enhance biodiversity on private land.
	Facilitate and participate in regional and national level engagement to improve collaboration and coordinate effort.

Minor changes to ECO Fund processes and administration

[20] Following internal and external feedback on the April 2022 round, minor changes to ECO Fund processes and administration to improve efficiency and efficacy noted by staff are proposed as detailed here.

[21] Changes to ECO Fund assessment scoring criteria are detailed in Attachment 1. These changes to the prioritisation/ranking process (assessment criteria) allow impact and effectiveness type attributes to contribute more to final scores and remove strategic and policy alignment type attributes which are more appropriately considered as eligibility criteria. The April 2022 assessment scoring criteria are provided in Attachment 2 for comparison.

[22] Other changes to ECO Fund criteria and Terms and Conditions are listed in Table 3 below. These are reflected in the revised ECO Fund Terms and Conditions and Rabbit management additional criteria provided in Attachments 3 and 4.

Table 3 – Summary of changes to ECO Fund processes and administration for March 2023 round.

Document	Change
Rabbit management additional criteria	Clarify that control costs are not eligible, and that priority will be given to facilitating community groups or groups of neighbours working collaboratively over fencing costs.
Terms and Conditions	Clarify groups must have their own bank account in the group's name. Clarify that funds can't be paid into individuals bank accounts, corporate bank accounts or other groups bank accounts on behalf.
Terms and Conditions	Eligibility criteria – Projects must meet the objectives of the ECO Fund* and align with at least one ORC strategic priority to eligible.
Terms and Conditions	Eligibility criteria – Applicants with outstanding accountability (final) reports for previous ECO Fund or Incentives Funding grants will not be eligible for funding.
Terms and Conditions	Applications – Funding is capped per project and applicant at $50,000 for ECO Fund and Incentives Funding - Sustained rabbit management; and $15,000 for Incentives Funding - Native planting after plant pest removal, Native planting for water quality, and Biodiversity enhancement of protected private land. Remove "Where applicants seek funding exceeding $50,000, Otago Regional Council will only fund a proportion of the total project (to be determined on a case-by-case basis)."
Terms and Conditions	Applicants may not speak to their applications at the Council meetings or approach representatives on Council to speak on their behalf.
Terms and Conditions	Clarify how applicants can meet the 50% cost-share requirement for salary costs.
Terms and Conditions	Assessment – Remove "If the ECO Fund is over-subscribed in any funding round priority will be given to projects involving threatened or at-risk species, or naturally uncommon ecosystems". This is now part of the assessment scoring criteria.
Terms and Conditions	Assessment – Applicants agree to be available for a phone call and/or site visit with ORC staff as part of the assessment process at a day and time suitable to the applicant.

* Projects under the Incentives Funding for 'Biodiversity enhancement of protected private land' do not need to meet the need to engage or involve the community.

[23] Administration of the ECO Fund is being further developed online. Applications to the April 2022 round were completed using an online form, and additional online forms for customers are being created for Expressions of Interest, Accountability (Final) Reports and Progress Reports.

ECO Fund Councillor assessment panel

[24] Administration of the ECO Fund is a multi-staged process. This process is detailed in Figure 1 below. A Councillor assessment panel assesses applications after being provided with a moderated staff score for each application, then meets to agree on final rankings and recommendations to Council (Step 4 in Figure 1).

[25] The March 2023 round will be the first of the new council triennium. Therefore, a new Councillor assessment panel needs to be convened for the March 2023 round.

[26] The Councillor assessment panel in 2022 was comprised of four councillors[20] including a chair, and a mana whenua representative. With over 50 applications to assess individually in 2022, and similar levels of interest expected in 2023, it is recommended that the panel for the new triennium be reduced to three Councillors and a mana whenua representative to reduce the combined workload of the panel.

