Final report

PDS Best Practice Predator Management at Lambing

Project code:	L.PDS.2005
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Abstract

The Goulburn Murray BestWool / BestLamb Group explored if best practice predator control can improve lamb survival in the north east of Victoria. Six core producers and four observer participants installed Canid Pest Ejectors (CPEs) for additional fox control for one to three lambing seasons. Over the life of the demo, 27 CPEs were triggered 72 times indicating a lethal dose of 1080 was delivered to a fox. There has been mixed success in the CPEs use due to crows and other creatures eating the lure heads or mechanisms failing to fire (as observed from camera footage). Paddock observations of dead lambs has found that four core participants had between 0-5% of dead lambs showed signs of predation with one producer observing 20% lamb losses were due to predation. In general survival rates in lambing mobs have been between 76% to 92%. Overall results show that CPEs may have led to a 2% increase in lamb survival resulting in a $0.28/ewe net benefit and the break even benefit was received if lamb survival rates could be increased by 1.5%. Most (67%) of the core participants and 38% of all observers surveyed will continue to use CPEs as well as other forms of predator management and all participants surveyed reported they had improved their confidence and skills in managing predators at lambing.

Executive summary

Background

Improving lamb survival has been a key focus for the Goulburn Murray BestWool/BestLamb group for the last eight years. While many gains have been made due to improved ewe management, nutrition and the use of pregnancy scanning for multiples, predation of newborn lambs is still considered a cause of significant losses each year.

The main predators responsible for losses are foxes, with crows and eagles often observed as well. Many group members bait using fox-off or have baited in the past and some also use shooters during lambing. There are, however, risks using fox-off baits when close to town or if neighbours have roaming dogs. There is also uncertainty around what is actually taking the fox-off baits and if they are being stockpiled. There are also risks using shooters as foxes become wary of spotlights or are simply not present when shooters are.

Canid Pest Ejectors (CPEs) are a device that allows for more targeted application of lethal doses of 1080 bait to the target species (foxes) with the added benefit of being easily 'disarmed' when working dogs are present in the paddock. They can be left armed permanently or disarmed seasonally providing round the clock fox control.

Objectives

The 'Best practice predator control at lambing' demonstration was set up to provide the members of the Goulburn Murray BestWool/BestLamb group and other local producers the opportunity to:

1. Share the latest information about predator behaviour, how it impacts on lamb survival and what works/doesn't work when planning to manage predators
2. Show how CPE's and other baits can be used in the field including field placement, monitoring etc.
3. Demonstrate the results from using improved predator management techniques over a number of seasons (3 years).

The specific objectives were by December 2022 to:

1. Conduct one Best Practice Predator Control field day with assistance from the Centre for Invasive Species Solutions, Agriculture Victoria (AV) and Dept of Environment, Water and Planning (DELWP) to increase producer's knowledge and skills in this area (target is all group members plus 10-15 additional producers).
2. Demonstrate the use of Best Practice Predator Control on 5-7 properties over 3 lambing seasons (2020-2022) to see if it increases number of lambs marked.
3. Conduct a cost:benefit analysis of using Best Practice Predator Control (ie costs = preg scanning for multiples if not already undertaken, baits/other control techniques costs, time for implementing control, benefits = more live lambs valued at market rates).
4. Share results via BWBL group meetings (discuss at 3 per year and circulate results to group members)
5. Conduct 3 open invitation field day at the completion of the project to share results and recommendations
6. At least 50% of GM BWBL group members and 25% of observers will have trialled improved predator control on their properties.

Methodology

Six core participants trialled the use of CPEs at least once over the three years of the demo during lambing to see if they could reduce predation. Another four observer participants also used CPEs at least once during the demo.

To test the effectiveness of the CPEs, participants monitored bait take and kept records of pregnancy scanning results, marking figures and causes of death in lambs. Motion detecting cameras were set up at some sites to monitor bait take and other non-target species interactions with CPEs and some sites elected to map CPE locations to foxscan. Lamb survival figures were compared pre and post demo to estimate benefits in number of additional live lambs at marking taking into account a factor for seasonal impacts.

Scenarios were generated estimating the benefits to participants of the use of improved predator management compared to costs. A break even improvement in lamb survival was estimated to cover the purchase and on-going costs of CPEs including labour.

Results/key findings

Thirty-three producers representing 28 businesses and 11 service providers were involved in the demo improving their knowledge, confidence and skills in the management of predators at lambing.

Six core producers and four observer participants installed Canid Pest Ejectors (CPEs) for additional fox control for at least one lambing season. Over the life of the demo, 27 CPEs were triggered 72 times over the 3 years of the demo indicating a lethal dose of 1080 was delivered to a fox.

There has been mixed success in the CPEs use due to crows and other creatures eating the lure heads or mechanisms failing to fire (as observed from camera footage). Modifications were made to the way CPEs were managed and different lureheads were tried to improve their effectiveness.

Paddock observations of dead lambs has found that four core participants had between 0-5% of dead lambs showed signs of predation with one producer observing 20% lamb losses were due to predation. In general survival rates in lambing mobs have been between 76% to 92%.

Overall results show that CPEs may have led to a 2% increase in lamb survival resulting in a $0.28/ewe net benefit and the break even benefit was received if lamb survival rates could be increased by 1.5%.

Most (67%) of the core participants and 38% of all observers surveyed will continue to use CPEs as well as other forms of predator management and all 14 participants surveyed reported they had improved their confidence and skills in managing predators at lambing.

Benefits to industry

The benefits to industry from the 'Best Practice Predator Control at Lambing' PDS are:
- A greater understanding of predator behaviour and effective methods of predator control
- More producers confident in using current best practice methods of predator control (improvement in confidence of 22 %)
- A greater understanding of the causes of mortality in lambs and how lamb survival can be improved.
- Improved lamb survival over time as the density of predators is reduced

Future research and recommendations

While the CPEs were shown to be another valuable tool in the arsenal of producers to manage predation, obtaining additional CPEs and supplies post demo has proved problematic for on-going use as there is only one known retailer in the region. This retailer is a long way (>100 km) from at least half of the participants which may prove a barrier to on-going use of the CPEs. The coordinator is currently in discussions with the wholesaler to come up with direct purchase arrangements to ensure the on-going use of CPEs.

PDS key data summary table

Project Aim: *To test whether improved predator control improves lamb survival*			
	Comments		**Unit**
Production efficiency benefit (impact) Reproductive efficiency – lamb survival %	*Core producers using CPEs % improvement in lamb survival*	2%	
Increase in income	For core producers	$2.30	/ewe
Additional costs (to achieve benefits)	Fore core producers	$2.02	/ewe
Net $ benefit (impact)		**$0.28**	**/ewe**
Number of core participants engaged in project		6	
Number of observer participants engaged in project		34	
Core group no. ha		2,894	ha
Observer group no. ha		22,293	ha
Core group no. sheep		6,100	hd ewes
Observer group no. sheep		20,240	hd ewes
% change in confidence – core	*Predator management and impacts of predators*	22%	
% change in confidence – observer **(from 8 post-demo surveys)**	*Predator management and impacts of predators*	24%	
% practice change adoption – core	*Using CPEs for improved predator management*	67%	
% practice change adoption – observers **(from 8 post-demo surveys)**	*Using CPEs for improved predator management*	38%	
% of total ha managed that the benefit applies to for core producers	*% of total ha grazed by sheep*	100%	
Key impact data (core producers)			
Net $ benefit /ha (total ha managed)	$0.38/ha		
Net $ benefit/ewe	$0.28/ewe		

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1. Background

1.1   The Goulburn Murray BESTWOOL/BESTLAMB Group

The Goulburn Murray BESTWOOL/BESTLAMB (BWBL) group was formed from the members of the previous Goulburn Murray Lamb Marksman group in 2012 to provide sheep producers in the area a forum to discuss ways of improving the management of their sheep enterprises. Current membership in 2022 is 20 businesses and over 25 participants managing 30,000 sheep over 10,000 ha.

The group is located north of Shepparton around Nathalia in Northern Victoria and includes members from around Barmah, Nathalia, Picola, Kaarimba, Katunga, Strathmerton, Tallygaroopna, Tatura, Taminick and Yalca. Group meetings have covered a range of topics including lamb survival, pasture and soil management, wool marketing, animal health, managing irrigation. Twelve members of the group have also completed Lifetime Ewe Management.

1.2   Predation as a significant cause of lamb losses

The members of the Goulburn Murray BWBL group have been monitoring lamb survival rates since 2015 after some of the members completed Lifetime Ewe Management. Since then, the group members have been constantly looking for changes that will give small improvements in survival rates. The changes group members have made show that of the producers that benchmark reproduction, many are consistently getting 80-90% survival rates across entire flocks.

One improvement openly discussed as a group was better predator control using the guidelines from the Centre for Invasive Species Solutions[*]. Predator control before and during lambing was a mixture of baiting, shooting and scare (fox lights) and was not always done in a coordinated or planned manner. It was speculated that movements of predators through flocks may be inadvertently causing mismothering even if the animals are not being attacked and that the range of new devices on the market (Canid Pest Ejectors - CPEs) offered another form of control that could be trialled.

As a group, it was agreed to see if changing predator management practices could impact on lamb survival. As a group already achieving high lamb survival rates and having records across seasons and years, the group thought they could explore this issue without other factors (ewe condition, feed on offer and management) confounding the results.

1.2.1   Impact on producers and the industry

It is estimated that 4 foxes exist per km^2 with as many as 1256 within 10 km radius of properties[†]. With this level of fox density, it hypothesized that foxes and other predators (pigs, wild dogs, birds of prey) are impacting on all sheep producers in Australia to some extent. Previous lamb mortality studies have estimated that primary predation accounts for 5-7% of lamb deaths at or just after birth[‡]. However, it is not known if the producers who took part in these studies were already undertaking best practice predator control or changed their predator management during the study when early results were observed indicating higher losses. It is also not known if the predators were contributing to other losses i.e. mismothering/starvation as a result of their movements through lambing flocks. For producers who are not using adequate predator control, the losses could be much higher, and many anecdotal stories are told of foxes and pigs taking lambs. However, there is

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[*] Mifsud, G (2018) A field guide to poison baiting: wild dogs and foxes. Centre for Invasive Species Solutions.
[†] Data from Greg Mifsud, National Wild Dog Management Coordinator, Centre for Invasive Species Solutions
[‡] Data from Agriculture Victoria's Sentinel Flock project and the Sheep CRC information nucleus *flock pers comm.*

no real evidence of the losses occurring from primary predation or secondary effects on ewe behaviour due to the presence of predators. The GM BWBL group wanted to look more closely at whether predators are really impacting on lamb survival or whether they just think they are.

