

July 2025



Pest Mammal Survey

BULLER PLATEAUX PEST MONITORING

Prepared for Bathurst Resources Ltd



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Executive Summary

This report outlines the findings from two rounds of pest monitoring which were undertaken across the Denniston and Stockton Plateaux. The aim of these surveys was to determine the presence (or absence) of mammalian pests and to obtain a coarse indication of relative abundance. Species targeted in these surveys included rats, mice, possums, hedgehogs, feral cats, mustelids, and browsing pests (such as deer and rabbits).

Understanding the current densities of pests is important information when considering potential management approaches and how these can be optimised to achieve the highest level of biodiversity recovery.

Multiple forms of monitoring techniques were employed, including tracking tunnels (targeting rodents), chew cards (targeting rodents and possums) and motion-detecting trail cameras (for mustelids, feral cats and ungulate species). The first survey occurred in early December 2024, and the second survey three months later in March 2025.

Results of the surveys showed that key pest species present across both the Denniston and Stockton Plateaux included mice, rats, stoats and browsers such as deer and rabbits/hares. No possums, hedgehogs or feral cats were detected in these surveys.

Monitoring demonstrated that key pests were present at levels known to result in biodiversity declines and were in exceedance of pests targets which would assist in population recovery of native biodiversity. Pest mammals are therefore likely to be having a measurable impact on biodiversity values, particularly those species which are highly vulnerable to predation (including invertebrates, lizards, snails and Great Spotted Kiwi/Rorua).

In order for biodiversity recovery to occur on the Buller Plateaux, these pest species need to be heavily suppressed on an ongoing basis. Undertaking an intensive control regime targeting pests to low levels would be beneficial for many native species. Native fauna particularly vulnerable to species such as mice (which can be difficult to control on a landscape scale), would benefit substantially from pest elimination (even in localised areas).

1. Purpose of pest monitoring

The aim of this monitoring was to determine presence, absence, and obtain a coarse indication of relative abundance, of rats, mice, possums, mustelids, hedgehogs, cats, and ungulates across the Stockton and Denniston Plateaux. Understanding the current densities of pest species across these areas is important when considering proposed management approaches such as exclusion fencing or intensive control, as this data can:

- Determine whether the proposed pest management actions will have a positive benefit on biodiversity, and that the benefits of the proposed management approaches are additional to the current scenario;
- Customise any pest management actions to best control current pest species and their densities to achieve the optimal biodiversity outcomes quickly; and
- Allow comparison of ongoing pest animal monitoring once the project has commenced to a pre-control baseline, facilitating adaptive management to achieve the best biodiversity outcomes.

While it is possible that pest densities within the Buller Plateaux are lower than the surrounding forested habitats, it is also well recognised that key pest species use all habitat types across New Zealand. The presence of some pest species is particularly relevant, as they will have significant impacts on high value species at the site. For example, Great spotted kiwi/Rōroa are known to be declining nationally primarily due to stoat predation (McLennan et al. 1987; PCE 2009). Similarly, threatened snail and lizard species known to be present on the Buller Plateaux are particularly susceptible to mouse and rat predation.

This monitoring therefore aimed to collect the necessary data to analyse the existing pests present across the Buller Plateaux. This data can then be used to inform appropriate management actions and activities.

2. Background to pests on the Buller Plateaux

A review of pest management on the Buller Plateaux was undertaken by Parkes in 2020. This review provided information on key pest species present, whether current control operations were sufficient and the adequacy of monitoring data for observing trends. As summarised in the Parkes (2020) report, the only coordinated pest control conducted in the area has been the large-scale aerial baiting by OSPRI (previously TBFree NZ) in the forested areas.