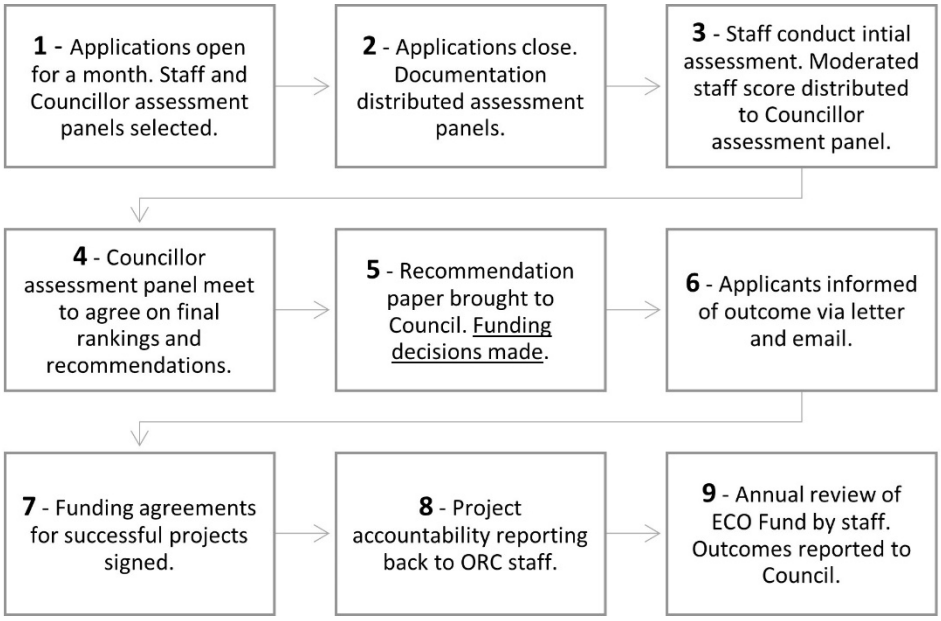


Figure 1 – ECO Fund process for administration.

OPTIONS

[27] **OPTION 1: Status quo** – Funding categories and levels, assessment criteria, Terms and Conditions, and structure of assessment panel remain the same for the March 2023 round as for the April 2022 round.

OPTION 2 (recommended): Approve recommended changes – The recommended changes aim to improve the efficiency and efficacy of ECO Fund.

CONSIDERATIONS

Strategic Framework and Policy Considerations

[28] This paper does not trigger Strategic Framework or Policy Considerations.

Financial Considerations

[29] The total amount available in the current 2022/23 Annual Plan for the March 2023 round of ECO Fund including Incentives Funding is $568,000.

Significance and Engagement Considerations

[30] This paper does not trigger ORC's policy on Significance and Engagement.

[20] Crs Deaker (Chair), Forbes, Wilson and Noone.

Legislative and Risk Considerations

[31] This paper does not trigger any legislative and risk considerations.

Climate Change Considerations

[32] This paper does not trigger any climate change considerations.

Communications Considerations

[33] Changes to available funding, online forms, criteria and Terms and Conditions will be communicated as part of the advertising and communications for the ECO Fund March 2023 round. This will include clear guidance around assessment criteria, reporting expectations and any changes to eligibility or multiple year funding. The ECO Fund online application form will be changed to better align with the assessment scoring criteria.

NEXT STEPS

[34] Update website and all relevant templates and process documents in line with changes detailed in this paper.

[35] The 2023 ECO Fund round will open on 1 March 2023 and close on 31 March 2023. Liaise closely with all staff assessors and Councillor assessment panel regarding assessment timeframes.

ATTACHMENTS

1. ECO Fund - March 2023 - Assessment criteria scoring [**5.4.1** - 3 pages]
2. ECO Fund - April 2022 - Assessment criteria scoring [**5.4.2** - 3 pages]
3. ECO Fund - March 2023 - Terms and Conditions [**5.4.3** - 2 pages]
4. ECO Fund - March 2023 - Rabbit management additional criteria [**5.4.4** - 2 pages]