1.2.2 Number of producers impacted

ABS figures for 2017-18 estimate there are 1025 sheep properties in the Goulburn Broken Catchment and that the region produces 750,000 lambs annually. A 1% improvement in survival achieved with better predator management has the potential to increase the number of lambs weaned by 7,500 lambs across the region at an estimated value of $185 each = $1.3 million. Within the GM BWBL group, a 1% improvement in survival could deliver at least 200-400 extra lambs annually to group members at similar value = $37,000 - $72,000 extra lamb income/year.

1.2.3 How it is being addressed

Prior to the start of this project, no group member was thought to be using current best practice predator control. This project was designed to help members learn and adopt these practices to see if it has an impact on overall lamb survival rates. It is currently unknown how many producers are using best practice predator control methods in the region as there are no published estimates, but it is surmised that very few are managing predators in an organised or coordinated way. This demonstration aims to apply proven techniques in a coordinated way to ensure that participants are applying techniques as close to guidelines as practical and to collect and manage data to demonstrate what impact these activities have had on lamb survival rates.

2. Objectives

Overall Aim : To test if using best practice predator control improves lamb survival at birth

This aim has three parts:

1. Promote the GM BWBL group PDS 'Best Practice Control at Lambing
2. Share the latest information about predator behaviour, how it impacts on lamb survival and what works/doesn't work when planning to manage predators
3. Show how CPEs and other forms of baiting/fox control can be used in the field, field placement, monitoring etc.

2.1 Specific Objectives

By December 2022:

1. Conduct one Best Practice Predator Control field day with assistance from the Centre for Invasive Species Solutions, Agriculture Victoria (AV) and Dept of Environment, Water and Planning (DELWP) to increase producer's knowledge and skills in this area (target is all group members plus 10-15 additional producers).
2. Demonstrate the use of Best Practice Predator Control on 5-7 properties over 3 lambing seasons (2020-2022) to see if it increases number of lambs marked.
3. Conduct a cost:benefit analysis of using Best Practice Predator Control (ie costs = preg scanning for multiples if not already undertaken, baits/other control techniques costs, time for implementing control, benefits = more live lambs valued at market rates).
4. Share results via BWBL group meetings (discuss at 3 per year and circulate results to group members)
5. Conduct 3 open invitation field day at the completion of the project to share results and recommendations

6. At least 50% of GM BWBL group members and 25% of observers will have trailed improved predator control on their properties.

3. Methodology

3.1 Demonstration Site Design

3.1.1 Field day and site selection

The project commenced with a Best Practice Predator Control Field Day, utilising services from Centre for Invasive Species Solutions and Victoria's Department of Environment, Land, Water and Planning (DELWP) wild dog controllers and Agriculture Victoria's (AV) Established Invasive Pests group to group members and others (18 Feb 2020) (see Appendices 9.1.1 for flyer).

Following the field day, 7 participants were identified that had good lamb survival figures and adequate records to trial improved predator control at lambing (March 2020). Each site needed to provide at least two seasons of lambing data for baseline comparison (pregnancy scanning for multiples, lamb marking, lamb survival and ewe survival figures), Agricultural Chemical Users Permit (ACUP) with 1080 endorsement and be prepared to engage neighbours in predator control program. Predator control was designed for each site including monitoring protocols. Of the initial 7 properties identified as participants, one withdrew (Fig. 1 – 'G') and two others participated intermittently with baiting activities.

In addition, 4 other participants self-nominated to trial the use of CPEs but as they either did not pregnancy scan and/or were unable to provide adequate records of lamb survival, they were not included as 'core' participants but as 'observer' participants. These participants provided data to the trial and contributed to the discussion of relative merit of the control measures being trialled.

The locations of the 'core' and 'observer' participants are shown in Fig. 1.

Figure 1: Locations of core participants (red A-G) and observers (blue H-K).
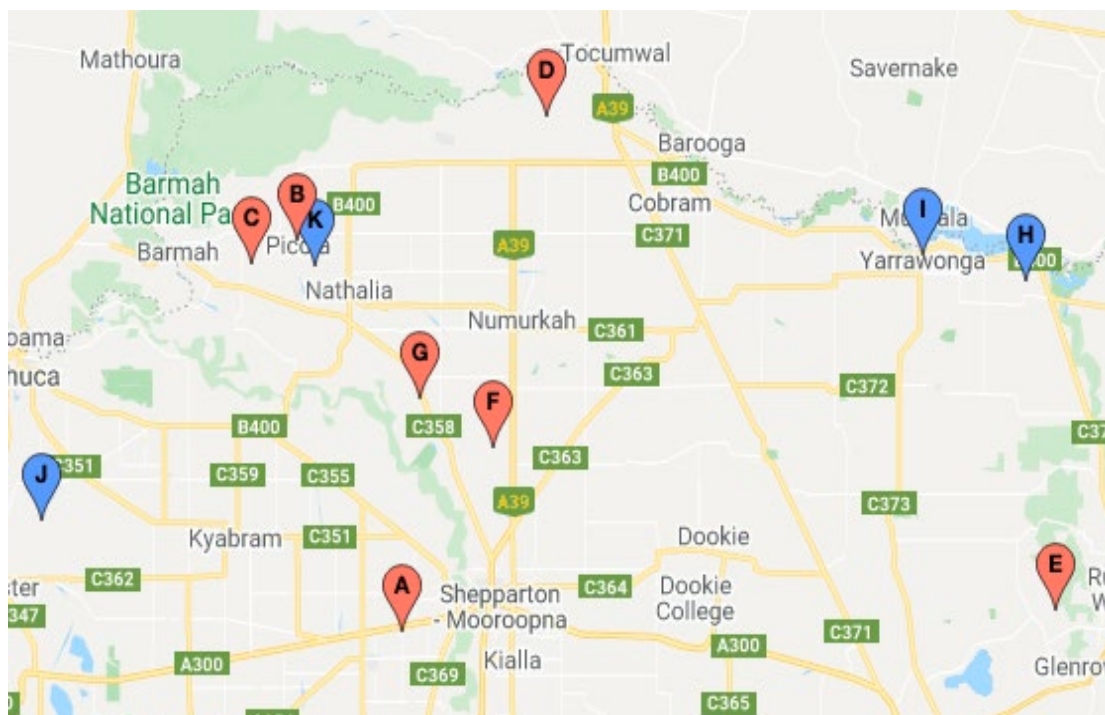
3.1.2   Monitoring methodology

The following activities were undertaken by core producers:

1. Collection and collation of past seasons lamb survival figures to set baseline for comparison on each site

2. Pregnancy scanning for singles and twins to determine conception rates (starting number of lambs for measuring survival rates)

3. Differential management of twins and singles mobs using LTEM guidelines to ensure ewe condition and nutrition were not factors impacting on survival.

4. Monitoring at lambing of lambs and ewes found dead for visual signs of primary and secondary predation. Tallying and recording of cause of death if known.

5. Marking of lambs in lambing mobs to calculate survival rates for each mob. Reconciliation of # dead lambs, live lambs and pregnancy scanning rates if possible.

6. Recording of predator management activities ie baits laid, shooting, dead predators noted etc.[§] using FoxScan.

7. Use of cameras on a selection of bait sites to monitor bait take

8. Recording of time for predator control activities and costs to allow benefit:cost to be calculated

At the end of each season data was collated and analysed for feedback to the group at their regular GM BWBL group meetings. At the start of each season, protocols were modified and adjusted based on the results from the previous season.

3.2   Economic analysis

Economic analysis was conducted using a benefit:cost approach. The costs were:

*   Initial outlay on purchase of CPEs, lure heads and 1080 capsules
*   Time spent setting, checking, resetting and removing CPEs
*   Raising additional lambs.

The benefits were considered to be the income from selling additional lambs.

For the purposes of this analysis, the cost of raising additional lambs and the benefit (income) from selling additional lambs was modelled by Lee Beattie using the methodology used for estimating benefits for other MLA extension projects. The parameters used to model this were extra lambs produced by 60 kg autumn lambing cross bred ewes having twins. Each additional lamb was considered to be a twin for this analysis as lambs lost are more likely to be twins. The figure used was $115 for each additional lamb raised.

As it is impractical to run a control with this demo, the improvement in lamb survival was compared to previously recorded lamb survival rates of core participants to see if there was an improvement during the demo. If there was, half of this improvement was considered to be seasonal/management and other half from improvements in predator management.

[§] Techniques used for monitoring fox abundance will be taken from 'Monitoring techniques for vertebrate pests – Foxes' (Mitchell and Balogh, 2007) NSW DPI and were designed in consultations with experts from CRC for Invasive Species Solutions, AV and DELWP to be practical and able to be conducted by the participants to manage foxes during lambing.

3.3   Extension activities

3.3.1   Field days

Originally four field days were planned for this PDS, an opening field day and three annual field days in October to show case each year's results. Due to COVID and flooding, the field days held were:

- Opening Field Day – 18 Feb 2020 to introduce the demo and provide information on the different management and control techniques available. Expressions of interest for participation were called for from the participants attending.
- End of Year 1 zoom feedback session to replace the end of Year 1 field day 12 Nov 2020 to share the results from the first year.
- Start of Year 2 Field day– 10 Feb 2021 to make plans and modifications to the protocol for year 2.
- Bus Trip to Mansfield – 3 Aug 2022 to visit the members of the PDS project 'Less Predators, More Lambs' to share learnings and results between the two groups.
- End of PDS field day – POSTPONED to 2023 due to floods. Held on Wednesday 1st February to share the results of the demo.

3.3.2   GM BWBL group meetings

In addition to field days, the group discussed results at their regular GM BWBL meetings. Due to COVID, some of this occurred via zoom when lockdowns prevented the group from meeting face to face. Results from the demo were discussed at meetings held on 9 September 2020, 19 May 2021, 23 February 2022, 6 April 2022 and 8 June 2022. At each meeting the group was presented with a summary of pregnancy scanning and lambing results, predator control methods and results and any other seasonal issues that were impacting on sheep reproduction.

