



Game Animal Council  
NEW ZEALAND



# WILD DEER MANAGEMENT AND MEAT RECOVERY

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Understanding the current context of meat recovery associated with wild deer management and how it fits into the New Zealand deer management system.

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December 2023



## CONTENTS

<b>1</b>	<b>INTRODUCTION</b>	<b>2</b>
1.1	Context	3
1.2	Executive Summary	3
1.3	Limitations	4
1.4	Acknowledgements	4
1.5	Report Preparation and Authorisation	4
<b>2</b>	<b>CASE STUDY REVIEW</b>	<b>4</b>
2.1	The Central North Island Sika Foundation Mince Project	5
2.2	Fiordland Wapiti Foundation Mince Project 2020	7
2.3	Lake Sumner Recreational Hunting Area (RHA) Deer Management Project	8
2.4	2022 Fiordland Deer Contract	10
2.5	Summary of Project Outputs	11
<b>3</b>	<b>HOW THESE APPROACHES FIT INTO NEW ZEALAND'S WIDER DEER MANAGEMENT SYSTEM</b>	<b>12</b>
3.1	Deer Management in New Zealand	12
3.2	Food Safety	13
3.3	Management Approaches	14
3.3.1	Financial	14
3.3.2	Operational	16
3.3.3	Environmental	18
3.3.4	Social	20
3.4	Key Considerations	21
<b>4</b>	<b>RECOVERY FOR CHARITY INNOVATIONS</b>	<b>24</b>
4.1	Funding	24
4.1.1	Government Funding	24
4.1.2	Corporate Sponsorship	24
4.1.3	Individual Contributions	24
4.2	Operational	25
4.2.1	National Programme	25
4.2.2	Private Land and Access	25
4.2.3	Partnerships with Iwi	25
4.2.4	Technology	26
<b>5</b>	<b>RECOMMENDATIONS FOR FURTHER WORK</b>	<b>27</b>

# 1 INTRODUCTION

Wild deer populations have established across much of New Zealand since their introduction between 1851 and 1926 and are present on public conservation land (PCL) - managed by the Department of Conservation (DOC), other crown land - managed by Land Information New Zealand (LINZ) and regional councils, and private land - managed by individuals and enterprises. There are seven deer species found in New Zealand that vary in body size, abundance, and range. Larger bodied species include red deer (*Cervus elaphus*), wapiti (*C. canadensis*), sambar deer (*C. unicolor*), and rusa deer (*C. timorensis*). Smaller bodied species include sika deer (*C. nippon*), fallow deer (*Dama dama*) and white-tailed deer (*Odocoileus virginianus*). Red deer and fallow deer are the most widespread species, ranging over much of the North and South Island. The other species occupy more discrete ranges in either the North, South or Stewart Islands.

Deer provide value to New Zealand communities as a financial, recreational and food resource. This is evident through their recognition as a 'valued introduced species' in Te Mana o te Taiao – Aotearoa New Zealand Biodiversity Strategy (ANZBS).<sup>1</sup> However, wild deer browse on palatable species of native vegetation and when deer numbers are too high can reduce their abundance, and in some cases, can suppress regeneration even when present at low density.<sup>2</sup> Accordingly, the ANZBS sets goals for managing valued introduced species, including deer, to protect New Zealand's indigenous biodiversity and to maintain the value they provide to communities.

Deer populations on PCL have traditionally been managed through agency search and destroy culling, commercial venison recovery for common large bodied species via Wild Animal Recovery Operations (WARO), and discretionary harvest by individual recreational hunters.<sup>3</sup> From the 1930's-1960's, agency culling was the primary deer population management approach. During the 1960's-1980's the primary approach shifted to WARO, which achieved significantly reduced red deer populations.<sup>4</sup> Since then, reductions in market demand for wild venison and increasing regulation and operational costs have resulted in significantly reduced WARO activity. Consequently, recreational hunting has been the primary contributor to managing deer populations on PCL over the past 30 years.

Recreational hunters were estimated to harvest around 135,000 deer per year in New Zealand in 2012.<sup>5</sup> Despite this significant harvest, the density of some deer species, such as red deer and fallow deer, have been increasing in many areas on PCL.<sup>6</sup> This indicates that hunter harvest plus natural mortality is less than population recruitment in these areas. Hunter harvest in many places is male biased, which results in populations with high reproductive potential, and is often limited by access

<sup>1</sup>Source: <https://www.doc.govt.nz/nature/biodiversity/aotearoa-new-zealand-biodiversity-strategy/>

<sup>2</sup> Tanentzap, Andrew J., Larry E. Burrows, William G. Lee, Graham Nugent, Jane M. Maxwell, and David A. Coomes. 2009. Landscape-Level Vegetation Recovery from Herbivory: Progress after Four Decades of Invasive Red Deer Control. *Journal of Applied Ecology* 46(5): 1064-72. <https://dx.doi.org/https://doi.org/10.1111/j.1365-2664.2009.01683.x>.

<sup>3</sup> Discretionary recreational hunting - the number of deer, what species or demographic and at which location is chosen by individuals, i.e. is not prescribed by managers.

<sup>4</sup> Figgins, G., and P. Holland. 2012. Red deer in New Zealand: game animal, economic resource or environmental pest? *New Zealand Geographer* 68: 36-48.

<sup>5</sup> Kerr, G. N., and W. Abell. 2014. Big game hunting in New Zealand: per capita effort, harvest and expenditure in 2011–2012. *New Zealand Journal of Zoology* 41: 124-138.

<sup>6</sup> Moloney, P. D., D. M. Forsyth, D. S. L. Ramsey, M. Perry, M. McKay, A. M. Gormley, B. Kappers, and E. F. Wright. 2021. Occupancy and relative abundances of introduced ungulates on New Zealand's public conservation land 2012-2018. *New Zealand Journal of Ecology* 45(1): 3437



difficulties, which allows deer populations in remote or inaccessible areas to increase unchecked.<sup>7,8</sup> Furthermore, in areas where other land tenures adjoin PCL and have deer management practices that favour high deer populations, hunter harvest rates may be insufficient to counter immigration rates. These areas can act as reserves that repopulate adjoining PCL where hunter harvest may otherwise limit deer population growth.

Hunting sector stakeholders have recognised that discretionary recreational hunter harvest and limited WARO activity is insufficient for stabilising some deer populations, and responded by organising deer management projects where they consider deer densities to be high, or where populations are likely to increase to unacceptable levels without increased mortality. These hunter-led projects utilise traditional population management approaches with various adaptations, and some incorporate meat recovery for charity.

## 1.1 Context

The New Zealand Game Animal Council (GAC), established under the Game Animal Council Act 2013, is a statutory entity with responsibilities for, *amongst other things*, advising and making recommendations (in relation to game animals and hunting) to the Minister of Conservation, raising awareness of the views of the hunting sector, conducting research, providing information, advising and liaising to improve the management of game animals and hunting opportunities.

The Department of Conservation (DOC) liaised with the GAC and commissioned this research report to better understand how some recently applied deer management approaches may fit within the context of the wider deer management system in New Zealand.

## 1.2 Summary

This report:

- Summarises the key features, outcomes, challenges and opportunities of four different deer management projects with and without meat recovery, including:
  - The Central North Island Sika Foundation (CNISF) Mince Project.
  - The Fiordland Wapiti Foundation (FWF) Mince Project 2020.
  - The Lake Sumner Recreational Hunting Area (RHA) Deer Management Project.
  - The DOC 2022 Fiordland Deer Contract.
- Discusses how these four management approaches fit within the wider New Zealand deer management system.
- Outlines key considerations for deciding the appropriate deer management approaches to implement.
- Explores potential innovations to approaches that incorporate meat recovery for charity.
- Provides recommendations for further work.

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<sup>7</sup>Fraser, W. 1996. *The effect of recreational hunters on deer populations in Pureora Conservation Park*. Department of Conservation <https://www.doc.govt.nz/globalassets/documents/science-and-technical/sfc031.pdf>.