ECO Fund - Assessment criteria scoring – March 2023

Description	Scoring & guidance	
1. Project objectives are realistic, and actions are likely to achieve the objectives	• Setting a clear project objective helps track the success of the project. Objectives should be realistic and able to be achieved within the timeframe of the project. • The project should also outline what actions will be undertaken to achieve the objective. There should be a clear linkage between the action and the intended outcome. • Consider overall group objectives and assess specific project actions in application in terms of contribution to that overall group objective / vision. • Projects that are implementing existing catchment group plans could be considered as higher scoring.	4 = Objectives are realistic and highly likely to be achieved within the timeframe. Obvious links between actions and objectives 3 = Objectives are realistic and likely to be achieved within the timeframe. Some linkage between the actions and objectives 2 = Objectives could be achievable, but project planning does not clearly demonstrate how proposed actions will lead to objectives 1 = Objectives are limited, and actions are not linked to the project objectives and unlikely to be achieved within the timeframe 0 = Objectives are unrealistic, irrelevant or unachievable.
2. Project is technically sound	• The likelihood of a successful project is increased when the applicants are well informed or experts in the area. • Projects should demonstrate that the planned approach is technically feasible and reflects best management practice. • This could be through the expertise of the project applicants or through information they have sought and intend on implementing	4 = Proponent has sought appropriate advice and/ or have the relevant expertise. Best practice is clearly being proposed. 3 = Proponent has sought some advice and/ or has some relevant experience. Best practice is mostly being proposed. 2 = Proponent has sought some advice and/ or has some relevant experience. Best practice is not being proposed or is not clear. 1 = Proponent has not demonstrated advice was sought or what relevant experience is being utilised. Best practice is not being proposed or is not clear. 0 = Best practice is not being implemented and proposed techniques are questionable.

3. Impact of the project - scale	The impact a project can have can be assessed by: - Scale, how effective and far reaching will the project outcomes be - Longevity, how enduring will the project outcomes be - Intervention level, is the project addressing the cause or symptom of a problem	4 = Significant environmental benefits at a district or regional scale. 3 = Moderate environmental benefits at multi-site or local scale. 2 = Benefits are site scale. 1 = Benefits are likely but are indirect and/or intangible. 0 = No clear benefits to the environment.
4. Impact of the project - timeframe	The impact a project can have can be assessed by: - Scale, how effective and far reaching will the project outcomes be - Longevity, how enduring will the project outcomes be - Intervention level, is the project addressing the cause or symptom of a problem	4 = Environmental benefits for long-term. (20+ years) 3 = Environmental benefits medium-term (6-20 years). 2 = Environmental benefits short-term (<5 years). 1 = Benefits are likely but are indirect and/or intangible and timeframes are difficult to assess. 0 = No clear benefits to the environment over any timeframe.
5. Special site values	Projects that protect or enhance sites with special environmental values add value to the outcomes ECO Fund is seeking. Special site values could include: - At-risk or threatened species, - Rare or much reduced-ecosystem types. - Important or distinctive habitat types.	2 = Project involves both at-risk or threatened species and important ecosystem or habitat types. 1 = Project involves either at-risk or threatened species, or important ecosystem or habitat types. 0 = Project involves common species and/or ecosystem or habitat types.
6. Level of community engagement	A key objective for the ECO Fund is community involvement. This criterion assesses how much community involvement is being proposed and how far reaching that involvement may be.	4 = Project is led by a community group and engages with other members of the community. 3 = Project is led and implemented by a community group with some community engagement. 2 = Not led by community but involves community in the implementation 1 = No community groups involved but outcomes will benefit or be utilised by the community. 0 = No community involvement or benefit.