3.3.3   Bus trip to Mansfield group

The cancelling of the year 2 October field day due to COVID lead to the group deciding to visit the members of the Mansfield 'Less Predators, More Lambs' PDS to compare results and experiences. This occurred as noted above on 3 August 2022. The members of the GM BWBL group travelled to Mansfield on a bus to meet with three members of the Mansfield group, their coordinator, the local vet and representatives from DELWP's wild dog program. Due to the weather, the group could not visit any properties but instead spent the day sharing each demos results and comparing experiences. The program for the day can be found in the appendices.

3.4 Monitoring and evaluation

3.4.1   KASA change

Pre and post questionnaires were drafted for use but due to the COVID lockdown, the pre questionnaires were unable to be completed as events were cancelled. An attempt was made to have members complete these online but only two participants did so.

It was agreed with MLA input, to capture this data as post questionnaires which due to the floods were conducted over the phone or as online surveys with the core and some key observer participants.

3.4.2   Practice change

All users of the CPEs were asked if they would continue to use them post demo as part of the post demo questionnaire.

3.5 COVID and other impacts

The impact of COVID on this PDS was significant. In 2020 and 2021, the coordinator was unable visit farms due to repeated lockdowns to assist with data collection and could only assist via the phone. Group meetings were conducted via zoom where possible and end of season field days were postponed, held on zoom or conducted as closed events.

In addition, the coordinator took bereavement leave in 2020 and 2022 which impacted on her ability to coordinate activities.

Finally, the flood event in Oct 2022 caused the postponement of the final field day as many group members were personally affected by flooding and road closures.

4. Results

4.1 Demonstration site results

4.1.1 Year 1 - 2020

The 'Best practice predator control for lambing' PDS has commenced with a 'Best practice predator control for lambing' field day held on Tuesday 18th February at Picola, Victoria. The field day was well attended by 26 local producers keen to hear from experts Greg Mifsud (Centre for Invasive Species Solutions) and Jason Wishart (Agriculture Victoria) on the latest predator control techniques.

Seven of the attendees were selected to be demo sites for the project, all obtaining CPEs to trial as part of their predator control program for 2020. Another four producers purchased CPEs for trial on their own properties but lacked the lambing records to participate as demonstration sites. Each participant received a number of CPEs to set up. Some elected to fox bait with fox-off baits as well as CPEs and some also had shooters spotlights or thermal imaging sights to cull foxes.

Of the seven producers who were selected to trial fox baiting using CPE's, five installed and used the devices in 2020. The four observer producers who purchased CPEs, all installed and used them in 2020.

Of the 11 producers who obtained CPE's:

- 9 out of 11 participants tried the CPE's
- 6 of the 9 producers using CPEs had at least one CPE fire at least once (total of 40 times the CPEs fired)
- 5 producers recorded that some CPE's fire multiple times
- 7 out of 9 producers who used CPEs also either used fox-off baits and/or used shooters as additional methods of fox control.

Due to the good season/mild lambing conditions and perceived low fox numbers, it was not possible to determine whether improvements in lamb survival were due to increased predator control activities or simply due to good seasonal conditions.

Their observations are provided in Table 1.

Table 1 : Bait takes and observations 2020

Site ID	lambing starts	CPEs set	Times CPEs fired	Loss of lureheads	Use of other control techniques	Time (hrs)	Commentary
A	May	4	8	yes -birds	yes - 6 other bait stations - lost up to 12 baits		Low fox numbers at start of lambing, more observed later in the season.
B	May	2	0		yes - fox-off baits		Improved lamb survival by 12% - exceptional year. Marked 135% from scanning of 141% but doesn't think this was due to extra fox control – thought it was due to good season. Saw a frill neck lizard for the first time in a number of years.
C	late March	5	12 (sites 2 & 3 most popular)	yes - birds	yes baiting and shooting	7.5	Improved lamb survival (up 5%) but doesn't attribute this to fox control – thinks season more of an influence. Tried homemade lures secured with cable ties or marking rings
D	late March	5	2	Yes - ants	80 fox off baits laid. Shooters used as well.	12	Same survival as last year but lower preg scanning/marking
E	July	6	2	yes - birds?	Local shooter got 23 foxes	13	Lamb survival down 3% (main losses in twins). Not sure why
F	August	Didn't set any CPEs			Shooters reported low fox numbers		Not happy with the condition score of the ewes - too fat and even though survival the same as last year, has had better (85-88% in other years). Doesn't think predators were a factor in low survival but more likely ewe nutrition.
G	April	Didn't set any CPEs			Shooters got some foxes		Survival up from a couple of years ago - figures for early lambs only
H	April	1	0		Yes - fox off baits but only one was taken		Lambing % same as last year
I	April	6	12		Yes - fox off baits - 15 replaced out of 40 laid. Spotlighting - only got 1 fox		No obvious losses due to foxes, even dead pile hadn't been touched.
J	?	4	0	Yes -birds - pecked out the 1080 capsules			Had some ewes mauled - not sure what did it. No obvious fox damage to lambs though.
K	April and August	6	4		Yes - 30 fox-off baits 6 taken		Put camera up over one station as it was losing a few baits and recorded two foxes one night and on another. Had regular takes of fox-off baits along the rail line.

The following observations were made about the 2020 lambing season:

- 2020 had a good autumn break and follow up rains meaning food on offer (FOO) was not limiting production (most ewes in condition 3.0 or more at lambing). In some cases ewes were over-fat at lambing causing dystocia related losses.
- Considered by many participants to be a 'low fox season' with less than normal fox sightings by shooters and farmers.
- A local professional bait layer who puts out 100 baits on Park Vic land reported that he usually has 40 taken out of 100 but this year only 10-15 were taken. He concurs that fox numbers appeared to be low.

Table 2 shows the demo site core participant's pregnancy scanning (conception) figures, marking % (to ewes joined) and lamb survival %. Where available, ewe survival figures were recorded.

Table 2: Core Participant conception, marking and lamb survival figures 2021.

| Site ID | Month lambing starts | Conception % | Marking % | Lamb survival % | | | | ewe deaths |
				single	twin	triplets	overall	
A	May	DNC*	122%				DNC*	DNC
B	May	141%	135%	99.8%	96%		96%	1.2%
C	late March	149%	133%	94%	88%		89%	1.8%
D	late March	149%	125%	87%	72%		84%	4%
E	July	160%	137%	101%	79%	94%**	86%	DNC
F	August	171%	131%	79%	76%		77%	DNC
G	April	110%	89%				86%	1.8%

*some wet/dry, some scanned for multiples

**Triplets intensively managed at birth including overnight shedding if required

DNC = data not collected

One participant at site C kept a record of the number of dead lambs found (Table 3), reason for death in order to determine how may lambs may be 'missing', possibly taken by predators. Interestingly, the figures show that all the single lambs were accounted for from pregnancy scanning to marking but there were 26 twin lambs unaccounted for. This could be either due to pregnancy scanning error, in-utero reabsorption of foetuses or lambs taken at birth by predators.

Table 3: Site C – reconciliation of lambs scanned to lambs marked taking into account dead lambs picked up 2020.

Lambs lost from …	singles	multiples	Total as a % of lambs scanned
…Ewes with lambs that died	10	14	**1.6%**
…Still birth	8	30	**2.6%**
…Miss mothering	2	42	**3%**
…Foxes		13	**0.9%**
…Ewes did not lamb (preg scanned in lamb but dry at lambing)	4	8	**0.8%**
Total lambs	**24**	**107**	**9%**
Lambs unaccounted for compared with preg scanning and marking rates	**0**	**26**	**1.8%**

At the group zoom on 12th November, the general feeling that there were not many foxes about compared to usual and that 2020 was not typical of the usual fox activity. In addition, the season was good resulting in ewes in good condition with plenty of feed and mild lambing conditions. This was seen as the over-riding reason why some participants had higher than last year lamb survival figures rather than from improved predator management.

In general, participants found the CPEs easy to use and to check as part of the lambing rounds. When making plans for 2021, many said they would set the CPEs up earlier (late Feb) before lambing commenced. Some were keen to try different lure heads (homemade) or putting them in different locations.

Constraining factors in 2020

Due to the outbreak of COVID in 2020 several planned activities were not undertaken. These included:

- Site visits from coordinator to map locations of CPEs and train individuals in the use of feral scan and cameras.
- Face to face group meetings to gather and share results (some reporting back to the group has occurred via zoom)
- 1080 users training for producers who don't have it
- Collection of pre-project survey data (attempt was made to collect this online but was not successful).

The coordinator was able to send the CPEs in the mail to each participant and data collection sheets and has on her return to work, captured records of what each participant was able to undertake during the year.

4.1.2   Year 2 - 2021

Year 2 commenced with a project member only[5] field day on 'Best practice predator control for lambing' on Wednesday 20th February at Picola, Victoria. The field day was attended by 12 producers who have been involved in the project with 4 of the original 7 demo sites (Fig. 1 sites A, C, D and F) deciding to use CPEs this year plus another 2 producers electing to use them again this year (Fig. 1 sites H and I). In addition, 2 demo site participants and one other producer set up cameras to monitor bait takes (Fig. 1 sites A, C and I). Of the 4 producers who had CPEs but didn't use them, two are still waiting to get their 1080 endorsements, one decided that he didn't need to use this year and one was unable to get them installed in time for lambing.

Use of fox-scan to monitor activity

This year some of the participants elected to upload bait location and fox activity data to the Centre for Invasive Species 'Fox Scan' website (part of Feral Scan). This is a free resource for landholders, Landcare groups, community groups, local Councils, professional pest controllers and biosecurity groups to record information about foxes to manage foxes more effectively and reduce the damage they cause. The group set up its own private group within fox scan to allow all members of the demo to access the group data.

Four of the demo sites and one other producer used fox scan to map the locations of their CPEs and fox activity (Fig. 1 sites A, C, D, F and I). The following information was obtained:

- 5 properties mapped out CPE locations (Fig. 2)

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[5] The field day was members only to comply with COVID restrictions operating in Victoria at the time.

- 2 properties recorded bait takes and fox sightings themselves – 1 also recorded fox-off bait locations.
- 3 properties had help from the coordinator to record bait takes and fox sightings
- Of the 5 sites;
    - 3 sites recorded foxes sightings
    - 2 sites had one CPE fire once
    - 1 site had one CPE fire twice
    - 1 site had two CPEs fire multiple times
    - 1 site had all CPEs fire multiple times.
- The site that didn't use fox scan had no CPE's fire at all (Fig. 1, site H)
- All 5 sites had lure heads eaten without triggering the 1080 capsule to fire. Lure heads were eaten by crows, ants and in one photo, lambs were seen to be nibbling them.