<sup>8</sup>Fraser, K. W., and P. J. Sweetapple. 1992. Hunters and hunting patterns in part of the Kaimanawa Recreational Hunting Area. *New Zealand Journal of Zoology* 19: 91-98.

### **1.3 Limitations**

- 1 This report has relied on information gathered from the GAC, the DOC and during personal communications with people involved with deer management in New Zealand as referenced.
- 2 The scope of this research and report was limited to deer management on public conservation land.

### **1.4 Acknowledgements**

We are grateful to Alex Gifford who gathered information and prepared the first draft of this report in 2022. We are also grateful to the hunting sector organisations who contributed freely with information for the development of this report.

### **1.5 Report Preparation and Authorisation**

This report has been prepared by the New Zealand Game Animal Council with funding provided by the Department of Conservation. This report is relevant to the brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than the Game Animal Council or the Department of Conservation, without our prior written agreement.

*The report has been reviewed by the Department of Conservation's Wild Animals Team and revised by New Zealand Game Animal Council staff.*

## 2 CASE STUDY REVIEW

This case study review summarises the key features, outcomes, challenges and opportunities of four different meat recovery or deer management projects. Information on administration and project management costs, and voluntary contributions was incomplete for all four projects. However, information on the operational costs, excluding voluntary contributions, was complete for all four projects. For consistency, where information beyond operational costs, excluding voluntary contributions, was provided, this was excluded from cost/output calculations presented in the project outcomes tables for all four projects.

### 2.1 The Central North Island Sika Foundation Mince Project

In May 2021, the Central North Island Sika Foundation (CNISF) launched an initiative to donate venison mince to families in Turangi, Taupo and Te Awamutu via foodbanks. The project aimed to provide up to 100 kg of meat per week reducing the foodbanks' weekly food budget by half.<sup>9</sup> The process for donations is as follows:

- Recreational ground hunters donate their harvest (or 'recreational catch' as defined by the Animals Product Act 1999), primarily sika deer venison, although red deer and fallow deer venison may also be donated.
- Deer can be targeted on PCL or private land.
- Venison can be dropped off directly to a processor in Taupo or Te Awamutu where it is minced, packaged and labelled. Alternatively, meat can be dropped at other recreational hunters' chillers and later delivered to processors by volunteers.
- Once processed, the mince is collected either by the foodbanks or delivered to foodbanks by volunteers.

The CNISF Project Manager contributed approximately 24 hours of their time for ongoing organisational tasks over a 3-month period. The initial set up of this project required approximately 100 hours of CNISF staff and volunteer time. These costs are not included in the cost of per kg of mince. The cost of processing the mince and printing the labels is included in the cost per kg of mince, which is covered by the CNISF through donations and sponsorship.

Hunters are encouraged to skin and bone out meat prior to processor delivery as skinning and boning by butchers incurs additional costs. For a sika deer, skinning and boning fees can quadruple the processing costs for 1 kg of mince and for red deer this can double the cost.

At the project inception the CNISF sought advice from the Ministry for Primary Industries (MPI) on food safety requirements. MPI advised that the meat could be processed as unregulated (i.e., not inspected) 'recreational catch' and donated to charity.<sup>10</sup> However, an 'eat at your own risk label' must be present on the packaging. Foodbanks must also communicate to recipients that it is recreationally hunted meat and eaten at their own risk.

The CNISF has engaged with Ngāti Tūwharetoa who are supportive of the project. The project has also featured on Te Karere.

<sup>9</sup> Source: Sika Foundation website <https://sikafoundation.co.nz/foodbank-support/>

<sup>10</sup> Source: Pers comm. Tim Maule, Project Manager, Sika Foundation. Advice provided to the Sika Foundation from MPI.

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## PROJECT OUTCOMES UP TO JUNE 2022

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**MINCE DONATED**  
~1,500 KG

**MINCE COST PER KG**  
\$1.50  
(+GST)

**COST PER DEER<sup>11</sup>**  
~\$22.50  
(+GST)

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### KEY ADVANTAGES

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- Partnerships: Local businesses and volunteers are very willing to support the initiative via offering discounted rates (e.g., processors and printers), supplying products (e.g., vacuum pack bags) or assisting with transport.
  - Sponsorship: The Sika Foundation has several business sponsors. Given the low cost of the project, significant funding beyond this sponsorship is not required for its ongoing operation.
  - Project reach: As it is open to all recreational hunters a wide range of people can potentially donate meat.
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### KEY CHALLENGES

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- Consistency of supply and demand: Demand from foodbanks is significantly higher than supply. High supply occurs during the summer and roar periods but quiet during the remainder of the year.
  - Operational: 'After-hours' chiller facilities are not readily available. Often recreational hunters are passing through on their way home 'after-hours' and want to drop off meat.
  - MPI Regulations: Only recreationally hunted meat is donated. There is no mechanism to enable the sale of meat to support project expansion, except through certified meat inspection and processing facilities, adding significant costs and logistical challenges.
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### KEY OPPORTUNITIES

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- Offering hunters incentives may increase supply: Incentives could be funded through sale of high value cuts if an affordable certified inspection mechanism was established.
  - Enabling ground cullers to donate meat could also help with supply.
  - Expanding the project to more regions throughout New Zealand could increase supply.
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<sup>11</sup> Assumes average mince delivered off a Sika hind is 15 kg. Processing costs only, does not include recreational hunter or administration costs.

## 2.2 Fiordland Wapiti Foundation Mince Project 2020

The Fiordland Wapiti Foundation (FWF), GAC and DOC formed a partnership in May 2020 to provide wild venison to charitable organisations free of charge. The FWF and GAC coordinated the project, which involved red deer and wapiti deer being shot and recovered from Fiordland National Park via helicopter, then processed and delivered to foodbanks.

Members of the FWF volunteered their time (approximately 100 hours) and the GAC contributed staff resource (approximately 100 hours) to the project. The FWF also covered the cost of running chillers to temporarily store mince. These costs are not included in the cost of per kg of mince.

The project employed 20 people across helicopter operator and meat processor industries for an unknown amount of time. Carcasses were collected and processed by Fare Game NZ Ltd in Invercargill. These operational costs were jointly funded, with DOC contributing \$171,000 (+GST) and the FWF \$36,000 (+GST).

The Meat the Need charity provided the GAC and FWF support with distribution of mince to foodbanks. Hunting sector organisations including Safari Club International (NZ Chapter), the New Zealand Deerstalkers' Association (NZDA), the CNISF and the New Zealand Tahr Foundation donated funds to cover transportation costs to deliver mince to foodbanks. These costs are not included in the cost per kg of mince. The GAC engaged with Ngāi Tahu, who were supportive of the project and provided recipes to be distributed with the mince. Recipes were also provided by Richard Hingston and Nadia Lim, leading NZ chefs.

### PROJECT OUTPUTS

HINDS CULLED	TOTAL COST	MINCE DONATED	MINCE COST PER KG	COST PER DEER PROCESSED <sup>1</sup>
600 (544 PROCESSED)	\$207,000 (+GST)	18,056 kg	\$11.50 (+GST)	~\$380 (+GST)

### KEY ADVANTAGES

- Partnerships: Large businesses were willing to support the project, including trucking companies and the Interislander ferry.
- Certifications and Health & Safety (H&S): Employing existing WARO helicopter companies and a certified processor meant that all MPI certifications for food safety, DOC concessions and H&S requirements were already met.

### KEY CHALLENGES

- Funding: The cost of culling with deer recovery was approximately 4x the cost of culling without recovery (see section 2.4).
- Hunting location: Helicopter cost is expensive and longer ferry times significantly reduce the efficiency of recovery. The project location at the bottom of the South Island also increased mince transportation distances to foodbanks across New Zealand and therefore costs.