7. Value for money	• Considering any level of investment contributed by the applicant, that is, their level of investment is a good measure for value for money. • See Funding Details section in application. • Applicant investment can include in-kind contributions such as labour or volunteer hours ($20 per hour minimum), monetary input from the group itself or project partners. • However, contributions from other grants are not considered applicant's investment and should not be used to leverage funding.	4 = Project is more than 1:1 cost sharing between fund requested and fund contributed 3 = Project is 1:1 (or within 5%) cost sharing 2 = Project is 1:2 applicant vs ECO Fund requested 1 = Project has some applicant contribution but not clear or costed 0 = Project relies solely on ECO Fund and/or other grants
8. New applicants	• It is good to encourage new applicants to access funding. • However, previous applicants are also typically involved in good works and maintaining momentum can be good. • Some previous successful applicants may not have completed all previous commitments, e.g., reporting.	2 = New applicant or previously unsuccessful applicant to the ECO Fund (with eligible project) 1 = Previous successful applicants with all requirements completed on time 0 = Previous successful applicant with outstanding reports or other commitments
9. Other funding	• ECO Fund has many repeat applicants and some with significant other funding to achieve their objectives, enabling them to commit resources to applying for additional funding. • Community groups without significant additional funding should receive a boost to their score to encourage new groups, new projects and a diversity and spread of ECO Fund projects.	2 = Community group has no other significant funding sources (total <$100k) 1 = Community group has other significant funding sources (total $100-$500k) 0 = Community group has other significant funding sources (total >$500k)

Note: Maximum score = 30

ECO Fund - Assessment criteria scoring

Criteria		Description	Scoring & guidance
Strategic	**1. Achieves ECO Fund objectives**	The objectives of the ECO Fund which are to: - Protect and enhance Otago's environment - Enable community-driven environmental activities How much is the project likely to contribute to achieving these objectives? Projects can address these objectives through on-ground works or education and capacity building activities.	4 = Yes, will contribute significantly to both objectives 3 = Yes, will contribute in some way to both objectives, or significantly to one 2 = Yes, will contribute one objective 1 = May contribute indirectly 0 = No, will not contribute at all
	2. Aligns with ORC activities and priorities	The Annual Plan 2020-21 lists the following significant activity areas (relevant to the ECO Fund): - Freshwater quality - Biosecurity - Biodiversity Other relevant documents which can guide this criterion include: - Biodiversity Strategy - Biosecurity Strategy - Urban & Rural Water Quality Strategies - Long-Term Plan (Land, Water and Biodiversity 'Must Do's')	4 = Clear alignment with two or more current strategic actions 3 = Clear alignment with one current strategic action 2 = Some alignment (not directly) with at least one strategy 1 = Aligns with general policy 0 = No obvious alignment with strategy or policy
Project merits	**3. Project objectives are realistic, and actions are likely to achieve the objectives**	Setting a clear project objective helps track the success of the project. Objectives should be realistic and able to be achieved within the timeframe of the project. The project should also outline what actions will be undertaken to achieve the objective. There should be a clear linkage between the action and the intended outcome. Consider overall group objectives and assess specific project actions in application in terms of contribution to that overall group objective / vision. Projects that are implementing existing catchment group plans could be considered as higher scoring.	4 = Objectives are realistic and highly likely to be achieved within the timeframe. Obvious links between actions and objectives 3 = Objectives are realistic and likely to be achieved within the timeframe. Some linkage between the actions and objectives 2 = Objectives could be achievable, but project planning does not clearly demonstrate how proposed actions will lead to objectives 1 = Objectives are limited, and actions are not linked to the project objectives and unlikely to be achieved within the timeframe 0 = Objectives are unrealistic, irrelevant or unachievable.

	4. Project is technically sound	The likelihood of a successful project is increased when the applicants are well informed or experts in the area. Projects should demonstrate that the planned approach is technically feasible and reflects best management practice. This could be through the expertise of the project applicants or through information they have sought and intend on implementing	4 = Proponent has sought appropriate advice and/ or have the relevant expertise. Best practice is clearly being proposed. 3 = Proponent has sought some advice and/ or has some relevant experience. Best practice is being proposed. 2 = Proponent has sought some advice and/ or has some relevant experience. Best practice is not being proposed or is not clear. 1 = Proponent has not demonstrated advice was sought or what relevant experience is being utilised. Best practice is not being proposed or is not clear. 0 = Best practice is not being implemented and proposed techniques are questionable.
Project outcomes	**5. Impact of the project**	The impact a project can have can be assessed by: - Scale, how far reaching will the project outcomes be - Longevity, how enduring will the project outcomes be - Intervention level, is the project addressing the cause or symptom of a problem	4 = Significant environmental benefits at a regional scale for long-term 3 = Moderate environmental benefits at district scale, for medium-term 2 = Benefits are site scale but long-term 1 = Benefits are site scale and short-term 0 = No clear benefits to the environment
	6. Level of community engagement	A key objective for the ECO Fund is community involvement. This criterion assesses how much community involvement is being proposed and how far reaching that involvement may be. If the recommendation in section 1 regarding mana whenua engagement is supported, this criterion will also include level of mana whenua engagement	4 = Project is led by a community group and engages with other members of the community 3 = Project is led and implemented by a community group with some community engagement 2 = Not led by community but involves community in the implementation 1 = No community groups involved but outcomes will benefit or be utilised by the community 0 = No community involvement or benefit