Figure 2: Outline of the group's fox scan area showing the locations of CPEs (grey circles with C) and fox sightings (yellow circles).
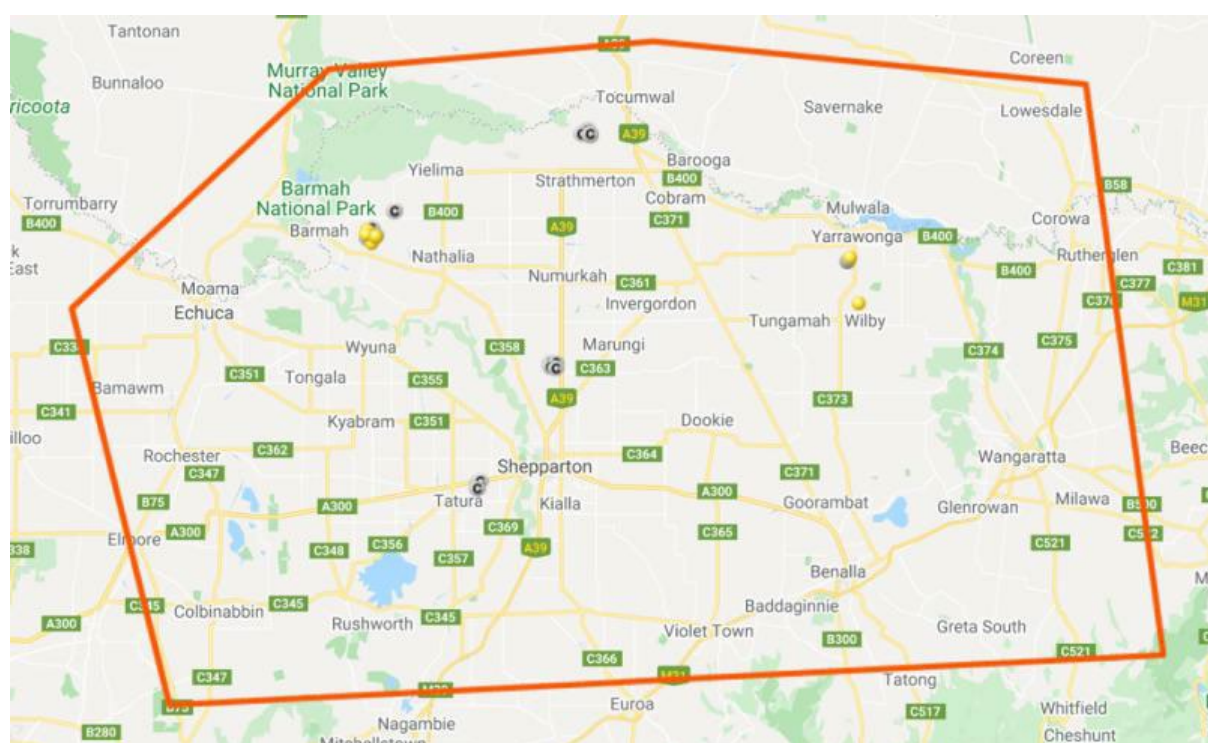
In summary, fox scan was considered to be a useful tool for capturing data by participants and the coordinator but participants needed reminding to record data to make it useful.

CPE and fox control

Of the 6 producers that used CPEs, some elected to fox bait with fox-off baits as well as CPEs and some also had shooters spotlights or thermal imaging scopes to cull foxes.

Table 4 contains details of the use of CPEs and other forms of fox control.

Table 4: Bait takes and observations 2021

Site ID	lambing starts	CPEs set	Times CPEs fired	Loss of lureheads	Use of other control techniques	Commentary
A	May	4	8+	Bird, lambs observed on camera chewing lure heads	Fox off baits	Tried some pest lures (need to find out if they worked). Cameras showed foxes coming to the CPEs as well as lambs nibbling lure heads.
B	May	Didn't set any CPEs			Fox-off baits	No marking data captured this year.
C	late March	5	data from fox scan - 4 fox sightings, one found dead, 1 shot, CPEs fired (site 3) once, another moved to a better site.	Crows observed on cameras pecking lure heads	yes baiting and shooting	Lamb survival approximately the same as last year with higher preg scanning and marking. Captured images of foxes on camera investigating CPEs but not triggering them. Captured images of crows pecking off lures.
D	late March	5	Site 2 fired once in March, reset	Ants thought to have eaten lure heads at Sites 3 & 5 –3-5 May	80 fox off baits laid. Shooters used as well.	Higher conception than last year - no maidens, less dry, more twins; higher marking by 13%, 4% improvement in lamb survival but think that is because no maidens lambing this year.
E	July	Didn't set any CPEs			Local shooter got 19 foxes	Lamb survival down by 10% - thought to be from increased rate of triplets (up from 7% in 2020 to 12% of flock) rather than predation. Only 3 lambs with signs of predation found.
F	August	5	1 bait site triggered twice, one chewed and reset		Had a shooter come out at the end of lambing, shot 3 foxes and 2 next door	Lamb survival better than last year (up 3%) but more likely due to ewes in better condition. Added sardine oil to bait sites to try to lure in more foxes.
G	April	Didn't set any CPEs			Shooters got some foxes	No lambing data supplied this year
H	April	1	0		Yes - fox off baits	No bait takes recorded this year
I	April	6	2 in lambing paddock fired, others had lures chewed off.		Yes – 40 fox off baits laid, 34 taken, shooting claimed 2 foxes	Best ever scanning figures for merinos, excellent survival, lambs unaccounted for from picking up dead was 49. Did extensive baiting and shooting. Had problems with CPEs having the lures chewed off.
J	?	Didn't set any CPEs				Estimates lost 20 lambs out of 70 lambs born.
K	April and August	Didn't set any CPEs			Yes – 10 baits laid – 4 taken	Decided not to use CPEs as not noticing much fox activity and no signs of predation in flock this year.

In summary:

- Twenty-six CPEs were set across 6 different properties and fired 15 times. Of these 6 properties, one had no CPEs fire, two had only one CPE fire once, one had two CPEs fire once each, one had one CPE fire twice and the last had all four CPEs fire multiple times.
- CPEs have had some problems due to crows or ants eating the dried meat lure heads. Participants have relocated some and rebaited others. One participant observed from cameras that his lambs were chewing on the lure heads and is concerned that they may have triggered a CPE at one point.

CPEs have had some 'firing' issues – perhaps due to 'stiffness' of the spring which was reduced when oiled. In general, CPE use was lower than last year and the units triggered less often. Only one property is thought to have a significant problem with foxes (Fig. 1, site A). This participant is a seedstock producer and tags lambs at birth so had evidence of losses between birth tagging and marking that were due to predation. His property is in an area that is prone to high fox numbers as surrounded by orchards and dairy farms and his losses this year were estimated at 33% of dead lambs accounting for 3.3% of lambs conceived and 20% of lambs lost from scanning to marking.

At other sites, signs of predation have been observed in 4% of dead lambs found in one flock, 1% in another and 0% in one flock. Only 4 participants recorded cause of death for lambs found in the paddock at lambing time.

The main cause of lamb death in found lambs thought to be starvation/mismothering based on external signs although no formal necroscopies were done.

In addition, the following observations were made about the 2021 lambing season:

- A good autumn break and follow up rains meant food on offer (FOO) was not limiting production (most ewes in condition 3.0 or more at lambing). In some cases ewes were over-fat at lambing causing dystocia related losses.
- Although foxes were sighted early in the season around silos capturing mice, fox numbers were considered low to normal for the year.

Table 5 shows the demo site participant's pregnancy scanning (conception) figures, marking % (to ewes joined) and lamb survival %. Where available, ewe survival figures were recorded.

Table 5: Conception, marking and lamb survival figures for 2021

Site ID	Month lambing starts	Conception %	Marking %	Lamb survival %			Ewe survival %
				single	**twin**	**overall**	
A	May	144%	120%			84%	
B	May	126%	DNC			DNC	
C	late March	145%	128%			88.5%	1.9%
D	late March	156%	138%	97%	85%	88%*	3.3%
E	July	166%	145%			76%	0.5%
F	August	173%	137%	87%	79%	80%*	2.9%
G	July	DNC	DNC			DNC	

DNC = data not collected, * figures improved from last year.

Two of the participants had improved lamb survival figures from last year (2020). Participant D thought his improvement of 4% was mainly due to not having any maiden ewes lambing this year

while participant F thought his improvement of 3% was due to having ewes in better condition. None attributed the improvements to use of CPEs as they only fired twice in each case.

Difference in numbers of dead lambs observed, marking and conception figures

Four participants recorded lamb deaths and reconciling to scanning and marking figures (i.e. number of lambs unaccounted for when # lambs conceived compared to #lambs found dead + # lambs marked) (Table 6). Lambs unaccounted for was 5.8-8.6% of foetuses scanned. Missing lambs i.e. 'unaccounted between scanning, marking and found dead' thought to be mainly due to scanning errors or losses in utero rather than predation except for one participant. Participant A's high lamb losses due to foxes are particularly notable as he tags at birth and observed that at least 30 tagged lambs were missing between birth and marking.

Table 6: Dead lambs showing signs of predation as a proportion of lambs conceived, lambs found dead or lambs lost from scanning to marking 2021.

	Site number			
Fox losses	A	C	D	I
…of lambs scanned	3%	0.2%	0.1%	0%
…of known dead lambs	33%	4.0%	1.2%	0%
…of lambs lost from scanning to marking	20%	2.0%	0.6%	0%
Lambs unaccounted for as proportion of scanned lambs i.e. not found dead or marked	**6.6%**	**5.8%**	**6%**	**8.6%**

Of the seven members of the GM BWBL group that volunteered to be participants in trialling CPEs and other improved methods of predator control, only four put out CPEs this year for a variety of reasons.

Of the other four producers who purchased CPEs to use on their properties, two continued to use them this year.

Of the 11 producers who obtained CPEs in 2020:

- 6 out of 11 participants used CPEs in 2021
- 5 of the 6 producers using CPEs had at least one CPE fire at least once
- 3 producers recorded that some CPEs fire multiple times
- All producers who used CPEs also either used fox-off baits and/or used shooters as additional methods of fox control.
- 26 CPEs fired 15 times. If every triggered CPE resulted in 1080 being ingested, it suggests that a maximum of 15 foxes may have died as a result.