These operations have occurred in 2005, 2009, 2015, 2020 and 2023. These aerial 1080 regimes have been designed to primarily target possums, but there is an expected associated reduction in rodents and stoats. As reported in Parkes (2020) report, the 2015 baiting reduced the population (on average) by only 69%, which is less than usual for aerial 1080 baiting. However, during the New Creek aerial predator control operation in 2023, 6 lines were monitored on the Denniston Pavement and 5 lines in the Denniston Forest, with all lines recording 0% for rats and mice post 1080. This would imply that pests are being at least temporarily suppressed during the irregular aerial operations.

However, the Parkes (2020) report highlights some important conclusions, namely:

"The distribution of mammals is highly patchy resulting in large variances between the monitoring transects and difficulty in inferring outcomes of events (masting or baiting) on changes in animal density indices"

"The current monitoring of possums, rodents and stoats has no consequences for control responses under the current programme, since the aerial baiting appears to be at a set frequency of about five years and not related to, for example, mast events."

"Given the observed indices of rats and stoats and extrapolating from other places, the control conducted may have had little biodiversity benefit – other than from the likely impacts of possums".

Parkes (2020) concludes that pest control and monitoring could be better refined and adapted for future planning. Parkes also recommends increasing the frequency and intensity of control at sites of particular value within the Buller Plateaux, with improved and focussed monitoring of pests and biodiversity.

3. Methodology

An assessment of current pest animal densities was conducted using a combination of methods including tracking tunnels, chew cards and lured camera traps deployed across both the Denniston and Stockton Plateaux (see Fig. 4 for approximate monitoring line locations).

Two monitors were conducted three months apart, one in December 2024 and one in March 2025. Undertaking two monitors three months apart enabled a comparison of potential seasonal changes from early summer through to autumn.

It should be noted that both chew cards and tracking tunnels only provide a relative index of population abundance, not a measure of the actual pest abundance. However, these techniques are still useful to determining the presence of pest species in an area and their approximate densities. The use of camera traps for pest monitoring is still a relatively new methodology but provides the advantage of increased detection probability (i.e. a higher chance that pests present in the landscape will actually be detected), versus chew cards and tracking tunnels.

Camera traps are widely regarded as one of the most effective tools for detecting medium- to large-bodied mammalian predators in New Zealand, including mustelids, feral cats, and ungulates. These species typically occur at low densities, are highly mobile, and are often trap-shy or nocturnal, making traditional detection methods such as tracking tunnels or chew cards less reliable for consistent detection (Glen et al., 2013; Gillies & Williams, 2013). Camera traps provide continuous, non-invasive monitoring, generate verifiable photographic evidence, and have high detection probabilities for mustelids and cats when deployed systematically along movement corridors or baited stations (O'Donnell et al., 2017).

3.1 Chew cards

Ten lines of chew cards (pre-filled with herbal peanut lure from Connovation Ltd, [REDACTED]) were placed on the Denniston and Stockton Plateaux ([REDACTED]). Each line comprised 10 chew cards spaced at 20 m intervals along a 200 m line. Cards were labelled in permanent marker with the location, line number, card number, date of deployment and date of retrieval, and were nailed to tree trunks 30 cm above the ground. After being deployed for seven nights, cards

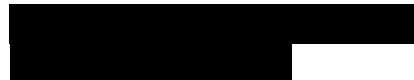


were collected and analysed for bite marks of the target pests. Chew card methods and analysis were as per standard best-practice methods (National Pest Control Agencies, 2020). A range of habitat types was targeted for placement, including areas of mānuka scrub, rocky outcrops, sandstone pavement, tall mānuka with Southern rātā and mountain beech.

3.2 Tracking tunnels

Five lines of tracking tunnels were deployed across the Denniston Plateau and five across the Stockton [REDACTED]. Each line consisted of 10 tunnels spaced 50 m apart. After acclimatisation, tracking cards were placed in the tunnels for a single night (baited with peanut butter) and then cards were collected the following day for analysis. Empty tunnels were left in place between the monitoring periods to keep pests acclimatised to their presence.

All tracking tunnel monitoring procedures occurred as per the standardised tracking tunnel protocols (Gillies & Williams, 2013).

