Felixer™ Feral Cat Grooming Trap Study

Final report

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Acknowledgements

Disclaimer

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Executive Summary

This report represents findings from the photo only (non-toxic) mode trials of Felixer™ feral cat grooming traps in and around Dryandra Woodland National Park (hereafter "Dryandra") in the southwest of Western Australia (WA). Units were tested on agricultural land surrounding Dryandra as well as in the reserve in order to collect data on the greatest array of species possible. This project is the first study of its kind in the Wheatbelt of WA, the second on private property in Australia and the first to field trial blue tooth blocking tags.

In summary, the study found that:
- Cats were the most common animal photographed by Felixer units, indicating that they are widespread and active in the properties surrounding Dryandra;
- An estimated 36-70 individual cats passed Felixer units during this trial, with the majority trialled on agricultural properties in or near infrastructure. These areas appear to be supporting high densities of cats that are likely to be travelling into Dryandra and satellite reserves;
- All native species in this trial, comprising 18 species of birds and 8 mammals, endemic to the WA Wheatbelt were correctly identified as non-targets;
- Across all sites, dogs, humans and vehicles were correctly identified as non-targets 100% of the time;
- The targeting rate on cats was 42% while in conservative mode, with many of these passes were by the same individuals therefore all of the cats that passed would likely have been targeted if Felixers were in toxic mode;
- Bluetooth tags were successful 100% of the time in blocking Felixer units when domestic cats and dogs were within a 30m radius;
- Lambs were found to be at risk of being targeted (1.2% or 8 of 683 triggers) emphasising the need to keep them physically separated (fenced, in different paddocks or reserves) or units used at times when lambs are not present;
- Setting Felixer units close to farm infrastructure (e.g. sheds, tips, water sources) is an effective method of targeting multiple individual cats in the area and channelling animals to pass by Felixer units; and
- Felixers are likely to have an effective role in suppressing invasion of feral cats into the National Park, and reducing feral cat presence on agricultural land, in addition to other control techniques.

1 Background

Feral cats (*Felis catus*) are recognised as one of the most harmful invasive species globally (Doherty et al., 2016). Termed 'feral' when living independently of humans in the wild, feral cats have a substantial negative impact on native wildlife through predation, competition, and disease transmission (Doherty et al., 2017). Feral cats have already contributed to 27 of Australia's 34 native mammal extinctions, and continue to threaten 75 more Australian species (Kearney et al., 2019). One feral cat in the bush can prey on 791 mammals, birds, reptiles and frogs, and 371 invertebrates each year (Legge et al., 2020b). Feral cats also have significant financial impacts on the Australian sheep industry via impacts from the cat-dependent diseases Toxoplasmosis and Sarcocystis (Legge et al., 2020a).

Feral cats present a significant threat to conservation values of Dryandra Woodland National Park (hereafter "Dryandra"), particularly the range of threatened critical weight range species including numbats, woylies and chuditch. These species are listed as Endangered, Critically Endangered and Vulnerable, respectively, under Western Australia's *Biodiversity Conservation Act* 2016. They are also listed as endangered under the Commonwealth's *Environmental Protection and Biodiversity Act* 1999. Dryandra is one of only two sites containing wild populations of numbats and woylie, and the localised extinction of either species would result in an irreparable loss of genetic diversity. Prior to feral cat control there was strong evidence that feral cats represented the primary predator of both woylies and numbats in the Woodland following the reduction in fox numbers (Marlow et al., 2015).

Control of feral cats is difficult due to their preference to hunting live prey rather than accepting baits, their cryptic and nocturnal behaviour, and their ability to persist in almost every habitat across the continent. The Felixer™ feral cat grooming trap is an emerging feral cat control technology that was developed by Thylation (https://thylation.com/) as a targeted and automated poisoning device. It uses an array of lidars to distinguish cats from other species and sprays 1080 gel onto the fur, relying on cats' compulsive grooming habits for ingestion of the toxin. Felixers are being trialled in a number of different locations throughout Australia, including the WA Pilbara, SA arid zone, South-west WA and as part of the Kangaroo Island and Christmas Island eradication efforts (Chambers et al., 2020; Dunlop et al., 2020; Hodgens, 2019; Moseby et al., 2020; Read et al., 2019). These trials have demonstrated Felixer traps to have high target-specificity to feral cats and foxes, indicating them as a promising technique for safe, effective and targeted feral animal control.