When taken in context of the area that the demo embraces, the success of CPEs for controlling foxes is hard to determine for all sites except site A. This may be a result of continued fox control over the years having had impact or could be that fox number in some sites are low. For site A, the challenge is that foxes continue to recolonize due to adjacent landholders having no sheep and therefore not undertaking predator control. CPEs do offer this participant an additional tool for managing fox numbers in addition to regular fox off baiting and spotlighting.

Constraining factors in 2021

Due to the continued COVID pandemic in 2021 some of the planned activities were not undertaken. These included:

- Face to face group meetings to gather and share results (some reporting back to the group has occurred via zoom)
- 1080 users training for producers who aren't accredited.

The coordinator was able at the start of the year to hold some face-to-face sessions with the group and visit and map locations of CPEs on some properties. Group members continued to supply data were able to via phone and email in lieu of face-to-face interactions.

4.1.3   Year 3 – 2022

Year 3 commenced with a session at the first GM BWBL meeting (23/2/22) reviewing the data from 2021 as COVID had prevented the group having an end of year field day. The group meeting was attended by 10 producers. This meeting also reviewed the plans for the demo sites for the final year.

Of the original 7 sites, 4 continued to use CPEs for autumn lambing (sites A, C, D, and F) and 2 decided not to put out CPEs this year. Site G officially withdrew from participation due to other commitments. Two observer participants have continued to use CPEs during lambing (sites K and I) and two are using fox-off baits.

The group met two more times with the second meeting 6/4/22 reporting progress on autumn lambing sites and the third 8/6/22 updating pregnancy scanning/lamb marking figures and reviewed survival figures for autumn lambers.

A final field day planned for 24/10/22 to present the overall results from the field day was postponed to 2023 due to the extensive flooding in the area which impacted on participants farms and access to the area. This field day was eventually held on 1/2/2023.

Issues with CPEs

Some issues with effectiveness of CPEs have been identified including lure heads being removed by non-target species and CPEs not firing. Video footage from last year has identified crows as culprits for lure head removal. As a result, members experimented with different types of lure heads. The most successful was using dry cat food mixed with PVA glue to hold it onto the lure head. This lure head seemed to draw in more foxes but was still prone to removal by non-target species such as crows and other unidentified species. The excessively wet winter and spring also created issues with softening of the lure heads and in some cases the dried meat 'fell off' the lure head.

Fox activity

Five sites recorded information on CPE locations using the fox scan app and two used cameras over bait sites to record activity.

Table 7 contains the details of the use of CPEs and other forms of fox control

Table 7: Bait takes and observations for 2022

Site ID	lambing starts	CPEs set	Times CPEs fired	Loss of lureheads	Use of other control techniques	Commentary
A	May	4	8+	Bird	Fox off baits	Shot 6 foxes and laid 10 1080 baits although the constant wet made it hard to see if they had been taken. Tried catfood lure heads – worked better
B	May	Didn't set any CPEs			Fox-off baits	Marking data an estimate this year. Used fox-off baits – estimates 14 taken. Have noticed that since they started baiting the public land that there seems to be less foxes.
C	late March	5	data from fox scan – 2 fox sightings, 1 fox shot, 2 CPEs fired – 3 times in total.	Crows observed on cameras pecking lure heads	yes baiting and shooting	Tried catfood on the lure heads – appears to be work better than the dried meat. Higher conception by 3% with 3% less dry. Marking 2% higher with lamb survival the same. Picked up more dead lambs ie less unaccounted for.
D	late March	5	CPEs fired 7 times		100 fox off baits laid. Shooters used as well.	Higher conception than last year less dry, more twins; higher marking by 4%. Lamb survival down by 1%
E	July	Didn't set any CPEs			Local shooter got 11 foxes	Overall conception down by 17% largely due to drop in ewe lamb scanning. Increase in triplets and quads and overall survival maintained from last year. Very few lambs lost from foxes this year, only found 2 dead with signs of fox damage.
F	August	5	0	Crows ate them		Preg scanning down this year 12% and more dry ewes (2%). Marking lower by 9% with survival sitting at similar to last year (1% lower). Ran out of lure heads so tried catfood but the crows ate them. Also tried cable tying livers to lureheads but lost them too.
G	*Withdrew from the trial*					
H	April	Didn't set this year				Conception down due to foot rot issues with merinos. Lamb survival 85%. Had good intentions of setting the CPEs but didn't happen.
I	April	6	No data available		30 fox baits laid – 24 taken Shot 16 foxes with thermal scope	No preg scanning figures this year as changed to Dorpers. Initially didn't use the CPEs as having issues with them firing but have tried again and working ok
J	?	2	6			No lambing data supplied this year
K	April and August	Didn't set any CPEs			Laid 5 baits, 5 taken – 3 dead foxes found (one adult and 2 cubs)	No pregnancy scanning but estimates based on observation show similar marking % and lamb survival as last year. Too wet to use CPEs.

Of the 5 sites using CPEs and recording fox activity:

- 3 sites recorded 14 set with CPEs firing a total of 17 times
- 1 site lost all the lure heads to crows with none firing
- 4 sites also used 1080 fox off baits
- 3 sites shot foxes

Of the sites that didn't set CPEs:

- One used a professional shooter and recorded 10 foxes shot.
- Other sites did not use any fox control at all.

In general CPE use declined in the group due to issues with the CPEs or perceived need for this form of fox control. Of those that used CPEs, only one property (Site A) is considered to have a 'fox problem'. This producer used additional CPEs and baits in an effort to reduce the number taken. This year there were 7 less lambs thought to be taken by foxes or showing signs of fox damage. This discussed further in the next section.

Lambing data was recorded at demo sites and by observer participants. Eight producers submitted data on pregnancy scanning rates and marking data. Three participants monitored dead lambs and reconciled these to pregnancy scanning and marking data to determine predation rates.

Table 8 shows the demo site participant's pregnancy scanning (conception) figures, marking % (to ewes joined) and lamb survival %. Where available, ewe survival figures were recorded.

Table 8: Conception, marking and lamb survival figures for 2022

Site ID	Month lambing starts	Conception %	Marking %	Lamb survival %			Ewe survival %
				single	twin	overall	
A	May	134%	122%			91%	
B	May	141%*	120%**			NC	
C	late March	148%	148%	97%	85%	88%	1.4%
D	late March	164%	142%	92%	86%	87%	
E	July	149%	112%	81%	78%/61%***	75%	
F	August	161%	137%	89%	77%	79%	
G	*Withdrew from the trial*						

* not all ewes scanned for singles/twins thus this is an estimate only
** estimate only as not all lambs counted.
*** triplet & quad survival
NC – not calculated as marking % an estimate only

In general conception figures were generally lower than in 2021 resulting in lower marking %. However, lamb survival figures remained relatively consistent for all participants and showed no great improvements due to better fox control. Instead it is thought that maintaining fox control enabled the lamb survival figures to stay high.

Seasonal conditions were very wet and although ewes were in good condition and there was plenty of feed, lambs were considered to have slower growth rates than normal. Wet conditions at lambing

were thought to affect lamb survival on wet days but overall there was no noticeable impact on survival.

Reconciliation of lambs to lost to lambs scanned and marked

This year the three participants that counted dead lambs were able to make a more accurate reconciliation of lambs lost to lambs scanned and marked (Table 9) with lambs unaccounted for being between 0.2% and 4.6%. This was either due to more diligence with finding dead lambs or less being taken/lost in utero. The results show that the lower difference could be also a result of less lambs going missing between birth and marking due to foxes either scavenging dead lambs or taking live ones. For two of the participants, the number of lambs found dead with signs of predation increased from less than 5 to around 10. While this on surface seems to indicate higher predation, it may also indicate that less lambs were taken overall by foxes as the numbers had been declining due to baiting/shooting as there was less of a difference between number found dead and number unaccounted for. However as observed above, overall lamb survival was not impacted.

Table 9: **Dead lambs showing signs of predation as a proportion of lambs conceived, lambs found dead or lambs lost from scanning to marking 2022**

Site ID	A	C	D
Lamb survival	92%	88%	87%
….lambs found dead	76 (8.5%)	135 (9%)	107 (9%)
Fox losses			
…number lost	23	10	8
…of lambs scanned	2.6%	0.6%	0.6%
Lambs unaccounted for as % of scanned lambs i.e. not found dead or marked	**0.2%**	**2.5%**	**4.6%**
#lambs	2	37	38

Constraining factors in 2022

The constraints in 2022 on this project were:

1. Coordinator needed to take bereavement leave affecting her ability to get 'on farm' at the beginning of lambing to map CPE locations.
2. The postponement of the final field day to February 2023 due to the floods in October affecting many participants and affecting roads in the area.

4.1.4 Overall impact on lamb survival

Analysis of the benefits of improving predator management are complicated as it is not possible to run a control when implementing improved predator management as the predators move throughout the landscape. At best, an estimate of benefits can be surmised by comparing before demo survival rates with during demo survival rates. This was done by averaging survival rates before demo for those core participants that had sufficient data and comparing this to averages during the 3 years of the demo. This was possible to do for four of the participants and showed an average gain of 4% in lamb survival (Table 10). However not all this can be attributed to improvements in predator management as the seasons of 2020-2022 were considered to be better than 2018-2019 which were drought or dry years. Therefore the gains made in lamb survival have

been considered to be 50% due to season and 50% due to improved predator management indicating that 2% additional lambs were gained by four of the core producers who used CPEs for at least 2 years of the 3 years of the demo. This figure is used to calculate the benefit cost of improved predator management.

Table 10: Gain in lamb survival over the life of the demo

Site ID	A	C	D	F	Average
Lamb survival before demo	84%	84%	84%	77%	82%
Lamb survival 2022	91%	88%	87%	79%	86%
Gain in survival	7%	4%	3%	2%	4%
Net gain in lamb survival (50% of total)	**3.5%**	**2%**	**1.5 %**	**1%**	**2%**

4.2   Economic analysis

4.2.1   Cash benefits

Three participants were able to estimate the time spent installing, monitoring and removing the CPEs each year. This information was used to calculate a 'cost' of implementing the CPEs and compared to the estimated gains in extra lambs marked. This averaged at 13.6 hours per year equalling 40.8 hours over the three years.

The gain in lamb survival over the course of the demo was estimated from the change in lamb survival figures of 4 of the core participants (see section 4.1.4) less a seasonal impact and estimated at 2% gains for those participants (core and observer) who used CPEs over the course of the demo.