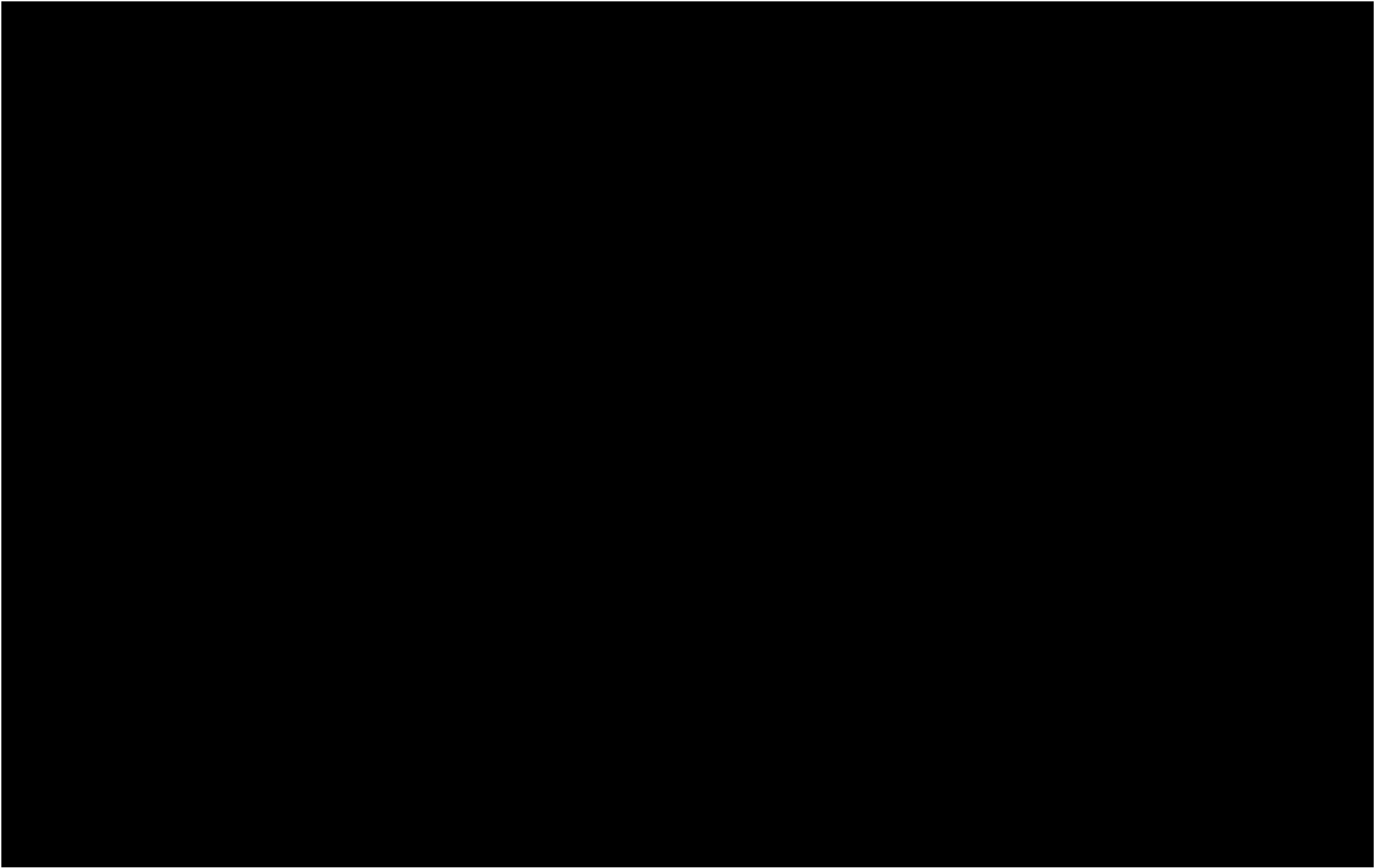


3.3 Trail Cameras

Camera trap monitoring methods followed the latest version of DOC's interim camera trapping protocol (Gillies, 2023). Cameras (Browning Dark Ops Dual Lens models) were set out for 21-nights and programmed to take a three-photo 'burst' every time the camera was triggered, with a 5-minute forced delay between triggers. Upon collection, photos were individually viewed, and any presence of a target animal recorded.