Given the importance of feral cat control in Dryandra and surrounding areas, in 2022 the Peel-Harvey Catchment Council (PHCC) developed the Dryandra Woonta Project

with support from Australian Government funding, to test emerging Felixer feral cat grooming trap technology. The trial represents one of several being undertaken Australia-wide but is the first in the Wheatbelt of Western Australia and one of only two trials undertaken on private property. The aim of the study was to collect data on the Felixer units in the matrix of farmland and remnant vegetation surrounding Dryandra and satellite blocks to assess the species specificity, target rates of feral cats and foxes and non-target species, and to inform the suitability of the method to compliment other control methods to protect highly susceptible species from fox and cat predation.

Following an eight-week pilot study on two private properties from June 2022 with one Felixer unit, six Felixer grooming traps were deployed in photo-only mode on nine private properties and four public reserve sites around Dryandra over a six-month period from October 2022 to March 2023. Units were also deployed within the fenced DBCA Numbat-Woylie Enclosure to maximise native animal encounters and to test the most current Artificial Intelligence (AI) version. This report details the findings from all units on both private property and within Dryandra Woodland NP.

2 Methods

Felixers were deployed at 15 sites (see Figure 1) made up of private and public lands, for a six-week period at each site, in conservative non-toxic mode. Sites included farmland surrounding Dryandra, on satellite blocks of native vegetation, and within the DBCA fauna enclosure (see examples provided in Figure 2). Sites were selected based on proximity to Dryandra, landowner willingness to participate, known feral cat activity and presence of a variety of species to collect local data to inform risk assessment.

Figure 1. Map location of Felixer trial sites in this study in the context of Dryandra Woodland National Park and satellite blocks of bushland.

Felixers were installed based on instructions provided by the manufacturer (Thylation Inc. see https://thylation.com/). The Felixers were set to conservative mode, which requires greater certainty of a cat before targeting, with audio lures activated, with the exception of within Dryandra, where lures were deactivated due to native animal ethics considerations. The units are fitted with a camera based artificial intelligence (AI) working in tandem with the four Lidars, to minimise false positive targeting. One trail camera per unit was placed facing the path in front of the Felixer, set to record 15 second video with a 15 second quiet period. Other trail cameras (Reconyx Hyperfire HC500) were set in the area (see Figure 3) to collect records of other species that might be present in the area, and where possible, to assist identifying individual cats through markings and other distinguishing features.

At two sites site, Bluetooth tags were trialled on three domestic dogs and two cats to test blocking capability of the units (Felixer unit is switched off for 1 minute any time the tag is within 30m radius), as well as a trial on seven dogs comprising a range of shapes and types (including Australian kelpie, Border collie, Pugs, Chihuahua and Labrador) for five minutes per individual dog, with and without the tags. Examples of tags and test subjects are shown in Figure 4.

Felixer data was uploaded to the Felixer Management System (FMS) and images classified to species where possible. The FMS is an Australia-wide collation of data from all Felixer units, allowing continual refinement of the technology as new non-target species are recorded and is a condition of use from the APVMA. Cat images were identified to individual where possible, by cross referencing both trail cameras and Felixer images.

Figure 2. (Left) Felixer set up near farm sheds with flat ground in front of the unit for accurate measurements of passing animals and (right) in native vegetation. Artificial grass helped prevent mud or sand splashing sensors during rain events.

Figure 3. Examples of camera trap setups in surrounding areas or facing Felixer units.

Figure 4. Blue tooth blocking tags trialled on domestic dogs of different breeds.

3 Results

Felixers were set between 10 June 2022 to 29 Mar 2023 (292 days) staggered across 13 locations in and around Dryandra Woodland National Park. A total of 2585 total triggers were recorded on the Felixer units, comprising 33 different categories (Figure 5 Table 1 in Appendices).

Cats were the most common species detected by Felixer units, with 826 detections representing 32% of all triggers. Of these, 42% (347 occasions) were considered to be targets. Feral cats were detected on all Felixer units with the exception of one site within remnant vegetation and within the fenced DBCA Numbat-Woylie Enclosure. One feral cat was photo targeted on a game trail within a 200m wide vegetated corridor at a target rate of 100%.

Cats approached Felixers in multiple directions depending on set up and behaviour, not always satisfying the criteria to be a target as a feral cat (Figure 6). Analysis of cat targeting by distance (Figure 7) shows that the higher target rates were recorded in the 51 to 200cm distance range, with the lower target rates in the short range (0-50cm) and longer rangers (250 to 400cm range).