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- Weather conditions: Low fog and cloud hampered helicopter flight and hunting on the alpine tops.
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## KEY OPPORTUNITIES

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- Partnerships: Regular projects could expand the number or contribution of supporting partners.
  - Strategy: Replacing the charitable output from mince to net revenue appropriated through the sale of wild venison. However, this would only be effective if revenue exceeded costs. Should this be the case, a feedback loop to providing meat for charity may be established if net revenue was donated to support the expansion of the CNISF project or a similar project.
  - Funding: Offsetting the cost of recovery by allocating funds used for aerial culling with an equivalent harvest output could reduce the cost of recovery for charity. This would ensure cost of culling/deer killed is maintained and may incentivise the recovery industry to support a charitable initiative.
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### 2.3 Lake Sumner Recreational Hunting Area (RHA) Deer Management Project

The Lake Sumner Recreational Hunting Area (RHA) deer management project was initiated as a proactive step to manage the deer population in the RHA. The RHA was gazetted in 1981 to provide additional hunting opportunities for recreational hunters via the exclusion of WARO.

The project was an organised recreational hunt that involved 28 experienced recreational ground-based hunters distributed across 14 blocks within the RHA. The GAC organised the recreational hunt in collaboration with the DOC, the NZDA, local landowners and recreational hunters. The project was completed over three days in late May 2022 with the objectives being:

1. Contribute to shifting the demographics of the Lake Sumner RHA red deer herd by removing a proportion (up to 30 percent) of the adult breeding hinds.
2. Gather baseline data from the animals seen and managed to contribute to future decision-making.
3. Compare the costs of deer removal by organised experienced recreational ground hunters and commercial aerial control alternatives.

Hunters were flown in and out of the blocks via helicopter. Baseline data on the deer herd was collected during the hunt to inform the development and implementation of a management strategy for the RHA. Data collected included hunting duration, animals seen and harvested, and lower jaws and reproductive tracts. Meat recovery was limited to that which could be taken out by hunters within helicopter weight limits. No meat was donated to charity.

The total reported project cost was \$33,400 excluding GST.<sup>12</sup> This included 75 hours of GAC staff resource to project management, implementation, and H&S. The DOC contributed \$7,000 towards the project and an unknown amount of administrative staff resource. Recreational hunters contributed \$10,000 for the helicopter flights. Participating hunters funded their personal costs for participating, including hunting equipment, transportation to helicopter pads, and accommodation.

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<sup>12</sup> <https://nzgameanimalcouncil.org.nz/wp-content/uploads/2023/05/Lake-Sumner-RHA-Management-Project-Final-Report-May-2023.pdf>

Architectural Glass Ltd also sponsored \$1,000 towards other consumables. Only the operational costs, i.e., aerial transport and consumables (totalling \$16,258 + GST), were used to calculate cost per deer killed below.

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### PROJECT OUTPUTS

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HINDS CULLED	TOTAL COST	COST PER DEER	DEER PER HUNTER <sup>13</sup>
<b>126</b>	<b>\$16,258</b>	<b>~\$129</b>	<b>4.5</b>
(OVER 3 DAYS)	(+GST)	(+GST)	(1.5 PER HUNTER PER DAY)

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### KEY ADVANTAGES

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- Quality control: Organised hunts allow for the selection of experienced hunters to maximise output potential and structured standardised documentation (health and safety, operational parameters, reporting) to ensure consistency.
  - Increased knowledge: The collection of extra data, other than simply the number harvested, during organised management hunts provides an increased understanding of the deer herd health.
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### KEY CHALLENGES

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- Volunteer hunters: Time available to regularly participate in organised recreational deer management is likely to be limited due to work, family and other personal commitments.
  - Volunteer costs: The costs of participating may prevent recreational hunters from regularly participating in organised hunts.
  - Weather: These hunts need to be organised well in advance to allow time for volunteers to prepare (e.g., take annual leave). As such, there is limited flexibility to change dates should poor weather prevent the hunt going ahead. This has the potential to result in expenditure of fixed costs for zero deer being removed.
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### KEY OPPORTUNITIES

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- Efficiencies: Administration and project management costs can likely be reduced for subsequent projects by using existing documents (e.g., project and operational plans, health & safety plans, information sheets) as a template.
  - Hunt Format: Facilitating individual recreational hunter contributions to population management through formal DIY mechanisms (e.g., provide hunters with focus areas, demographic targets/guidelines and a system for recording and registering self-directed contributions) could reduce limitations of weather, volunteer availability and operational costs.
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<sup>13</sup> Assumes 28 hunters hunting for three days.

## 2.4 2022 Fiordland Deer Contract

The Fiordland Deer Contract was implemented by the Department of Conservation, with input from the Game Animal Council (GAC) and Fiordland Wapiti Foundation (FWF), to remove hinds (female deer) from sensitive conservation areas in western Fiordland around Kaikiekie/Bradshaw Sound.. The intention of the project was to partially address the gap left by the reduction in WARO activity due to depressed wild venison prices. WARO previously removed around 4,000 - 6,000 deer annually from Fiordland National Park.<sup>14</sup> The project had a target of culling a minimum of 300 red deer hinds via helicopter without meat recovery from within 113,000 ha (approximately 9% of Fiordland National Park).

DOC coordinated the project, engaged WARO operators directly, and contributed \$50,000 of funding. This budget primarily went towards the helicopter costs of the culling operation. The GAC contributed staff resource (approximately 10 hours) to the project. FWF volunteered their time (approximately 20 hours).

### PROJECT OUTPUTS

HINDS CULLED	TOTAL COST	COST PER DEER	DEER PER HOUR
<b>432</b> (OVER 21.42 HOURS OF FLYING)	<b>\$50,000</b> (+GST)	<b>~\$116</b> (+GST)	<b>20</b>

### KEY ADVANTAGE

- Certifications and Health & Safety (H&S): Employing existing WARO helicopter companies meant that DOC concessions and H&S requirements were already met.

### KEY CHALLENGES

- Funding: Availability of funding limits the number of deer that can be culled. Funding the removal of the 6,000 deer that WARO previously removed annually would cost approximately \$636,000 per annum.
- DOC policy: DOC cannot engage companies that use Robinson helicopters due to a H&S risk of mast bumping. Robinson 44's (R44) are approximately ~20% cheaper to run per hour than a Hughes 500. With the \$50,000 budget, using an R44 would result in an additional ~7 hours flight time and a further ~140 deer culled, assuming both machines are equally effective.

### KEY OPPORTUNITY

- Efficiencies: The cost per deer could be reduced if hinds and stags are killed as less time is spent searching for animals. However, killing stags does not contribute to reduction in population reproductive potential as deer are polygynous. Removal of stags (males) affects the population dynamics and is also

<sup>14</sup> Pers. comms George Ledgard, DOC and Roy Sloan, Fiordland Wapiti Foundation.

likely to reduce recreational hunter effort in the area and create conflict. The harvest of females is the factor that influences population abundance.

## 2.5 Summary of Project Outputs

PROJECT	DEER KILLED	TOTAL COST (+GST)	MINCE DONATED	MINCE COST PER KG (+GST)	COST PER DEER (+GST) <sup>15</sup>
<b>CNISF MINCE PROJECT</b>	~100 <sup>17</sup>	~\$2,250 <sup>17</sup>	~1,500 KG	\$1.50	~\$22.50 <sup>16</sup>
<b>FWF MINCE PROJECT</b>	600 (544 processed)	\$207,000	18,056 kg	\$11.50	~\$380 <sup>17</sup>
<b>LAKE SUMNER RHA DEER MANAGEMENT PROJECT</b>	126 (1.5 per hunter per day)	\$16,258	N/A	N/A	~\$129
<b>2022 FIORDLAND DEER CONTRACT</b>	432 (20 deer per hour) <sup>18</sup>	\$50,000	N/A	N/A	~\$116

<sup>15</sup> All projects exclude staff resource or volunteer contributions in cost calculations.

<sup>16</sup> Assumes average mince delivered off a Sika hind is 15 kg.

<sup>17</sup> The cost per deer culled was approximately \$345.