Six lines of camera traps were deployed across the Denniston and Stockton Plateau ([REDACTED]). Each line consisted of 4 cameras at 200 metre spacings, with a trail camera mounted on either vegetation or a post focused on the lure area ([REDACTED]). In the first monitor, cameras were lured with meat baits only (as per the DOC protocol). However, in this monitoring round weka consumed the meat baits within 24 – 48 hours of deployment at almost all stations. To help address this issue a non-edible scented lure (POAUKU lure blocks) were also used in the second monitor ([REDACTED]).





[Redacted text]

4. Results

4.1 Chew cards

Chew cards showed rats and mice were present across both the Denniston and Stockton Plateau (Tables 1 and 2). Results of the first summer chew card monitor showed mice were present on every line excluding one, with one line on the Denniston recording 60% chew card index (CCI). Rat distribution was variable, although they were still recorded on 50% of the lines (with two lines recording 60% CCI). The average CCI during the first survey was 29% for mice and 21% for rats.

In the second monitor, the average CCI for mice increased to 40%, while the rats decreased to 12%. One line returned a 90% CCI for mice, suggesting a very high local population. While the rat interactions with chew cards reduced, the high numbers of rats recorded on trail cameras in the second monitor (see Section 3.3.3), suggests this was unlikely to be due to a population reduction of rats and more likely due to seasonal changes in food preferences impacting interactions with chew cards.

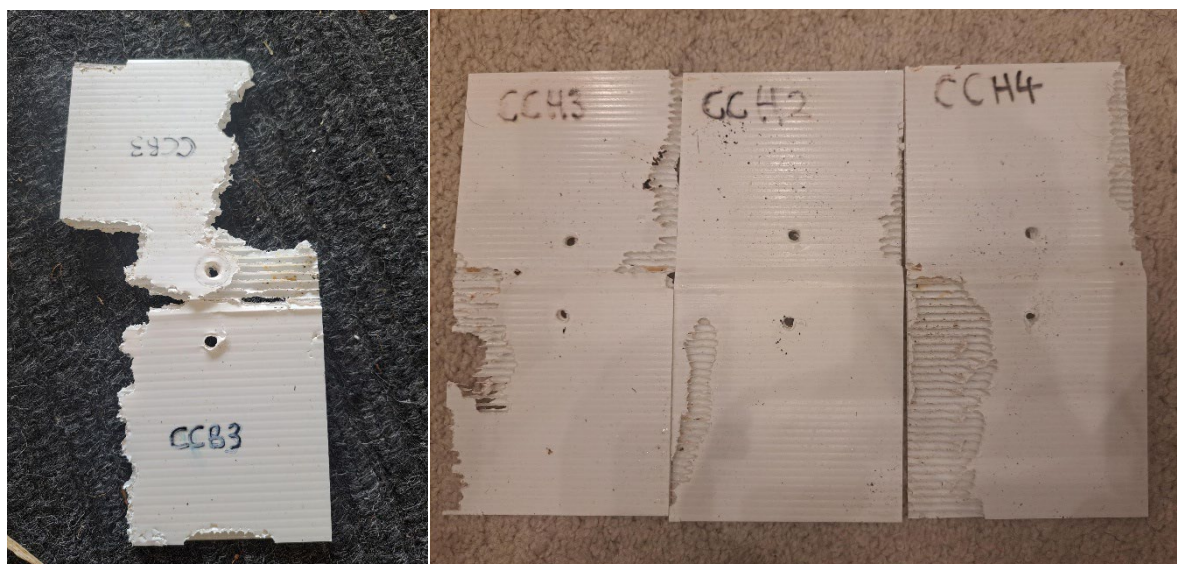
While chew cards are not a recommended method for stoat detection, one line recorded stoat bite marks in the first monitor. No possums were detected on chew cards in either the first or second monitor.