Combined information from Felixer and trail cameras indicated there were more than 10 individual cats present at some sites, active during the day and night (Figure 8.). At least 36 individual cats were able to be identified from photos, but this number may be as high as 70. Therefore, many of the photo targets were repeat visits by the same individual cats passing by shearing sheds and other infrastructure and individuals passing Felixer units would have been targeted approximately every second occasion. Kittens were recorded at two sites with none photo targeted, consistent with advice from Thylation.

Eight native mammals and 18 native birds were recorded passing Felixer units. These included woylies, chuditch, common bronzewing pigeons, numbats, brush wallaby, short-beaked echidna, red-capped parrots and rufous treecreepers. During this trial, two species were completely new to Felixer trials in Australia (non-native Indian peafowl and native rufous treecreeper). No native species were incorrectly recorded as photo targets.

Felixer units were purposely trialled in the presence of companion animals present on farms, including domestic dogs, sheep, peafowl, as well as humans and vehicles. None of these were considered targets by the Felixer units, except for eight lambs (8/683 = 1.2%). All sheep photo targets were lambs, from the pilot study purposely set in a location with lambs present and moving through. These targets were in the majority in

the long distance range at 351 to 400cm with two targets in the 201 to 250 cm and 251 to 300cm range. No other species were incorrectly recorded as photo targets.

Ten of the photo targets of cats were blocked by Bluetooth tags added to collars of two domestic (i.e. owned) cats as part of a field trial at one property. The unit was blocked 100% of the time when cats were wearing the bluetooth tags when identified as targets, example shown in Figure 9. No domestic dogs were identified as targets with or without the Bluetooth blocking tags. One cat lost its Bluetooth tag with its collar during the trials.

4 Discussion

A surprising number of cats were detected, especially in areas with access to additional resources, with 36-70 individual cats passed Felixer units during this trial. Farms appear to be supporting high densities of cats that are likely to be travelling into Dryandra and predating on native animals. Setting Felixer units close to farm infrastructure (sheds, woolsheds, water sources etc.) was found to be an effective method of targeting multiple individual cats in the area and is recommended for future deployments when on private property. The Felixer trialled on a game trail on a vegetated corridor was shown to have potential to target feral cats, with a high target rate, showing this could be an option for future deployments, even on a rotational basis.

Many landholders attest that keeping cats around farm infrastructure helps to control rodents, however this is generally not an effective long term approach. Rodents have a large reproductive capacity and can outbreed predation. Furthermore, cats switch between prey type which increases the nutritional broadness of their diet and helps cats to survive where their prey is seasonal (Crawford et al. 2019). Although feral cats are ineffective at controlling rodents, there are a number of innovative and effective options available to control rodents around hay and grain storage sheds.