<sup>18</sup> Assumes 28 hunters hunting for three days.

## 3 HOW THESE APPROACHES FIT INTO NEW ZEALAND'S WIDER DEER MANAGEMENT SYSTEM

### 3.1 Deer Management in New Zealand

Deer management in New Zealand is enabled through the Wild Animal Control Act 1977 (WAC Act), with the responsible agency being the Department of Conservation (DOC) as per the Conservation Act 1987, and subject to other Acts relevant to land tenure, e.g., National Parks Act 1980 or when specified, e.g., Biosecurity Act 1993.

The Department of Conservation's Policy Statement on Deer Control (2001) sets out DOC's general approach to deer management on public conservation land (PCL) in New Zealand:

*"To reduce the impacts of deer, along with other threats, on public conservation lands so as to maintain and enhance forest regeneration and indigenous ecosystem protection."*

Conservation Management Strategies and National Park Plans describe DOC's approach to deer management for each regional conservancy and national park, respectively. These documents are developed through a public consultation process and approved by the New Zealand Conservation Authority as per the Conservation Act 1987.

While DOC's overarching approach to deer management is outlined nationally and by conservancy/land tenure, there is no national deer management plan in New Zealand. DOC site-specific deer management plans exist in a few areas, typically where the objective is deer eradication or very low density, e.g., Northland. Government directed aerial or professional ground culling is undertaken in these areas.

Recreational and commercial hunting are enabled on PCL through the WAC Act, with the purpose of coordinating hunting measures and for concerted action against the damaging effects of wild animals on vegetation, soils, water, and wildlife. However, hunting is largely undertaken at the discretion of individual hunters and operators, e.g., hunters decide where to hunt and what/how many to harvest. Therefore, hunter contributions to deer population management are typically not coordinated other than through provisions for access, e.g., permits and concessions administered by the DOC, and food safety requirements administered by the Ministry for Primary Industries under the Animal Products Act 1999.

Recreational hunting is open across most PCL, however some areas are restricted, e.g., limits the number of firearms carried, and in some areas, hunting is not permitted. Areas not permitted for recreational hunting are determined by regional conservancies. In permitted and restricted areas, hunters are required to apply for a free hunting permit to carry a weapon on PCL. Commercial aerial and ground-based hunters require a concession to operate and pay a management fee.<sup>19</sup> For wild animal recovery (WARO) activities, concession permits are assigned in line with the WARO Land Tenure Schedule, which defines areas that are permitted, restricted or not permitted for WARO activities. Restricted areas typically define periods when WARO activities are not permitted.

Community agreements between non-government organisations and DOC are operating in some areas, including the Fiordland Wapiti Area, where recreational and commercial hunting is

<sup>19</sup> [north-island-war-o-concession-permit.pdf \(doc.govt.nz\)](https://www.doc.govt.nz/assets/conservation/land-tenure/waro-land-tenure-schedule/2019-2024/north-island-war-o-concession-permit.pdf)



coordinated for deer management that supports sustainable hunter effort and improved conservation outcomes.

More recently, Te Mana o te Taiao Aotearoa New Zealand Biodiversity Strategy 2020 (ANZBS) was released, which establishes the goal of quantifying impacts and developing management plans for valued introduced species, including deer, to reduce their impacts and maintain their recreational and cultural value. However, deer management plans under ANZBS have not yet been developed.

### 3.2 Food Safety

The sale of wild venison is subject to Ministry for Primary Industries food safety regulations, under the Animal Products Act 1999. Wild venison is only permitted for sale if the supplier is certified (e.g., existing WARO operators or listed hunters), and regulations for transportation and certified food safety inspection of whole carcasses are followed within specified time frames. Consequently, the viability of commercial venison recovery is limited by the cost or time to harvest and transport whole carcasses to certified chillers and processing facilities for inspection. These limitations affect the viability of ground-based recovery to a greater degree than aerial recovery due to the added difficulty of transporting whole carcasses to vehicle access points within set time frames on foot.

Wild venison destined for sale cannot be sourced within 2 km of areas where poisons have been used until the poison caution period (1 month – 3 years) has passed.<sup>20</sup> It also cannot be sourced within 2 km of private property unless a Poison Use Declaration is supplied from the landowner confirming past poison uses and dates. If a Poison Use Declaration cannot be obtained, there is a 2km 'no take' area for commercial venison recovery around the property boundary. Poison use on PCL and landowner declaration requirements pose a significant challenge for effective deer management as they limit the management approaches that may be applied to large areas of PCL. For example, significant proportions of the Aorangi, Ruahine or Kaimai ranges are not available for commercial venison recovery without numerous landowner Poison Use Declarations due to their shape, e.g., they are long and narrow. Recreational harvest in poison use areas or within 2 km of private land is not regulated but hunters are recommended to follow the same guidelines.

Recovered wild venison can be donated to charitable organisations through the commercial pathway or via an alternative pathway, unregulated recreational catch. Venison recovered through the recreational pathway cannot be sold or traded but it may be donated. An 'eat at your own risk label' must be present on packaging. Foodbanks must communicate to recipients that it is recreationally hunted meat eaten at their own risk.<sup>21</sup>

Under the Animal Products Act 1999 there is some uncertainty around what meat can be donated as 'recreational catch'. This hinges on undefined aspects such as being a 'member of the hunting (or catcher's) party' and when recovery of an animal becomes 'trade', and therefore, must go through the commercial pathway. For example, it is unclear whether a ground-based culler can be paid to cull deer and then voluntarily recover and donate the meat.

<sup>20</sup> Refer to Section 12.6 of the Ministry for Primary Industries 'Specifications for Products Intended for Human Consumption 2020'.

<sup>21</sup> Pers. comms Jordan Hoult, Principal Advisor Animal Products MPI, 2023 and Tim Maule, Project Manager, Sika Foundation, advice provided to the Sika Foundation from MPI by email, 2022.

### 3.3 Management Approaches

The four projects outlined in the case study review are examples of coordinated hunting activity on public conservation land, in line with the WAC Act. Each employs a different management approach and variably combines agency, non-government organisation and voluntary contributions. The hunter-led management approaches used are each operationally comparable to a traditional NZ deer management approach. These include, discretionary recreational hunting, aerial control with commercial meat recovery and professional ground and aerial culling with no meat recovery.

Below, the financial, operational, environmental, and social aspects of the four outlined management approaches are discussed in context with their comparable traditional deer management approach.

PROJECT	PROJECT MANAGEMENT APPROACH	COMPARABLE TRADITIONAL MANAGEMENT APPROACH
<b>CNISF Mince Project</b>	Recreational hunting with meat recovery for charity.	Discretionary recreational hunting.
<b>FWF Mince Project</b>	Aerial control with meat recovery for charity. (WARO for charity)	Aerial control with commercial meat recovery. (WARO for profit)
<b>Lake Sumner RHA Deer Management Project</b>	Organised recreational hunting with no meat recovery. (Recreational culling)	Professional ground culling. (Ground culling)
<b>2022 Fiordland Deer Contract</b>	Aerial control with no meat recovery. (Agency directed aerial culling)	Aerial control with no meat recovery. (Agency directed aerial culling)

#### 3.3.1 Financial

The cost per deer killed will vary between individual operations using any management approach as it is dependent on local deer abundance, environmental context, and operational efficiencies. As such, the cost per deer killed or per kg of mince reported in the projects cannot reliably predict the cost of using these approaches in every scenario. However, they do provide an indication of the cost of applying these approaches in similar areas with similar deer abundances.

The case study review only outlines operational costs (excluding voluntary contributions)/output of the four projects. Firstly, because information on administration and project management costs was incomplete. Secondly, because voluntary contributions were not quantified. These may include volunteer time to hunt deer and deliver mince, and personal financial costs such as transportation, equipment, food, and running chillers. If staff and volunteer resourcing for administration or project management and volunteer operational contributions were included in the analysis, the cost per deer killed or per kg of mince reported would be significantly higher than estimated for all four of the projects. However, the administration and project management costs of traditional deer

management approaches are also typically not reported, thus enabling a generalised cost comparison with these approaches, excluding voluntary contributions.