Line no.	Mouse	Rat	Possum	stoat
█	10	0	0	0
█	50	40	0	0
█	40	0	0	0
█	50	60	0	10
█	10	0	0	0
█	0	0	0	0
█	30	60	0	0
█	30	40	0	0
█	10	0	0	0
█	60	10	0	0
Avg. % detections per line	29.0	21.0	0.0	1.0
Standard error	7.9	9.8	0.0	1.2

Table 2: Results of autumn chew card monitoring conducted over the Denniston and Stockton Plateaux.

Line no.	Mouse	Rat	Possum	stoat
0	0	0	0	0
10	10	10	0	0
30	30	0	0	0
60	60	20	0	0
40	40	0	0	0
10	10	0	0	0
60	60	50	0	0
90	90	40	0	0
50	50	0	0	0
50	50	0	0	0
Avg. % detections per line	40.0	12.0	0.0	0.0
Standard error	10.5	7.1	0.0	0.0



4.2 Tracking tunnels

Tracking tunnels generally return lower interaction rates than chew cards, which was evident in the data collected here. Chew cards generally have higher detection sensitivity than tracking tunnels, particularly at low pest densities, with comparative studies showing rodents detected at a greater proportion of stations using chew cards than tracking tunnels under similar conditions (Sweetapple & Nugent, 2011; Glen et al., 2013). DOC guidance also notes that tracking tunnels provide a coarse relative abundance index and

may fail to detect rodents or mustelids when present at low densities, supporting the use of chew cards where higher probability of detection is required (Gillies & Williams, 2013).

However, there were still strong similarities between the methods, with the first tracking tunnel monitor again recording mice on 90% of the lines (the same result as the chew cards), with an average tracking tunnel index (TTI) of 29%. Rats were only detected on three tracking tunnel lines, with an average TTI of 10%. It should be noted that while comparisons can be made between the chew card and tracking tunnel methods in terms of general findings, the lines for each monitoring method were in different locations so comparisons of results between labelled lines for the different methods in each monitor should not be made.

There was a slight decrease in both mice and rat TTI in the second monitor, although mice were still recorded on 50% of the lines and rats on 40%. The average TTI decreased to an average mouse tracking at 17% TTI, and rat tracking at 6%. Line 'J' tracked highly for mice in both monitors, with [REDACTED] consistently detecting rats.

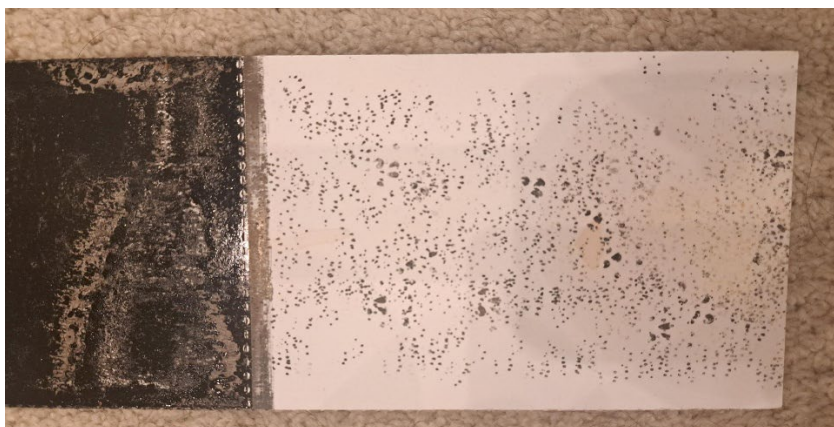


Line no.	Mouse	Rat	Possum	stoat
[REDACTED]	30	0	0	0
[REDACTED]	10	0	0	0
[REDACTED]	0	0	0	0
[REDACTED]	10	30	0	0
[REDACTED]	30	10	0	0
[REDACTED]	30	0	0	0
[REDACTED]	50	0	0	0
[REDACTED]	50	0	0	0
[REDACTED]	10	0	0	0
[REDACTED]	70	60	0	0
Avg. % detections per line	29.0	10.0	0.0	0.0
Standard error	8.4	7.6	0.0	0.0

Table 4: Results of tracking tunnel monitoring conducted on the Denniston and Stockton Plateaus during the second monitoring round (March 2025).