Across all sites, cats were considered targets on a total of 347 of the 826 occasions (42.0%). This appears low due in part to the "conservative" settings on the Felixers, whereby more movement and lidar requirements must be satisfied for the units to consider an individual a target. Improvements in the setup of units (e.g. channelling animals past the unit rather than approaching at an angle, aiming to maximise targets by setting at a 50-200cm distance) and in Felixer technology via trials such as these will improve the categorisation data. Many of these were repeat passes by the same individual cats, so if the Felixers were operational, cats would have been targeted every second time passing Felixer units. Shifting from conservative mode, this rate is likely to increase.
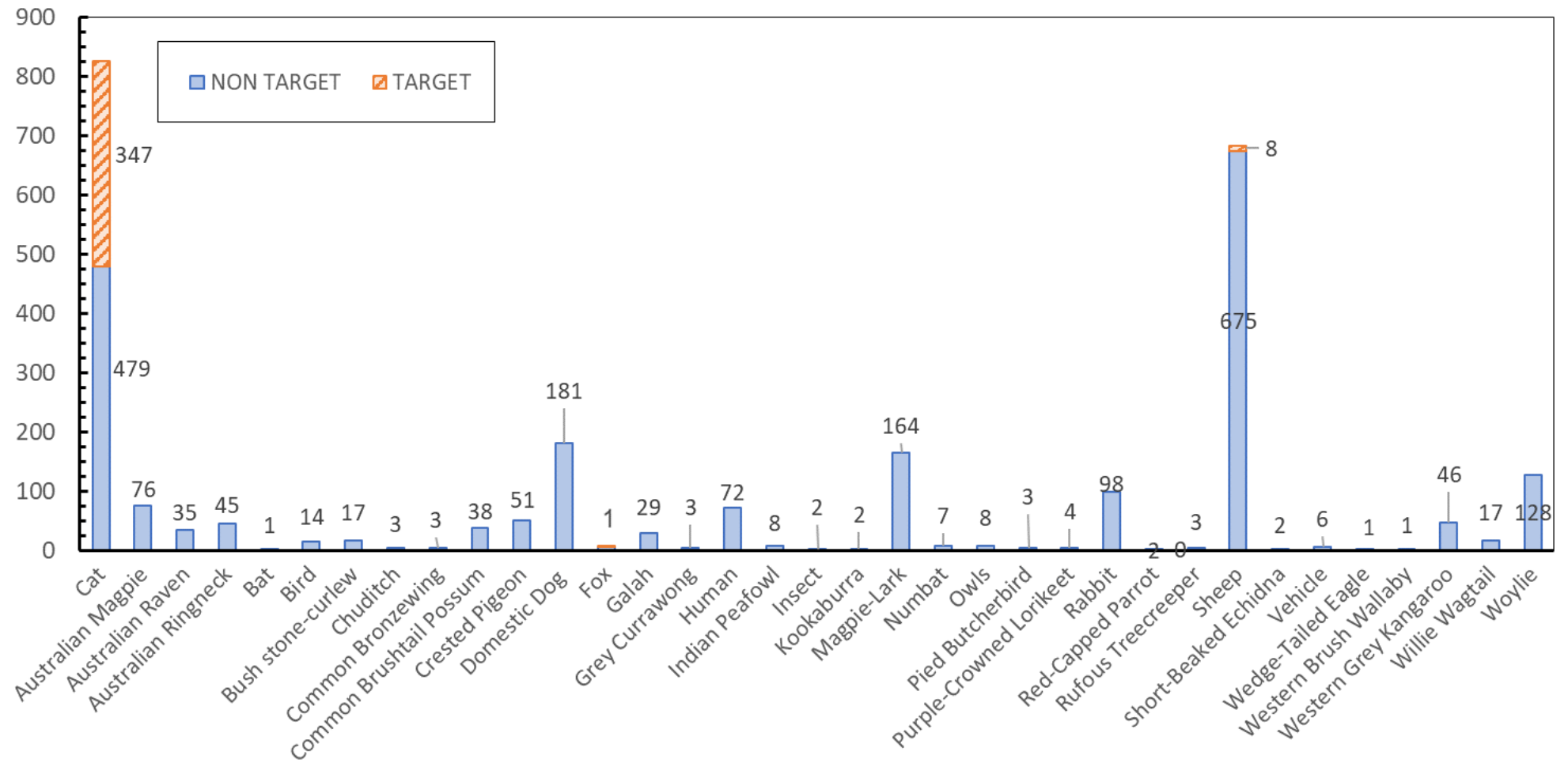
Figure 4. All detections of species from Felixers across all sites within Dryandra Woodland National Park and on the surrounding farms. A total of 2585 detections across 35 categories were assessed. Only cats, foxes and eight lambs were considered targets

Figure 6. Angle of approach by a feral cat influences whether or not it satisfies the criteria to be moving as expected for a feral cat, and therefore whether the Felixer unit considers it to be a target. Left: target photo, right: non-target photo.
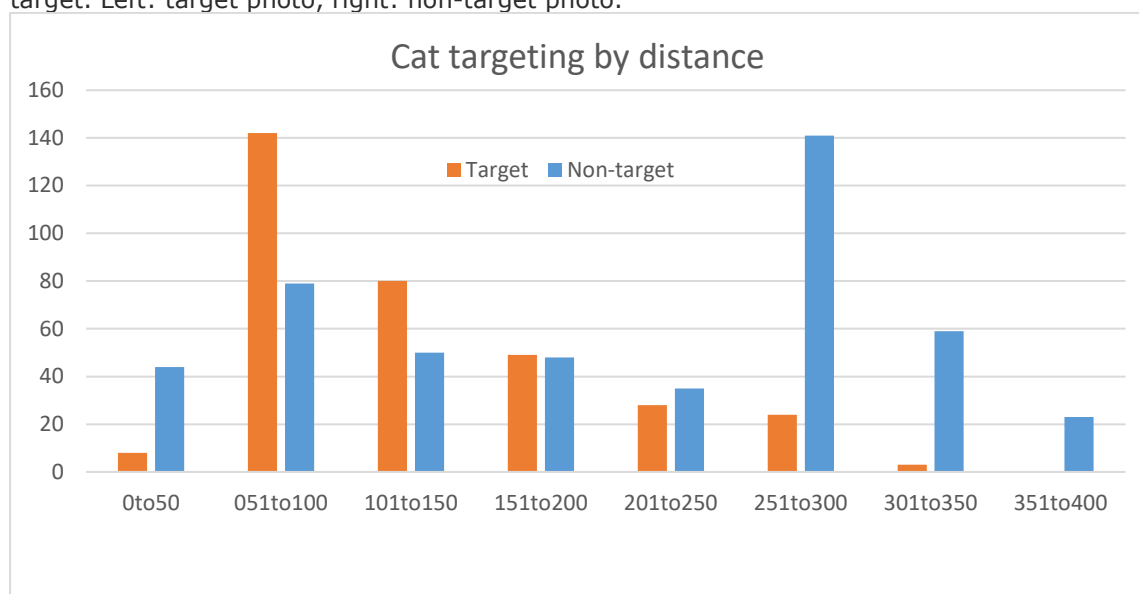