Information on the Lake Sumner RHA project's administrative and project management costs were almost complete (only lacking DOC administration costs) and accounted for almost half of the total project cost (excluding voluntary contributions).<sup>22</sup> This suggests that administration and project management costs may be a significant component to the overall cost of applying deer management approaches. However, the Lake Sumner RHA project was the first hunter-led recreational culling operation coordinated by the GAC, so likely incurred higher administration and project management costs than would be expected for any repeated application because processes and documentation would then be pre-existing.

The operational cost/output of aerial and professional ground culling are relatively well understood in New Zealand as these approaches have been used extensively for the management of deer and other wild animals, for example Himalayan tahr and wild goats. These approaches are only financially viable if funding to undertake them is provided, usually government allocated, irrespective of abundance or location, as they do not include a mechanism for gathering revenue.

The 2022 Fiordland deer contract operational cost/output was comparable to previous agency directed aerial culling operations in this area.<sup>23</sup> The operational cost of the Lake Sumner RHA project was likely significantly lower than if professional ground culling had been used instead. This is due to volunteer contributions of time, equipment and personal transport to and from access points in lieu of paid employment.<sup>24</sup> However, the difference in output between the two approaches is unknown as professional ground culling has not been recently applied in this area.

The cost of WARO, whether for charity or profit, is strongly influenced by helicopter effort required to find, recover, and transport carcasses and processing fees, and revenue is influenced by venison markets. Helicopter operating costs have recently increased, so the costs reported here are likely to under-estimate current costs. WARO for charity is only a financially viable option when funding is provided or if revenue appropriated through the later sale of venison (where net-profit is used for charitable purposes) is higher than recovery and processing costs.

Discretionary recreational hunting is a zero-cost operational approach for agencies, as these costs are entirely covered by hunters, i.e., voluntary contributions. The CNISF mince project utilises the voluntary contribution of discretionary recreational hunting to enable a low financial cost model for meat recovery for charity, i.e., the cost of harvest, recovery and meat preparation for processing is covered by recreational hunters, transport costs are covered by foodbanks or volunteers and meat processing and packaging costs are covered by local business sponsorship. The low financial cost facilitates sustainable application of this approach so long as volunteer inputs, and local business sponsorship are maintained. In addition, this approach can be used to target smaller deer species which are less financially viable than larger deer species to recover via helicopter and process in terms of cost per kg of venison.

<sup>22</sup> <https://nzgameanimalcouncil.org.nz/wp-content/uploads/2023/05/Lake-Sumner-RHA-Management-Project-Final-Report-May-2023.pdf>

<sup>23</sup> Based on pers. comms from Roy Sloan, president of the FWF, and George Ledgard from DOC and the 2022 Fiordland Deer Contract (22 deer per hour average of the Fiordland Deer Contract 2022 and 4 hours of helicopter operation per day.)

<sup>24</sup> Assumes \$70 per hour for professional ground hunter and an 8-hour day and 1-3 deer per hunter-day (pers. comm. Jordan Munn, Trap and Trigger).

### 3.3.2 Operational

#### 3.3.2.1 Efficiency and Effectiveness

When comparing different deer management approaches in the same habitat types with the same deer population density, efficiency can be measured in the financial cost per deer killed, and effectiveness can be measured by the number of deer killed per day. However, efficiency and effectiveness will vary through time and at place due to variability of environmental parameters, changes in deer abundance and economic parameters. Reductions in deer abundance will result in reduced effectiveness and efficiency, regardless of the management approach applied, because more time will be spent searching for deer in areas with low deer numbers.

The efficiency and effectiveness of the Fiordland deer contract 2022 (which targeted hinds only) was comparable to government directed aerial culling when applied under the same operational parameters.<sup>25</sup> This is because both approaches utilise the same professionally based mechanism, i.e., professional helicopter pilots and shooters. Aerially based culling with operational parameters that target all deer, rather than a specific demographic may be more efficient and effective within individual operations because they do not need to fly past any deer observed. However, this may not extend to efficiencies for longer term deer management, whereby, reducing a population's reproductive potential through the targeting of females, and thereby, also retaining recreational or commercial hunting activities, may reduce the frequency operations need to be undertaken to maintain deer populations at desirable levels.<sup>26</sup> This is further discussed in section 3.3.3.

The FWF Mince Project was likely as effective as WARO for profit, again due to it being undertaken utilising the same professionally based mechanism. However, when considering efficiency to agencies, i.e., cost to agencies per deer killed, WARO for charity is significantly less efficient than WARO for profit. WARO for profit incurs no operational costs to agencies and the FWF Mince Project was approximately four times more expensive per deer than the 2022 Fiordland Deer Contract. However, if meat recovery costs were covered by the later sale of venison, like WARO for profit, but the revenue appropriated for charitable purposes instead of direct delivery of meat, WARO for charity could also incur no net-cost. Therefore, for agencies, the efficiency of WARO for charity may be less or equivalent to WARO for profit, depending on whether revenue appropriation for charity is utilised.

The Lake Sumner RHA Deer Management Project resulted in 1.5 deer killed per day per hunter and professional ground hunters reported during phone interviews that 1-3 deer killed per day per hunter was typical for professional ground culling operations. This suggests that recreational culling and professional ground culling may be similarly effective.<sup>27</sup> This is supported by comparable outputs of recent professional ground culling and recreational culling operations targeting Himalayan tahr.<sup>28</sup>

<sup>25</sup> Pers. comms George Ledgard, DOC and Roy Sloan, Fiordland Wapiti Foundation.

<sup>26</sup> Bowyer, R. T., K. M. Stewart, V. C. Bleich, J. C. Whiting, K. L. Monteith, M. E. Blum, and T. N. LaSharr. 2020. Metrics of harvest for ungulate populations: Misconceptions, lurking variables, and prudent management. *Alces: A Journal Devoted to the Biology and Management of Moose* 56:15-38.

<sup>27</sup> Assumes \$70 per hour for professional ground hunter and an 8-hour day and 1-3 deer per hunter-day (pers. comm. Jordan Munn, Trap and Trigger).

<sup>28</sup> The New Zealand Tahr Foundation Annual Report 2022. [https://nztf.org.nz/sites/default/files/2022-09/NZ\\_Tahr\\_Foundation-Annual-Report-2022.pdf](https://nztf.org.nz/sites/default/files/2022-09/NZ_Tahr_Foundation-Annual-Report-2022.pdf)

However, further comparative analysis of recreational and professional ground culling operational outputs with the same operational parameters and in the same area would need to be undertaken to confirm their relative effectiveness. However, as professional ground culling has not been undertaken in the area in recent years the difference in deer killed per hunter day cannot be directly compared. However, recreational culling is likely to be significantly more efficient for agencies than professional ground culling as it utilises voluntary contributions, thus removing the employment cost component. The limitations of the scope for this approach's application is discussed in section 3.3.3.

For the CNISF Mince Project, effectiveness is difficult to quantify because recreational hunters harvest deer at an unquantified level regardless of the opportunity to donate meat to charity. Therefore, the effectiveness of this approach can only be assessed if the number of deer harvested above that which hunters would typically harvest is known, i.e., would hunters have killed the deer if there was not an option of providing the meat to charity? Consequently, the efficiency of recreational ground hunters with meat recovery for charity is also unknown, so may be less, more, or equivalent to discretionary recreational harvest.

### **3.3.2.2 Landscape and Accessibility**

The management approaches that may be applied in an area are limited by landscape features, e.g., terrain and vegetation types, and the accessibility or distance to that area. As such, there are areas of PCL where a range of management approaches may be applied and other areas where neither traditional nor hunter-led management approaches may be applied, e.g., with thick vegetation and steep terrain.