Table 11 shows the net benefits of 3 scenarios:

1. <u>Most likely</u> showing the benefits to the 6 participants (4 core, 2 observer) that saw an increase in lamb survival of 2% for better predator management
2. <u>Best case</u> – if all participants who bought CPEs used them and gained on average 2% increase in survival
3. <u>Worst case</u> – if none of the participants gained any benefits from the purchase of CPEs – all gains thought to be seasonal.

Table 11: Benefits and costs associated with using CPEs

VARIABLES	Most Likely Scenario (6 participants gained benefits of 2% improved survival)	Best Case Scenario (2 % improvement in survival all 11 participants)	Worst Case Scenario (No improvement in survival)
Ewe numbers 60 kg ewes mixed breed	**4890**	**10340**	**10340**
number of ha managed	**3543**	**10536**	**10536**
COSTS			
extra labour putting out baits x 3 years	245	449	449
Value of labour (@$30 per hour)	$ 7,350.00	$13,475.00	$13,475.00
Initial cost of CPEs	$ 2,543.23	$ 4,000.49	$ 4,000.49

TOTAL FIRST YEAR COSTS	$ 9,893.23	$ 17,475.49	$17,475.49
BENEFITS			
value per head lamb	$115.00	$ 115.00	$ 115.00
increased lamb survival %	2%	2 %	0%
number of lambs	98	207	0
TOTAL BENEFITS	$ 11,247.00	$23,782.00	$-
NET BENEFIT	$1,353.77	$6,306.52	$ (17,475.49)
NET BENEFIT/ewe	$ 0.28	$ 0.61	$(1.69)
NET BENEFIT/ha	$ 0.38	$ 0.60	$(1.66)

The most likely scenario (Table 11) shows a $ benefit to the 6 participants that used CPEs of $0.28/ewe or $0.38/ha if 2% extra lambs survived until marking. However if all participants who bought the CPEs received the benefits from using them, the net benefits increased to $0.61/ewe or $0.60/ha. Conversely if none of the 11 participants benefited from using the CPEs, the net cost per ewe was $1.69 and per ha the cost was $1.66 per ha.

The breakeven benefit (where cost approximated benefits) was an increase of 1.5% in lamb survival. Given that predation levels for most sites monitoring lamb deaths varied from 0 to 1% (Table 3, Table 6 and Table 9), there are not many more gains to be made for most participants by improving predator management (participant A is the exception with at least 3% lamb deaths to predation). However there is a benefit for maintaining predator management at current practices to ensure that predation doesn't become a major source of lamb deaths in the future.

4.2.2 Non-cash benefits

There were considered by the participants to be non-cash benefits for using improved predator management. These consisted of:

- Improved animal welfare for sheep with less stress from predation.
- Less stress and worry for the producer about the impact of predation on livestock.
- Greater capacity and capability to manage predators by producers through increased understanding and knowledge of predator behaviour and management techniques.
- Increased confidence by core and observer participants to try different approaches to predator management.

4.3   Extension and communication

4.3.1   Group attendance/field day attendance

Table 12 shows the extension activities/events were undertaken during the demo and the attendance at each event.

Table 12: Extension events held during the demonstration

Date	Event	Activity	Attendance
18/2/20	Best Practice Predator Control Field Day	Talks about predator control methods, demonstration of CPEs	29 participants 25 producers representing 22 businesses
9/9/20	Group meeting via zoom	Update on results from Year 1	10 participants 9 producers representing 8 businesses
12/11/20	Group meeting via zoom	End of year 1 report to the group	13 participants 12 producers representing 11 businesses
10/2/21	Field day	Planning for Year 2 and demos of FoxScan and CPEs	13 participants 12 producers representing 10 businesses
19/5/21	Group meeting	Update on results from Year 2	12 participants 11 producers representing 10 businesses
23/2/22	Group meeting	End of Year 2 report and planning for Year 3	11 participants 10 producers representing 9 businesses
6/4/22	Group meeting	Update on results from Year 3	15 participants 13 producers representing 11 businesses
8/6/22	Group meeting	Update on results from Year 3	13 participants 12 producers representing 10 businesses
3/8/22	Bus Trip to Mansfield	Sharing of results with Mansfield group	23 participants 16 producers representing 14 businesses
Postponed due to floods	End of PDS field day	End of PDS report to the group	
1/2/2023	End of PDS field day	End of PDS report to the group	30 participants representing 24 farmers from 16 businesses

Articles about the demo have appeared in the:

- NE Farmer September 2022

Overall the project has reached in person 50 people of whom:

- 9 were service providers (livestock consultants, vets, DELWP staff, AgVic staff and Centre for Invasive Species Solutions, guest presenters)
- 41 were producers representing 30 businesses

4.4   Monitoring and evaluation

Monitoring and evaluation proved to be difficult during the PDS as pre surveys were not able to be collected due to the sudden lockdown of Victoria in 2020. Several attempts were made to have participants complete online surveys but only two were completed.

Post demo evaluations were due to be completed at the end of PDS field day but as this too was postponed due to the flood events in October 2022, the method of collection was changed to over the phone interviews with participants with some completing this online. The results are presented in the next section

4.4.1   Evaluation Survey Results

Fourteen participants completed end of demo evaluations, eight observers and six of the core participants. The results showed that on average, the confidence of all participants in undertaking effective predator control program on their farm increased by 23% with no difference between the observers and core participants in improved confidence.

Change in practice and adoption

Change in knowledge and skills was difficult to assess without a pre-survey so instead, the focus of the evaluation examined the change in practice and attitudes to predator control. Table 13 shows the participants who made a change in practice during the life of the demo. It is important to note that many of these practices, with the exception of use of CPEs, were normal practice for many producers so there was no expectation that they would change. However it is worth noting that:

- Two observers (14%) started to pregnancy scan for multiples with one only doing it for their merino flock and not their dorpers with 50% of observers pregnancy scanning now as normal practice. All core participants were already pregnancy scanning for multiples and monitoring lamb survival.
- All core producers tried CPEs at least once and half of them are going to continue to use them as normal practice while the others will use them sometimes as needs.
- Three observers (38%) tried CPEs at least once and all will continue to use them as normal practice.
- Two observers started to monitor dead lambs for signs of predation with 75% of observers and 100% of core participants monitoring dead lambs as a normal practice.
- One core participant (17%) changed from putting out fox baits once a year to undertaking an annual fox baiting program with multiple bait laying and monitoring/replacing baits and one observer (13%) started fox baiting annually and one started an annual program. Overall 67% of core and 38% of observers are using fox baits as a program as normal practice.

Table 13: Core and observer participant change in practices as a result of the PDS and proportion now using that practice as a normal practice at the end of the PDS.

Practice	Core		Observer		Total	
	% made a change	% normal practice	% made a change	% normal practice	% made a change	% normal practice
Undertake an annual fox baiting program ie multiple bait laying at strategic times, replace taken baits	17%	67%	13%	38%	**7%**	**50%**
Use canid pest ejectors for baiting and monitor activation	100%	50%	38%	38%	**64%**	**43%**
Monitor dead lambs for signs of predation	0%	100%	25%	75%	**14%**	**86%**
Pregnancy scan for multiples and monitor lamb survival	0%	100%	25%	50%	**14%**	**71%**

When the participants were asked whether they intended to keep using the CPEs post the demo, 67% of the core participants and 38% of the observers said they would while a further 25% of observers said they may start using the CPEs after the PDS if the need and opportunity arises.

Change in attitudes and beliefs

Attitudes to the use of baiting and understanding of the causes of lamb losses is mixed within the group with 59% of participants still convinced that predation is a major cause of lambs losses despite data from the demo showing this is not the case. There is also the belief that shooting, especially with thermal imaging scopes is as effective or more effective than baiting with 21% thinking that shooting and baiting all year around is the most effective form of predator control. Participants in general like the tangible outcome of seeing dead predators rather than taken baits or triggered CPEs as proof that their control methods are working.

Satisfaction with the demo

Overall the participants rated their satisfaction with the demo at an average of 9.3/10 (core 9/10, observers 9.5/10) and all would recommend the PDS to others.

Participants also rated the value of the demo to their livestock enterprises at an average of 9/10 (core 8.3/10 and observers 9.5/10).

A range of comments were made about the impact of the demo with the key impacts being summed up as follows:

'(I have) More confidence using the various tools for predator control'

'Have a better handle on how to approach it but haven't done it - have had issues with lure heads and non-targets taking them.'

'More awareness of the problem with foxes and other predators. Now I have more tools that I can use other than shooting. More aware of the other predators that are around and know what to look for.'

'Have learnt that I need to mix up the control methods. Now aware of the numbers of foxes and the number of lambs we lose to foxes. There is more cover for the foxes because of the cropping around my place.'

'Have learnt heaps, completely changed what I thought I knew and what I do now. Have tripled my time into predator control than I used to. The wet years have upset the gains I have made with their breeding cycles and mice plague, extra feed around etc. The feed for foxes has meant their numbers have grown. Have bought a thermal scope to help as seemed to be missing the bigger foxes via camera footage. Every little bit has helped though. Better placed now to manage foxes than before.'

'Gave me more of an idea of what was going on - we don't always know what is going on and this project helped us see that because we were monitoring our baits and dead lambs.'

'CPEs didn't really go off or were effective to make it worthwhile. Really think thermal imaging with a professional shooter is what works with me in the area I am in.'

'Reminder to keep on top of predator management.'

'Learnt a lot about fox control and what is really killing the lambs like starvation/mismothering etc. Not just about killing foxes and how to set traps and baits. I now know how to use the various forms of fox control and what works and doesn't work.'

'I've given CPEs a go, especially to target those foxes who had learnt to evade the spotlight.'

4.5   Outcomes in achieving objectives

Objective 1 was achieved successfully with 34 people attending the 2020 Best Practice Predator Control field day. Thirteen of these participants came from outside of the group and 4 have since become regular group members.

Objective 2 was achieved successfully with 6 core producers and 4 additional observers using CPEs or other forms of fox control over 3 seasons. Each contributed data to the demo to measure the impact.

Objective 3 a cost:benefit analysis of using Best Practice Predator Control (ie costs = preg scanning for multiples if not already undertaken, baits/other control techniques costs, time for implementing control, benefits = more live lambs valued at market rates) showed a most likely benefit of $0.28 per ewe or $0.38 per ha for participants using CPEs.

Objective 4 was achieved successfully even though COVID and other factors impacted on the way results were shared amongst the group on 8 occasions and via email reports to all group members and other interested producers.

Objective 5 was eventually achieved in February 2023 as extensive flooding in October and November affected many of the producers involved causing the original date to be postponed.