Figure 7. Cat photo targeting analysed by distance of cat to Felixer, with triggers shown on y axis and distance (cm) on x axis, day and night triggers combined.

Figure 8. A group of four cats pass a Felixer unit set on a farm property.

Triggered at: 5th Jan 2023, 08:51:52 PM Trigger: TARGET_PHOTO_BLOCKED

Serial Number: SP030239

Figure 9. Domestic cat photo targeted but blocked by blue tooth blocking tag, visible in the image.

There were some triggers from lambs, but not adult sheep. This finding is consistent with results from similar trials in Kangaroo Island, and provides local supporting evidence that units need to be deployed strategically either spatially or temporally to avoid risk to lambs, for example in a fenced exclusion area, within fenced windbreaks or habitat reserves, or at a time of year when lambs are not present. No other species were incorrectly recorded as photo targets. No dogs were considered targets at any location (181 occasions).

Other native species including an array of birds, bats, brushtail possums, numbats, chuditch, woylie, brush tail wallaby and echidna were never considered to be targets. Based on this and other studies assessing native Australian wildlife, Felixers are considered to be safe for use in toxic mode in the presence of species present in the WA wheatbelt as well as more broadly in southwest WA (Chambers et al., 2020; Moseby et al., 2020; Read et al., 2019). As a precautionary approach and to inform risk assessments for approvals, it is recommended that any use of units in non-conservative toxic mode be contingent of a minimum 4 week non-conservative photo only ie. safe mode as per current APVMA guidelines and requirements of risk assessments.

Results of field trials of Bluetooth pet tags on a range of dog shapes and types as well as domestic cats showed that the tags have high potential for effective blocking of the Felixers for domestic dogs and cats. For domestic dogs, blue tooth tags provide an additional level of risk reduction to an already low risk, as identified in this study.

Due to the risk of blue tooth tags to be lost with domestic cats, in addition to the welfare and wildlife protection benefits, it is highly recommended owned cats be contained in suitable enclosures.

Felixers provide an additional tool in the feral cat control toolbox, and may offer a lower intensity option for keeping cat numbers low in addition to targeted shooting. If the control effort by landowners and professional contractor lapsed or reduced in a particular location, deploying Felixers may have a significant role in suppressing feral cats through greater detections and targets with higher abundance of cats present, making it also more cost effective. As well as feral cats, foxes were detected on Felixers and trail cameras with a small percentage of photo targets, suggesting the units may provide some level of control for foxes also. Further research to help determine the effectiveness and application of the technology is recommended, particularly into including fox and feral cat re-invasion rates with toxic trials, as well as trialling at other sites such as tip transfer stations.

Monitoring via trail cameras during Felixer deployment provided insight into the potential number of individual cats at each site, other species that were present, and the nuances of Felixer behaviour. This monitoring revealed greater abundance of feral cats than expected, even with existing control being implemented. The lack of threatened fauna detections on all private properties surveyed, non-baited conservation reserves and in the majority of corridors surveyed reflect the high predation pressure in the areas between and within non-baited blocks of Dryandra. This has major implications for the natural dispersal particularly of critical weight range mammals such as numbat, woylie and chuditch.

In the future, it is recommended that camera surveys be undertaken at least two weeks prior to Felixer deployment, as well as during operation to help determine the best placement of Felixers and the density, distribution and re-invasion rates of feral cats at locations such as sheds, other infrastructure and water points. An array of long term deployed trail cameras in strategic locations would also help identify where control of feral cats through Felixers and other methods may be required.