Aerial culling, traditional or hunter-led, is limited to open areas, such as alpine tops, or slips, clearings and riverbeds in areas of dense bush. Similarly, WARO, for profit or charity, is limited to these same areas, though the terrain must also be conducive to recovery. Aerial operations involving long ferry times (15-20 minutes) to reach hunting areas will incur higher costs and therefore, accessibility is determined by the cost of access. At the time this report was first drafted, a 20-minute ferry time in the Hughes 500 equated to \$610 - \$640.<sup>29</sup> Ferry time costs impact WARO approaches more so than aerial culling approaches. Helicopters have weight restrictions, limiting the number of carcasses that can be transported per trip. Once the collective weight of deer killed reach the helicopter weight restriction limit, multiple ferry trips must be undertaken to enable recovery. In addition, the Ministry for Primary Industries regulations restrict wild meat recovery within 2 km of private property boundaries unless landowners/managers provide a Poison Use Statement Declaration. In areas where there are multiple property boundaries, obtaining the required declarations can be insurmountable. This can create large areas of PCL where access to use tools which utilise meat recovery is hindered (see section 3.2).

Professional ground culling, recreational culling, discretionary recreational hunting and recreational hunting with meat recovery for charity may be applied in any traversable landscape and vegetation coverage. However, all these approaches are limited by accessibility or distance. Professional ground culling and recreational culling can be applied in remote areas by utilising helicopter transportation; accessibility is only limited by transportation cost and DOC landing permissions. Discretionary recreational harvest in remote areas is limited by the personal cost of access, e.g., helicopter

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<sup>29</sup> Based on pers. comms from Roy Sloan, president of the FWF, and George Ledgard from DOC and the DOC 2022 Fiordland Deer Contract.



transportation costs or time/effort to reach areas on foot, and DOC landing and hunting permissions. Recreational hunting with meat recovery for charity is further limited by the distance/time to reach chillers for meat donation. Without good vehicle or aerial access, the ability for a ground hunter to recover deer and transport meat to chillers within food safety time requirements is hindered. This means recreational meat recovery projects will generally be limited to fringe areas of PCL.

The use of Thermal Animal Detection Systems (TADS) may change the aerial accessibility of deer in some bush areas. The use of TADs can allow aerial hunters to locate deer beneath the forest canopy and, working in combination with a shooter using a thermal equipped scope, deer are shot through the forest canopy. This technology also increases the speed at which deer are located and the probability of a dispatch as deer can be tracked through the bush and are less likely to escape, thereby, improving the efficiency and effectiveness of aerial culling. Nonetheless, the effective application of TADS remains limited in areas with a dense canopy and understory. The application of TADs for enhancing WARO and ground-based culling and recovery for charity is yet to be officially tested. However, recovering deer carcasses via helicopter in canopied areas would be challenging, and in many cases not possible.

### 3.3.3 Environmental

Reducing deer populations by any mechanism results in reduced deer browse on palatable plant species. However, the degree of benefit that reducing a deer population provides to palatable plant species is dependent on individual species browse susceptibility, and the level of reduction and maintenance of deer densities through time.<sup>30</sup> Most palatable plants can persist in the presence of low to moderate deer densities, but some are extirpated (no longer found in a given area) in the presence of very low deer densities.<sup>31</sup> As such, desirable deer densities will vary by place and deer management practices employed will need to differ depending on their effectiveness and efficiency for achieving and maintaining desirable deer densities.

To achieve deer population reduction and maintenance requires an understanding of the influence of deer demography on population trends. For population reduction, the number of deer killed must exceed recruitment rate less natural mortality. To maintain populations, an equilibrium of recruitment and mortality must be achieved. Males have little effect on long-term population abundance as deer are polygynous, i.e., a single male can impregnate multiple females, and the lifespan of a male is finite, i.e., when female populations are held at reduced levels, the male population will be reduced through natural mortality through time irrespective of harvest.<sup>32</sup> Accordingly, the number of females within a population and their reproductive potential determines the level of harvest required to achieve deer population reduction and maintenance over the long term.

Traditional aerial and ground culling can be effective at reducing deer populations to very low levels when applied intensively in conducive landscapes, e.g., open landscapes and traversable landscapes

<sup>30</sup> Forsyth, D., D. Coomes, and G. Nugent. 2003. Framework for assessing the susceptibility of management areas to deer impacts. Department of Conservation Wellington, New Zealand.

<sup>31</sup> Tanentzap, Andrew J., Larry E. Burrows, William G. Lee, Graham Nugent, Jane M. Maxwell, and David A. Coomes. 2009. Landscape-Level Vegetation Recovery from Herbivory: Progress after Four Decades of Invasive Red Deer Control. *Journal of Applied Ecology* 46(5): 1064-72. <https://dx.doi.org/https://doi.org/10.1111/j.1365-2664.2009.01683.x>.

<sup>32</sup> Nussey, D. H., L. E. Kruuk, A. Morris, M. N. Clements, J. M. Pemberton, and T. H. Clutton-Brock. 2009. Inter-and intrasexual variation in aging patterns across reproductive traits in a wild red deer population. *The American Naturalist* 174:342-357.

respectively.<sup>33</sup> However, the frequency, intensity and scope of their application is limited by government funding allocations, so they are generally inefficient for maintaining very low deer densities over large areas indefinitely.

Aerial culling may also be applied to achieve very low deer densities in conducive landscapes as it utilises the same professional mechanism as traditional aerial culling, but only if there is hunter support for this aim. Hunter support is more likely when this approach is applied to reduce and maintain deer populations at levels (low-moderate density) and with demographics (male biased) that retain recreational or commercial hunting activity. Hunter support for deer management approaches is discussed further in section 3.3.4.2. Hunter-led aerial culling may also be influenced by government allocations, depending on the level of financial contribution from hunters or alternative funding sources. However, by being coordinated with other approaches, discretionary recreational and commercial hunting, the frequency, or intensity that it needs to be applied to maintain low-moderate deer densities would likely be less than traditional aerial culling.

The effectiveness of recreational culling for reducing deer populations across large landscapes has not yet been demonstrated. However, in some scenarios, as outlined in this report, it has been shown to remove similar numbers to professional ground culling during individual operations at a significantly reduced cost to agencies. It is, however, unlikely that hunters would volunteer to reduce deer densities to very low levels, so is also unlikely to be as effective as ground culling in areas where this is the aim. In addition, volunteer time is limited due to social, work and family commitments, thus limiting the capacity of this approach's application.

WARO for profit can effectively reduce larger bodied deer species populations in open landscapes, so long as it remains financially viable.<sup>34</sup> However, the external drivers of financial viability for WARO harvest, particularly of females, can cause its effectiveness for reducing populations to fluctuate through time. WARO for charity may be similarly effective and limited, depending on whether funding is dependent or independent of industry markets. In addition, neither of these approaches would be efficient at maintaining very low deer densities as population density influences their financial viability. They could, however, be applied to reduce and maintain low-moderate deer populations in open landscapes when markets allow or by being funded/supplemented by resources independent of industry markets.

The effectiveness of providing an avenue for recreational hunters to donate meat to reduce or maintain deer densities is unknown. However, it is unlikely that this approach would be effective at reducing or maintaining deer populations at very low levels as hunter effort is related to the likelihood of hunter success.<sup>35</sup> Nonetheless, given the extent of discretionary recreational hunting, i.e., number of deer removed and area of application, even a small percentage increase in overall discretionary recreational harvest, particularly of females, would be a significant contribution to deer population maintenance across large landscapes, though primarily in more easily accessible areas.

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<sup>33</sup> Nugent, G., and D. Choquenot. 2004. Comparing cost-effectiveness of commercial harvesting, state-funded culling, and recreational deer hunting in New Zealand. *Wildlife Society Bulletin* **32**:481-492.

<sup>34</sup> Nugent, G., and D. Choquenot. 2004. Comparing cost-effectiveness of commercial harvesting, state-funded culling, and recreational deer hunting in New Zealand. *Wildlife Society Bulletin* **32**:481-492.