Line no.	Mouse	Rat	Possum	Stoat
[REDACTED]	0	0	0	0
[REDACTED]	0	0	0	0
[REDACTED]	0	0	0	0
[REDACTED]	10	30	0	0
[REDACTED]	0	10	0	0
[REDACTED]	30	0	0	0

Line no.	Mouse	Rat	Possum	Stoat
█	10	10	0	0
█	40	0	0	0
█	0	0	0	0
█	80	10	0	0
Avg. % detections per line	17.0	6.0	0.0	0.0
Standard error	9.9	3.7	0.0	0.0



[REDACTED]

4.3 Camera traps

4.3.1 Overview

The camera trap surveys detected a large number of pest species passes across both the Stockton and Denniston Plateaus, including key known predator species for high-value biodiversity such as mice, rats and stoats, as well as browsers including deer, rabbits and hare.

[REDACTED]

In many situations,

, leaving no pest

[REDACTED]

attractant for the remainder of the 21-day monitoring period. In the second survey, a non-edible, solid lure block was used to successfully circumvent this issue. The addition of this lure block in the second survey may be partly responsible for the considerable increase in pest detections on the cameras (from 380 pest images in the first survey to 937 in the second), although increases in rodent populations and peak stoat activity in summer may have also contributed.

In addition to the [REDACTED] during the first survey, six cameras also recorded Great spotted kiwi/Rōroa. However, the camera which had the highest number of kiwi images [REDACTED], also recorded the highest number of stoats ([REDACTED]). As seen in [REDACTED] one stoat was recorded on a camera shortly [REDACTED] had been at the same station. Kiwi detections dropped from [REDACTED] in the first survey to [REDACTED] in the second. Camera trap detection rates for kiwi are influenced by seasonal patterns in behaviour and activity, with monitoring aligned to breeding and peak foraging periods (commonly in spring and early summer) often producing higher detection rates (Tansell, 2022; Fan, 2023). Only one camera station [REDACTED] recorded kiwi in both surveys. However, in the second survey a juvenile kiwi was captured on one of the cameras [REDACTED] suggesting that kiwi are successfully breeding on the Plateau or the immediate surrounds. [REDACTED]

Overall counts from the camera monitor are provided in [REDACTED] and the following sections provide an overview of results on pest species of specific interest. A clear trend was a substantial increase in overall pest numbers at the Denniston Plateau during the second survey.

*Three cameras [REDACTED] recorded thousands of 'false-triggers' and had little useable data.

Ship Rat	Stoat	Deer	Mice	Hare/ rabbit	Weasel	Total pest detections
				9		9
	1			4		5
				6		6
	7	2		23		32
5		3				8
						0
						0
4			11			15
16						16
			21			21
						0
			2			2
8						8
56						56
34						34
						0
						0
						0
						0
3			27			30
			126			126
3						3
6			3			9
135	8	5	190	42	0	380

Table 6: Image data obtained from camera traps during the second of the pest surveys undertaken in early autumn. Camera traps were out for a 21-day period.