The use of Felixers around Dryandra is a similar application of the technology in a mixed rural, agricultural and bushland situation to that being used on Kangaroo Island's Dudley Peninsula, as part of the Kangaroo Island eradication project. The target specificity (97.5% correctly targeting cats) of Felixers make them an appealing choice compared to other methods such as baiting or trapping. Prior studies have shown that bait availability to cats is low in areas with many native species, as baits are taken by a

wide variety of species before a cat encounters them (Dundas et al., 2014). Cage trapping may only be effective for some individual cats, and may never capture wary cats or very effective hunters (Moseby et al., 2015). It is likely that an array of different tools is the most effective method of reducing cat densities.

5 Recommendations

- Felixers offer an additional target-specific tool to assist with managing feral cats around important fauna reserves and within corridors, subject to landowner/manager willingness;
- Monitoring via trail cameras is recommended prior to Felixer deployment to help determine the density and movement of feral cats. Good locations include shedding, hay storage, tracks, tips and water points;
- Lambs are at risk of being targeted (1.4% or 8 of 683 triggers) therefore it is recommended to use Felixers outside of times when lambs are present, or, using Felixers in a location where lambs are securely fenced away from the units;
- Setting Felixer units close to farm infrastructure (Shedding, woolsheds, water sources etc) is an effective method of targeting multiple individual cats in the area and is recommended for future deployments when on private property;
- Further research to help determine the effectiveness and application of the technology, particularly into including fox and feral cat re-invasion rates with toxic trials, as well as trialling at other sites such as tip transfer stations;
- Continued use of artificial lawn as a splashguard, blocking areas adjacent to the units if used in infrastructure areas and development of a catalogue of individual cats at each site based on trail camera data to determine approximate numbers of cats targeted. Clearing a flat earth runway at 2.5m perpendicular to the device has been proven to aid detection rates, so should be used where possible, along with audio lures built into the Felixer units; and
- Although shown to be low risk of Felixers deeming dogs to be targets, Bluetooth blocking tags are recommended for use where landowners have domestic dogs that may access any areas with Felixers in toxic mode to further reduce risks. While allowing roaming of owned cats in the Dryandra region is not supported, tags for owned cats contained or uncontained are recommend where Felixers are used in toxic mode to provide safe guards.

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7 Appendices

7.1 Felixer triggers

Felixers correctly identified all native species as non-targets. Photo examples that Felixer units classified as non-targets (from top to bottom – brushtail possums, owl, human, magpie lark).

Triggered at: 4th Mar 2023, 11:37:14 PM   **Trigger:** RIGHT
Serial Number: SP030239   **Distance:** 144cm

Triggered at: 10th Nov 2022, 02:25:55 AM   **Trigger:** TOP

Triggered at: 9th Nov 2022, 01:52:13 PM   **Trigger:** TOP

7.2 Trail camera triggers

Selection of trail camera images from surveys.

Table 1. All occasions of animals passing Felixer units across all sites in and around Dryandra Woodland National Park.

Category	Non-target	Target	Grand Total
Cat	479	347	826
Australian Magpie	76	0	76
Australian Raven	35	0	35
Australian Ringneck	45	0	45
Bat	1	0	1
Bird	14	0	14
Bush stone-curlew	17	0	17
Chuditch	3	0	3
Common Bronzewing	3	0	3
Common Brushtail Possum	38	0	38
Crested Pigeon	51	0	51
Domestic Dog	181	0	181
Fox	5	1	6
Galah	29	0	29
Grey Currawong	3	0	3
Human	72	0	72
Indian Peafowl	8	0	8
Insect	2	0	2
Kookaburra	2	0	2
Magpie-Lark	164	0	164
Numbat	7	0	7
Owls	8	0	8
Pied Butcherbird	3	0	3
Purple-Crowned Lorikeet	4	0	4
Rabbit	98	0	98
Red-Capped Parrot	2	0	2
Rufous Treecreeper	3	0	3
Sheep	675	8	683
Short-Beaked Echidna	2	0	2
Vehicle	6	0	6
Wedge-Tailed Eagle	1	0	1
Western Brush Wallaby	1	0	1
Western Grey Kangaroo	46	0	46
Willie Wagtail	17	0	17
Woylie	128	0	128
Grand Total	2229	356	2585