<sup>35</sup> Woods, A., and G. Kerr. 2010. *Recreational game hunting: motivations, satisfactions and participation*. Lincoln University, Canterbury, New Zealand.

### 3.3.4 Social

#### 3.3.4.1 Benefits

Deer management can provide a range of social benefits to individuals and the wider community. These can include health and wellbeing benefits, such as fitness and connection with nature, and economic benefits, such as contributions to economic growth, job creation, and sustainable resource utilisation. Understanding the social benefits provided by different deer management approaches is complex and requires a comprehensive analysis that is beyond the scope of this report. Instead, the relevance of social benefits to the deer management approaches discussed in this report are briefly outlined below.

Ground-based approaches, including discretionary hunter harvest, with or without meat recovery, and recreational and professional ground culling, provide health and well-being benefits to participating hunters through physical fitness and outdoor experiences connecting with nature.<sup>36</sup> Recreational hunting or WARO with meat recovery for charity provides community benefits to those receiving donated meat and also individual wellbeing benefits to participants through undertaking charitable work.<sup>37</sup> Economic benefits are provided by all the discussed population management approaches but vary between approaches and may be directly linked, e.g., helicopter, transportation, meat processor and packaging industries, or indirectly linked, e.g., equipment suppliers, support services and businesses that rely on recreational consumerism.

#### 3.3.4.2 Social Licence

Ongoing approval from communities for projects is termed 'social licence'.<sup>38</sup> For deer management, there are a range of different communities to obtain social licence from, some of which have conflicting views about the application of different deer management approaches, i.e., operational social licence. Below, the social licence for deer management approaches of three communities; those with strong environmental, hunting, and resource use values, are briefly discussed.

Communities in New Zealand with strong environmental values seek deer management programmes that aim for deer eradication or for deer populations to be held at the lowest practicable level.<sup>39</sup> Accordingly, management approaches that are most effective at reducing deer populations to very low densities, e.g., agency directed aerial and professional ground culling, generally have social licence from this community. Conversely, management approaches that do not typically aim to achieve very low deer densities, e.g., hunter-led approaches, generally have limited social licence from this community, i.e., only have social licence when application of preferred approaches is unfeasible.

Communities with strong hunting values support deer management that considers the value of the deer resource to hunting and the use of operational parameters that protect or enhance these values.<sup>39</sup> Accordingly, approaches that retain drivers for recreational and commercial hunting, and

<sup>36</sup> Martin, L., M. P. White, A. Hunt, M. Richardson, S. Pahl, and J. Burt. 2020. Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology* 68:101389.

<sup>37</sup> Son, J., and J. Wilson. 2012. Volunteer work and hedonic, eudemonic, and social well-being. *Sociological Forum* 27(3): 658-681.

<sup>38</sup> Dare, M., J. Schirmer, and F. Vanclay. 2014. Community engagement and social licence to operate. Impact assessment and project appraisal 32:188-197.

<sup>39</sup> Nugent, G., and K. W. Fraser. 1993. Pests or valued resources - conflicts in management of deer. *New Zealand Journal of Zoology* 20:361-366.

do not conflict with hunting activities through time and space generally have social licence from this community. Culling and WARO approaches that target both females and males, or females with dependent young, are applied over peak hunting periods, e.g., the rut, or to achieve very low deer densities, generally do not have social licence from this community. However, the social licence for different approaches and their operational parameters can vary between locations depending on the area's accessibility, or the value of the deer herd present, to hunting.

Communities with strong resource use values support deer management that maximises the use of deer removed, i.e., uses approaches that incorporate carcass recovery. For example, Ngāti Koata and Nelson City Council (NCC) recently undertook a deer, goat and pig culling operation on NCC reserves and Ngāti Koata land. The local community insisted that the carcasses be recovered, and as a result, recovery was incorporated into the operation. During culling the professional ground hunters' GPS recorded the location of killed deer, and after each hunting period Ngāti Koata recovered the deer. However, social licence for culling without recovery by communities with strong resource use values may be situationally dependent, e.g., where recovery is not practical, culling without recovery may be acceptable. Recovery in the example above was facilitated by existing 4WD tracks throughout the hunting areas.

While there are likely some individuals who strictly adhere to only one of these communities, many New Zealanders will be partial to multiple communities and their values with varying and situationally changeable tendencies. For example, a hunter may observe abundant deer populations and environmental impacts, and consequently, increase their support of culling approaches. Alternatively, a hunter may observe the culling of males in a high value herd and consequently, more strongly oppose culling approaches. Overall, coordinating deer population management approaches to achieve population reduction and maintenance in a way that supports collective social licence is situationally variable and a key challenge for deer managers in New Zealand.

### 3.4 Key Considerations

Overall, the effectiveness, efficiency and social acceptance of applying different management approaches varies by location, management goal, deer species/abundance and whether operations are standalone or repeated. The table below summarises key questions to answer when determining which deer management approach to apply, and an example of hypothetical answers and applicable approaches based on those answers.

ASPECT	QUESTION	EXAMPLE ANSWER	POTENTIAL APPROACHES
<b>Management goal</b>	What is the desirable deer density at this location for achieving biodiversity goals, and how does that interact with maintaining recreational and community values?	<ul style="list-style-type: none"> <li>• Low to moderate deer densities and their impacts are acceptable.</li> <li>• High use recreational hunting area.</li> <li>• WARO is permitted.</li> <li>• Important area for community food gathering.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li>• Recreational culling.</li> <li>• Aerial culling.</li> <li>• Professional ground culling.</li> <li>• WARO for profit</li> <li>• WARO for charity</li> </ul>

ASPECT	QUESTION	EXAMPLE ANSWER	POTENTIAL APPROACHES
<b>Landscape and accessibility</b>	What approaches are suitable for application in the area relevant to its size, terrain, vegetative cover and accessibility?	<ul style="list-style-type: none"> <li>• Moderate size.</li> <li>• Primarily bush and closed canopy.</li> <li>• Traversable landscape.</li> <li>• Located near urban population.</li> <li>• Accessible by 4wd but no aerial access.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li>• Recreational culling.</li> <li><del>• Aerial culling.</del></li> <li>• Professional ground culling.</li> <li><del>• WARO for profit</del></li> <li><del>• WARO for charity</del></li> </ul>
<b>Funding</b>	What is the available funding or funding opportunities for deer population management?	<ul style="list-style-type: none"> <li>• No/limited government allocation.</li> <li>• Potential sponsorship, voluntary and partnership opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li>• Recreational culling.</li> <li><del>• Professional ground culling.</del></li> </ul>
<b>MPI regulations</b>	<p>Is the area subject to regular poison applications or within 2km of private land?</p> <p>Is the area near enough to processing plants to meet transportation regulations?</p>	<ul style="list-style-type: none"> <li>• Not subject to poison operations.</li> <li>• Is within 2 km of private land. Declarations are obtainable.</li> <li>• Is near to processing facilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li>• Recreational culling.</li> </ul>
<b>Social licence</b>	Will different communities support/oppose these management approaches?	<ul style="list-style-type: none"> <li>• Community support/resistance for culling.</li> <li>• Community support/resistance for meat recovery.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li><del>• Recreational culling.</del></li> </ul>
<b>Improvements to the approach</b>	Are there any adaptations to approaches that could be made to improve their effectiveness or efficiency in this location or increase their social acceptance?	<ul style="list-style-type: none"> <li>• Nearby meat collection points can be established.</li> <li>• Recreational culling with meat recovery can be enabled.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> <li>• Recreational culling <i>with meat recovery</i>.</li> </ul>
<b>Efficiency and effectiveness</b>	How many and what demographic of deer need to be removed and how frequently to achieve and maintain	<ul style="list-style-type: none"> <li>• Currently high deer density, immediate 50% reduction required.</li> <li>• Maintenance female harvest at low-moderate density is higher than current</li> </ul>	<p>Population reduction</p> <ul style="list-style-type: none"> <li>• Recreational culling <i>with meat recovery</i>.</li> </ul> <p>Population maintenance</p>



ASPECT	QUESTION	EXAMPLE ANSWER	POTENTIAL APPROACHES
	desirable deer densities?	discretionary recreational hunting harvest. <ul style="list-style-type: none"> <li>• Bi-annual population reduction - 30% of estimated female population required for maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>• Discretionary recreational hunting.</li> <li>• Recreational hunting with meat recovery.</li> </ul>
	What operational parameters support ongoing population maintenance at desirable densities?	<ul style="list-style-type: none"> <li>• Culling operations target females post rut, pre-parturition.</li> <li>• Incentivise discretionary recreational hunters to target females.</li> </ul>	

## 4 RECOVERY FOR CHARITY INNOVATIONS

This section outlines potential innovations to funding and operational aspects of the hunter-led management approaches that incorporate meat recovery for charity discussed in this report. Further investigation of these innovations would be required to confirm their feasibility.