Financial	**7. Value for money**	Considering any level of investment contributed by the applicant, that is, their level of investment is a good measure for value for money. See Funding Details section in application. Applicant investment can include in-kind contributions such as labour or volunteer hours ($20 per hour minimum), monetary input from the group itself or project partners. However, contributions from other grants are not considered applicant's investment and should not be used to leverage funding.	4 = Project is more than 1:1 cost sharing between fund requested and fund contributed 3 = Project is 1:1 (or within 5%) cost sharing 2 = Project is 1:2 applicant vs ECO Fund requested 1 = Project has some applicant contribution but not clear or costed 0 = Project relies solely on ECO Fund and/or other grants
Applicant history	**8. New applicants**	It is good to encourage new applicants to access funding. However, previous applicants are also typically involved in good works and maintaining momentum can be good. Some previous successful applicants may not have completed all previous commitments, e.g. reporting.	2 = New applicant or previously unsuccessful applicant to the ECO Fund (with eligible project) 1 = Previous successful applicants with all requirements completed on time 0 = Previous successful applicant with outstanding reports or other commitments

ECO Fund Terms and Conditions – March 2023

General

- *Projects must meet the objectives of the ECO Fund and align with at least one ORC strategic priority to eligible. Note that projects for Incentives Funding – Biodiversity enhancement on protected private land do not need to meet the objective for enabling community driven environmental activities.*
- Except for multi-year projects, projects must be completed within 12 months of receiving funding.
- All applications for each round are assessed and ranked against the ECO Fund assessment criteria (link to criteria to be provided).
- All funding is GST exclusive. All financial information provided in an application must be exclusive of GST.
- The ECO fund supports both one-off projects and those running over multiple years for up to 3 years. For multiple year funding, funds will be released annually conditional upon appropriate project reports which demonstrate meaningful progress being submitted.
- Successful applicants must agree to Otago Regional Council promoting their project.
- *Applicants must have completed accountability (final) reports for any previous ECO Fund grants received to be eligible for funding.*
- If work funded is not completed within the specified time frame or funds are not spent as agreed, Otago Regional Council reserves the right to demand the return of funds.
- The ECO Fund does not provide funding for:
    - commercial or private gain
    - government organisations
    - projects created to comply with Resource Consent conditions
    - responses to any actual or potential enforcement action (excluding projects under the sustained rabbit control programme)
    - the purpose of seed capital
    - individuals *(except for Incentives Funding – Biodiversity enhancement on protected private land)*.
    - maintenance for existing projects
    - retrospective costs

Applications

- Applicants can only submit one application per funding round.
- Projects must have a defined start and finish date.
- Applicants must disclose any other funding they have applied for or received for their project.
- *Funding is capped per project and applicant at $50,000 for ECO Fund and Incentives Funding - Sustained rabbit management; and $15,000 for Incentives Funding - Native planting after plant pest removal, Native planting for water quality, and Biodiversity enhancement of protected private land*.
- If funding is requested for salary costs, only 50% will be funded. Applicants need to demonstrate that requested salary funding is not more than 50% of total cost, and detail where the additional funding will come from *e.g., applicant 50% contribution to salary could be from other grants, existing group funds, or existing staff capacity or volunteer contributions allocated to the same project position*.