Objective 6 The final objective of having at least 50% of GM BWBL group members and 25% of observers trialling improved predator control on their properties was achieved with 100% of core participants and 38% of observers trialling CPEs on their properties at least once. Post demo, 67% of core participants and 38% of observers intend to keep using CPEs while a further 25% of observers may use the CPEs in the future

5 Conclusion

This demonstration of improved fox control at lambing using CPEs and a variety of other tools has shown participants that predator management is complex and requires diligence year in and year out. While only one of the participating producers, was considered to have a significant fox problem, all reported that it was an issue that required constant monitoring and vigilance in case it got 'out of hand' and there is a prevailing sentiment that foxes and other predators are still a major cause of lambs losses.

The use of CPEs had mixed results as non-target species removed the lures (dried meat and cat food) from the lure heads and some didn't always fire even though foxes were observed via cameras approaching the CPEs. However, they did fire at total of 72 times indicating that at this number of foxes received a lethal dose of 1080. Over time the participants developed skills in setting the CPEs and ensuring they were in places that were more likely to be visited by targeted species.

Monitoring of lamb survival rates before and after the demo with core participants estimated there was an average change in lamb survival of 4%, 2% of which was thought to be due to improved seasons and 2% attributed to better predator management. This resulted in a benefit of $0.28 per ewe or $0.38 per ha for participants using CPEs. The breakeven benefit for using CPEs in this demo was achieved if there was an improvement of 1.5% in lamb survival over 3 years.

Post- demo evaluation showed that 67% core participants and 38% of observers intend to keep using CPEs while a further 25% of observers may use the CPEs in the future. An issue with obtaining CPEs, lureheads and 1080 capsules was identified by participants who have found it difficult to source these supplies from their local Ag and Vet chemical retailer. This is due to the low volume of sales making it hard for these retailers to justify the requirements for selling 1080 products. This is discussed further in the last section.

6 Benefits to industry

The benefits to industry from the 'Best Practice Predator Control at Lambing' PDS are:
- A greater understanding of predator behaviour and effective methods of predator control
- More producers confident in using current best practice methods of predator control (improvement in confidence of 22 %)
- A greater understanding of the causes of mortality in lambs and how lamb survival can be improved.
- Improved lamb survival over time as the density of predators is reduced

7 Future Research and Recommendations

One of the unintended consequences from the demo was the discovery that it is difficult to purchase CPEs, replacement lureheads and 1080 capsules locally. Only one retailer (based in Echuca) is currently prepared to order in fox-off baits and CPEs. This is problematic for on-going baiting as some of the participants live over 100 km from Echuca and it is not their regional centre. The coordinator is currently in discussions with ACTA, the wholesaler of CPEs, to come up with a direct purchase arrangement for those producers who cannot access the supplies they need due to distance from Echuca.

The restricted access to CPEs was not known at the beginning of the demo as all CPEs and parts were ordered as a bulk order from ACTA. In future if another demo using CPEs and fox-off baits was to be undertaken, it is recommended that a retailer be included who is willing to maintain the necessary

1080 accreditations to be able to supply participants with CPEs, lureheads and capsules after the demo.

8 Acknowledgements

We would like to acknowledge the support provided by Greg Mifsud (Centre for Invasive Species Solutions) and Lucy-anne Coby and Tim Enshaw (Wild dog program, Department of Environment, Water, Land and Planning) in providing advice and resources for this demo.

We would also like to acknowledge all the time provided by the producer participants towards demonstrating the outcomes of this project.

9 Appendices

9.1.1 Flyer for first field day

Field day:

Best practice predator control for lambing

This field day is for sheep producers wanting to reduce predation during lambing using the latest management techniques to improve lamb survival.

When: Tuesday 18th February 2020

Time: 9.30am for 10.00 am start concludes 3.00 pm

Where: Picola Football Club Rooms, Picola (am) for presentations from experts Field trip (pm) for demonstration of baiting laying and monitoring

Free Entry

The field day features:

- **National experts talking about fox and pig ecology, latest control techniques including the new canid pest ejectors (CPEs) and HOGGONE.**
- **Practical on farm demonstration of bait laying and monitoring using cameras and Feral Scan.**
- **An overview of the Goulburn Murray BESTWOOL/BESTLAMB group Producer Demonstration Site project 'Best practice predator control for lambing' including how to get involved.**

PROGRAM
9:30	Registration and morning tea
10:00	**Introductions and aims**
10:30	Predator impacts on lambing
	• Foxes
	• Pigs
	Best practice control techniques
	Using 1080
	Your predator control plan
LUNCH – Hot meat rolls	
1:30	**Practical demonstration**
	• Signs of pest animals
	• Preparing & laying baits
	• Monitoring sites
3:00 PM CLOSE	

Speaker Bios

Dr Kristy Howard (Facilitator and Coordinator of the Goulburn Murray BESTWOOL/BESTLAMB group - Inspiring Excellence). Kristy is a livestock consultant who currently works with sheep producer and lifetime ewe management groups in the North East of Victoria and Southern NSW to make their farming operations more profitable and viable.

Greg Mifsud (National Wild Dog Management Coordinator – Centre for Invasive Species Solutions) – Greg has had an extensive career in vertebrate pest and natural resource management spanning the past 20 years. He has worked closely with farming groups, industry and various levels of government to develop wild dog and fox management programs to reduce the impacts of these predators on livestock and native wildlife.

Jason Wishart (Biosecurity Manager for Established Invasive Animals - Agriculture Victoria). Prior to joining Agriculture Victoria in 2019, Jason was involved in the development of large-scale predator management projects aimed at reducing the impact of foxes and feral pigs as well as the development of HOGHOPPER, PIGOUT, HOGGONE and other pest animal baits.

RSVP's essential for catering and to register your interest in the project to Rina Cooper 0417535822 or email office@inspiringexcellence.com.au

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mla
MEAT & LIVESTOCK AUSTRALIA

9.1.2 Flyer for bus trip to Mansfield

Reminder

Goulburn Murray BESTWOOL/BESTLAMB

Bus Trip to Mansfield to look at Predator Demo

When

Wednesday 3 August 2022

7.15am - 5.00pm

Program

7.15am	Pick up location 1 - Picola Pub	John Corry Bus Driver
7.30am	Pick up location 2 - Nathalia (location to be confirmed)	
8.15am	Pick up Shepparton or Bunbartha (location to be confirmed depending on people's preferences)	
9.00am	Wayside stop on Benalla Mansfield road just past the overpass to pick up Kristy	
10.00am	Arrive at Mansfield	
1.	Introduction and overview	Dr Kristy Howard and Matt Mahoney
2.	'Less Predators, More Lambs' group meet with the 'Best Practice Predator Control at Lambing' group and discuss trial findings.	Kristy and Matt

Lunch at Mansfield Pub

3.	Property tours – visits to one or two properties to see predator control in action i.e. baiting sites and other control measures such as fencing/paddocks for lambing etc.	Matt Mahoney
3.15pm	Close and thankyous	

PLEASE CONFIRM YOU ATTENDANCE AT THIS EVENT AND YOUR PREFERRED PICK UP LOCATION BY MONDAY 25 JULY.

Kristy: 03 5728 2992 or 04 0028 2222 or Email: kristy@inspiringexcellence.com.au

Rina: 0417535822 or Email: office@inspiringexcellence.com.au

COVID rules apply

9.1.3 Media from Mansfield Bus Trip

Collaborative predator management

September 2022

North East and Goulburn Murray Farmer - Page 13

By KIM WOODS, National Wild Dog Action Plan

SHARED KNOWLEDGE: Participants in the Less Predators more lambs trial discuss their findings after another season of a concerted and organised baiting program.

CELEBRATING the 156th
WANGARATTA SHOW
OCTOBER 7 & 8

DRUG AND ALCOHOL FREE EVENT

Winsec Monster Fireworks Display
Animal Nursery
ALL4FMX motorbikes Friday night
Donnaspark Hoopla
Animals Of Oz Display
Live Music
Steam Engines and Fergie Tractors
Cattle, Alpacas, Sheep, Poultry & Pigeons

TICKETS AVAILABLE ONLINE VIA EVENTBRITE
http://wangarattashow.org.au (03) 5721 3280

9.1.4   Flyer for end of program field day

End of Demo Field day:
Best practice predator control at lambing

This field day is for sheep producers wanting to reduce predation during lambing using the latest management techniques to improve lamb survival.

The field day will present the results of the Goulburn Murray BESTWOOL/BESTLAMB group's 3 year Producer Demonstration Site project 'Best practice predator control at lambing' including:

- The benefits and costs of predator control
- The real cause of lamb losses during pregnancy and lambing
- Best Practice predator control – what works and what doesn't
- A professional hunter demonstrating the use of thermal imaging scopes for fox control.

NEW DATE
When: Wednesday 1 February 2023
Time: 9.30am for 10.00 am start concludes 3.00 pm
Where: Picola Football Club Rooms, Picola

Free Entry & Lunch

PROGRAM
9:30am Registration and morning tea
10:00am Introductions and aims
10:20am Group demo results:
- Benefit:cost of predator management
- The real cause of lamb losses
- Best practice predator control – what works and what doesn't

12:30pm LUNCH – Hot meat rolls
1:30pm Thermal imaging scopes
- Everything you need to know about scopes
- Fox video footage

3:00 pm CLOSE

Speaker Bios

Dr Kristy Howard (Facilitator and Coordinator of the Goulburn Murray BESTWOOL/BESTLAMB group - Inspiring Excellence). Kristy is a livestock consultant who currently works with sheep producer and lifetime ewe management groups in the North East of Victoria and Southern NSW to make their farming operations more profitable and viable.

RSVP's essential for catering and to reserve your seat by Monday 30th January 2023 to
Rina Cooper 0417535822 or email office@inspiringexcellence.com.au

9.1.5 Survey end of program

MLA Producer Demonstration Sites
End of project survey
Participants

PDS Name Best practice predator control for lambing

PDS Code L.PDS.2005

The following questions are used to determine your level of understanding of *Best Practice Predator Management at Lambing.* The knowledge and skills audit is used at the start and completion of the program to allow individuals to track their skill development and adoption of new practices. It will also be used:

1. To improve the content of future project meetings; and
2. As part of the evaluation process for the project

The information will be completely confidential and individuals will not be identified in the analysis of data.