### 4.1 Funding

#### 4.1.1 Government Funding

The DOC contributed most of the funding for the FWF mince project. However, the primary benefactors were food banks which, since the start of COVID-19, have received funding from the Ministry for Social Development (MSD) through the Food Secure Communities Programme to purchase food.<sup>40</sup> Rather than MSD providing funds directly to foodbanks to purchase food, the potential for MSD to fund meat recovery for charity could be explored. At \$11.50/kg the mince delivered to foodbanks is likely to be cheaper than an equivalent product purchased by a foodbank with MSD funding.<sup>41</sup> Therefore, meat recovery projects have the potential to reduce MSD's and foodbanks' operating costs. Joint funding between DOC and MSD may be possible as these projects benefit both the environment and support food security/minimise food insecurity, thereby achieving objectives of both the DOC and MSD.

#### 4.1.2 Corporate Sponsorship

Publicity and marketing of the benefits of meat recovery for charity projects has been limited to media releases. Therefore, the wider community is unlikely to be aware of these projects. Also, there isn't an established process for businesses to sponsor the projects if they wanted to.

Many corporate businesses are looking for ways to contribute to the United Nations' Sustainable Development Goals.<sup>42</sup> Meat recovery for charity projects utilise deer as a resource and directly contribute to goals 2- zero hunger, 11-sustainable communities and 15-life on land. By sponsoring a meat recovery project, businesses could demonstrate their corporate responsibility in their own backyard. The results are fast and easily reportable by the business (e.g., deer removed, kilograms delivered).

A corporate sponsorship programme could be investigated to provide a secondary funding source to government funding. Kai ika is a similar initiative that receives corporate sponsorship to distribute fish frames. A similar deer programme would need to include a marketing plan, identify conservation areas to be sponsored, and identify business reporting outcomes.

#### 4.1.3 Individual Contributions

There are many crowd funding platforms available to raise funds for various causes. However, the donor has to deliberately access the website and make a contribution and, therefore, donations are likely to be one-off for most people.

<sup>40</sup> Food Secure Communities Programme: [Food Secure Communities - Ministry of Social Development \(msd.govt.nz\)](https://www.msd.govt.nz/what-we-can-do/community/food-secure-communities/index.html)  
<https://www.msd.govt.nz/what-we-can-do/community/food-secure-communities/index.html>

<sup>41</sup> 500g of venison mince was priced at \$12 in Countdown supermarket on 20 June 2022.

<sup>42</sup> <https://www.un.org/en/sustainable-development-goals>

A more passive and enduring funding source would be to set up a system where shoppers can 'round up' their purchase at the retailer's checkout to donate to a meat recovery project fund. An example of a round up system is Trade Me supporting "Save the Kiwi." Given that meat recovery projects benefit both the environment and the community, the businesses that may be interested in participating may be broader than hunting and outdoor equipment retailers.

## **4.2 Operational**

### **4.2.1 National Programme**

The organisation of meat recovery for charity projects to date has been relatively ad hoc and championed by local volunteers. If multiple projects are to occur in future, a national programme dedicated to organising the projects could result in organisational and operational efficiencies. The national programme could:

- Identify locations and coordinate projects.
- Form partnerships with businesses and landowners for access and to obtain Poison Use Statements.
- Undertake marketing and seek sponsorship and funding.
- Explore options for additional certified meat inspectors at strategically placed drop off points to enable commercial pathways and increase hunter effort and supply.

### **4.2.2 Private Land and Access**

Often access to PCL across private land, or to hunt on private land, is difficult to obtain for individual hunters who are unknown to the landowner. Also, as the PCL fringe country is within 2km of private land these areas are often not hunted by WARO operators because of the difficulties of obtaining Poison Use Declarations.

Given the social benefit of meat recovery for charity projects, landowners may be more willing to provide access. If so, a not-for-profit programme with paid or recreational ground hunters, or WARO operators could be established to remove carcasses for a meat recovery for charity project. The following would be required:

- 1 Landowner contacted and informed of the project. Asked if they would like to participate and can provide Poison Use Declarations to enable the commercial pathway.
- 1 Hunters visit the property and recover carcasses according to operational parameters agreed by the landowner.
- 2 Carcasses transported to a local processor.
- 3 Meat distributed to recipients.

### **4.2.3 Partnerships with Iwi**

Iwi may wish to partner in meat recovery initiatives or lead meat recovery projects on public conservation land and distribute the meat amongst whanau. Iwi as kaitiaki have a close association with the environment and its protection. Many iwi are also aiming to build their social resilience and want to enable whanau to feed whanau. Meat recovery projects may be a vehicle for some iwi to contribute towards their environmental and social goals. These projects could occur annually and

could provide a significant source of food to iwi. There may also be opportunities for employment of Māori or volunteer contributions in the end-to-end process.

This may also assist in satisfying important aspects of the partnership iwi, hapu and whānau have with the Department of Conservation and Game Animal Council to implement Te Ara ki Mua.

#### **4.2.4 Technology**

Utilising Thermally Assisted Aerial Control (TAAC) can significantly improve the efficiency of deer removal. Utilising this technology as part of a recovery operation may reduce overall costs of aerial recovery for charity projects due to a reduction in time searching for deer. However, the practicalities of recovering deer from within the bush needs to be confirmed. This technology may also be used effectively by ground hunters to locate animals, so may be of benefit for recreationally based meat recovery for charity but would first need to be permitted for use.

## 5 RECOMMENDATIONS FOR FURTHER WORK

Based on this report, there are four key recommendations for further work, as outlined:

- 1 Quantify and compare the administration and project management costs of applying different deer management approaches and identify potential innovations for cost reduction, e.g., develop standardised administration and project management processes for applying different deer management approaches.
- 2 Undertake a future funding options and innovations analysis for different deer management approaches, including government and non-government funding options.
- 3 Establish a decision-making framework for determining the most effective and efficient management approach to apply in different scenarios, e.g., that considers approach feasibility and potential costs, benefits and risks. This may include the following:
  - Map areas of conservation land where different approaches would be practically feasible for application, i.e., based on terrain, vegetative cover, accessibility, and species present.
  - Establish baseline data on deer herd abundance and demographics, and current harvest rates within mapped areas.
  - Undertake an analysis of the social benefits, costs, and risks of applying feasible deer management approaches within mapped areas.
  - Conduct a cost/benefit analysis of applying feasible management approaches, or combinations of approaches, within mapped areas.
- 4 Identify and remove or reduce limitations that result in deer management approaches being unfeasible, or enhance the effectiveness of feasible deer management approaches e.g.,
  - Poison declarations from landowners could be obtained by deer managers to enable WARO activities with 2km of property boundaries.
  - Clarify guidelines for recreationally donated meat, e.g., is professional culling with recovery for charity permissible, and explore ground-based commercial pathway meat recovery opportunities.
  - Establish national programmes for enhancing community-based deer management approaches, e.g., discretionary recreational hunting with and without meat recovery for charity.
  - Explore the potential of technology advancements for enhancing population management approaches, e.g., Thermal Animal Detection Systems.