	Ship Rat	Stoat	Deer	Mice	Hare/ rabbit	Weasel	Total pest detections
	3						3
	13						13
	9	1					10
			2		1		3
							0
							0
	6		1	3			10
							0
	30						30
		1		18			19
	25	1		3			29
				3			3
	252						252
	45			3			48
	35	6					41
	3			68			71
	3			50			53
				68			68
				101			101
				31			31
				90			90
	3	6		27		2	38
				9			9
	3			12			15
	430	15	3	486	1	2	937

4.3.2 Stoats and weasels

Stoats were detected at both the Stockton and Denniston Plateaus (see Tables 5 and 6), with more detections in the second survey (likely due to survey timing coinciding with peak activity periods). There were eight images of stoats obtained in the first survey, and 15 in the second. On one line [REDACTED] on the Denniston Plateau, two different individual stoats could be distinguished in the pictures, and this line also had two images of a weasel. The Stockton 'A' line [REDACTED], detected stoats in both surveys, as well as [REDACTED] of kiwi on the same line.



4.3.3 Rodents (rats and mice)

Rats and mice were detected on cameras in both surveys, but with substantially more images collected in the second survey period. House mice increased from being detected on 25% of the cameras in the first survey to 58% in the second, and rats from 37.6% to 54%. The number of images of these species collected during the monitor also increased noticeably, from 135 rat images collected in the first monitor, to 430 images in the second monitor three months later. Similarly, mice detections on cameras increased from 190 to 486 over the same period. During the second monitor, there was only three camera stations which did not detect rats or mice, suggesting a widespread distribution of rodents. The Denniston Plateau in particular had a substantial increase in mice between the two seasons (Tables 5 and 6). One station [REDACTED] had multiple rats present with images frequently captured more than one individual ([REDACTED]).



4.3.4 Browsing pests

While baited and set to look for smaller mammals, trail cameras can also be useful for determining the present of larger browsing pest species. Deer were detected on the Stockton Plateau on the cameras in both surveys, as were rabbits/hare. There were no detections of any ungulates or rabbits on the Denniston Plateau.



4.3.5 Other species

While trail cameras are not a standard tool for monitoring native species such as birds, they can still be a useful indicator of presence and absence. In addition to the weka and kiwi detected and discussed in Section 3.3.1, the following species were also detected on the cameras:

- Robin ([REDACTED])
- Rifleman ([REDACTED])
- Tomtit
- Fernbird
- Redpoll
- Blackbirds
- Thrush
- Wasps





5. Discussion and Conclusions

Pest monitoring demonstrated that rodents were present (and reasonably abundant), across the majority of both the Denniston and Stockton Plateaus, with numbers increasing between the two monitoring periods for both chew cards and camera traps. It is important to note that the 2024/2025 spring and summer season (when this monitoring occurred), was not a mast event (although it was a dry/hot summer). During mast events beech forests produce large numbers of seeds which enables rapid rodent population growth, and consequently an explosion of stoat numbers. On the West Coast, DOC generally focuses aerial 1080 control operations when mast events are predicted to occur (as outlined in Section 2). However, this monitoring provides evidence that rodent and stoat numbers are remaining at densities likely to have an impact on native fauna regardless of recent 1080 operations and despite this season not being a mast event. Pest impacts on biodiversity across the Buller Plateaux are likely continuous and ongoing, and they are likely to be even further amplified in mast seasons.

Given the results of the New Creek aerial predator control operation in 2023 recorded 0% for rats and mice post 1080, it is likely that a) these pest suppressions are very temporary and rodents (and stoats) are quickly returning to pre-control levels, and b) the pest monitoring tools used are likely inadequate. There is no evidence that the irregular 1080 operations are leading to widespread control of mice, rats or stoats. This report is therefore in general agreement with many of Parkes (2020) findings about the inadequacy of control and monitoring operations. However, possum populations appear to be well suppressed, as they were not detected in either survey.

For predation sensitive species (including snails, lizards and kiwi species known to be present), key predators must be *continually* sustained at very low levels in order for biodiversity recovery to occur. Evidence of the impacts of mice on lizards and invertebrates for example, is becoming well established. Norbury *et al.* (2023) found strong evidence that geckos, skinks and wētā are all strongly impacted when mouse abundance exceeds 5% tracking. Monks *et al.* (2024), further confirmed this via a long-term study which found that skink abundance declined over time and was negatively correlated with mouse abundance. Furthermore, the Monk *et al.* (2024) paper also concluded that current predator control in place to protect vulnerable forest birds and bats (including the aerial 1080 regimes currently undertaken here), is insufficient to protect ground-dwelling lizards, and may in fact result in even higher predation events as mouse numbers increase following widespread rat suppression.