Assessment

- All applications are assessed and ranked against the ECO Fund assessment criteria.
- *Applicants agree to be available (if requested) for a phone call and/or site visit with ORC staff as part of the assessment process at a day and time suitable to the applicant.*
- ~~If the ECO Fund is over subscribed in any funding round priority will be given to projects involving threatened or at risk species, or naturally uncommon ecosystems.~~
- If an applicant is unsuccessful in one round of the ECO Fund, they may apply again in a subsequent funding round.
- Decisions made by Otago Regional Council are final and are made at our sole discretion.
- *Applicants may not speak to their applications at the Council meetings or approach representatives on Council to speak on their behalf.*
- ~~Where applicants seek funding exceeding $50,000, Otago Regional Council will only fund a proportion of the total project (to be determined on a case-by-case basis).~~

Decision and Grant

- Successful applicants must accept the grant by signing an acceptance letter and funding agreement.
- Recipients must pay all costs associated with the project. ECO Fund grants will be transferred to recipients' nominated bank accounts.
- Nominated bank accounts cannot be private accounts; it must be an account in the ~~Applicant's~~ name *of the applicant. Grant funds will not be paid into individuals bank accounts, corporate bank accounts or another groups bank accounts on behalf.*
- Successful applicants must agree to report on the project outcomes to ORC within a specified timeframe, and account for how funds were spent. Successful applicants must agree to submit progress reports, where applicable, and a final report on the project outcomes to ORC within a specified timeframe, and account for how funds were spent.
- Successful applicants agree to report on their project at a council meeting, if requested.
- Funds granted expire 6 months after Council approval. If the applicant fails to comply with the Otago Regional Council's terms and conditions within 6 months (unless otherwise agreed), the funding lapses.
- Grants are approved subject to the Otago Regional Council being satisfied that the information given by recipients is true and correct. Otago Regional Council reserves the right to refuse grant funding, and/or request return of grant funding where it determines that it has been misled, that the applicant or recipient has omitted relevant information, or if the recipient enters into receivership, liquidation or ceases to exist (e.g., removed from register).

ECO Fund – Rabbit management additional criteria – March 2023

This fund supports coordinated community-led rabbit management throughout Otago. It aims to provide community groups, or groups of neighbours working collaboratively, with an opportunity to lead the improvement of rabbit management in their area.

Funding is available for:

- Groups of landowners (five or more adjacent landholdings)
- Non-profit community organisations e.g., community association, charitable trust, incorporated society
- Individual properties with the following status:
  - Māori customary land
  - Māori freehold land
  - Crown land reserved for Māori
  - General land within the boundary of an original native reserve, if that land is still owned or partly owned by Māori

Funding is not available for:

- Individuals or work on individual properties (unless operating collaboratively with neighbours or as a community)
- Territorial authorities or government agencies
- *Rabbit control costs*

Examples of community led approaches eligible for funding

Note that priority will be given to facilitating community groups or groups of neighbours working collaboratively over fencing costs.

Working together

- Forming a community group to coordinate rabbit management in your area
- Forming a community group to collect landowner contributions for collective rabbit management
- Developing collaborative long-term rabbit management plans / community action plan
- Forming new partnerships with other groups including community, government agencies, school groups, absentee landholders, landcare groups and mana whenua groups

Building and sharing skills and knowledge

- Building community capacity for best practice rabbit management techniques, e.g., hosting community workshops, training in best practice, hosting expert guests.
- Raising awareness of your programme via media, e.g. You Tube clips, webinars
- Show casing community groups participating in best practice rabbit management

- Producing advertising material to promote your community plan
- Designing rabbit management signage for your local area

Rabbit ~~control~~ *exclusion* costs

- Newly created groups (within first year) implementing long-term ~~control~~ rabbit exclusion i.e., fencing across multiple properties (number of properties required will depend on local context)

Innovation

- Trialling new techniques to inform best practice rabbit management
- Trialling creative new community engagement / collaboration ideas

Monitoring

- Developing a citizen science programme to monitor rabbit numbers in your area
- Developing tools to monitor and map rabbit densities in your area
- Collecting data to assist with local area rabbit management planning

6. CLOSURE