Name: -
_____
_____

Date: /   /

MLA may contact me to further assess the impact of their programs?   ☐ Yes ☐ No

MLA may send me newsletters and inform me of future events?   ☐ Yes ☐ No

Section A – Demographic Information

A1. Your contact details

a. Property name...

b. Business / trading name ....

c. Property address ....

d. Postal address...

e. Email address..

f. Phone...

g. Mobile..

A2. What area do you manage? *(please write the number of hectares that you managed)*

a. Hectares..

A3. What numbers of livestock do you run? *(please write the number of head against each of the categories of livestock that you run)*

a. Number of beef breeders...

b. Number of cattle turned off per year ....

c. Total number of cattle..

d. Number of ewes ....

e. Number of lambs turned off per year ....

f. Total number of sheep...

g. Number of goats turned off per year ....

h. Other ....

Section B – Knowledge and Skills *(If you do not know, please select the 'Unsure' option)*

B1. What are the key causes of lamb mortality? *(Tick one of the options below)*

a. Predation and Dystocia...

b. Starvation/mismothering and Dystocia..

c. Dystocia and still births ....

d. Infection and misadventure..

e. Still births and predation ....

f. Starvation/mismothering and predation...

g. Unsure...

B2. True or False 'Victorian and NSW studies have shown that predation is responsible for 7% of lamb losses': *(Tick one of the options below)*

a. True...☐

b. False ....☐

c. Unsure..☐

B3. The most effective form of predator control to reduce lamb deaths is: *(Tick only one of the options below)*

d. Spotlighting/shooting during lambing ....☐

e. Baiting and trapping at lambing time...☐

f. Shooting and baiting all year round ....☐

g. Exclusion fencing and guardian animals...☐

h. Combination of baiting, shooting, trapping, fencing, guardian animals all year round☐

i. Combination of baiting, shooting, trapping, fencing, guardian animals at targeted times of the year...☐

j. Unsure..☐

B4. Effective predator control requires an understanding of: *(Tick only one of the options below)*

a. How to use all the tools i.e. canid pest ejectors, baits, traps etc................................☐

b. Where predators move around my property and when they are most active (predator behaviour) ....☐

c. How many potential lambs I had a pregnancy scanning ....☐

d. The rules for use of 1080 ....☐

e. What my control options are and how to best use them on my property ....☐

f. Unsure..☐

B5. To measure the effectiveness of baiting I need to: *(Tick the best option below)*

a. Know how many predators are in my area ....☐

b. Know how many lambs I had at pregnancy scanning and how many I marked.........☐

c. Put cameras on all the bait sites to monitor bait take...☐

d. Regularly monitor (weekly) all bait sites for bait take and replenish taken baits ....☐

e. Count the dead foxes and lambs I find..☐

f. Unsure..☐

B6. The main advantage of canid pest ejectors (CPEs) over fox off baits are: *(Tick the best option below)*

a. CPE's only go off if an animal over 1.6 kg exerts an upward pull targeting foxes over non-targets ....☐

b. The device is staked to the ground by a sturdy metal peg and cannot be easily moved or cached ....☐

c. The device can be disarmed for mustering or when not required.............................☐

d. Devices may be set and left in place for extended periods (subject to local regulations) and can thus be used in long-term management programs. ....☐

e. Because of the upward pressure exerted, 1080 is delivered into mouth of target predator ensuring a kill ....☐

f. It doesn't kill farm dogs or neighbours dogs...☐

g. Unsure..☐

B7. To achieve effective predator control I need to: *(Tick one of the options below)*

a. Get all my neighbours involved otherwise it is a waste of time................................☐

b. Have my 1080 ACUP endorsement ....☐

c. Bait all year round ....☐

d. Be clever with my time and effort and use the methods that will be most effective....☐

e. Bait, shoot, trap, fence, use guardian animals and anything else that helps ....☐

f. Just use CPE's and check regularly to replace capsules/lure heads........................☐

g. Unsure..☐

Section C – Confidence and Practices

C1. How confident <u>were you</u> in *undertaking an effective predator control program on your farm <u>before</u> the project started*?

(please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Poor   Excellent

C2. How confident are you <u>now in</u> *undertaking an effective predator control program on your farm <u>now this project has finished?</u>*

(please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Poor   Excellent

C3. Which practices did you use before the project?

	Normal practice	Sometimes	Rarely	Never	Not Applicable
Put out fox baits once a year at or before lambing					
Undertake an annual fox baiting program ie multiple bait laying at strategic times, replace taken baits					
Use canid pest ejectors for baiting and monitor activation					
Monitor dead lambs for signs of predation					
Pregnancy scan for multiples and monitor lamb survival					

C4. Which practices do you use now after the project?

	Normal practice	Sometimes	Rarely	Never	Not Applicable

Put out fox baits once a year at or before lambing					
Undertake an annual fox baiting program ie multiple bait laying at strategic times, replace taken baits					
Use canid pest ejectors for baiting and monitor activation					
Monitor dead lambs for signs of predation					
Pregnancy scan for multiples and monitor lamb survival					

C5. What impact has this project had on your predator management practices? (please detail)

_____

_____

_____

_____

_____

_____

_____

_____

_____

Section D

Please rate each of the questions below out of 10 (where 1 is negative and 10 is positive)

D1.   Overall, how satisfied are you with this PDS? _____/10

D2. **How valuable was this PDS in assisting you manage your livestock enterprise?**

_____/10 43

D3. **Would you recommend MLA's PDS program to others?** ☐ **Yes** ☐ **No** ☐

Not Sure

D4. **Please provide any feedback to help us improve the PDS program:**

9.1.6   Demo site information and protocol

Demo site information and Protocol

Introduction

The Goulburn Murray BWBL group has secured funding from MLA for 3 years to demonstrate if using best practice predator control for lambing in the form of better baiting and flock management can increase lamb survival.

The objectives of the demonstration are that by December 2022 we will:

7. Conduct one Best Practice Predator Control field day with assistance from the Centre for Invasive Species Solutions, Agriculture Victoria (AV) and Dept of Environment, Water and Planning (DELWP) to increase producer's knowledge and skills in this area (target is all group members plus 10-15 additional producers).
8. Demonstrate the use of Best Practice Predator Control on 5-7 properties over 3 lambing seasons (2020-2022) to see if it increases number of lambs marked.
9. Conduct a cost:benefit analysis of using Best Practice Predator Control (ie costs = preg scanning for multiples if not already undertaken, baits/other control techniques costs, time for implementing control, benefits = more live lambs valued at market rates).
10. Share results via BWBL group meetings (discuss at 3 per year and circulate results to group members)
11. Conduct 3 open invitation field day at the completion of the project to share results and recommendations
12. At least 50% of GM BWBL group members and 25% of observers will have trailed improved predator control on their properties.

To achieve the objectives, producers who take part as a demo site will need to do the following:

1. Provide a record your past seasons lamb survival figures to set baseline for comparison for your site (if Kristy does not already have them).
2. Provide pregnancy scanning for singles and twins to determine conception rates (starting number of lambs for measuring survival rates).
3. Differentially management of twins and singles mobs using Lifetime ewe management (LTEM) guidelines to ensure ewe condition and nutrition are not factors impacting on survival. This means splitting into twin/single mobs where practical, monitoring ewe condition prior to lambing, monitoring feed on offer and supplementing when insufficient to ewe needs etc. Kristy will go through this with each producer.
4. Monitor dead lambs and ewes for visual signs of primary and secondary predation. Cause of death recorded if known.
5. Mark lambs in lambing mobs to calculate survival rates for each mob. Comparisons to be made to previous seasons lamb survival figures. Reconciliation of # dead lambs, live lambs and pregnancy scanning rates if possible.
6. Record predator management activities ie baits laid, shooting/spotlighting activities, dead predators found/shot etc. Record on physical farm map or using the Feral scan app.

(If resources permit, it would be good to undertake fox abundance monitoring either using spotlight technique or monitoring bait sites for tracks and other signs of bait take[6]).

7. Optional – set up a camera on a bait site to monitor activity.
8. Records of labour time for predator control activities and costs to allow cost:benefit to be calculated

Data records 2020 for (name):

Number of ewes joined for 2020 season	**ewes**
Ewe breed	
Ram breed	
Did you pregnancy scan for singles/multiples	Yes ☐ No ☐
Pre-lambing condition score	Yes ☐ No ☐ **Average =**
Date lambing started	
Date lambing finished	
What other forms of predator control did you use? Eg spotlighting, fox drive, guardian animals, trapping etc. How successful were they?	

---

[6] Techniques used for monitoring fox abundance will be taken from 'Monitoring techniques for vertebrate pests – Foxes' (Mitchell and Balogh, 2007) NSW DPI and will be design in consultations with experts from CRC for Invasive Species Solutions, AV and DELWP to be practical and able to be conducted by the local shooters employed by land holders to manage foxes during lambing.

Details of baits

Bait ID (as per map)	Type of bait	Date laid	Date removed or disarmed	Details ie dates checked, times taken/CPE triggered
Eg 1	*CPE kangaroo lure*	*31/3/20*	*1/6/20*	*7/4/20 – triggered, rearmed* *14/4 – triggered, rearmed* *21/4 – checked, intact* *28/4 – triggered, rearmed* *5/5 – checked, intact* *12/5 – checked, intact* *19/5 – checked, intact* *Camera showed fox activity and triggering*

Bait ID (as per map)	Type of bait	Date laid	Date removed or disarmed	Details ie dates checked, times taken/CPE triggered

Bait ID (as per map)	Type of bait	Date laid	Date removed or disarmed	Details ie dates checked, times taken/CPE triggered

Details of lambing mobs

Mob name or descriptor	Singles, twins, or mixed	Number in mob for lambing	Paddock/s lambed in	Feed on offer and ewe condition	Number of dead lambs found/signs of predation	Number of lambs at marking
Eg Maiden Singles	Singles	156	House paddock 7 weeks Moved after marking to grazing wheat	House paddock 1000 kg/ha green grass Grazing wheat >2000 kg/ha DM Ewes condition score av 3.2	8 dead lambs found – one had back legs missing. 2 had eyes/tongues missing (could have been crow) 1 dead ewe	146

Mob name or descriptor	Singles, twins, or mixed	Number in mob for lambing	Paddock/s lambed in	Feed on offer and ewe condition	Number of dead lambs found/signs of predation	Number of lambs at marking

Notes

Include any additional information ie time taken to check baits, cost of additional baits/CPE lures etc.

Eg Shooters found that as lambing progressed, they hardly saw a fox, appeared to lose lambs early but not after 3rd week.

Notes