It is likely that on the mainland of New Zealand, lizards will only benefit from very intensive control regimes which suppress mice to low levels (Reardon *et al.* 2012, Norbury *et al.* 2014). Alternatively, evidence from offshore islands suggests elimination of rodents leads to optimal population gains (Newman 1994). Rodents can also have a key role in reducing food availability for other species such as Great spotted Kiwi through their consumption of invertebrates (competing with juvenile kiwi for food sources, Roroa Practitioner Group 2021).

Stoats are known to be a key agent of decline for Great Spotted Kiwi (Roroa Practitioner Group, 2021), as well as many other native species including birds and lizards. Stoats were detected on both plateaus and their numbers suggest a fairly uncontrolled population that will almost certainly be having impact. Stoats are prolific and very successful hunters, which means that their potential impacts far outweigh their numbers in an area. Stoats prey on adult and young birds and raid nests for eggs, they are known to directly predate juvenile kiwi. Kiwi chicks are vulnerable to stoats (and potentially weasels), until they reach a safe weight of 1000 g, which can be achieved as early as 6 months of age but may take over 1 year (Roroa Practitioner Group, 2021).

Another key native species present across the Buller Plateaux, is *Powelliphanta*—a genus of threatened large land snails. A key agent of decline for *Powelliphanta* is ongoing predation including from ship rats, possums and pigs (Walker 2003). The role of weka in ongoing predation is also becoming better understood (and is clearly evidenced on the plateaux, see Lloyd 2024). It is also likely that mice have a key predation role, potentially preying directly on smaller thin shelled *Powelliphanta* (Walker 2003 and Bennet *et al.* 2002). While not well researched in New Zealand, Rosin *et al.* (2011), documented high incidences of snail predation by mice on several snail species in Europe. Given *Powelliphanta* susceptibility to predation and the 'Threatened – Nationally Critical' status of *P. augusta* and *P. patrickensis*, optimal biodiversity recovery regimes for snails are likely to be predator exclusion (potentially including weka).

For general forest bird recovery, a recommended target for rodents would usually be to suppress them under 5% tracking (Innes *et al.* 1999). For lizard recovery this target should be closer to 1%, with optimal population growth likely to occur in the absence of predators (Newman 1994, Reardon *et al.* 2012, Norbury *et al.* 2014). For *Powelliphanta*, it is likely that this target would need to be closer to 0% (Lloyd 2024). Monitoring results for both chew cards and tracking tunnels undertaken in this survey returned average tracking well in exceedance of 5%, with average TTI's between 6 – 28% and CCI's between 14 – 40%. It can therefore be concluded that rodents will be having an impact on key biodiversity values across the Buller Plateaux.

Great Spotted Kiwi are estimated to be declining at a rate of 1.6% per year. In order to increase numbers current modelling predicts that sustained, effective predator management will be required (Roroa Practitioner Group 2021). This will include the effective and widespread management of stoats. Evidence from these surveys suggests that stoats are not being effectively managed, and that they are present in known kiwi ranges.

In conclusion, the pest monitoring across the Buller Plateaux demonstrated that rodent and stoat densities are well in excess of recommended targets for biodiversity gain, and resultingly many native species will be in continued decline. The existing, irregular control work occurring across the Buller Plateaux and surrounds appears to be ineffective at suppressing any pest species (with the exception of possums). A revised approach to provide ongoing pest suppression is required, as intensive, long-term control or elimination of key pests species is critical to assist in population recovery.

6. Applicability

This report has been prepared for the exclusive use of our client Bathurst Resources Ltd with respect to the particular 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 our client, without our prior written agreement.

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